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Empirical Studies on the European Economic Integration.

An Approach Based on Sraffian Schemes and Subsystems.

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Introduction

The order in which the keywords enter into the title suggests that this is mainly a work on empirical issues related to the European process of economic integration, while the methodology chosen for the investigation, the use of Sraffian Schemes and subsystems, is somehow secondary. Nevertheless, the Sraffian Schemes and the notion of subsystems are at the very core of the articles presented here.

Indeed, at the beginning of the research, the aim was mainly to investigate the potential application of Sraffian subsystems, and specifically to apply them to the study of alternative allocation of resources. As it is reported in most of the following chapters, a subsystem has been defined by Sraffa as a "smaller self-replacing system the net product of which consists of only one kind of commodity" Sraffa (1960, p. 105).

The net product of a Sraffian scheme is a vector of physical goods[1], which are destined to the final demand.

The industries of an economic system are strictly interconnected among them. This is well represented by Sraffian Schemes, which are Leontief-type Input-Output tables expressed in real terms with the vector of the employed labour relative to each industry. Therefore, when the production of a specific good is increased (or decreased) it is not just the related industry that has to increase (or decrease) the inputs used. All the industries that provide the inputs are affected, and hence all the industries providing the inputs for the other inputs are in turn affected and so on.

The notion of subsystem allows to keep track of the overall changes implied in the variation of the net product of a specific good. The notion of subsystem is very useful in order to study how an economic system would change when shifting one specific resource, for example labour, from one sector to the other. The study of subsystem is useful for the evaluation of alternative allocations of resources inside an economic system and, hence, alternative specialization patterns.

[1]Throughout this thesis the term "physical" is to be associated with the notion of actual physical goods and services. It has been decided to use the term "physical" to mean a commodity which is measurable in "real" terms as opposed to its exchange value.

Partly thanks to Samuelson, from the beginning of the work that led to this dissertation it became clear that subsystems would be a powerful way to study Comparative Advantages in the framework of Sraffian Schemes or, as Samuelson puts it, in "the realistic Sraffa scenario" (Samuelson, 2001, p. 1206).

The idea to focus the attention on Europe was also somehow in the air from the very beginning of my PhD research work. This choice is strictly related to the specificity of the approach adopted. Studying specialization processes and Comparative Advantages from the point of view taken here means also to study how well the countries considered are integrated. That is to say, it means to study if a group of countries succeeded in specializing in an efficient way, so that there is little scope for increasing production and hence consumption through alternative allocation of resources—see Chapter 1.

While this question may be interesting for whichever group of countries, a specialization process of this kind is theoretically feasible just when the institutional framework is favorable to such an outcome. Specifically, a fundamental condition is the absence of barriers to trade or of other protectionist measures among the countries considered. Given data availability and the power of the European common institutions, Europe seemed a privileged case for this kind of study.

The papers presented in this thesis are not typical of the traditional literature on Sraffa. The declared objective of (Sraffa, 1960, p. vii) was to lay the foundations for a critique of the marginal theory. Although he used a framework close to the one of Leontief (1951), based on the classical representation of the economy as a circular flow, their interests were different since Sraffa's analysis was much more focused on theoretical analysis than on applying the Input-Output framework for practical problems (Kurz and Salvadori, 2006).

Subsequent literature on Sraffa's work keep elaborating theoretically on his main insights, for example providing an interpretation of his work in terms of long-term equilibrium or analyzing the implications for marginalist theory of Sraffa's main propositions, a task that Sraffa had left open—for the legacy of Sraffa's work see Kurz (2000) and Aspromourgos (2004).

Empirical applications of Sraffian Schemes are rare. Gossling (1972) applied the notion of subsystems for analyzing productivity trends in the U.S., but much empirical researches on topics related to Sraffa are much more recent, as for example those of Shaikh (1988), Velupillai and Zambelli (1993), Han and Shefold (2006), Degasperi and Fredholn (2010), Zambelli and Fredholn (2010), Mariolis and Tsoulfidis (2011), Shaikh (2012), Schefold (2013), Zambelli et al. (2014), Zambelli (2017).

Some of them are inspired by Sraffa's work in order to provide new measures of productivity and technological progress—Degasperi and Fredholn (2010), Zambelli and Fredholn (2010) and Zambelli et al. (2014). Others—Han and Shefold (2006) and Zambelli (2017)—use empirical methods to address the "capital controversy" or "two Cambridges debate", a debate originated from Sraffa's contribution and focused basically on the realism of the neo-classical assumptions about the form of the aggregate production function.

As explained by Zambelli (2017), the debate remained without a clear answer also because of the lack of empirical investigations on the topic, a problem that the author disentangles thanks to modern computing techniques, specifically devised algorithms and a fairly wide databank on Input-Output tables—the World Input-Output Database (Timmer et al., 2015), the same which is used here.

The spirit of this thesis is similar to the one of Zambelli (2017). In the first two Chapters of this thesis the main aim is to check whether a well-known theory, namely the theory of Comparative Advantages, is compatible with the available data. Empirical Input-Output tables and computing techniques are coupled with Sraffa's insights in order to check the tenability of specific economic theories.

In the third Chapter it is shown that a similar methodology can be applied in order to deal with a very practical problem, that is to say how to limit greenhouse gases emission—a maybe unexpected consequence of studying specialization processes through the lenses of Sraffian Schemes.

Even if the topic and the approach of this thesis may seem far from the great part of the Sraffian literature, some of Sraffa's theoretical insights may have important implications.

The study of specialization processes with the approach adopted here can be divided in two problems. The first is the productive problem, which is the study of the productive structure of a group of countries to check whether it is compatible with Comparative Advantages or environmental preservation. In order to do this, we construct scenarios of alternative specialization patterns in which Comparative Advantages are exploited and/or CO2 is minimized and we compare the actual situation with these scenarios through the use of specifically devised indexes.

The second is the distributive problem, which is the study of how the overall surplus of a group of countries can be redistributed in order to make a more efficient or CO2-saving specialization pattern convenient for all the countries involved. If this distributive task is left to the market, then it becomes important to understand the mechanism of the formation of prices which, in a Sraffian framework, depends on the distribution of the surplus among wages and profits. As explained in Chapters 1, 2 and 3, this problem is not treated here because it is quite demanding. My hope is that the inclusion of these important Sraffian elements, following the methods used in Zambelli et al. (2014) and Zambelli (2017), in the framework presented here will be done in the future.

The identification of the proper databank has not been an easy task. As explained above, Sraffian Schemes are basically Input-Output tables expressed in real terms. However, this kind of data is rarely available.

The alternative chosen here has been to deflate the original Input-Output tables in order to compute Input-Output tables at constant prices. The original Input-Output tables, at current prices, has been taken from the World Input-Output Database (Timmer et al., 2015), while the deflation procedure has been devised specifically for this series of papers.

This would be a more than acceptable alternative, provided that the proper data and deflators are available. But also this kind of data is not very easy to be found. Moreover, there does not seem to be consensus on the best deflating procedure. The fact that Sraffian Schemes and related subsystems are seldom applied to investigate empirical issues may be somehow due to the lack of data and to the scarcity of evidence on which procedure provides the most reliable results.

Nevertheless, as explained in Chapter 4, different databases have been combined in order to obtain tables as close as possible to Sraffian Schemes. These tables are the basis of all the articles presented in the remaining three core chapters of the dissertation.

A final comment should be dedicated to the algorithmic work behind this thesis. Most part of the research has been devoted to the construction of the appropriate algorithms for the many different problems tackled in the following chapters. For each chapter there is a set of algorithms that my supervisor and/or myself have written with the software Matlab.

There has been an effort to construct specific algorithms for most of the main objectives of this thesis. It can be asserted that the construction of these algorithms has been part of the study of the problem.

The underlying algorithmic contents are almost hidden in the following chapters. The description of the algorithms used is for the most part relegated to the appendices. Moreover, they contain just the fundamental information, trying to convey the key-parts of the algorithms used in the most synthetic and simplest possible way. This is done in the hope that it will facilitate the reading of the thesis, leaving the most technical aspects to specific parts for the interested reader.

Chapter 1 lays the foundations of the first three chapters. The fundamental features of subsystems are provided and an example of their application for the study on Comparative Advantages under the assumption that only final goods can be traded is analyzed. The notion of Net Product Possibility Frontier, which represents a benchmark scenario in which Comparative Advantages are fully exploited, is presented and analyzed. Then, the Net Product Possibility Frontier is computed for a set of European countries, in order to check whether the countries specialized in the sector in which they have Comparative Advantages as assumed by the theory.

In Chapter 2 a fundamental assumptions of Chapter 1, namely that only the final goods are traded while the means of production are not, is relaxed in order to allow free mobility across countries both of final goods and of the means of production. The new scopes in terms of allocation of resources are analyzed and then the new Net Product Possibility Frontier is computed. The conclusions reached in Chapter 1 hold or are strengthened under the new set of assumptions.

Chapter 3 is devoted to the study of the relations between specialization patterns and CO2 emissions. It is shown that exploiting alternative specialization patterns, a group of countries can reduce the CO2 emissions, keeping fixed a given vector of net product. Moreover, the gains from a better exploitation of Comparative Advantages may be combined with the benefits deriving from a lower CO2. The scopes for reducing CO2 and combining such reductions with a higher economic efficiency, due to a better exploitation of Comparative Advantages, are studied in the European context and also for an extended sample of 30 countries.

Chapter 4 deals with the problems related to the deflation of Input-Output tables, which are basically two. The first is the aggregation problems, i.e. the fact that one industry of an Input-Output table generally aggregates many different goods. The second is the nominal values problem, i.e. the fact that Sraffian Schemes are built supposing to have information on real quantities, while Input-Output tables are expressed in nominal terms. The chapter analyzes the possible strategies to deal with these problems and the procedure followed to deflate the Input-Output tables used in this thesis is described.

In the conclusions, the main results of the four chapters are synthetized and some potential further developments of the approach presented here are discussed.

Chapter 1

European Economic Integration and Comparative Advantages

Michele Boglioni and Stefano Zambelli

Abstract

On the basis of a set of Input-Output tables we computed the European Net Product Possibility Frontier ($NPPF$) for the years from 1995 to 2011. During this period, several barriers to trade have been removed, allowing higher levels of trade and regional integration.

Subsequently, we propose a method to check whether the prediction to be derived from Comparative Advantages (CAs) theory, namely a specialization pattern that allows to reach the $NPPF$, is verified.

The results suggest that CAs were not exploited well during the period considered and no positive trend emerged.

The implication of our results is that there is ample scope for a coordinated policy aimed at improving allocation of resources. Further research on this topic seems to be necessary.

Introduction

In this paper we compute the n-commodities Net Product Possibility Frontier ($NPPF$)—a sort of production possibility frontier built on the concept of net product—of a set of European countries. Subsequently, we determine the Comparative Advantages (CAs) of each European country involved, and we verify whether European countries have a productive structure that is consistent with the specialization implied by CAs.

National production systems are highly interconnected—i.e. produced goods are used as final consumption goods as well as means of production—and this fact is well-encapsulated in the available Input-Output tables. This implies that for each sectoral production we have to consider the contributions of both direct and indirect labour. The totality of labour involved in the production of the individual industry surplus—i.e. the individual commodity net product—can be computed through the Sraffa-Gossling-Pasinetti notion of subsystem (Sraffa, 1960; Gossling, 1972; Pasinetti, 1989).

Once the total production system is described in terms of Sraffian Schemes or Leontief Input-Output tables, a subsystem for the production of good i is defined as the part of the total system, considering the interindustry production of the means of production, which is necessary for the exclusive production of the social or national surplus of commodity i.

As it is well known—see Gossling (1972, pp.26-27)—the sum of all the subsystems is equal to the total system. This property allows the use of Input-Output tables in order to investigate n-dimensional Net Product Possibility Frontiers, i.e. $NPPF$ for many goods and many countries.

Samuelson (2001) admitted that the insertion of means of production (or intermediate goods) renders the economic scenario to study CAs more realistic. He named these scenarios "the realistic Sraffa scenario" (Samuelson, 2001, p. 1206). This paper is the first of a series of papers aiming to set up a framework that allows the study of CAs for the case of many different virtual scenarios such as:

1. free trade and mobility of final goods, but no mobility of workers—i.e. workers don't migrate;
2. free trade and mobility of final goods and of the means of production and/or workers;
3. free transfers of the knowledge of production techniques, free trade and mobility of the final goods and means of production.

In this paper we construct the $NPPF$ associated with the first case above and leave the other two cases to subsequent works.

The data used for the computation of the $NPPF$ is the World Input Output Database (WIOD) and covers the period 1995-2011 (Timmer et al., 2015). We assume that each sector present in each Input-Output table is a method of production specific to the individual countries. As will be explained below, the European $NPPF$ is the set of those vectors of surplus that efficiently exploit a given amount of resources. Therefore, all the points below the European $NPPF$ are inefficient points, i.e. points in which the net product is lower than the one reachable when CAs are properly exploited. In the case that inefficiency has been found or demonstrated, feasible alternative vectors of net product where CAs would have been exploited are studied.

We have refined our investigation with the computation of an Inefficient Frontier (IF). An IF is a set of possible net products obtainable when resources are allocated at the European level in the worst possible way. It could be asserted that the IF represents the case in which there is specialization, but this specialization is totally inefficient.

These computations are performed through a specifically designed algorithm. We compute not only the achievable efficiency improving (or efficiency worsening in the case of the IF) vectors of production, but also how the economy of each country would have to be restructured in order to reach these efficient $NPPF$-points or the inefficient IF-points.

In this paper we verify whether CAs-compatible specialization processes occurred. This being the case there would be no scope for efficiency-improving policies.

We have found that the CAs did not emerge. This is evidence that a scope for efficiency-improving policies may exist, but further and more detailed research on this matter would be needed.

This paper is structured in four sections. In Section 1.1 the notion and the properties of subsytems are discussed. In Section 1.2 it is explained how to use these subsystems to construct the n-dimensional Net Product Possibility Frontiers and Inefficiency Frontiers. In Section 1.3 the data bank used for the empirical section is discussed, along with an example of European $NPPF$s and some remarks about the assumptions implied in its construction. In Section 1.4 the n-dimensional $NPPF$ is used to analyze three things: a) potential gains from specialization; b) the evolution of European markets with respect to their frontier; c) the pattern of specialization needed to reach the gains. The paper is concluded with a summary of the results obtained.

1.1 Definition and properties of subsystems

The notion of subsystem was introduced by Sraffa in the first appendix of his work *Production of Commodities by Means of Commodities* as a "smaller self-replacing system the net product of which consists of only one kind of commodity" Sraffa (1960, p. 105). Gossling explained how to compute it in an iterative way and used it for the analysis of productive trends in the USA Gossling (1972)[1].

Suppose a start from the following representation of a national economic system

$$\mathbf{A}, \mathbf{l} \mapsto \mathbf{b} \tag{1.1.1}$$

where $\mathbf{A}$ is the $n \times n$ input matrix, $\mathbf{l}$ is the $n \times 1$ labour vector and $\mathbf{b}$ is the $n \times 1$ gross product vector. In other words, matrix $\mathbf{A}$ and vector $\mathbf{l}$ represents the inputs of the n production processes that are carried out in the economic system, while $\mathbf{b}$ is a vector representing the gross output of each of these production processes.

Each row i of matrix $\mathbf{A}$, $[a_{i1}, a_{i2}, \ldots, a_{in}]$, represents the means of production used by industry i for the production of the total gross industry output b_i. And l_i is the amount of labour used.

The column j of matrix $\mathbf{A}$, $[a_{1j}, a_{2j}, \ldots, a_{nj}]'$, represents the means of production produced by industry j and used for the production for the output by all the industries $i = 1, 2, \ldots, n$.

If we subtract from vector $\mathbf{b}$ the sum—by column—of the inputs of production described by $\mathbf{A}$ we obtain what is called surplus, or net national product and it is often represented by the $n \times 1$ vector $\mathbf{y}$—see (Pasinetti, 1989, p. 79) and (Kurz and Salvadori, 1995, p. 168).

Formally

$$\mathbf{y} = (diag(\mathbf{b}) - \mathbf{A})'\boldsymbol{\iota} \tag{1.1.2}$$

where $diag(\mathbf{b})$ is a diagonal matrix with the gross output vector $\mathbf{b}$ on its main diagonal and $\boldsymbol{\iota}$ is the summation vector—i.e., all entries are equal to 1.

In this context $\mathbf{y} = [y_1, ..., y_n]'$ is a vector of physical quantities, which expresses how much of each good goes to the final demand and is used for consumption, investment or exports. If these goods are aggregated in a unique measure through the means of current market prices, we obtain what is commonly known as Gross Domestic Product.

[1]The concept of *vertically integrated sector*, as in the definition of Pasinetti (1989, pp. 369-376), is similar to the concept of subsystems. See also (Kurz and Salvadori, 1995, pp. 168-169).

Each row i of matrix $\mathbf{A}$, and the associated elements i of $\mathbf{l}$ and of $\mathbf{b}$ represents a method of production.

In order to compute a subsystem—see Gossling (1972)—each row of $\mathbf{A}$, as well as the relative amount of labour and gross output, must be reproportioned in such a way that each component of the net output vector is 0, except for the commodity in which we are interested. Denote with $\bar{\mathbf{y}}_i$ the vector $[0, ..., y_i, ..., 0]'$, where i identify the sector. In order to find a subsystem, we have to compute a reproportioning vector $\mathbf{x}_i$ such that

$$(diag(\mathbf{b}) - \mathbf{A})'\mathbf{x}_i = \bar{\mathbf{y}}_i \tag{1.1.3}$$

from which we have

$$\mathbf{x}_i = ((diag(\mathbf{b}) - \mathbf{A})')^{-1}\bar{\mathbf{y}}_i \tag{1.1.4}$$

Then a subsystem is given by the triple[2]

$$\begin{aligned} \boldsymbol{A}_i &= diag(\mathbf{x}_i)\mathbf{A} \\ \boldsymbol{l}_i &= diag(\mathbf{x}_i)\mathbf{l} \\ \boldsymbol{b}_i &= diag(\mathbf{x}_i)\mathbf{b} \end{aligned} \tag{1.1.5}$$

so that, for convenience, we can define a subsystem $\boldsymbol{S}_i$ as

$$\boldsymbol{S}_i = [\boldsymbol{A}_i | \boldsymbol{l}_i | \boldsymbol{b}_i] \tag{1.1.6}$$

As stressed by Gossling (1972), subsystems have two important properties:

1. the sum of the subsystems is equal to the original system, that is to say
$$\sum_{i=1}^{n} \boldsymbol{S}_i = [\mathbf{A} | \mathbf{l} | \mathbf{b}] \tag{1.1.7}$$

2. the alteration of one subsystem affects just the final output of the commodity relative to the subsystem modified, but not the other elements of the net output vector.

As explained below, these two properties make subsystems an instrument particularly suited for the construction of a Global or European Net Product Possibility Frontier.

[2] A *vertically integrated sector*, as in the definition of Pasinetti (1989, p.375), is just the vector obtained summing up the rows of a matrix $\boldsymbol{A}_i$—see equation 1.5—, divided by a constant.

1.2 The construction of a Net Product Possibility Frontier

The Net Product Possibility Frontier, abbreviated as $NPPF$, is the benchmark on which the subsequent analysis is based.

In the standard textbook exposition of the Ricardian theory we find that the explanation of the Production Possibility Frontier (PPF) is limited to the two countries case. It is important to stress that in most textbooks the only input of production is labour (i.e capital is not considered). Hence there is no difference between gross and net output. Or said in other words all the production is production of final goods. Moreover, this implies that the only labour involved in the production of, say, cloth, is just the labour employed directly in the sector "cloth"[3].

Here concepts similar to those presented in the textbooks are used, but extended to the Input-Output framework in which there are more than two goods. Consequently, the total inputs involved for the production of the net output of a certain good i are the sum of the direct and indirect means of production used, see above the definition of subsystems, eq. 1.1.5. We believe that the definition of the national frontiers is more general with respect to the standard representation because it is directly linked with the computation of the yearly national added value, but is is not exactly the same thing.

As it will be clear below, in the context of this paper we do not compute the aggregate value of production. This would require the computation of prices, which we do not. What we do is to consider the net national product as a vector formed by the social surplus of an economic system. On one hand there is a disadvantage in following this approach because we are bound to work with an n-dimension surplus vector. On the other hand this allows us to avoid the complications associated with aggregation and, most importantly, to keep track of the necessary inter-industrial relations.

In other words, following (Samuelson, 2001, p. 1206), we are working inside "the realistic Sraffa scenario" where we consider the coexistence of many final goods as well as many inputs.

1.2.1 The computation of the autarkic national frontiers

CAs theory is strictly linked to the economic concept of "technology". Here, a "technology" is just a specific combination of the inputs a_{ij} for

[3] In some versions of this theory, it is also showed that it is possible to unify the two $PPFs$ of the two countries in a unique frontier, which may be called simply PPF (Samuelson, 2001) or world transformation frontier (Gandolfo, 2014)

$j = 1, ..., n$ and l_i that gives a specific output b_i. For example, in standard textbook in which labour is considered as the only input, the difference in productivity in sector i between the domestic and the foreign country is supposed to reflect the different technologies used in sector i in the domestic and in the foreign country.

As explained in Section 1.3.1, this is a diffused practice in economic literature, but it may be misleading. For this reason, in this paper we prefer the notion of "method of production" to identify a specific combination of inputs and output. The assumptions made on the methods of production are: a) labour is the only primary resource, so that it cannot be produced but just reallocated ; b) the methods of production are divisible so as to maintain fixed proportions among inputs and outputs, i.e. the relative proportions are independent from the level of activity.

Consider the example of an economic system composed of three sectors represented in Tab. 1.1. The three goods produced are iron, coal and wheat—rows 1, 2 and 3 respectively.

Table 1.1: A hypothetical economic system

Sector	Input			Labour	Gross Output
	Iron	Coal	Wheat		
Iron	2	3	2	2/5	16
Coal	5	4	2	2/5	14
Wheat	6	2	3	1/5	9
Tot	13	9	7	1	/

This economic system can be divided in three subsystems, but before it is convenient to define the augmented subsystem $\boldsymbol{S}_i^*$. If $\boldsymbol{a}_i = \boldsymbol{A}_i \boldsymbol{\iota}$ and $L_i = \boldsymbol{l}_i' \boldsymbol{\iota}$, then

$$\boldsymbol{S}_i^* = \left[\begin{array}{c|c|c} \boldsymbol{A}_i & \boldsymbol{l}_i & \boldsymbol{b}_i \\ \hline \boldsymbol{a}_i' & L_i & / \end{array} \right] \quad (1.2.1)$$

so that in the last row is reported the sum of each input necessary for the production of the gross output vector.

The three augmented subsystems are

$$\boldsymbol{S}_1^* = \begin{array}{ccc|c|c} 0.65 & 0.97 & 0.65 & 0.13 & 5.19 \\ 0.64 & 0.51 & 0.25 & 0.05 & 1.78 \\ 0.90 & 0.30 & 0.45 & 0.03 & 1.36 \\ \hline 2.19 & 1.78 & 1.36 & 0.21 & / \end{array} \quad \boldsymbol{S}_2^* = \begin{array}{ccc|c|c} 0.81 & 1.22 & 0.81 & 0.16 & 6.49 \\ 3.47 & 2.78 & 1.39 & 0.28 & 9.73 \\ 2.20 & 0.73 & 1.10 & 0.07 & 3.30 \\ \hline 6.49 & 4.73 & 3.30 & 0.51 & / \end{array} \quad \boldsymbol{S}_3^* = \begin{array}{ccc|c|c} 0.53 & 0.81 & 0.54 & 0.11 & 4.32 \\ 0.89 & 0.71 & 0.36 & 0.07 & 2.49 \\ 2.90 & 0.97 & 1.45 & 0.10 & 4.34 \\ \hline 4.32 & 2.49 & 2.34 & 0.28 & / \end{array}$$

which if summed up gives back the original system.

Suppose starting from the frontier for iron and coal, and consider $\boldsymbol{S}_1^*$ and $\boldsymbol{S}_2^*$. As can be seen, the total labour employed are, respectively $L_1 = 0.21$ and $L_2 = 0.51$. Hence, the maximum net product of iron when all the labour of the two subsystems is devoted to the production of the net output of iron can be computed using the subsystem $\widehat{\boldsymbol{S}}_1^* = \boldsymbol{S}_1^* \times (0.51 + 0.21)/0.21$ that is to say

$$\widehat{\boldsymbol{S}}_1^* = \boldsymbol{S}_1^* \times (L_1 + L_2)/L_1 = \begin{array}{ccc|c|c} 2.23 & 3.34 & 2.23 & 0.45 & 17.82 \\ 2.19 & 1.75 & 0.88 & 0.18 & 6.13 \\ 3.10 & 1.03 & 1.55 & 0.10 & 4.66 \\ \hline 7.52 & 6.13 & 4.66 & 0.72 & / \end{array} \tag{1.2.2}$$

Subsystem $\widehat{\boldsymbol{S}}_1^*$ shows that the maximum possible surplus of iron, when the surplus of coal is zero, amounts to more or less $\hat{y}_1 \approx 10.3$. It is interesting to analyze the matrix $\widehat{\boldsymbol{S}}_1^* + \boldsymbol{S}_3^*$, which represents the original system once a specialization in iron has happened—and hence the subsystem of coal has been set equal to 0

$$\widehat{\boldsymbol{S}}_1^* + \boldsymbol{S}_3^* = \begin{array}{ccc|c|c} 2.77 & 4.15 & 2.77 & 0.55 & 22.15 \\ 3.08 & 2.46 & 1.23 & 0.25 & 8.62 \\ 6 & 2 & 3 & 0.2 & 9 \\ \hline 11.85 & 8.62 & 7 & 1 & / \end{array} \tag{1.2.3}$$

As can be seen in (1.2.3), the surplus in iron is 10.3, which is equal to the surplus of the subsystem of iron once the surplus of coal is 0. The surplus of wheat is exactly the original one. The sum of labour is also unchanged. This means that, due to the properties of the subsystems stated before, the specialization procedure is a *ceteris paribus* procedure. By shifting the total labour of the two subsystems into one subsystem, we are simulating a rearranging of the production such that the net production of iron reaches its maximum, keeping fixed the level of employment and leaving unaltered all the remaining sectors.

An analogous procedure can be performed to simulate the specialization in coal, which gives $\hat{y}_2 \approx 7.05$. The two points $(0, 7.05)$ and $(10.3, 0)$ represents the intercepts on the axis of the national frontier for the net production of iron and coal, which is illustrated in the northwest orthant of Fig. 1.1.

It is important to note that the the gradient of the frontier does not depend on the quantity of labour involved in the two subsystems. Suppose, for example, that we want to normalize the frontier on the quantity of labour involved. The original gradient g of the frontier is

$$g = \frac{\hat{y}_2 - 0}{0 - \hat{y}_1} = -\frac{\hat{y}_2}{\hat{y}_1} \tag{1.2.4}$$

The maximum production of iron and coal per worker in this case is

$$\hat{y}_1^w = \frac{\hat{y}_1}{(L_1 + L_2)}, \quad \hat{y}_2^w = \frac{\hat{y}_2}{(L_1 + L_2)} \tag{1.2.5}$$

The surpluses should be divided by the sum of workers in the two subsystems because, coherently with the subsystem approach, all the labour directly and indirectly involved in the production of the respective goods must be considered.

It is easy to see, as shown in (1.2.6), that the gradient of the frontier per worker is the same as the total frontier gradient.

$$-\frac{\hat{y}_2^w}{\hat{y}_1^w} = -\frac{\dfrac{\hat{y}_2}{L_1 + L_2}}{\dfrac{\hat{y}_1}{L_1 + L_2}} = -\frac{\hat{y}_2}{\hat{y}_1} = g \tag{1.2.6}$$

What changes is just the quotient of the frontier q, which has to be rescaled by $L_1 + L_2$. This property has important implications for the analysis of specialization processes.

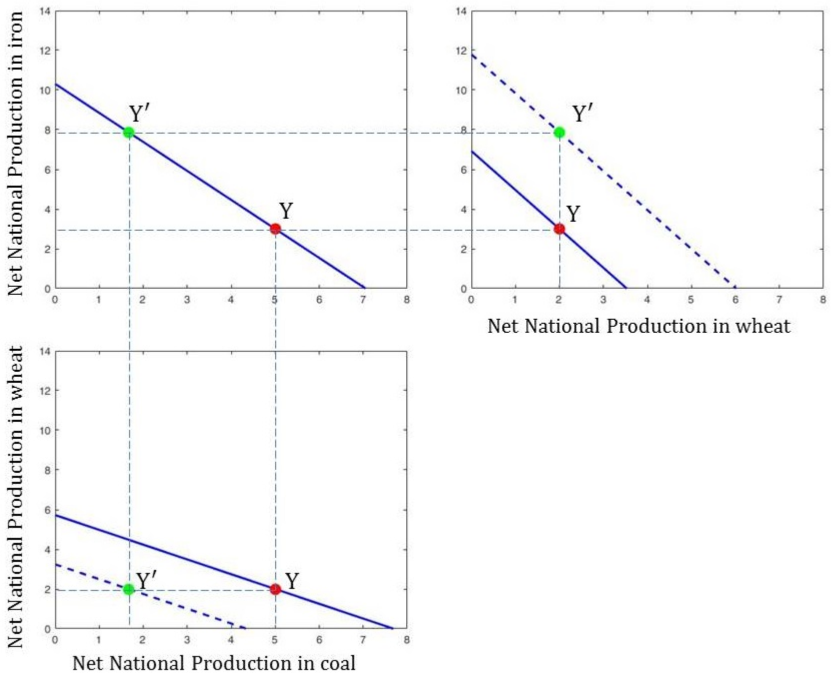
Suppose the case of a partial specialization in iron at the expense of the net output in coal. The changes from the point of view of the single subsystems are summarized in Fig. 1.1.

The net output in iron and coal shifts from point Y to point Y' of the graph on the northwest part. This implies that the total labour increases in the iron subsystem but decreases in the coal subsystem. As a consequence, the wheat-iron frontier shifts outwards—graph on the northeast—while the coal-wheat frontier shifts inwards—graph on the southwest. For the property summarized in eq. 1.2.6, the new frontiers are parallel to the original ones. Moreover, the figure highlights the fact that the net output in wheat is fixed at the original level.

It is important to note that a specialization process of this kind does not alter the net output of other sectors, but it does alter the domain of all the frontiers in which the two subsystems are involved—except for the frontier relative to the two sectors considered. They contract or expand according to the contraction or expansion of the subsystems.

It should be kept in mind that we are working with subsystems. Moving from Y to Y' means that all the inputs used in the production of iron and coal—labour and capital goods—are increased or reduced in a specialization process. The richness of using Sraffa-Gossling subsystems is

Figure 1.1: Specialization in the iron sector. The three graphs show the national frontiers relative to the hypothetical system described in Tab. 1.1, and the consequences of a specialization in the iron sector.



the fact that direct and indirect uses of all the means of production are constantly tracked. Labour is only one of these means of production. The difference between labour and the other means of production is that labour is not produced, while the others means of production are. On the one hand, the complexity of industrial interactions is kept, while on the other the analysis is simplified in a rigorous way.

1.2.2 From the autarkic national frontiers to the NPPF for a set of countries

Once a set of national frontiers has been computed for a group of countries, we can study the case in which redistribution of the national surplus among the different countries could take place. The theory on CAs suggests that some of the feasible specialization patterns allow to improve *total* net product, that is the sum of autarkic national net products.

The redistribution mechanism that allows this process to take place is normally assumed to be the market. In a market framework, the existence of patterns of specialization that would allow to produce a higher net product is just one side of the problem, because there is the associated problem of analyzing whether the terms of trade would be consistent with specialization patterns convenient for the single countries.

However, a discussion of this point would imply to analyze the formation of prices and hence the distribution of the net product among wages and profits. An analysis of this kind would require too much space here and it is left for future studies.

Here, we just focus on the assessment of whether for a given set of countries, namely the European countries, there is scope for better specialization so as to allow the achievement of higher levels of the European Net Product. Whether this specialization and the associated redistribution of surplus among the countries should or could take place thanks to international agreements or through the market mechanism (i.e. market prices) is not a matter of this paper. Below we will consider country specializations that are Pareto improving, in the sense that there exists alternative allocations of produced resources such that individual countries could in principle enjoy higher vectors of consumption goods, i.e. higher surplus.

The $NPPF$ is the fundamental construction for this kind of analysis. We explain its meaning and use with the aid of a simple example. The graph on the northwest orthant of Fig. 1.2 shows the $NPPF$ for three countries and two goods: iron and coal. The three segments below the shaded area are the three national frontiers.

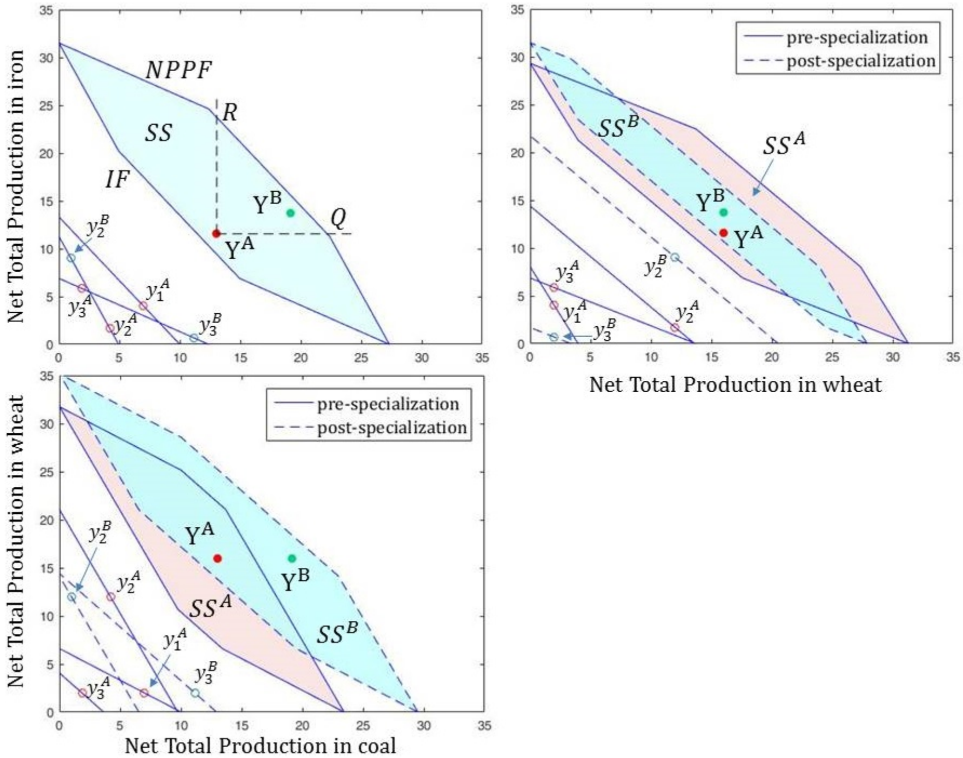
Suppose that, when the system is autarkic, the citizens of each country are satisfied with the surpluses represented by the three dots y_1^A, y_2^A, y_3^A of Fig. 1.2. Any other point along the national frontiers would imply a different vector of net output, which could not clearly dominate the original one, in the sense that in order to improve the net output in one good, countries would have to diminish the net output in the other good. Without inserting specific assumptions on the preferences of the consumers of each country, each point may be as good as any other.

However, if we consider the system as a whole, new possibilities become available. From this perspective, the object of the analysis is the net *total* product, which is the sum of the production of the three countries. In Fig. 1.2, the net total product is represented by point Y^A. For example, if the net product in iron in country c is $y^A_{iron,c}$, the net total product in iron is $Y^A_{iron} = \sum_{c=1}^{3} y^A_{iron,c}$, so that the coordinates of point Y^A are (Y^A_{coal}, Y^A_{iron}).

The $NPPF$ of a group of countries represents the maximum possible net total product in iron Y^A_{iron} for any feasible net total product in coal Y^A_{coal}, given that the amount of labour is fixed. A way to compute it is to order the three national frontiers from the flatter to the steeper[4]. As can be noted,

[4]For an alternative framing of the problem from the point of view of linear program-

Figure 1.2: A three countries, three goods example of $NPPF$. The three graphs show what a specialization process implies from the point of view of the three $NPPF$s that can be constructed when three goods are considered.



point Y^A is considerably far from the $NPPF$. In fact, it is closer to another frontier, IF, which represents the minimum possible net total product in iron Y^A_{iron} for any feasible net total product in coal Y^A_{coal}, keeping fixed the total labour employed. The IF is formed by the same national frontiers that compose the $NPPF$, they are just ordered in the opposite way[5].

All the points inside the area delimited by the IF and the $NPPF$ can be reached with a proper specialization pattern. For this reason, the area delimited by the two frontiers has been called the Specialization Space (SS).

Specifically, all the points inside the triangle $\overline{Y^AQR}$ in the northwest orthant represent Pareto-improving solutions, i.e. feasible vectors of net product, in which the surplus of iron and coal are both higher than in the original vector. This means that, with an appropriate distributive mech-

ming, see Samuelson (1966).

[5]This implies that the assumptions explained at the beginning of Section 1.2.1 are the same for both the frontiers.

anism, the citizens of the three countries could enjoy a higher surplus than the one originally given by the autarkic condition. Therefore, for whichever preferences the citizens of the three countries we consider, if "more is better", as it is generally assumed in economics, the coordinated solution is to be preferred to the autarkic one because it is Pareto improving.

Suppose that country 2 shifts its labour force from coal to iron in order to realize the net product vector represented by point y_2^B, while country 3 shifts its labour in the opposite direction in order to reach the vector y_3^B. Country 1 does not change its net product vector. The new net total product is represented now by point Y^B, which is higher than Y^A with respect to both iron and coal, while the net product in wheat is the original one.

In the original situation, countries 2 and 3 were not exploiting their CA, implying that the net total product of the three countries was close to the IF. The specialization process led each country close to a full specialization in the sector in which it has a CA, increasing the net total product up until a point close to the maximum potentialities of the system considered—i.e. close to the $NPPF$.

According to much of the literature on the CAs, the "invisible hand" associated with trade occurring in free markets should generate a specialization process of this kind, as explained by Samuelson (2001). Each country should specialize in the sector that has a CA in order to move the net total output vector at the outer frontier of the shaded area.

In order to avoid misunderstandings, it is better to stress that this kind of analysis does not imply any evaluation of the efficiency of the methods of production of the single countries. We assume that the the realized methods of production are the ones we derive from Input-Output tables. This does not at all imply that the individual countries are using the best or most efficient technique. For clarifications on the data used for the computation of the international frontiers see Section 1.3.1.

The two additional graphs have been reported to help the reader visualize what this kind of process implies for the overall system when more than two goods are produced. This is important in order to understand the workings of the algorithm used for the computation of the n dimensional frontier—see Section 1.4 and Appendix 1.A.

Suppose that the graph on the northwest is a bidimensional projection of a system in which wheat is produced. The orthants on the northeast and on the southwest describe what this specialization process implies for the wheat-iron and coal-wheat frontiers. Since country 2 increases the quantity of labour in the subsystem of iron at the expense of the subsystem of coal, its wheat-iron frontier shifts outwards (compare point y_2^B with point y_2^A and their relative frontiers of the graph on the northeast orthant). On the other hand, the coal-wheat frontier of country 2 shifts inwards—see graph on the southwest orthant. The national frontiers of country 3 move in the opposite direction. The new frontiers are represented by the dashed lines, which form the new $NPPF$s and IFs that delimit the specialization space SS^B.

1.3 $NPPF$s in Europe

1.3.1 The Data

The Input-Output tables used in this paper have been taken from the World Input-Output Databank (WIOD) (Timmer et al., 2015). The data set provides Input-Ouput tables called WIOTs (World Input-Output Tables) divided in 35 sectors, for 40 countries, from 1995 to 2011. This analysis is focused on European countries, so we extracted data for 17 of them, as reported in Tab. 2.3 at the end of the paper. There are some other European countries in the database which have been excluded because of their relatively small dimensions and the diversity of their structure[6].

The number of sectors has been reduced from 35 to 17. The analysis of the Net Product Possibility Frontier is useful when applied to commodities that can be standardized and exported, while it is less relevant when applied to the services that are intrinsically local[7]. For this reason, the sectors included are those that enters the Standard International Trade Classification of the United Nations. The list of sectors considered and those excluded is reported in Tab. 2.4 at the end of the paper.

Computing $NPPF$s on the basis of real data implies assuming that the available empirical Input-Output tables' data—at constant prices—are equivalent to national industry aggregate methods of production. This also implies that the inputs a_{ij}s for $j = 1, ..., n$ and outputs b_is are considered to be homogeneous across sectors and countries as if they were made of the same *physical substance*.

[6]The countries excluded are: Bulgaria, Cyprus, Latvia, Lithuania, Luxembourg, Malta, Romania.

[7]As explained above, studying the European $NPPF$ implies to suppose that the total European production could be concentrated in some selected countries, and then redistributed among all the countries. While manufactured products can be, and actually are, produced in places that are often far from the consumer, this is not possible for many services, the provision of which depends on the direct relationship between the customer and the provider. This is the case of education, health services, retailing sales, restaurants & hotels, and many other sectors excluded from Tab. 2.4.

It has to be noted that the assumption that I-O tables represent methods of production or technologies is not so rare in the literature— see, for example, Leontief (1985), Han and Shefold (2006), Zambelli and Fredholn (2010), Zambelli et al. (2014), Zambelli (2017) or, in a context closer to this paper, Ten Raa and Mohnen (2001).

The entries of the I-O tables are influenced by many factors different from technology as, for example, the state of the aggregate demand and the business cycle, the price of commodities, the distribution of the value added in wages and profits and the institutional framework. Technology itself may depend on the specific set of prices and on the distribution of the net product among workers and producers—as well as among different producers.

Nevertheless, we work with ex-post realized values, and hence the quantities observed are the result of actual choices. Evaluating the way in which factors other than technology may influence the data would require information unavailable to us.

Another problem in considering I-O tables as expressing aggregate methods of production is that in reality the inputs a_{ij}s and the outputs b_is are formed through the aggregation at market prices of a mix of goods that change from one cell to the other. The problem that market prices are used instead of quantities would not be relevant if relative prices between each good and the general level of prices were sufficiently homogeneous across the countries involved and they would not change in time.

Since prices in reality change across sectors, countries and time, the I-O tables have been properly deflated in order to obtain constant price data. There are at least two ways to do this. The first is the double deflation method and the second is based on the RAS algorithm (Dietzenbacher and Hoen, 1998). As explained by the WIOD research group, the second strategy works better on their I-O tables. They provide most of the time-deflators needed to do it, describe how to obtain the additional data required and explain the steps to be followed to correctly apply a specific version of the RAS algorithm in Los et al. (2014).

The WIOD research group computes previous-year-prices tables, so they are not interested in the variation of prices across countries, which is important from the point of view of this paper. Therefore, their deflators have to be weighted with an index of the level of the sectoral prices of the countries considered. In order to do this, we have used the level of prices provided by the International Comparison Program of the World Bank. For detailed information on the procedure followed here to deflate the I-O Tables see Chapter 4.

However, this deflation procedure cannot solve the problem that we are working with aggregate industries. Problems of this kind are pervasive in economics. Empirical economists have no choice but working with aggregate measures and index numbers. Without knowing the quantity and the prices of the goods involved in determining the cells of the I-O, or without having finely disaggregated tables, this problem cannot be solved.

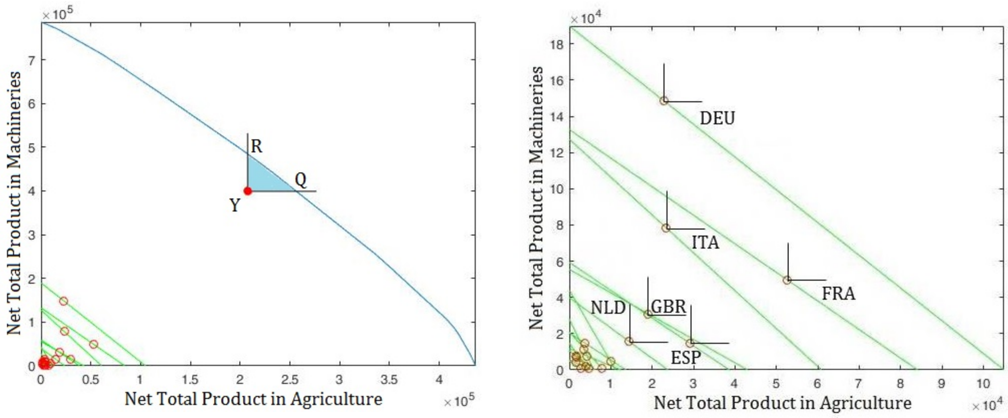
1.3.2 An European Net Product Possibility Frontier

An example of European $NPPF$ is reported in Fig. 1.3a. It represents the frontier of the production in "Agriculture, Hunting, Foresting and Fishing"—Sector 1 of Tab. 1.4— and "Machinery, Nec"—Sector 13—in 2002. The segments below the European frontier represent the national frontiers that form the $NPPF$, while the circles on the segments identify the observed national productions.

Figure 1.3: An example of Net Product Possibility Frontier in Europe

(a) The European $NPPF$ for Agriculture and Machineries in 2002

(b) The national frontiers composing the European Agriculture-Machineries $NPPF$ reported in Fig. 1.3a



Point Y represents the total production of the sample and is not on the frontier, which means that countries are not exploiting their CAs in the two sectors considered here. The area $\overline{YQR}$ is the set of the Pareto-improving Net Total Product. The points at the frontier between Q and R represent the highest possible combinations of machineries and agricultural commodities inside this set, the efficiency improving set for the production of these two goods in 2002.

As explained below, the algorithm for the computation of the the n-dimensional $NPPF$ searches for efficiency improving vectors in an n-dimensional area which is analogous to the $\overline{YQR}$ triangle in Fig. 1.3a. Specifically, we search for alternative allocations of resources that allow improvement to the net product in all the sectors considered by the same ratio. In Fig. 1.3b, the segments of the national frontiers have been highlighted in order to stress the fact that the new net total product allows shifting of the net national product points—the circles—inside the respective triangles. In other words, an efficient productive pattern allows, at least in principle, improvements to the consumption of all the countries in all the sectors.

Two important features of this approach must be stressed. The first is that, in this study, no assumption is made about unused resources. Computing the $NPPF$s relative to a given quantity of labour does not imply assuming that Europe was on a full-employment equilibrium. The perspective adopted here is simply different: it is a problem of allocative efficiency, not of economic growth and full employment.

The second is that studying different allocations of labour does not mean that we reduce all the inputs to labour. As explained in Section 1.2, working with subsystems means that each time labour is reallocated, *all* the other inputs are adjusted so as to keep the original proportions in which they enter into the production function of each sector. Substitution between labour and the physical means of production is here not possible, and we do not resort to a reduction of all the inputs to the embodied labour they contain.

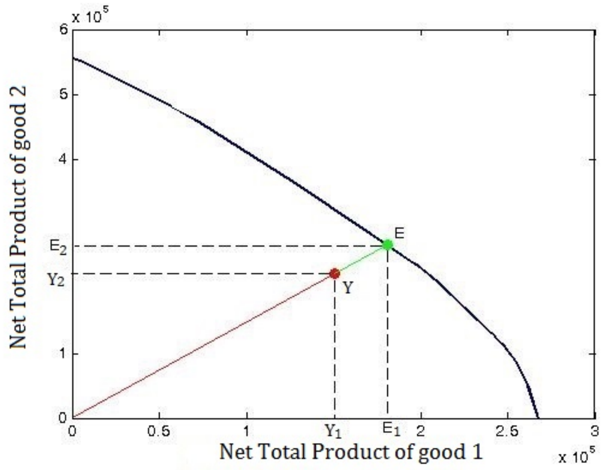
1.4 The n-dimensional $NPPF$

In order to evaluate how far European countries were from the n-dimensional $NPPF$, it is useful to determine a point on the n-dimensional $NPPF$ that allows a simple measure of the distance between the actual vector of Net Total Product and the efficient one.

The algorithm that finds the point in the n-dimensional case is explained in Appendix 1.A, but the basic idea can be described in the two-dimensional case. Among the set $\overline{YQR}$ of Fig. 1.3, there is a special subset for which the surplus of both goods increases by the same proportion. In Fig. 1.4 this set is formed by the points lying on the segment $\overline{YE}$, which lies on the ray passing through the origin and the historically observed production point Y.

A point on the straight segment $\overline{YE}$ is a feasible higher surplus where the proportions between the goods do not change in the aggregate. This is a situation where a higher level of consumption is achievable after specialization, but could not be achieved in the autarkic case.

Figure 1.4: The efficient point of production and the gains from specialization. Point E represents which could be the net product if countries exploited fully their CAs, while Y represents the historical net product. Segment $\overline{EY}$ represents how much it could be gained through a proper specialization.



Using the notation of Fig. 1.4, the ratio GS, where GS stands for gains from specialization, can be defined as in (1.4.1).

$$GS = \frac{\overline{Y_2 E_2}}{\overline{0Y_2}} = \frac{\overline{Y_1 E_1}}{\overline{0Y_1}} \tag{1.4.1}$$

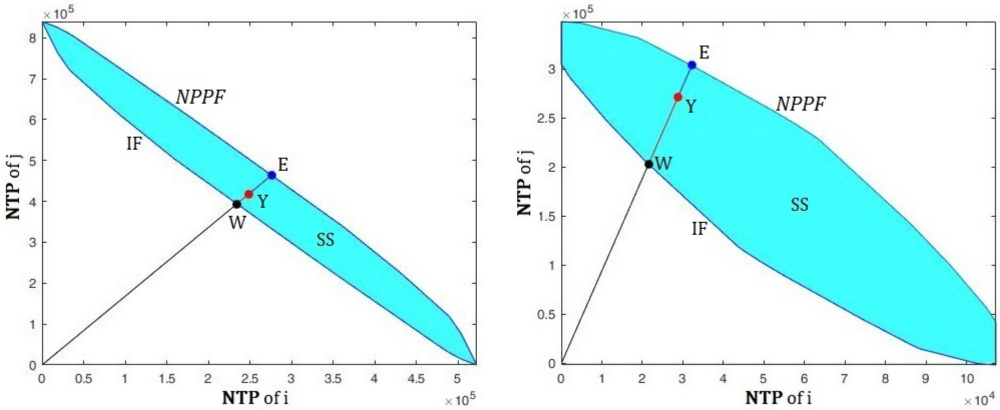
The indexes described below are all based on a point in the n-dimensional space which is equivalent to point E in Fig. 1.4. Please note that point E implicitly defines Comparative Advantages: all the countries on the right of E have a CA in sector j, while all those on the left of E have a CA in i.

If Europe is not on the $NPPF$, it is interesting to know if it is closer to an efficient allocation of resources—$NPPF$—or to an inefficient allocation—IF.

For example, in Fig. 1.5, the intersection between the ray $\overline{0E}$ and the IF is called W. It can be noted that the distance from the frontier $\overline{0E}$ is similar in the two graphs. Nevertheless, the situations described are different. In Fig. 1.5a, the distance from the NPPF reflects an inefficient use of resources in both absolute and relative terms, since point Y is closer to W than to E. Differently, in Fig. 1.5b, Y is clearly closer to E than to W.

In order to explain the indexes used below, it is convenient to provide some mathematical definitions, such as the matrix of the Net Products and the Net Total Product vector. Given that $\mathbf{y}_c = [y_{1,c}, ..., y_{n,c}]'$, where n is the number of sectors, is the vector of the recorded net output of country c, the

Figure 1.5: Two NPPFs



(a) In this case, Comparative Advantages are not very strong, and hence the difference between the efficient production point E and the inefficient production point W is not very high.

(b) Here, Comparative Advantages are stronger than in Fig. 1.5a, and hence the difference between the efficient production point E and the inefficient production point W is higher.

matrix of the Net Products $\mathbf{Y}$ is the matrix of all the $\mathbf{y}$ considered, that is,

$$\mathbf{Y} = \begin{bmatrix} \mathbf{y}_1 & \dots & \mathbf{y}_m \end{bmatrix} = \begin{bmatrix} y_{1,1} & \cdots & y_{1,m} \\ \vdots & \ddots & \vdots \\ y_{n,1} & \cdots & y_{n,m} \end{bmatrix} \tag{1.4.2}$$

where m is the number of countries. Summing up all the sectoral net products of each country, i.e. the elements of each column of $\mathbf{Y}$, the vector of the Net Total Product $\mathbf{NTP}$ is obtained (see (1.4.3)).

$$\mathbf{NTP} = \mathbf{Y}\iota = \begin{bmatrix} \sum_{c=1}^{m} y_{1,m} \\ \vdots \\ \sum_{c=1}^{m} y_{n,m} \end{bmatrix} = \begin{bmatrix} Y_1 \\ \vdots \\ Y_n \end{bmatrix} \tag{1.4.3}$$

where ι is the summation vector

The efficient Net Total Product, i.e. the vector of the coordinates of a point equivalent to E in the n-dimensional space, is called $\mathbf{NTP}^E$.

The efficient Net Total Product vector $\mathbf{NTP}^E$ is just the sum by column of an $n \times m$ matrix $\mathbf{Y}^E$ where m is the number of countries considered and n the number of sectors as before. The matrix $\mathbf{Y}^E$ is the matrix of the efficient net products $y_{i,c}^E$, since an element $y_{i,c}^E$ of matrix $\mathbf{Y}^E$ represents which should be the net product of the good i in country c in order to reach the n-dimensional $NPPF$.

In the same way, the most inefficient Net Total Product vector $\mathbf{NTP}^W$ is the sum by column an $n \times m$ matrix $\mathbf{Y}^W$ of the most inefficient net products $y^W_{i,c}$, since an element $y^W_{i,c}$ of matrix $\mathbf{Y}^W$ represents which should be the net product of the good i in country c in order to reach the n-dimensional IF.

1.4.1 Evolution of Efficiency in Europe from 1995 to 2011

The first aspect to be analyzed is the distance of the real Net Total Product $\mathbf{NTP}$ from the efficient Net Total Product $\mathbf{NTP}^E$. As explained in Section 1.2.2, the theory on CAs suggests that if markets are left free to operate, they should drive the Net Total Product vector on the $NPPF$. Therefore, the $\mathbf{NTP}^E$ and the $\mathbf{NTP}$ should coincide.

In practice, even if an improving $\mathbf{NTP}^E$ vector is found, we should find that it is at least close to the original $\mathbf{NTP}$. A way to measure the distance between them is to compute the $\mathbf{GSF}$ vector[8]

$$\mathbf{GSF_t} = (\mathbf{NTP}^E_t - \mathbf{NTP}_t) \oslash \mathbf{NTP}_t = [GSF_{1,t}, ..., GSF_{n,t}] \tag{1.4.4}$$

In a similar way, the potential loss of an inefficient specialization pattern can be measured as IF

$$\mathbf{LSF}_t = (\mathbf{NTP}^W_t - \mathbf{NTP}_t) \oslash \mathbf{NTP}_t = [LSF_{1,t}, ..., LSF_{n,t}] \tag{1.4.5}$$

In Tab. 1.2, the $\mathbf{GSF}$ and the $\mathbf{LSF}$ vectors relative to 2008 are reported. Please note that both the GSF and the LSF are constant across sectors for all the sectors that were historically in surplus. This happens by construction, since we are interested in knowing how much the $\mathbf{NTP}$ can be increased keeping the proportion across sectors unaltered.

Another characteristic is that both $GSF_{2,2008}$ and $LSF_{2,2008}$,as well as $GSF_{12,2008}$ and $LSF_{12,2008}$, are 0. This is because the Net National Product in Sector 2, labeled "Mining and Quarrying", and in Sector 12, labeled "Basic metals and Fabricated Metal" is negative for many countries[9]. One of the constraints of the problem is that countries cannot worsen their deficits, because this would imply the use of additional resources produced outside the system. The algorithm allows in some cases for a reduction of

[8] The symbol $\oslash$ means division element by element, that is to say that each element of the dividend is divided by the element of the divisor that occupies the same position inside the matrix.

[9] The $\mathbf{NTP}$ for Sector 2 is negative during all the period considered, while for Sector 12 just starting from 2008

Table 1.2: Potential gains from specialization and costs of inefficiency in 2008. Column $\mathbf{NTP}_{2008}$ reports the net product of Europe for each of the sectors considered. $\mathbf{GSF}_{2008}$ and $\mathbf{LSF}_{2008}$ represent respectively how much it could be produced in the efficient and in the most inefficient specialization patterns—see eq. 1.4.4 and 1.4.5

Sectors	$\mathbf{NTP}_{2008}$	$\mathbf{GSF}_{2008}$	$\mathbf{LSF}_{2008}$
1	1426.58	24.39%	-21.48%
2	-1671.84	0%	0%
3	6003.20	24.39%	-21.48%
4	1071.50	24.39%	-21.48%
5	230.18	24.39%	-21.48%
6	324.58	24.39%	-21.48%
7	1956.09	24.39%	-21.48%
8	1828.60	24.39%	-21.48%
9	3630.32	24.39%	-21.48%
10	501.55	24.39%	-21.48%
11	1222.71	24.39%	-21.48%
12	-510.52	0%	-0%
13	4925.65	24.39%	-21.48%
14	7272.64	24.39%	-21.48%
15	6838.81	24.39%	-21.48%
16	1672.14	24.39%	-21.48%
17	2.826.68	24.39%	-21.48%

Source: Our own computation based on WIOD database

the deficits, but it is not the case of Sectors 2 and 12, whose deficits are maintained fixed both in the efficient and in the inefficient scenario.

Given that these two constraints hold for all the years for both the **GSF** and the **LSF**, for simplicity we can compare the two scalars $GSF_t = GSF_{i,t} \; \forall \; i \neq 2, 12$ and $LSF_t = LSF_{i,t} \; \forall \; i \neq 2, 12$ instead of the vectors **GSF** and **LSF**.

Table 1.2, relative to 2008, shows that the production of each sector can be improved by circa the 24.39%, which means that in 2008 European markets were quite far from the $NPPF$. Observing the LSF_{2008} it is also clear that the distance from the Inefficient Frontier measured with the $|LSF|$ is lower than the GSF, and hence the system was closer to the IF—i.e. to an inefficient allocation of resources—than to the $NPPF$—i.e. to an efficient allocation of resources—, although the distances were not very different.

The evolution of markets during the period 1995-2011 is described by the two graphs in Fig. 1.6. The first graph shows the evolution of the GSF—Fig. 1.6a—,and the second the evolution of the Relative Efficiency index, abbreviated in RE—Fig. 1.6b—which has been computed as follows

$$RE_t = \frac{NTP^E_{i,t} - Y_{i,t}}{NTP^E_{i,t} - NTP^W_{i,t}}, \quad \forall\, i \neq 2, 12 \tag{1.4.6}$$

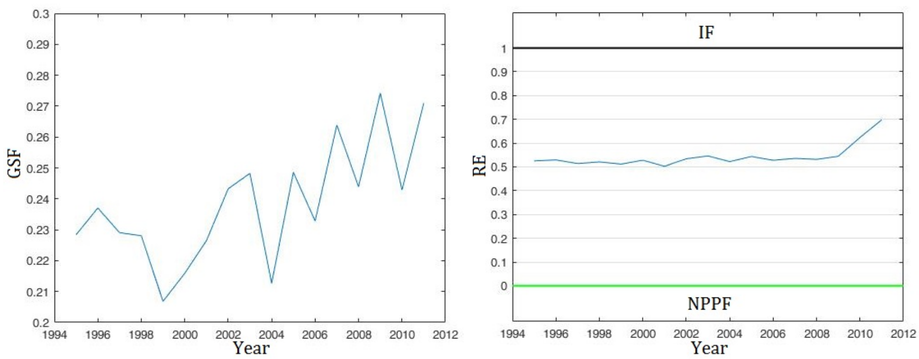
For the properties of $\mathbf{NTP}^E$ and $\mathbf{NTP}^W$, the RE_t is equal for all the sectors except for Sectors 2 and 12. In fact, eq. (1.4.6) can be reformulated in the following way

$$RE_{i,t} = \frac{\dfrac{NTP^E_{i,t} - Y_{i,t}}{Y_{i,t}}}{\dfrac{NTP^E_{i,t} - Y_{i,t} + Y_{i,t} - NTP^W_{i,t}}{Y_{i,t}}} = \frac{GSF_{i,t}}{GSF_{i,t} - LSF_{i,t}} \tag{1.4.7}$$

Since it has already been shown that $GSF_t = GSF_{i,t}\ \forall\, i \neq 2, 12$ and $LSF_t = LSF_{i,t}\ \forall\, i \neq 2, 12$, then $RE_t = RE_{i,t}\ \forall\, i \neq 2, 12$. $RE_t \in [0, 1]$, where 0 means that the system is on the IF and 1 means that the system is on the $NPPF$.

This is the Relative Efficiency index since in some sense, while the GSF is a measure of the *absolute* distance from the $NPPF$, the RE is a measure of the *relative* distance, allowing an evaluation of whether the **NTP** is closer to the $NPPF$ or to the IF.

Figure 1.6: Indexes of absolute and relative distance from the NPPF and the IF



(a) GSF index. It represents how much could be increased the net product of Europe in the efficient specialization pattern—see eq. 1.4.4

(b) RE index. It is a measure of the position of the Net Total Product between the $NPPF$ and the IF. If $RE < 0.5$, the set of countries is closer to an efficient allocation of resources than to the most inefficient allocation pattern—see eq. 1.4.6

As can be seen from Fig. 1.6a, the absolute distance of the **NTP** from the $NPPF$ increased over the period considered. Until 2004 the trend is not very clear, while from 2004 to 2009 the increase is clear, despite some oscillations in the order of the 1%-3%, and it passes from 21.27% in 2004 to 27.42% in 2009. In years 2010 and 2011 the index still there is an oscillation of 3% which firstly reduces the index to 24% and then increases it up again to the 27%.

With respect to the relative distance from the frontier, the RE index was fairly stable during the period considered—see Fig. 1.6b—, implying that the oscillations of the GS index tended to be compensated by analogous oscillations in the LSF index. The RE stayed during the whole period considered between 0.51 and 0.55. This more or less stable trend suddenly changed in 2010-2011, where the IF became sensitively closer during these years. In fact, as can be seen from 1.6a, the distance from the $NPPF$ did not improve in 2010-2011. Therefore, the fact that Europe shifted towards an even more inefficient allocation of resources must be due to the reduction of the distance from the IF.

During the period considered not only the distance from the $NPPF$ was not reduced, but Europe stayed slightly closer to an inefficient than to an efficient allocation of resources. This implies that CAs do not seem to have exerted a decisive influence on specialization patterns.

1.4.2 Comparative Advantages and labour reallocation

Once the matrix of the efficient net product $\mathbf{Y}^E$ has been computed, it is possible to derive information on the CAs of each country. A way to do it is to compare the efficient specialization ratio ESR

$$ESR_{i,c,t} = \frac{y^E_{i,c,t}}{\sum_{c=1}^{m} y^E_{i,c,t}} = \frac{y^E_{i,c,t}}{Y^E_{i,t}} \tag{1.4.8}$$

with the real specialization ratio RSR

$$RSR_{i,c,t} = \frac{y_{i,c,t}}{\sum_{c=1}^{m} y_{i,c,t}} = \frac{y_{i,c,t}}{Y_{i,t}} \tag{1.4.9}$$

where $i = 1, ..., n$ identifies the sectors, $c = 1, ..., m$ the countries and $t = 1, .., T$ the years. The matrix $\mathbf{ESR}_t$, which collects the ESR related to each country and each sector at time t, is called from now on the *efficient specialization pattern* at time t, while the matrix $\mathbf{RSR}_t$, an analogous matrix for the all the RSR at time t, is called the *real specialization pattern* at time t.

Due to lack of space here it is not possible to report these matrices because, it would mean to analyze 17 tables, each of which with 17 row and

17 columns. These Tables are provided in Appendix 1.B to this article.

In Appendix 1.B, along with the ESR and the RSR, another index is presented. The algorithm explained in Appendix 1.A allows to compute the quantity of labour that should be employed in the efficient specialization pattern. This can be used to compute the labour mobility index, that is

$$lm_{i,c,y} = \frac{l^E_{i,c,t} - l_{i,c,t}}{\sum_{i=1}^{n} l_{i,c,t}} \times 100 \tag{1.4.10}$$

where $l^E_{i,c,t}$ and $l_{i,c,t}$ are, respectively, the quantity of workers employed in sector i of country c at time t in the efficient scenario and in the original data set.

As explained in Appendix 1.B, comparing the ESR with the RSR is the most correct way to analyze CAs, but the lm can also be used as a rough proxy of CAs[10]. The advantage of working with labour reallocation is that it allows for a simple aggregation across sectors, and hence it is a convenient measure of the structural changes that each country would have to bear in order to realize an efficient specialization pattern. It is easy to compute the share of workers that should change job inside a country in order to reach the $NPPF$ with the following index

$$LM_{c,t} = \frac{\sum_{i=1}^{n} |l^E_{i,c,t} - l_{i,c,t}|}{2 \times \sum_{i=1}^{n} l_{i,c,t}} \times 100 \tag{1.4.11}$$

The LM index is just a sum across sectors of the absolute values of the lm index, with the difference that the denominator is now doubled. This is because, otherwise, each worker would be counted two times: when he exits from a sector and when he enters into another.

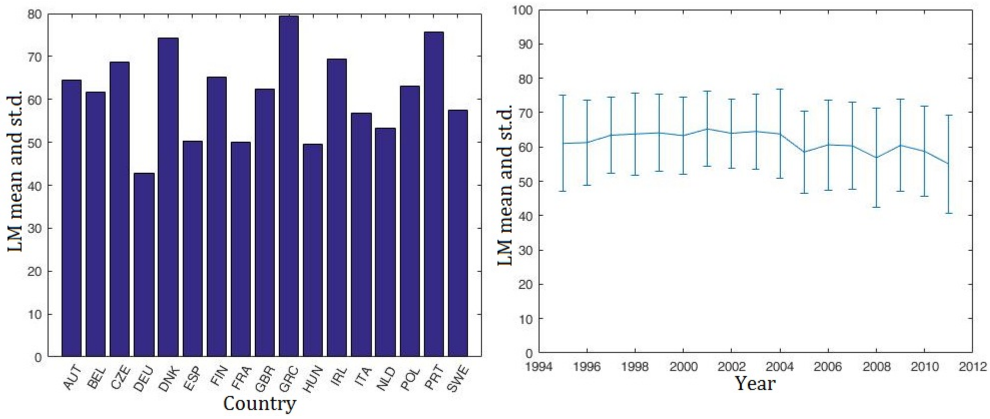
The results are reported in Tab. 1.5. There are two points to be highlighted with respect to Tab. 1.5. The first is that there are marked differences between countries with respect to the share of workers to be shifted.

The graph in Fig. 1.7a has been created to show this feature. Countries such as Portugal and, especially, Greece would need to restructure deeply their economies in order to align their real specialization pattern with the efficient pattern. Other countries such as Germany and France are closer to

[10] In fact, when a country has a CA in a certain Sector the lm is positive, otherwise it tends to be negative. However, the strength of the CA may appear very different when using the two indexes. For further information, see Appendix 1.B

Figure 1.7: Cross-country average and standard deviation of the Labour Mobility index LM, 1995-2011. The LM index counts how many workers should have changed their job in order to fully exploit the CAs so as to realize the efficient specialization pattern.

(a) Cross-year average LM **(b)** Cross-country average LM



it from the point of view of the LM index, although they would still have to shift more than the 40 % of their labour force.

The second feature to be stressed is that values higher than 50% represent the majority of the cases and there is no overall trend to improve them. This is highlighted in Fig. 1.7b, in which the cross-country average LM has been reported, along with the standard deviation. As can be noted, the distance is stable until 2004 a bit over the 60%, then it decreases in 2005 and it stays on average around the 58% from 2005 to 2011. This is somewhat unexpected, since the GSF increased starting from 2004.

This implies that even if the distance from the $NPPF$ increased, the sectoral productivities, intended as output per labour, has moved in such a way that the social costs of fulfilling such a gap from the $NPPF$ decreased in time. The decrease is slight, more or less 2 percentage points, but present. However, a simple inspection of Table 1.5 reveals that this is not the result of a common trend across countries. Quite on the contrary, while some countries as Austria or Belgium improved, other countries as Denmark, Great Britain or Poland did not exhibit any stable improvement of this kind. Once again, this does not square well from the point of view of CAs theories.

Conclusions

The main result of this paper is that for the period considered the European economy as a whole was not on the $NPPF$. The distance between the European economy and the $NPPF$ grew throughout the years from 23% in 1995 to 27% circa in 2011. This implies that there is scope for a higher level of specialization that would allow higher consumption possibilities for each country. This is evidence that what to be expected from the theory of Comparative Advantages (CAs), as explained in the first Section of this chapter and in Samuelson (2001), is not realized.

As a provisional explanation of why the $NPPF$ remained during the period considered far from the real net product vector, we have two major possibilities. The first could be attributed to market imperfections to be associated with the intrinsic complexity of the exchange process. The second could be attributed to regulations and/or inappropriate institutional frameworks.

The results suggest that, even if the institutional framework plays an important role, there exist intrinsic limits to the capacity of markets to drive the specialization process towards an efficient scenario. Before the period considered, 1995-2011, regulations have been implemented so as to allow higher market integration. Ever since the 50s, Europe has started an economic integration project which received a decisive impulse in 1986 with the Single European Act. This treaty aimed at removing the remaining barriers to the free circulation of goods, workers and capitals by 1992, an objective that was completed with the Maastricht Treaty. In fact, one of the mandates of the Maastricht Treaty was to forbid any restriction to the free circulation of capitals, which were still somehow limited by the member states. The introduction of the euro in 1999 (2001) was the final step of the construction of a single European market.

In an institutional framework built with the precise purpose of easing the functioning of markets, we expected to see a progressive reduction of the distance from the $NPPF$ over the period considered—from 1995 to 2011. What emerged is exactly the opposite.

In order to evaluate the gap from the $NPPF$ from another point of view, a benchmark called Inefficient Frontier (IF) has been computed. As the name suggests, the IF describes the most inefficient allocation of resources—in the same way as the $NPPF$ describes the efficient allocation of resources. The computation of the IF allows checking whether Europe was at least relatively closer to an efficient or to an inefficient allocation of resources. The result is that Europe stayed more or less in the middle between these two scenarios during all the period considered.

In the paper it is presented another index which may be useful to evaluate the distance from the $NPPF$, which is called the Labour Mobility (LM) index. The LM index computes the quantity of labour that in principle should have to be shifted in order to reach the $NPPF$. The main result is that, on average, the LM index is about the 60% of the labour force, which is a remarkable quantity of workers. There is a decrease in 2005, but it is a slight shift, since for the rest of the period considered the LM oscillated around the 58%. Moreover, strong differences among countries persist over time with respect to this index and while some of them improved, many of them oscillated without reaching a stable improvement.

Overall, this evidence does not contradict the idea that when markets are left free to operate, different technological endowments may play a role in the specialization process. What seems questionable is the conjecture, conveyed by CA theory, that each country will be involved so as to realize an efficient division of production. The data presented in this paper does not show any evident movement of this kind.

It is possible that the results depend on the fact that capital goods, workers and technologies are not really confined to their original countries as it has been assumed here. Relaxing the constraints on these factors, different scenarios could be obtained, which may throw a different light on the functioning of real markets.

The results exposed here suggest that there is ground to investigate further the real working and consequences of Samuelson (2001)'s "invisible hand" in free markets.

Table 1.3: The list of countries

1	AUT	Austria	10	GRC	Greece
2	BEL	Belgium	11	HUN	Hungary
3	CZE	Czech Republic	12	IRL	Ireland
4	DEU	Germany	13	ITA	Italy
5	DNK	Denmark	14	NLD	Netherlands
6	ESP	Spain	15	POL	Poland
7	FIN	Finalnd	16	PRT	Portugal
8	FRA	France	17	SWE	Sweden
9	GBR	Great Britain			

Table 1.4: The list of sectors*

1	Agriculture, Hunting, Forestry and Fishing
2	Mining and Quarrying
3	Food, Beverages and Tobacco
4	Textiles and Textile Products
5	Leather, Leather and Footwear
6	Wood and Products of Wood and Cork
7	Pulp, Paper, Paper, Printing and Publishing
8	Coke, Refined Petroleum and Nuclear Fuel
9	Chemicals and Chemical Products
10	Rubber and Plastics
11	Other Non-Metallic Mineral
12	Basic Metals and Fabricated Metal
13	Machinery, Nec
14	Electrical and Optical Equipment
15	Transport Equipment
16	Manufacturing, Nec; Recycling
17	Electricity, Gas and Water Supply

*The sectors excluded are Construction; Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Wholesale Trade and Commission Trade, Except for Vehicles and Motorcycles; Retail Trade Except for Vehicles and Motorcycles, Repair of Household Goods; Hotels and Restaurant; Inland Transport; Water Transport; Air Transport; Other Supporting and Auxiliary Activities; Activities of Travel Agencies; Post and Telecommunications; Financial Intermediation; Real Estate Activities; Renting of M&Eq and Other Business Activities; Public Administration and Defense, Compulsory Social Security; Education; Health and Social Work; Private Households with Employed Persons.

Table 1.5: Labour mobility index LM*, evolution 1995-2011

	Year																		
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean	St. Dev.
AUT	77.31	75.11	70.86	75.17	77.48	76.39	76.90	70.18	67.75	75.23	62.78	55.72	54.51	57.76	51.99	40.96	31.53	64.57	13.45
BEL	61.42	72.18	68.11	69.68	67.90	65.55	71.63	65.57	62.79	71.68	61.70	62.75	55.21	51.92	53.03	51.54	34.45	61.59	9.52
CZE	65.70	57.40	63.43	73.17	58.54	74.19	73.76	71.06	70.93	74.84	72.72	75.55	72.73	56.41	73.74	66.78	66.22	68.66	6.22
DEU	29.47	47.19	50.82	50.37	49.73	49.72	43.25	45.53	41.19	46.51	39.31	36.28	32.35	34.40	41.54	50.12	41.40	42.89	6.55
DNK	69.47	67.93	80.98	82.31	75.88	74.76	71.28	74.58	60.34	62.73	76.39	73.76	77.09	78.67	77.83	79.40	80.00	74.32	6.02
ESP	45.36	40.38	71.30	48.95	49.03	53.75	52.35	45.09	52.45	45.63	43.55	55.87	49.81	50.74	59.40	46.21	46.03	50.35	6.99
FIN	73.80	75.80	60.64	58.39	64.32	60.47	67.69	65.45	70.89	67.87	59.71	67.65	73.57	61.24	58.66	57.72	63.11	65.12	5.67
FRA	55.08	55.59	55.77	50.82	51.81	37.57	51.43	61.89	50.33	53.95	44.24	43.66	52.40	40.23	48.22	49.47	46.62	49.95	5.93
GBR	73.43	55.92	60.19	57.28	69.86	66.70	68.69	56.60	72.43	72.02	57.35	60.96	60.16	47.19	67.84	47.92	67.00	62.44	7.89
GRC	82.03	83.17	82.09	81.86	83.91	83.89	86.52	78.30	83.51	73.75	76.27	89.37	74.09	74.60	84.59	84.25	46.33	79.33	9.33
HUN	34.03	34.48	34.48	40.48	67.60	58.29	57.63	63.02	69.16	33.99	47.97	50.13	47.83	34.42	50.16	54.74	63.41	49.52	12.14
IRL	72.19	68.70	67.08	73.33	72.95	62.52	64.81	66.90	71.30	65.63	67.04	64.76	69.69	76.59	76.06	74.00	66.85	69.43	4.10
ITA	57.30	60.33	54.89	60.22	56.77	59.14	54.04	59.38	54.65	54.23	61.77	50.65	62.88	56.84	59.11	58.54	46.06	56.87	4.07
NLD	55.69	53.68	55.57	53.77	42.09	54.55	55.49	55.92	55.45	55.38	50.73	55.30	60.72	60.48	41.84	48.53	51.99	53.36	5.04
POL	55.95	62.98	68.09	66.81	62.27	56.71	76.28	55.92	61.23	73.54	50.23	59.15	62.98	58.89	64.79	69.15	67.75	63.10	6.55
PRT	65.39	67.71	67.98	73.90	73.74	75.27	70.71	83.12	82.48	84.76	75.97	79.24	77.55	82.72	76.06	75.35	76.05	75.76	5.48
SWE	63.49	62.90	65.38	67.51	65.85	66.35	66.48	68.66	69.69	72.64	46.55	49.65	41.90	43.16	43.06	43.02	40.55	57.46	11.62
Mean	61.01	61.26	63.39	63.77	64.10	63.28	65.23	63.95	64.50	63.79	58.49	60.61	60.32	56.84	60.47	58.69	55.02		
St.dev.	14.02	12.45	11.02	11.97	11.12	11.17	10.92	10.04	10.94	13.04	11.97	13.12	12.63	14.38	13.32	13.13	14.26		

*The labour mobility index $LM_{c,t}$ computes the share of workers that should change their job inside each country in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. It is computed as $\frac{\sum_{i=1}^{n}|l^{E}_{i,r}-l_{i,r}|}{2\times\sum_{i=1}^{n} l_{i,t}}$—see (1.4.11)

Appendix 1.A The algorithm for the computation of the n-dimensional $NPPF$

The algorithm for the computation of the n-dimensional $NPPF$ is an iterative algorithm that analyzes all the possible two-goods $NPPF$s that is possible to construct with a given number of sectors. The procedure is based on the idea that the two-goods $NPPF$s are a sort of partial derivatives of the full n-dimensional $NPPF$, in the sense that they provide a measure of how much the net product of two goods can increase—other things being equal. This is possible thanks to the properties of subsystems—see Section 1.2.1.

In an n-dimensional $NPPF$, the number of sectors considered is n, so that the number of possible couples of n sectors is $nk = \frac{n!}{2!(n-2)!}$. In some sense, the n-dimensional $NPPF$ can be analyzed from nk bidimensional perspectives.

Since nk couples of sectors can be considered, a generic couple of sectors can be defined as (i_k, j_k), so that $\Omega_{NPPF} = \{(i_1, j_1), .., (i_{nk}, j_{nk})\}$. For each couple (i_k, j_k), it is possible to compute the related GS_k, and organize them in a vector called $\mathbf{GS} = [GS_1, ..., GS_{nk}]'$. Then, it is easy to find $GS_{min} = min(\mathbf{GS})$, that is to say the minimum of the elements belonging to the vector $\mathbf{GS}$. The GS_{min} provides a benchmark for evaluating the maximum possible expansion in all the sectors considered, reachable through a proper reallocation of workers across sectors.

Actually, the aim of the algorithm is to find a new Net Total Product vector $\mathbf{NTP}^1 = [Y_1^1, ..., Y_n^1]'$, such that $\forall\, Y_i > 0 \in \mathbf{NTP}$, the corresponding $Y_i^1 \in \mathbf{NTP}^1$ gives $Y_i^1/Y_i - 1 = GS^* > 0$, while $\forall\, Y_i < 0 \in \mathbf{NTP}$, the corresponding $Y_i^1 \in \mathbf{NTP}^1$ gives $Y_i^1 = Y_i$.

In words, in vector $\mathbf{NTP}^1$, all the positive elements of the original vector $\mathbf{NTP}$ must be increased by the same proportion, while all the negative elements have to be kept fixed. The GS_{min} is a sort of upper boundary for the GS^*: probably, applying to the original $\mathbf{NTP}$ a proportion $GS^* > GS_{min}$, the resulting $\mathbf{NTP}^1$ would be outside the $NPPF$. On the contrary, if a certain ratio $r \in (0, 1)$ of the GS_{min} is applied to $\mathbf{NTP}$, it is highly probable that $\mathbf{NTP}^1 = (1 + r \times GS_{min}) \times \mathbf{NTP}$ is feasible, an hence GS^* should be computed as $GS^* = r \times GS_{min}$.

Then, the problem becomes to compute a matrix $\mathbf{Y}^1 = \mathbf{Y} \circ \mathbf{X}$, where symbol $\circ$ means the Hadamard or element-by-element product, such that

$$\mathbf{Y}^1 \iota = \mathbf{NTP}^1 \tag{1.A.1}$$

The problem can be solved using linear programming. In order to explain how to frame the problem from the point of view of linear programming, consider an example of 3 goods and 3 countries.

As should be clear from Section 1.2.1, the net product y of good i in country c is a linear function of the total labour employed in subsystem i of country c. We define with $L_{i,c}$ the quantity of labour employed in subsystem i of country c, while L_c is the total labour employed by country c. The vector $\boldsymbol{L}'$ is given by

$$\boldsymbol{L}' = [L_{1,1}, L_{1,2}, L_{1,3}, L_{2,1}, L_{2,2}, L_{2,3}, L_{3,1}, L_{3,2}, L_{3,3}] \tag{1.A.2}$$

and the vector $\mathbf{L}$ is given by

$$\mathbf{L} = \begin{bmatrix} \mathrm{L}_1 \\ \mathrm{L}_2 \\ \mathrm{L}_3 \end{bmatrix} \tag{1.A.3}$$

Then, consider the matrix

$$\mathbf{YC} = \begin{bmatrix} y_{1,1} & 0 & 0 & y_{2,1} & 0 & 0 & y_{3,1} & 0 & 0 \\ 0 & y_{1,2} & 0 & 0 & y_{2,2} & 0 & 0 & y_{3,2} & 0 \\ 0 & 0 & y_{1,3} & 0 & 0 & y_{2,3} & 0 & 0 & y_{3,3} \end{bmatrix} \tag{1.A.4}$$

and the matrix

$$\boldsymbol{LC} = \begin{bmatrix} L_{1,1} & L_{1,2} & L_{1,3} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & L_{2,1} & L_{2,2} & L_{2,3} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & L_{3,1} & L_{3,2} & L_{3,3} \end{bmatrix} \tag{1.A.5}$$

The, solving the problem

$$\begin{aligned} min \quad & \boldsymbol{L}'\mathbf{x} & & \\ s.t. \quad & \mathbf{YCx} & = & \ \mathbf{NTP}^1 \\ & \boldsymbol{LC}\mathbf{x} & = & \ \mathbf{L} \end{aligned} \tag{1.A.6}$$

we find a vector $\mathbf{x}$ of reproportiong factors, which is the factorization of the matrix $\mathbf{X}$ that allows to compute an $\mathbf{Y}^1$ such that $\mathbf{Y}^1\iota = \mathbf{NTP}^1$. Moreover, the overall quantity of labour to be shifted to reach $\mathbf{NTP}^1$ is minimized.

Standard linear programming packages allow to condition the boundaries in which each element $x \in \mathbf{x}$ can move. A lower boundary has to be set to 0 for all those $x \in \mathbf{x}$ that are related to a positive net product, in order to avoid the possibility of generating deficits. Those x that are related to a negative net product can be constrained to 1 in order to keep fixed the deficit—as in the cases of Sector 2 and, from 2008, Sector 12 in our sample.

The overall algorithm can be summarized as follows

1. Compute all the possible nk two-goods NPPF in Ω_{NPPF} and the associated vector $\mathbf{GS}$;

2. Find the minimum $GS_{min} = min(\mathbf{GS})$;

3. Compute the objective vector $\mathbf{NTP}^1 = (1 + r \times GS_{min}) \times \mathbf{NTP}$, where $r \in (0, 1)$ is a predefined parameter;

4. Solve problem 1.A.6, with the appropriate boundaries, in order to find a vector of reproportioning factors that allows to compute the matrix $\mathbf{Y}^1$ such that $\mathbf{Y}^1\iota = \mathbf{NTP}^1$

5. Start a new loop from point 1.

Iteration after iteration, the **NTP** improves thanks to the specialization process. The algorithm stops when the scopes for improvements, quantified by $max(\mathbf{GS})$, are less than a predefined parameter. The computations have been performed using the software Matlab.

It is important to apply just a portion $r \in (0, 1)$—step 3—of GS_{min}, not just to be sure to find an **NTP** that lies inside the frontier, but also because in so doing, at the successive loop, further scopes for improvement can be found. Actually, at each loop the shift of labour between i_1 and j_i, between i_2 and j_2 and so on changes the amount of labour available for each of the nk couple of sectors and redefines the structure of the nk frontiers—see Section 1.2. Hence, it is important not to exploit fully the scope identified by GS_{min} at the first loop. Otherwise the algorithm could terminate too early, i.e., when sizable expansion, in presence of a different reallocation, is still possible.

As Jones (1961) demonstrated, it is be possible to follow another approach in order to establish Comparative Advantages. The method suggested by Jones (1961) allows to assign to each country a single sector of specialization in order to reach the maximum possible efficiency. However, the rule devised by him would not be applicable directly in his case, since if each country specializes completely in just one sector, the production would be scarce in some sectors and abundant in others, in such a way that the demand could not be satisfied. Moreover, it is not clear how Jones's rule could be adapted to control for scarce resources in addition to the primary resource, as in the case of Sector 2 of our sample—see Section 1.4.1. Nevertheless, it being understood the differences, our conjecture is that the algorithm described here should tend to the solution found by Jones (1961).

Appendix 1.B Tables on Comparative Advantages and labour mobility Index

1.B.1 Measures of Comparative Advantages

In this Section are presented the data relative to two indexes, the ESR and the RSR, defined as follows

$$ESR_{c,i,t} = \frac{y^E_{c,i,t}}{\sum_{c=1}^{m} y^E_{c,i,t}} = \frac{y^E_{c,i,t}}{Y^E_{i,t}} \tag{1.B.1}$$

with the real specialization ratio RSR

$$RSR_{c,i,t} = \frac{y_{c,i,t}}{\sum_{c=1}^{m} y_{c,i,t}} = \frac{y_{c,i,t}}{Y_{i,t}} \tag{1.B.2}$$

where $i = 1, ..., n$ identifies the sectors, $c = 1, ..., m$ the countries and $t = 1, .., T$ the years. The matrix $\mathbf{ESR}_t$, which collects the ESR related to each country and each sector at time t, is called from now on the *efficient specialization pattern* at time t, while the matrix $\mathbf{RSR}_t$, an analogous matrix for the all the RSR at time t, is called the *real specialization pattern* at time t. The results of these two indexes are reported in Tables 1.6-1.22.

The results for Sector 2 and, in some years, for Sector 12 have not been reported because, as explained in Section 1.4.1, the great majority of countries are in deficit in this index, implying a negative Net Total Product in this sector. For this reason, although countries can reduce their deficits in Sector 2 and Sector 12, nobody can specialize in it, making the comparison between the ESR and the RSR not very interesting. Since Tables 1.6-1.22 contain a lot of data, it is better to avoid reporting irrelevant information. Therefore, we have chosen to exclude Sector 2 from Tables 1.6-1.22.

Where the ESR is higher than the RSR, the countries considered have a CA. For example, it is evident from Tab. 1.6 that the main CAs of Austria were in Sector 12—Basic Metal and Fabricated Metal—during the period 1996-2004, in Sector 15—Transport Equipment—during the period 2006-2010 and in Sector 8—Coke, Refined Petroleum and Nuclear Fuel—during the period 2007-2011. In most of the cases, the algorithm identifies 2 or 3 sectors of specialization—although cases in which there 1 or 4 sectors of specialization are not rare. For all the other Sectors, countries are said to have a comparative disadvantage, as it is the case of the production of Agricultural goods in Austria. In an efficient scenario it should have been 0 for all the years considered. In reality, it was always above 1.3%, although with a declining trend, which means that the real specialization progressively approached the efficient specialization in this case.

As for what concerns the two biggest European countries, it emerges that Germany had historically a strong CA in Sector 15—Transport Equipment—and in some years Sector 4—Textiles and Textile Production—, Sector 6—Wood and Products of Wood and Cork, Sector 11—Other Non-Metallic Mineral—. France excelled in Sector 1—Agriculture—, Sector 9—Chemicals and Chemical product—and Sector 4—Textiles and textile production.

Table 1.6: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Austria*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.39	1.73	0.02	-0.19	1.85	2.46	3.17	2.53	2.54	1.79	1.10	2.07	1.64	1.75	1.41	0.23	-0.53
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.81	1.74	1.77	1.75	1.66	1.65	1.52	1.66	1.66	1.66	1.82	1.91	1.85	1.91	1.95	1.84	1.78
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.76	1.87	1.88	1.81	1.67	1.72	1.63	1.70	1.66	1.47	1.72	1.78	1.60	1.86	1.43	1.39	0.91
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.38	1.30	1.51	1.48	1.69	1.79	1.62	1.60	1.53	1.53	1.69	1.47	-1.47	0.58	1.41	-3.29	-13.11
6	E	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	8.04	8.86	8.50	8.03	5.75	8.07	7.37	6.60	6.85	7.18	13.18	18.74	10.20	14.19	10.01	12.41	14.56
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.45	2.54	2.76	2.80	2.76	2.73	2.68	2.62	2.62	2.61	2.71	2.99	3.31	4.12	2.94	3.43	2.64
8	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.03	0.03	73.48	11.27	10.52	61.41	56.93
	R	0.83	0.85	0.69	1.68	1.63	1.15	1.48	1.36	1.34	1.14	1.98	0.96	2.76	16.41	15.29	79.45	75.79
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-6.43
	R	1.05	1.11	1.10	1.12	1.19	0.89	0.77	1.06	0.89	0.96	1.38	1.53	1.51	1.83	1.17	-8.19	-25.96
10	E	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	-0.59
	R	2.08	2.28	2.84	2.53	2.45	2.71	2.67	2.33	2.20	2.28	4.06	2.12	1.56	3.58	1.04	-9.45	-37.47
11	E	74.04	41.66	70.34	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	R	3.80	4.06	3.87	3.48	3.37	3.35	3.29	3.10	3.45	2.04	3.09	3.91	4.01	3.90	3.35	2.87	1.71
12	E	0.20	25.16	6.01	60.29	84.22	36.24	43.77	4.12	15.66	39.82	0.00	0.00	0.01	/	/	/	/
	R	3.26	3.81	4.54	4.90	5.44	3.38	4.15	2.52	3.77	3.50	4.55	4.79	12.60	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	13.22	0.00	20.41	0.00	0.01	0.01	0.00	0.00	0.00
	R	2.48	2.51	2.63	2.66	2.77	2.76	2.84	2.75	2.96	2.70	2.84	3.10	3.06	3.58	3.22	1.49	-0.98
14	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.71	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.69	2.67	2.49	2.44	2.32	2.31	2.57	2.68	2.57	2.51	0.93	1.89	1.70	1.89	1.72	1.72	1.48
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	20.25	14.72	19.57	11.37	5.76	0.00
	R	1.27	1.35	1.43	1.34	1.38	1.39	1.41	1.81	1.63	1.96	2.06	1.99	1.98	2.01	1.73	1.84	2.06
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	15.56	0.00	0.00
	R	3.02	3.27	3.07	2.97	2.66	2.71	2.76	2.89	2.86	2.82	3.05	3.30	3.22	3.78	4.15	3.92	3.66
17	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.79	1.93	1.89	1.87	2.24	2.41	2.64	2.63	2.70	2.70	3.31	3.07	3.10	1.31	2.35	-21.06	-17.57

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Austria should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Austria actually produced. An $ESR > RSR$ means that Austria had a Comparative Advantage in the relative sector.

Table 1.7: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Belgium*

Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.44	0.27	0.63	1.14	1.15	0.98	-1.91	-0.62	0.72	-1.14	1.68	1.32	0.82	-1.15	0.90	-0.55	0.66
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	9.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00	0.00	8.73	6.56
	R	3.32	3.36	3.29	3.43	3.10	3.16	3.35	3.23	3.14	3.32	3.28	3.42	3.27	3.54	3.52	3.44	3.57
4	E	0.00	0.01	26.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	R	3.83	3.93	4.46	4.51	4.82	3.82	3.83	3.87	3.90	4.01	3.95	4.25	4.06	3.91	4.25	4.34	4.96
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04
	R	0.51	0.58	0.53	0.56	0.50	0.46	0.43	0.47	0.45	0.45	0.55	0.51	0.64	0.67	0.70	0.87	1.10
6	E	0.00	0.01	0.00	0.00	0.01	0.05	0.01	28.21	52.45	0.01	0.03	0.04	43.38	0.04	0.01	0.01	14.06
	R	1.61	1.40	2.67	2.42	2.78	3.57	3.31	3.41	3.38	3.43	5.01	8.68	3.77	5.07	4.08	3.84	5.21
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.52	2.55	2.46	2.41	2.41	2.41	2.77	2.75	2.68	2.97	2.74	2.67	2.82	2.74	2.49	2.37	2.67
8	E	0.00	0.00	0.00	0.00	0.07	0.01	0.01	0.03	0.01	0.00	0.00	3.14	0.05	2.18	2.09	0.81	0.47
	R	4.98	4.86	3.67	6.01	5.01	6.29	6.07	5.46	5.28	6.35	7.03	6.09	6.60	3.21	2.81	0.50	0.48
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	4.73	4.60	5.60	5.06	5.41	5.96	5.51	5.62	5.81	6.15	5.85	6.24	5.09	5.67	5.69	6.01	7.93
10	E	0.00	21.16	5.86	75.14	94.06	0.01	0.01	0.01	0.10	0.08	99.96	99.92	0.54	45.21	0.01	0.02	0.22
	R	2.48	2.67	3.45	2.89	3.00	2.02	2.04	2.35	2.02	2.52	6.03	4.10	4.12	5.51	3.48	4.67	7.32
11	E	17.07	54.02	26.69	20.98	17.51	32.50	0.00	19.97	23.87	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.14
	R	4.78	4.24	4.95	4.38	4.41	4.03	3.88	4.40	4.20	4.04	3.28	4.27	4.36	3.85	3.85	4.76	4.52
12	E	0.00	0.01	0.00	0.00	0.00	2.14	44.02	18.21	9.41	40.94	0.00	0.01	0.02	/	/	/	/
	R	4.48	4.57	6.42	6.44	8.41	4.88	6.03	4.80	4.96	5.89	8.66	8.79	28.63	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.84	1.75	1.82	1.92	1.80	1.91	1.84	1.79	1.78	1.79	1.65	1.57	1.49	1.47	1.42	1.39	1.41
14	E	0.00	0.00	0.00	0.00	0.00	12.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.68	1.41	1.71	1.70	1.63	2.07	1.60	1.39	1.57	1.58	1.19	1.00	0.82	0.68	0.74	0.62	0.56
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.92	4.12	11.75	10.80	15.10	0.00	3.52
	R	3.16	2.99	2.81	2.90	2.71	2.82	3.05	3.16	2.76	2.70	2.79	2.87	2.51	2.45	2.49	1.96	2.05
16	E	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
	R	2.92	2.74	2.67	2.58	2.39	2.80	2.78	2.65	2.65	2.75	2.63	2.76	2.72	2.69	2.55	2.38	2.62
17	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.87	1.80	1.81	1.78	2.00	1.71	1.71	1.83	1.64	1.48	1.80	1.86	1.84	1.51	1.93	2.01	2.10

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Belgium should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Belgium actually produced. An $ESR > RSR$ means that Belgium had a Comparative Advantage in the relative sector.

Table 1.8: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Czech Republic*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	18.51	10.57	13.41	19.98	0.38	23.07	26.33	22.96	32.30	21.60	24.74	20.00	21.89	0.02	18.67	21.81	17.18
	R	3.16	2.65	2.77	2.44	2.91	1.06	2.30	2.32	3.28	2.06	1.80	2.33	1.74	2.05	1.40	2.28	2.22
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	0.00	0.00	0.00	10.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.51	0.00	0.00	0.30
	R	1.98	2.04	1.86	2.25	2.13	1.92	2.03	2.19	1.69	2.00	1.58	1.81	1.54	1.56	1.60	1.43	1.47
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	0.97	1.48	1.28	1.21	1.02	0.97	0.87	0.83	0.76	0.90	0.55	0.01	1.15	1.48	0.95	1.10	1.37
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.47	1.19	0.99	0.71	0.71	0.75	0.64	0.07	0.33	0.29	-0.01	-0.72	-3.89	-2.29	-0.01	-1.52	-2.96
6	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
	R	3.09	3.69	2.90	1.84	2.99	3.22	2.42	1.63	1.66	3.02	3.81	-63.98	2.82	3.81	3.22	3.03	3.78
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.25	1.35	1.48	1.40	1.30	1.14	1.27	1.43	1.47	1.69	1.35	2.15	1.91	1.85	1.54	1.79	2.04
8	E	0.01	0.00	0.00	2.22	0.03	0.02	1.18	0.00	6.92	2.55	10.07	0.98	0.00	0.11	0.00	0.00	0.00
	R	23.37	24.88	12.75	1.35	1.15	0.72	1.35	1.16	1.66	1.23	2.16	0.52	2.98	0.84	0.39	-1.56	-1.97
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	-0.51	0.12	0.74	0.54	0.79	0.43	0.30	0.31	0.29	0.03	0.19	0.37	0.30	0.48	0.19	0.57	0.83
10	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.09
	R	1.04	1.14	1.17	0.40	0.21	1.08	0.59	0.23	1.43	1.78	1.23	0.66	-0.64	-1.09	-0.92	-1.22	-1.52
11	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	2.22	2.51	2.44	2.26	2.58	2.27	1.99	2.43	2.45	1.80	2.29	3.05	3.11	2.69	2.15	2.94	2.60
12	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/	/	/
	R	3.49	1.28	4.31	4.39	4.17	2.32	2.11	1.11	0.73	-0.08	-0.94	0.57	-0.54	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.98	1.29	1.24	1.31	1.14	1.15	1.18	1.26	1.38	1.49	1.44	1.70	1.88	2.00	1.65	1.81	1.90
14	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	0.99	1.41	1.23	1.01	1.25	1.12	1.12	1.04	1.39	2.30	1.27	1.56	1.61	2.00	1.17	1.46	1.48
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.86	0.00	1.27	0.78
	R	0.80	1.08	1.22	1.09	1.12	1.38	1.50	1.69	1.61	1.81	1.95	2.38	2.48	2.80	2.96	2.99	3.43
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.32	1.25	1.45	1.26	1.48	1.78	1.79	2.06	1.92	1.91	1.69	1.93	1.89	1.79	2.02	2.54	2.67
17	E	26.85	44.71	27.27	0.00	1.91	2.78	0.06	0.00	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.00	0.01
	R	4.01	3.98	3.43	4.07	4.91	5.04	4.89	4.58	4.64	4.27	3.82	3.79	-1.03	0.52	3.36	3.98	4.24

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that the Czech Republic should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that the Czech Republic actually produced. An $ESR > RSR$ means that the Czech Republic had a Comparative Advantage in the relative sector.

Table 1.9: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Denmark*

Sector	E/R	Year 1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	15.70	0.00	0.00	0.00	0.00	0.01	0.02	0.00	7.81	5.68	13.00	7.56	14.07	17.50	14.12	23.95	15.97
	R	1.43	1.43	1.18	1.30	0.74	1.77	0.72	0.49	0.05	1.27	-0.79	-2.29	-0.86	-1.03	-0.18	1.30	0.99
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.81	1.74	1.72	1.82	1.67	1.67	1.65	1.72	1.73	1.55	1.90	2.08	1.79	1.80	1.76	1.66	1.62
4	E	0.00	0.09	0.00	0.58	0.00	0.01	0.02	0.26	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	0.84	0.84	0.85	0.81	0.81	0.75	0.71	0.74	0.74	0.69	0.68	0.67	0.69	0.73	0.61	0.63	0.61
5	E	0.14	99.94	96.25	99.99	99.97	99.93	46.45	54.52	0.01	0.02	0.00	0.00	0.00	0.01	0.00	0.00	0.03
	R	0.45	0.40	0.33	0.29	0.34	0.45	0.29	0.16	0.16	0.13	0.10	0.08	-0.04	-0.06	0.07	0.07	0.01
6	E	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.02
	R	0.92	0.63	1.48	1.04	2.16	1.47	0.94	0.97	1.34	1.45	0.17	3.67	2.12	2.65	1.64	1.47	1.35
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.19	1.19	1.20	1.32	1.33	0.72	0.83	0.63	0.76	0.67	1.17	0.89	-0.81	-0.14	1.14	0.96	0.71
8	E	0.00	0.01	0.01	0.03	23.02	49.89	81.46	73.86	71.90	79.05	33.33	72.69	0.01	0.00	0.00	0.00	0.00
	R	0.51	0.60	0.43	0.75	0.61	0.36	0.48	0.53	0.39	0.33	-0.42	0.44	0.21	-0.05	-0.12	-0.07	-0.32
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	0.66	0.83	1.10	1.08	1.27	1.21	1.47	1.40	1.36	1.42	1.59	1.64	1.52	1.56	2.02	1.93	2.39
10	E	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	R	1.54	1.71	1.88	1.64	1.68	1.51	1.54	1.70	1.62	1.64	2.48	1.80	2.24	2.42	1.63	2.12	2.82
11	E	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.00	0.92	1.38	1.40	1.53	1.16	0.99	1.07	0.98	0.94	1.08	1.36	1.57	1.24	0.92	0.91	0.93
12	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/	/	/
	R	0.66	-0.09	0.15	0.87	-0.55	0.77	0.59	0.79	0.36	0.49	0.50	0.14	1.99	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	2.10	2.01	2.15	2.05	1.86	1.90	1.83	1.95	1.81	1.78	1.61	1.60	1.67	1.88	1.96	1.81	1.86
14	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.35	1.46	1.43	1.26	1.38	1.36	1.51	1.68	1.42	1.46	0.91	1.15	1.14	1.10	1.07	1.15	0.86
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	R	0.61	0.64	0.57	0.50	0.38	0.40	0.37	0.37	0.34	0.34	0.31	0.31	0.27	0.26	0.22	0.16	0.15
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	2.41	2.32	2.32	2.29	2.11	2.10	2.04	1.95	1.93	1.89	1.97	2.09	1.97	1.64	1.55	1.66	1.61
17	E	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.20	1.32	1.27	1.23	1.47	1.43	1.43	1.34	1.34	1.28	1.17	1.24	1.05	1.16	1.11	1.41	1.48

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Denmark should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Denmark actually produced. An $ESR > RSR$ means that Denmark had a Comparative Advantage in the relative sector.

Table 1.10: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Finland*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.80	0.61	-1.54	-2.95	-1.50	-3.51	0.99	-1.36	-2.14	-1.63	1.52	1.46	1.53	1.38	0.05	-1.30	1.03
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.88	0.84	0.88	0.92	0.90	0.87	0.86	0.91	0.94	0.91	1.12	1.24	1.20	1.16	1.21	1.23	1.23
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.52	0.58	0.57	0.57	0.57	0.51	0.47	0.52	0.42	0.48	0.54	0.56	0.58	0.54	0.51	0.56	0.52
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	0.42	0.42	0.41	0.44	0.41	0.45	0.39	0.47	0.43	0.47	0.45	0.43	0.53	0.37	0.43	0.51	0.47
6	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	7.27	6.60	6.36	5.06	11.89	7.34	7.31	6.58	8.48	8.07	-6.24	-9.72	11.06	12.51	9.18	11.04	11.97
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	5.19	5.61	5.87	6.20	5.28	5.07	4.61	4.98	4.97	5.52	6.27	6.46	8.14	6.76	5.02	7.60	7.34
8	E	0.00	0.00	0.00	0.00	1.47	2.16	1.64	1.57	1.87	2.15	17.64	4.17	2.94	0.00	0.00	0.00	0.00
	R	0.85	1.12	0.74	1.75	1.47	1.29	1.28	1.50	1.34	1.36	2.23	1.39	2.64	0.69	0.56	0.14	0.03
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60
	R	0.91	1.06	1.12	1.06	0.78	1.00	0.88	1.04	0.82	0.94	1.30	0.98	1.05	1.01	0.93	1.38	1.79
10	E	3.27	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.42	1.35	1.96	1.76	1.84	1.67	1.75	1.86	2.14	2.06	3.26	2.25	2.71	3.42	2.14	2.96	4.78
11	E	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28
	R	1.16	1.35	1.36	1.34	1.33	1.32	1.23	1.31	1.46	1.48	1.59	1.74	1.79	1.55	1.16	1.61	1.46
12	E	23.10	32.42	4.59	6.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/	/	/
	R	1.50	2.10	3.17	3.42	3.33	2.18	2.06	1.97	2.11	2.62	5.86	5.01	18.15	/	/	/	/
13	E	0.00	0.00	13.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.06	2.08	2.44	2.36	2.22	1.92	1.87	1.93	2.08	2.16	2.00	2.04	2.27	2.26	1.95	1.60	2.28
14	E	0.00	0.00	0.00	12.30	15.84	17.29	18.80	22.90	20.84	19.44	25.32	28.79	32.34	29.77	23.03	22.77	22.12
	R	1.55	1.78	1.88	2.36	2.59	3.15	2.98	3.67	2.96	2.98	5.56	4.81	5.16	6.11	5.17	5.04	4.03
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.70	0.53	0.55	0.49	0.46	0.61	0.65	0.65	0.53	0.26	0.42	0.49	0.47	0.44	0.43	0.34	0.28
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.83	0.85	0.87	0.90	0.80	0.88	0.89	0.88	0.95	1.01	1.02	1.02	0.95	0.92	0.80	0.80	0.82
17	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15
	R	0.71	0.77	0.82	0.81	0.86	1.04	0.95	0.98	1.04	1.05	1.18	1.03	0.88	1.02	1.06	1.38	1.21

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Finland should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Finland actually produced. An $ESR > RSR$ means that Finland had a Comparative Advantage in the relative sector.

Table 1.11: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in France*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	43.60	89.41	84.57	43.53	1.55	37.17	33.12	73.20	0.01	72.70	43.34	0.01	0.01	75.73	0.00	7.32	66.69
	R	32.96	23.19	26.99	27.03	27.44	25.94	29.72	29.37	34.27	22.58	29.75	34.83	26.35	32.19	20.27	20.51	31.57
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	40.64	10.19	16.77	27.37	60.63	22.47	22.68	0.01	43.55	19.76	0.00	0.00	0.00	0.00	0.00	0.00	15.99
	R	12.77	13.25	13.08	14.07	15.90	15.57	15.23	14.94	14.05	15.49	16.31	10.97	16.10	15.64	18.00	18.07	16.00
4	E	0.00	0.00	0.00	0.00	0.00	0.01	91.57	99.73	0.01	7.35	99.99	99.93	99.99	99.95	99.99	0.03	99.40
	R	9.92	9.98	9.93	9.87	12.44	11.84	12.55	13.90	13.48	13.70	18.56	16.76	17.74	11.47	16.43	15.75	12.04
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.03
	R	8.08	8.13	8.71	9.34	12.26	12.57	10.63	9.80	9.11	8.77	8.97	9.11	10.92	9.01	8.99	10.96	10.96
6	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.04
	R	7.53	8.83	5.20	4.65	6.94	5.48	5.95	6.17	6.47	6.37	7.48	21.33	10.98	4.78	11.45	18.33	6.94
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	11.51	11.85	11.21	11.37	12.35	11.64	12.94	12.08	12.73	12.71	14.76	13.93	3.65	4.80	13.09	10.05	5.90
8	E	0.00	0.00	0.00	0.00	0.00	4.96	13.78	10.78	4.75	12.04	0.00	0.79	0.01	8.14	0.00	0.00	4.41
	R	7.96	6.44	3.66	8.01	7.27	12.37	19.96	15.57	16.25	14.30	-3.19	29.47	-22.55	10.22	23.61	6.64	5.60
9	E	0.00	0.02	0.00	0.00	30.29	57.21	28.57	30.56	99.95	20.77	30.91	99.98	16.83	14.53	97.59	40.73	0.02
	R	4.29	9.36	11.34	10.94	13.54	15.90	15.71	13.12	13.28	11.18	23.19	23.21	23.05	21.85	19.29	27.82	21.67
10	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.02	0.07	0.64	99.95	99.92	99.62
	R	11.65	11.97	13.55	10.52	9.81	9.42	9.00	6.14	5.27	11.72	-14.14	18.68	23.23	16.18	23.35	51.88	36.45
11	E	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	10.18	9.54	11.43	10.53	9.36	10.97	9.11	10.17	9.14	8.89	10.80	13.16	13.16	10.13	10.18	13.99	9.59
12	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/	/	/
	R	7.42	6.89	3.59	2.61	4.93	11.81	11.68	11.44	10.55	11.62	14.14	13.50	29.36	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	51.10	0.00	65.09	0.10	14.13	64.86	0.07
	R	8.18	8.35	7.22	7.37	9.31	9.29	8.35	8.16	8.06	9.81	13.59	13.03	12.98	11.94	13.35	15.45	13.16
14	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	26.11	28.07	0.13
	R	9.39	7.78	11.65	10.55	10.42	11.67	12.72	11.86	10.81	11.95	13.88	9.39	11.65	12.74	15.92	16.60	13.50
15	E	0.00	0.01	0.00	0.00	0.00	31.01	0.00	0.00	0.01	0.03	0.00	47.58	9.11	27.39	0.00	0.01	0.03
	R	15.22	15.96	15.48	14.90	18.75	17.96	17.86	17.31	17.27	16.75	21.18	19.55	17.64	18.01	17.16	18.44	13.10
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	10.64	10.53	9.77	10.70	12.33	12.58	13.75	14.37	13.80	12.48	13.06	12.17	11.70	10.54	10.22	9.99	10.51
17	E	21.91	49.23	17.58	99.99	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	22.77	22.96	22.51	22.18	11.75	11.26	10.94	12.93	12.85	12.61	14.37	13.27	13.69	14.00	12.90	15.38	16.73

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that France should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that France actually produced. An $ESR > RSR$ means that France had a Comparative Advantage in the relative sector.

Table 1.12: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Germany*

Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
	R	5.68	4.54	10.71	9.89	1.65	2.78	8.45	6.22	6.25	15.04	17.41	19.53	19.45	17.73	18.98	15.67	15.57
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	18.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	65.00	34.18	50.63	28.82	0.18	0.02
	R	19.94	19.45	19.89	17.30	18.07	19.61	18.90	20.31	19.64	19.31	19.89	22.43	20.18	19.75	17.29	16.48	16.90
4	E	0.00	99.85	73.80	99.41	99.98	99.83	8.37	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	99.95	0.42
	R	14.90	14.86	14.08	14.01	14.04	12.66	12.60	12.08	12.22	13.26	13.39	13.57	13.97	14.20	13.29	13.48	14.88
5	E	0.01	0.02	0.01	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.05
	R	7.35	7.28	7.18	7.01	7.26	6.66	6.42	6.90	5.57	6.91	6.46	6.23	2.10	2.42	7.21	4.93	2.84
6	E	0.01	0.02	99.95	0.00	0.04	0.04	0.02	0.02	0.01	0.01	99.96	99.91	56.58	99.88	99.98	99.97	85.15
	R	31.92	33.28	38.88	23.02	23.88	29.63	22.90	29.72	23.57	22.30	24.07	28.63	10.62	10.53	14.45	4.88	3.29
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	13.43	20.80	17.16	15.77	17.32	20.59	19.19	17.56	15.38	15.63	16.95	16.98	17.76	19.55	17.47	14.39	15.47
8	E	0.00	84.01	22.64	0.00	0.00	0.01	1.82	0.00	7.01	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	11.15	11.98	41.12	14.18	15.36	12.47	10.94	12.02	14.67	13.36	13.98	3.46	5.93	5.06	3.57	-2.87	-3.42
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.04	0.00	0.01
	R	35.15	34.29	29.90	30.16	29.62	27.34	27.59	26.38	26.52	29.79	29.01	31.88	28.84	30.48	27.59	27.78	37.04
10	E	19.00	0.03	0.01	0.00	0.01	0.04	51.03	91.20	0.10	0.64	0.01	0.02	0.01	0.05	0.01	0.01	0.13
	R	34.23	42.10	34.18	31.50	28.66	32.29	30.23	30.22	30.20	31.55	60.64	25.88	18.15	20.95	26.00	11.90	15.65
11	E	7.46	0.02	0.01	61.49	0.02	31.99	0.01	0.01	0.03	0.02	99.98	82.17	70.75	35.58	99.99	93.54	72.55
	R	21.51	21.81	16.20	22.31	16.53	20.50	19.72	19.47	16.29	21.46	24.34	30.06	33.72	26.65	25.60	29.68	26.82
12	E	0.01	0.03	0.00	0.00	0.00	0.18	0.03	17.41	0.02	0.08	0.00	0.00	0.00	/	/	/	/
	R	26.42	27.77	6.65	16.20	-8.38	23.26	25.04	33.36	32.02	32.93	26.51	18.17	-10.27	/	/	/	/
13	E	49.45	28.46	0.00	1.20	11.02	0.14	63.21	50.24	33.50	7.90	28.48	0.00	0.00	0.00	0.00	0.00	0.01
	R	35.87	35.14	33.74	33.71	35.68	35.80	38.27	34.92	36.70	32.75	33.96	33.96	33.78	35.45	34.89	33.18	34.84
14	E	0.00	0.00	0.00	0.00	0.02	54.49	0.01	0.01	53.58	79.13	10.76	23.91	12.39	17.25	0.01	0.00	20.94
	R	30.72	30.47	26.12	29.40	30.35	27.52	27.70	28.18	32.12	32.18	28.49	31.22	29.60	26.49	26.52	26.80	28.93
15	E	99.99	99.97	84.50	100.00	99.99	68.98	99.99	99.99	99.98	99.95	91.08	28.00	64.42	40.32	73.53	88.15	95.48
	R	34.86	34.07	35.20	36.50	35.91	35.15	36.44	35.33	35.85	37.51	36.26	36.34	38.64	38.53	38.73	38.36	41.82
16	E	0.00	0.00	70.59	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	R	20.34	19.32	20.14	18.87	17.77	18.24	17.01	15.63	15.25	15.71	18.19	19.39	17.96	18.79	17.76	17.06	17.83
17	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	15.44	15.71	15.80	14.74	18.96	17.27	16.85	16.39	15.84	15.30	18.03	18.68	19.20	19.63	19.71	25.66	24.58

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Germany should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Germany actually produced. An $ESR > RSR$ means that Germany had a Comparative Advantage in the relative sector.

Table 1.13: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Great Britain*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	1.62	0.00	0.00	0.00	52.15	39.73	40.43	0.00	0.00	0.00	9.34	0.01	0.00	0.00	0.00	0.00	0.00
	R	0.85	12.33	11.46	8.48	8.15	6.05	6.78	10.96	4.50	8.58	4.70	-0.15	0.84	12.71	9.83	11.47	8.50
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	30.67	62.93	29.06	0.01	0.03	0.01	22.04	0.00	0.00	0.00	0.00	0.00	9.72	0.00	25.31	0.01
	R	13.05	12.84	12.86	12.50	12.19	11.74	11.78	11.83	11.51	11.15	12.13	13.14	11.49	10.84	10.43	11.19	12.76
4	E	99.99	0.03	0.00	0.00	0.00	0.14	0.02	0.00	99.96	92.63	0.00	0.06	0.00	0.01	0.00	0.01	0.06
	R	12.39	12.07	11.71	10.78	11.84	9.67	8.36	8.71	9.20	8.72	9.48	9.65	9.25	9.62	9.73	9.58	11.57
5	E	0.01	0.00	0.00	0.00	0.00	0.02	53.47	45.43	99.91	99.92	99.99	99.97	99.97	99.89	100.12	100.17	0.30
	R	4.85	4.39	3.75	2.86	3.70	3.54	3.27	3.37	3.06	2.88	3.38	3.21	3.76	3.83	4.10	4.65	8.50
6	E	99.96	99.93	0.01	99.99	99.93	99.86	99.92	71.75	47.50	99.94	0.00	0.01	0.01	0.01	0.00	0.00	0.05
	R	-4.92	-4.39	-18.24	4.96	-9.79	-7.63	-1.51	2.31	6.20	6.19	-1.07	7.36	6.41	6.23	6.43	4.14	8.68
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	21.26	19.94	20.15	19.43	19.55	17.81	17.65	17.56	18.30	18.47	16.25	15.45	19.43	16.17	15.47	15.95	18.79
8	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	10.04	9.40	7.28	11.12	11.86	12.62	11.33	10.68	10.51	10.52	23.11	14.40	18.30	7.21	6.23	1.46	1.72
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	16.18	14.90	13.08	14.00	12.83	14.24	13.56	12.82	12.56	14.85	12.14	12.58	10.45	9.51	10.71	9.04	12.66
10	E	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02
	R	15.50	10.16	5.21	15.67	17.25	15.69	16.80	15.19	14.97	10.27	-0.93	16.11	16.62	13.31	15.31	11.91	30.92
11	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	10.93	11.12	11.26	8.85	10.08	9.55	8.62	7.52	9.31	9.14	9.41	11.37	11.31	9.48	9.60	12.10	11.47
12	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	58.77	63.53	0.02	/	/	/	/
	R	13.25	17.50	17.47	12.75	18.12	7.44	8.45	6.30	7.00	12.06	13.13	12.95	44.63	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10.54	34.89	17.18	49.38	0.00	56.92
	R	12.22	11.64	12.56	11.85	8.79	8.95	9.49	8.90	8.89	8.92	9.72	8.92	8.55	8.58	9.26	10.71	12.02
14	E	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	17.51	16.31	17.07	16.77	15.79	16.75	13.99	14.44	12.29	10.99	10.12	9.14	8.57	7.68	8.76	7.66	7.74
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	14.94	14.23	13.55	14.64	12.72	12.84	12.12	12.10	12.64	11.57	11.54	11.66	10.60	10.97	12.12	13.26	14.76
16	E	99.99	99.98	0.01	100.00	99.99	99.96	99.97	99.99	99.98	99.99	100.00	99.99	99.99	99.09	84.43	99.69	99.84
	R	13.08	13.48	13.25	13.09	12.78	12.03	12.38	13.67	13.38	13.83	13.52	13.58	13.18	12.97	13.71	14.99	15.51
17	E	0.01	0.00	0.00	0.00	0.00	37.56	0.01	0.00	0.02	0.04	33.35	34.75	20.40	0.08	0.00	0.00	0.02
	R	11.88	11.83	12.03	12.69	10.00	16.18	14.06	11.26	14.19	14.05	17.76	17.14	20.12	19.28	17.31	22.22	21.45

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Great Britain should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Great Britain actually produced. An $ESR > RSR$ means that Great Britain had a Comparative Advantage in the relative sector.

Table 1.14: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Greece*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	7.05	5.43	4.80	4.73	5.76	5.87	6.29	2.95	2.05	4.64	4.67	2.77	2.26	1.40	2.91	3.25	2.34
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.24
	R	1.52	1.61	1.65	1.86	1.74	1.78	2.13	2.31	2.31	2.16	2.10	2.37	2.01	2.23	2.37	2.15	1.97
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	2.71	2.73	2.55	2.72	3.11	2.51	2.20	1.85	2.90	1.59	1.55	1.53	1.42	2.65	2.51	2.41	2.36
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.11	97.84
	R	0.84	0.83	0.77	0.84	0.84	0.91	1.10	0.32	-0.25	0.41	0.65	0.83	0.84	0.59	0.87	0.98	1.25
6	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.42
	R	2.80	2.97	2.43	2.24	2.49	2.13	2.06	1.57	1.51	1.41	1.80	1.14	1.33	0.35	0.61	0.03	-0.73
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.50	1.40	1.22	1.24	1.23	1.01	1.13	1.21	1.23	0.35	0.20	0.55	0.23	-0.44	0.47	0.51	0.48
8	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	63.37	3.05	0.00	0.01
	R	2.80	2.69	1.94	3.20	2.85	2.98	2.02	3.29	3.36	3.48	3.55	2.55	5.41	1.78	1.60	0.31	0.21
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03
	R	1.30	1.18	1.10	0.99	0.89	0.87	-0.02	0.27	0.80	1.07	0.79	0.68	0.71	0.84	0.74	0.62	0.71
10	E	77.61	78.17	94.09	16.10	5.86	16.96	0.00	0.00	0.00	1.84	0.00	0.00	23.34	53.65	0.00	0.00	0.02
	R	1.55	1.53	1.75	1.38	1.56	1.35	1.44	1.44	1.97	1.87	2.14	1.34	1.64	2.51	1.10	1.27	1.56
11	E	1.40	3.74	2.93	0.01	0.01	35.46	53.37	55.95	62.90	19.67	0.00	0.00	0.57	0.05	0.00	6.42	4.96
	R	1.64	1.84	2.01	2.01	2.13	2.03	2.47	2.09	3.56	2.82	2.29	3.06	2.75	2.03	1.70	1.91	1.53
12	E	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	19.09	41.22	36.44	99.93	/	/	/	/
	R	1.73	2.18	2.25	2.26	3.11	1.34	0.44	1.51	1.61	2.01	3.14	4.16	11.00	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.04	8.47	0.05
	R	-0.76	-0.75	-0.65	-0.51	-0.54	-0.20	0.27	0.28	0.30	0.34	0.32	0.31	0.30	0.33	0.27	0.23	0.22
14	E	0.00	0.00	0.00	15.35	16.26	2.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.45	0.41	0.38	0.37	0.33	0.36	0.53	0.55	0.50	0.39	0.23	0.20	0.20	0.21	0.06	0.05	0.04
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.24	0.24	0.23	0.22	0.19	0.20	0.17	0.23	0.23	0.23	0.17	0.20	0.18	0.17	0.17	0.14	0.12
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.03	1.00	0.94	0.95	0.94	0.98	0.98	0.77	0.79	0.94	0.77	0.69	0.63	1.15	1.26	1.16	1.01
17	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.06
	R	1.46	1.44	1.48	1.58	1.98	2.04	2.06	2.15	2.00	1.84	1.87	2.40	1.98	2.05	1.99	2.39	2.06

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Greece should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Greece actually produced. An $ESR > RSR$ means that Greece had a Comparative Advantage in the relative sector.

Table 1.15: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Hungary*

Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	9.58	9.93	0.00	6.64	8.32	10.79	0.13
	R	1.99	1.81	1.94	1.85	2.11	1.66	3.34	2.17	-2.37	3.32	4.02	3.85	2.16	4.24	3.23	4.46	4.79
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	4.89	7.00	6.72	3.53	0.00	0.00	0.00	0.00	0.00	6.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	3.13	3.30	2.76	2.61	2.48	2.53	1.90	1.88	2.13	1.67	0.40	0.45	0.41	0.22	0.33	0.37	0.37
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.11	1.25	1.20	1.27	1.26	1.07	1.16	1.06	1.12	0.89	0.29	0.39	0.11	0.17	0.14	0.12	0.21
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.44	1.63	1.74	1.61	1.60	1.23	1.06	0.69	0.26	-0.05	-0.29	-0.03	-2.00	-1.42	-0.44	-2.61	-4.75
6	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.12	1.18	1.10	0.91	1.10	1.24	1.20	1.02	1.18	1.00	0.06	0.85	0.74	0.67	0.44	0.74	0.66
7	E	0.00	0.00	0.00	2.93	24.52	0.00	11.70	19.29	25.32	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.66	0.58	0.69	0.72	0.80	0.80	0.90	0.91	1.11	0.97	0.48	-0.12	0.18	0.46	0.52	0.37	0.38
8	E	0.00	0.01	0.01	0.00	0.02	0.01	0.01	2.86	4.92	0.01	2.30	1.97	0.01	0.00	0.00	0.00	0.00
	R	4.10	3.38	2.55	6.84	6.75	4.27	2.67	2.41	3.11	2.71	1.02	0.06	1.65	0.06	-0.23	-1.26	-1.31
9	E	15.08	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.28	1.83	1.62	1.17	0.78	0.55	0.44	0.50	0.74	0.39	-0.20	-0.17	-0.18	-0.35	-0.21	0.00	0.08
10	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.03
	R	0.62	0.62	0.73	0.63	0.50	0.68	0.51	0.67	1.04	0.56	0.98	-2.36	-0.88	-6.21	-0.41	-1.33	-1.45
11	E	0.00	0.01	0.00	17.51	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.94	0.43	0.00	0.00	0.01
	R	0.94	0.97	0.98	1.05	1.00	0.99	0.94	0.94	1.10	0.98	0.54	0.70	0.77	0.72	0.60	0.79	0.71
12	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/	/	/
	R	0.86	1.07	0.96	0.49	0.12	0.60	0.43	0.56	0.73	0.63	-0.71	0.07	/	/	/	/	
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.68	1.82	8.12
	R	0.35	0.33	0.23	0.05	0.05	0.18	0.27	0.34	0.48	0.37	0.20	0.34	0.15	0.33	0.50	1.14	1.68
14	E	0.00	0.00	0.00	0.00	0.00	13.24	7.17	3.21	0.00	1.39	0.00	0.00	4.66	2.35	0.00	0.00	0.00
	R	0.36	0.48	0.67	1.02	1.87	2.37	2.65	2.61	2.64	2.67	1.45	1.78	2.05	2.32	1.71	2.11	1.85
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00
	R	0.50	0.60	0.81	1.08	0.99	0.97	0.93	0.95	1.14	1.12	0.77	0.87	0.93	1.21	0.89	0.86	0.89
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.39	0.34	0.35	0.39	0.39	0.40	0.39	0.45	0.50	0.46	0.31	-0.07	0.29	0.37	0.31	0.33	0.35
17	E	0.00	4.11	3.49	0.00	6.93	6.48	4.66	1.14	0.02	3.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	4.28	4.17	4.01	3.81	4.33	4.33	4.24	3.64	3.50	3.61	0.87	1.07	0.92	1.00	0.86	1.08	1.02

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Hungary should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Hungary actually produced. An $ESR > RSR$ means that Hungary had a Comparative Advantage in the relative sector.

Table 1.16: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Ireland*

Sector	E/R	Year																
		1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.91	0.89	1.01	1.07	1.21	1.28	1.10	1.84	-0.49	-0.56	0.66	-1.46	-1.42	-0.70	0.43	-0.50	0.16
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.45	1.37	1.34	1.35	1.29	1.35	1.50	1.46	2.13	2.14	1.84	2.18	2.09	1.97	2.15	2.32	2.37
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.65	0.66	0.62	0.52	0.52	0.39	0.43	0.41	0.40	0.27	0.37	0.43	0.37	0.38	0.32	0.33	0.39
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.92
	R	0.36	0.26	0.28	0.27	0.25	0.23	0.20	0.22	0.25	0.30	0.28	0.23	0.35	0.33	0.35	0.40	0.51
6	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	0.74	0.85	0.66	0.93	0.98	0.85	0.79	0.97	1.03	0.96	1.70	3.63	1.71	1.99	1.12	1.80	2.23
7	E	33.45	33.97	6.83	0.00	45.57	18.64	0.00	0.00	41.15	0.01	44.84	45.70	73.09	70.08	62.32	84.96	99.94
	R	2.52	2.91	3.22	3.61	3.94	3.79	3.15	3.00	3.81	4.48	4.32	3.98	6.73	6.40	5.21	7.13	8.61
8	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.14	0.13	0.14	0.21	0.15	0.15	0.29	0.24	0.06	0.09	-0.19	0.62	1.53	0.52	0.40	0.05	0.01
9	E	0.01	0.01	39.30	57.51	0.01	42.76	71.40	69.43	0.01	79.20	0.00	0.01	0.00	0.00	0.01	0.00	7.72
	R	2.23	2.65	3.33	4.48	4.58	6.89	7.28	7.47	7.84	8.81	5.80	5.67	4.48	5.12	7.86	7.16	9.98
10	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	0.43	0.30	0.00	0.34	0.31	0.20	0.38	0.31	-0.08	0.32	-1.32	0.22	-0.06	-1.01	0.43	-0.64	0.00
11	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.91	0.99	1.10	0.93	1.13	1.01	0.98	0.90	0.75	1.20	0.27	0.38	0.73	0.77	0.77	0.60	0.58
12	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/	/	/
	R	0.06	0.12	0.16	0.34	0.07	0.11	0.16	0.11	-0.25	0.09	-0.81	-1.66	-0.91	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00
	R	0.52	0.48	0.53	0.42	0.29	0.30	0.27	0.23	0.01	0.32	0.36	0.36	0.34	0.31	0.28	0.26	0.22
14	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	3.26	3.24	3.89	3.48	3.96	4.85	4.53	5.08	4.60	4.19	3.27	3.03	2.76	2.91	2.53	2.72	2.81
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.16	0.17	0.18	0.17	0.13	0.13	0.13	0.16	0.17	0.14	0.15	0.21	0.22	0.20	0.18	0.17	0.16
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.88	0.00	0.30	0.01
	R	0.26	0.28	0.31	0.27	0.22	0.19	0.24	0.23	0.26	0.27	0.24	0.41	0.57	0.56	0.61	0.63	0.61
17	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.36	0.32	0.33	0.35	0.30	0.36	0.47	0.50	0.53	0.48	0.63	1.12	0.72	0.74	0.73	0.90	0.92

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Ireland should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Ireland actually produced. An $ESR > RSR$ means that Ireland had a Comparative Advantage in the relative sector.

Table 1.17: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Italy*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	14.06	13.29	11.42	12.05	15.51	16.53	-4.76	12.59	11.31	13.08	13.19	14.63	11.73	5.26	8.96	7.86	7.92
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	3.26	56.20	0.01	54.69	0.00	50.82	42.68	40.01
	R	11.52	11.19	11.64	12.57	11.99	11.51	11.78	10.30	11.75	11.78	10.93	9.73	11.72	11.90	11.78	11.55	11.27
4	E	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	32.27	31.85	31.63	32.93	27.90	35.83	37.35	35.66	33.96	35.24	32.71	34.25	33.41	35.29	33.46	34.32	32.87
5	E	99.84	0.01	3.73	0.01	0.00	0.02	0.02	0.02	0.02	0.01	0.00	0.01	0.01	0.02	0.00	0.01	0.07
	R	51.57	50.88	50.25	51.00	46.33	45.96	52.94	52.67	56.84	55.81	57.41	58.61	67.56	63.53	54.64	62.44	74.63
6	E	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.04
	R	11.37	2.54	12.63	11.57	10.80	9.02	15.78	12.09	10.29	13.22	7.24	11.31	7.12	-4.07	4.96	2.64	-0.18
7	E	0.00	0.00	0.00	0.00	2.66	0.00	0.01	0.00	0.00	0.00	7.73	54.29	0.00	0.01	0.00	0.00	0.01
	R	12.13	9.43	11.56	12.15	11.24	9.09	9.21	10.73	9.16	8.00	9.02	11.34	13.33	12.17	9.83	10.82	9.60
8	E	9.62	8.90	5.33	13.58	0.00	6.82	0.03	7.59	0.03	0.00	18.98	0.31	0.01	0.22	0.00	0.05	0.01
	R	11.46	11.23	7.42	17.23	13.95	13.65	13.38	14.14	12.03	15.43	14.51	13.39	25.82	8.25	4.01	0.47	-0.20
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	9.99	9.04	10.16	9.72	8.88	4.96	6.05	9.41	8.33	4.22	3.72	-1.32	7.82	7.16	6.21	7.76	8.63
10	E	0.01	0.01	0.00	0.00	0.00	0.01	0.02	0.02	65.67	90.42	0.00	0.02	0.02	0.04	0.01	0.00	0.07
	R	14.90	14.06	19.74	17.11	18.44	17.14	18.33	19.68	19.87	16.32	29.27	19.81	19.67	26.26	13.35	14.92	22.07
11	E	0.01	0.02	0.00	0.01	0.01	0.01	46.55	0.01	13.12	0.03	0.00	0.00	0.01	0.08	0.00	0.00	0.17
	R	18.48	18.73	18.79	17.59	19.66	17.41	20.29	18.97	19.51	19.07	12.51	-5.00	-14.15	5.84	12.48	-6.92	8.36
12	E	0.08	16.40	0.00	0.00	0.01	61.41	12.17	60.24	74.89	0.02	0.00	0.01	0.00	/	/	/	/
	R	14.66	21.59	21.03	21.66	30.86	23.25	21.44	19.09	19.22	8.09	28.80	29.13	73.48	/	/	/	/
13	E	50.54	71.52	86.83	98.80	88.97	99.85	36.78	49.75	53.27	92.08	0.00	70.60	0.00	77.38	0.02	0.00	9.73
	R	22.58	22.92	24.83	23.97	24.07	22.98	20.37	23.31	22.13	23.74	19.86	20.00	20.02	18.21	18.12	17.62	18.05
14	E	99.98	77.38	53.35	47.75	44.34	0.00	73.99	50.14	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	16.31	15.62	15.36	13.62	12.23	10.09	11.94	11.31	12.25	12.08	6.26	7.32	7.47	7.02	5.69	5.13	4.69
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	11.70	11.55	11.90	10.28	10.04	9.82	9.97	9.59	8.77	8.72	6.25	7.44	7.33	6.94	6.80	6.00	4.86
16	E	0.00	0.00	29.39	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03
	R	23.75	24.07	23.11	23.22	23.97	24.46	24.08	24.01	24.01	24.12	23.02	22.29	21.34	21.00	20.58	21.05	20.69
17	E	0.01	0.01	0.01	0.00	25.45	0.92	1.66	0.10	9.45	22.66	0.00	0.00	18.49	15.14	11.58	15.18	7.47
	R	11.13	10.90	10.76	11.01	13.57	12.34	12.33	12.01	12.17	12.59	10.22	10.47	11.51	11.67	11.22	13.82	11.98

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Italy should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Italy actually produced. An $ESR > RSR$ means that Italy had a Comparative Advantage in the relative sector.

Table 1.18: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Netherland*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	20.55	0.00	2.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	3.50	4.23	2.70	5.82	7.56	8.26	7.79	7.50	8.05	6.17	7.60	6.31	4.44	-2.11	8.34	4.62	2.95
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	2.63	0.01	21.39	14.65	24.29	24.48	26.66	24.31	25.20	7.46	22.93	2.87	0.00	19.50	3.87	1.63
	R	7.48	7.49	7.48	6.94	7.13	7.03	7.01	7.02	7.53	6.61	7.10	6.93	7.03	7.44	7.30	7.42	7.77
4	E	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04
	R	2.19	2.11	2.14	2.11	2.25	2.15	2.01	2.06	2.13	2.00	2.10	2.18	2.18	2.50	2.21	2.39	2.78
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.00	0.01	0.14
	R	0.75	0.70	0.74	0.73	0.66	0.73	0.59	0.61	0.61	0.67	0.80	0.78	0.89	0.78	1.04	1.20	1.43
6	E	0.00	0.01	0.01	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02
	R	3.85	3.95	4.63	3.95	4.57	3.93	3.69	3.25	2.96	2.84	0.54	4.49	2.64	3.50	3.21	2.21	3.06
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	5.32	4.44	5.35	5.54	5.30	4.80	4.80	4.89	4.79	4.72	4.09	4.46	5.26	5.39	4.66	5.00	5.17
8	E	90.35	0.02	69.93	77.07	75.32	24.39	0.04	0.01	0.07	0.02	0.00	0.00	0.01	0.01	61.18	26.48	22.89
	R	6.48	5.82	4.17	8.19	7.18	6.24	6.59	5.91	6.27	5.76	2.60	2.70	2.64	2.19	2.16	-0.08	0.13
9	E	61.20	99.89	60.68	0.00	28.13	0.00	0.01	0.00	0.02	0.01	69.08	0.00	83.16	85.45	2.34	59.25	97.99
	R	11.20	10.24	10.21	9.16	8.86	10.25	9.84	9.77	9.90	11.34	8.49	9.14	8.43	7.83	8.94	9.70	14.26
10	E	0.00	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.05
	R	3.67	3.92	4.51	3.86	3.96	3.85	3.86	4.05	4.21	4.12	5.30	3.44	4.21	6.03	4.04	4.63	6.71
11	E	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.02
	R	3.83	3.90	3.91	3.73	3.85	3.73	3.63	3.46	3.18	3.01	3.28	4.42	4.80	4.23	3.58	4.20	3.89
12	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/	/	/
	R	5.47	5.87	7.01	6.84	6.85	4.55	4.88	4.59	4.14	5.66	5.03	5.43	17.79	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.51
	R	3.09	3.25	3.15	3.49	3.02	3.52	3.70	3.94	3.58	3.76	3.42	3.59	3.69	3.51	3.71	3.93	3.90
14	E	0.00	0.00	4.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	5.27	5.23	5.45	4.90	4.64	4.70	4.12	4.47	4.02	3.80	2.93	2.65	2.38	2.47	2.38	2.16	2.18
15	E	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	2.10	1.78	1.62	1.94	1.66	1.44	1.71	1.80	1.72	1.45	1.36	1.40	1.60	0.70	0.97	1.32	1.38
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	4.88	5.06	5.31	5.25	5.36	5.20	4.71	4.91	5.01	4.91	4.91	4.85	5.17	5.13	5.51	5.51	5.14
17	E	0.00	0.01	11.33	0.00	0.00	0.00	0.01	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	3.70	3.85	3.99	3.93	4.35	4.39	4.49	4.70	4.40	4.46	3.97	3.86	3.87	3.65	3.97	4.46	4.17

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Netherlands should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Netherlands actually produced. An $ESR > RSR$ means that Netherlands had a Comparative Advantage in the relative sector.

Table 1.19: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Poland*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	4.94	3.92	8.39	8.40	3.21	3.13	13.10	2.63	2.01	7.02	-2.94	-8.51	4.71	6.56	5.03	4.89	3.18
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	3.12	0.00	0.19	0.01
	R	3.73	4.27	4.55	4.97	4.67	4.96	5.05	5.16	5.59	5.42	5.13	6.58	5.65	6.13	5.98	6.35	6.64
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.00	2.13	2.21	2.33	2.20	1.92	1.97	2.15	2.05	2.13	1.26	1.58	1.30	1.81	2.02	2.04	2.40
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	R	1.58	1.81	1.88	1.77	2.02	1.72	1.37	1.69	1.39	1.25	0.95	1.19	-0.19	1.05	1.54	1.40	-2.85
6	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.07
	R	5.59	6.71	6.30	6.39	8.24	7.93	5.55	6.47	5.90	6.39	8.93	16.18	6.13	8.76	7.51	9.25	10.90
7	E	47.09	30.84	93.16	97.07	27.24	81.34	88.26	80.69	33.48	99.96	47.42	0.00	26.90	29.89	37.67	15.04	0.01
	R	1.87	1.82	1.73	1.93	2.40	2.96	3.05	3.61	3.30	3.08	2.16	2.55	2.03	2.99	2.66	2.24	2.68
8	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.62	0.00	0.00	0.01	2.60	0.00	0.00
	R	2.31	2.18	1.66	3.23	3.62	6.62	6.56	4.88	6.44	9.11	17.21	12.91	24.51	10.25	7.30	2.49	1.96
9	E	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.19	1.20	1.38	1.21	1.43	1.23	1.28	1.45	1.48	-0.87	-0.64	0.75	0.22	0.34	0.74	0.97	0.36
10	E	0.01	0.54	0.00	0.00	0.01	0.01	0.00	0.01	0.05	4.38	0.00	0.00	76.00	0.31	0.01	0.02	0.21
	R	1.76	1.86	1.98	2.09	2.79	3.85	3.90	5.56	6.02	5.47	6.63	4.66	3.17	6.03	4.80	5.41	10.50
11	E	0.01	0.49	0.00	0.00	82.43	0.00	0.00	0.00	0.00	0.00	0.01	17.80	27.71	63.75	0.00	0.02	15.65
	R	2.53	2.86	3.15	3.30	3.82	3.90	2.98	3.89	3.81	3.90	2.88	4.16	4.61	3.96	4.18	6.98	6.23
12	E	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.01	/	/	/	/
	R	2.70	3.26	2.96	2.72	4.07	2.12	0.69	1.75	2.50	2.86	0.68	1.11	-6.02	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.85	0.00	0.01	15.86	24.66	23.54
	R	0.95	1.02	0.90	0.88	1.21	1.15	0.91	1.03	1.31	1.22	1.15	1.41	1.36	1.92	1.86	1.75	1.26
14	E	0.00	22.59	0.00	0.00	0.00	0.01	0.00	0.01	25.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.28	1.38	1.33	1.39	1.50	1.38	1.59	1.78	1.76	1.63	0.65	0.77	0.65	1.06	0.77	0.89	0.43
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.02	1.20	1.31	1.34	1.61	1.57	1.47	1.39	1.76	2.27	1.69	1.97	2.07	2.53	2.87	2.60	2.78
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.95	2.08	2.56	2.66	2.72	2.48	2.77	2.82	3.67	4.02	2.86	3.34	4.46	5.13	5.36	5.23	5.80
17	E	29.70	0.01	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	8.43	8.13	8.69	8.54	9.79	10.00	10.28	10.03	8.68	9.21	4.56	4.34	4.38	4.99	4.14	5.85	5.17

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Poland should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Poland actually produced. An $ESR > RSR$ means that Poland had a Comparative Advantage in the relative sector.

Table 1.20: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Portugal*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.95	1.28	-1.16	1.61	2.09	1.80	-0.84	1.14	1.17	1.57	0.01	2.52	2.30	1.04	1.46	1.29	1.24
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.30	2.34	2.18	1.74	1.91	2.01	2.13	1.67	1.73	1.77	1.47	1.62	1.58	1.66	1.56	1.69	1.65
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	5.08	4.92	5.29	5.15	4.78	4.40	4.31	4.50	4.65	4.72	4.32	3.34	3.27	3.67	3.61	3.51	3.73
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	R	6.21	5.71	6.28	6.22	5.86	6.54	5.17	5.68	5.30	5.41	4.09	3.87	4.00	3.77	4.50	3.92	4.21
6	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	4.26	4.98	4.96	5.71	4.96	4.52	4.24	3.00	4.14	2.75	6.24	7.31	2.74	3.91	2.82	2.87	3.08
7	E	19.44	35.17	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	R	1.69	1.61	1.72	1.54	0.90	1.23	1.26	0.94	1.15	1.34	1.36	1.29	1.59	1.67	1.64	1.85	1.90
8	E	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.17	1.17	1.42	0.53	1.59	1.76	2.26	7.38	6.16	1.64	-0.76	-1.30	-2.06	-0.16	0.03	-0.06	-0.06
9	E	23.68	0.02	0.00	42.49	41.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	0.28	-0.09	0.15	0.43	0.44	-0.17	0.22	0.40	0.21	0.31	0.36	0.50	0.58	0.70	0.50	0.48	0.52
10	E	0.07	0.03	0.01	8.75	0.04	82.95	48.88	0.00	4.87	2.38	0.00	0.01	0.00	0.03	0.00	0.00	0.05
	R	0.87	0.89	1.24	1.04	1.10	1.03	1.28	1.24	0.47	0.67	1.85	0.48	0.75	1.68	0.95	0.91	1.17
11	E	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.06	0.00	0.00	0.04
	R	2.43	2.74	2.91	2.53	2.91	2.88	2.93	3.05	3.08	2.67	3.38	2.83	3.26	2.97	3.13	3.98	3.31
12	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/	/	/
	R	0.72	0.22	1.12	0.69	0.68	0.65	0.75	0.76	0.82	0.71	-1.19	0.51	-4.23	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.49	0.50	0.58	0.56	0.54	0.57	0.49	0.55	0.54	0.53	0.45	0.38	0.40	0.43	0.40	0.37	0.34
14	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.58	0.56	0.53	0.56	0.66	0.69	0.68	0.83	0.88	0.82	1.00	0.69	0.71	0.70	0.59	0.48	0.43
15	E	0.00	0.00	15.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.00	0.01	0.00	0.00	0.01
	R	0.46	0.87	0.91	0.87	0.69	0.61	0.54	0.67	0.63	0.60	0.91	0.87	0.81	0.89	0.91	0.74	0.68
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.90	1.79	1.86	1.98	1.68	1.76	1.70	1.60	1.69	1.63	1.17	1.10	1.12	1.10	1.26	1.20	1.11
17	E	0.00	1.89	5.48	0.00	0.00	0.02	32.20	83.11	75.76	71.00	66.64	65.23	61.08	58.20	69.89	84.80	77.27
	R	1.37	1.38	1.39	1.52	1.95	2.11	2.17	2.08	2.04	2.09	2.17	2.35	2.54	2.62	2.40	2.95	2.73

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Portugal should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Portugal actually produced. An $ESR > RSR$ means that Portugal had a Comparative Advantage in the relative sector.

Table 1.21: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Spain*

Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.01	0.00	0.00	36.49	45.91	0.01	0.08	3.84	59.86	0.00	0.00	62.49	64.02	0.10	58.88	36.12	0.01
	R	13.60	17.75	14.47	13.58	15.54	19.44	18.56	15.00	22.88	12.59	16.11	16.20	18.76	13.66	15.85	20.23	14.41
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	13.32	30.71	0.00	0.00	0.00	41.99	40.32	32.51	14.63	27.01	35.43	12.06	8.18	29.01	0.87	19.04	33.23
	R	11.06	10.94	10.86	11.84	11.01	10.85	11.27	11.32	10.61	11.17	10.64	10.60	9.98	10.21	10.53	10.40	10.21
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	8.22	8.15	8.94	8.71	10.12	9.15	8.92	9.32	9.68	9.19	8.04	8.58	8.44	9.22	7.98	7.49	7.53
5	E	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.04
	R	12.48	14.22	14.41	14.67	15.32	15.74	13.59	15.00	14.64	14.34	14.14	13.89	15.72	16.61	14.68	15.34	18.21
6	E	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.03
	R	7.41	8.34	8.11	6.99	7.56	7.20	6.59	5.60	6.11	4.51	5.38	6.78	7.07	8.20	7.83	7.28	8.91
7	E	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	7.11	4.63	5.21	4.37	5.13	7.45	7.79	7.98	8.38	7.94	8.22	7.94	9.28	9.50	8.29	8.33	9.00
8	E	0.00	5.06	2.08	4.06	0.00	11.72	0.01	0.00	0.03	0.00	13.02	15.92	23.44	0.02	2.11	2.46	1.06
	R	8.97	10.22	7.82	10.92	15.43	13.32	9.45	9.89	7.30	9.19	9.51	8.53	19.42	8.05	6.41	1.96	1.92
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	6.94	5.34	5.47	6.55	6.25	6.59	6.54	5.96	6.10	6.28	4.42	3.98	5.05	4.77	5.42	5.90	7.54
10	E	0.01	0.01	0.00	0.00	0.01	0.01	0.00	8.74	29.15	0.21	0.00	0.00	0.00	0.01	0.00	0.00	0.05
	R	4.78	2.59	3.63	4.85	4.62	4.99	4.96	5.01	5.02	5.21	-4.29	1.77	5.18	8.50	5.19	5.46	8.55
11	E	0.00	0.01	0.01	0.01	0.01	0.01	0.03	24.05	0.03	80.23	0.00	0.01	0.00	0.02	0.00	0.00	6.13
	R	11.97	10.98	12.79	12.79	14.56	13.36	15.38	15.78	16.66	15.47	17.70	19.46	22.89	18.67	15.65	18.12	14.57
12	E	76.60	25.94	89.39	33.52	15.76	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	/	/	/	/
	R	9.23	-1.39	11.49	9.51	12.76	6.98	7.26	6.37	7.40	8.54	-7.95	5.79	-107.78	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.31	8.89	0.04	0.04
	R	3.05	3.95	2.91	3.99	3.88	4.05	4.01	4.39	3.86	3.96	3.72	3.62	4.17	4.38	4.53	3.84	3.84
14	E	0.00	0.01	41.67	24.59	23.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	3.81	6.26	4.78	5.05	4.48	4.79	5.13	4.25	4.38	4.28	2.52	2.37	3.18	3.21	2.88	2.21	1.81
15	E	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	4.81	0.08
	R	8.44	9.14	8.97	8.46	8.14	8.84	8.42	8.77	8.63	8.17	7.58	7.09	7.86	7.82	8.01	6.40	6.25
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	9.04	9.53	9.61	9.98	9.90	8.99	9.22	9.02	9.30	9.55	9.91	9.31	10.50	10.55	10.88	9.67	8.45
17	E	0.00	0.00	0.02	0.00	26.33	0.02	17.09	15.62	14.69	2.78	0.00	0.01	0.01	26.53	18.52	0.01	14.97
	R	4.75	4.85	5.23	5.26	6.29	3.01	5.14	7.90	7.76	7.99	10.08	10.41	11.13	12.06	11.93	15.05	14.42

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Spain should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Spain actually produced. An $ESR > RSR$ means that Spain had a Comparative Advantage in the relative sector.

Table 1.22: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Sweden*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	4.31	4.63	4.18	3.75	4.62	4.50	5.23	4.27	5.90	3.60	-0.51	4.60	3.55	5.02	1.15	4.30	3.00
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	13.95	18.79	13.57	18.64	14.01	11.19	12.51	18.78	17.50	18.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.25	2.23	2.17	2.10	2.15	1.81	1.91	2.09	1.86	1.88	2.36	2.53	2.12	2.05	2.25	2.41	2.42
4	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	0.63	0.61	0.66	0.67	0.66	0.63	0.62	0.66	0.72	0.74	0.49	0.46	0.47	0.49	0.56	0.55	0.87
5	E	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.14	-0.31	-0.53
	R	0.28	0.26	0.25	0.19	0.24	0.28	0.28	0.26	0.32	0.40	0.37	0.30	0.27	0.24	-0.11	-0.25	-0.45
6	E	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	7.42	9.58	11.44	10.29	12.71	12.04	11.40	8.64	8.92	8.88	21.71	33.60	12.53	16.92	11.06	14.03	16.29
7	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	8.40	7.34	7.02	8.20	6.76	6.76	6.76	7.10	8.12	8.86	7.95	6.49	5.16	5.99	7.56	7.23	6.62
8	E	0.01	1.98	0.00	3.04	0.05	0.00	0.00	2.73	2.48	3.18	0.00	0.00	0.00	14.68	18.45	8.78	14.20
	R	2.88	3.07	2.54	4.80	4.12	3.74	3.91	3.57	3.83	3.99	5.66	3.81	4.19	25.48	25.97	12.43	19.44
9	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.11	2.36	2.61	2.33	2.47	1.88	2.61	3.00	3.06	3.14	2.62	2.32	1.09	1.20	2.20	1.08	-0.42
10	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	R	1.47	0.86	2.19	1.79	1.82	0.53	0.72	2.02	1.64	1.63	-3.19	-0.96	-1.66	-8.06	-1.48	-5.43	-8.05
11	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	1.71	1.45	1.45	1.53	1.76	1.54	1.56	1.45	1.06	1.11	1.27	1.08	1.34	1.31	1.10	1.48	1.73
12	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	/	/	/	/
	R	4.08	3.24	6.71	3.92	6.01	4.37	3.83	2.99	2.33	2.36	0.59	-8.46	-5.01	/	/	/	/
13	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	4.00	3.54	3.73	3.92	3.88	3.78	4.04	4.25	4.15	4.36	3.72	4.07	3.88	3.41	2.63	3.43	4.01
14	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	63.91	47.29	50.61	50.61	50.85	49.16	56.76
	R	2.80	3.53	4.01	4.11	4.58	4.82	4.66	4.17	3.83	4.19	19.34	21.03	20.35	21.41	22.32	23.20	27.18
15	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	3.81	3.59	3.28	3.27	3.14	3.85	3.23	4.02	4.33	4.38	4.62	4.36	4.40	4.05	3.36	4.41	5.24
16	E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	2.22	2.05	2.41	2.64	2.52	2.43	2.49	2.09	2.03	1.70	1.67	1.85	2.31	1.89	1.48	1.88	1.60
17	E	21.51	0.01	34.81	0.00	39.35	52.21	44.29	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	R	4.83	4.66	4.57	4.63	5.27	5.10	5.35	5.05	4.66	4.99	4.19	3.89	4.09	2.79	3.03	2.53	3.30

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Sweden should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Sweden actually produced. An $ESR > RSR$ means that Sweden had a Comparative Advantage in the relative sector.

1.B.2 Comparative Advantages organized by ranking

From another perspective, it may be interesting to have an overall view on the countries that should play a leading role in specific sectors. The Tables 1.23-1.38 have been reported for this purpose. From Tab. 1.23, for example, it is evident that France or Spain–depending on the year—should have been the leading countries in Agriculture, while other countries that ranked pretty well in many years are the Great Britain, Denmark or the Czech Republic.

Aside the value in the ESR, a sign +, - or = has been reported in Tables 1.23-1.38. The sign specifies whether the country should have improved (+), lowered (-), or kept more or less constant (=) the net product. If the distance between the ESR and the RSR has been lower than the 20% of the RSR, the country has been considered to be close to its CA and an equals sign has been reported.

Table 1.23: Ranking of the Efficient Specialization Ratio (E) in Agriculture, Hunting, Forestry and Fishing*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	FRA	FRA	FRA	FRA	GBR	GBR	GBR	FRA	ESP	FRA	FRA	ESP	ESP	FRA	ESP	ESP	FRA
	43.60+	89.41+	84.57+	43.53+	52.15+	39.73+	40.43+	73.20+	59.86+	72.70+	43.34+	62.49+	64.02+	75.73+	58.88+	36.12+	66.69+
2	NLD	CZE	CZE	ESP	ESP	FRA	FRA	CZE	CZE	CZE	CZE	CZE	CZE	DNK	CZE	DNK	CZE
	20.55+	10.57+	13.41+	36.49+	45.91+	37.17+	33.12=	22.96+	32.30+	21.60+	24.74+	20.00+	21.89+	17.50+	18.67+	23.95+	17.18+
3	CZE	ESP	NLD	CZE	FRA	CZE	CZE	ESP	DNK	DNK	DNK	HUN	DNK	HUN	DNK	CZE	DNK
	18.51+	0.00-	2.01-	19.98+	1.55-	23.07+	26.33+	3.84-	7.81+	5.68+	13.00+	9.93+	14.07+	6.64+	14.12+	21.81+	15.97+
4	DNK	DNK	DNK	DNK	CZE	ESP	ESP	DNK	FRA	HUN	HUN	DNK	FRA	ESP	HUN	HUN	HUN
	15.70+	0.00-	0.00-	0.00-	0.38-	0.01-	0.08-	0.00-	0.01-	0.01-	9.58+	7.56+	0.01-	0.10-	8.32+	10.79+	0.13-
5	GBR	NLD	ESP	GBR	NLD	DNK	DNK	GBR	SWE	ESP	GBR	GBR	NLD	CZE	FRA	FRA	ESP
	1.62+	0.00-	0.00-	0.00-	0.00-	0.01-	0.02-	0.00-	0.01-	0.00-	9.34+	0.01+	0.00-	0.02-	0.00-	7.32-	0.01-
6	ESP	GBR	BEL	NLD	DEU	NLD	NLD	NLD	GBR	SWE	DEU	FRA	GBR	DEU	DEU	DEU	NLD
	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.01-	0.00-	0.01-	0.01-
7	BEL	BEL	GBR	BEL	DNK	DEU	SWE	SWE	NLD	NLD	ESP	NLD	DEU	NLD	NLD	NLD	DEU
	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-
8	DEU	DEU	DEU	DEU	BEL	BEL	DEU	DEU	BEL	GBR	NLD	DEU	BEL	GBR	BEL	BEL	BEL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-
9	SWE	SWE	SWE	SWE	SWE	SWE	BEL	BEL	DEU	DEU	BEL	ITA	ITA	ITA	ITA	ITA	ITA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
10	FIN	ITA	HUN	ITA	ITA	ITA	HUN	ITA	ITA	ITA	ITA	BEL	HUN	BEL	GBR	GBR	GRC
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-
11	ITA	HUN	FIN	HUN	PRT	HUN	ITA	HUN	HUN	BEL	POL	SWE	POL	POL	SWE	POL	GBR
	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00+	0.00-	0.00+	0.00+	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
12	HUN	FIN	ITA	GRC	GRC	GRC	FIN	POL	POL	POL	SWE	GRC	SWE	PRT	POL	SWE	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
13	PRT	PRT	GRC	FIN	HUN	FIN	POL	GRC	FIN	GRC	PRT	PRT	GRC	GRC	PRT	GRC	POL
	0.00-	0.00-	0.00-	0.00+	0.00-	0.00+	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	POL	POL	PRT	POL	FIN	PRT	GRC	FIN	GRC	PRT	GRC	POL	PRT	SWE	AUT	PRT	IRL
	0.00-	0.00-	0.00+	0.00-	0.00+	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-
15	AUT	GRC	AUT	PRT	POL	POL	PRT	PRT	PRT	FIN	AUT	AUT	AUT	FIN	GRC	AUT	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	GRC	AUT	POL	AUT	AUT	AUT	AUT	AUT	AUT	AUT	FIN	FIN	FIN	AUT	FIN	FIN	FIN
	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-
17	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00-	0.00+	0.00+	0.00+	0.00-	0.00+	0.00+

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.24: Ranking of the Efficient Specialization Ratio (E) in Food, Beverages and Tobacco*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	FRA	ESP	GBR	GBR	FRA	ESP	ESP	ESP	FRA	ESP	ITA	DEU	ITA	DEU	ITA	ITA	ITA
	40.64+	30.71+	62.93+	29.06+	60.63+	41.99+	40.32+	32.51+	43.55+	27.01+	56.20+	65.00+	54.69+	50.63+	50.82+	42.68+	40.01+
2	DEU	GBR	FRA	FRA	NLD	NLD	NLD	NLD	NLD	NLD	ESP	NLD	DEU	ESP	DEU	GBR	ESP
	18.02=	30.67+	16.77+	27.37+	14.65+	24.29+	24.48+	26.66+	24.31+	25.20+	35.43+	22.93+	34.18+	29.01+	28.82+	25.31+	33.23+
3	SWE	SWE	SWE	NLD	SWE	FRA	FRA	GBR	SWE	FRA	NLD	ESP	ESP	GBR	NLD	ESP	FRA
	13.95+	18.79+	13.57+	21.39+	14.01+	22.47+	22.68+	22.04+	17.50+	19.76+	7.46=	12.06=	8.18=	9.72=	19.50+	19.04+	15.99=
4	ESP	FRA	HUN	SWE	CZE	SWE	SWE	SWE	ESP	SWE	DEU	ITA	NLD	CZE	ESP	BEL	BEL
	13.32+	10.19-	6.72+	18.64+	10.70+	11.19+	12.51+	18.78+	14.63+	18.71+	0.61-	0.01-	2.87-	7.51+	0.87-	8.73+	6.56+
5	BEL	HUN	NLD	HUN	GBR	GBR	GBR	FRA	CZE	HUN	BEL	BEL	POL	POL	BEL	NLD	GRC
	9.17+	7.00+	0.01-	3.53+	0.01-	0.03-	0.01-	0.01-	0.00-	6.07+	0.30-	0.00-	0.06-	3.12-	0.00-	3.87-	2.24=
6	HUN	NLD	CZE	CZE	ESP	ITA	CZE	CZE	GBR	ITA	FRA	GBR	FRA	ITA	CZE	POL	NLD
	4.89+	2.63-	0.00-	0.00-	0.00-	0.02-	0.00-	0.00-	0.00-	3.26-	0.00-	0.00-	0.00-	0.00-	0.00-	0.19-	1.63-
7	CZE	CZE	BEL	ESP	ITA	CZE	DEU	ITA	DEU	GBR	GBR	FRA	BEL	NLD	GBR	DEU	CZE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.18-	0.30-
8	NLD	BEL	DEU	BEL	BEL	DEU	HUN	DEU	BEL	DEU	CZE	CZE	CZE	FRA	POL	CZE	DEU
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.02-
9	GBR	ITA	ESP	ITA	DEU	DNK	POL	HUN	DNK	CZE	DNK	DNK	GBR	BEL	FRA	FRA	POL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
10	ITA	DEU	DNK	DEU	HUN	BEL	DNK	AUT	AUT	DNK	AUT	PRT	GRC	DNK	DNK	GRC	GBR
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
11	DNK	DNK	ITA	DNK	DNK	HUN	BEL	BEL	ITA	GRC	POL	SWE	DNK	PRT	GRC	AUT	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
12	FIN	PRT	GRC	PRT	PRT	GRC	FIN	DNK	PRT	POL	HUN	AUT	AUT	GRC	AUT	SWE	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
13	PRT	FIN	FIN	POL	GRC	PRT	AUT	GRC	HUN	BEL	GRC	GRC	HUN	AUT	HUN	DNK	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	GRC	GRC	PRT	GRC	AUT	AUT	ITA	PRT	POL	AUT	FIN	HUN	PRT	SWE	SWE	PRT	FIN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
15	POL	POL	POL	FIN	FIN	POL	GRC	POL	GRC	PRT	PRT	POL	SWE	HUN	PRT	HUN	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	AUT	AUT	AUT	AUT	POL	IRL	PRT	FIN	FIN	FIN	SWE	FIN	FIN	FIN	FIN	FIN	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
17	IRL	IRL	IRL	IRL	IRL	FIN	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.25: Ranking of the Efficient Specialization Ratio (E) in Textiles and Textile Production*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	GBR	DEU	DEU	DEU	DEU	DEU	FRA	FRA	GBR	GBR	FRA	FRA	FRA	FRA	FRA	DEU	FRA
	99.99+	99.85+	73.80+	99.41+	99.98+	99.83+	91.57+	99.73+	99.96+	92.63+	99.99+	99.93+	99.99+	99.95+	99.99+	99.95+	99.40+
2	DEU	DNK	BEL	DNK	DNK	GBR	DEU	DNK	FRA	FRA	GBR	GBR	GBR	GBR	DEU	FRA	DEU
	0.00-	0.09-	26.19+	0.58-	0.00-	0.14-	8.37-	0.26-	0.01-	7.35-	0.00-	0.06-	0.00-	0.01-	0.00-	0.03-	0.42-
3	ITA	GBR	GBR	BEL	GBR	ITA	DNK	DEU	NLD	DNK	DEU	DEU	DEU	DEU	GBR	GBR	GBR
	0.00-	0.03-	0.00-	0.00-	0.00-	0.01-	0.02-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.01-	0.00-	0.01-	0.06-
4	DNK	BEL	NLD	ITA	BEL	FRA	GBR	GBR	DEU	DEU	BEL	ITA	NLD	NLD	ITA	NLD	NLD
	0.00-	0.01-	0.00-	0.00-	0.00-	0.01-	0.02-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.04-
5	AUT	NLD	ITA	GBR	NLD	DNK	ITA	ITA	DNK	ITA	ITA	NLD	ITA	DNK	DNK	BEL	BEL
	0.00-	0.01-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.02-
6	ESP	ITA	ESP	NLD	ITA	NLD	ESP	BEL	BEL	NLD	NLD	BEL	DNK	ITA	BEL	ITA	ITA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
7	BEL	AUT	AUT	ESP	FRA	AUT	BEL	NLD	SWE	BEL	AUT	DNK	BEL	ESP	ESP	AUT	GRC
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
8	NLD	ESP	FRA	AUT	AUT	ESP	NLD	AUT	ITA	ESP	ESP	AUT	AUT	BEL	NLD	GRC	ESP
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
9	PRT	FRA	DNK	GRC	ESP	BEL	AUT	ESP	ESP	AUT	PRT	ESP	ESP	AUT	AUT	ESP	CZE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
10	FRA	PRT	GRC	FRA	GRC	PRT	PRT	SWE	AUT	SWE	GRC	GRC	GRC	GRC	GRC	CZE	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
11	SWE	SWE	PRT	PRT	SWE	GRC	SWE	GRC	GRC	PRT	POL	PRT	CZE	CZE	CZE	DNK	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
12	FIN	FIN	SWE	SWE	PRT	FIN	FIN	PRT	PRT	GRC	CZE	CZE	PRT	PRT	PRT	POL	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
13	GRC	GRC	FIN	FIN	FIN	POL	HUN	CZE	CZE	FIN	IRL	POL	POL	POL	POL	PRT	POL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	POL	HUN	HUN	POL	POL	HUN	GRC	FIN	FIN	CZE	SWE	SWE	HUN	SWE	SWE	SWE	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
15	HUN	POL	CZE	HUN	HUN	SWE	CZE	HUN	HUN	HUN	FIN	IRL	SWE	HUN	HUN	FIN	FIN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	CZE	CZE	POL	CZE	CZE	CZE	POL	POL	POL	POL	HUN	HUN	IRL	FIN	FIN	IRL	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
17	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	DNK	FIN	FIN	IRL	IRL	HUN	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.26: Ranking of the Efficient Specialization Ratio (E) in Leather, Leather and Footwear*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	ITA	DNK	DNK	DNK	DNK	DNK	GBR	DNK	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GRC
	99.84+	99.94+	96.25+	99.99+	99.97+	99.93+	53.47+	54.52+	99.91+	99.92+	99.99+	99.97+	99.97+	99.89+	100.12+	100.17+	97.84+
2	DNK	DEU	ITA	ITA	DEU	ITA	DNK	GBR	ITA	DNK	DEU	ITA	NLD	GRC	GRC	GRC	IRL
	0.14-	0.02-	3.73-	0.01-	0.01-	0.02-	46.45+	45.43+	0.02-	0.02-	0.00-	0.01-	0.01-	0.02-	0.01-	0.11-	1.92+
3	DEU	ITA	DEU	DEU	ITA	GBR	ITA	ITA	FRA	ITA	ITA	IRL	ITA	NLD	ITA	NLD	GBR
	0.01-	0.01-	0.01-	0.00-	0.00-	0.02-	0.02-	0.02-	0.01-	0.01-	0.00-	0.00-	0.01-	0.02-	0.00-	0.01-	0.30-
4	GBR	ESP	ESP	ESP	FRA	DEU	GRC	DEU	DNK	DEU	FRA	DEU	BEL	ITA	NLD	ITA	NLD
	0.01-	0.01-	0.00-	0.00-	0.00-	0.01-	0.01-	0.01-	0.01-	0.01-	0.00-	0.00-	0.00-	0.02-	0.00-	0.01-	0.14-
5	PRT	FRA	GBR	GBR	GBR	FRA	DEU	FRA	DEU	FRA	DNK	NLD	DEU	DNK	DEU	DEU	ITA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.01-	0.01-	0.01-	0.00-	0.00-	0.00-	0.01+	0.00-	0.00-	0.07-
6	ESP	GBR	BEL	FRA	ESP	SWE	FRA	ESP	ESP	AUT	IRL	FRA	DNK	ESP	DNK	BEL	DEU
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00+	0.01-	0.00-	0.00-	0.05-
7	BEL	BEL	FRA	PRT	BEL	PRT	SWE	BEL	AUT	NLD	NLD	AUT	FRA	DEU	BEL	ESP	BEL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.04-
8	FRA	PRT	PRT	BEL	NLD	AUT	AUT	AUT	BEL	BEL	AUT	DNK	IRL	FRA	AUT	AUT	ESP
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00+	0.04-
9	SWE	AUT	NLD	NLD	PRT	BEL	ESP	NLD	SWE	ESP	BEL	ESP	ESP	BEL	FRA	DNK	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.03+
10	AUT	NLD	SWE	GRC	AUT	GRC	PRT	GRC	NLD	SWE	POL	GRC	GRC	AUT	ESP	POL	FRA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.03-
11	GRC	HUN	GRC	SWE	GRC	NLD	BEL	SWE	GRC	PRT	ESP	BEL	AUT	IRL	POL	FRA	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.02-
12	NLD	SWE	AUT	AUT	SWE	ESP	NLD	PRT	POL	GRC	GRC	POL	POL	PRT	IRL	CZE	POL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00+	0.02+
13	POL	FIN	HUN	POL	POL	IRL	IRL	POL	PRT	IRL	PRT	PRT	PRT	POL	FIN	PRT	CZE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01+
14	IRL	GRC	FIN	HUN	HUN	HUN	FIN	IRL	CZE	POL	SWE	SWE	HUN	HUN	HUN	FIN	FIN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00+	0.00-	0.01-
15	FIN	POL	IRL	FIN	FIN	FIN	HUN	CZE	HUN	HUN	CZE	CZE	SWE	SWE	PRT	HUN	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00+	0.00-	0.00-	0.00-	0.00+	0.01+
16	HUN	IRL	POL	IRL	IRL	CZE	POL	FIN	IRL	FIN	FIN	HUN	CZE	CZE	CZE	IRL	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00+	0.00+	0.00-	0.00+
17	CZE	CZE	CZE	CZE	CZE	POL	CZE	HUN	FIN	CZE	HUN	FIN	FIN	FIN	SWE	SWE	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	-0.14-	-0.31-	-0.53-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.27: Ranking of the Efficient Specialization Ratio (E) in Wood and Products of Wood and Cork*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	GBR	GBR	DEU	GBR	GBR	GBR	GBR	GBR	BEL	GBR	DEU	DEU	DEU	DEU	DEU	DEU	DEU
	99.96+	99.93+	99.95+	99.99+	99.93+	99.86+	99.92+	71.75+	52.45+	99.94+	99.96+	99.91+	56.58+	99.88+	99.98+	99.97+	85.15+
2	DEU	DEU	GBR	DEU	DEU	BEL	DEU	BEL	GBR	BEL	BEL	BEL	BEL	BEL	BEL	BEL	BEL
	0.01-	0.02-	0.01+	0.00-	0.04-	0.05-	0.02-	28.21+	47.50+	0.01-	0.03-	0.04-	43.38+	0.04-	0.01-	0.01-	14.06+
3	DNK	BEL	DNK	BEL	BEL	DEU	SWE	DEU	DEU	DEU	FRA	GBR	GBR	GBR	ITA	POL	GRC
	0.00-	0.01-	0.01-	0.00-	0.01-	0.04-	0.01-	0.02-	0.01-	0.01-	0.00-	0.01-	0.01-	0.01-	0.00-	0.00-	0.42+
4	BEL	NLD	NLD	DNK	SWE	SWE	ITA	SWE	SWE	DNK	GBR	ITA	FRA	POL	GBR	GBR	POL
	0.00-	0.01-	0.01-	0.00-	0.00-	0.01-	0.01-	0.00-	0.01-	0.01-	0.00+	0.01-	0.01-	0.01-	0.00-	0.00-	0.07-
5	ESP	DNK	SWE	SWE	DNK	ITA	DNK	AUT	NLD	SWE	ITA	FRA	POL	ITA	POL	ITA	GBR
	0.00-	0.01-	0.00-	0.00-	0.00-	0.01-	0.01-	0.00-	0.01-	0.00-	0.00-	0.01-	0.01-	0.01+	0.00-	0.00-	0.05-
6	NLD	ESP	ESP	ESP	ITA	DNK	AUT	DNK	DNK	ITA	POL	DNK	GRC	FRA	ESP	GRC	ITA
	0.00-	0.01-	0.00-	0.00-	0.00-	0.01-	0.01-	0.00-	0.00-	0.00-	0.00-	0.01-	0.01-	0.01-	0.00-	0.00-	0.04+
7	SWE	SWE	BEL	NLD	ESP	NLD	BEL	ITA	FRA	FRA	ESP	ESP	ITA	ESP	GRC	FRA	FRA
	0.00-	0.01-	0.00-	0.00-	0.00-	0.01-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.04-
8	ITA	ITA	ITA	ITA	NLD	ESP	NLD	FRA	ITA	NLD	AUT	NLD	DNK	DNK	DNK	ESP	ESP
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.03-
9	AUT	AUT	POL	POL	AUT	AUT	ESP	NLD	ESP	AUT	NLD	AUT	AUT	GRC	FRA	CZE	CZE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.03-
10	FIN	POL	GRC	GRC	GRC	FRA	FRA	ESP	GRC	POL	DNK	GRC	ESP	NLD	CZE	AUT	NLD
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.02-
11	POL	GRC	AUT	AUT	FRA	POL	FIN	GRC	AUT	ESP	GRC	PRT	NLD	CZE	AUT	NLD	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.02-
12	GRC	FRA	FIN	FRA	POL	PRT	GRC	CZE	POL	GRC	CZE	SWE	CZE	PRT	NLD	SWE	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
13	FRA	FIN	FRA	HUN	PRT	HUN	HUN	HUN	CZE	HUN	PRT	POL	HUN	HUN	HUN	HUN	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
14	HUN	CZE	CZE	CZE	CZE	CZE	POL	POL	HUN	CZE	FIN	HUN	PRT	AUT	PRT	DNK	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
15	PRT	PRT	HUN	PRT	FIN	GRC	CZE	PRT	PRT	PRT	HUN	CZE	SWE	SWE	SWE	PRT	FIN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.01-
16	IRL	HUN	IRL	FIN	HUN	FIN	PRT	FIN	FIN	FIN	SWE	FIN	FIN	FIN	FIN	FIN	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.01-
17	CZE	IRL	PRT	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.28: Ranking of the Efficient Specialization Ratio (E) in Pulp, Paper, Paper, Printing and Publishing*

									Year								
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	POL	PRT	POL	POL	IRL	POL	POL	POL	IRL	POL	POL	ITA	IRL	IRL	IRL	IRL	IRL
	47.09+	35.17+	93.16+	97.07+	45.57+	81.34+	88.26+	80.69+	41.15+	99.96+	47.42+	54.29+	73.09+	70.08+	62.32+	84.96+	99.94+
2	IRL	IRL	IRL	HUN	POL	IRL	HUN	HUN	POL	HUN	IRL	IRL	POL	POL	POL	POL	POL
	33.45+	33.97+	6.83+	2.93+	27.24+	18.64+	11.70+	19.29+	33.48+	0.02-	44.84+	45.70+	26.90+	29.89+	37.67+	15.04+	0.01-
3	PRT	POL	HUN	ITA	HUN	CZE	ITA	ITA	HUN	IRL	ITA	PRT	HUN	ITA	ITA	ITA	ITA
	19.44+	30.84+	0.00-	0.00-	24.52+	0.00-	0.01-	0.00-	25.32+	0.01-	7.73=	0.00-	0.00-	0.01-	0.00-	0.00-	0.01-
4	ESP	ITA	CZE	PRT	ITA	ITA	ESP	SWE	SWE	SWE	BEL	AUT	ITA	PRT	AUT	AUT	DEU
	0.01-	0.00-	0.00-	0.00-	2.66-	0.00-	0.01-	0.00-	0.03-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-
5	ITA	HUN	ITA	IRL	PRT	SWE	SWE	ESP	ESP	ITA	FRA	POL	AUT	CZE	DEU	DEU	BEL
	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
6	FIN	CZE	ESP	SWE	CZE	ESP	IRL	AUT	ITA	ESP	ESP	FRA	BEL	ESP	BEL	BEL	CZE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
7	GBR	ESP	SWE	ESP	DEU	AUT	AUT	CZE	FRA	FRA	AUT	BEL	GBR	AUT	ESP	CZE	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
8	GRC	FRA	GRC	GBR	ESP	PRT	FRA	BEL	CZE	BEL	DEU	ESP	PRT	HUN	CZE	ESP	GRC
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
9	HUN	BEL	BEL	CZE	SWE	DEU	GBR	FRA	AUT	AUT	GBR	GBR	CZE	BEL	PRT	GBR	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
10	AUT	GBR	PRT	GRC	GBR	FRA	BEL	IRL	BEL	CZE	HUN	DEU	FRA	DEU	FRA	FRA	FRA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
11	CZE	DEU	FRA	DEU	FRA	GBR	DEU	GBR	GBR	PRT	PRT	HUN	ESP	FRA	GBR	GRC	ESP
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-
12	BEL	GRC	GBR	BEL	GRC	HUN	FIN	GRC	PRT	GBR	FIN	NLD	GRC	GBR	HUN	NLD	NLD
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
13	SWE	FIN	NLD	FRA	AUT	BEL	PRT	DEU	DEU	DEU	CZE	SWE	DEU	NLD	NLD	HUN	FIN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	DEU	SWE	FIN	NLD	BEL	GRC	CZE	PRT	NLD	NLD	NLD	GRC	SWE	DNK	DNK	PRT	GBR
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-
15	FRA	AUT	DEU	DNK	FIN	NLD	GRC	NLD	GRC	DNK	SWE	DNK	NLD	SWE	GRC	SWE	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	DNK	DNK	AUT	AUT	NLD	FIN	NLD	FIN	FIN	GRC	GRC	CZE	DNK	GRC	SWE	FIN	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00-	0.00-	0.00-
17	NLD	NLD	DNK	FIN	DNK	DNK	DNK	DNK	DNK	FIN	DNK	FIN	FIN	FIN	FIN	DNK	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.29: Ranking of the Efficient Specialization Ratio (E) in Coke, Refined Petroleum and Nuclear Fuel*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	NLD	DEU	NLD	NLD	NLD	DNK	DNK	DNK	DNK	DNK	DNK	DNK	AUT	GRC	NLD	AUT	AUT
	90.35+	84.01+	69.93+	77.07+	75.32+	49.89+	81.46+	73.86+	71.90+	79.05+	33.33+	72.69+	73.48+	63.37+	61.18+	61.41-	56.93-
2	ITA	ITA	DEU	ITA	DNK	NLD	FRA	FRA	DEU	FRA	ITA	ESP	ESP	SWE	SWE	NLD	NLD
	9.62=	8.90-	22.64-	13.58-	23.02+	24.39+	13.78-	10.78-	7.01-	12.04=	18.98+	15.92+	23.44+	14.68-	18.45-	26.48+	22.89+
3	SWE	ESP	ITA	ESP	FIN	ESP	DEU	ITA	CZE	SWE	FIN	FIN	FIN	AUT	AUT	SWE	SWE
	0.01-	5.06-	5.33-	4.06-	1.47=	11.72=	1.82-	7.59-	6.92+	3.18-	17.64+	4.17+	2.94=	11.27-	10.52-	8.78-	14.20-
4	CZE	SWE	ESP	SWE	BEL	ITA	FIN	HUN	HUN	CZE	ESP	BEL	GRC	FRA	GRC	ESP	FRA
	0.01-	1.98-	2.08-	3.04-	0.07-	6.82-	1.64+	2.86=	4.92+	2.55+	13.02+	3.14-	0.05-	8.14-	3.05+	2.46+	4.41-
5	DNK	NLD	DNK	CZE	SWE	FRA	CZE	SWE	FRA	FIN	CZE	HUN	BEL	BEL	POL	BEL	ESP
	0.00-	0.02-	0.01-	2.22+	0.05-	4.96-	1.18=	2.73-	4.75-	2.15+	10.07+	1.97+	0.05-	2.18-	2.60-	0.81+	1.06-
6	HUN	PRT	HUN	DNK	CZE	FIN	NLD	FIN	SWE	DEU	POL	CZE	NLD	ITA	ESP	ITA	BEL
	0.00-	0.01-	0.01-	0.03-	0.03-	2.16+	0.04-	1.57=	2.48-	0.98-	4.62-	0.98+	0.01-	0.22-	2.11-	0.05-	0.47=
7	DEU	DNK	CZE	HUN	HUN	CZE	ITA	AUT	FIN	NLD	HUN	FRA	ITA	CZE	BEL	GRC	GRC
	0.00-	0.01-	0.00-	0.00-	0.02-	0.02-	0.03-	0.56-	1.87+	0.02-	2.30+	0.79-	0.01-	0.11-	2.09-	0.00-	0.01-
8	GRC	HUN	PRT	FIN	ITA	DEU	HUN	BEL	NLD	HUN	AUT	ITA	FRA	ESP	DEU	DEU	ITA
	0.00-	0.01-	0.00-	0.00-	0.00-	0.01-	0.01-	0.03-	0.07-	0.01-	0.03-	0.31-	0.01+	0.02-	0.00-	0.00+	0.01+
9	POL	CZE	SWE	BEL	ESP	BEL	ESP	NLD	ITA	ESP	NLD	AUT	DNK	POL	ITA	FRA	DEU
	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.01-	0.01-	0.03-	0.00-	0.00-	0.03-	0.01-	0.01-	0.00-	0.00-	0.00+
10	BEL	POL	FIN	POL	AUT	HUN	BEL	DEU	ESP	ITA	GRC	NLD	HUN	NLD	FRA	POL	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.01-	0.00-	0.03-	0.00-	0.00-	0.00-	0.01-	0.01-	0.00-	0.00-	0.00+
11	FRA	BEL	FRA	FRA	POL	SWE	AUT	ESP	BEL	AUT	DEU	DEU	DEU	DNK	CZE	HUN	FIN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00+	0.00-
12	GBR	GRC	POL	DEU	FRA	POL	SWE	CZE	POL	POL	PRT	GRC	GBR	HUN	DNK	CZE	CZE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00+	0.00+	0.00+
13	AUT	FRA	GBR	GBR	DEU	GBR	GBR	GRC	GRC	GRC	GBR	GBR	CZE	DEU	PRT	DNK	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+
14	FIN	GBR	BEL	AUT	GBR	AUT	GRC	POL	GBR	BEL	BEL	SWE	SWE	GBR	HUN	FIN	POL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-
15	PRT	AUT	AUT	PRT	GRC	GRC	PRT	GBR	PRT	GBR	FRA	PRT	POL	PRT	FIN	GBR	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00-	0.00+	0.00-	0.00-	0.00+
16	ESP	FIN	GRC	GRC	PRT	PRT	POL	PRT	AUT	PRT	SWE	IRL	PRT	FIN	GBR	PRT	GBR
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00+	0.00-
17	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	POL	IRL	IRL	IRL	IRL	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.30: Ranking of the Efficient Specialization Ratio (E) in Chemicals and Chemical Products*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	NLD	NLD	NLD	IRL	PRT	FRA	IRL	IRL	FRA	IRL	NLD	FRA	NLD	NLD	FRA	NLD	NLD
	61.20+	99.89+	60.68+	57.51+	41.57+	57.21+	71.40+	69.43+	99.95+	79.20+	69.08+	99.98+	83.16+	85.45+	97.59+	59.25+	97.99+
2	PRT	HUN	IRL	PRT	FRA	IRL	FRA	FRA	NLD	FRA	FRA	IRL	FRA	FRA	NLD	FRA	IRL
	23.68+	0.04-	39.30+	42.49+	30.29+	42.76+	28.57+	30.56+	0.02-	20.77+	30.91+	0.01-	16.83-	14.53-	2.34-	40.73+	7.72-
3	HUN	FRA	HUN	NLD	NLD	NLD	NLD	NLD	IRL	NLD	DEU	DEU	BEL	PRT	DEU	GRC	FIN
	15.08+	0.02-	0.00-	0.00-	28.13+	0.00-	0.01-	0.00-	0.01-	0.01-	0.01-	0.00-	0.00-	0.00-	0.04-	0.01-	0.60-
4	IRL	PRT	BEL	HUN	IRL	DEU	DEU	DEU	BEL	DEU	PRT	NLD	AUT	DEU	IRL	DEU	GRC
	0.01-	0.02+	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.03-
5	POL	IRL	FRA	BEL	BEL	PRT	ESP	ESP	ESP	PRT	BEL	BEL	IRL	IRL	AUT	BEL	FRA
	0.01-	0.01-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.02-
6	DEU	POL	PRT	ESP	ESP	BEL	DNK	ITA	DEU	ESP	IRL	PRT	POL	POL	BEL	AUT	DEU
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.01-
7	ESP	ESP	FIN	FRA	DEU	ESP	PRT	BEL	PRT	BEL	AUT	DNK	DEU	AUT	POL	POL	BEL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
8	FRA	BEL	POL	POL	POL	AUT	BEL	DNK	SWE	SWE	POL	AUT	PRT	BEL	DNK	IRL	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
9	ITA	DEU	CZE	ITA	ITA	POL	ITA	PRT	ITA	ITA	ITA	POL	ITA	ITA	ITA	ITA	ITA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
10	BEL	CZE	AUT	DEU	DNK	ITA	GBR	SWE	DNK	DNK	ESP	ITA	GRC	ESP	GRC	ESP	ESP
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.01-
11	AUT	ITA	DNK	AUT	AUT	FIN	FIN	AUT	AUT	HUN	FIN	ESP	DNK	CZE	ESP	PRT	POL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
12	FIN	FIN	ESP	FIN	FIN	HUN	HUN	POL	HUN	AUT	DNK	GBR	GBR	DNK	PRT	DNK	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
13	GRC	DNK	GRC	DNK	SWE	DNK	SWE	HUN	POL	POL	GBR	GRC	ESP	GRC	CZE	SWE	CZE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	DNK	AUT	SWE	CZE	CZE	SWE	AUT	FIN	FIN	GRC	GRC	SWE	CZE	GBR	GBR	CZE	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+
15	CZE	GRC	DEU	SWE	HUN	GRC	GRC	GBR	GRC	FIN	CZE	CZE	SWE	SWE	SWE	GBR	GBR
	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	SWE	SWE	ITA	GRC	GRC	CZE	POL	GRC	GBR	CZE	SWE	FIN	HUN	HUN	HUN	FIN	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00+	0.00-	0.00-
17	GBR	GBR	GBR	GBR	GBR	GBR	CZE	CZE	CZE	GBR	HUN	HUN	FIN	FIN	FIN	HUN	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00-	0.00-	0.00-	0.00+	-6.43+

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.31: Ranking of the Efficient Specialization Ratio (E) in Rubber and Plastics*

Rank	Year 1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	GRC	GRC	GRC	BEL	BEL	PRT	DEU	DEU	ITA	ITA	BEL	BEL	POL	GRC	FRA	FRA	FRA
	77.61+	78.17+	94.09+	75.14+	94.06+	82.95+	51.03+	91.20+	65.67+	90.42+	99.96+	99.92+	76.00+	53.65+	99.95+	99.92+	99.62+
2	DEU	BEL	BEL	GRC	GRC	GRC	PRT	ESP	ESP	POL	DEU	DEU	GRC	BEL	BEL	BEL	BEL
	19.00-	21.16+	5.86+	16.10+	5.86+	16.96+	48.88+	8.74+	29.15+	4.38=	0.01-	0.02-	23.34+	45.21+	0.01-	0.02-	0.22-
3	FIN	POL	PRT	PRT	PRT	DEU	ITA	ITA	PRT	PRT	POL	FRA	BEL	FRA	DEU	POL	POL
	3.27+	0.54-	0.01-	8.75+	0.04-	0.04-	0.02-	0.02-	4.87+	2.38+	0.00-	0.02-	0.54-	0.64-	0.01-	0.02-	0.21-
4	PRT	DEU	NLD	DEU	DEU	POL	AUT	AUT	BEL	GRC	ITA	ITA	FRA	POL	POL	DEU	DEU
	0.07-	0.03-	0.01-	0.00-	0.01-	0.01-	0.01-	0.01-	0.10-	1.84=	0.00-	0.02-	0.07-	0.31-	0.01-	0.01-	0.13-
5	ITA	PRT	DEU	ESP	POL	ESP	BEL	BEL	DEU	DEU	FRA	PRT	ITA	DEU	ITA	ITA	CZE
	0.01-	0.03-	0.01-	0.00-	0.01-	0.01-	0.01-	0.01-	0.10-	0.64-	0.00+	0.01-	0.02-	0.05-	0.01-	0.00-	0.09+
6	POL	FIN	FIN	ITA	ESP	ITA	GBR	POL	POL	ESP	PRT	POL	DEU	ITA	ESP	CZE	ITA
	0.01-	0.01-	0.01-	0.00-	0.01-	0.01-	0.01-	0.01-	0.05-	0.21-	0.00-	0.00-	0.01-	0.04-	0.00-	0.00+	0.07-
7	ESP	NLD	ESP	AUT	AUT	BEL	NLD	GRC	AUT	BEL	AUT	GRC	AUT	PRT	AUT	ESP	PRT
	0.01-	0.01-	0.00-	0.00-	0.00-	0.01-	0.01-	0.00-	0.01-	0.08-	0.00-	0.00-	0.00-	0.03-	0.00-	0.00-	0.05-
8	GBR	ITA	ITA	POL	ITA	GBR	GRC	PRT	NLD	AUT	ESP	ESP	GBR	NLD	CZE	NLD	NLD
	0.01-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.01-	0.00+	0.00-	0.00-	0.02-	0.00+	0.00-	0.05-
9	AUT	DNK	DNK	FIN	NLD	AUT	FIN	NLD	GBR	FRA	NLD	NLD	PRT	CZE	PRT	GBR	ESP
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.01-	0.00-	0.00-	0.00-	0.02+	0.00-	0.00-	0.05-
10	DNK	ESP	AUT	NLD	GBR	NLD	POL	DNK	FRA	HUN	GBR	AUT	NLD	ESP	NLD	AUT	HUN
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.01-	0.00+	0.00-	0.00-	0.01-	0.00-	0.00+	0.03+
11	NLD	GBR	GBR	GBR	FIN	FRA	DNK	GBR	DNK	NLD	GRC	GBR	CZE	GBR	GBR	PRT	GRC
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00+	0.01-	0.00-	0.00-	0.02-
12	BEL	AUT	POL	DNK	DNK	DNK	HUN	FRA	HUN	DNK	CZE	DNK	HUN	AUT	DNK	HUN	GBR
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.01-	0.00-	0.00+	0.02-
13	HUN	HUN	HUN	HUN	SWE	FIN	FRA	SWE	SWE	GBR	HUN	CZE	ESP	DNK	GRC	GRC	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.02-
14	SWE	FRA	SWE	SWE	FRA	SWE	SWE	HUN	FIN	SWE	DNK	HUN	DNK	HUN	HUN	DNK	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00+	0.00+	0.00-	0.01+
15	FRA	CZE	CZE	FRA	HUN	HUN	ESP	FIN	GRC	CZE	FIN	SWE	SWE	SWE	SWE	IRL	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00+	0.00+	0.00+	0.01+
16	CZE	SWE	FRA	CZE	CZE	CZE	CZE	CZE	CZE	FIN	SWE	FIN	FIN	FIN	FIN	SWE	FIN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00+	0.01-
17	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	FIN	AUT
	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00+	0.00-	0.00+	0.00+	0.00-	0.00-	-0.59+

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.32: Ranking of the Efficient Specialization Ratio (E) in Other Non-Metallic Mineral*

									Year								
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	AUT	BEL	AUT	DEU	POL	GRC	GRC	GRC	GRC	ESP	DEU	DEU	DEU	POL	DEU	DEU	DEU
	74.04+	54.02+	70.34+	61.49+	82.43+	35.46+	53.37+	55.95+	62.90+	80.23+	99.98+	82.17+	70.75+	63.75+	99.99+	93.54+	72.55+
2	BEL	AUT	BEL	BEL	BEL	BEL	ITA	ESP	BEL	GRC	POL	POL	POL	DEU	GRC	GRC	POL
	17.07+	41.66+	26.69+	20.98+	17.51+	32.50+	46.55+	24.05+	23.87+	19.67+	0.01-	17.80+	27.71+	35.58+	0.00-	6.42+	15.65+
3	DEU	GRC	GRC	HUN	DEU	DEU	ESP	BEL	ITA	ITA	AUT	PRT	HUN	HUN	ITA	POL	ESP
	7.46-	3.74+	2.93+	17.51+	0.02-	31.99+	0.03-	19.97+	13.12-	0.03-	0.00-	0.01-	0.94+	0.43-	0.00-	0.02-	6.13-
4	GRC	POL	ESP	ITA	ITA	FRA	DEU	ITA	ESP	DEU	ITA	ESP	GRC	ITA	POL	ESP	GRC
	1.40=	0.49-	0.01-	0.01-	0.01-	0.01-	0.01-	0.01-	0.03-	0.02-	0.00-	0.01-	0.57-	0.08-	0.00-	0.00-	4.96+
5	POL	DEU	DEU	ESP	ESP	ESP	GBR	DEU	DEU	HUN	PRT	FRA	ITA	PRT	AUT	BEL	FIN
	0.01-	0.02-	0.01-	0.01-	0.01-	0.01-	0.00-	0.01-	0.03-	0.01-	0.00-	0.00-	0.01+	0.06-	0.00-	0.00-	0.28-
6	ITA	ITA	NLD	GRC	GRC	ITA	BEL	AUT	AUT	BEL	ESP	BEL	BEL	GRC	ESP	GBR	ITA
	0.01-	0.02-	0.01-	0.01-	0.01-	0.01-	0.00-	0.00-	0.01-	0.01-	0.00-	0.00-	0.01-	0.05-	0.00-	0.00-	0.17-
7	ESP	PRT	ITA	AUT	AUT	GBR	AUT	HUN	FRA	POL	GBR	GBR	GBR	ESP	PRT	AUT	BEL
	0.00-	0.01-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.02-	0.00-	0.00-	0.14-
8	FIN	NLD	DNK	POL	GBR	POL	FRA	POL	GBR	FRA	BEL	NLD	NLD	NLD	BEL	ITA	PRT
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00+	0.04-
9	GBR	ESP	FIN	DNK	NLD	PRT	NLD	FRA	HUN	AUT	NLD	GRC	AUT	AUT	GBR	NLD	NLD
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.02-
10	DNK	FIN	HUN	FIN	DNK	AUT	POL	DNK	DNK	GBR	FRA	ITA	FRA	GBR	NLD	FRA	GBR
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.01-
11	NLD	HUN	PRT	NLD	FRA	NLD	PRT	NLD	NLD	DNK	GRC	AUT	PRT	BEL	FRA	HUN	FRA
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
12	HUN	DNK	POL	PRT	FIN	HUN	HUN	PRT	PRT	NLD	DNK	HUN	ESP	FRA	DNK	PRT	CZE
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
13	PRT	GBR	GBR	GBR	PRT	DNK	SWE	GBR	POL	PRT	HUN	DNK	DNK	CZE	HUN	CZE	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
14	FRA	FRA	CZE	SWE	HUN	SWE	DNK	SWE	SWE	SWE	FIN	CZE	CZE	DNK	CZE	SWE	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
15	SWE	CZE	FRA	FRA	SWE	FIN	FIN	CZE	FIN	FIN	CZE	FIN	SWE	IRL	FIN	IRL	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	CZE	SWE	SWE	CZE	CZE	IRL	CZE	FIN	CZE	CZE	SWE	SWE	FIN	SWE	SWE	DNK	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
17	IRL	IRL	IRL	IRL	IRL	CZE	IRL	IRL	IRL	IRL	IRL	IRL	IRL	FIN	IRL	FIN	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.33: Ranking of the Efficient Specialization Ratio (E) in Basic Metals and Fabricated Metal*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	ESP	FIN	ESP	AUT	AUT	ITA	BEL	ITA	ITA	BEL	GBR	GBR	GRC	/	/	/	/
	76.60+	32.42+	89.39+	60.29+	84.22+	61.41+	44.02+	60.24+	74.89+	40.94+	58.77+	63.53+	99.93+	/	/	/	/
2	FIN	ESP	AUT	ESP	ESP	AUT	AUT	BEL	AUT	AUT	GRC	GRC	GBR	/	/	/	/
	23.10+	25.94+	6.01+	33.52+	15.76+	36.24+	43.77+	18.21+	15.66+	39.82+	41.22+	36.44+	0.02-	/	/	/	/
3	AUT	AUT	FIN	FIN	ITA	BEL	ITA	DEU	BEL	GRC	ITA	BEL	BEL	/	/	/	/
	0.20-	25.16+	4.59+	6.18+	0.01-	2.14-	12.17-	17.41-	9.41+	19.09+	0.00-	0.01-	0.02-	/	/	/	/
4	ITA	ITA	BEL	ITA	DEU	DEU	DEU	AUT	DEU	DEU	BEL	ITA	AUT	/	/	/	/
	0.08-	16.40-	0.00-	0.00-	0.00+	0.18-	0.03-	4.12+	0.02-	0.08-	0.00-	0.01-	0.01-	/	/	/	/
5	DEU	DEU	HUN	BEL	FIN	ESP	ESP	ESP	ESP	ITA	AUT	DEU	POL	/	/	/	/
	0.01-	0.03-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.02-	0.00-	0.00-	0.01+	/	/	/	/
6	GRC	POL	NLD	DEU	BEL	FIN	GBR	FRA	FRA	GBR	POL	POL	ITA	/	/	/	/
	0.00-	0.02-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.02-	0.00-	0.00-	0.00-	/	/	/	/
7	GBR	BEL	DNK	DNK	POL	FRA	FRA	DNK	POL	ESP	DEU	AUT	NLD	/	/	/	/
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	/	/	/	/
8	DNK	GRC	ITA	GRC	GBR	GRC	FIN	GBR	GBR	POL	FIN	ESP	DEU	/	/	/	/
	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00+	/	/	/	/
9	POL	DNK	CZE	NLD	GRC	GBR	SWE	SWE	SWE	FRA	FRA	FRA	ESP	/	/	/	/
	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	/	/	/	/
10	BEL	HUN	GRC	HUN	FRA	SWE	DNK	POL	GRC	DNK	ESP	NLD	HUN	/	/	/	/
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00+	/	/	/	/
11	NLD	GBR	SWE	GBR	DNK	POL	HUN	GRC	DNK	HUN	NLD	DNK	FRA	/	/	/	/
	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	/	/	/	/
12	SWE	NLD	DEU	POL	SWE	HUN	GRC	NLD	NLD	NLD	PRT	PRT	PRT	/	/	/	/
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00+	/	/	/	/
13	CZE	CZE	PRT	SWE	NLD	DNK	NLD	HUN	HUN	SWE	DNK	FIN	DNK	/	/	/	/
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	/	/	/	/
14	PRT	FRA	GBR	CZE	CZE	NLD	CZE	FIN	FIN	FIN	HUN	HUN	FIN	/	/	/	/
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	/	/	/	/
15	HUN	SWE	POL	FRA	HUN	CZE	PRT	PRT	PRT	PRT	CZE	SWE	CZE	/	/	/	/
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00+	0.00+	/	/	/	/
16	FRA	PRT	FRA	PRT	PRT	PRT	POL	CZE	CZE	CZE	SWE	CZE	IRL	/	/	/	/
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00+	/	/	/	/
17	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	SWE	/	/	/	/
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00+	0.00+	0.00+	/	/	/	/

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.34: Ranking of the Efficient Specialization Ratio (E) in Machinery, Nec*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	ITA	ITA	ITA	ITA	ITA	ITA	DEU	DEU	ITA	ITA	FRA	ITA	FRA	ITA	GBR	FRA	GBR
	50.54+	71.52+	86.83+	98.80+	88.97+	99.85+	63.21+	50.24+	53.27+	92.08+	51.10+	70.60+	65.09+	77.38+	49.38+	64.86+	56.92+
2	DEU	DEU	FIN	DEU	DEU	DEU	ITA	ITA	DEU	DEU	DEU	POL	GBR	GBR	POL	POL	POL
	49.45+	28.46=	13.16+	1.20-	11.02-	0.14-	36.78+	49.75+	33.50=	7.90-	28.48=	18.85+	34.89+	17.18+	15.86+	24.66+	23.54+
3	FIN	FIN	ESP	FIN	ESP	AUT	AUT	AUT	AUT	AUT	AUT	GBR	AUT	ESP	FRA	GRC	ITA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	13.22+	0.00-	20.41+	10.54=	0.01-	5.31+	14.13=	8.47+	9.73-
4	GBR	DNK	NLD	ESP	AUT	BEL	GBR	BEL	BEL	GBR	GBR	FRA	ITA	FRA	GRC	HUN	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.10-	11.04+	1.82+	8.12+
5	DNK	GBR	AUT	BEL	BEL	GBR	BEL	ESP	GBR	FRA	BEL	AUT	POL	POL	ESP	IRL	NLD
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	8.89+	0.15-	1.51-
6	AUT	AUT	DNK	AUT	GBR	FRA	ESP	DNK	FRA	BEL	POL	DEU	GRC	HUN	HUN	ESP	FRA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.68+	0.04-	0.07-
7	ESP	BEL	BEL	DNK	FIN	ESP	FRA	FRA	NLD	ESP	ITA	BEL	DEU	AUT	ITA	GBR	GRC
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.02-	0.00-	0.05-
8	BEL	NLD	DEU	GBR	DNK	DNK	NLD	NLD	ESP	DNK	NLD	NLD	BEL	DEU	AUT	ITA	ESP
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.04-
9	NLD	ESP	GBR	NLD	NLD	NLD	DNK	GBR	DNK	NLD	ESP	ESP	NLD	GRC	DEU	DEU	DEU
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
10	SWE	POL	PRT	PRT	FRA	SWE	SWE	POL	POL	HUN	PRT	DNK	DNK	NLD	BEL	CZE	BEL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
11	POL	FRA	SWE	SWE	SWE	PRT	PRT	SWE	SWE	POL	GRC	GRC	HUN	CZE	DNK	AUT	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
12	PRT	PRT	GRC	POL	POL	FIN	FIN	PRT	HUN	SWE	HUN	PRT	ESP	BEL	NLD	NLD	CZE
	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
13	FRA	SWE	CZE	FRA	PRT	POL	HUN	HUN	PRT	PRT	DNK	HUN	PRT	DNK	PRT	BEL	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	IRL	CZE	HUN	CZE	GRC	HUN	POL	FIN	FIN	FIN	FIN	CZE	CZE	PRT	CZE	DNK	SWE
	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
15	CZE	HUN	FRA	GRC	CZE	GRC	GRC	GRC	GRC	GRC	CZE	SWE	SWE	SWE	FIN	PRT	FIN
	0.00-	0.00-	0.00-	0.00+	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	HUN	IRL	POL	HUN	HUN	CZE	CZE	CZE	CZE	CZE	SWE	FIN	FIN	FIN	IRL	SWE	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
17	GRC	GRC	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	SWE	FIN	AUT
	0.00+	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.35: Ranking of the Efficient Specialization Ratio (E) in Electrical and Optical Equipment*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	ITA	ITA	ITA	ITA	ITA	DEU	ITA	ITA	DEU	DEU	SWE	SWE	SWE	SWE	SWE	SWE	SWE
	99.98+	77.38+	53.35+	47.75+	44.34+	54.49+	73.99+	50.14+	53.58+	79.13+	63.91+	47.29+	50.61+	50.61+	50.85+	49.16+	56.76+
2	POL	POL	ESP	ESP	ESP	FIN	FIN	AUT	POL	FIN	FIN	FIN	FIN	FIN	FRA	FRA	FIN
	0.00-	22.59+	41.67+	24.59+	23.53+	17.29+	18.80+	23.71+	25.55+	19.44+	25.32+	28.79+	32.34+	29.77+	26.11+	28.07+	22.12+
3	ESP	ESP	NLD	GRC	GRC	HUN	HUN	FIN	FIN	HUN	DEU	DEU	DEU	DEU	FIN	FIN	DEU
	0.00-	0.01-	4.97=	15.35+	16.26+	13.24+	7.17+	22.90+	20.84+	1.39-	10.76-	23.91-	12.39-	17.25-	23.03+	22.77+	20.94-
4	DEU	NLD	FIN	FIN	FIN	BEL	GBR	HUN	AUT	SWE	FRA	IRL	HUN	HUN	DEU	DEU	FRA
	0.00-	0.00-	0.00-	12.30+	15.84+	12.21+	0.01-	3.21+	0.01-	0.01-	0.00-	0.00-	4.66+	2.35=	0.01-	0.00-	0.13-
5	GBR	DEU	GRC	DEU	DEU	GRC	DEU	DEU	ITA	DNK	HUN	GBR	GBR	FRA	GBR	IRL	GBR
	0.00-	0.00-	0.00-	0.00-	0.02-	2.70+	0.01-	0.01-	0.01-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
6	AUT	DNK	DNK	NLD	POL	GBR	NLD	DNK	NLD	FRA	GBR	FRA	FRA	GBR	AUT	GBR	POL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.04-	0.00-	0.01-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
7	NLD	AUT	AUT	AUT	GBR	POL	DNK	POL	DNK	POL	POL	HUN	GRC	PRT	DNK	POL	ITA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
8	DNK	GRC	IRL	GBR	AUT	ITA	ESP	IRL	ESP	ITA	BEL	PRT	AUT	ESP	ESP	ESP	CZE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
9	IRL	GBR	GBR	POL	HUN	NLD	AUT	ESP	SWE	AUT	PRT	DNK	POL	CZE	ITA	CZE	ESP
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
10	GRC	FIN	DEU	DNK	NLD	SWE	BEL	BEL	BEL	BEL	AUT	POL	BEL	ITA	POL	ITA	NLD
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
11	FIN	IRL	BEL	BEL	IRL	AUT	FRA	GBR	FRA	ESP	ITA	BEL	DNK	DNK	PRT	HUN	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
12	BEL	BEL	POL	HUN	DNK	ESP	GRC	GRC	GBR	GBR	NLD	ITA	ITA	NLD	HUN	AUT	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
13	FRA	FRA	FRA	SWE	SWE	FRA	SWE	FRA	HUN	NLD	IRL	AUT	NLD	POL	BEL	BEL	BEL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	PRT	PRT	HUN	IRL	BEL	DNK	POL	NLD	PRT	PRT	ESP	NLD	PRT	BEL	NLD	NLD	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
15	SWE	CZE	PRT	FRA	FRA	IRL	PRT	SWE	GRC	IRL	DNK	ESP	CZE	AUT	GRC	DNK	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	CZE	SWE	SWE	PRT	PRT	PRT	IRL	PRT	IRL	GRC	GRC	GRC	ESP	GRC	CZE	GRC	GRC
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
17	HUN	HUN	CZE	CZE	CZE	CZE	CZE	CZE	CZE	CZE	CZE	CZE	IRL	IRL	IRL	PRT	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.36: Ranking of the Efficient Specialization Ratio (E) in Transport Equipment*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	DEU	FRA	DEU	DEU	DEU	DEU	DEU
	99.99+	99.97+	84.50+	100.00+	99.99+	68.98+	99.99+	99.99+	99.98+	99.95+	91.08+	47.58+	64.42+	40.32=	73.53+	88.15+	95.48+
2	ITA	FRA	PRT	ESP	FRA	FRA	FRA	AUT	FRA	FRA	BEL	DEU	AUT	FRA	BEL	AUT	BEL
	0.00-	0.01-	15.43+	0.00-	0.00-	31.01+	0.00-	0.00-	0.01-	0.03-	8.92+	28.00-	14.72+	27.39+	15.10+	5.76+	3.52+
3	AUT	AUT	NLD	BEL	BEL	ITA	ITA	FRA	ESP	AUT	AUT	AUT	BEL	AUT	AUT	ESP	CZE
	0.00-	0.00-	0.05-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	20.25+	11.75+	19.57+	11.37+	4.81-	0.78-
4	ESP	ITA	ESP	AUT	AUT	HUN	ESP	ESP	AUT	BEL	FRA	BEL	FRA	BEL	ESP	CZE	ESP
	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	4.12+	9.11-	10.80+	0.00-	1.27-	0.08-
5	BEL	PRT	FRA	FRA	ESP	ESP	BEL	BEL	BEL	HUN	POL	PRT	GBR	CZE	GBR	FRA	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.05-	0.00-	1.86-	0.00-	0.01-	0.07-
6	GBR	BEL	ITA	ITA	ITA	BEL	GBR	ITA	ITA	ESP	ITA	ITA	HUN	HUN	ITA	BEL	FRA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.03-	0.00-	0.00-	0.03-
7	FRA	ESP	HUN	HUN	POL	PRT	HUN	HUN	HUN	ITA	GBR	GBR	NLD	ESP	FRA	POL	NLD
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.02-	0.00-	0.00-	0.01-
8	NLD	NLD	BEL	PRT	NLD	GBR	AUT	NLD	POL	POL	PRT	POL	ITA	PRT	POL	GBR	POL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.01-
9	POL	POL	AUT	NLD	GBR	POL	SWE	PRT	SWE	SWE	NLD	ESP	POL	NLD	CZE	HUN	GBR
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
10	FIN	HUN	FIN	GBR	SWE	SWE	PRT	GRC	NLD	NLD	ESP	NLD	GRC	ITA	PRT	ITA	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
11	DNK	GBR	DNK	DNK	PRT	AUT	NLD	SWE	PRT	DNK	HUN	HUN	PRT	GBR	NLD	IRL	ITA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
12	SWE	DNK	POL	POL	DNK	NLD	DNK	POL	GBR	GBR	GRC	GRC	ESP	POL	DNK	NLD	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
13	HUN	FIN	CZE	FIN	HUN	CZE	FIN	GBR	DNK	PRT	CZE	DNK	CZE	GRC	GRC	DNK	GRC
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	CZE	CZE	GBR	SWE	FIN	DNK	POL	DNK	GRC	GRC	SWE	CZE	DNK	DNK	SWE	GRC	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
15	GRC	SWE	SWE	CZE	CZE	FIN	GRC	CZE	FIN	CZE	DNK	SWE	SWE	SWE	HUN	SWE	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	PRT	GRC	GRC	GRC	GRC	GRC	CZE	FIN	CZE	FIN	FIN	FIN	IRL	IRL	FIN	PRT	FIN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
17	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	FIN	FIN	IRL	FIN	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.37: Ranking of the Efficient Specialization Ratio (E) in Manufacturing, Nec; Recycling*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	GBR	GBR	DEU	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR
	99.99+	99.98+	70.59+	100.00+	99.99+	99.96+	99.97+	99.99+	99.98+	99.99+	100.00+	99.99+	99.99+	99.09+	84.43+	99.69+	99.84+
2	DEU	DEU	ITA	ITA	DEU	BEL	ITA	ITA	ITA	DNK	BEL	ITA	ITA	IRL	AUT	IRL	BEL
	0.00-	0.00-	29.39+	0.00-	0.00-	0.01-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.88+	15.56+	0.30-	0.04-
3	ITA	DNK	GBR	DEU	ITA	DEU	DEU	FRA	BEL	ITA	DEU	BEL	BEL	BEL	BEL	BEL	ITA
	0.00-	0.00-	0.01-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.03-
4	DNK	ITA	BEL	DNK	DNK	ITA	BEL	BEL	FRA	BEL	ITA	DEU	DNK	ITA	DEU	AUT	DEU
	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.02-
5	BEL	BEL	ESP	BEL	BEL	FRA	FRA	DEU	DEU	DEU	FRA	FRA	FRA	DEU	ITA	DEU	ESP
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
6	ESP	FRA	AUT	ESP	FRA	DNK	DNK	DNK	DNK	FRA	AUT	AUT	DEU	DNK	DNK	ITA	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
7	AUT	AUT	FRA	PRT	ESP	AUT	AUT	AUT	ESP	AUT	POL	DNK	AUT	ESP	ESP	ESP	POL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
8	PRT	ESP	FIN	FRA	AUT	ESP	ESP	ESP	AUT	ESP	ESP	ESP	POL	AUT	POL	POL	CZE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
9	FRA	FIN	DNK	AUT	PRT	PRT	PRT	POL	POL	POL	DNK	POL	ESP	POL	GRC	FRA	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
10	FIN	PRT	PRT	POL	FIN	POL	FIN	CZE	CZE	GRC	PRT	PRT	GRC	FRA	FRA	CZE	FRA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
11	POL	POL	GRC	GRC	GRC	SWE	SWE	SWE	PRT	PRT	GRC	GRC	HUN	CZE	CZE	GRC	GRC
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
12	CZE	CZE	CZE	FIN	POL	FIN	POL	PRT	SWE	SWE	CZE	IRL	CZE	GRC	PRT	DNK	PRT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
13	SWE	GRC	NLD	SWE	SWE	GRC	HUN	GRC	GRC	FIN	IRL	NLD	PRT	PRT	NLD	PRT	NLD
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	NLD	HUN	SWE	HUN	NLD	NLD	CZE	HUN	FIN	CZE	NLD	CZE	IRL	NLD	FIN	NLD	FIN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
15	GRC	NLD	HUN	NLD	CZE	HUN	NLD	FIN	NLD	HUN	FIN	HUN	NLD	HUN	HUN	HUN	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.00-	0.00-
16	HUN	IRL	POL	CZE	HUN	IRL	IRL	NLD	HUN	NLD	SWE	SWE	SWE	FIN	IRL	FIN	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
17	IRL	SWE	IRL	IRL	IRL	CZE	GRC	IRL	IRL	IRL	HUN	FIN	FIN	SWE	SWE	SWE	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 1.38: Ranking of the Efficient Specialization Ratio (E) in Electricity, Gas and Water Supply*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	POL	FRA	SWE	FRA	SWE	SWE	SWE	PRT	PRT	PRT	PRT	PRT	PRT	PRT	PRT	PRT	PRT
	29.70+	49.23+	34.81+	99.99+	39.35+	52.21+	44.29+	83.11+	75.76+	71.00+	66.64+	65.23+	61.08+	58.20+	69.89+	84.80+	77.27+
2	CZE	CZE	CZE	PRT	ESP	GBR	PRT	ESP	ESP	ITA	GBR	GBR	GBR	ESP	ESP	ITA	ESP
	26.85+	44.71+	27.27+	0.00-	26.33+	37.56+	32.20+	15.62+	14.69+	22.66+	33.35+	34.75+	20.40=	26.53+	18.52+	15.18=	14.97=
3	FRA	HUN	FRA	ITA	ITA	HUN	ESP	HUN	ITA	HUN	ITA	ESP	ITA	ITA	ITA	ESP	ITA
	21.91=	4.11=	17.58-	0.00-	25.45+	6.48+	17.09+	1.14-	9.45-	3.45=	0.00-	0.01-	18.49+	15.14+	11.58=	0.01-	7.47-
4	SWE	PRT	NLD	ESP	HUN	CZE	HUN	ITA	HUN	ESP	ESP	ITA	GRC	GBR	GRC	GBR	FIN
	21.51+	1.89+	11.33+	0.00-	6.93+	2.78-	4.66=	0.10-	0.02-	2.78-	0.00-	0.00-	0.01-	0.08-	0.00-	0.00-	0.15-
5	GBR	POL	PRT	GBR	CZE	ITA	ITA	SWE	GBR	GBR	AUT	CZE	ESP	CZE	GBR	GRC	GRC
	0.01-	0.01-	5.48+	0.00-	1.91-	0.92-	1.66-	0.01-	0.02-	0.04-	0.00-	0.00-	0.01-	0.02-	0.00-	0.00-	0.06-
6	ITA	SWE	HUN	CZE	POL	ESP	CZE	DNK	SWE	CZE	CZE	AUT	AUT	GRC	AUT	AUT	GBR
	0.01-	0.01-	3.49=	0.00-	0.01-	0.02-	0.06-	0.00-	0.01-	0.02-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.02-
7	HUN	ITA	ESP	NLD	PRT	PRT	GBR	GBR	NLD	DNK	POL	NLD	NLD	AUT	NLD	DEU	CZE
	0.00-	0.01-	0.02-	0.00-	0.00-	0.02-	0.01-	0.00-	0.01-	0.02-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
8	PRT	DNK	ITA	HUN	GBR	POL	DNK	GRC	DNK	NLD	NLD	DNK	BEL	NLD	DEU	NLD	NLD
	0.00-	0.01-	0.01-	0.00-	0.00-	0.01-	0.01-	0.00-	0.01-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
9	NLD	NLD	DNK	DNK	NLD	NLD	NLD	NLD	FRA	SWE	BEL	DEU	DEU	FRA	BEL	BEL	DEU
	0.00-	0.01-	0.01-	0.00-	0.00-	0.00-	0.01-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
10	DNK	GBR	GBR	POL	DNK	DNK	GRC	AUT	POL	POL	DEU	POL	POL	POL	DNK	CZE	FRA
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.01-
11	GRC	ESP	POL	SWE	DEU	DEU	DEU	POL	GRC	GRC	GRC	FRA	CZE	DEU	POL	FRA	BEL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+	0.00-	0.00-	0.00-	0.01-
12	ESP	BEL	BEL	BEL	GRC	GRC	FRA	FRA	DEU	FRA	FRA	BEL	FRA	BEL	FRA	POL	POL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
13	BEL	GRC	DEU	DEU	AUT	BEL	AUT	DEU	AUT	DEU	DNK	GRC	DNK	DNK	CZE	DNK	DNK
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
14	DEU	DEU	GRC	GRC	BEL	FRA	BEL	BEL	CZE	AUT	HUN	HUN	HUN	HUN	SWE	SWE	IRL
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
15	AUT	AUT	FIN	AUT	FRA	AUT	POL	CZE	BEL	BEL	FIN	SWE	SWE	IRL	FIN	HUN	SWE
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
16	FIN	FIN	AUT	FIN	FIN	FIN	FIN	FIN	FIN	FIN	SWE	FIN	FIN	SWE	IRL	IRL	HUN
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-
17	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	IRL	FIN	HUN	FIN	AUT
	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00-	0.00+

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

1.B.3 The labour mobility index

The algorithm computes the quantity of labour that should be employed in each sector by each country in order to realize the ESR. This can be used to compute the following index

$$lm_{i,c,y} = \frac{l^E_{i,c,t} - l_{i,c,t}}{\sum_{i=1}^{n} l_{i,c,t}} \times 100 \tag{1.B.3}$$

where $l^E_{i,c,t}$ and $l_{i,c,t}$ are, respectively, the quantity of workers employed in sector i of country c at time t in the efficient scenario and in the original data set.

In Tables 1.39-1.55 the results for this index are reported, organized as those of the ESR and the RSR Tables—i.e. each Table represents a country. Sector 2 and 12 are reported in this case since Tables 1.39-1.55 contain less data than Tables 1.6-1.22, and a sector more does not worsen the clearness of the Tables. It can be noted that the values are often but not always 0. This happens because, as explained further on in the text, working with subsystems means to reorganize the *gross* production, in order to reach some objectives in the *net* product. The algorithm keeps the net deficit in Sector 2 and Sector 12 equal to or lower than the original deficit. But in order to do this, it may be necessary to adjust the gross production in Sector 2 and Sector 12 and hence the quantity of employed in that sector. However, it can also be noted that these adjustments are almost always rather slight.

There is a strict relation between the CAs and this index. In order to infer the CA of a country, in some cases it may be even easier just to check whether the $lm_{i,c,t}$ is positive or negative and how high its absolute value is, than to compare the $ESR_{i,c,t}$ with respect to $RSR_{i,c,t}$.

For example, it has been noted above that Austria in an efficient pattern should decrease its net product in Sector 1 down to 0 for all the years considered—see Tab. 1.6. Since Austria employs a great ratio of its labour force in that sector, the relative lm is deeply negative—see Tab. 1.39. The 30% circa of the labour force employed in Sectors 1-17 should leave Sector 1 in 1995 and be reallocated in other sectors—Sector 15 in many years and Sector 16 in 2009, 2010 and 2011.

However, even if the ESR and the lm are strictly related, they may lead to weigh in different ways the closeness of single sectors, or even of countries, to the efficient specialization pattern. This happens because adjusting the net output in one sector implies a reallocation of labour that involves all the system. This is due to the complexity of industrial relations assumed by the approach of subsystems. It may well be the case that a slight adjustment of the net product of a sector i in country c involves more labour reallocation than a considerable net product adjustment in sector j in country d. It all depends on how much the single sectors are linked to others. Therefore, the ESR and the lm are complementary rather than reciprocal substitutes.

Table 1.39: Labour mobility index of Austria*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-30.19	-30.25	-27.58	-27.17	-29.01	-29.04	-29.15	-29.67	-28.96	-29.18	-27.69	-26.51	-25.07	-27.79	-23.92	-11.61	-4.07
2	2.87	4.91	2.38	0.07	0.18	0.84	0.37	-0.69	-0.69	1.03	-0.64	-0.01	4.79	-0.83	-0.77	-0.90	-0.81
3	-8.24	-8.31	-8.20	-7.98	-8.00	-7.85	-7.68	-7.80	-7.86	-7.96	-7.93	-7.62	-7.78	-6.81	-6.99	-6.94	-6.18
4	-3.72	-3.55	-3.34	-3.32	-2.95	-2.95	-2.91	-2.70	-2.40	-2.36	-2.22	-1.42	-1.25	-1.31	-1.06	-1.33	-0.82
5	-0.72	-0.70	-0.72	-0.71	-0.70	-0.66	-0.63	-0.61	-0.58	-0.54	-0.52	-0.09	1.32	0.39	-0.07	0.64	1.74
6	-2.97	-3.18	-3.12	-3.20	-2.82	-3.15	-3.06	-3.45	-3.42	-3.32	-3.38	-2.91	-3.39	-3.19	-1.57	-3.72	-3.24
7	-2.94	-3.93	-3.66	-4.28	-4.40	-4.53	-4.33	-4.39	-4.18	-4.40	-4.24	-3.86	-3.47	-3.79	-3.45	-3.00	-1.91
8	-0.02	-0.06	-0.03	-0.12	-0.12	-0.02	-0.06	-0.08	-0.11	0.00	-0.10	-0.06	3.04	-0.02	-0.03	0.00	0.00
9	-0.56	-1.21	-0.91	-1.54	-1.83	-0.89	-1.17	-1.11	-1.25	-1.11	-1.79	-1.30	-1.20	-1.64	-1.04	7.86	11.64
10	-1.81	-1.83	-1.69	-1.39	-1.31	-1.49	-1.39	-0.73	-0.28	-1.50	-0.50	2.63	2.88	2.36	1.86	4.44	7.81
11	74.44	36.98	65.60	-2.69	-2.58	-2.66	-3.07	-2.26	-2.94	-1.96	-2.65	-1.78	-1.79	-2.03	-2.20	-1.59	-1.09
12	-5.10	33.22	2.87	75.10	77.30	75.54	76.53	9.23	34.49	74.19	3.68	3.80	5.89	8.85	8.79	1.15	-1.02
13	-5.64	-6.16	-5.81	-6.31	-6.73	-6.70	-7.13	-6.31	33.27	-6.87	57.33	-2.57	-2.57	-4.23	-5.14	-2.98	1.83
14	-6.71	-6.62	-6.48	-6.72	-7.04	-6.99	-6.98	60.94	-5.28	-7.01	1.78	-2.19	-2.69	-2.54	-3.78	-5.92	-5.32
15	-2.59	-2.67	-3.09	-3.34	-3.65	-3.67	-3.76	-3.61	-3.63	-4.03	-4.15	49.29	36.59	46.16	28.79	11.19	-4.37
16	-5.10	-5.00	-4.91	-4.51	-4.27	-3.79	-3.70	-4.38	-3.95	-3.38	-4.34	-3.31	-3.15	-3.00	12.54	-2.96	-2.69
17	-1.01	-1.65	-1.32	-1.89	-2.08	-2.00	-1.87	-2.38	-2.23	-1.61	-2.64	-2.10	-2.15	-0.58	-1.97	15.67	8.51

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.40: Labour mobility index of Belgium*

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Year																
1	20.88	-11.06	-9.43	-10.52	-10.09	-10.87	-10.21	-7.86	-5.92	-10.94	-10.53	-10.91	-7.69	-10.03	-10.50	23.77	7.14
2	-0.52	5.28	-0.51	-0.49	-0.49	-0.48	-0.43	-0.43	-0.44	-0.05	-0.44	-0.44	-0.44	-0.43	-0.49	-0.50	-0.50
3	28.01	-12.27	-12.23	-12.09	-12.10	-12.20	-12.31	-12.37	-12.61	-13.09	-11.66	-12.95	-12.96	-13.24	-12.37	27.31	16.92
4	-7.94	-7.30	44.67	-6.26	-5.37	-6.61	-6.36	-6.14	-5.88	-5.67	-4.71	-4.46	-4.33	-3.97	-4.67	-5.19	-4.76
5	-0.33	-0.46	-0.21	-0.34	-0.31	-0.26	-0.26	-0.24	-0.23	-0.22	-0.22	-0.19	-0.18	-0.22	-0.23	-0.24	-0.22
6	-1.43	-0.96	-1.46	-1.31	-1.32	-1.41	-1.56	13.87	28.25	-1.72	-0.55	-0.83	19.62	-1.19	-1.02	-1.37	2.94
7	-4.30	-5.12	-5.34	-4.30	-4.31	-5.27	-6.10	-5.84	-5.27	-5.95	-5.04	-4.31	-4.36	-4.71	-5.31	-2.81	-2.75
8	-0.67	-0.64	-0.64	-0.54	-0.51	-0.62	-0.58	-0.67	-0.66	-0.71	-0.61	-0.22	-0.59	-0.17	-0.33	0.46	-0.27
9	-6.93	-2.99	-3.65	3.78	2.15	-6.51	-7.20	-7.37	-6.55	-7.14	-4.60	-2.32	-7.73	-6.89	-7.88	-7.95	-7.96
10	-2.18	13.40	0.99	46.92	51.81	-0.61	-1.96	-2.23	-1.95	-2.16	38.86	56.85	-0.05	15.54	-0.46	-1.92	-1.04
11	12.52	53.50	22.45	18.97	13.94	32.90	-3.14	18.47	22.77	-3.50	-2.69	-2.85	-2.56	-3.27	-3.42	-4.20	-3.57
12	-11.70	-8.24	-10.31	-9.75	-9.49	-3.19	71.63	33.23	11.78	71.68	-9.93	-10.42	-6.77	3.06	5.27	-3.82	-0.88
13	-4.54	-4.25	-4.41	-4.59	-4.39	-4.78	-4.88	-4.83	-5.03	-4.68	-3.79	-4.51	-2.73	-3.24	-1.88	-5.51	-4.43
14	-6.61	-5.97	-6.40	-6.34	-6.46	32.65	-5.08	-5.21	-5.83	-5.09	-1.79	-3.15	0.92	1.93	4.08	-5.96	-2.47
15	-7.70	-7.60	-7.73	-7.76	-7.65	-7.74	-7.77	-7.72	-7.64	-7.21	22.84	5.91	34.66	31.40	43.67	-6.56	7.45
16	-4.20	-4.08	-3.94	-3.87	-3.84	-3.45	-2.91	-3.19	-3.20	-2.61	-2.71	-2.91	-2.07	-2.04	-1.41	-2.73	-2.67
17	-2.39	-1.22	-1.87	-1.51	-1.58	-1.55	-0.91	-1.47	-1.58	-0.93	-2.44	-2.29	-2.74	-2.52	-3.04	-2.79	-2.92

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.41: Labour mobility index of the Czech Republic*

Sector	Year 1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	46.00	26.54	42.36	73.05	15.22	74.19	73.71	71.06	70.42	74.63	72.21	53.78	72.73	15.82	73.71	62.98	57.93
2	-5.14	-4.84	-4.61	-4.26	-3.99	-3.69	-3.56	-2.84	-2.95	-2.85	-2.73	-2.80	-1.01	-2.87	-1.81	0.96	0.22
3	-6.84	-7.70	-6.56	-6.60	42.51	-4.81	-4.98	-6.29	-3.56	-6.33	-6.29	-6.85	-5.94	39.60	-6.30	-6.97	-4.60
4	-6.88	-7.58	-7.43	-7.59	-6.93	-7.18	-6.47	-5.70	-5.18	-5.41	-4.82	-3.88	-4.12	-3.54	-3.43	-3.65	-3.69
5	-1.80	-1.60	-1.42	-1.31	-1.17	-1.15	-1.08	-0.46	-0.60	-0.66	-0.57	-0.45	-0.19	0.99	-0.42	0.03	0.00
6	-3.47	-3.38	-3.19	-2.62	-3.24	-3.65	-3.38	-3.09	-3.48	-4.35	-3.63	21.75	-3.58	-2.30	-3.58	-3.56	-3.35
7	-2.74	-2.88	-2.83	-3.03	-1.09	-3.01	-3.08	-3.41	-3.52	-3.57	-3.39	-3.55	-3.56	-2.21	-3.60	-3.54	-3.75
8	-0.39	-0.42	-0.15	0.12	-0.07	-0.07	0.04	-0.04	0.51	0.17	0.51	0.02	-0.08	-0.09	0.03	2.81	8.07
9	-0.68	-1.08	-1.53	-0.85	-1.30	-1.07	-0.57	-0.38	-0.56	0.04	-0.55	-1.33	-0.99	-1.17	-0.25	-0.75	-0.41
10	-1.78	-1.84	-2.06	-2.11	0.80	-2.83	-2.73	-2.22	-2.92	-3.47	-3.32	-4.05	-4.10	-0.49	-3.50	-0.89	-0.53
11	-4.28	-4.32	-4.19	-4.44	-3.97	-4.82	-4.60	-4.74	-4.56	-4.32	-4.48	-4.49	-4.22	-3.63	-3.83	-3.97	-3.84
12	-10.84	-2.24	-8.88	-11.92	-9.86	-12.45	-11.90	-10.70	-10.99	-10.95	-9.95	-12.46	-12.05	-14.53	-13.82	-14.51	-15.02
13	-7.79	-6.45	-6.39	-7.87	-7.26	-8.03	-7.53	-6.98	-7.74	-7.33	-7.60	-8.73	-8.82	-8.92	-7.15	-7.88	-8.14
14	-4.81	-4.58	-5.00	-7.80	-8.58	-9.34	-9.52	-9.62	-10.32	-11.03	-10.55	-11.71	-11.45	-10.69	-10.42	-9.95	-9.30
15	-4.61	-4.63	-4.76	-4.62	-4.95	-5.61	-6.04	-6.15	-6.25	-6.52	-7.25	-7.60	-8.11	-1.49	-7.86	-3.72	-6.20
16	-3.66	-3.84	-4.41	-4.63	-4.71	-5.01	-4.89	-4.91	-4.79	-4.77	-4.60	-4.53	-4.44	-4.10	-4.64	-4.64	-4.41
17	19.70	30.86	21.07	-3.52	-1.42	-1.49	-3.43	-3.55	-3.51	-3.30	-2.98	-3.13	-0.07	-0.39	-3.12	-2.75	-2.98

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l_{i,r}^{E}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.42: Labour mobility index of Denmark*

Sector	Year 1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	69.47	-11.74	-13.10	-13.31	-10.98	-12.80	-12.02	-13.01	26.67	29.10	63.55	34.77	77.08	78.62	77.69	79.40	79.96
2	-0.25	-0.48	-0.43	-0.37	4.07	11.42	19.12	17.81	16.26	15.77	7.53	21.24	-0.15	-0.14	-0.14	-0.28	-0.06
3	-11.19	-9.89	-11.35	-11.53	-11.69	-11.38	-11.65	-12.89	-12.98	-11.77	-12.90	-13.17	-11.87	-11.86	-13.61	-15.68	-15.64
4	-3.20	-0.49	-2.38	0.44	-1.26	-1.63	-1.59	-0.84	-1.90	-1.82	-1.80	-1.70	-1.63	-1.61	-1.40	-1.49	-1.47
5	-0.22	67.05	80.98	81.88	67.87	54.29	36.23	40.99	-0.10	-0.07	-0.08	-0.07	-0.05	-0.05	-0.05	-0.05	-0.04
6	-2.27	-2.05	-2.45	-2.50	-2.54	-2.47	-2.15	-2.18	-2.33	-2.47	-2.72	-2.75	-2.89	-2.85	-2.52	-2.26	-2.18
7	-7.95	-3.88	-6.09	-7.21	-7.69	-5.57	-5.66	-5.45	-6.57	-6.23	-8.07	-7.26	-6.35	-6.95	-7.50	-7.94	-7.39
8	-0.04	-0.10	-0.12	-0.11	3.95	8.57	13.58	14.88	15.20	14.53	5.31	17.75	0.01	0.05	0.14	-0.02	0.04
9	-1.88	0.88	-1.66	-2.44	-2.60	-1.66	-2.03	-2.52	-1.56	-2.07	-5.24	-4.84	-5.39	-5.53	-5.22	-5.20	-5.05
10	-3.08	-2.28	-2.64	-3.03	-2.83	-2.71	-2.35	-2.80	-2.75	-3.03	-3.79	-3.56	-4.00	-3.71	-3.58	-3.58	-3.24
11	-3.08	-2.65	-3.18	-3.41	-3.47	-3.06	-2.69	-2.62	-2.19	-2.46	-2.95	-2.93	-3.29	-3.45	-3.04	-3.26	-2.97
12	-6.58	-5.27	-7.60	-7.82	-5.63	-7.34	-5.98	-6.74	-4.88	-6.55	-8.19	-8.15	-9.38	-10.29	-6.70	-6.89	-9.37
13	-11.16	-10.66	-10.92	-11.31	-10.09	-10.22	-9.95	-9.63	-10.13	-10.68	-11.87	-11.63	-12.36	-12.56	-13.08	-13.51	-13.39
14	-6.87	-7.03	-7.23	-7.53	-7.89	-7.83	-7.54	-8.18	-7.50	-8.34	-8.69	-8.77	-9.58	-9.75	-10.94	-11.06	-10.86
15	-3.65	-3.57	-3.55	-3.39	-3.12	-2.69	-2.50	-2.65	-2.31	-2.19	-2.61	-2.40	-2.67	-2.89	-3.17	-0.57	-0.30
16	-5.55	-5.21	-5.60	-5.59	-5.62	-5.42	-5.18	-5.05	-5.13	-5.05	-5.07	-4.99	-4.89	-4.29	-4.25	-4.77	-4.94
17	-2.50	-2.62	-2.68	-2.76	-0.48	0.49	2.35	0.89	2.20	3.32	-2.41	-1.52	-2.57	-2.74	-2.62	-2.85	-3.09

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.43: Labour mobility index of Finland*

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Year																
1	-24.79	-22.71	-18.40	-11.46	-18.10	-12.04	-18.68	-14.84	-16.77	-15.47	-15.41	-17.77	-19.74	-19.10	-17.20	-16.39	-18.63
2	6.76	5.95	-1.02	-0.93	-0.94	-0.93	-0.95	-0.98	-0.98	-0.95	-1.00	-1.10	-1.06	-0.90	-0.09	-0.33	-1.32
3	-6.89	-6.55	-6.04	-5.96	-6.11	-5.03	-5.46	-5.15	-5.94	-5.64	-5.65	-6.36	-6.27	-6.06	-6.03	-6.26	-6.47
4	-2.56	-2.74	-2.67	-2.68	-2.35	-2.07	-2.04	-2.22	-1.26	-1.62	-1.41	-2.00	-1.89	-1.58	-1.77	-1.74	-1.72
5	-0.62	-0.57	-0.51	-0.53	-0.52	-0.48	-0.47	-0.46	-0.44	-0.42	-0.42	-0.23	-0.24	0.05	-0.29	-0.28	-0.02
6	-4.33	-4.00	-4.00	-3.56	-4.68	-4.39	-4.60	-4.59	-5.01	-5.02	5.89	-0.86	-4.81	-4.27	-4.82	-4.64	-4.81
7	-10.43	-11.58	-11.22	-10.76	-9.86	-9.99	-9.13	-9.67	-8.84	-9.34	-7.90	-9.57	-8.86	-7.43	-8.27	-8.89	-8.89
8	0.02	-0.34	-0.45	-0.45	0.06	0.44	0.14	0.09	0.17	0.23	3.45	0.92	0.14	-0.35	-0.43	-0.40	-0.19
9	-1.07	-1.73	-2.28	-1.95	-1.52	-1.77	-1.99	-2.21	-2.14	-2.00	-1.95	-1.93	-2.23	-1.65	-1.90	-2.71	-1.46
10	2.91	-1.58	-1.36	-1.25	-0.56	0.77	-0.12	-0.91	-2.07	-1.81	-1.08	-1.70	-2.03	-1.28	-1.63	-1.66	-1.93
11	-1.51	-1.75	-1.82	-2.02	-2.02	-2.25	-2.23	-2.36	-2.44	-2.52	-2.06	-2.45	-2.31	-2.09	-2.04	-1.96	-1.48
12	64.10	69.85	10.84	7.70	-1.87	-5.53	-4.90	-5.09	-7.02	-6.11	-6.10	-6.07	-6.29	7.51	8.66	6.93	3.91
13	-7.45	-7.66	49.42	-8.82	-8.09	-7.75	-8.49	-8.50	-9.52	-9.11	-8.96	-9.54	-9.97	-9.30	-7.04	-5.38	-9.12
14	-7.40	-8.28	-6.08	50.69	64.26	59.26	67.55	65.36	70.71	67.64	50.37	66.74	73.43	53.68	50.00	50.78	59.19
15	-3.64	-2.68	0.38	-3.25	-3.32	-3.34	-3.69	-3.64	-3.55	-2.98	-3.21	-3.39	-3.56	-3.42	-3.53	-3.53	-3.42
16	-1.70	-1.91	-2.47	-2.67	-2.59	-2.69	-2.68	-2.64	-2.73	-2.73	-2.53	-2.60	-2.57	-1.98	-1.39	-1.71	-1.88
17	-1.40	-1.73	-2.30	-2.09	-1.81	-2.21	-2.26	-2.20	-2.18	-2.16	-2.02	-2.08	-1.75	-1.83	-2.23	-1.84	-1.75

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.44: Labour mobility index of France*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	24.21	50.61	48.69	21.19	7.81	14.03	9.69	29.13	-2.58	44.69	4.56	-16.94	-19.03	16.46	-17.31	-14.94	25.59
2	-1.02	-0.02	-0.93	1.07	-0.81	-0.79	-0.64	-0.64	-0.65	-0.67	-0.69	-0.70	-0.71	-0.75	-0.74	-0.75	-0.75
3	30.24	0.16	7.08	15.55	40.07	8.83	9.54	-10.44	33.94	7.28	-11.82	-7.72	-12.65	-12.63	-10.96	-12.25	3.84
4	-5.55	-5.34	-5.16	-4.98	-4.53	-3.76	29.47	28.47	-3.28	-1.36	16.32	16.80	15.72	17.35	16.38	-2.16	15.89
5	-1.05	-1.02	-0.98	-0.93	-0.88	-0.84	-0.75	-0.67	-0.73	-0.69	-0.63	-0.57	-0.58	-0.49	-0.66	-0.72	-0.57
6	-1.61	-1.65	-1.32	-1.29	-1.29	-1.16	-1.43	-1.49	-1.39	-1.43	-1.15	-0.89	-1.29	-0.77	-0.97	-1.11	-0.84
7	-4.38	-5.69	-5.40	-4.85	-3.68	-4.67	-4.94	-5.17	-3.40	-4.98	-5.03	-3.56	-1.28	-2.52	-2.57	-1.95	-2.50
8	-0.50	-0.37	-0.31	-0.02	-0.17	-0.13	-0.05	0.01	-0.12	0.06	0.14	-0.21	0.06	-0.03	-0.18	-0.30	-0.03
9	-1.10	-1.64	-1.98	-2.24	3.93	7.03	2.73	4.28	16.39	1.91	1.86	10.98	-0.19	-0.27	12.89	2.49	-1.64
10	-3.12	-3.57	-3.32	-3.14	-2.01	-1.00	-2.59	-2.70	-0.19	-3.34	-0.39	0.84	-1.50	-0.81	7.80	3.90	1.30
11	-2.78	-2.76	-2.87	-2.68	-1.97	-2.22	-2.50	-2.66	-1.82	-2.47	-2.27	-1.23	-2.00	-2.12	-1.50	-1.72	-2.26
12	-9.36	-9.41	-9.24	-7.21	-8.65	-5.10	-10.44	-10.51	-9.02	-10.86	-2.60	0.21	5.26	-2.36	3.23	8.20	-10.97
13	-6.44	-6.31	-5.45	-5.07	-6.18	-5.11	-6.00	-5.17	-5.81	-6.11	21.36	-4.94	31.37	-5.16	2.16	27.80	-6.51
14	-7.84	-7.45	-8.29	-8.02	-8.53	-7.02	-8.78	-8.42	-8.00	-7.96	-5.87	-2.12	-4.80	-6.35	5.75	7.08	-6.82
15	-6.57	-6.57	-6.59	-6.65	-6.78	7.68	-7.15	-7.26	-7.30	-7.23	-7.39	14.82	-2.52	6.42	-8.61	-8.59	-6.74
16	-3.76	-3.80	-3.75	-3.73	-3.82	-3.47	-3.84	-3.85	-3.79	-3.91	-3.49	-2.66	-2.95	-2.93	-2.40	-2.12	-3.33
17	0.63	4.82	-0.19	13.00	-2.48	-2.30	-2.33	-2.92	-2.24	-2.95	-2.91	-2.11	-2.91	-3.04	-2.31	-2.86	-3.66

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.45: Labour mobility index of Germany*

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Year																
1	-1.59	-8.31	-8.81	-8.76	-8.01	-8.39	-9.14	-9.32	-9.23	-9.68	-8.97	2.42	-2.95	3.61	-4.82	-9.39	-9.69
2	-1.00	0.01	-1.63	-0.43	-0.99	-1.35	-1.11	-1.10	-1.10	-1.06	0.38	-0.09	-0.09	-0.79	-0.02	0.48	0.19
3	0.84	-9.03	-9.39	-9.14	-9.48	-9.73	-9.74	-10.33	-10.64	-10.62	-10.26	27.43	11.90	22.89	10.04	-9.22	-8.97
4	-3.03	21.69	15.09	20.09	17.59	19.65	-0.28	-1.86	-1.61	-1.66	-1.55	-1.75	-1.56	-1.54	-1.49	11.83	-1.20
5	-0.39	-0.38	-0.33	-0.34	-0.30	-0.29	-0.29	-0.27	-0.23	-0.24	-0.22	-0.23	-0.13	-0.18	-0.24	-0.13	-0.08
6	-1.63	-1.67	4.63	-1.27	-1.10	-1.64	-1.12	-1.66	-1.41	-1.46	2.98	1.18	2.70	3.13	4.05	4.48	3.11
7	-3.80	-5.65	-5.14	-4.36	-4.52	-5.65	-5.42	-5.36	-4.36	-4.02	-4.83	-4.02	-3.62	-3.65	-3.52	-2.71	-2.88
8	-0.19	1.58	-0.07	-0.17	-0.22	-0.18	-0.13	-0.17	-0.08	-0.14	-0.10	-0.06	-0.05	-0.08	-0.06	0.11	0.15
9	-3.83	-3.85	-3.40	-3.40	-3.74	-2.55	-3.11	-3.18	-3.32	-3.05	-3.70	-4.03	-3.86	-4.12	-3.60	-3.18	-3.21
10	0.10	-2.91	-1.43	-1.41	-0.34	-1.89	4.25	8.22	-0.09	-0.31	-1.20	-2.01	-0.11	-0.88	-0.70	1.42	1.84
11	-1.18	-2.33	-1.75	6.15	-1.59	2.43	-2.27	-2.22	-1.47	-2.28	9.68	5.25	4.01	1.56	9.22	6.24	5.16
12	-0.32	-0.08	1.87	1.64	7.95	-3.49	1.86	1.26	-3.26	-1.92	1.19	-6.08	1.66	-3.29	1.35	7.12	11.57
13	7.65	0.82	-8.49	-7.57	-4.95	-9.56	12.13	9.27	2.22	-5.73	1.42	-11.03	-10.39	-11.98	-12.19	-11.08	-10.47
14	-6.89	-7.44	-7.80	-8.82	-9.47	13.52	-6.00	-5.55	12.10	21.67	-3.77	-1.23	-4.92	-2.66	-10.14	-9.86	-0.19
15	20.87	23.09	17.51	22.49	24.19	14.12	25.00	26.78	26.87	24.83	23.66	-0.68	12.08	3.20	16.88	18.43	19.38
16	-3.13	-3.11	11.72	-2.71	-2.71	-2.98	-2.63	-2.47	-2.34	-2.40	-2.66	-2.85	-2.58	-2.98	-2.42	-1.98	-2.07
17	-2.50	-2.43	-2.59	-2.00	-2.31	-2.02	-2.01	-2.03	-2.05	-1.95	-2.06	-2.20	-2.10	-2.24	-2.34	-2.57	-2.65

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.46: Labour mobility index of Great Britain*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-6.89	-0.18	9.81	3.54	27.69	18.67	19.79	-3.00	-8.67	-10.26	-3.40	-10.21	-11.00	-7.29	-14.36	2.11	-14.26
2	-1.11	-0.94	-0.79	-0.81	-0.69	-0.04	-0.93	-0.85	-1.05	-1.03	0.29	0.34	-0.04	-0.90	-1.52	-0.96	-0.91
3	-10.19	19.83	50.13	17.36	-9.16	-9.25	-9.49	13.81	-10.35	-10.68	-10.72	-10.70	-10.76	1.38	-10.48	19.16	-11.27
4	38.35	-3.96	-4.46	-3.43	-3.10	-3.02	-2.53	-2.37	32.04	26.44	-1.77	-1.79	-1.75	-1.70	-1.89	-1.72	-1.83
5	-0.31	-0.32	-0.37	0.01	-0.24	-0.20	5.54	3.85	7.75	5.94	5.27	4.98	4.25	4.30	4.36	3.44	-0.10
6	14.30	13.78	0.01	12.46	17.42	19.15	17.31	14.12	8.75	16.51	5.99	3.81	2.24	2.79	1.56	2.46	1.42
7	-8.21	-6.96	-6.35	-6.93	-9.04	-9.45	-9.14	-8.22	-8.44	-8.07	-8.61	-8.35	-8.21	-7.37	-8.62	-5.72	-7.35
8	-1.26	-1.30	-1.25	-1.14	-1.32	-1.19	-1.22	-1.47	-1.46	-1.32	-1.20	-1.37	-0.86	-1.39	-1.45	-1.17	-1.75
9	-4.61	-5.49	-5.15	-5.53	-5.95	-5.70	-5.74	-6.20	-4.89	-4.94	-6.09	-6.47	-6.41	-5.88	-6.46	-5.43	-5.42
10	-2.53	-0.77	0.23	-2.14	-2.83	-2.97	-2.86	-2.08	-2.34	-1.52	0.37	-2.61	-1.99	-0.63	-2.00	-0.78	-1.94
11	-2.85	-2.66	-2.47	-2.36	-2.52	-2.62	-2.50	-2.12	-2.75	-2.72	-2.41	-2.43	-2.51	-2.46	-2.58	-2.20	-2.39
12	-7.65	-6.58	-8.33	-6.27	-6.76	-6.02	-5.58	-4.03	-5.30	-5.75	17.96	20.83	2.25	4.23	9.06	-1.68	10.59
13	-6.86	-6.27	-6.53	-6.65	-6.13	-6.12	-6.50	-5.49	-6.18	-5.56	-5.59	3.34	25.14	9.18	33.10	-6.47	34.02
14	-9.82	-9.49	-9.96	-10.17	-10.46	-10.76	-10.21	-9.19	-8.86	-8.37	-7.86	-7.54	-7.11	-7.36	-6.61	-7.78	-5.90
15	-9.08	-8.87	-9.34	-9.76	-9.64	-9.37	-9.64	-9.67	-9.91	-9.72	-9.70	-9.50	-9.53	-9.46	-9.14	-11.10	-11.13
16	20.78	22.32	-3.16	23.93	24.75	25.19	26.06	24.81	23.89	23.12	24.52	24.03	25.42	25.31	19.76	20.76	20.97
17	-2.07	-2.13	-2.04	-2.09	-2.02	3.68	-2.35	-1.92	-2.23	-2.07	2.94	3.63	0.85	-2.74	-2.74	-2.92	-2.76

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.47: Labour mobility index of Greece*

Sector	Year																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-53.48	-53.79	-53.26	-55.26	-56.38	-55.56	-54.12	-48.85	-49.16	-50.62	-50.55	-50.15	-47.71	-43.54	-47.99	-49.01	-22.00
2	-1.10	-1.14	-1.13	1.26	1.79	15.56	27.71	12.99	26.03	7.64	6.59	44.34	2.70	16.89	-1.33	-1.23	-1.28
3	-6.78	-7.03	-7.24	-7.58	-7.72	-8.20	-9.26	-9.13	-8.99	-9.86	-10.56	-11.10	-10.84	-11.25	-9.75	-9.79	4.62
4	-7.50	-7.56	-7.21	-7.58	-7.51	-7.67	-7.24	-4.70	-6.98	-2.30	-0.07	-5.38	-3.71	-6.78	-7.37	-7.17	-7.11
5	-0.66	-0.68	-0.59	-0.59	-0.57	-0.60	-0.71	-0.32	5.58	-0.41	-0.58	-0.62	-0.47	-0.17	-0.38	-0.33	33.66
6	-1.63	-1.72	-1.66	-1.71	-1.72	-1.72	-1.71	-1.29	-1.20	-2.05	-1.92	-1.80	-1.52	-1.08	-1.29	-1.11	0.58
7	-2.37	-2.50	-2.50	-2.78	-2.83	-2.71	-2.92	-2.96	-2.98	-0.10	-0.05	-3.55	0.34	10.36	-3.60	-3.52	-1.29
8	-0.26	-0.25	-0.23	-0.18	-0.18	-0.19	-0.02	-0.33	-0.31	-0.35	-0.20	-0.32	-0.26	14.49	0.72	-0.30	-0.22
9	3.71	2.77	3.30	-0.05	-0.78	0.71	-0.37	-0.49	-0.98	-0.79	-1.22	-1.92	1.87	1.65	-2.33	-1.49	-1.77
10	59.46	61.77	63.31	13.51	4.10	13.80	-0.96	-0.95	-1.23	0.41	-1.04	-1.33	19.91	30.98	-1.11	-1.63	-1.12
11	1.82	3.99	2.78	2.30	2.55	39.36	58.82	65.13	51.91	20.51	-2.49	-2.53	-1.90	-2.34	-2.21	5.70	7.47
12	-2.06	-2.18	-2.00	2.34	3.69	-1.28	-2.01	-3.51	-4.03	44.99	68.16	45.02	48.75	-0.16	4.21	3.38	-0.21
13	17.05	14.64	12.71	12.01	12.55	5.85	-0.34	0.19	-0.70	-1.51	-1.59	-1.96	-1.83	-1.90	77.25	73.08	-1.67
14	-0.72	-0.77	-0.76	50.44	59.22	8.62	-1.19	-1.17	-1.63	-1.57	-1.34	-2.08	-1.95	-2.04	2.40	2.09	-0.69
15	-1.62	-1.52	-1.46	-1.41	-1.34	-1.33	-1.14	-1.17	-1.33	-1.37	-1.47	-1.83	-1.77	-0.47	-1.69	-2.02	-2.47
16	-2.88	-2.88	-2.95	-2.98	-3.01	-3.10	-3.28	-2.97	-3.48	-2.82	-3.19	-3.22	-2.13	-4.87	-3.74	-4.86	-5.22
17	-0.97	-1.16	-1.11	-1.75	-1.87	-1.52	-1.27	-0.47	-0.52	0.20	1.52	-1.58	0.52	0.23	-1.79	-1.77	-1.28

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.48: Labour mobility index of Hungary*

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Year																
1	5.06	17.45	14.75	-7.43	-31.60	-31.17	-28.99	-27.90	-16.89	1.91	41.92	44.47	-22.82	17.69	45.01	40.02	-26.92
2	-2.09	-1.99	-1.66	-1.53	-1.46	-1.21	-0.84	-0.94	-0.88	-1.01	-1.09	-1.11	-1.09	-0.68	-0.49	0.04	0.40
3	8.85	16.28	19.47	6.15	-9.37	-9.77	-10.07	-10.32	-10.45	31.40	-7.23	-7.28	-10.02	-3.16	-5.67	-10.37	-12.78
4	-7.46	-7.21	-7.67	-7.93	-5.86	-5.89	-6.16	-5.53	-4.91	-5.92	-5.16	-5.31	0.41	-2.02	-3.36	-3.21	-1.24
5	-1.92	-2.04	-2.30	-2.12	-2.14	-1.52	-1.64	-1.62	-1.25	-0.72	-0.52	-0.71	7.72	1.96	-0.44	0.27	3.89
6	-1.56	-1.66	-1.81	-0.53	-0.40	-1.61	-1.47	-1.80	-1.99	-2.15	-0.21	-1.18	-2.04	-1.46	-1.16	-1.50	-0.80
7	-1.04	-0.86	-0.81	6.65	63.32	-1.44	33.46	58.60	68.86	-1.16	-2.58	-0.72	0.13	-2.06	-3.04	-3.19	-0.93
8	-0.13	-0.17	-0.16	-0.23	-0.19	-0.26	-0.24	0.12	0.30	-0.22	0.57	1.22	-0.32	0.17	0.78	10.96	11.30
9	20.12	-2.45	-2.22	-1.88	-0.93	0.41	-0.10	-0.63	-0.90	-0.64	5.47	4.43	3.69	7.44	4.37	-0.60	0.10
10	-0.58	-0.75	-0.58	-0.88	-0.10	1.78	0.76	-0.42	-0.88	-0.43	-1.94	-0.18	4.25	5.50	-2.12	-2.65	0.08
11	-1.41	-1.43	-1.29	27.68	-1.58	-1.01	-1.59	-1.80	-2.34	-1.81	-1.83	-1.96	1.10	-0.57	-1.85	-1.69	-1.30
12	-3.10	-3.17	-2.96	-1.38	-1.75	2.42	-0.14	-3.21	-5.45	-4.30	-0.46	-5.00	8.80	-7.70	-7.76	-6.19	14.43
13	-3.63	-3.67	-3.36	-1.93	-0.87	-0.29	-1.58	-1.67	-2.96	-3.07	-2.69	-3.80	-0.32	-3.51	0.00	3.46	33.21
14	-4.56	-5.10	-5.45	-6.73	-6.85	50.94	21.89	4.30	-10.81	-5.10	-12.23	-12.17	21.72	1.66	-11.11	-12.54	-7.32
15	-1.98	-2.35	-2.39	-3.00	-3.16	-2.37	-3.24	-3.86	-4.19	-4.53	-5.02	-5.09	-5.66	-5.80	-5.50	-4.89	-5.30
16	-1.80	-1.65	-1.82	-1.83	-1.34	-1.75	-1.58	-1.65	-2.57	-2.92	-3.14	-1.38	-1.68	-2.75	-2.85	-2.48	-2.11
17	-2.75	0.76	0.26	-3.07	4.27	2.74	1.53	-1.66	-2.69	0.67	-3.86	-4.24	-3.85	-4.69	-4.80	-5.43	-4.71

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.49: Labour mobility index of Ireland*

Sector	Year																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-29.52	-27.47	-26.63	-26.23	-27.50	-23.98	-22.20	-25.54	-26.50	-22.71	-25.02	-20.66	-22.18	-24.02	-23.69	-21.38	-16.48
2	-0.96	-0.62	0.17	0.31	-0.50	0.23	0.73	0.36	-0.89	0.80	-0.03	-0.52	-0.52	-2.13	-1.89	-1.88	-0.97
3	-9.54	-9.18	-9.03	-9.54	-10.02	-9.48	-10.04	-10.47	-13.48	-12.58	-12.49	-12.00	-11.87	-10.82	-11.45	-11.14	-12.45
4	-4.85	-4.49	-4.03	-3.45	-2.60	-2.19	-2.10	-1.95	-1.40	-0.78	-1.19	-0.82	-1.12	-1.27	-0.99	-0.98	-0.73
5	-0.28	-0.22	-0.24	-0.24	-0.18	-0.12	-0.15	-0.14	-0.16	-0.11	-0.10	-0.05	-0.07	-0.08	-0.07	-0.08	0.24
6	-0.65	-0.58	-0.96	-1.22	-0.68	-0.92	-1.39	-1.81	-1.59	-1.47	-1.29	-1.55	-1.81	-1.68	-1.49	-1.66	-1.68
7	72.19	68.29	9.38	-4.30	72.86	28.40	-4.09	-3.49	70.78	-4.11	65.20	61.15	69.69	75.88	76.06	74.00	64.02
8	-1.25	-1.26	-0.84	-0.77	-1.07	-0.19	-0.61	-0.47	-0.16	2.23	-0.06	-1.20	-0.94	-4.35	-3.71	-1.54	1.61
9	-1.71	-2.53	57.33	73.02	-4.50	33.55	64.08	66.54	-5.94	62.50	-6.01	-5.91	-4.74	-4.93	-5.97	-7.20	0.98
10	-0.31	0.41	0.20	-0.77	0.09	0.34	-0.10	-0.19	0.13	0.10	0.72	-0.59	-0.52	-0.16	-1.13	-0.05	-0.33
11	-2.49	-2.49	-2.43	-2.30	-2.64	-2.49	-2.41	-2.34	-1.69	-2.91	1.12	0.80	-1.41	-1.78	-2.00	-1.18	-1.28
12	-2.14	-1.92	-2.19	-2.62	-2.12	-2.06	-1.42	-1.18	-0.62	-1.51	-0.23	2.80	-2.55	-4.93	-3.47	-5.05	-5.30
13	-2.73	-2.20	-3.05	-2.93	-1.46	-1.94	-2.50	-1.75	0.38	-2.19	-2.62	-2.60	-2.65	-2.52	-1.99	-1.40	-3.40
14	-10.27	-10.74	-13.32	-14.25	-14.62	-15.56	-14.20	-13.03	-12.81	-13.13	-13.08	-13.87	-14.47	-14.82	-13.43	-16.92	-20.11
15	-2.15	-1.68	-1.75	-1.95	-1.87	-1.55	-1.91	-2.00	-2.46	-1.79	-1.74	-1.93	-2.05	-1.52	-2.18	-1.55	-1.81
16	-1.20	-1.22	-1.25	-1.32	-1.28	-0.90	-0.81	-0.95	-1.18	-0.88	-0.69	-0.78	-1.05	0.71	-0.79	-0.34	-0.72
17	-2.13	-2.09	-1.35	-1.44	-1.91	-1.13	-0.89	-1.59	-2.43	-1.46	-2.48	-2.28	-1.75	-1.59	-1.80	-1.64	-1.59

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.50: Labour mobility index of Italy*

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Year																
1	-18.06	-18.42	-18.05	-17.39	-16.81	-16.69	-14.76	-16.28	-15.01	-14.41	22.99	-15.27	22.32	-15.15	21.76	27.47	15.15
2	-0.66	-0.64	-0.65	-0.66	-0.68	-0.65	-0.65	-0.71	-0.68	-0.66	-0.67	-0.65	-0.64	-0.64	-0.79	-0.71	-0.66
3	-6.87	-7.07	-7.17	-7.49	-7.39	-7.23	-7.02	-7.07	-7.34	-5.16	38.11	-7.11	36.76	-8.11	36.82	29.57	30.92
4	-10.92	-11.09	-10.77	-10.82	-9.45	-10.12	-10.28	-10.10	-9.62	-9.60	-9.37	-8.50	-8.83	-8.90	-9.54	-9.24	-9.00
5	4.34	-3.51	-3.04	-3.40	-3.17	-2.99	-3.25	-3.09	-3.10	-2.90	-2.87	-2.68	-2.78	-2.78	-2.77	-2.68	-2.82
6	-2.34	-1.74	-0.56	-2.10	-2.23	-1.89	-2.48	-2.35	-2.11	-2.47	-2.17	-1.68	-2.11	-1.20	-1.63	-1.70	-1.34
7	-2.92	-2.47	-3.02	-3.04	-2.09	-2.79	-2.67	-3.30	-2.65	-2.11	0.57	16.62	-2.87	-3.24	-2.71	-2.82	-2.23
8	-0.03	-0.03	-0.07	-0.04	-0.29	-0.14	-0.31	-0.12	-0.24	-0.32	0.11	-0.32	-0.36	-0.36	-0.26	-0.29	-0.17
9	-1.72	-1.73	-1.97	-2.07	-1.99	-1.22	-1.29	-2.19	-1.01	0.31	-1.67	0.63	-2.51	-2.34	-2.22	-2.65	-2.44
10	-0.95	-0.82	-1.04	-1.03	-0.98	-1.28	-1.48	-1.75	6.39	9.86	-2.51	-1.24	-2.49	-1.13	-1.97	-2.18	-1.80
11	-2.85	-2.83	-2.89	-2.72	-2.86	-2.67	6.57	-2.92	-0.11	-3.20	-2.42	1.14	2.32	-0.75	-2.23	0.97	-1.25
12	3.33	9.40	7.16	8.21	6.21	23.93	2.67	23.52	30.30	9.26	-12.77	0.87	-13.38	16.21	-8.53	-9.44	-5.77
13	13.09	22.02	25.47	32.01	28.06	35.22	9.90	13.76	17.83	33.17	-9.65	31.39	-10.04	39.76	-10.24	-10.33	-3.62
14	36.53	28.90	19.49	20.00	20.59	-2.43	34.91	22.10	-4.83	-5.01	-6.85	-3.90	-7.45	-4.11	-6.31	-6.60	-5.39
15	-4.14	-4.05	-4.07	-3.89	-4.22	-3.67	-4.17	-3.82	-3.72	-3.67	-4.19	-3.67	-4.46	-3.45	-4.81	-4.78	-4.47
16	-4.23	-4.32	2.76	-4.08	-4.61	-4.23	-4.71	-4.39	-4.25	-4.73	-5.23	-4.46	-4.97	-4.68	-5.10	-5.13	-4.81
17	-1.63	-1.60	-1.58	-1.50	1.92	-1.13	-0.97	-1.28	0.13	1.64	-1.39	-1.16	1.48	0.88	0.53	0.54	-0.30

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.51: Labour mobility index of Netherlands*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	14.07	-12.61	-13.93	16.23	3.05	17.89	20.34	16.07	22.02	17.10	-7.72	23.13	-11.52	-15.65	2.39	-8.75	-14.05
2	7.28	0.85	9.92	4.55	5.03	1.10	-0.67	-0.70	-0.64	-0.69	2.48	-0.59	3.02	0.68	4.38	6.63	4.34
3	-9.98	-5.38	-10.34	28.75	16.20	34.30	35.15	39.84	33.43	38.28	3.74	32.18	-4.48	-10.21	28.19	-3.74	-8.40
4	-2.22	-1.80	-1.99	-2.01	-1.70	-1.95	-1.90	-1.75	-1.65	-1.54	-1.26	-1.47	-1.27	-1.24	-1.30	-1.20	-1.18
5	-0.34	-0.29	-0.30	-0.27	-0.22	-0.22	-0.22	-0.19	-0.18	-0.17	-0.16	-0.16	-0.15	-0.13	-0.12	-0.12	-0.11
6	-1.18	-0.81	-1.28	-1.40	-1.28	-1.40	-1.35	-1.37	-1.31	-1.31	-0.54	-0.98	-1.10	-0.96	-1.11	-0.69	-0.71
7	-6.93	-2.94	-6.19	-6.20	-5.53	-6.33	-5.85	-5.69	-5.43	-4.55	-5.04	-5.01	-5.53	-5.91	-4.20	-4.75	-4.78
8	6.88	0.05	8.40	4.24	4.67	1.26	-0.42	-0.42	-0.44	-0.43	1.59	-0.39	2.55	1.39	6.88	7.13	6.06
9	27.46	52.78	29.98	-4.61	13.15	-4.51	-4.75	-5.02	-4.79	-4.72	42.93	-4.94	55.15	56.76	-2.69	34.67	40.92
10	-1.48	-1.02	-0.99	-1.78	-1.21	-1.76	-1.77	-1.79	-1.78	-1.77	-0.99	-1.57	-1.19	-0.58	-1.26	-0.96	-0.63
11	-2.19	-1.89	-1.99	-2.24	-1.98	-2.17	-2.15	-2.03	-1.90	-1.86	-1.68	-1.96	-1.95	-2.05	-1.79	-1.81	-1.86
12	-7.09	-4.97	-4.75	-7.66	-5.33	-8.16	-8.20	-8.23	-8.01	-8.52	-6.47	-8.04	-5.99	0.60	-1.78	-1.01	0.67
13	-4.51	-4.58	-2.46	-5.44	-4.08	-5.77	-6.53	-6.22	-6.38	-6.45	-6.13	-6.83	-6.72	-6.31	-6.42	-5.97	-2.18
14	-6.07	-5.17	1.87	-6.77	-6.27	-6.76	-6.31	-6.52	-6.42	-6.53	-5.56	-6.43	-5.63	-5.59	-5.92	-5.54	-5.03
15	-3.39	-1.92	-1.65	-3.82	-3.14	-3.68	-3.88	-3.90	-3.95	-3.81	-2.73	-3.74	-2.90	1.05	-3.38	-3.03	-2.20
16	-9.40	-9.30	-9.71	-9.99	-10.06	-10.28	-9.90	-10.26	-10.79	-11.22	-11.20	-11.36	-11.30	-10.73	-10.98	-10.96	-10.70
17	-0.92	-0.99	5.41	-1.58	-1.27	-1.58	-1.62	-1.80	-1.78	-1.79	-1.25	-1.84	-0.99	-1.12	-0.88	0.10	-0.15

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.52: Labour mobility index of Poland*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-26.64	-36.44	-37.68	-35.55	-34.77	-23.46	-37.93	-17.62	-30.86	-34.51	-9.43	-29.25	-32.65	-22.78	-32.74	-35.68	-33.70
2	4.51	-1.39	-1.25	-1.51	0.53	-2.41	-3.98	-2.54	-2.62	-2.98	-3.91	-4.11	-3.64	-3.93	-3.92	-3.94	-3.42
3	-6.95	-6.56	-7.15	-6.91	-6.89	-6.59	-8.04	-7.94	-8.93	-8.82	-8.71	-8.75	-8.77	-3.49	-9.06	-8.73	-9.31
4	-6.16	-5.65	-4.83	-4.95	-4.09	-4.06	-4.83	-4.28	-4.25	-3.42	-3.76	-4.11	0.45	-3.57	-3.43	-4.16	-4.35
5	-1.13	-1.16	-0.99	-0.81	-0.98	-0.73	-0.91	-0.81	-0.70	-0.65	-0.62	-0.52	-0.30	-0.62	-0.67	-0.66	-0.25
6	-1.19	-1.31	-0.86	-0.80	-1.31	-1.58	-2.03	-2.38	-2.25	-1.78	-1.82	-1.96	-1.75	-1.64	-1.85	-2.39	-2.33
7	41.13	24.60	68.08	66.81	17.84	55.88	75.54	55.52	22.94	68.87	46.63	-1.74	21.54	22.21	31.51	9.21	-1.92
8	-0.08	-0.13	-0.18	-0.22	-0.10	-0.26	-0.42	-0.37	-0.22	-0.22	-0.14	-0.17	-0.15	-0.21	-0.12	-0.30	-0.31
9	-0.25	-0.02	0.01	-0.16	-0.34	0.83	0.74	0.40	0.45	4.47	3.60	-0.20	4.07	1.14	0.27	-0.52	-0.40
10	-0.75	0.17	-0.12	-0.38	-0.11	-0.91	-0.95	-1.44	-0.12	0.21	-1.14	-0.41	23.63	-0.76	-0.32	-0.16	-0.35
11	-1.60	-1.27	-1.82	-1.91	43.91	-2.13	-1.95	-2.33	-0.51	-2.25	-2.01	8.61	13.28	35.55	-1.67	-1.92	5.43
12	-3.20	-0.31	-3.24	-3.26	-2.12	-3.48	-3.29	-4.05	-0.47	-4.40	-4.01	13.07	-0.33	-4.20	6.77	13.22	16.37
13	-1.92	-2.05	-1.84	-1.84	-2.02	-2.20	-1.47	-1.72	-2.04	-2.16	-2.18	36.75	-2.41	-3.06	25.52	45.53	43.25
14	-1.51	38.20	-1.84	-2.06	-2.40	-2.15	-2.13	-2.14	37.85	-2.49	-2.12	0.72	-2.36	-3.11	0.72	1.18	2.69
15	-2.30	-2.47	-2.31	-2.39	-2.29	-2.38	-2.61	-2.39	-2.72	-3.37	-3.72	-3.60	-4.42	-4.69	-4.25	-3.70	-3.99
16	-2.29	-1.92	-2.00	-2.03	-2.82	-2.32	-2.84	-2.61	-2.50	-4.10	-3.69	-1.64	-3.81	-4.22	-3.76	-3.38	-3.76
17	10.32	-2.29	-1.96	-2.04	-2.04	-2.05	-2.90	-3.30	-3.05	-2.39	-2.96	-2.69	-2.39	-2.61	-3.00	-3.60	-3.65

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.53: Labour mobility index of Portugal*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-16.96	-17.23	-33.38	-31.18	-31.80	-32.48	-30.99	-35.35	-36.07	-36.97	-33.64	-37.13	-37.11	-37.14	-38.45	-38.97	-41.33
2	-0.25	-0.85	-0.93	1.61	1.55	-0.43	10.19	27.32	27.18	38.90	28.01	34.64	34.35	46.27	24.43	22.42	23.91
3	-6.39	-6.60	-6.63	-5.78	-6.60	-6.80	-6.78	-6.83	-6.94	-7.19	-7.37	-7.38	-7.57	-7.56	-7.27	-7.12	-6.85
4	-16.04	-15.99	-14.12	-13.89	-12.05	-13.24	-13.48	-14.88	-14.05	-14.20	-13.53	-12.48	-12.27	-12.29	-11.88	-11.63	-11.16
5	-4.54	-4.42	-4.34	-4.27	-4.20	-3.82	-3.90	-4.03	-3.86	-3.76	-3.64	-3.20	-3.13	-3.13	-3.04	-2.93	-2.77
6	-3.30	-2.93	-2.34	-3.60	-3.38	-3.11	-3.09	-3.33	-3.49	-3.34	-3.24	-3.27	-3.18	-3.25	-2.89	-2.76	-2.62
7	30.62	63.74	-2.48	-0.18	2.63	-2.07	-1.73	-1.43	-1.61	-2.09	-1.99	-2.05	-1.91	-2.17	-2.14	-1.94	-1.94
8	-0.01	-0.05	-0.05	0.11	0.03	0.00	0.01	0.01	-0.01	0.17	0.98	2.09	2.00	1.28	1.02	1.26	1.25
9	34.78	1.51	0.11	61.80	65.04	13.65	5.54	-0.47	0.33	0.12	1.07	0.16	-0.18	-0.74	-0.05	0.11	0.26
10	-0.42	-0.58	0.86	7.49	-0.03	60.32	33.79	-1.14	2.91	0.69	-0.86	-0.74	-0.86	-1.15	-0.54	-0.31	-0.21
11	-3.80	-4.03	-1.86	-3.35	-3.62	-3.73	-3.73	-3.84	-3.78	-3.79	-3.40	-2.65	-2.73	-2.93	-2.80	-2.67	-2.57
12	-2.72	-3.98	14.46	2.90	4.49	1.30	0.38	-3.44	-3.61	-3.63	3.29	-2.08	2.85	-2.59	3.14	5.12	4.55
13	-2.27	-2.47	-0.62	-1.72	-1.81	-0.91	-0.52	-1.67	-1.95	-1.94	-1.82	-1.90	-1.87	-2.10	-0.83	-0.96	-0.72
14	-2.86	-2.99	4.70	-3.11	-3.24	-2.96	-1.26	0.39	-0.57	-1.24	-0.09	0.20	-0.28	-1.06	2.58	2.89	3.20
15	-1.99	-2.09	42.74	-2.26	-2.31	-1.54	-1.75	-2.43	-2.23	-2.30	-2.34	-2.29	-2.48	-2.46	-2.32	-2.30	-2.17
16	-3.40	-3.50	-1.22	-3.72	-3.78	-3.30	-3.48	-4.27	-4.30	-4.32	-4.06	-4.07	-3.99	-4.15	-3.85	-3.75	-3.70
17	-0.45	2.46	5.11	-0.83	-0.92	-0.88	20.81	55.41	52.07	44.88	42.61	42.15	38.35	35.17	44.89	43.54	42.87

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.54: Labour mobility index of Spain*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-6.92	6.38	-27.73	19.59	23.30	18.91	18.66	14.32	38.36	2.93	10.40	50.06	48.15	17.89	52.12	29.90	8.02
2	-1.15	-1.30	-1.21	-1.10	-1.08	-1.01	-1.03	-1.05	-1.09	-1.13	-1.08	-1.06	-1.08	-1.02	-0.94	-0.95	-1.25
3	4.70	25.04	-10.52	-9.28	-9.15	34.84	31.37	24.33	7.88	18.86	32.49	5.69	1.61	27.78	-9.31	16.25	37.25
4	-6.11	-6.04	-6.25	-6.40	-6.49	-6.35	-6.16	-5.71	-5.36	-4.99	-4.51	-4.58	-4.26	-3.90	-3.54	-3.52	-3.41
5	-1.95	-2.19	-2.14	-2.19	-2.05	-2.00	-1.86	-1.93	-1.85	-1.74	-1.65	-1.51	-1.49	-1.42	-1.28	-1.31	-1.42
6	-1.67	-1.65	-1.90	-2.12	-2.26	-1.72	-1.68	-1.71	-2.22	-1.51	-0.99	-1.94	-2.06	-1.68	-1.98	-1.53	-1.19
7	-3.75	-2.21	-3.15	-3.48	-3.78	-4.02	-3.73	-4.17	-4.72	-3.82	-3.74	-5.22	-5.10	-4.40	-5.82	-4.63	-3.78
8	-0.17	-0.08	-0.14	-0.11	-0.15	0.00	-0.12	-0.14	-0.11	-0.14	0.05	0.13	0.04	-0.33	-0.19	0.06	-0.16
9	-2.19	-2.08	-1.58	-2.56	-2.75	-2.78	-2.82	-2.63	-2.31	-2.37	-2.33	-2.56	-3.05	-2.96	-3.35	-3.75	-3.45
10	-1.64	-1.09	-0.40	-1.49	-1.47	-1.77	-1.71	0.44	4.65	-1.80	0.61	-1.79	-2.08	-1.41	-2.37	-0.89	-0.54
11	-3.78	-3.37	-3.70	-4.03	-4.23	-3.71	-3.93	4.31	-4.56	23.84	-4.25	-4.78	-5.15	-4.52	-4.35	-3.57	-1.21
12	40.65	8.96	38.20	11.24	1.67	-8.31	-8.35	-7.89	-9.45	-7.78	-3.63	-9.25	-2.04	-12.32	-11.16	-10.60	-10.88
13	-1.55	-3.41	-0.35	-3.02	-3.25	-4.15	-4.10	-3.77	-4.24	-3.16	-4.05	-4.56	-4.83	1.97	5.39	-4.40	-4.31
14	-3.07	-4.22	33.09	18.12	19.38	-4.52	-4.44	-3.73	-3.93	-3.87	-3.63	-4.12	-4.32	-3.69	-3.30	-3.43	-3.08
15	-6.45	-6.36	-6.63	-6.71	-6.87	-7.01	-6.88	-6.92	-6.93	-7.17	-6.95	-7.11	-7.25	-7.26	-6.40	-0.44	-6.79
16	-3.85	-4.97	-4.45	-5.07	-5.49	-5.54	-5.55	-5.45	-5.66	-5.47	-5.22	-5.64	-5.22	-5.81	-5.40	-4.84	-4.57
17	-1.11	-1.39	-1.15	-1.39	4.69	-0.84	2.32	1.70	1.55	-0.66	-1.52	-1.75	-1.88	3.10	1.88	-2.35	0.76

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Table 1.55: Labour mobility index of Sweden*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	7.16	-0.29	-3.18	3.37	-3.89	-2.52	-3.87	-1.84	-1.20	-5.06	-8.55	-10.58	-9.43	-10.11	-9.99	-11.43	-10.47
2	-0.95	-0.88	-0.93	-0.92	-0.86	-0.78	-0.79	-0.84	-0.89	-0.90	0.32	4.39	0.58	-1.00	-1.45	-1.37	-1.19
3	45.59	62.90	44.84	64.15	45.71	39.38	44.97	68.66	69.69	72.64	-6.85	-6.79	-6.33	-6.07	-6.27	-6.63	-6.27
4	-1.34	-1.20	-1.29	-1.24	-1.11	-1.23	-1.17	-1.14	-1.11	-1.06	-0.62	-0.62	-0.44	-0.50	-0.75	-0.58	-0.89
5	-0.15	-0.16	-0.15	-0.13	-0.13	-0.13	-0.13	-0.12	-0.12	-0.14	-0.09	-0.06	-0.02	-0.02	0.00	0.00	0.00
6	-2.75	-3.48	-2.88	-3.80	-2.89	-2.70	-2.79	-3.89	-4.11	-4.17	-3.32	-3.65	-3.37	-2.75	-2.04	-2.34	-1.99
7	-9.37	-8.24	-8.34	-8.71	-7.83	-8.74	-7.97	-7.47	-8.25	-8.25	-5.04	-4.22	0.23	-2.41	-5.77	-2.95	-1.30
8	-0.17	-0.07	-0.18	-0.07	-0.17	-0.17	-0.17	-0.03	-0.07	-0.04	-0.33	-0.29	-0.16	-0.10	-0.02	-0.03	-0.02
9	-2.66	-3.02	-3.14	-3.41	-3.31	-2.35	-3.04	-3.83	-3.52	-3.04	-0.83	-0.78	1.83	0.80	-0.98	1.01	2.77
10	-1.45	-0.21	-1.34	-1.26	-1.33	-1.27	-0.68	-1.19	-0.88	-0.73	5.36	2.46	3.77	6.99	3.45	5.51	4.87
11	-1.69	-1.50	-1.47	-1.62	-1.68	-1.58	-1.55	-1.42	-1.02	-1.14	-0.42	-0.17	-0.06	-0.34	-0.17	-0.23	-0.47
12	-9.35	-8.17	-9.44	-9.30	-8.66	-10.16	-9.19	-9.44	-9.52	-9.70	13.30	27.05	16.34	17.33	21.07	22.15	18.59
13	-9.72	-9.18	-8.98	-9.80	-9.37	-9.35	-9.84	-10.02	-10.69	-10.80	-6.28	-8.58	-7.06	-6.09	-4.66	-5.79	-5.91
14	-9.40	-9.97	-9.94	-10.03	-10.21	-10.23	-10.49	-9.48	-9.47	-9.08	27.57	15.73	19.14	18.03	18.54	14.35	14.32
15	-9.13	-9.18	-8.70	-9.24	-9.09	-9.77	-9.37	-10.39	-10.93	-11.18	-9.75	-9.11	-9.67	-9.14	-7.56	-8.17	-8.33
16	-5.36	-4.89	-5.40	-5.34	-5.32	-5.37	-5.43	-5.03	-4.95	-4.20	-1.56	-1.87	-2.62	-2.46	-0.84	-1.82	-1.65
17	10.74	-2.46	20.55	-2.64	20.14	26.97	21.51	-2.53	-2.95	-3.16	-2.93	-2.90	-2.74	-2.17	-2.56	-1.67	-2.06

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (1.B.3)

Chapter 2

European Economic Integration, Comparative Advantages and Free Trade of the Means of Production

Michele Boglioni

Abstract

One of the most known theories on international trade suggests that when markets are left free to operate countries should specialize according to their Comparative Advantages. The results provided in Chapter 1 suggest that Comparative Advantages do not seem to have worked in Europe during the period 1995-2011.

The computation of the Net Product Possibility Frontier implies to make assumptions about the tradability of the output as well as of the means of production, i.e. the inputs of each industry. In this paper we compute the Net Product Possibility Frontier associated to the case in which the means of production are considered to be traded.

There is evidence that for the case of the European Union the national specialization and the efficient allocation of resources implied by standard Comparative Advantages theory seem not to have been realized.

Introduction

In Chapter 1 we have computed the Net Product Possibility Frontier ($NPPF$) for a group of countries. The $NPPF$ is a useful tool to evaluate the effectiveness of Comparative Advantages (CAs) in determining specialization patterns.

CAs theory implies that when international markets are left "free" to operate, each country should specialize in the industries in which it has a CA. The efficient scenario described by the theory should emerge as the result of the action of the free markets "invisible hand" (Samuelson, 2001).

When empirical observation demonstrate that these efficient scenarios do not emerge there may be two main explanations. A first explanation could be that the institutional framework is too different from the "free markets" hypothesis, which is a fundamental condition for the realization of CAs. A second explanation is that "free markets" are not so effective in realizing the efficient specialization patterns as the theory on CAs suggests. Boglioni and Zambelli (2016) provide evidence for the case of the European Union in support of market failures.

The evidence provided in Chapter 1 was found by assuming that only final goods were traded in the international markets, while the means of production were produced and used domestically. Here we relax this assumption and check whether the results are substantially the same.

The computed $NPPF$ represents a benchmark which is a set of virtual European Union best scenarios. The existence of these scenarios does not imply that they are politically feasible, but the lack of empirically verified efficient specializations represent evidence of market failures. When the historical European net production is located at a sizable distance below the $NPPF$, a search of feasible economic policies is theoretically justifiable.

This paper is composed by four sections. In Section 2.1 some basic notions about subsystems, which are a fundamental keystone of the paper, are briefly introduced. In Section 1.2 we explain how the assumption on the mobility of the means of production changes the computation of the $NPPF$, which may imply a different evaluation of the effectiveness of CAs. In Section 2.3 the data bank used for the empirical section is presented, along with an example of European $NPPF$ with and without mobility of the means of production, and some remarks about the approach adopted in this paper. In Section 2.4 the results obtained with the new $NPPF$ are compared to those discussed in Chapter 1.

2.1 Definition and properties of subsystems

Subsystems are the fundamental tool for the construction of a Net Product Possibility Frontier ($NPPF$), which is in turn the benchmark to evaluate the effectiveness of CAs in determining specialization patterns. Subsystems have been introduced by Sraffa in the first appendix of his work *Production of Commodities by Means of Commodities*. He defined a subsystem as a "smaller self-replacing system the net product of which consists of only one kind of commodity" (Sraffa, 1960, p. 105).

Subsequently, Gossling has shown how to use them in an empirical study of productivity trends in the USA (Gossling, 1972). The concept of *vertically integrated sector*, as in the definition of Pasinetti (1989, pp. 369-376), is similar to the concept of subsystems—see also (Kurz and Salvadori, 1995, pp. 168-169).

A productive process can be represented by

$$\mathbf{A}, \mathbf{l} \mapsto \mathbf{b} \tag{2.1.1}$$

where $\mathbf{A}$ is an $n \times n$ matrix of physical inputs, $\mathbf{l}$ is the $n \times 1$ labour vector and $\mathbf{b}$ is the $n \times 1$ gross product vector.

Each row i of matrix $\mathbf{A}$, $[a_{i1}, a_{i2}, \ldots, a_{in}]$ represents the means of production used by industry i for the production of the total gross industry output b_i. And l_i is the amount of labour used.

The column j of matrix $\mathbf{A}$, $[a_{1j}, a_{2j}, \ldots, a_{nj}]'$, represents the means of production produced by industry j and used for the production for the output by all the industries $i = 1, 2, \ldots, n$.

If we subtract from vector $\mathbf{b}$ the sum—by column—of the inputs of production described by $\mathbf{A}$ we obtain what is called surplus, or net national product and it is often represented by the $n \times 1$ vector $\mathbf{y}$—see (Pasinetti, 1989, p. 79) and (Kurz and Salvadori, 1995, p. 168).

Formally

$$\mathbf{y} = (diag(\mathbf{b}) - \mathbf{A})'\boldsymbol{\iota} \tag{2.1.2}$$

where $diag(\mathbf{b})$ is a diagonal matrix with the gross output vector $\mathbf{b}$ on its main diagonal and $\boldsymbol{\iota}$ is the summation vector—i.e., all entries are equal to 1.

In this context $\mathbf{y} = [y_1, ..., y_n]'$ is a vector of physical quantities, which expresses how much of each good goes to the final demand and is used for consumption, investment or exports. If these goods are aggregated in a unique measure through the means of current market prices, we obtain what is commonly known as Gross Domestic Product.

Each row i of matrix $\mathbf{A}$, and the associated elements i of $\mathbf{l}$ and of $\mathbf{b}$, represents a method of production.

In order to compute a subsystem, each row of $\mathbf{A}$, as well as the relative amount of labour and gross output, must be reproportioned in such a way that each component of the net output vector is 0, except for the commodity in which we are interested. Denote with $\bar{\mathbf{y}}_i$ the vector $[0, ..., y_i, ..., 0]'$, where i identify the sector. In order to find a subsystem, we have to compute a reproportioning vector $\mathbf{x}_i$ such that

$$(diag(\mathbf{b}) - \mathbf{A})'\mathbf{x}_i = \bar{\mathbf{y}}_i \tag{2.1.3}$$

from which we have

$$\mathbf{x}_i = ((diag(\mathbf{b}) - \mathbf{A})')^{-1}\bar{\mathbf{y}}_i \tag{2.1.4}$$

Then a subsystem is given by the triple

$$\begin{aligned} \boldsymbol{A}_i &= diag(\mathbf{x}_i)\mathbf{A} \\ \boldsymbol{l}_i &= diag(\mathbf{x}_i)\mathbf{l} \\ \boldsymbol{b}_i &= diag(\mathbf{x}_i)\mathbf{b} \end{aligned} \tag{2.1.5}$$

so that, for convenience, we can define a subsystem $\boldsymbol{S}_i$ as

$$\boldsymbol{S}_i = [\boldsymbol{A}_i|\boldsymbol{l}_i|\boldsymbol{b}_i] \tag{2.1.6}$$

Gossling (1972) highlights two properties of subsystems which are fundamental for the purpose of this paper:

1. the sum of the subsystems is equal to the original system, that is to say
$$\sum_{i=1}^{n} \boldsymbol{S}_i = [\mathbf{A}|\mathbf{l}|\mathbf{b}] \tag{2.1.7}$$

2. the alteration of one subsystem affects just the final output of the commodity relative to the subsystem modified, but not the other elements of the net output vector.

2.2 Net Product Possibility Frontiers with free mobility of the mans of production

The major purpose of this paper is to investigate how the assumption of international mobility of the means of production changes the shape of an $NPPF$, with respect to the case in which there is mobility only of final consumption goods.

2.2.1 National frontiers without mobility of the means of production

In order to construct a national frontier, two assumptions are made: a) labour is the only primary resource, it cannot be produced but just reallocated; b) the methods of production are divisible so as to maintain fixed proportions among inputs and outputs, i.e. the relative proportions may be independent from the level of activity.

Consider the example of an economic system composed of three sectors in Table 2.1. The three goods produced are iron, coal and wheat—rows 1, 2 and 3 respectively.

Table 2.1: A hypothetical economic system

Sector	Input			Labour	Gross Output
	Iron	Coal	Wheat		
Iron	2	3	2	2/5	16
Coal	5	4	2	2/5	14
Wheat	6	2	3	1/5	9
Tot	13	9	7	1	/

The economic system in Table 2.1 can be divided in three subsystems. Define the augmented subsystem $\boldsymbol{S}_i^*$ as in eq. 2.2.1.

$$\boldsymbol{S}_i^* = \left[\begin{array}{c|c|c} \boldsymbol{A}_i & \boldsymbol{l}_i & \boldsymbol{b}_i \\ \hline \boldsymbol{a}_i' & L_i & / \end{array}\right] \tag{2.2.1}$$

In the last row of eq. 2.2.1 is reported the sum of each input necessary for the production of the gross output vector, that is to say that If $\boldsymbol{a}_i = \boldsymbol{A}_i'\boldsymbol{\iota}$ and $L_i = \boldsymbol{l}_i'\boldsymbol{\iota}$.

With respect to the hypothetical economic system described in Table 2.1, the three augmented subsystems—one for each good—are

$$\boldsymbol{S}_1^* = \begin{array}{ccc|c|c} 0.65 & 0.97 & 0.65 & 0.13 & 5.19 \\ 0.64 & 0.51 & 0.25 & 0.05 & 1.78 \\ 0.90 & 0.30 & 0.45 & 0.03 & 1.36 \\ \hline 2.19 & 1.78 & 1.36 & 0.21 & / \end{array} \quad \boldsymbol{S}_2^* = \begin{array}{ccc|c|c} 0.81 & 1.22 & 0.81 & 0.16 & 6.49 \\ 3.47 & 2.78 & 1.39 & 0.28 & 9.73 \\ 2.20 & 0.73 & 1.10 & 0.07 & 3.30 \\ \hline 6.49 & 4.73 & 3.30 & 0.51 & / \end{array} \quad \boldsymbol{S}_3^* = \begin{array}{ccc|c|c} 0.53 & 0.81 & 0.54 & 0.11 & 4.32 \\ 0.89 & 0.71 & 0.36 & 0.07 & 2.49 \\ 2.90 & 0.97 & 1.45 & 0.10 & 4.34 \\ \hline 4.32 & 2.49 & 2.34 & 0.28 & / \end{array}$$

As captured by eq. 2.1.7, the sum of the three subsystems is the original system.

It is easy to check, using eq. (2.1.2), that in the subsystem of iron, the net product of iron is the original one[1], while the other net products are zero. Moreover, it is important to stress that, as a simple inspection of eq. (2.1.2) reveals, the net product of a specific good is a linear function of the related subsytem, that is to say that

$$y_i = \alpha_i \boldsymbol{S}_i \tag{2.2.2}$$

where α_i is a scalar coefficient embedded in the triple $\mathbf{A}, \mathbf{l}$ and $\mathbf{b}$—see the explanation on the computation of subsystems as described by eq.s (2.1.1)-(2.1.5) in Section 2.1.

Suppose to start from the frontier for iron and coal, so that we have to consider $\boldsymbol{S}_1^*$ and $\boldsymbol{S}_2^*$. As can be seen, the total labour employed in the two subsystems is, respectively, $L_1 = 0.21$ and $L_2 = 0.51$. As explained in Chapter 1, when the means of production are not be traded, the maximum net product of iron with respect to the iron-coal frontier can be obtained by computing the total labour employed in the two subsystems, that is $L_1 + L_2 = 0.72$, and then rescaling the subsystem of iron in order to obtain the following subsystem

$$\widehat{\boldsymbol{S}}_1^* = \boldsymbol{S}_1^* \times \frac{L_1 + L_2}{L_1} = \begin{array}{ccc|c|c} 2.23 & 3.34 & 2.23 & 0.45 & 17.82 \\ 2.19 & 1.75 & 0.88 & 0.18 & 6.13 \\ 3.10 & 1.03 & 1.55 & 0.10 & 4.66 \\ \hline 7.52 & 6.13 & 4.66 & 0.72 & / \end{array} \tag{2.2.3}$$

Subsystem $\widehat{\boldsymbol{S}}_1^*$ shows that the maximum possible net product of iron, when the net product of coal is zero, amounts to more or less $\hat{y}_1 \approx 10.3$.

Plotting the line passing through the original net product in coal and iron (5,3) and the new point (0,10.3) we obtain the coal-iron frontier[2]. The frontier is represented in in Fig. 2.1.

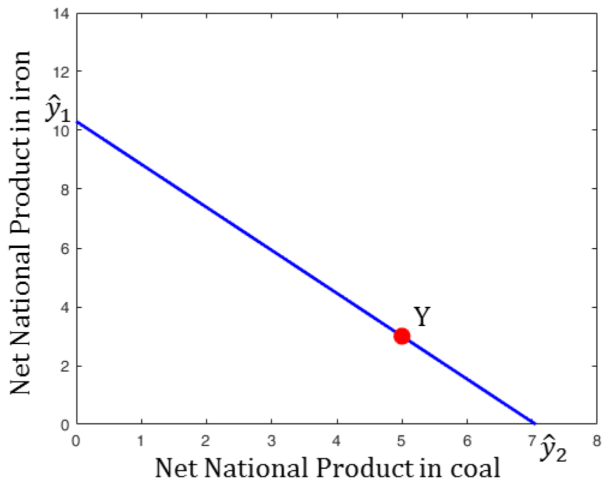
[1]The iron gross output is 5.19 while the total use of iron of means of production, column 1 of S_1^* is 2.19. Therefore the surplus of the subsystem is 3 units of iron, and 0 units of coal and wheat.

[2]There is an alternative way to compute the equation of the frontier, which makes clearer the role played by the industrial interrelations described by the triple $\mathbf{A}, \mathbf{l}$ and $\mathbf{b}$—see Section 2.1—in determining the frontier.

Here we have assumed that labour is the only primary good, which implies the labour constraint $L_1 + L_2 = \bar{L}$, where $\bar{L}$ is the total quantity of labour originally employed in the two subsystems. However $\bar{L}$, as well as the L_1 and L_2 related to a specific net output in good 1 and good 2, are fully determined by triple $\mathbf{A}, \mathbf{l}$ and $\mathbf{b}$ through eq.s (2.1.1)-(2.1.5).

Indeed, as can be deduced by eq. (2.2.2), L_1 and L_2 are related to y_1 and y_2 through simple linear functions as $L_1 = \alpha_1 y_1$ and $L_2 = \alpha_2 y_2$. Therefore, the equation of the frontier is given by

Figure 2.1: The coal-iron national frontier. National coal-iron frontier under the assumption that the means of production cannot be traded or redistributed among countries



Since, as shown in (2.2.2), the net product is a linear function of the subsystem, the maximum possible net product $\hat{y}_1$ can be computed by taking the original surplus $y_1 = 3$ and applying to it the reproportioning factor $(L_1 + L_2)/L_1$, as the following equation shows

$$y_1 \times \frac{L_1 + L_2}{L_1} = 3 \times \frac{0.72}{0.21} \approx 10.3 = \hat{y}_1 \tag{2.2.5}$$

In this case the constraint that the total amount or labour involved is at most L1+L2 implies that the net production of coal must be set equal to 0. Therefore, the original system becomes

---

$$\alpha_1 y_1 + \alpha_2 y_2 = \bar{L} \tag{2.2.4}$$

where α_1, α_2 and $\bar{L}$ are parameters embedded in $\mathbf{A}, \mathbf{l}$ and $\mathbf{b}$. We may replace the assumption on the total quantity of labour with another assumption, without altering sensitively the underlying logic.

Suppose that we want to assume that the primary good is an exhaustible energy like coal instead of labour. Then $\bar{L}$ would become $\bar{C}$, i.e. the total quantity of coal used in the two subsystems, while coefficients α_1 and α_2 would be the same—because of (2.2.2). These three parameters would still be determined by the triple $\mathbf{A}, \mathbf{l}$ and $\mathbf{b}$—through eq.s (2.1.1)-(2.1.5)—, which are, hence, the ultimate determinants of the equation of the frontier (2.2.4).

$$\widehat{\boldsymbol{S}}_1^* + \boldsymbol{S}_3^* = \begin{array}{ccc|c|c} 2.77 & 4.15 & 2.77 & 0.55 & 22.15 \\ 3.08 & 2.46 & 1.23 & 0.25 & 8.62 \\ 6 & 2 & 3 & 0.2 & 9 \\ \hline 11.85 & 8.62 & 7 & 1 & / \end{array} \tag{2.2.6}$$

There are three things to be noted about the economic system described by (2.2.6). The first is that the surplus in iron is 10.3, which is equal to the surplus of the subsystem of iron once the surplus of coal is 0. The second is that the surplus of wheat is exactly the original one, so the above procedure has not altered at all the third sector. The last one is that there is still production of coal, whose gross product is 8.62, and it is what is barely needed to have a net output in the other two sectors.

This means that this hypothetical country is still producing all the means of production needed to produce the new net output vector. Therefore, the specialization process is somehow incomplete, in the sense that the country under analysis still has an amount of labour that could be shifted from the production of coal to the production of iron, provided that the country could import a quantity of coal sufficient for its needs.

2.2.2 National frontiers with free mobility of the means of production

When international movements of the means of production are allowed, a country can buy some of the inputs of its productive process from abroad. Therefore, the minimum surplus of an industry i is no longer 0, but may be a negative number. That is a national system may use as means of production i more than it produces. When this happens all the labour force that would have to be used for the production of a surplus of sector i may be used in other sectors.

In the example described above, this implies that the feasible national frontier is not bound to the first orthant of the plane as represented in Fig. 2.1, but it crosses the axis and extends to the second and the fourth orthant. The computation of the two extremes of the new frontier is a bit more complicated in this case and it is explained in Appendix 2.A.

With the procedure explained in the Appendix and following the example of Section 2.2.1, we compute the minimum net product in coal, which is $\check{y}_2 = -8$ and the maximum net product in iron, which is $\hat{y}_1 = 22$. Therefore, point (-8,22) is the left extreme of the iron-coal frontier in the coal-iron plane. Because of the linearity property described by 2.2.2, in order to compute the subsystems of coal and iron in this new framework, we just have to rescale all the elements of the two subsystems by, respectively, $\frac{-8}{5}$ and $\frac{22}{3}$.

The subsystems of coal and iron become respectively

$$\check{\boldsymbol{S}}_2^* = \begin{array}{ccc|c|c} -1.30 & -1.95 & -1.30 & -0.26 & -10.38 \\ -5.56 & -4.45 & -2.22 & -0.44 & -15.57 \\ -3.52 & -1.17 & -1.76 & -0.12 & -5.28 \\ \hline -10.38 & -7.57 & -5.28 & -0.82 & / \end{array} \qquad \widehat{\boldsymbol{S}}_1^* = \begin{array}{ccc|c|c} 4.76 & 7.13 & 4.76 & 0.95 & 38.05 \\ 4.67 & 3.74 & 1.87 & 0.38 & 13.08 \\ 6.62 & 2.21 & 3.31 & 0.22 & 9.94 \\ \hline 16.05 & 13.08 & 9.94 & 1.55 & / \end{array}$$

which gives a total system

$$\widehat{\boldsymbol{S}}_1^* + \check{\boldsymbol{S}}_2^* + \boldsymbol{S}_3^* = \begin{array}{ccc|c|c} 4 & 6 & 4 & 0.8 & 32 \\ 0 & 0 & 0 & 0 & 0 \\ 6 & 2 & 3 & 0.2 & 9 \\ \hline 10 & 8 & 7 & 1 & / \end{array} \tag{2.2.7}$$

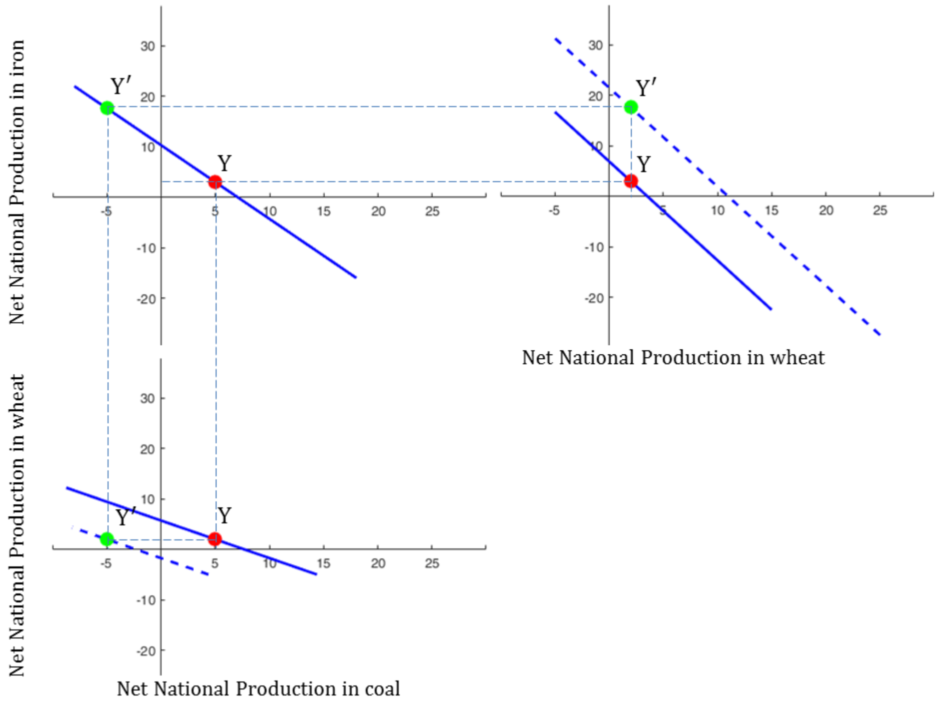
It is interesting to note that the movements of the means of production requires the use of negative subsystems. In fact, when a sector is in deficit, its relative subsystem computed with eq. (2.1.3) gives as a result a negative matrix $\boldsymbol{S}_i$. This may not square well with the original definition of subsystem, according to which a subsystem should describe all the resources that are directly and indirectly involved in the production of the net product of a good. When a subsystem is computed on a sector in deficit, it means that the national system has to import from the other national systems the not domestically produced means of production.

In some sense, we could think to those numbers as the resources that would be necessary to produce the good for which the system is in deficit using the domestic technologies. The point in using negative subsystems is that they allow to work with non self-replacing systems, i.e. systems that produce an insufficient quantity of some means of production—see Chiodi (1992)—, keeping the accounting right.

Indeed, in eq. (2.2.7) it can be noted that: (1) sector 2 is nullified, so all the resources have been drained from sector 2 and destined to sector 1, which was the main objective of this procedure; (2) the final net outputs $\check{y}_2$ and $\hat{y}_1$ are exactly the desired ones, -8 and 22 respectively; (3) the total sum of labour is equal to unity, which means that the constraint on labour is satisfied; (4) the net product of wheat is the original one.

Using the formulas in Appendix 2.A, we can compute an analogous full specialization in coal. In this case, the maximum net product of coal would be $\hat{y}_2 = 18$, while the minimum net product of iron would be $\check{y}_1 = -16$. Point $(18, -16)$ represents the right extreme of the coal-iron frontier, which is plotted on the northwest orthant of Fig. 2.2. In the other two orthants are

Figure 2.2: Specialization in the iron sector. The three graphs show the national frontiers relative to the hypothetical system described in Tab. 2.1, and the consequences of a specialization in the iron sector.



reported the wheat-iron frontier—northeast orthant—and the coal-wheat frontier—southwest orthant.

Fig. 2.2 also shows what a specialization in the iron sector at the expense of the coal sector implies for the overall system. Suppose that the net output in iron and coal shifts from point Y to point Y' of the graph on the northwest part. This implies that the total labour increases in the iron subsystem but decreases in the coal subsystem. As a consequence, the wheat-iron shifts outwards—graph on the northeast—while the coal-wheat frontier shifts inwards—graph on the southwest. As explained in Chapter 1, the new frontiers must be parallel to the original ones.

2.2.3 NPPFs for a set of countries with mobility of the means of production

The importance of studying both the cases of no mobility and free mobility of the means of production becomes clear when we compare the Net Product Possibility Frontier ($NPPF$) obtained in the two cases.

It has to be noted that when the $NPPF$ of a group of countries is studied, it is assumed that a redistribution mechanism exists, such that countries can give up part of their national production and receive back some goods they have not produced. For a discussion of this assumption, see Chapter 1, but what is important to stress here is that this redistributive mechanism is generally assumed to be the market.

Indeed, as (Samuelson, 2001, p.1205) explains, the theory on CAs suggests that when markets are left free to work, the “invisible hand” should lead each country to specialize in such a way that the overall net product is maximized—keeping fixed the available resources.

The main problem we deal with in this article is that different assumptions on the mobility of the means of production influence our evaluation of the effectiveness of the “invisible hand”.

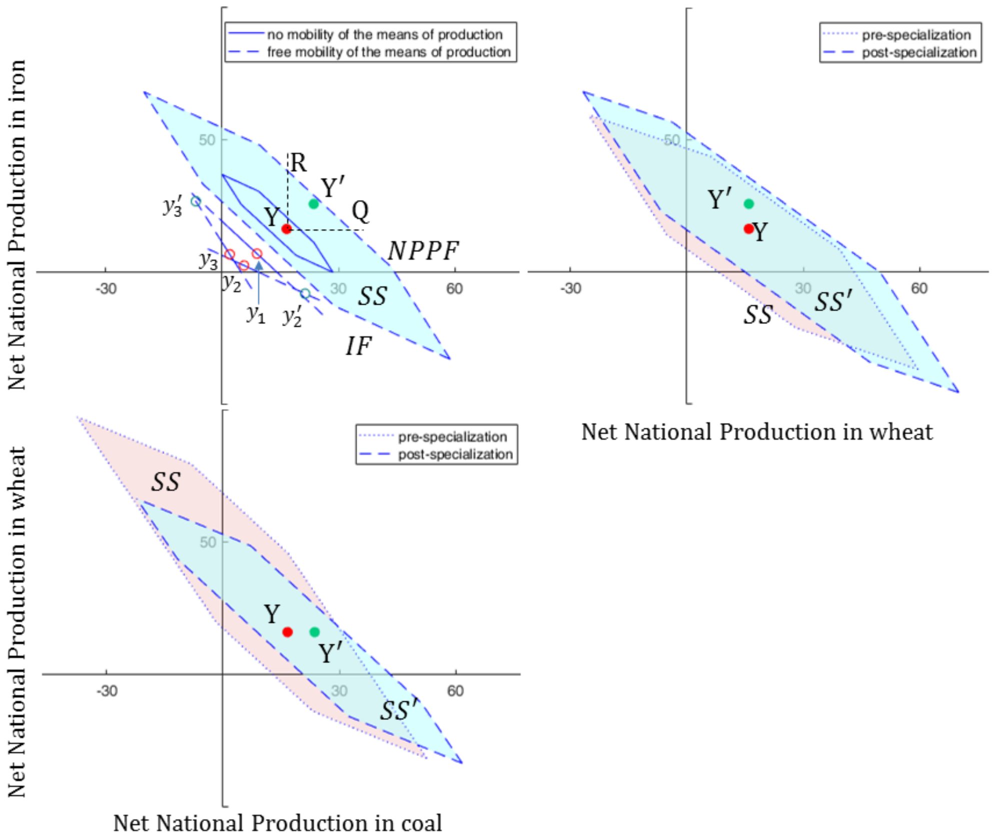
In order to explain the point, consider an example of three countries as the one in Fig. 2.3. Suppose that the three countries produce the surpluses represented by the three dots y_1, y_2, y_3 of Fig. 2.3, and suppose that trade among countries is allowed just for final goods, while the means of production have to be produced domestically. As explained before, this implies that countries cannot shift their net product outside the boundaries defined by the two axes.

In Fig. 2.3, this means that the three countries can move their net product vector along their respective frontiers—the segments below the shaded area—inside the range delimited by the two axes. As a consequence, the net total product point Y cannot exit from the area delimited by the solid lines inside the shaded area SS. This no-mobility of the means of production region is delimited by the solid $NPPF$ in the upper part and by the solid Inefficient Frontier (IF) in the lower part. It is called the Inefficient Frontier because it defines the minimum possible net total product in iron for every feasible net product in coal. As can be noted, point Y is closer to the solid upper boundary than to the lower one.

This means that resources tend to be used in an efficient way and that countries tend to specialize in the sector in which they have a CA. Therefore, basing our assessment on the area delimited by the solid lines, we would conclude that the “invisible hand” of international markets is working as the theory on CAs suggests.

However, when the means of production can be shifted internationally, the scenario changes sensitively. Each country can reach also the productive points represented by the dashed part of their national frontiers, and the net total product point Y can move inside all the shaded area SS, delimited by the dashed $NPPF$ and IF. Specifically, all the points inside the triangle $\overline{YQR}$ represent feasible vectors of net product, in which the surplus of iron and coal are higher than in the original vector.

Figure 2.3: A three countries, three goods example of $NPPF$. The three graphs show what a specialization process implies from the point of view of the three $NPPF$s that can be constructed when three goods are considered.



For example, country 2 could shift resources—i.e. physical means of production and labour—from coal to iron in order to realize the net product vector represented by point $y_2^{'}$, while country 3 could shift productive resources in the opposite direction in order to reach the vector $y_3^{'}$. Country 1 does not change its net product vector. The new net total product is represented now by point $Y^{'}$, which is higher than Y with respect to both iron and coal, while the net product in wheat is the original one.

As can be noted, the scopes for improving the net product are much wider than in the case in which just final goods are traded. Moreover, in this case, point Y is closer to the IF than to the $NPPF$. This means that the evaluation on the working of CAs is exactly reversed with respect to the final-products-only case. Using as benchmark scenarios the dashed $NPPF$ and IF instead of the solid $NPPF$ and IF, we would conclude that countries are far from exploiting their CAs and hence that the “invisible hand" of international markets is not leading countries to exploit well the resources they have[3].

This example shows that the assumption on the mobility of final goods could in principle change our evaluation of the effectiveness of the "invisible hand" in international markets. Please note that the example of Fig. 2.3 is relative to the simple case of three goods and three countries. For the sake of the exposition we keep the global net production in wheat fixed. As explained below, for our theoretical and empirical investigation we consider alternative allocations of resources that allow a proportional global increase in the surplus of all the industries. The number of countries considered and the number of industries is much larger than 3.

In Chapter 1 it has been found that the "invisible hand" did not seem to work well in Europe during the period 1995-2011. In this paper we check whether this conclusion holds when the means of production are assumed to be freely mobile across countries.

2.3 $NPPF$s in Europe

2.3.1 The Data

The Input-Output tables used in this paper have been taken from the World Input-Output Database (Timmer et al., 2015). The data set provides Input-Ouput tables called WIOTs (World Input-Output Tables) divided in 35 sectors, for 40 countries, from 1995 to 2011. This paper is focused on European countries, so we extracted data for 17 of them—those reported in Tab. 1.3 at the end of the paper. There are some European countries in the database which have been excluded because of their relatively small dimensions and

[3]The two additional graphs in Fig. 2.3 have been reported to help the reader to visualize what the specialization process that leads to improve the net product from Y to Y' implies for the overall system when more than two goods are produced. This is important in order to understand the workings of the algorithm used to compute the $NPPF$ in an n-dimensional case.

Suppose that the graph on the northwest orthant is a bidimensional projection of a system in which wheat is produced too. The orthants on the northeast and on the southwest describe what the specialization process described above implies for the wheat-iron and coal-wheat frontiers. The change of the SS in these two dimensions is due to the fact that, as it has been shown in Section 2.2.2, when a country shifts its labour force from one subsystem to another along one specific frontier, the other frontiers shift inwards or outwards depending on the specific specialization process. Therefore, the $NPPF$ and the IF in the other dimensions also change and hence they redefine the shape of the SS.

For a more detailed explanation of this process and of the algorithm used for the computation of the $NPPF$ and of the IF in the n-dimensional space see Chapter 1.

the diversity of their structure[4].

The number of sectors has been reduced from 35 to 17. The analysis of the Net Product Possibility Frontier is useful when applied to commodities that can be standardized and exported, while it is less relevant when applied to the services that are intrinsically local[5]. For this reason, the sectors included are those that enters the Standard International Trade Classification of the United Nations. The list of sectors considered and those excluded is reported in Tab. 1.4 at the end of the paper.

Comparative Advantages theorems are all developed on the basis of real quantities, while Input-Output (I-O) tables are generally structured in a limited number of industrial sectors, in which many goods are aggregated through the use of market prices. The aggregation problem cannot be solved without having finely disaggregated I-O tables, but it is at least possible to deflate the I-O tables properly in order to take into account the fact that prices changes across countries and through the years. For a discussion of these problems and of the procedure adopted to deflate the I-O tables see Chapter 1.

2.3.2 An European Net Product Possibility Frontier

An example of European $NPPF$ has been reported in Fig. 2.4a. The sectors considered are "Agriculture, Hunting, Foresting and Fishing"—Sector 1 of Tab. 1.4— and "Machinery, Nec"—Sector 13—in 2002. The solid blue line represents the frontier in the case of trade of final products only, while the dashed line is the new frontier. As can be noted the new frontier is fairly higher than the solid one.

The segments below the European frontier represent the national frontiers that form the $NPPF$, while the red circles on the segments identify the observed national productions. The dashed part of the segments represents those combinations of net national product which become available when the means of production can be traded.

In this paper we search for efficiency-improving vectors that would allow to improve the consumption of each country according to their pref-

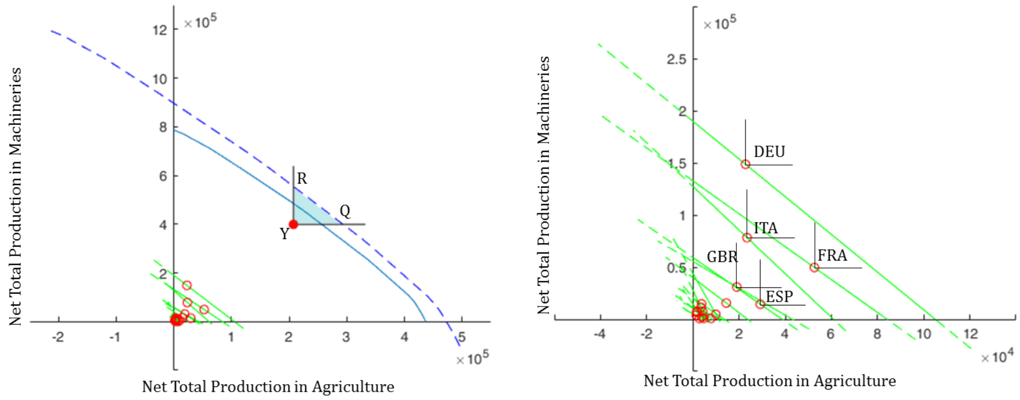
[4]The countries excluded are: Bulgaria, Cyprus, Latvia, Lithuania, Luxembourg, Malta, Romania.

[5]As explained above, studying the European $NPPF$ implies to suppose that the total European production could be concentrated in some selected countries, and then redistributed among all the countries. While manufactured products can be, and actually are, produced in places that are often far from the consumer, this is not possible for many services, the provision of which depends on the direct relationship between the customer and the provider. This is the case of education, health services, retailing sales, restaurants & hotels, and many other sectors excluded from Tab. 1.4.

Figure 2.4: An example of Net Product Possibility Frontier in Europe

(a) The European $NPPF$ for Agriculture and Machineries in 2002

(b) The national frontiers composing the European Agriculture-Machineries $NPPF$ reported in Figure 2.4a



erences. In other words, we investigate those specialization patterns that allow to shift point Y inside the triangle $\overline{YQR}$. In such a way, with a proper redistributive pattern, the net national product of each country could shift inside the respective triangles–see Fig. 2.4b. In other words, a redistribution of this kind would be Pareto improving, because it would allow each individual country to reach a higher level of consumption. This higher level of consumption would not be feasible without specialization and coordinate trade.

In this article there is no space to enter into the details of how a redistribution of this kind could take place and whether it would be possible to reach it through market exchanges, but moving inside the $\overline{YQR}$ we ensure the basic condition to make it possible.

Another point to be stressed is that this is a pure allocative study. It is out of the scope of this paper to investigate whether countries are on a full-employment equilibrium or not, so that no assumption is implied on how far the full-employment equilibrium might be from the scenario described below.

Finally, please note that thanks to the use of subsystems—see Section 2.2—all the inputs are considered all the time. Substitution between different inputs is not allowed, and we do not resort to a reduction of all the inputs to the embodied labour they contain. In so doing, the complexity of industrial relation is not reduced or bypassed.

2.4 The n-dimensional $NPPF$ and the indexes

There are two basic information which are important for the evaluation of Comparative Advantages. One is the distance of the actual Net Total Product from the $NPPF$ and the other is the distance from the IF. They can be measured in many ways. A simple way to measure the distance from the $NPPF$ in a bidimensional context is the following—see Fig. 2.5

$$GS = \frac{E_2 - Y_2}{Y_2} = \frac{E_1 - Y_1}{Y_1} \tag{2.4.1}$$

where GS stands for Gains from Specialization. This measure is based on point E, which is the only point that is efficient—in the sense that it lies on the $NPPF$—and at the same time keeps unaltered the proportions between the two goods—because it lies also on the line passing through the origin and point Y. Point E implicitly defines Comparative Advantages: all the countries on the right of E have a CA in sector j, while all those on the left of E have a CA in i.

Point E represents the Net Total Product vector that should be reached if CAs worked well, assuming that the preferences of European consumers would not change, increasing the amount of goods consumed. This also implies that point E allows, at least in principle, to redistribute the additional Net Total Product produced—$\overline{Y_1 E_1}$ and $\overline{Y_2 E_2}$—to each country according to the ratio in which each country consume the goods considered—see Section 2.3.

In a similar way, we can compute the distance from the IF in the following way:

$$LS = \frac{W_2 - Y_2}{Y_2} = \frac{W_1 - Y_1}{Y_1} \tag{2.4.2}$$

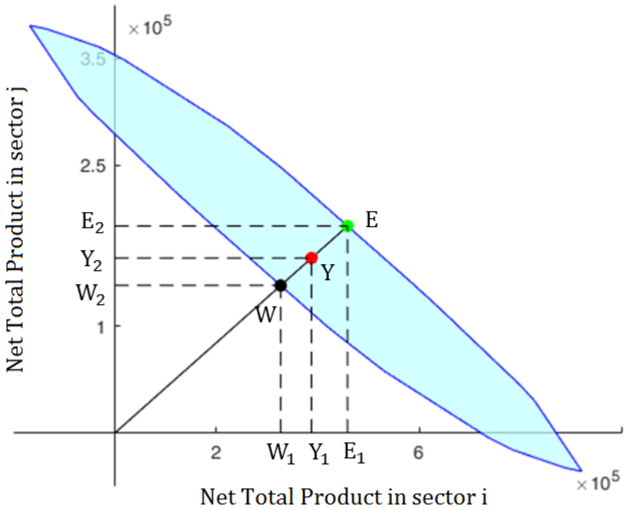
where LS stands for losses from specialization. The two indexes can be combined in a third one that is

$$RE = \frac{E_1 - Y_1}{E_1 - W_1} = \frac{E_2 - Y_2}{E_2 - W_2} \tag{2.4.3}$$

in which the distance $\overline{Y_1 E_1}$ is now weighted on the distance $\overline{E_1 W_1}$, which is the range in which Y_1 can move.

It is called RE index because it is a measure of relative efficiency. The GS index is a measure of absolute efficiency, in the sense that it measures how much the Net Total Product could be improved if CAs are exploited well. The RE indicates whether the actual specialization is closer to an efficient or an inefficient allocation of resources. When RE is close to 0, the $NPPF$ this means that countries tend to specialize according to CAs.

Figure 2.5: The efficient point of production and the gains from specialization. Point E represents which could be the net product if countries exploited fully their CAs, while Y represents the historical net product. Segment $\overline{EY}$ represents how much it could be gained through a proper specialization.



When it is close to 1, the countries considered are close to the most inefficient allocation of resources. Values of the RE close to 0.5 mean that the set of countries is somehow in the middle way between these two extremes and this is still a poor evidence of the working of CAs. In fact, it has to be stressed that, according to the theory on CAs, both the GS and the RE should be 0.

In an n-dimensional context, point Y is called vector $\mathbf{NTP}$, so that E and W become $\mathbf{NTP}^E$ and $\mathbf{NTP}^W$. The algorithm to compute them is a variation of the one explained in Appendix 1.A. What changes with respect to the original algorithm is just the length of the national frontiers and hence the width of the domain in which the vector of the surplus can move in order to improve the efficiency of the overall system—see Section 2.2.2.

In the following part of the paper, the GS and the LS index are called GSF and LSF, where the F stands for final. This is because the Algorithm used is iterative and at each step an $\mathbf{NTP}^E$ and an $\mathbf{NTP}^W$ are computed, with the related GS and LS indexes. Since we take just the GS and the LS computed in the the last loop, they are called GSF and LSF.

Table 2.2 reports the vectors $\mathbf{GSF}$ and the $\mathbf{LSF}$ for 2008 and compares them with $\mathbf{GSF^*}_{2008}$ and $\mathbf{LSF^*}_{2008}$, which are the index computed under the assumption of no mobility of the means of production. As can be seen, the GSF and the LSF are the same for all the Sectors considered except for

Table 2.2: Potential gains from specialization and costs of inefficiency in 2008. Column $\mathbf{NTP}_{2008}$ reports the net product of Europe for each of the sectors considered. $\mathbf{GSF}_{2008}$ and $\mathbf{LSF}_{2008}$ represent respectively how much it could be produced in the efficient and in the most inefficient specialization patterns—see eq. 1.4.1 and eq. 2.4.2

Sectors	$\mathbf{NTP}_{2008}$	$\mathbf{GSF}_{2008}$	$\mathbf{GSF^*}_{2008}$	$\mathbf{LSF}_{2008}$	$\mathbf{LSF^*}_{2008}$
1	1426.58	37.59%	24.39%	-28.14%	-21.48%
2	-1671.84	0%	0%	0%	0%
3	6003.20	37.59%	24.39%	-28.14%	-21.48%
4	1071.50	37.59%	24.39%	-28.14%	-21.48%
5	230.18	37.59%	24.39%	-28.14%	-21.48%
6	324.58	37.59%	24.39%	-28.14%	-21.48%
7	1956.09	37.59%	24.39%	-28.14%	-21.48%
8	1828.60	37.59%	24.39%	-28.14%	-21.48%
9	3630.32	37.59%	24.39%	-28.14%	-21.48%
10	501.55	37.59%	24.39%	-28.14%	-21.48%
11	1222.71	37.59%	24.39%	-28.14%	-21.48%
12	-510.52	0%	0%	0%	0%
13	4925.65	37.59%	24.39%	-28.14%	-21.48%
14	7272.64	37.59%	24.39%	-28.14%	-21.48%
15	6838.81	37.59%	24.39%	-28.14%	-21.48%
16	1672.14	37.59%	24.39%	-28.14%	-21.48%
17	2.826.68	37.59%	24.39%	-28.14%	-21.48%

Source: WIOD database for column 2. Column 3 has been computed using equation 1.4.1

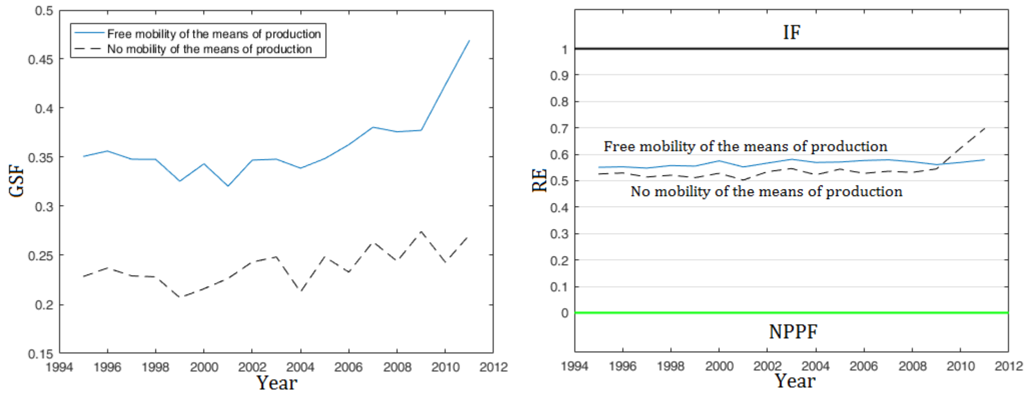
Sector 2 and Sector 12.

The GSF and the LSF for Sector 2 and Sector 12 are null because the net total production in these sectors is negative for most of the Sectors considered. As explained in Chapter 1, this creates problems when the free mobility of the means of production is not allowed and hence, in order to make a meaningful comparison with the scenario described there, the net total product of Sector 2 and Sector 12 has been kept fixed also in this case. In other Sectors the value of the indexes is the same because, as explained above, by construction we search for that efficiency improving $\mathbf{NTP}^E$ that keeps unaltered the proportions between each element of the $\mathbf{NTP}$.

Since all the elements of vectors $\mathbf{GSF}$ and $\mathbf{LSF}$ are equals except for Sector 2, we use the notation GSF and LSF, which refers to a generic element of the vectors **GSF** and **LSF** different from the second and the twelfth element.

The first point to be noted is that with free mobility of the means of production, the $\mathbf{NTP}$ in 2008 could be improved by the 37.59% using the same amount of labour, the 13% more than the gains reachable without the

Figure 2.6: Indexes of absolute and relative distance from the NPPF and the IF



(a) GSF index. It represents how much could be increased the net product of Europe in the efficient specialization pattern—see eq. 1.4.1

(b) RE index. It is a measure of the position of the Net Total Product between the $NPPF$ and the IF. If $RE < 0.5$, the set of countries is closer to an efficient allocation of resources than to the most inefficient allocation pattern—see eq. 1.4.6

free mobility of the means of production.

The second point is that while the GSF is higher than the GSF^* by 13 percentage points, the LSF is lower than the LSF^* by 7 percentage points. This means that the distance from the $NPPF$ is higher in this case not just in absolute terms as should be expected, but also in relative terms—that is to say from the point of view of the RE index, which was 0.57 in 2008. This also implies that in 2008 Europe was clearly closer to an inefficient use of resource than to an efficient one.

The evolution of markets during the period 1995-2011 is described by the two graphs in Fig. 2.6. The first shows the results of the GSF—Fig. 2.6a—,and the second the results of the RE index—Fig. 2.6b. The dashed line represents the case of no mobility of the means of production.

As can be seen in Fig. 2.6a, the GSF is decisively higher in the scenario analyzed here than in the original scenario for all the years considered. In both the cases, the trend until 2004 seems more or less stable and then it becomes increasing in the subsequent years. The difference is that while in the case of trade of final-goods-only the improvement is due to a slight trend, in the case analyzed in this paper the acceleration of the GSF is marked, especially in 2010 and 2011.

For what concerns Fig. 2.6b, it emerges that the RE index oscillated between 0.55 and 0.58 during all the period considered. Overall, hence, Europe stayed permanently closer to an inefficient allocation of resources than to an efficient allocation scenario. The results are clear: during the period considered European countries did not specialize in the sectors in which they had a CA and Europe did not approach an efficient scenario.

2.4.1 Comparative Advantages and labour reallocation

The analysis of CAs can be performed on the basis of two indexes, the efficient specialization ratio

$$ESR_{c,i,t} = \frac{y^E_{c,i,t}}{\sum_{c=1}^m y^E_{c,i,t}} = \frac{y^E_{c,i,t}}{Y^E_{i,t}} \tag{2.4.4}$$

and the real specialization ratio as

$$RSR_{c,i,t} = \frac{y_{c,i,t}}{\sum_{c=1}^m y_{c,i,t}} = \frac{y_{c,i,t}}{Y_{i,t}} \tag{2.4.5}$$

where $i = 1, ..., n$ identifies the sectors, $c = 1, ..., m$ the countries and $t = 1, .., T$ the years. The matrix $\mathbf{ESR}_t$, which collects the ESR related to each country and each sector at time t, is called from now on the *efficient specialization pattern* at time t, while the matrix $\mathbf{RSR}_t$, an analogous matrix for the all the RSR at time t, is called the *real specialization pattern* at time t. Since in the dataset used here there are 17×17 I-O tables for 17 countries and 17 years, the full tables describing the results of the ESR and of the RSR cannot be included here and are provided in Appendix 2.B.

However, we can still analyze how much each country is far away from its efficient specialization pattern starting from the following index

$$lm_{i,c,y} = \frac{l^E_{i,c,t} - l_{i,c,t}}{\sum_{i=1}^{n} l_{i,c,t}} \times 100 \tag{2.4.6}$$

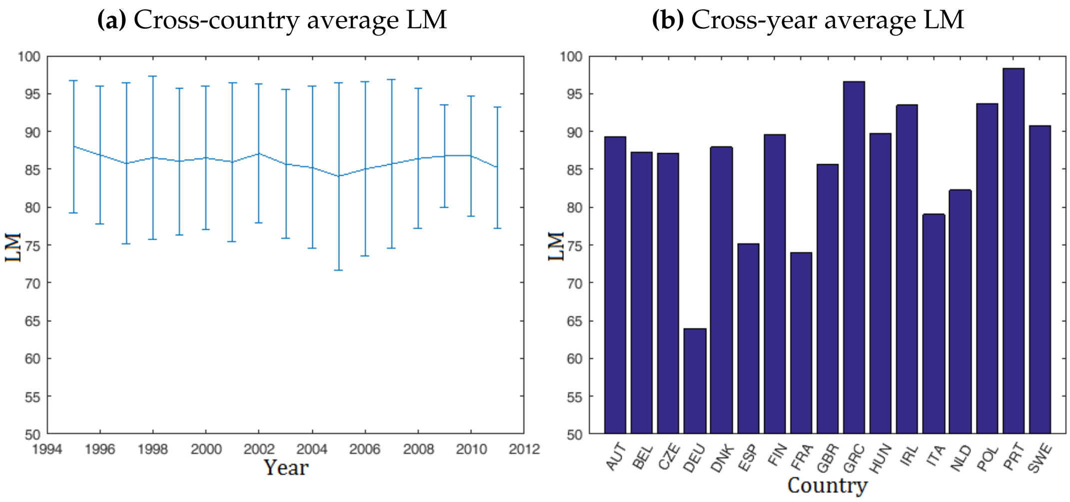
where $l^E_{i,c,t}$ and $l_{i,c,t}$ are, respectively, the quantity of workers employed in sector i of country c at time t in the efficient scenario and in the original data set.

The complete results in the lm index would require as much space as the Tables on the ESR and the RSR and are provided in Appendix 2.B. However, the advantage of using the lm index is that it can be easily aggregated across sectors in order to provide a synthetic measure of the structural changes that each country would have to bear in order to realize an efficient specialization pattern. It is easy to compute the share of workers that should change job inside a country in order to reach the $NPPF$ with the following index

$$LM_{c,t} = \frac{\sum_{i=1}^{n} |l^E_{i,c,t} - l_{i,c,t}|}{2 \times \sum_{i=1}^{n} l_{i,c,t}} \times 100 \tag{2.4.7}$$

The LM index is just a sum across sectors of the absolute values of the lm index, with the difference that the denominator is now doubled. This is because, otherwise, each worker would be counted two times: when he exits from a sector and when he enters into another.

Figure 2.7: Cross-country average and standard deviation of the Labour Mobility index LM, 1995-2011. The LM index counts how many workers should have changed their job in order to fully exploit the CAs so as to realize the efficient specialization pattern.



The results for the LM index are reported in Tab. 2.5. Figures 2.7a and 2.7b help to highlight a few characteristics of Tab. 2.5. The first represents the average cross-country LM for each year, while the second the cross-year average for each country. A first result that emerges in Fig. 2.7a is that the social costs that should be bore by each country are very high: on average more than the 85 % of the European workforce should have changed job in order to reach the $NPPF$.

These results remark how far Europe was from the efficient scenario assumed by CAs theories and they are in line with the results of the GSF index. This may have been expected since the free mobility of the means of production allows for a high degree of specialization. The great majority of the industrial sectors of each country should be closed and all the labour force should be employed in 2-3 sectors on average.

However, what was less easily predictable is that the average quantity of workers to be shifted does not change during the period considered. Throughout the years, the cross-country average LM is always comprised between the 85% and the 87% except for 1995 (88%).

Fig. 2.7b shows that there are some differences among countries with respect to this index. Some countries are closer than others to the specialization pattern that would allow to reach the $NPPF$, as for example Germany, Spain and France. The variability is not marked, but present.

Conclusions

The results of this paper confirm and reinforce what found in Chapter 1, that is to say that Comparative Advantages (CAs) do not seem to have worked in Europe during the period 1995-2011.

In this paper one fundamental assumption used in Chapter 1, namely that the means of production had to be produced domestically, has been relaxed in order to allow the means of production to be exchanged and a new Product Possibility Frontier ($NPPF$) has been computed.

The $NPPF$ is an important tool to evaluate whether a particular economic system has specialized in the direction suggested by CAs or not. If an economic system approaches the $NPPF$, than a CAs compatible specialization process is occurring, otherwise other forces are driving the specialization process. Whether means of production are supposed to be traded or not, we find that the distance from the $NPPF$ increases during the period considered.

Other indexes analyzed in the paper provide further evidence of the ineffectiveness of CAs in Europe during the period 1995-2011. One of these indexes is based on the Inefficient Frontier—IF—, which describes the most inefficient allocation of resources—in the same way as the $NPPF$ describes the efficient allocation of resources. Comparing the distance from the $NPPF$ with the distance from the IF, we can check whether an economic system is closer to an efficient scenario or to an inefficient.

In Chapter 1 it has been found that Europe stayed constantly more or less in the middle, although slightly closer to the IF than to the $NPPF$. Here it has been found that Europe is even closer to the IF than to the $NPPF$ during almost all the period considered. The only exception is year 2011, a year in which, in any case, the index still suggests a clearly inefficient situation.

Finally, a proxy of the social costs that should be bore to reach the $NPPF$ is given by the LM index, which computes the quantity of workers that each country should shift from one industry to another in order to realize a specialization pattern compatible with the CAs. The results in this index are coherent with the rest of the analysis: during the period considered, the average quantity of workers to be shifted stayed almost always above the 85% with no evident trend.

The results presented here are particularly significant considering the fact that in Europe many measures have been taken to construct a unified free market. This is important because the role played by institutions cannot be overlooked. In some cases a CAs incompatible specialization pattern may be due to institutional underpinnings that are too different from those supposed by the theory on CAs. However, in the case of Europe, there has been a specific effort in order to create a market as close as possible to the concept of "free market" assumed by the theory on CAs. Therefore, the results exposed above cast many doubts on the effectiveness of the principle of CAs itself.

However, this conclusion should not be taken as definitive. The assumption on the mobility of the means of production is just one of the feature of the original framework that could be modified. Other assumptions implied in this paper concern migrations, which are assumed to be not possible, and technologies, which are assumed to be not transferable from one country to another. The database might also be improved, collecting more disaggregated data on the industrial sectors that form the productive structure of the countries considered. Nevertheless, the results provided here seem at least sufficient to be skeptical about the real influence of CAs on the structure of productive systems and to justify further investigations on this topic.

Table 2.3: The list of countries

1	AUT	Austria	10	GRC	Greece
2	BEL	Belgium	11	HUN	Hungary
3	CZE	Czech Republic	12	IRL	Ireland
4	DEU	Germany	13	ITA	Italy
5	DNK	Denmark	14	NLD	Netherlands
6	ESP	Spain	15	POL	Poland
7	FIN	Finalnd	16	PRT	Portugal
8	FRA	France	17	SWE	Sweden
9	GBR	Great Britain			

Table 2.4: The list of sectors*

1	Agriculture, Hunting, Forestry and Fishing
2	Mining and Quarrying
3	Food, Beverages and Tobacco
4	Textiles and Textile Products
5	Leather, Leather and Footwear
6	Wood and Products of Wood and Cork
7	Pulp, Paper, Paper, Printing and Publishing
8	Coke, Refined Petroleum and Nuclear Fuel
9	Chemicals and Chemical Products
10	Rubber and Plastics
11	Other Non-Metallic Mineral
12	Basic Metals and Fabricated Metal
13	Machinery, Nec
14	Electrical and Optical Equipment
15	Transport Equipment
16	Manufacturing, Nec; Recycling
17	Electricity, Gas and Water Supply

*The sectors excluded are Construction; Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Wholesale Trade and Commission Trade, Except for Vehicles and Motorcycles; Retail Trade Except for Vehicles and Motorcycles, Repair of Household Goods; Hotels and Restaurant; Inland Transport; Water Transport; Air Transport; Other Supporting and Auxiliary Activities; Activities of Travel Agencies; Post and Telecommunications; Financial Intermediation; Real Estate Activities; Renting of M&Eq and Other Business Activities; Public Administration and Defense, Compulsory Social Security; Education; Health and Social Work; Private Households with Employed Persons.

Table 2.5: Labour mobility index LM*, evolution 1995-2011

	Year																		
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Mean	St. Dev.
AUT	90.59	86.79	86.62	90.04	89.98	93.42	89.45	89.51	92.28	95.76	89.01	88.89	88.61	90.73	92.36	77.18	86.78	89.29	3.83
BEL	95.59	92.53	90.11	96.84	83.25	92.71	86.64	86.09	84.02	85.76	83.63	85.33	85.18	84.95	85.46	83.92	82.17	87.31	4.37
CZE	82.85	95.15	84.14	84.93	85.52	86.30	83.60	87.47	87.66	88.09	88.55	88.82	85.84	85.58	88.52	88.87	89.91	87.16	2.82
DEU	66.62	67.76	73.44	61.36	71.46	72.46	60.86	72.97	60.27	60.81	52.09	49.82	51.37	59.05	71.31	65.64	70.05	63.96	7.59
DNK	89.42	86.31	98.82	99.22	93.18	96.47	99.19	97.18	82.25	73.24	82.18	79.48	83.04	86.53	83.09	82.86	81.90	87.90	7.78
ESP	83.56	70.99	71.72	72.42	73.73	74.64	66.96	62.90	75.85	70.90	59.26	77.17	77.40	77.37	88.83	89.29	85.42	75.20	8.06
FIN	92.40	91.91	90.96	90.76	89.02	88.77	88.67	88.97	89.30	89.09	88.84	88.95	88.82	88.92	88.72	88.72	89.34	89.54	1.15
FRA	78.93	72.40	72.41	72.54	69.87	69.92	77.30	77.20	69.72	69.36	76.45	69.09	69.83	74.91	76.78	79.90	80.22	73.93	3.88
GBR	86.00	80.43	84.94	82.61	85.35	85.18	84.80	84.05	82.10	91.85	92.03	89.82	85.46	87.02	79.51	89.02	85.84	85.65	3.44
GRC	98.91	98.90	98.87	96.29	98.85	97.52	97.50	97.42	97.35	97.17	97.28	97.44	95.82	95.95	90.22	97.63	87.75	96.52	2.93
HUN	89.36	89.37	89.61	89.48	94.16	90.86	88.93	89.20	88.27	81.72	74.47	85.80	97.84	97.55	94.46	93.36	91.62	89.77	5.44
IRL	95.32	90.70	94.71	94.56	94.33	94.29	93.73	93.33	93.40	93.24	93.87	94.15	94.08	93.42	87.06	93.83	94.91	93.47	1.87
ITA	85.08	84.82	77.17	81.60	83.76	75.94	74.99	79.53	79.09	78.69	78.63	78.49	81.54	81.17	78.95	79.30	64.98	79.04	4.46
NLD	72.87	82.94	61.63	72.18	67.67	71.99	88.49	88.49	88.57	88.62	88.63	88.67	88.84	88.30	87.21	91.45	81.25	82.22	8.96
POL	96.75	94.83	94.90	94.87	94.86	94.52	97.26	94.98	95.49	95.12	94.96	94.41	94.22	89.04	94.17	84.86	87.03	93.66	3.27
PRT	95.44	98.54	98.52	98.54	98.57	98.50	98.42	98.48	98.48	98.46	98.57	98.38	98.37	98.36	98.42	98.47	98.48	98.30	0.72
SWE	96.75	92.90	89.57	92.72	89.65	86.72	84.54	92.42	92.49	90.69	90.69	90.77	90.59	90.12	89.62	90.70	90.69	90.68	2.54
Mean	88.03	86.90	85.77	86.53	86.07	86.48	85.96	87.07	85.68	85.21	84.07	85.03	85.70	86.41	86.75	86.76	85.20		
St. Dev.	8.73	9.13	10.66	10.83	9.70	9.51	10.52	9.18	9.84	10.71	12.40	11.50	11.19	9.23	6.77	7.95	8.02		

*The labour mobility index $LM_{c,t}$ computes the share of workers that should change their job inside each country in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. It is computed as $\frac{\sum_{i=1}^{n} |l_{i,r}^{E} - l_{i,r}|}{2 \times \sum_{i=1}^{n} l_{i,t}}$—see (2.4.7)

Appendix 2.A Computation of the repreportioning factor that brings an entire industry to 0

In order to explain the procedure to compute the two extremes of a national frontier when the means of production are free to move across countries, it is useful to define a general element of the subsystem i as $s_{k,j,i}$. For example, the gross product of coal in the original subsystem of iron is $s_{2,5,1} = 1.78$, the gross product of coal in the original subsystem of coal is $s_{2,5,2} = 9.73$ and, finally, the gross product of coal in the original subsystem of wheat is $s_{2,5,3} = 2.49$. As explained above, we have that

$$b_2 = s_{2,5,1} + s_{2,5,2} + s_{2,5,3}. \tag{2.A.1}$$

Suppose to compute firstly the left extreme of the coal-iron frontier in the case of free mobility of the means of production. The coordinates of the new point are denoted with $(\check{y}_2, \hat{y}_1)$, which are respectively the minimum possible net product in coal and the corresponding maximum net output in iron. We need to know the minimum net product in coal $\check{y}_2$, such that b_2 becomes zero and all the labour force l_2 is redistributed in sectors 1 and 3 in order to obtain $\hat{y}_1$. Mathematically, reminding that y_2 is the original net output in coal, we want to compute $\check{y}_2$ such that

$$\check{s}_{2,5,2} = \frac{\check{y}_2}{y_2} s_{2,5,2} \tag{2.A.2}$$

and

$$b_2 = \hat{s}_{2,5,1} + \check{s}_{2,5,2} + s_{2,5,3} = 0 \tag{2.A.3}$$

where $\check{s}_{2,5,2}$ and $\hat{s}_{2,5,1}$ identify the gross output in coal respectively in the subsystems of coal and iron which allow to nullify b_2.

Eq. 2.A.2 is a direct consequence of the linearity property explained in Section 2.2.1—eq. (2.2.2)—, which basically implies that, given a subsystem $\boldsymbol{S}_i$ and the related net output y_i, in order to find the subsystem related to a new objective net output y'_i we just have to multiply all the elements of the original subsystem for y'_i/y_i.

Eq. 2.A.3 is the fundamental condition of the problem. If it is satisfied, this implies that all the labour force of the coal subsystem has been devoted to the iron subsystem. Actually, as is explained below, 2.A, we could rewrite the equations using $s_{2,4,i}$ for $i = (1, 2, 3)$, the element of the subsystems 1,2 and 3 related to labour in the coal sector, and results would be exactly the same.

Clearly, the system defined by equations 2.A.2-2.A.3 is not defined, because there are three unknowns: $\check{y}_2$, $\check{s}_{2,5,2}$ and $\hat{s}_{2,5,1}$. A way to close the system is to find the relation between $\check{s}_{2,5,1}$ and $\check{y}_2$, which is straightforward. In a way analogous to eq. 2.A.2, we know that

$$\hat{s}_{2,5,1} = \frac{\hat{y}_1}{y_1} s_{2,5,1} \tag{2.A.4}$$

and then, since the extreme $(\check{y}_2, \hat{y}_1)$ must lie on a prolongation of the frontier in Fig. 2.1, we have that

$$\hat{y}_1 = \check{y}_2 g + q \tag{2.A.5}$$

where g and q are given and represent the gradient and the quotient of the frontier. Putting eq. 2.A.5 in eq. 2.A.4 we obtain the formula

$$\hat{s}_{2,5,1} = \frac{\check{y}_2 g + q}{y_1} s_{2,5,1} \tag{2.A.6}$$

Eq.s 2.A.2, 2.A.3 and 2.A.6 represent the system from which $\check{y}_2$ can be computed. Putting eq.s 2.A.2 and 2.A.6 into 2.A.3 we can obtain that

$$s_{2,5,1} \frac{\check{y}_2 g + q}{y_1} + \frac{\check{y}_2}{y_2} s_{2,5,2} + s_{2,5,3} = 0 \tag{2.A.7}$$

from which we can obtain the formula

$$\check{y}_2 = \frac{-s_{2,5,3} - \frac{s_{2,5,1} q}{y_1}}{\frac{s_{2,5,1} g}{y_1} + \frac{s_{2,5,2}}{y_2}} \tag{2.A.8}$$

Summing up, with eq. (2.A.8) we determine the minimum net product in coal that brings the gross production in coal to 0, the consequent maximum production in iron $\hat{y}_1$ through eq. (2.A.5), and hence the factors $\hat{y}_1/y_1$ and $\check{y}_2/y_2$ that multiply the subsystem of iron and coal respectively.

It is important to note that, for the properties of subsystems, if we compute a factor $\check{y}_i/y_i$, and the related factor $\hat{y}_j/y_j$, that brings the gross product of a generic industry i to 0 and the net product of industry j to its maximum, then all the inputs of industry i will be brought to 0.

This is due to the fact, described by equations (2.1.3)-(2.1.4), that a row in a subsystem is simply the row of the original system, multiplied by a constant $x_{k,i} < 1$. This is because, in a subsystem, the original productive technologies must be respected, and hence the proportions in which each input enters into the productive process of an industry must be the original ones.

Continuing the example of Section 2.2.2, in the subsystem of coal we have that row 2 is determined multiplying the original inputs and output of the industry of coal by a factor $x_{2,2}$. Mathematically, we have that

$$\begin{aligned} s_{2,1,2} &= x_{2,2}a_{2,1} \\ s_{2,2,2} &= x_{2,2}a_{2,2} \\ s_{2,3,2} &= x_{2,2}a_{2,3} \\ s_{2,4,2} &= x_{2,2}l_2 \\ s_{2,5,2} &= x_{2,2}b_2 \end{aligned}$$

where $s_{2,i,2}$ identifies a generic element of row 2 of the subsystem of coal—see Section 2.2.2.

In the same way, row 2 of the subsystems of iron and wheat are determined by the factors $x_{2,1}$ and $x_{2,3}$

Therefore, eq (2.A.7) becomes

$$\begin{aligned} x_{2,1}b_2\frac{\check{y}_2 g + q}{y_1} + \frac{\check{y}_2}{y_2}x_{2,2}b_2 + x_{2,3}b_2 = \\ x_{2,1}\frac{\check{y}_2 g + q}{y_1} + \frac{\check{y}_2}{y_2}x_{2,2} + x_{2,3} = 0 \end{aligned} \tag{2.A.9}$$

This means that the determination of the minimum net output in coal depend just on the factors $x_{2,1}, x_{2,2}$ and $x_{2,3}$, not on b_2. If we rewrite eq. (2.A.7) in the following way

$$\begin{aligned} s_{2,1,1}\frac{\check{y}_2 g + q}{y_1} + \frac{\check{y}_2}{y_2}s_{2,1,2} + s_{2,1,3} = \\ a_{2,1}x_{2,1}\frac{\check{y}_2 g + q}{y_1} + \frac{\check{y}_2}{y_2}a_{2,1}x_{2,2} + a_{2,1}x_{2,3} = \\ x_{2,1}\frac{\check{y}_2 g + q}{y_1} + \frac{\check{y}_2}{y_2}x_{2,2} + x_{2,3} = 0 \end{aligned} \tag{2.A.10}$$

the result is the same, which in turn demonstrates that the same reproportioning factors $\hat{y}_1/y_1$ and $\check{y}_2/y_2$ that bring b_2 to 0, bring to 0 also $a_{2,1}$ and the same is true for whichever input of the industry of coal.

Appendix 2.B Tables on Comparative Advantages and labour mobility Index

2.B.1 Comparative Advantages Indexes

The indexes suggested in the article to perform an analysis of Comparative Advantages are the efficient specialization ratio

$$ESR_{c,i,t} = \frac{y^E_{c,i,t}}{\sum_{c=1}^{m} y^E_{c,i,t}} = \frac{y^E_{c,i,t}}{Y^E_{i,t}} \tag{2.B.1}$$

and the real specialization ratio as

$$RSR_{c,i,t} = \frac{y_{c,i,t}}{\sum_{c=1}^{m} y_{c,i,t}} = \frac{y_{c,i,t}}{Y_{i,t}} \tag{2.B.2}$$

where $i = 1, ..., n$ identifies the sectors, $c = 1, ..., m$ the countries and $t = 1, .., T$ the years. The matrix $\mathbf{ESR}_t$, which collects the ESR related to each country and each sector at time t, is called from now on the *efficient specialization pattern* at time t, while the matrix $\mathbf{RSR}_t$, an analogous matrix for the all the RSR at time t, is called the *real specialization pattern* at time t. The results of these two indexes are reported in Tables 2.6-2.22.

The results for Sector 2 and, in some years, for Sector 12 in some years have not been reported because, as explained in Section 2.4, the great majority of countries are in deficits in this index, implying a negative Net Total Product in this sector. For this reason, although countries can reduce their deficits in Sector 2 and Sector 12, nobody can specialize in it, making the comparison between the ESR and the RSR not very interesting. Since Tables 2.6-2.22 contain a lot of data, it is better to avoid reporting irrelevant information. Therefore, we have chosen to exclude Sector 2 from Tables 2.6-2.22.

When the ESR is higher than the RSR, the countries considered have a CA in that Sector. The results in CAs obtained under the assumption of free mobility of the means of production are different from those presented in Appendix 1.B—where it was assumed that just final goods were traded—, but there are many similarities.

Without mobility of means of production Austria had a CA in Sector 12—Basic Metal and Fabricated Metal—during the period 1996-2004, in Sector 15—Transport Equipment—during the period 2006-2010 and in Sector 8—Coke, Refined Petroleum and Nuclear Fuel—during the period 2007-2011—see Tab. 1.6.

In this case, as it emerges from Tab. 2.6, the CA of Austria in Sector 12 is confirmed, although the CAs in Sectors 8 and 15 almost completely disappear. Therefore, the new efficient scenario is different, but not completely revolutionized with the respect to the one presented in Tab. 1.6.

For what concerns Germany the CA in Sector 15 is confirmed, the CAs in Sector 6 and 11 are more sporadic, while there is a fairly stable CA in Sector 12 that was not present in Tab. 1.12 of Appendix 1.B.

Table 2.6: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Austria*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-0.05	-0.07	-0.11	-0.10	-0.05	-0.28	-0.04	-0.04	-0.04	-0.05	-0.04	-0.02	-0.02	-0.03	-1.73	-0.03	-0.03
	R	2.23	1.99	0.91	-0.10	1.88	1.71	1.53	1.46	1.49	1.52	1.46	1.27	1.31	1.25	1.08	1.23	1.34
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.02	-0.03	-0.03	-0.03	-0.02	-0.03	-0.03	-0.03	-0.03	-0.07	-0.03	-0.03	-0.04	-0.06	-0.08	-0.03	-0.03
	R	1.80	1.74	1.73	1.68	1.64	1.61	1.61	1.66	1.67	1.71	1.73	1.76	1.78	1.81	1.84	1.83	1.81
4	E	-0.10	-0.14	-0.16	-0.10	-0.13	-0.40	-0.09	-0.09	-0.13	-0.52	-0.10	-0.13	-0.15	-0.20	-0.24	-0.14	-0.15
	R	1.81	1.88	1.88	1.80	1.79	1.78	1.73	1.75	1.74	1.57	1.56	1.59	1.49	1.44	1.34	1.50	1.38
5	E	-0.04	-0.03	-0.03	-0.05	-0.05	-0.02	-0.04	-0.03	-0.08	-2.45	-0.06	-0.06	-0.23	-0.19	-0.06	-0.24	-0.05
	R	1.41	1.45	1.50	1.52	1.65	1.68	1.72	1.69	1.78	1.86	1.63	1.41	1.20	1.35	1.47	1.44	1.65
6	E	-0.92	-1.29	-1.38	-1.05	-4.44	-0.93	-1.28	-1.15	-0.56	-1.02	-0.97	-1.13	-1.11	-0.69	-1.67	-1.11	-1.35
	R	7.22	7.08	7.23	7.55	-0.49	6.96	6.97	6.88	7.41	7.98	8.18	8.82	9.32	9.05	8.59	9.15	9.67
7	E	-0.34	-0.61	-0.61	-0.33	-0.32	-0.53	-0.29	-0.23	-0.37	-0.52	-0.22	-0.23	-0.26	-0.44	36.34	-0.25	-0.26
	R	2.49	2.47	2.65	2.68	2.80	2.69	2.69	2.69	2.63	2.55	2.56	2.57	2.66	2.75	2.82	2.91	2.82
8	E	-1.07	-1.02	-0.94	-1.02	-0.85	-0.89	-0.96	-0.83	-0.18	-0.37	-1.36	-1.24	-1.17	135.00	-0.42	-1.08	-1.13
	R	0.96	1.17	0.81	1.41	1.41	1.25	1.37	1.18	1.16	1.06	1.18	1.23	1.30	1.09	1.03	0.79	0.87
9	E	-0.82	-1.04	-1.01	-0.78	-0.69	-4.24	-0.55	-0.45	-1.04	-0.67	-0.62	-0.73	-0.79	-1.32	-1.31	-0.63	-0.81
	R	0.94	0.96	0.93	0.83	0.87	0.94	0.87	1.01	0.97	1.14	1.24	1.22	1.33	1.38	1.47	1.21	1.19
10	E	-1.61	-1.21	-1.14	-1.81	-1.82	58.53	-1.48	-1.65	-2.78	-7.20	-1.31	-1.49	-1.58	-3.22	-1.43	-1.65	-1.76
	R	2.37	2.19	2.55	2.64	2.60	2.72	2.67	2.34	2.19	2.21	2.16	2.21	2.18	2.20	2.17	1.91	1.86
11	E	-0.92	62.09	68.42	-0.92	-0.92	41.21	-0.59	-0.59	-1.47	-2.08	-0.60	-0.67	-0.69	-0.58	31.98	-0.75	-0.81
	R	3.78	3.98	3.81	3.58	3.29	3.37	3.34	3.24	3.32	2.78	3.20	3.20	3.31	3.34	3.42	3.46	3.32
12	E	45.34	13.69	10.30	49.83	48.93	-1.31	46.06	42.71	-4.31	-9.88	44.59	44.99	46.06	/	/	/	/
	R	3.25	3.18	3.43	3.81	3.83	3.66	3.62	3.31	3.62	3.61	4.08	4.14	4.38	/	/	/	/
13	E	-0.39	-0.40	-0.39	-0.37	-0.36	-0.33	-0.41	-0.42	-0.53	-4.21	-0.44	-0.41	-0.42	25.66	-0.30	1.83	-0.48
	R	2.48	2.48	2.54	2.65	2.74	2.67	2.70	2.77	2.87	2.77	2.87	3.10	3.14	3.35	3.27	3.15	3.23
14	E	-0.39	-0.30	-0.29	-0.36	-0.33	-0.19	-0.26	-0.24	29.89	-3.45	-0.29	-0.22	-0.24	-1.66	-0.10	-0.34	-0.26
	R	2.70	2.64	2.59	2.59	2.46	2.34	2.58	2.62	2.56	2.49	2.35	2.33	2.38	2.49	2.50	2.43	2.32
15	E	-0.05	-0.05	-0.05	-0.06	-0.04	-0.04	-0.06	-0.05	-0.09	34.98	-0.06	-0.10	-0.11	-0.28	-0.03	-0.10	-0.12
	R	1.22	1.36	1.34	1.29	1.36	1.37	1.42	1.75	1.67	1.89	1.91	1.93	1.84	1.76	1.61	1.61	1.80
16	E	-0.48	-0.38	-0.45	-0.62	-0.61	-0.72	-1.21	-1.37	-0.26	-1.36	-1.30	-1.50	-1.82	-0.27	-0.40	-1.60	-1.89
	R	2.96	3.25	3.07	2.93	2.76	2.72	2.83	3.03	2.96	2.91	2.83	2.90	2.96	3.37	3.68	3.55	3.49
17	E	-0.90	-1.19	-1.22	-0.83	-0.91	-1.13	-0.96	-0.94	-0.49	-0.60	-1.46	-1.44	-0.98	-0.46	-1.66	-1.07	-1.10
	R	1.69	1.78	1.84	1.82	2.17	2.31	2.44	2.50	2.61	2.62	2.41	2.35	2.30	2.28	2.57	1.92	2.52

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Austria should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Austria actually produced. An $ESR > RSR$ means that Austria had a Comparative Advantage in the relative sector.

Table 2.7: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Belgium*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-0.01	-0.12	-0.12	-0.31	-0.20	-0.01	-0.05	-0.04	-2.88	-0.05	-0.35	-0.01	0.00	0.00	-4.84	0.00	-0.05
	R	0.76	0.57	0.81	1.25	1.08	1.10	0.08	0.69	0.68	-1.22	1.17	1.05	1.05	0.98	0.78	0.81	0.79
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.04	-0.05	-0.05	-0.09	-0.05	-0.06	-0.05	-0.04	-0.05	-0.06	-0.05	-0.05	-0.05	-0.05	4.39	-0.04	-0.04
	R	3.25	3.23	3.23	3.31	3.09	3.15	3.34	3.20	3.15	3.33	3.11	3.10	3.17	3.31	3.41	3.34	3.43
4	E	-0.04	-0.37	-0.42	-1.20	-0.67	-0.13	-0.14	-0.13	-0.13	-0.14	-0.12	-0.10	-0.11	-0.10	-0.24	-0.09	-0.10
	R	3.74	3.99	4.33	4.47	4.62	3.90	3.90	3.84	3.74	3.88	3.56	3.84	3.83	3.65	4.00	4.26	4.50
5	E	-0.01	-0.02	-0.02	-0.04	-0.03	-0.07	-0.05	-0.05	-0.06	-0.06	-0.03	-0.03	-0.04	-0.03	-0.04	-0.03	-0.02
	R	0.57	0.62	0.49	0.52	0.47	0.45	0.42	0.46	0.46	0.50	0.52	0.51	0.57	0.53	0.59	0.66	0.65
6	E	-1.09	-0.84	-0.84	-0.70	-0.78	-0.53	-0.43	-0.36	154.52	-0.36	22.56	-0.09	-0.48	-0.40	154.43	-0.29	2.85
	R	2.19	2.16	2.39	2.30	3.03	3.35	3.60	3.55	3.93	3.85	3.66	3.74	3.76	3.73	3.60	3.57	3.84
7	E	-0.51	-0.56	-0.53	-0.71	-0.52	-0.66	-0.20	-0.17	-0.57	-0.15	-0.20	-0.13	-0.11	-0.10	-0.96	-0.10	-0.10
	R	2.43	2.40	2.37	2.33	2.41	2.46	2.68	2.59	2.66	2.77	2.36	2.32	2.34	2.41	2.39	2.37	2.42
8	E	-0.66	-0.79	-0.75	-0.86	-1.16	-0.14	-0.69	-0.51	-0.44	-0.61	-0.47	-0.46	-0.50	-0.45	-0.38	-0.37	-0.36
	R	5.13	6.06	4.22	5.63	4.60	6.04	5.68	4.95	4.88	5.72	6.64	6.27	5.51	5.02	5.18	4.93	4.15
9	E	-1.43	-5.97	-7.10	-17.30	-7.79	-1.43	-1.18	-1.04	-2.10	-1.09	-0.96	-0.85	-0.90	-0.82	-1.33	-0.66	-0.69
	R	4.70	4.73	5.34	4.85	5.24	5.78	5.49	5.29	6.00	6.02	5.37	5.40	5.19	5.45	5.65	5.87	6.26
10	E	-0.69	45.51	56.48	148.44	68.73	-5.79	-1.59	-1.46	-1.95	-1.36	-1.07	-0.99	-1.02	-0.93	-1.74	-0.83	-0.89
	R	2.27	2.28	2.70	2.73	2.94	2.24	2.12	2.17	2.06	2.39	3.16	2.96	3.09	3.04	2.77	3.07	3.40
11	E	91.78	59.39	51.91	-0.32	-0.61	-1.39	-1.15	-0.96	-0.86	-0.96	-0.54	-0.49	-0.48	-0.47	-0.90	-0.50	-0.50
	R	4.52	4.49	4.62	4.45	4.16	4.09	4.28	4.21	4.13	4.04	3.63	3.68	3.66	3.89	4.53	4.50	4.71
12	E	-2.01	-1.54	-0.40	-1.06	26.01	-4.05	51.56	45.93	8.09	45.62	36.34	42.52	43.95	/	/	/	/
	R	5.35	5.18	5.57	5.69	6.06	5.94	6.17	5.87	5.93	5.86	5.95	5.97	6.76	/	/	/	/
13	E	-0.35	-0.27	-0.25	-0.16	-0.24	-0.19	-0.27	-0.26	-0.08	-0.27	-0.28	-0.31	-0.32	-0.29	-0.19	-0.25	-0.25
	R	1.79	1.72	1.84	1.90	1.85	1.94	1.88	1.76	1.86	1.83	1.57	1.46	1.44	1.41	1.43	1.36	1.33
14	E	-0.11	-0.09	-0.08	-0.11	-0.30	30.69	-0.49	-0.47	-0.13	-0.44	-0.35	-0.38	-0.37	-0.34	-0.13	-0.32	-0.33
	R	1.85	1.76	1.77	1.77	1.71	2.16	1.91	1.67	1.70	1.63	1.26	1.14	0.99	0.99	1.02	0.93	0.81
15	E	-0.06	-0.05	-0.05	-0.03	-0.08	-0.12	-0.24	-0.23	-0.07	-0.21	-0.11	-0.11	-0.13	-0.12	-0.04	-0.11	-0.10
	R	3.02	2.97	2.76	2.75	2.66	2.74	2.93	2.94	2.63	2.64	2.37	2.35	2.17	2.07	2.17	1.83	1.90
16	E	-0.10	-0.11	-0.13	-0.16	-0.44	-0.39	-1.25	-1.45	-0.70	-1.83	-1.28	-1.52	-1.04	-0.89	-0.45	-1.26	-0.85
	R	2.97	2.77	2.70	2.61	2.43	2.86	2.92	2.62	2.62	2.57	2.60	2.62	2.63	2.58	2.36	2.25	2.35
17	E	-1.53	-1.28	-1.35	-0.81	-1.45	-0.65	-1.81	-1.44	-0.75	-1.31	-1.29	-1.57	-1.44	-1.38	-0.52	-1.08	-1.13
	R	1.67	1.68	1.62	1.60	1.79	1.55	1.54	1.68	1.61	1.51	1.24	1.14	1.36	1.17	1.34	1.30	1.38

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Belgium should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Belgium actually produced. An $ESR > RSR$ means that Belgium had a Comparative Advantage in the relative sector.

Table 2.8: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Czech Republic*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	24.07	-0.08	20.22	23.68	23.00	24.47	20.38	26.62	30.89	27.35	31.63	29.54	25.30	24.75	26.12	23.00	26.15
	R	2.93	2.47	2.10	1.82	1.84	1.65	1.77	1.68	1.86	1.61	2.24	1.92	1.78	1.76	1.87	1.60	1.84
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.45	-0.03	-0.56	-0.60	-0.59	-0.71	-0.59	-0.74	-0.70	-0.66	-0.60	-0.60	-0.55	-0.55	-0.66	-0.55	-0.68
	R	2.04	2.08	2.06	2.14	2.11	1.99	2.14	2.17	2.03	2.01	1.89	1.89	1.84	1.85	1.91	1.76	1.76
4	E	-0.02	-0.09	-0.02	-0.02	-0.02	-0.02	-0.15	-0.12	-0.14	-0.08	-0.04	-0.06	-0.05	-0.06	-0.06	-0.07	-0.09
	R	1.44	1.36	1.23	1.23	1.19	1.25	1.17	1.00	1.22	1.32	1.26	1.35	1.44	1.47	1.29	1.26	1.32
5	E	-0.02	-0.04	-0.02	-0.01	-0.01	0.00	-0.03	-0.20	-0.10	-0.02	-0.01	-0.02	-0.02	-0.02	-0.01	-0.02	-0.01
	R	1.41	1.19	0.87	0.69	0.68	0.75	0.68	0.28	0.42	0.48	0.34	0.25	0.09	0.18	0.58	0.19	0.61
6	E	-0.44	-0.14	-0.57	-0.66	-0.80	-0.35	-1.03	-0.57	-0.53	-0.25	-0.59	-1.16	-0.61	-0.71	-0.88	-0.86	-1.04
	R	2.45	2.82	2.57	1.97	2.16	2.31	2.39	2.62	3.07	3.22	2.49	0.84	2.92	3.25	3.44	3.10	3.14
7	E	-0.03	-0.19	-0.04	-0.04	-0.03	-0.03	8.10	-0.04	-0.04	-0.03	-0.10	-0.10	-0.11	-0.10	-0.11	-0.11	-0.13
	R	1.25	1.28	1.38	1.33	1.29	1.27	1.37	1.49	1.44	1.55	1.53	1.66	1.73	1.84	1.83	1.74	1.76
8	E	-3.22	131.31	125.93	-1.29	-1.17	-0.90	-1.14	-1.04	-1.34	-1.18	-1.21	-1.06	-1.04	-1.02	-1.02	-0.91	-1.04
	R	16.28	2.55	1.55	2.06	1.78	1.24	1.47	1.59	1.52	1.59	1.55	2.06	1.83	1.88	1.87	1.79	1.46
9	E	-0.25	-0.24	-0.80	-0.61	-0.65	-0.55	-0.69	-0.60	-0.55	-0.60	-0.61	-0.61	-0.53	-0.51	-0.54	-0.56	-0.75
	R	0.56	0.92	0.90	0.68	0.56	0.48	0.32	0.31	0.33	0.30	0.46	0.44	0.35	0.52	0.50	0.51	0.42
10	E	-0.09	-0.28	-0.24	-0.25	-0.19	-0.19	-0.42	-0.57	-0.56	-0.35	-0.49	-0.51	-0.42	-0.43	-0.50	-0.51	-0.65
	R	1.07	1.28	1.11	0.62	0.50	0.75	0.82	0.76	1.15	1.40	1.35	1.68	2.06	2.31	2.13	1.99	1.89
11	E	-0.06	-0.24	-0.14	-0.08	-0.06	-0.05	-0.17	-0.06	-0.06	-0.05	-0.05	-0.06	-0.08	-0.07	-0.06	-0.06	-0.08
	R	2.22	2.31	2.40	2.27	2.36	2.46	2.39	2.41	2.44	2.55	2.58	2.77	2.78	2.93	2.72	2.68	2.56
12	E	-0.15	-1.65	-0.35	-0.27	-0.17	-0.14	-0.31	-0.26	-0.23	-0.17	-0.17	-0.16	-0.24	/	/	/	/
	R	3.72	3.26	3.21	2.88	2.57	2.43	2.30	1.70	1.94	1.89	1.72	1.57	1.52	/	/	/	/
13	E	-0.08	-0.52	-0.19	-0.16	-0.14	-0.12	-0.26	-0.18	-0.29	-0.20	-0.27	-0.30	-0.29	-0.28	-0.30	-0.31	-0.40
	R	0.92	1.29	1.19	1.21	1.10	1.18	1.17	1.33	1.32	1.53	1.65	1.94	2.10	2.20	1.95	1.96	1.91
14	E	-0.03	-0.95	-0.04	-0.02	-0.01	-0.01	-0.09	-0.02	-0.02	-0.02	-0.02	-0.02	-0.18	-0.10	-0.03	-0.03	-0.04
	R	0.88	1.25	1.12	1.05	1.15	1.13	1.15	1.36	1.52	2.14	1.85	2.00	2.18	2.47	1.98	1.85	1.91
15	E	-0.01	-0.05	-0.05	-0.06	-0.06	-0.05	-0.05	-0.09	-0.08	-0.06	-0.07	-0.10	-0.08	-0.07	-0.10	-0.09	-0.14
	R	0.79	0.95	1.04	1.11	1.16	1.39	1.57	1.71	1.62	1.77	2.12	2.46	2.61	2.86	3.18	3.16	3.45
16	E	-0.02	-0.07	-0.06	-0.03	-0.09	-0.01	-0.08	-0.03	-0.03	-0.02	-0.02	-0.02	-0.03	-0.02	-0.02	-0.02	-0.03
	R	1.21	1.28	1.29	1.24	1.39	1.71	1.87	2.13	1.87	1.91	1.75	1.85	1.96	1.95	2.25	2.58	2.62
17	E	-0.38	76.97	-1.08	-0.40	-0.45	-0.36	-0.67	-0.32	-0.29	-0.23	-0.37	-0.40	10.96	6.70	-0.37	-0.33	-0.33
	R	3.83	4.47	4.02	3.64	3.98	4.47	4.29	4.10	4.02	3.97	4.45	4.44	4.06	4.22	4.12	3.40	3.52

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^n y^E_{c,i,t}}$ and represents the share of European net output that the Czech Republic should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that the Czech Republic actually produced. An $ESR > RSR$ means that the Czech Republic had a Comparative Advantage in the relative sector.

Table 2.9: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Denmark*

Sector	E/R	Year 1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	1.00	1.23	-0.34	-0.27	0.14	-0.40	-0.29	-0.24	10.57	8.20	9.98	1.40	9.55	-0.02	11.88	9.03	10.02
	R	1.24	1.28	1.34	1.33	1.30	1.51	1.29	1.26	1.38	1.26	1.35	1.06	1.42	1.28	1.42	1.83	1.87
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.32	-0.39	-0.20	-0.13	-0.11	-0.17	-0.23	-0.06	-0.26	-0.24	-0.27	-0.07	-0.29	-0.02	-0.31	-0.18	-0.18
	R	1.88	1.78	1.76	1.82	1.74	1.70	1.70	1.72	1.69	1.69	1.71	1.66	1.59	1.61	1.55	1.50	1.40
4	E	-0.42	-0.52	-0.07	-0.16	0.86	1.30	-0.26	21.34	-0.03	-0.04	-0.02	-0.17	-0.02	-0.04	-0.01	-0.02	-0.01
	R	0.86	0.86	0.87	0.80	0.78	0.76	0.74	0.75	0.73	0.70	0.71	0.70	0.70	0.68	0.60	0.59	0.57
5	E	104.54	104.34	104.55	77.43	106.34	105.55	90.62	0.02	0.00	0.00	0.00	-0.03	-0.01	-0.03	0.00	-0.01	0.00
	R	0.47	0.43	0.33	0.29	0.33	0.41	0.30	0.17	0.17	0.14	0.09	0.08	0.04	0.05	0.06	0.06	0.06
6	E	-0.12	-0.19	-0.09	-0.21	-0.15	-0.23	-0.30	-0.31	-0.26	-0.33	-0.26	-0.42	-0.24	-0.38	-0.12	-0.21	-0.12
	R	1.46	1.42	1.54	1.33	1.86	1.46	1.27	1.30	1.41	1.54	1.57	1.75	1.60	1.52	1.35	1.13	1.04
7	E	-0.33	-0.53	-0.23	-0.29	-0.18	-0.34	-0.27	-0.25	-0.09	-0.15	-0.07	-0.19	-0.13	-0.16	-0.05	-0.10	-0.05
	R	1.20	1.19	1.20	1.23	1.21	0.86	1.03	0.92	1.00	0.79	1.06	1.01	0.89	0.90	1.02	0.88	0.84
8	E	-0.16	-0.32	-0.06	-0.18	-0.09	-0.29	-0.41	-0.31	-0.64	-0.66	-0.91	-0.45	-0.68	-0.44	-0.60	-0.60	-0.51
	R	0.75	0.96	0.66	0.86	0.77	0.48	0.53	0.58	0.44	0.52	0.38	0.41	0.40	0.31	0.25	0.20	0.04
9	E	-1.03	-1.25	-0.64	-0.56	-0.60	-0.72	-0.70	-0.83	-0.34	-0.38	-0.40	-0.45	-0.37	-0.24	-0.27	-0.35	-0.26
	R	0.71	0.72	0.98	0.93	1.11	1.16	1.32	1.26	1.24	1.27	1.42	1.38	1.40	1.38	1.73	1.59	1.68
10	E	-0.45	-0.65	-0.30	-0.44	-0.34	-0.61	-0.64	-0.68	-0.29	-0.43	-0.31	-0.89	-0.32	-0.57	-0.18	-0.29	-0.18
	R	1.72	1.83	1.80	1.75	1.73	1.72	1.63	1.70	1.66	1.57	1.50	1.50	1.58	1.28	1.31	1.23	1.16
11	E	-0.02	-0.19	-0.04	-0.23	-0.10	-0.23	-0.21	-0.20	-0.17	-0.23	-0.12	-0.76	-0.13	-0.16	-0.06	-0.14	-0.08
	R	1.37	1.36	1.41	1.45	1.34	1.17	1.03	1.09	1.01	0.97	1.10	1.12	1.19	1.15	0.97	0.84	0.83
12	E	-0.29	-0.43	-0.19	-0.29	-0.26	-0.35	-0.53	-0.46	-0.50	-0.71	-0.47	-2.31	-0.52	/	/	/	/
	R	0.87	0.85	0.82	0.93	0.80	0.83	0.74	0.87	0.72	0.67	0.36	0.41	0.50	/	/	/	/
13	E	-0.12	-0.19	-0.09	-0.18	-0.15	-0.21	-0.36	-0.23	-0.24	-0.29	-0.19	-0.63	-0.21	10.68	-0.15	-0.18	-0.12
	R	2.24	2.07	2.14	2.04	1.90	1.95	1.88	1.94	1.89	1.86	1.76	1.75	1.81	2.04	2.08	1.93	1.88
14	E	-0.02	-0.10	-0.03	-0.10	-0.05	-0.10	-0.17	-0.17	-0.19	1.39	-0.15	9.18	-0.14	-1.10	-0.09	-0.15	-0.09
	R	1.33	1.39	1.28	1.27	1.39	1.36	1.50	1.62	1.52	1.50	1.58	1.62	1.59	1.51	1.65	1.72	1.52
15	E	0.00	-0.01	0.00	-0.01	-0.01	-0.02	-0.03	-0.03	-0.03	-0.03	-0.03	-0.07	-0.04	-0.12	-0.04	-0.04	-0.01
	R	0.62	0.63	0.54	0.51	0.42	0.42	0.41	0.38	0.35	0.35	0.35	0.33	0.30	0.29	0.24	0.17	0.17
16	E	-0.04	-0.07	-0.02	-0.04	-0.03	-0.08	-0.13	-0.17	-0.06	-0.06	-0.05	-0.15	-0.07	-0.12	-0.04	-0.06	-0.03
	R	2.42	2.35	2.37	2.30	2.09	2.15	2.08	2.01	1.96	1.98	2.07	2.09	1.96	1.66	1.57	1.68	1.60
17	E	-0.04	-0.08	-0.06	-0.36	-0.18	-0.16	-0.30	-0.30	-0.28	-0.25	-0.21	-0.22	-0.29	-0.22	-0.20	-0.29	-0.17
	R	1.19	1.25	1.27	1.19	1.37	1.40	1.31	1.27	1.30	1.27	1.22	1.23	1.11	1.10	1.13	1.17	1.20

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Denmark should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Denmark actually produced. An $ESR > RSR$ means that Denmark had a Comparative Advantage in the relative sector.

Table 2.10: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Finland*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-0.01	-0.01	-0.01	-0.01	-0.01	-0.03	-0.01	-0.01	-0.01	-0.02	-0.02	-0.04	-0.02	-0.03	-0.02	-0.02	-0.01
	R	1.00	0.82	0.53	-0.72	0.17	-0.52	0.63	-0.07	0.21	0.13	0.63	0.91	0.85	0.81	0.72	0.11	1.09
2	E	19.13	23.50	17.56	32.48	0.22	1.84	0.08	0.09	0.07	0.08	0.13	0.06	0.08	0.09	0.08	0.10	0.07
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	0.87	0.87	0.87	0.90	0.83	0.86	0.87	0.90	0.91	0.88	0.87	0.92	0.94	0.97	1.00	1.00	0.99
4	E	-0.04	-0.02	-0.02	-0.02	-0.07	-0.13	-0.13	-0.08	-0.19	-0.16	-0.13	-0.03	-0.03	-0.03	-0.03	-0.02	-0.02
	R	0.55	0.59	0.57	0.57	0.55	0.53	0.48	0.53	0.46	0.48	0.52	0.53	0.53	0.51	0.50	0.51	0.50
5	E	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02	-0.12	-0.09	-0.11	-0.07	-0.06	-0.04
	R	0.41	0.42	0.41	0.45	0.40	0.42	0.41	0.46	0.46	0.47	0.43	0.41	0.40	0.40	0.39	0.39	0.38
6	E	-0.56	-0.61	-0.64	-0.80	-0.88	-0.35	-0.26	-0.27	-0.23	-0.29	-0.58	-0.46	-0.39	-0.43	-0.40	-0.43	-0.37
	R	7.10	7.11	7.98	8.42	11.14	8.89	8.22	8.23	8.39	8.52	7.44	7.40	8.44	7.72	7.22	7.93	7.86
7	E	-0.53	-0.42	-0.41	-0.36	-0.90	-1.12	-1.15	-1.16	-1.25	-1.10	-1.28	-0.56	-0.63	-0.71	-0.64	-0.47	-0.47
	R	4.65	4.31	4.74	5.16	4.55	4.82	4.44	4.64	4.65	4.60	4.19	4.60	4.54	4.28	3.83	4.43	4.14
8	E	-1.05	-1.10	-0.70	-0.72	-0.11	-0.07	-0.09	-0.13	-0.05	-0.05	-0.04	-0.08	-0.06	-0.08	-0.04	-0.02	-0.03
	R	1.27	1.37	0.94	1.97	1.56	1.44	1.27	1.52	1.52	1.63	1.35	1.28	1.34	1.18	1.21	1.11	0.97
9	E	-0.77	-0.84	-0.77	-0.66	-0.55	-0.29	-0.31	-0.33	-0.33	-0.39	-0.52	-0.51	-0.45	-0.49	-0.45	-0.25	-0.32
	R	0.66	0.84	0.83	1.09	0.70	1.13	0.83	0.88	0.78	0.78	0.73	0.68	0.74	0.88	0.98	1.20	1.24
10	E	-0.48	-0.52	-0.45	-0.40	-1.64	-3.08	-2.28	-1.64	-0.67	-0.80	-1.00	-0.76	-0.51	-0.64	-0.54	-0.43	-0.44
	R	1.69	1.70	1.79	1.94	1.78	1.88	1.78	1.84	1.84	1.82	1.86	1.79	1.84	1.88	1.76	1.84	1.89
11	E	-0.41	-0.39	-0.39	-0.37	-0.23	-0.22	-0.20	-0.14	-0.18	-0.17	-0.23	-0.16	-0.20	-0.23	-0.20	-0.18	-0.20
	R	1.12	1.17	1.21	1.35	1.23	1.37	1.27	1.30	1.36	1.41	1.48	1.42	1.45	1.45	1.29	1.43	1.47
12	E	29.33	31.37	29.97	36.29	-2.14	-1.54	-1.75	-1.69	-1.45	-1.79	-1.72	-1.88	-2.15	/	/	/	/
	R	1.27	1.91	2.08	2.86	2.16	2.93	2.21	2.20	2.10	2.34	2.61	2.46	2.54	/	/	/	/
13	E	-0.41	-0.37	-0.37	-0.28	-0.31	-0.39	-0.36	-0.32	-0.32	-0.40	-0.46	-0.51	-0.53	-0.63	-0.62	-0.51	-0.48
	R	2.07	2.20	2.32	2.33	2.18	1.99	1.91	1.84	1.82	1.96	2.11	2.16	2.30	2.41	2.32	2.05	2.27
14	E	-0.17	-0.13	-0.12	-0.10	20.70	22.41	21.32	24.02	24.91	26.14	29.52	29.74	32.16	38.07	31.79	30.42	28.69
	R	1.45	1.57	1.75	2.40	2.75	3.16	2.91	3.19	3.28	3.49	4.09	4.09	4.55	5.39	4.61	4.55	4.12
15	E	-0.10	-0.08	-0.07	-0.06	-0.05	-0.06	-0.05	-0.05	-0.06	-0.04	-0.05	-0.06	-0.07	-0.05	-0.04	-0.03	-0.03
	R	0.65	0.59	0.54	0.53	0.47	0.64	0.68	0.66	0.54	0.35	0.43	0.51	0.51	0.50	0.48	0.37	0.30
16	E	-0.41	-0.36	-0.33	-0.18	-0.11	-0.12	-0.15	-0.15	-0.14	-0.14	-0.16	-0.15	-0.16	-0.19	-0.19	-0.12	-0.12
	R	0.84	0.86	0.88	0.91	0.84	0.92	0.93	0.93	0.99	1.04	0.99	0.94	0.89	0.86	0.79	0.81	0.79
17	E	-0.57	-0.56	-0.52	-0.48	-0.38	-0.17	-0.13	-0.14	-0.14	-0.16	-0.19	-0.17	-0.19	-0.21	-0.20	-0.17	-0.15
	R	0.63	0.73	0.72	0.76	0.73	0.96	0.82	0.86	0.96	0.93	0.84	0.80	0.86	0.83	0.91	1.02	0.90

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Finland should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Finland actually produced. An $ESR > RSR$ means that Finland had a Comparative Advantage in the relative sector.

Table 2.11: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in France*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	135.97	108.65	60.34	75.29	64.43	44.45	126.82	123.28	50.30	64.80	97.73	60.05	49.49	62.42	132.55	147.49	141.70
	R	23.03	22.94	23.03	23.27	22.09	24.26	21.06	22.15	21.12	22.68	22.15	22.94	21.65	23.22	23.13	22.25	26.16
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-1.58	-1.33	-0.77	-0.94	-1.03	-1.05	-2.29	-2.23	-1.29	-1.57	-2.54	-2.23	-2.30	-2.54	-3.16	-2.06	-2.19
	R	12.55	12.48	12.84	13.48	15.35	15.13	14.92	14.80	14.98	14.79	14.91	14.81	14.99	14.45	16.42	15.69	14.78
4	E	-0.17	-0.92	-2.41	-2.15	-3.78	-3.83	-1.05	-1.02	-4.45	-4.14	-2.34	-3.99	108.64	108.64	-1.22	-0.47	-0.41
	R	8.82	8.82	8.97	9.19	11.31	11.75	11.62	12.41	12.15	12.50	12.47	12.01	12.62	12.15	12.54	11.60	11.96
5	E	-0.08	-0.15	-0.30	-0.37	-0.53	-0.47	-0.12	-0.13	-0.58	-0.47	-0.13	-0.33	-0.97	-0.90	-0.18	-0.15	-0.14
	R	8.30	8.39	8.72	9.45	11.53	11.32	10.68	9.60	9.07	8.53	8.79	8.79	8.48	8.73	8.56	8.69	7.13
6	E	-1.92	-2.47	-3.56	-3.53	-6.16	-4.81	-3.15	-3.21	-5.09	-5.12	-3.75	-4.61	-3.04	-3.31	-4.65	-3.72	-3.83
	R	4.68	4.81	5.03	4.71	6.14	5.22	5.28	5.87	6.11	6.50	5.96	6.78	6.55	6.07	7.05	6.52	5.82
7	E	-0.25	-0.55	-1.09	-0.99	-1.71	-3.06	-2.16	-2.09	-2.79	-2.76	-3.83	-4.07	-4.72	-4.95	-2.03	-0.52	-0.41
	R	10.42	10.25	10.28	10.59	11.94	11.54	11.77	11.72	11.56	11.67	11.67	11.43	11.16	11.32	11.84	10.73	11.75
8	E	-1.62	-1.79	-1.42	-1.82	-2.88	-4.93	-6.71	-6.24	-5.21	-6.10	-12.81	-14.77	-15.27	-16.87	-13.15	-5.80	-7.90
	R	7.82	8.60	6.41	10.21	10.56	12.40	19.21	16.89	15.17	13.16	12.35	18.89	15.89	20.70	27.33	26.64	30.54
9	E	-5.25	-4.38	-4.05	-4.20	7.93	62.72	60.50	58.81	60.77	65.90	135.53	134.24	134.30	133.65	51.74	-3.66	-4.02
	R	9.77	10.50	10.93	11.01	12.79	14.50	14.05	13.81	13.93	14.34	15.08	15.93	16.40	16.88	15.22	15.70	12.27
10	E	-0.66	-7.39	-19.94	-16.06	-23.44	-27.16	-5.02	-5.21	-28.22	-25.52	-11.08	-23.33	-13.75	-12.98	-5.89	-1.26	-1.35
	R	7.43	7.39	7.22	7.21	7.84	8.85	8.37	8.17	8.75	10.16	10.39	11.10	11.88	12.93	14.54	14.84	12.66
11	E	-0.43	-1.36	-2.97	-2.78	-4.78	-5.17	-1.59	-1.59	-5.09	-4.73	-2.86	-4.72	-3.05	-2.99	-1.89	-0.85	-0.83
	R	9.31	9.28	9.53	9.55	10.25	11.31	10.09	10.09	10.14	10.39	10.09	10.29	9.99	9.70	10.31	10.36	9.44
12	E	-0.56	-13.08	-36.10	-33.69	-46.19	-42.68	-3.10	-3.14	-32.51	-28.51	-5.09	-20.95	-7.79	/	/	/	/
	R	11.13	11.00	11.01	10.87	11.72	12.68	11.61	11.92	11.36	10.98	10.28	10.73	10.76	/	/	/	/
13	E	-0.87	-1.84	-3.91	-3.27	-5.43	-5.39	-1.48	-1.60	-5.61	-5.09	-1.61	-3.91	-1.70	-1.55	-2.11	-1.57	-1.68
	R	7.17	7.22	7.40	7.49	9.01	9.07	8.89	9.16	8.97	9.46	9.34	9.46	9.30	9.35	10.09	10.00	9.24
14	E	-0.04	-2.91	-7.17	-5.70	-8.48	-8.52	-0.27	-0.31	-9.39	-8.11	-0.56	-5.67	-1.23	-0.58	-0.30	-0.08	-0.09
	R	10.04	9.53	9.63	9.60	10.59	11.21	11.64	12.29	12.01	12.27	12.28	11.84	11.50	11.71	14.73	13.31	13.75
15	E	-0.12	38.22	103.80	80.00	103.71	105.01	-0.07	-0.12	83.16	69.46	-0.12	46.33	6.14	-0.10	-0.14	-0.09	-0.08
	R	17.39	16.68	16.36	15.58	17.82	17.29	16.87	15.67	16.56	17.10	17.55	16.37	15.51	15.86	15.76	15.69	11.57
16	E	-0.04	-1.30	-4.21	-2.76	-3.71	-4.39	-0.34	-0.36	-5.80	-5.06	-0.72	-3.56	-1.49	-1.14	-0.39	-0.10	-0.09
	R	9.94	10.01	10.23	10.39	11.85	12.30	13.08	13.40	12.92	11.65	12.13	11.23	10.91	10.46	9.98	9.63	9.58
17	E	-1.57	-2.15	-3.07	-2.55	-1.75	-3.99	-2.72	-2.73	-3.31	-3.43	-4.79	-5.30	-5.21	-5.51	-2.81	-1.06	-1.11
	R	21.11	20.69	20.62	20.46	11.23	11.29	11.97	12.14	12.10	11.93	11.21	11.21	10.98	11.21	10.52	11.06	11.07

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that France should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that France actually produced. An $ESR > RSR$ means that France had a Comparative Advantage in the relative sector.

Table 2.12: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Germany*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-71.86	-1.51	-2.39	-1.98	-2.40	-1.68	-1.29	-1.00	-0.45	-0.17	-0.21	-1.15	-0.18	-4.04	-0.65	-4.70	-4.94
	R	7.13	7.08	7.30	7.23	6.86	6.77	8.04	7.74	8.04	8.45	8.23	8.06	8.33	7.63	8.97	8.16	9.40
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	83.29	-0.27	-0.26	-0.30	-0.24	-0.30	-0.42	-0.36	-0.26	-0.21	-0.34	-0.28	-0.33	-0.34	-0.27	-0.27	-0.27
	R	19.85	19.51	19.10	18.52	18.56	18.94	18.86	18.79	18.53	18.28	18.09	18.11	17.72	17.65	15.25	15.04	15.12
4	E	-1.26	70.20	108.20	109.85	110.61	107.95	108.41	88.02	-1.40	-0.68	-2.04	-1.50	-1.75	-1.76	105.82	107.90	91.98
	R	14.66	14.41	14.01	13.78	13.32	12.89	12.99	12.22	12.01	12.42	12.70	12.87	13.20	12.76	11.61	12.01	12.51
5	E	-0.57	-0.70	-0.70	-0.86	-0.80	-0.69	-0.90	-0.92	-0.71	-0.67	-0.89	-0.75	-1.03	-0.93	-0.85	-1.28	-1.06
	R	6.99	6.90	6.65	6.90	6.66	6.23	6.62	7.03	6.26	6.55	5.98	6.08	6.13	5.69	5.87	5.62	6.34
6	E	-10.79	-10.43	-7.56	-7.77	39.50	-6.75	-9.53	-8.95	-7.23	-6.39	-8.93	29.89	-8.31	140.87	-5.96	144.63	138.80
	R	27.15	26.03	26.59	24.71	28.97	25.15	23.67	24.11	21.66	21.76	21.31	20.81	18.98	18.80	18.91	18.55	19.22
7	E	-7.92	-3.76	-3.77	-4.32	-3.46	-3.24	-3.91	-3.76	-3.07	-2.93	-3.36	-2.88	-3.31	-3.17	-3.17	-3.56	-3.38
	R	21.39	21.47	21.38	20.13	20.89	20.01	19.40	18.58	18.10	18.73	19.29	19.21	19.02	18.87	17.86	17.40	17.48
8	E	-2.93	-3.33	-5.62	-3.53	-3.12	-3.46	-3.80	-3.95	-4.51	-3.80	-2.92	-3.37	-2.80	-3.44	-2.44	-2.64	-3.01
	R	10.49	12.60	36.62	11.34	11.71	11.47	10.84	11.68	13.31	15.04	15.64	13.63	12.66	11.82	11.63	10.33	9.08
9	E	-7.77	-10.90	-10.62	-12.01	-11.07	-10.96	-12.46	-9.83	-11.45	-7.05	-7.46	-7.26	-7.59	-8.37	-7.82	-10.10	-16.20
	R	31.27	30.47	29.44	28.28	27.24	26.55	25.86	25.97	25.70	25.94	26.23	26.94	26.99	27.09	23.75	23.68	24.43
10	E	5.12	-24.26	-13.16	-16.48	-9.54	-5.16	-18.87	-28.70	81.69	-13.10	-35.00	-23.55	-33.10	-32.39	-27.39	-34.28	136.74
	R	34.89	33.98	33.52	32.48	31.64	31.58	31.27	32.00	30.81	30.71	29.86	29.08	27.83	27.70	27.07	27.99	28.20
11	E	20.47	-8.66	-6.36	57.34	116.90	-5.36	-6.98	-7.71	15.82	35.90	-7.67	-6.96	-7.27	-8.55	86.83	48.16	-7.91
	R	22.92	22.00	20.90	20.44	19.97	19.08	17.95	17.54	17.19	17.26	16.71	17.07	16.75	16.96	17.03	17.46	18.08
12	E	-23.71	151.96	159.08	133.65	160.55	152.35	36.84	98.36	202.23	147.70	15.00	96.62	28.26	/	/	/	/
	R	28.12	27.36	26.98	25.85	24.26	25.77	27.40	27.74	26.44	25.15	23.83	23.55	21.48	/	/	/	/
13	E	5.35	13.60	59.84	34.01	16.82	62.85	23.96	-5.30	-6.29	56.72	28.72	32.47	29.47	-2.71	-7.28	5.16	-8.49
	R	35.89	35.15	34.67	34.97	34.92	34.67	35.00	34.35	34.04	33.75	33.79	33.79	34.16	35.00	33.82	33.27	33.77
14	E	-7.71	-7.01	-5.62	-5.67	-3.39	-5.94	-9.97	-8.85	27.90	38.21	40.32	32.12	37.56	32.41	38.18	32.53	30.65
	R	30.16	28.94	28.38	27.76	27.19	26.46	26.01	26.42	27.30	28.11	29.14	30.84	31.84	31.73	29.96	32.74	35.32
15	E	103.27	65.14	-1.21	22.88	-0.90	-1.32	103.25	103.39	19.76	-1.42	103.09	56.83	97.05	103.37	103.58	104.28	104.64
	R	33.23	33.28	33.53	34.84	34.30	34.42	36.03	36.64	35.88	35.53	36.11	36.30	37.46	37.08	36.22	37.11	39.23
16	E	-2.86	-4.02	-3.41	-3.32	-2.51	-3.54	-4.72	-5.77	-5.30	-4.61	-5.13	-5.65	-5.98	-6.59	-4.12	-4.78	-4.77
	R	20.31	19.56	19.31	19.17	18.29	18.04	17.73	16.40	15.82	15.61	16.10	16.92	17.11	18.21	16.36	16.52	16.85
17	E	-5.87	-6.72	-6.40	-7.08	-8.14	-7.43	-6.68	-7.78	-7.62	-7.25	-6.06	-5.99	-6.15	-6.38	-5.41	-5.30	-5.12
	R	15.30	15.73	15.11	15.10	17.96	17.13	16.22	16.15	16.18	16.46	16.11	16.37	16.69	16.01	16.99	16.66	15.96

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Germany should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Germany actually produced. An $ESR > RSR$ means that Germany had a Comparative Advantage in the relative sector.

Table 2.13: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Great Britain*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	3.96	-24.74	-32.62	-17.55	-30.36	-27.18	-23.41	-15.65	-0.12	-1.22	-1.46	-1.31	-1.46	-0.06	-0.05	-0.05	-0.18
	R	6.58	7.23	7.85	8.34	7.10	7.48	7.13	7.85	6.94	7.65	8.11	7.50	8.11	8.46	7.91	7.85	7.18
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.34	34.31	45.71	26.08	47.80	39.88	39.65	29.23	-0.76	-0.75	-0.63	-0.58	-0.48	-0.47	-0.41	-0.38	-0.05
	R	12.79	12.79	12.80	12.06	12.08	11.88	11.60	11.79	11.49	11.37	11.22	11.01	10.71	10.43	9.86	10.75	12.00
4	E	105.23	34.79	-2.40	-2.68	-2.72	-2.27	-2.38	-2.67	110.02	110.00	108.62	110.39	-1.89	-1.88	0.78	-1.93	12.18
	R	12.19	12.06	11.73	10.83	10.90	9.74	8.61	8.61	8.93	8.63	8.53	8.75	8.72	8.64	8.76	9.31	10.36
5	E	-1.15	-1.02	-1.03	-4.43	-1.85	-1.45	-1.41	104.72	108.86	107.31	103.83	104.76	105.36	104.92	103.84	104.25	103.60
	R	6.29	5.92	5.51	2.65	4.02	3.87	3.79	3.78	3.28	2.81	2.79	2.83	2.83	2.91	3.06	3.24	4.42
6	E	135.02	125.41	134.89	125.44	92.11	124.31	127.67	126.73	-27.83	126.04	104.71	89.03	125.14	-23.79	-25.62	-24.99	-21.67
	R	5.79	6.10	2.99	5.06	-3.09	1.89	3.89	5.30	5.89	6.46	6.80	6.75	6.65	7.00	7.36	7.48	7.16
7	E	-4.43	-6.56	-6.80	-6.13	-6.07	-5.52	-5.65	-5.03	-3.73	-3.79	-3.10	-2.85	-2.21	-1.97	-1.92	-2.08	-2.03
	R	17.99	18.18	17.70	18.21	17.84	16.43	16.71	16.78	16.99	16.56	15.69	15.11	15.39	15.12	14.94	15.09	14.82
8	E	-1.36	-1.34	-0.93	-4.30	-0.93	-1.04	-1.05	-0.88	-0.85	-1.49	-1.41	-1.29	-1.53	-1.23	-1.01	-0.77	-0.62
	R	9.71	12.12	8.76	10.78	10.86	12.23	10.35	9.62	9.69	10.92	11.02	8.39	8.32	7.78	7.07	7.96	8.63
9	E	-7.15	-5.12	-4.00	-3.29	-3.15	-3.37	-3.22	-3.17	-4.45	-4.66	-3.77	-2.98	-2.24	-1.98	-1.67	-1.45	-1.43
	R	16.50	16.64	16.13	16.98	15.99	15.04	15.27	14.65	14.50	15.05	13.00	12.50	11.60	11.41	11.43	10.43	10.99
10	E	-10.23	-14.65	-17.05	-12.46	-14.94	-15.11	-14.93	-13.43	-9.83	-9.79	-9.06	-6.80	-6.55	-6.38	-7.07	-8.73	-8.14
	R	15.29	15.72	14.62	15.53	15.46	14.22	14.40	12.86	12.66	11.83	12.32	13.05	13.04	12.39	12.58	12.33	12.96
11	E	-0.97	-2.06	-2.21	-1.51	-2.03	-2.11	-2.27	-2.00	-0.69	-1.11	-0.92	-0.82	-1.40	-1.26	-1.12	-0.65	-0.64
	R	9.99	9.80	9.71	9.45	9.39	8.96	8.85	8.60	9.00	9.45	9.15	8.76	8.58	8.56	9.25	10.09	10.16
12	E	-8.57	-9.90	-10.05	-10.71	-10.40	-10.36	-10.57	-9.95	-9.50	-9.69	-9.30	-8.97	45.12	/	/	/	/
	R	9.29	8.90	8.50	8.60	8.49	8.01	7.96	7.90	7.95	9.06	9.99	9.61	9.99	/	/	/	/
13	E	-1.24	-1.34	-1.39	-1.43	-2.01	-1.59	-1.63	-1.74	-1.66	-2.14	-2.07	-1.96	-2.14	-2.25	7.50	61.81	59.47
	R	11.87	12.04	11.72	11.29	9.61	9.46	9.53	8.90	9.11	8.65	8.97	8.32	8.12	7.91	8.60	9.86	10.49
14	E	-0.68	-0.74	-0.67	-1.18	-0.78	-0.80	-0.82	-0.75	15.82	-0.78	-0.68	-0.68	-0.70	-0.86	-1.10	-2.64	-2.42
	R	16.59	17.03	16.91	17.52	17.24	16.58	14.86	13.88	12.89	11.70	10.57	10.13	9.62	9.38	9.76	9.67	9.44
15	E	-0.69	-0.68	-0.66	-0.51	-0.51	-0.53	-0.60	-0.55	-0.53	-0.69	-0.66	-0.66	-0.64	-0.59	-0.77	-1.09	-1.06
	R	14.89	15.56	15.23	15.16	13.94	13.48	12.91	12.77	13.37	12.94	12.06	12.04	11.34	11.50	12.72	14.11	15.49
16	E	111.92	110.11	112.80	111.69	111.80	114.00	113.84	115.50	116.80	117.21	123.43	116.73	114.94	113.43	133.77	131.48	124.45
	R	12.97	13.36	12.97	13.26	12.83	12.23	12.19	12.91	12.86	14.02	13.63	13.20	12.80	12.58	13.16	13.90	15.01
17	E	-2.91	-3.42	-3.66	118.40	-4.45	-4.12	-4.02	-3.97	6.01	0.58	0.63	12.63	-4.45	-5.30	-4.02	-2.72	-3.12
	R	13.60	13.51	13.60	14.92	13.52	15.55	14.52	14.56	15.39	14.76	16.73	16.33	16.55	17.63	16.20	16.51	17.24

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Great Britain should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Great Britain actually produced. An $ESR > RSR$ means that Great Britain had a Comparative Advantage in the relative sector.

Table 2.14: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Greece*

Sector	E/R	Year 1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-0.47	-0.37	-0.38	-0.12	-0.29	-0.02	-0.01	-0.23	-0.06	0.00	0.00	-0.01	-0.01	-0.01	-9.57	-0.04	-5.43
	R	4.87	4.63	4.77	4.92	5.40	5.35	5.12	4.69	4.56	5.07	4.64	4.43	4.43	4.68	4.78	4.82	4.16
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.06	-0.05	-0.05	-0.02	-0.04	-0.01	-0.01	-0.17	-0.21	0.00	0.00	-0.01	-0.01	-0.01	18.41	0.05	10.65
	R	2.18	2.27	2.22	2.30	2.21	2.09	2.30	2.29	2.27	2.26	2.28	2.28	2.16	2.36	2.43	2.26	2.03
4	E	-0.41	-0.34	-0.30	-0.12	-0.21	-0.04	-0.05	-0.86	-0.05	-0.01	-0.02	-0.07	-0.04	-0.03	-0.10	-0.04	-0.13
	R	2.62	2.66	2.55	2.77	3.18	2.71	2.34	2.20	2.90	2.26	2.34	1.83	1.83	2.52	2.87	2.72	2.53
5	E	-0.03	-0.02	-0.02	-0.02	-0.02	-0.01	-0.01	-0.11	-3.63	0.00	0.00	0.00	0.00	0.00	-0.01	-0.01	-0.03
	R	1.04	1.09	0.94	1.04	0.99	0.98	1.10	0.80	0.53	0.84	1.01	0.99	0.99	0.99	1.09	1.05	0.96
6	E	-0.55	-0.45	-0.43	-0.26	-0.49	-0.17	-0.23	-1.72	-1.70	-0.03	-0.06	-0.23	-0.10	-0.08	-3.47	-0.19	-2.21
	R	1.86	1.81	1.64	1.65	2.43	1.62	1.06	0.64	0.83	0.54	0.70	0.30	0.18	0.21	0.25	0.09	0.17
7	E	-0.49	-0.39	-0.37	-0.19	-0.30	-0.11	-0.15	-0.23	-0.06	-0.03	-0.03	-0.10	-0.06	-0.07	-0.83	-0.13	-0.50
	R	1.08	1.05	0.93	0.96	1.06	0.94	1.01	1.06	1.12	0.94	0.93	0.91	0.96	0.93	1.09	0.97	0.88
8	E	-0.80	-0.76	-0.56	-1.12	-0.28	-1.01	-1.54	-1.84	-0.66	-0.08	-0.24	-1.44	-0.58	-0.11	-0.85	-0.69	-2.12
	R	2.42	2.93	2.00	2.78	2.78	3.01	2.66	2.64	3.06	3.06	3.21	2.99	3.38	3.03	3.24	2.29	1.39
9	E	-7.82	-6.26	-5.99	-1.71	-3.51	-0.12	-0.21	-0.47	-0.50	-0.02	-0.05	-0.17	-0.40	-0.64	-0.42	-0.17	-0.29
	R	0.72	0.73	0.71	0.79	0.90	0.73	0.46	0.47	0.62	0.80	0.64	0.49	0.57	0.72	0.78	0.63	0.65
10	E	139.15	136.31	123.15	33.65	115.06	-0.11	-0.27	-0.50	-0.12	-0.01	-0.04	-0.16	4.90	10.95	-1.26	-0.18	-0.84
	R	1.64	1.64	1.48	1.46	1.52	1.46	1.65	1.57	1.72	1.70	1.45	1.37	1.45	1.37	1.31	1.19	1.04
11	E	-0.32	-0.29	-0.29	57.00	-0.32	82.87	83.03	79.71	101.91	82.72	81.69	79.45	64.65	60.73	-1.92	72.96	-1.31
	R	2.22	2.42	2.49	2.60	2.62	2.52	2.56	2.36	3.00	2.81	2.73	2.60	2.47	2.21	1.67	1.57	1.39
12	E	-0.95	-0.76	-0.74	-0.45	-0.53	-0.29	-0.55	-1.25	-0.50	-0.03	-0.09	-0.28	-0.16	/	/	/	/
	R	0.82	0.81	0.81	1.10	1.43	1.25	0.85	0.84	1.47	2.12	1.91	1.88	1.84	/	/	/	/
13	E	-0.25	-0.22	-0.22	-0.46	-0.28	-0.38	-0.26	-0.43	-0.15	-0.01	-0.05	-0.18	-0.07	-0.05	-0.09	-0.23	-0.24
	R	0.13	0.13	0.11	0.09	0.10	0.16	0.26	0.23	0.30	0.34	0.32	0.30	0.31	0.31	0.30	0.24	0.21
14	E	-0.21	-0.23	-0.34	-1.91	-3.70	-3.13	-0.33	-0.40	-0.11	-0.01	-0.04	-0.15	-0.06	-0.04	-0.06	-0.20	-0.18
	R	0.34	0.25	0.13	-0.35	-2.02	-0.74	0.46	0.48	0.53	0.45	0.40	0.36	0.36	0.40	0.24	0.19	0.16
15	E	-0.02	-0.02	-0.02	-0.04	-0.06	-0.05	-0.08	-0.08	-0.03	0.00	-0.01	-0.06	-0.02	-0.02	-0.04	-0.08	-0.03
	R	0.22	0.22	0.19	0.21	0.13	0.17	0.18	0.23	0.24	0.23	0.24	0.25	0.24	0.25	0.25	0.20	0.18
16	E	-0.22	-0.18	-0.18	-0.14	-0.15	-0.12	-0.14	-0.18	-0.03	0.00	0.00	-0.02	-0.01	-0.01	-0.07	-0.02	-0.05
	R	1.03	1.03	0.98	0.98	1.00	1.04	1.06	0.86	0.87	1.04	0.95	0.89	0.89	1.39	1.52	1.42	1.27
17	E	-1.10	-0.91	-0.95	-1.02	-1.23	-1.20	-1.71	-2.65	-1.34	-0.10	-0.48	-1.66	-0.80	-0.45	-1.67	-1.69	15.38
	R	1.24	1.23	1.30	1.38	1.76	1.86	1.61	1.78	1.93	2.09	2.08	1.90	2.14	1.98	1.70	1.64	1.51

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Greece should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Greece actually produced. An $ESR > RSR$ means that Greece had a Comparative Advantage in the relative sector.

Table 2.15: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Hungary*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-17.40	-20.50	-18.89	-15.72	-0.19	-0.09	-0.06	-0.05	-0.14	-0.08	15.89	-0.11	-0.10	-0.14	-0.10	-0.11	-0.16
	R	1.81	1.64	1.79	1.86	1.83	1.84	2.72	2.29	0.25	3.14	3.22	3.02	2.33	3.54	3.39	3.32	4.49
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	21.58	24.02	20.34	18.01	-0.13	-0.03	-0.04	-0.03	-0.04	-0.03	-0.42	-0.04	-0.05	-0.05	-0.03	-0.03	-0.03
	R	3.08	3.21	2.63	2.46	2.39	2.37	1.85	1.82	1.99	1.61	1.56	1.62	1.53	1.48	1.43	1.38	1.42
4	E	-0.53	-0.21	-0.17	-0.53	-0.56	-0.14	-0.38	-0.35	-0.20	-0.17	-0.02	-0.13	-0.15	-0.17	-0.19	-0.21	-0.22
	R	1.22	1.37	1.29	1.36	1.29	1.20	1.32	1.14	1.26	1.07	0.86	0.78	0.59	0.54	0.52	0.51	0.55
5	E	-0.30	-0.13	-0.12	-0.32	-0.34	-0.14	-0.47	-0.59	-0.65	-0.49	-0.02	-0.14	-0.09	-0.10	-0.16	-0.34	-0.20
	R	1.37	1.54	1.58	1.56	1.45	1.21	1.16	0.74	0.60	0.39	0.43	0.65	0.83	0.66	0.86	0.34	1.57
6	E	-0.73	-0.47	-0.41	-0.56	-0.73	-0.29	-0.38	-0.29	-0.28	-0.24	-0.17	-0.94	-1.04	-1.15	-0.29	-0.38	-0.32
	R	0.97	1.00	0.91	0.84	1.01	0.99	1.14	1.01	1.12	1.05	1.03	1.07	0.95	1.01	0.84	0.81	0.71
7	E	-1.69	-1.28	-1.21	-1.63	-0.35	-0.18	-0.58	-0.56	-0.55	-0.45	-0.03	-0.20	-0.34	-0.40	-0.30	-0.39	-0.36
	R	0.68	0.68	0.79	0.81	0.86	0.85	0.97	0.94	1.07	1.03	1.05	0.98	0.92	0.89	0.98	0.98	0.97
8	E	130.48	-3.19	-1.85	122.56	118.79	-10.14	-1.04	-0.29	-0.36	-0.70	-0.61	-1.25	-1.45	-1.61	-0.36	-0.50	-0.46
	R	5.19	5.65	3.79	6.20	6.47	4.11	1.31	2.32	2.70	2.58	2.90	2.43	3.10	2.64	1.91	2.30	2.21
9	E	-3.74	-1.47	-1.25	-3.05	-1.34	-0.31	-0.97	-0.67	-0.68	-0.59	-0.43	-0.69	-0.91	-1.02	-0.51	-0.67	-0.70
	R	2.15	1.86	1.58	1.22	0.81	0.62	0.64	0.56	0.72	0.68	0.80	0.76	0.71	0.72	0.65	0.71	0.77
10	E	-2.19	-1.94	-1.93	-2.31	-0.83	-0.86	-3.95	-3.68	-3.47	-2.83	-0.15	-1.18	-0.96	-1.08	-1.49	-2.09	-1.99
	R	0.73	0.69	0.74	0.73	0.67	0.60	0.79	0.72	0.97	0.96	1.03	0.96	1.03	1.17	1.32	1.53	1.85
11	E	-0.96	-0.77	-0.66	-0.88	-0.32	-0.26	-0.77	-0.64	-0.73	-0.70	-0.07	46.21	60.21	64.60	-0.53	-0.66	-0.64
	R	0.91	0.93	0.91	1.01	0.92	0.92	0.97	0.92	0.98	0.97	1.13	1.26	1.30	1.62	1.39	1.25	1.28
12	E	-2.15	-1.01	-0.96	-2.07	-2.21	-1.36	-2.53	-2.03	-1.79	-1.61	-0.18	-1.13	-1.11	/	/	/	/
	R	0.90	0.89	0.76	0.51	0.42	0.49	0.63	0.47	0.60	0.60	0.48	0.61	0.39	/	/	/	/
13	E	-0.84	-0.16	-0.14	-0.86	-1.03	-0.32	-0.50	-0.50	-0.46	-0.40	-0.06	-0.34	-0.35	-0.42	22.03	25.82	24.82
	R	0.33	0.31	0.23	0.16	0.12	0.21	0.27	0.37	0.40	0.48	0.53	0.62	0.50	0.47	0.98	1.55	1.97
14	E	-0.34	-0.07	-0.07	-0.49	-1.02	0.21	21.25	19.71	19.74	15.80	-0.03	2.05	-0.18	-0.17	-1.41	-2.01	-1.80
	R	0.36	0.47	0.80	1.12	2.01	2.50	2.77	2.49	2.72	2.63	2.74	2.80	3.22	2.99	2.48	2.72	2.37
15	E	-0.08	-0.04	-0.03	-0.08	-0.10	-0.06	-0.16	-0.11	-0.12	-0.10	-0.02	-0.04	-0.09	-0.10	-0.39	-0.44	-0.47
	R	0.46	0.51	0.81	1.06	0.99	1.02	0.99	0.98	1.19	1.12	1.20	1.35	1.47	1.59	1.38	1.29	1.32
16	E	-0.17	-0.05	-0.05	-0.17	-0.17	-0.08	-0.22	-0.22	-0.21	-0.16	-0.01	-0.07	-0.08	-0.10	-0.18	-0.20	-0.19
	R	0.39	0.35	0.35	0.40	0.39	0.39	0.41	0.45	0.44	0.47	0.51	0.47	0.52	0.57	0.57	0.57	0.57
17	E	-11.62	-3.51	-2.77	-8.24	77.36	92.91	-0.73	-0.46	-0.48	4.46	-0.32	-2.41	-2.70	-2.81	-0.74	-0.82	-0.81
	R	4.61	4.36	4.18	3.97	4.49	4.54	4.30	3.73	3.62	3.73	3.33	3.87	3.45	3.20	3.09	3.17	3.02

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Hungary should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Hungary actually produced. An $ESR > RSR$ means that Hungary had a Comparative Advantage in the relative sector.

Table 2.16: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Ireland*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-0.08	-0.05	-0.15	-0.13	-0.15	-0.19	-0.17	-0.20	-0.22	-0.18	-0.06	-0.08	-0.05	-0.05	-0.13	-0.04	-0.05
	R	0.96	0.94	0.97	1.17	1.15	1.20	1.03	1.16	1.00	0.81	0.64	0.50	0.49	0.59	0.66	0.72	0.86
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.10	-0.18	-0.21	-0.18	-0.16	-0.21	-0.20	-0.20	-0.22	-0.21	-0.13	-0.12	-0.10	-0.06	-0.28	-0.04	-0.05
	R	1.52	1.49	1.44	1.33	1.35	1.40	1.61	1.57	1.85	1.93	1.97	2.07	2.19	2.11	2.28	2.50	2.47
4	E	-0.08	-0.14	-0.11	-0.07	-0.10	-0.12	-0.11	-0.09	-0.12	-0.16	-0.11	-0.24	-0.14	-0.11	-0.23	-0.10	-0.12
	R	0.60	0.60	0.57	0.50	0.42	0.36	0.40	0.38	0.41	0.36	0.37	0.43	0.34	0.34	0.35	0.34	0.36
5	E	-0.02	-0.03	-0.02	-0.05	-0.03	-0.04	-0.02	-0.05	-0.06	-0.07	-0.11	-0.23	-0.13	-0.06	-0.20	-0.03	-0.03
	R	0.43	0.31	0.33	0.28	0.26	0.27	0.25	0.25	0.25	0.25	0.26	0.22	0.25	0.27	0.33	0.33	0.32
6	E	-0.06	-0.42	-0.11	-0.08	-0.15	-0.13	-0.09	-0.06	-0.09	-0.10	-0.22	-0.27	-0.17	-0.12	-0.14	-0.17	-0.22
	R	0.70	0.76	0.88	0.91	1.12	0.93	0.83	0.91	1.15	1.18	1.39	1.39	1.39	1.13	1.14	1.40	1.45
7	E	-0.45	37.47	-0.65	-0.71	-0.98	-1.20	-1.20	-1.20	-1.40	-1.44	55.87	65.28	65.61	61.89	8.96	79.42	95.10
	R	2.32	2.77	3.05	3.35	3.69	3.92	2.99	3.11	3.34	3.76	4.14	4.68	4.96	5.19	5.20	6.42	6.69
8	E	-0.13	-0.07	-0.16	-0.16	-0.19	-0.31	-0.29	-0.24	-0.32	-0.55	-0.23	-0.23	-0.16	-0.14	-0.41	-0.12	-0.14
	R	0.10	0.11	0.12	0.16	0.11	0.11	0.18	0.15	0.13	0.19	0.21	0.29	0.47	0.33	0.34	0.25	0.19
9	E	43.62	0.63	53.67	66.28	68.85	82.02	83.32	82.44	79.48	77.45	-0.65	-1.11	-0.86	-0.67	82.44	-0.83	-1.04
	R	2.02	2.45	3.16	4.43	4.66	5.66	6.35	7.01	6.60	6.48	6.49	5.75	6.63	6.83	8.76	9.20	9.48
10	E	-0.31	-0.70	-0.55	-0.57	-0.62	-0.86	-0.62	-0.50	-0.62	-0.64	-0.28	-0.43	-0.36	-0.28	-1.08	-0.31	-0.37
	R	0.76	0.78	0.65	0.48	0.57	0.48	0.53	0.54	0.59	0.66	0.58	0.57	0.79	0.70	0.68	0.52	0.55
11	E	-0.14	-0.20	-0.22	-0.18	-0.20	-0.26	-0.20	-0.16	-0.18	-0.19	-0.24	-0.27	-0.13	-0.09	-0.25	-0.10	-0.12
	R	0.69	0.75	0.85	0.84	0.86	0.87	0.84	0.85	0.92	1.08	1.15	1.24	1.33	1.06	1.04	0.92	0.94
12	E	-0.13	-0.14	-0.21	-0.20	-0.28	-0.36	-0.30	-0.26	-0.29	-0.27	-0.12	-0.22	-0.15	/	/	/	/
	R	0.24	0.28	0.25	0.32	0.24	0.25	0.23	0.29	0.28	0.37	0.34	0.29	0.25	/	/	/	/
13	E	-0.08	-0.26	-0.11	-0.10	-0.14	-0.17	-0.13	-0.13	-0.19	-0.18	-0.09	-0.12	-0.13	-0.10	-0.16	-0.09	-0.13
	R	0.42	0.42	0.43	0.37	0.31	0.30	0.24	0.24	0.27	0.26	0.33	0.31	0.31	0.29	0.31	0.29	0.25
14	E	-0.17	-0.25	-0.19	-0.19	-0.25	-0.36	-0.36	-0.32	-0.36	-0.42	-0.66	-0.78	-0.55	-0.52	-0.57	-0.48	-0.55
	R	3.22	3.38	3.93	3.74	4.52	4.86	4.93	5.07	4.98	4.86	5.09	4.88	4.56	4.40	4.68	4.38	4.19
15	E	-0.01	-0.03	-0.02	-0.03	-0.03	-0.04	-0.04	-0.04	-0.04	-0.05	-0.04	-0.06	-0.06	-0.04	-0.08	-0.05	-0.06
	R	0.14	0.16	0.17	0.16	0.12	0.14	0.12	0.12	0.14	0.15	0.17	0.21	0.24	0.23	0.23	0.18	0.18
16	E	-0.04	-0.05	-0.06	-0.05	-0.06	-0.09	-0.10	-0.08	-0.10	-0.12	-0.06	-0.07	-0.07	-0.06	-0.14	-0.05	-0.06
	R	0.23	0.26	0.28	0.25	0.21	0.16	0.21	0.16	0.20	0.18	0.24	0.33	0.56	0.55	0.67	0.59	0.60
17	E	-0.14	-0.11	-0.20	-0.18	-0.22	-0.33	-0.34	-0.22	-0.28	-0.31	-0.17	-0.45	-0.34	-0.27	-0.62	-0.26	-0.36
	R	0.33	0.30	0.31	0.33	0.28	0.33	0.42	0.46	0.46	0.41	0.55	0.83	0.60	0.59	0.65	0.69	0.75

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Ireland should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Ireland actually produced. An $ESR > RSR$ means that Ireland had a Comparative Advantage in the relative sector.

Table 2.17: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Italy*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-0.77	-0.75	-22.05	-0.79	-0.68	-55.88	-13.93	-3.81	-30.71	-40.71	-42.70	-42.39	-41.92	-38.80	-25.33	-55.31	-19.34
	R	12.75	12.28	12.65	12.51	12.51	13.29	12.61	11.84	11.83	11.96	11.98	11.75	11.72	11.06	9.97	10.10	9.14
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.14	-0.13	23.15	-0.31	-0.15	66.02	16.45	4.45	36.44	53.61	58.47	59.43	59.79	57.62	41.30	85.99	31.97
	R	11.32	11.19	11.39	11.93	11.58	11.74	11.40	11.47	11.70	11.75	11.82	11.50	11.61	11.51	11.66	11.33	11.03
4	E	-0.59	-0.56	-0.51	-0.93	-0.93	-0.70	-0.89	-0.73	-1.39	-2.11	-1.25	-1.11	-0.89	-0.89	-0.86	-0.76	-0.83
	R	33.01	32.79	32.80	33.66	31.51	34.25	35.83	35.89	35.07	35.66	35.86	35.80	35.34	35.61	36.25	36.47	34.50
5	E	-1.94	-1.80	-1.90	29.13	-2.29	-1.86	12.82	-2.32	-2.67	-2.72	-2.15	-2.56	-2.24	-2.04	-1.83	-1.54	-1.53
	R	50.09	49.76	50.03	51.15	48.61	49.63	50.94	51.67	53.88	54.80	55.40	55.95	56.62	55.38	54.50	55.87	53.35
6	E	-2.53	-2.46	-2.83	-2.42	-3.79	-4.24	-3.31	-2.85	-4.50	-4.91	-4.48	-4.23	-3.98	-3.73	-2.97	-3.91	-3.43
	R	9.51	9.14	9.45	9.49	6.58	9.25	10.30	8.89	8.33	7.90	7.59	7.76	7.50	7.33	7.02	6.04	5.51
7	E	-3.67	-3.35	-3.27	-3.12	-3.14	-3.91	-3.27	-2.86	-3.73	-4.31	-3.85	-3.60	-3.65	-3.53	-2.87	-3.80	-2.13
	R	11.18	11.20	10.98	11.20	10.96	10.07	10.54	10.61	10.41	10.47	10.37	10.30	10.12	10.01	9.77	9.43	8.69
8	E	-1.17	-1.08	-0.99	-1.36	-1.15	-1.15	-1.07	-0.75	-0.92	-1.16	-1.05	-0.97	-0.87	-0.77	-0.64	-0.90	-0.84
	R	14.69	16.30	11.51	18.81	16.18	15.15	16.25	14.51	15.09	15.53	14.85	12.93	13.36	11.61	7.65	8.46	6.61
9	E	-4.69	-4.69	-4.82	-4.68	-4.28	-4.24	-3.93	-3.36	-6.68	-12.14	-5.50	-4.32	-2.97	-2.65	-2.40	-2.95	-2.46
	R	9.43	9.19	9.33	9.35	9.70	8.26	8.78	9.16	8.21	7.81	7.75	7.46	7.13	6.89	7.41	7.05	6.66
10	E	-18.68	-19.76	-17.13	-20.28	-20.33	-12.34	-16.57	-17.92	59.69	158.11	38.89	14.48	-9.36	-8.99	-8.53	-5.38	-5.89
	R	17.28	17.13	17.91	18.33	18.17	17.79	17.52	18.45	18.33	17.86	17.05	16.16	15.05	14.03	12.77	12.11	11.97
11	E	-4.78	-4.89	-5.29	-4.65	-4.89	-6.09	-5.46	-5.17	-5.17	-5.17	-5.48	-5.38	-5.39	-4.93	-3.96	-8.06	-4.59
	R	18.66	18.84	18.49	18.24	18.12	18.01	18.53	18.97	18.59	18.23	17.96	16.76	16.72	16.18	15.59	13.89	15.23
12	E	-66.63	-60.82	-43.59	-62.07	-64.49	-32.10	-54.79	-61.94	-53.49	-31.13	-37.44	-36.20	-38.41	/	/	/	/
	R	15.38	16.53	16.30	17.11	17.75	16.35	16.81	17.38	17.85	16.80	17.85	18.40	18.65	/	/	/	/
13	E	105.02	94.13	49.36	75.06	95.11	49.02	85.09	114.44	117.58	58.47	81.01	78.49	79.19	74.15	85.95	12.99	32.66
	R	23.42	23.19	23.41	23.16	23.73	23.35	22.97	23.27	23.44	23.35	22.67	22.23	21.56	20.49	19.88	19.22	18.84
14	E	112.52	115.04	116.18	117.42	99.13	35.41	72.74	64.37	-5.86	-3.77	-4.49	-4.28	-4.13	-3.89	-4.23	-1.27	-2.54
	R	16.14	15.69	15.43	14.84	13.89	12.41	12.96	13.28	13.03	12.94	12.63	12.17	11.91	11.06	10.33	9.83	8.82
15	E	-1.17	-1.16	-0.94	-1.17	-1.19	-0.77	-1.19	-1.38	-1.29	-1.21	-1.17	-1.14	-1.15	-1.10	-1.20	-0.36	-0.84
	R	11.84	11.35	11.49	10.70	10.43	10.50	9.83	9.85	9.04	8.86	8.27	8.60	8.67	8.40	8.38	7.42	6.57
16	E	-2.21	-1.85	-1.98	-2.22	-2.24	-1.77	-2.83	-3.42	-2.68	-2.26	-2.27	-2.19	-2.18	-2.07	-2.20	-1.25	-3.60
	R	24.41	24.03	23.61	22.94	23.20	23.61	22.73	23.08	23.18	22.57	22.55	22.64	22.39	21.33	21.72	21.90	21.28
17	E	-4.04	-3.89	-4.25	-3.88	-4.74	-6.23	-5.13	-4.91	-5.82	-6.54	-5.81	-6.06	-5.65	-5.44	4.03	7.10	-3.77
	R	11.03	10.77	10.84	10.84	13.12	12.42	11.68	11.91	11.93	11.86	11.57	11.63	11.53	11.57	12.26	12.10	11.40

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Italy should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Italy actually produced. An $ESR > RSR$ means that Italy had a Comparative Advantage in the relative sector.

Table 2.18: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Netherlands*

Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	26.81	-22.44	14.29	-28.69	-22.69	25.80	-41.26	-35.88	-40.65	-36.83	-34.50	-34.12	-34.47	-30.32	-25.10	-1.55	-3.63
	R	7.59	7.04	7.00	7.74	7.70	8.39	8.28	8.12	8.99	8.14	8.77	8.64	8.75	8.66	8.98	8.90	7.04
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-1.38	21.58	12.65	37.12	38.75	-0.73	49.16	48.18	47.72	48.22	47.96	47.72	47.77	46.45	41.67	-0.22	3.90
	R	7.25	7.32	7.20	7.17	7.16	7.11	6.92	6.96	6.85	6.84	6.86	6.86	6.81	6.94	7.15	7.16	7.31
4	E	-0.40	-0.50	-0.25	-0.31	-0.24	-0.15	-0.21	-0.25	-0.26	-0.23	-0.24	-0.21	-0.21	-0.21	-0.20	-0.68	-0.65
	R	2.14	2.08	2.06	2.04	2.11	2.13	2.08	2.06	2.08	1.98	2.03	2.11	2.19	2.14	2.16	2.31	2.46
5	E	-0.08	-0.09	-0.06	-0.10	-0.07	-0.09	-0.09	-0.09	-0.07	-0.09	-0.09	-0.08	-0.08	-0.06	-0.05	-0.12	-0.12
	R	0.70	0.66	0.67	0.66	0.58	0.65	0.60	0.62	0.67	0.71	0.75	0.75	0.78	0.81	0.88	0.94	0.92
6	E	-1.33	-1.56	-0.82	-1.05	-1.07	-0.56	-0.66	-0.56	-0.55	-0.54	-0.65	-0.57	-0.61	-0.57	-0.53	-1.02	-0.96
	R	3.64	3.73	3.87	3.85	4.63	3.49	3.74	3.44	3.28	3.20	3.34	3.36	3.26	3.37	3.56	2.94	3.02
7	E	-1.87	-3.60	-1.63	-3.03	-2.94	-0.72	-3.09	-3.14	-3.10	-2.92	-3.01	-2.75	-2.76	-2.67	-2.50	-1.58	-1.66
	R	4.96	4.99	5.07	5.34	5.13	4.87	4.87	4.80	4.68	4.66	4.66	4.66	4.71	4.66	4.84	4.72	4.56
8	E	-6.95	-9.27	-2.99	-2.50	-0.37	-0.54	-0.41	-0.54	-0.34	-0.43	-0.37	-0.35	-0.33	-0.29	129.63	123.51	126.32
	R	7.84	8.59	5.66	9.01	7.50	6.84	6.89	6.27	6.78	6.76	6.50	5.50	5.66	5.72	6.17	5.07	4.93
9	E	76.94	88.65	30.17	22.21	-1.31	-1.57	-1.26	-1.24	-1.26	-1.35	-1.18	-1.02	-0.98	-0.91	-1.67	138.49	136.21
	R	10.08	9.88	9.80	9.54	9.14	9.22	9.37	9.42	9.51	9.78	9.61	9.72	9.75	8.85	10.16	10.86	12.64
10	E	-2.78	-4.14	-1.89	-3.23	-2.62	-1.95	-2.85	-2.72	-2.68	-2.47	-2.64	-2.39	-2.16	-2.02	-1.93	-3.27	-3.22
	R	3.64	3.75	3.94	3.79	3.85	3.94	3.92	4.02	3.93	3.83	3.76	3.76	3.89	3.82	3.90	3.83	3.72
11	E	-0.72	-1.32	-0.65	-1.09	-1.04	-0.89	-1.18	-1.12	-1.11	-1.12	-1.12	-1.07	-1.02	-1.00	-0.93	-0.85	-0.82
	R	3.48	3.70	3.68	3.78	3.73	3.70	3.56	3.36	3.15	3.15	3.17	3.29	3.38	3.56	3.66	3.41	3.48
12	E	-1.88	-2.85	-1.32	-2.47	-2.10	-4.45	-2.12	-2.05	-2.00	-1.92	-1.95	-1.84	-1.79	/	/	/	/
	R	4.58	4.81	4.84	4.91	4.75	4.45	4.47	4.42	4.35	4.62	4.66	4.66	5.17	/	/	/	/
13	E	-0.94	-0.81	-0.53	-0.51	-0.48	-0.60	-0.27	-0.28	-0.28	-0.26	-0.28	-0.25	-0.21	-0.19	-0.24	-0.65	-0.60
	R	2.84	3.10	3.31	3.27	3.22	3.52	3.74	3.82	3.67	3.82	3.76	3.87	3.97	3.69	3.98	4.24	4.09
14	E	-1.15	-1.45	-0.63	-0.85	-0.62	31.23	-0.65	-0.53	-0.54	-0.57	-0.55	-0.46	-0.43	-0.42	-0.43	-1.14	-1.08
	R	5.02	5.16	5.25	5.07	4.95	4.80	4.48	4.30	4.25	4.12	4.08	3.97	3.63	3.61	3.78	3.74	3.73
15	E	-0.63	-0.83	-0.33	-0.33	-0.15	-1.27	-0.21	-0.19	-0.17	-0.15	-0.14	-0.12	-0.11	-0.12	-0.12	-1.08	-0.95
	R	1.75	1.70	1.60	1.80	1.69	1.56	1.64	1.66	1.56	1.51	1.52	1.51	1.70	1.70	1.24	1.33	1.61
16	E	-0.32	-0.54	-0.37	-0.50	-0.46	-0.29	-0.69	-0.72	-0.64	-0.60	-0.59	-0.56	-0.56	-0.53	-0.58	-0.99	-0.90
	R	4.88	5.19	5.26	5.34	5.42	5.36	5.23	5.27	5.30	5.15	5.18	5.14	5.24	5.26	5.47	5.52	5.26
17	E	-2.60	-2.51	-1.80	-1.59	-1.53	-1.28	-1.26	-1.21	-1.19	-1.17	-1.22	-1.31	-1.21	-1.11	-1.36	-3.31	-3.21
	R	3.89	4.07	3.96	3.87	4.27	4.43	4.68	4.59	4.49	4.39	4.16	4.05	3.98	3.86	4.23	3.84	3.82

(Column heads 1995–2011 are grouped under "Year".)

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Netherlands should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Netherlands actually produced. An $ESR > RSR$ means that Netherlands had a Comparative Advantage in the relative sector.

Table 2.19: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Poland*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-4.30	-3.69	-5.18	-5.68	-5.72	-6.14	-3.63	-3.49	-5.36	-3.53	-3.45	-3.78	-2.98	-5.88	-2.88	-17.61	-43.96
	R	11.24	10.61	10.05	10.17	10.23	5.24	9.74	9.58	9.46	9.37	7.98	6.88	7.21	7.04	7.90	7.48	6.10
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.10	-0.10	-0.14	-0.14	-0.18	-0.20	-0.14	-0.17	-0.18	-0.20	-0.25	-0.32	-0.37	3.06	-0.35	17.96	57.25
	R	3.88	4.50	5.02	5.28	4.76	5.25	5.51	5.42	5.69	5.91	6.28	7.13	7.71	8.29	8.21	8.56	8.92
4	E	-0.31	-0.35	-0.50	-0.53	-0.62	-0.33	-0.72	-0.95	-1.14	-1.09	-1.70	-2.25	-2.81	-2.80	-2.72	-2.80	-0.84
	R	2.32	2.43	2.56	2.57	2.39	2.31	2.27	2.36	2.43	2.64	2.55	2.94	3.10	3.46	3.71	3.68	3.87
5	E	-0.09	-0.14	-0.16	-0.10	-0.10	-0.12	-0.10	-0.11	-0.12	-0.10	-0.19	-0.23	-0.27	-0.29	-0.25	-0.34	-0.25
	R	1.71	1.97	2.06	1.97	2.06	1.78	1.66	1.81	1.69	1.70	1.61	1.90	2.05	2.34	2.74	2.66	3.22
6	E	-2.41	-2.74	-4.18	-4.54	-6.45	-2.42	-2.48	-3.53	-4.23	-4.26	-2.97	-3.16	-3.30	-3.79	-4.13	-3.64	-2.33
	R	5.12	5.50	5.95	6.52	8.70	7.66	7.01	6.89	7.22	7.98	8.22	8.95	9.55	10.25	10.83	12.04	12.30
7	E	100.37	87.00	122.65	124.73	125.06	121.86	115.61	123.76	122.51	122.42	65.52	54.22	54.47	57.86	71.78	35.50	18.44
	R	1.87	1.85	1.99	2.14	2.44	3.30	3.51	3.58	3.47	3.47	3.53	3.82	4.26	4.60	4.80	4.78	5.07
8	E	-0.62	-2.98	-1.12	-1.44	-1.44	-1.57	-0.98	-0.90	-1.18	-1.42	-2.58	-3.08	-3.43	-3.17	-2.87	-3.50	-2.76
	R	2.39	2.65	2.09	2.80	3.11	5.71	5.38	4.22	5.03	7.50	7.31	7.90	8.91	9.01	8.18	9.63	9.70
9	E	-1.82	-2.19	-2.50	-2.50	-2.07	-3.26	-3.41	-3.78	-4.94	-7.86	-9.26	-10.81	-12.54	-11.64	-11.00	-11.58	-2.44
	R	1.63	1.29	1.54	1.18	1.25	1.56	1.38	1.41	1.61	0.43	1.47	1.70	1.69	1.89	1.91	1.90	1.54
10	E	-1.95	-2.45	-3.23	-3.38	-3.39	-2.71	-2.63	-3.61	13.50	10.17	127.96	151.07	168.56	162.32	163.91	164.34	-6.22
	R	1.94	2.08	2.32	2.59	2.80	4.25	4.38	4.83	5.43	5.62	6.13	6.69	7.31	8.07	8.51	9.18	10.07
11	E	-0.12	-0.38	-0.27	-0.36	-0.41	-0.75	-0.54	-1.18	-0.92	-0.82	-2.59	-3.13	-3.62	-3.77	-3.88	-4.83	-2.02
	R	2.69	3.09	3.40	3.71	3.87	4.02	3.88	4.08	4.14	4.39	4.32	4.91	5.54	6.08	6.72	7.64	8.32
12	E	-0.40	-1.35	-1.00	-1.30	-1.10	-0.89	-0.58	-1.34	-0.87	-0.82	-2.24	-2.45	-2.86	/	/	/	/
	R	2.85	2.68	2.66	2.52	2.45	2.57	2.20	2.24	2.65	3.32	2.94	3.11	3.17	/	/	/	/
13	E	-0.32	-0.77	-0.63	-0.64	-0.49	-0.53	-0.61	-0.48	-0.64	-0.47	-0.53	-0.53	-0.53	-0.55	-0.61	-0.60	-0.53
	R	0.90	1.00	1.01	0.99	1.18	1.25	1.16	1.21	1.37	1.44	1.69	1.94	2.16	2.33	2.68	2.37	1.85
14	E	-0.18	-0.62	-0.43	-0.46	-0.47	-0.55	-0.25	5.61	-0.36	-0.35	-0.38	-0.38	-0.36	-0.38	-0.40	-0.46	-0.31
	R	1.34	1.47	1.55	1.66	1.76	1.66	1.69	1.85	2.04	1.97	2.03	2.19	2.29	2.41	2.59	2.60	2.05
15	E	-0.05	-0.12	-0.11	-0.20	-0.14	-0.08	-0.07	-0.09	-0.10	-0.10	-0.15	-0.17	-0.20	-0.21	-0.22	-0.25	-0.21
	R	1.07	1.26	1.42	1.47	1.84	1.79	1.62	1.60	1.98	2.52	2.65	2.93	3.17	3.48	4.19	3.70	4.02
16	E	-0.81	-0.86	-1.25	-1.17	-0.96	-0.48	-0.39	-0.49	-0.49	-0.43	-0.55	-0.63	-0.76	-0.81	-0.85	-0.79	-0.59
	R	2.08	2.29	2.94	2.94	3.01	2.85	3.11	3.24	4.28	4.74	4.68	5.35	5.99	6.35	6.84	6.61	7.52
17	E	-0.38	51.00	11.11	10.80	16.35	40.63	-3.45	-3.65	-3.58	-4.08	-3.75	-3.56	-3.59	-3.66	-3.15	-3.32	-3.43
	R	9.12	8.87	9.63	9.12	10.45	10.73	10.64	9.89	9.21	9.58	9.85	9.42	9.48	9.45	9.03	9.41	9.29

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Poland should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Poland actually produced. An $ESR > RSR$ means that Poland had a Comparative Advantage in the relative sector.

Table 2.20: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Portugal*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-2.05	-0.41	-0.48	-0.16	-0.15	-0.40	-0.22	-0.20	-0.14	-0.12	-0.06	-0.05	-0.06	-0.05	-0.06	-0.06	-0.05
	R	1.35	1.55	1.18	1.64	1.93	1.49	1.00	1.68	2.00	1.90	1.49	1.61	1.47	1.43	1.51	1.40	1.20
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.09	-0.15	-0.16	-0.26	-0.15	-0.03	-0.04	-0.04	-0.03	-0.04	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03
	R	2.28	2.19	2.14	1.80	1.82	1.93	1.90	1.76	1.76	1.79	1.84	1.97	2.11	2.16	2.03	2.19	2.13
4	E	-0.34	-0.64	-0.70	-0.79	-1.17	-0.78	-0.16	-0.19	-0.16	-0.16	-0.13	-0.11	-0.12	-0.11	-0.13	-0.13	-0.13
	R	5.11	5.05	5.25	5.27	4.48	4.54	4.72	4.70	4.64	4.66	4.58	4.30	4.12	4.27	4.25	4.17	4.12
5	E	-0.02	-0.06	-0.06	-0.10	-0.12	-0.44	-0.04	-0.04	-0.04	-0.03	-0.03	-0.02	-0.03	-0.02	-0.03	-0.03	-0.03
	R	6.29	6.32	6.41	6.17	5.68	5.94	5.47	5.76	5.63	5.42	5.33	5.04	4.88	5.24	5.49	5.39	5.26
6	E	-0.52	-0.23	-0.27	-0.33	-0.41	-0.61	-0.10	-0.27	-0.21	-0.21	-0.21	-0.21	-0.25	-0.22	-0.29	-0.30	-0.27
	R	3.84	4.11	4.76	4.69	5.24	3.91	3.94	3.69	3.70	3.36	3.38	2.98	2.81	2.94	2.84	2.55	2.37
7	E	23.37	-1.32	-1.35	-1.66	-2.89	-0.45	-0.48	-0.47	-0.47	-0.53	-0.56	-0.52	-0.63	-0.51	-0.43	-0.47	-0.42
	R	1.50	1.53	1.49	1.44	0.84	1.17	1.23	1.16	1.27	1.23	1.25	1.29	1.31	1.39	1.67	1.64	1.54
8	E	-1.39	-3.29	-3.69	-1.27	-3.13	-0.82	123.00	120.82	118.17	119.62	-8.36	-4.02	-5.04	-4.13	-4.22	-4.15	-3.29
	R	2.58	2.98	3.10	1.20	2.84	3.45	3.55	10.27	8.75	3.42	2.21	1.43	1.36	1.32	1.14	0.89	0.62
9	E	27.38	56.76	62.41	64.85	62.37	-10.66	-4.71	-5.65	-3.80	-4.23	-0.42	-0.39	-0.47	-0.38	-0.46	-0.48	-0.46
	R	0.32	0.28	0.36	0.42	0.45	0.15	0.28	0.12	0.23	0.36	0.39	0.34	0.35	0.40	0.29	0.22	0.20
10	E	-1.31	-1.26	-1.49	-1.79	-1.78	119.31	-0.27	-0.27	-0.28	-0.34	-0.28	-0.27	-0.34	-0.29	-0.36	-0.40	-0.35
	R	0.79	0.75	0.83	0.90	1.05	0.96	1.04	0.92	0.92	0.83	1.21	1.10	1.06	1.11	1.10	0.93	0.84
11	E	-0.18	-0.35	-0.40	-0.55	-0.55	-0.30	-0.28	-0.46	-0.38	-0.38	-0.38	-0.40	-0.49	-0.42	-0.57	-0.63	-0.56
	R	2.39	2.57	2.69	2.62	2.66	2.81	3.00	2.94	2.77	2.76	2.75	2.71	2.70	2.83	3.02	3.14	2.95
12	E	-0.94	-1.76	-2.06	-2.94	-2.95	-2.53	-0.58	-0.61	-0.57	-0.69	-0.66	-0.65	-0.83	/	/	/	/
	R	0.45	0.38	0.47	0.46	0.47	0.56	0.64	0.70	0.69	0.59	0.56	0.58	0.64	/	/	/	/
13	E	-0.07	-0.12	-0.14	-0.17	-0.18	-0.53	-0.24	-0.21	-0.20	-0.24	-0.24	-0.22	-0.28	-0.25	-0.37	-0.37	-0.34
	R	0.51	0.49	0.55	0.54	0.54	0.54	0.54	0.57	0.54	0.53	0.52	0.46	0.46	0.46	0.48	0.42	0.36
14	E	-0.02	-0.04	-0.04	-0.05	-0.06	-0.12	-1.04	-1.00	-1.19	-1.36	-1.47	-1.28	-1.42	-1.23	-1.81	-2.01	-1.79
	R	0.61	0.56	0.54	0.59	0.75	0.70	0.69	0.84	0.86	0.81	0.79	0.58	0.57	0.57	0.56	0.47	0.41
15	E	-0.01	-0.01	-0.02	-0.02	-0.02	-0.21	-0.03	-0.03	-0.03	-0.03	-0.03	-0.02	-0.03	-0.02	-0.03	-0.03	-0.03
	R	0.45	0.83	0.88	0.84	0.70	0.61	0.58	0.65	0.66	0.60	0.61	0.59	0.55	0.57	0.61	0.51	0.47
16	E	-0.17	-0.04	-0.05	-0.05	-0.05	-0.64	-0.07	-0.07	-0.06	-0.07	-0.07	-0.05	-0.06	-0.05	-0.06	-0.06	-0.05
	R	1.86	1.68	1.72	1.85	1.61	1.61	1.63	1.51	1.55	1.58	1.51	1.40	1.39	1.41	1.47	1.46	1.35
17	E	-1.25	-0.39	-0.46	-0.64	-0.72	-0.84	119.11	124.33	120.82	121.49	129.57	119.98	124.17	127.80	123.27	118.23	113.74
	R	1.24	1.24	1.30	1.39	1.74	1.91	1.92	1.90	1.85	1.88	1.89	2.00	2.12	2.15	2.03	2.01	1.95

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Portugal should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Portugal actually produced. An $ESR > RSR$ means that Portugal had a Comparative Advantage in the relative sector.

Table 2.21: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Spain*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	5.46	82.60	90.17	89.76	87.82	97.65	37.25	24.25	103.29	82.62	27.64	92.11	96.97	92.31	-0.05	0.04	0.00
	R	13.43	15.38	16.30	16.34	15.75	18.03	16.52	16.46	18.62	15.93	14.61	16.67	17.52	16.13	15.74	17.63	15.38
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	-0.20	-1.81	-1.97	-2.03	-2.07	-2.20	-1.03	-0.61	-2.42	2.41	-0.90	-2.71	-2.86	-2.86	-0.11	-0.09	-0.12
	R	11.22	11.11	11.39	11.67	11.20	10.85	11.39	11.53	11.37	11.76	11.74	11.15	11.10	11.05	11.42	11.36	11.03
4	E	-0.49	-0.12	-0.14	-0.16	-0.17	-0.19	-1.65	-1.79	-0.20	-0.28	-0.33	-0.23	-0.23	-0.21	-0.33	-0.39	-0.40
	R	8.21	8.38	8.72	8.55	9.51	9.29	9.18	9.49	9.53	9.18	9.44	9.54	9.24	9.15	8.56	7.95	7.55
5	E	-0.16	-0.08	-0.08	-0.09	-0.06	-0.10	-0.14	-0.11	-0.07	-0.10	-0.08	-0.09	-0.08	-0.07	-0.04	-0.04	-0.06
	R	12.25	12.79	13.25	14.56	14.42	14.17	13.93	14.61	14.50	14.16	14.24	13.71	13.46	14.11	13.56	13.18	13.22
6	E	-2.61	-0.64	-0.81	-0.90	-1.24	-0.81	-2.18	-2.19	-0.83	-1.32	-2.50	-0.75	-0.82	-0.78	-2.65	-2.67	-2.85
	R	6.18	6.30	5.94	5.84	7.53	6.02	5.84	6.15	6.17	5.07	6.03	6.18	5.80	6.28	5.90	5.36	5.13
7	E	-0.69	-0.07	-0.08	-0.11	-0.12	-0.29	-0.87	-1.03	-0.09	-0.32	-0.63	-0.23	-0.27	-0.11	-0.47	-0.43	-0.73
	R	6.72	6.69	6.49	5.44	4.86	7.73	7.87	8.16	8.17	7.89	8.60	8.45	8.26	7.94	8.06	7.63	7.42
8	E	-1.38	-0.69	-0.56	-0.71	-0.82	127.88	-1.94	-2.14	-0.93	-0.91	134.69	134.16	135.00	-1.13	-1.13	-1.37	-2.03
	R	8.97	11.14	8.46	10.01	13.60	11.19	9.18	8.17	7.10	7.44	8.66	10.46	12.93	12.68	11.44	13.85	15.14
9	E	-3.91	-1.18	-1.27	-1.47	-1.33	-2.13	-9.46	-9.33	-1.63	-1.60	-2.95	-1.59	-1.61	-1.34	-3.69	-3.48	-3.70
	R	6.59	6.57	6.08	6.37	6.55	6.19	6.29	6.06	6.11	6.02	6.46	6.35	6.60	6.38	6.72	6.53	6.59
10	E	-2.42	-0.50	-0.57	-0.63	-0.66	-1.13	173.09	184.55	-1.31	-1.73	-2.22	-0.98	-1.11	-1.10	-2.81	-2.78	-2.53
	R	4.61	4.92	4.69	4.80	4.88	4.99	5.22	5.30	5.08	4.83	4.78	4.58	4.53	4.78	4.63	4.03	4.18
11	E	-1.82	-0.09	-0.11	-0.11	-0.12	-0.32	39.18	42.71	-0.23	-0.59	41.59	-0.34	-0.40	-0.25	-2.02	-2.24	121.75
	R	12.06	11.69	12.37	13.18	13.84	13.89	15.89	16.48	16.45	16.40	17.35	17.34	17.21	16.74	15.59	15.24	13.30
12	E	135.16	-0.88	-0.94	-1.21	-1.44	-1.86	-4.42	-1.09	-1.31	-1.68	67.47	-1.87	-2.06	/	/	/	/
	R	7.41	7.56	7.54	7.32	8.11	7.30	7.15	7.57	7.71	7.74	8.05	8.06	7.81	/	/	/	/
13	E	-3.70	-0.15	-0.18	-0.19	-0.23	-0.55	-1.68	-2.02	-0.33	-0.38	-2.46	-0.61	-0.63	-0.34	-2.28	-1.95	-2.28
	R	3.10	3.44	3.41	3.81	3.69	4.05	4.02	4.21	4.05	3.89	3.89	4.07	3.98	4.06	4.34	3.66	3.48
14	E	-0.72	-0.03	-0.03	-0.04	-0.04	-0.10	-0.28	-0.52	-0.04	-0.05	-0.42	-0.11	-0.12	-0.04	-0.45	-0.46	-0.42
	R	5.46	5.75	5.47	5.57	5.31	5.10	5.29	4.57	4.98	4.79	4.75	4.59	4.26	4.05	3.90	3.29	2.76
15	E	-0.14	-0.10	-0.10	-0.12	-0.15	-0.16	-0.14	-0.16	-0.11	-0.08	-0.14	-0.15	-0.15	-0.12	-0.09	-0.08	-0.09
	R	8.69	8.63	8.84	8.67	8.59	8.78	8.65	8.74	8.77	8.43	8.26	8.19	8.13	8.05	8.15	7.12	6.72
16	E	-3.83	-0.05	-0.06	-0.06	-0.06	-0.09	-0.28	-0.78	-0.08	-0.11	-10.78	-0.16	-0.23	-0.19	-23.70	-19.77	-10.89
	R	9.20	9.55	9.84	10.09	10.15	9.55	9.65	9.79	9.97	10.30	10.15	9.81	9.41	9.27	9.40	8.78	7.63
17	E	-3.72	-0.49	-0.55	-0.58	-0.75	-4.40	-2.82	7.01	-0.70	-0.83	-3.80	-1.78	-1.84	-1.01	-4.30	-3.60	-4.98
	R	4.95	4.99	5.35	5.33	6.32	4.36	6.84	7.94	7.99	8.08	7.98	8.46	8.43	8.66	8.90	9.05	9.27

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Spain should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Spain actually produced. An $ESR > RSR$ means that Spain had a Comparative Advantage in the relative sector.

Table 2.22: Percentage Efficient Specialization Ratio (E) and Real Specialization Ratio (R) in Sweden*

		Year																
Sector	E/R	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	E	-0.27	-17.76	-2.30	-17.23	-12.51	-0.08	-0.09	-13.30	-14.28	-0.02	-0.02	-0.05	-0.03	-0.03	-0.03	-0.03	-0.03
	R	1.11	1.54	1.38	1.22	1.18	1.24	1.44	1.43	1.57	1.61	1.33	1.79	1.58	1.50	1.20	1.78	1.97
2	E	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
	R	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
3	E	0.01	24.67	2.64	23.90	18.47	-0.01	-0.04	23.03	22.43	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
	R	2.26	2.23	2.18	2.15	2.15	1.99	2.09	2.14	2.07	2.08	2.12	2.14	2.05	2.03	2.16	2.36	2.37
4	E	-0.02	-0.06	-0.02	-0.06	-0.07	-0.05	-0.04	-0.05	-0.04	-0.03	-0.04	-0.05	-0.05	-0.06	-0.05	-0.05	-0.05
	R	0.70	0.67	0.63	0.64	0.63	0.61	0.63	0.67	0.69	0.69	0.66	0.64	0.70	0.66	0.67	0.81	0.97
5	E	-0.02	-0.01	-0.01	-0.02	-0.02	-0.01	0.00	-0.01	-0.01	-0.04	-0.04	-0.06	-0.05	-0.05	-0.03	-0.04	-0.04
	R	0.26	0.25	0.23	0.14	0.20	0.25	0.28	0.28	0.33	0.37	0.41	0.41	0.42	0.37	-0.05	-0.06	-0.05
6	E	-8.44	-0.48	-10.39	-0.58	-4.07	-1.13	-2.28	-0.44	-0.40	-0.65	-0.92	-0.68	-0.67	-0.71	-0.66	-0.73	-0.68
	R	10.14	10.10	10.30	10.14	13.02	10.90	10.84	10.52	10.35	9.89	10.92	11.12	10.34	10.34	10.10	11.34	11.59
7	E	-0.55	-1.28	-0.60	-1.09	-1.15	-0.51	-0.44	-1.54	-1.20	-1.02	-1.14	-1.09	-0.90	-0.85	-0.80	-0.95	-0.89
	R	7.87	7.68	7.49	7.67	7.23	7.05	6.90	7.16	7.43	7.33	7.11	6.99	6.78	6.88	7.06	7.89	8.16
8	E	-5.98	-0.29	-3.58	-0.27	-1.11	-0.62	-0.88	-0.22	-0.25	-0.09	-0.10	-0.12	-0.11	-0.13	-0.10	-0.09	-0.08
	R	3.39	4.21	3.30	4.77	4.16	3.88	3.88	3.45	3.67	3.89	4.05	3.91	3.56	3.88	4.34	3.51	3.47
9	E	-1.48	-0.49	-1.42	-0.52	-0.81	-0.90	-0.74	-0.51	-0.49	-0.71	-0.75	-0.76	-0.71	-0.67	-0.62	-0.67	-0.64
	R	1.93	1.96	1.98	2.05	2.04	2.05	2.43	2.62	2.92	2.83	2.87	2.93	2.58	2.35	2.59	2.72	2.99
10	E	-0.41	-2.11	-0.57	-2.00	-1.66	-0.78	-0.70	-2.01	-2.11	-1.70	-1.92	-1.82	-1.92	-1.98	-1.70	-1.93	-1.92
	R	1.88	1.88	2.15	2.02	2.00	1.56	1.89	1.82	1.90	1.62	1.39	1.46	1.39	1.23	1.44	1.48	1.75
11	E	-0.39	-0.29	-0.33	-0.30	-0.34	-0.69	-0.62	-0.45	-0.49	-0.33	-0.43	-0.43	-0.51	-0.56	-0.53	-0.62	-0.64
	R	1.67	1.61	1.53	1.50	1.40	1.45	1.58	1.55	1.40	1.37	1.48	1.56	1.64	1.73	1.80	2.13	2.55
12	E	-1.47	-0.85	-1.44	-1.03	-1.21	51.92	47.70	-0.93	-1.01	-4.41	-3.96	-5.22	-5.32	/	/	/	/
	R	4.36	4.41	4.78	4.27	4.48	4.53	5.02	4.59	4.34	4.27	4.39	3.98	4.13	/	/	/	/
13	E	-0.72	-0.30	-0.66	-0.29	-0.45	-0.58	-0.60	-0.33	-0.30	-0.65	-0.70	-0.69	-0.85	-0.88	-0.79	-0.89	-0.94
	R	3.92	3.77	3.73	3.74	3.78	3.69	3.84	4.02	4.09	4.06	4.23	4.22	4.37	4.22	3.49	4.42	4.84
14	E	-0.58	-0.12	-0.44	-0.19	-0.34	-0.12	-0.34	-0.13	-0.06	37.78	40.26	41.31	40.39	40.84	41.14	48.63	52.56
	R	2.51	3.14	3.46	3.81	4.37	4.32	4.18	4.06	3.83	4.11	4.38	4.48	4.55	4.84	5.22	5.59	6.29
15	E	-0.12	-0.13	-0.14	-0.18	-0.24	-0.24	-0.22	-0.19	-0.18	-0.27	-0.29	-0.31	-0.32	-0.31	-0.27	-0.36	-0.42
	R	3.56	3.33	3.24	3.34	3.39	3.67	3.55	3.63	3.80	4.02	4.15	4.07	4.10	3.82	3.19	4.19	5.01
16	E	-0.18	-0.20	-0.22	-0.22	-0.16	-1.19	-1.25	-0.23	-0.22	-0.39	-0.43	-0.42	-0.41	-0.41	-0.39	-0.40	-0.34
	R	2.31	2.20	2.20	2.40	2.52	2.49	2.35	2.19	2.20	2.28	2.12	2.22	2.38	2.21	2.16	2.23	2.22
17	E	138.61	-0.75	117.23	-0.57	33.18	-1.24	13.62	-0.62	-0.57	-0.31	-0.27	-0.31	-0.28	-0.28	-0.26	-0.30	-0.33
	R	4.56	4.33	4.34	4.28	4.81	4.76	4.79	4.55	4.35	4.54	4.38	3.98	4.36	4.09	4.35	5.05	5.19

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that Sweden should have produced in order to realize the efficient specialization pattern, that is to say the pattern of specialization that would have placed the set of European countries considered here on their n-dimensional $NPPF$. The RSR is the share of European net output that Sweden actually produced. An $ESR > RSR$ means that Sweden had a Comparative Advantage in the relative sector.

2.B.2 Comparative Advantages ranking

The following Tables present the Efficient Specialization Ratio—see eq. 2.B.1—in another perspective. A Table represent a sector and in each column are reported the countries with the highest ESR. Presenting the data in this way offers allow to identify rapidly which countries that should play a leading role in specific sectors.

Aside the value in the ESR, a sign +, - or = has been reported in Tables 2.23-2.38. The sign specifies whether the country should have improved (+), lowered (-), or kept more or less constant (=) the net product. If the distance between the ESR and the RSR has been lower than the 20% of the RSR, the country has been considered to be close to its CA and an equals sign has been reported.

The results tend to be similar to those in Chapter 1, although some differences emerge. For example, Sector 1 is still dominated by France and Spain, but in this case Spain occupies the first position much more frequently. Another example is Sector 10—Rubber and Plastics—, in which Poland is a dominant country here during the period 2005-2010, a result that did not emerge in Tab. 1.31.

Table 2.23: Ranking of the Efficient Specialization Ratio (E) in Agriculture, Hunting, Forestry and Fishing*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	FRA	FRA	ESP	ESP	ESP	ESP	FRA	FRA	ESP	ESP	FRA	ESP	ESP	ESP	FRA	FRA	FRA
	135.97+	108.65+	90.17+	89.76+	87.82+	97.65+	126.82+	123.28+	103.29+	82.62+	97.73+	92.11+	96.97+	92.31+	132.55+	147.49+	141.70+
2	NLD	ESP	FRA	FRA	FRA	FRA	ESP	CZE	FRA	FRA	CZE	FRA	FRA	FRA	CZE	CZE	CZE
	26.81+	82.60+	60.34+	75.29+	64.43+	44.45+	37.25+	26.62+	50.30+	64.80+	31.63+	60.05+	49.49+	62.42+	26.12+	23.00+	26.15+
3	CZE	DNK	CZE	CZE	CZE	NLD	CZE	ESP	CZE	CZE	ESP	CZE	CZE	CZE	DNK	DNK	DNK
	24.07+	1.23=	20.22+	23.68+	23.00+	25.80+	20.38+	24.25+	30.89+	27.35+	27.64+	29.54+	25.30+	24.75+	11.88+	9.03+	10.02+
4	ESP	FIN	NLD	FIN	DNK	CZE	FIN	FIN	DNK	DNK	HUN	DNK	DNK	BEL	FIN	ESP	ESP
	5.46-	-0.01-	14.29+	-0.01+	0.14-	24.47+	-0.01-	-0.01+	10.57+	8.20+	15.89+	1.40+	9.55+	-0.00-	-0.02-	0.04-	0.00-
5	GBR	IRL	FIN	AUT	FIN	BEL	GRC	BEL	FIN	GRC	DNK	GRC	BEL	GRC	SWE	BEL	FIN
	3.96-	-0.05-	-0.01-	-0.10-	-0.01-	-0.01-	-0.01-	-0.04-	-0.01-	-0.00-	9.98+	-0.01-	-0.00-	-0.01-	-0.03-	-0.00-	-0.01-
6	DNK	AUT	AUT	GRC	AUT	GRC	AUT	AUT	AUT	SWE	GRC	BEL	GRC	DNK	ESP	FIN	AUT
	1.00=	-0.07-	-0.11-	-0.12-	-0.05-	-0.02-	-0.04-	-0.04-	-0.04-	-0.02-	-0.00-	-0.01-	-0.01-	-0.02-	-0.05-	-0.02-	-0.03-
7	FIN	CZE	BEL	IRL	PRT	FIN	BEL	HUN	GRC	FIN	SWE	AUT	FIN	FIN	GBR	AUT	SWE
	-0.01-	-0.08-	-0.12-	-0.13-	-0.15-	-0.03+	-0.05-	-0.05-	-0.06-	-0.02-	-0.02-	-0.02-	-0.02-	-0.03-	-0.05-	-0.03-	-0.03-
8	BEL	BEL	IRL	PRT	IRL	SWE	HUN	PRT	GBR	AUT	FIN	FIN	AUT	SWE	PRT	SWE	IRL
	-0.01-	-0.12-	-0.15-	-0.16-	-0.15-	-0.08-	-0.06-	-0.20-	-0.12-	-0.05-	-0.02-	-0.04-	-0.02-	-0.03-	-0.06-	-0.03-	-0.05-
9	AUT	GRC	DNK	DNK	HUN	HUN	SWE	IRL	PRT	BEL	AUT	SWE	SWE	AUT	HUN	GRC	BEL
	-0.05-	-0.37-	-0.34-	-0.27-	-0.19-	-0.09-	-0.09-	-0.20-	-0.14-	-0.05+	-0.04-	-0.05-	-0.03-	-0.03-	-0.10-	-0.04-	-0.05-
10	IRL	PRT	GRC	BEL	BEL	IRL	IRL	GRC	HUN	HUN	IRL	PRT	IRL	IRL	IRL	IRL	PRT
	-0.08-	-0.41-	-0.38-	-0.31-	-0.20-	-0.19-	-0.17-	-0.23-	-0.14-	-0.08-	-0.06-	-0.05-	-0.05-	-0.05-	-0.13-	-0.04-	-0.05-
11	SWE	ITA	PRT	ITA	GRC	AUT	PRT	DNK	IRL	PRT	PRT	IRL	PRT	PRT	DEU	GBR	HUN
	-0.27-	-0.75-	-0.48-	-0.79-	-0.29-	-0.28-	-0.22-	-0.24-	-0.22-	-0.12-	-0.06-	-0.08-	-0.06-	-0.05-	-0.65-	-0.05-	-0.16-
12	GRC	DEU	SWE	DEU	ITA	DNK	DNK	DEU	DEU	DEU	DEU	HUN	HUN	GBR	AUT	PRT	GBR
	-0.47-	-1.51-	-2.30-	-1.98-	-0.68-	-0.40-	-0.29-	-1.00-	-0.45-	-0.17-	-0.21-	-0.11-	-0.10-	-0.06-	-1.73-	-0.06-	-0.18-
13	ITA	POL	DEU	POL	DEU	PRT	DEU	POL	BEL	IRL	BEL	DEU	DEU	HUN	POL	HUN	NLD
	-0.77-	-3.69-	-2.39-	-5.68-	-2.40-	-0.40-	-1.29-	-3.49-	-2.88-	-0.18-	-0.35-	-1.15-	-0.18-	-0.14-	-2.88-	-0.11-	-3.63-
14	PRT	SWE	POL	HUN	POL	DEU	POL	ITA	POL	GBR	GBR	GBR	GBR	DEU	BEL	NLD	DEU
	-2.05-	-17.76-	-5.18-	-15.72-	-5.72-	-1.68-	-3.63-	-3.81-	-5.36-	-1.22-	-1.46-	-1.31-	-1.46-	-4.04-	-4.84-	-1.55-	-4.94-
15	POL	HUN	HUN	SWE	SWE	POL	ITA	SWE	SWE	POL	POL	POL	POL	POL	GRC	DEU	GRC
	-4.30-	-20.50-	-18.89-	-17.23-	-12.51-	-6.14-	-13.93-	-13.30-	-14.28-	-3.53-	-3.45-	-3.78-	-2.98-	-5.88-	-9.57-	-4.70-	-5.43-
16	HUN	NLD	ITA	GBR	NLD	GBR	GBR	GBR	ITA	NLD	NLD	NLD	NLD	NLD	NLD	POL	ITA
	-17.40-	-22.44-	-22.05-	-17.55-	-22.69-	-27.18-	-23.41-	-15.65-	-30.71-	-36.83-	-34.50-	-34.12-	-34.47-	-30.32-	-25.10-	-17.61-	-19.34-
17	DEU	GBR	GBR	NLD	GBR	ITA	NLD	NLD	NLD	ITA	ITA	ITA	ITA	ITA	ITA	ITA	POL
	-71.86-	-24.74-	-32.62-	-28.69-	-30.36-	-55.88-	-41.26-	-35.88-	-40.65-	-40.71-	-42.70-	-42.39-	-41.92-	-38.80-	-25.33-	-55.31-	-43.96-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.24: Ranking of the Efficient Specialization Ratio (E) in Food, Beverages and Tobacco*

									Year								
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	DEU	GBR	GBR	NLD	GBR	ITA	NLD	NLD	NLD	ITA	ITA	ITA	ITA	ITA	NLD	ITA	POL
	83.29+	34.31+	45.71+	37.12+	47.80+	66.02+	49.16+	48.18+	47.72+	53.61+	58.47+	59.43+	59.79+	57.62+	41.67+	85.99+	57.25+
2	HUN	SWE	ITA	GBR	NLD	GBR	GBR	GBR	ITA	NLD	NLD	NLD	NLD	NLD	ITA	POL	ITA
	21.58+	24.67+	23.15+	26.08+	38.75+	39.88+	39.65+	29.23+	36.44+	48.22+	47.96+	47.72+	47.77+	46.45+	41.30+	17.96+	31.97+
3	SWE	HUN	HUN	SWE	SWE	GRC	ITA	SWE	SWE	ESP	GRC	GRC	GRC	POL	GRC	GRC	GRC
	0.01-	24.02+	20.34+	23.90+	18.47+	-0.01-	16.45+	23.03+	22.43+	2.41-	-0.00-	-0.01-	-0.01-	3.06-	18.41+	0.05-	10.65+
4	AUT	NLD	NLD	HUN	AUT	SWE	GRC	ITA	AUT	GRC	PRT	PRT	PRT	GRC	BEL	HUN	NLD
	-0.02-	21.58+	12.65+	18.01+	-0.02-	-0.01-	-0.01-	4.45-	-0.03-	-0.00-	-0.03-	-0.03-	-0.04-	-0.01-	4.39+	-0.03-	3.90-
5	BEL	AUT	SWE	GRC	GRC	PRT	AUT	AUT	PRT	HUN	AUT	AUT	SWE	DNK	HUN	AUT	HUN
	-0.04-	-0.03-	2.64+	-0.02-	-0.04-	-0.03-	-0.03-	-0.03-	-0.03-	-0.03-	-0.03-	-0.03-	-0.04-	-0.02-	-0.03-	-0.03-	-0.03-
6	GRC	CZE	AUT	AUT	BEL	HUN	PRT	HUN	HUN	PRT	SWE	FIN	AUT	PRT	PRT	PRT	PRT
	-0.06-	-0.03-	-0.03-	-0.03-	-0.05-	-0.03-	-0.04-	-0.03-	-0.04-	-0.04-	-0.04-	-0.04-	-0.04-	-0.03-	-0.03-	-0.03-	-0.03-
7	FIN	GRC	GRC	BEL	DNK	AUT	SWE	PRT	BEL	SWE	BEL	SWE	FIN	SWE	SWE	FIN	AUT
	-0.07-	-0.05-	-0.05-	-0.09-	-0.11-	-0.03-	-0.04-	-0.04-	-0.05-	-0.04-	-0.05-	-0.04-	-0.05-	-0.04-	-0.04-	-0.04-	-0.03-
8	PRT	BEL	BEL	FIN	FIN	BEL	HUN	BEL	FIN	BEL	IRL	HUN	HUN	HUN	FIN	IRL	FIN
	-0.09-	-0.05-	-0.05-	-0.10-	-0.11-	-0.06-	-0.04-	-0.04-	-0.15-	-0.06-	-0.13-	-0.04-	-0.05-	-0.05-	-0.05-	-0.04-	-0.04-
9	POL	FIN	FIN	DNK	HUN	FIN	BEL	DNK	POL	AUT	FIN	BEL	BEL	BEL	AUT	SWE	SWE
	-0.10-	-0.09-	-0.09-	-0.13-	-0.13-	-0.16-	-0.05-	-0.06-	-0.18-	-0.07-	-0.19-	-0.05-	-0.05-	-0.05-	-0.08-	-0.04-	-0.04-
10	IRL	POL	POL	POL	PRT	DNK	POL	POL	GRC	FIN	POL	DNK	IRL	FIN	ESP	BEL	BEL
	-0.10-	-0.10-	-0.14-	-0.14-	-0.15-	-0.17-	-0.14-	-0.17-	-0.21-	-0.16-	-0.25-	-0.07-	-0.10-	-0.05-	-0.11-	-0.04-	-0.04-
11	ITA	ITA	PRT	IRL	ITA	POL	FIN	GRC	IRL	POL	DNK	IRL	DNK	AUT	DEU	ESP	GBR
	-0.14-	-0.13-	-0.16-	-0.18-	-0.15-	-0.20-	-0.16-	-0.17-	-0.22-	-0.20-	-0.27-	-0.12-	-0.29-	-0.06-	-0.27-	-0.09-	-0.05-
12	ESP	PRT	DNK	PRT	IRL	IRL	IRL	FIN	DNK	DEU	DEU	DEU	DEU	IRL	IRL	DNK	IRL
	-0.20-	-0.15-	-0.20-	-0.26-	-0.16-	-0.21-	-0.20-	-0.20-	-0.26-	-0.21-	-0.34-	-0.28-	-0.33-	-0.06-	-0.28-	-0.18-	-0.05-
13	DNK	IRL	IRL	DEU	POL	DEU	DNK	IRL	DEU	IRL	HUN	POL	POL	DEU	DNK	NLD	ESP
	-0.32-	-0.18-	-0.21-	-0.30-	-0.18-	-0.30-	-0.23-	-0.20-	-0.26-	-0.21-	-0.42-	-0.32-	-0.37-	-0.34-	-0.31-	-0.22-	-0.12-
14	GBR	DEU	DEU	ITA	DEU	CZE	DEU	DEU	CZE	DNK	CZE	GBR	GBR	GBR	POL	DEU	DNK
	-0.34-	-0.27-	-0.26-	-0.31-	-0.24-	-0.71-	-0.42-	-0.36-	-0.70-	-0.24-	-0.60-	-0.58-	-0.48-	-0.47-	-0.35-	-0.27-	-0.18-
15	CZE	DNK	CZE	CZE	CZE	NLD	CZE	ESP	GBR	CZE	GBR	CZE	CZE	CZE	GBR	GBR	DEU
	-0.45-	-0.39-	-0.56-	-0.60-	-0.59-	-0.73-	-0.59-	-0.61-	-0.76-	-0.66-	-0.63-	-0.60-	-0.55-	-0.55-	-0.41-	-0.38-	-0.27-
16	NLD	FRA	FRA	FRA	FRA	FRA	ESP	CZE	FRA	GBR	ESP	FRA	FRA	FRA	CZE	CZE	CZE
	-1.38-	-1.33-	-0.77-	-0.94-	-1.03-	-1.05-	-1.03-	-0.74-	-1.29-	-0.75-	-0.90-	-2.23-	-2.30-	-2.54-	-0.66-	-0.55-	-0.68-
17	FRA	ESP	ESP	ESP	ESP	ESP	FRA	FRA	ESP	FRA	FRA	ESP	ESP	ESP	FRA	FRA	FRA
	-1.58-	-1.81-	-1.97-	-2.03-	-2.07-	-2.20-	-2.29-	-2.23-	-2.42-	-1.57-	-2.54-	-2.71-	-2.86-	-2.86-	-3.16-	-2.06-	-2.19-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.25: Ranking of the Efficient Specialization Ratio (E) in Textiles and Textile Production*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	GBR	DEU	DEU	DEU	DEU	DEU	DEU	DEU	GBR	GBR	GBR	GBR	FRA	FRA	DEU	DEU	DEU
	105.23+	70.20+	108.20+	109.85+	110.61+	107.95+	108.41+	88.02+	110.02+	110.00+	108.62+	110.39+	108.64+	108.64+	105.82+	107.90+	91.98+
2	SWE	GBR	FIN	CZE	DNK	DNK	SWE	DNK	DNK	GRC	HUN	FIN	DNK	FIN	GBR	DNK	GBR
	-0.02-	34.79+	-0.02-	-0.02-	0.86=	1.30+	-0.04-	21.34+	-0.03-	-0.01-	-0.02-	-0.03-	-0.02-	-0.03-	0.78-	-0.02-	12.18=
3	CZE	FIN	SWE	FIN	CZE	CZE	GRC	SWE	SWE	SWE	GRC	SWE	FIN	GRC	DNK	FIN	DNK
	-0.02-	-0.02-	-0.02-	-0.02-	-0.02-	-0.02-	-0.05-	-0.05-	-0.04-	-0.03-	-0.02-	-0.05-	-0.03-	-0.03-	-0.01-	-0.02-	-0.01-
4	BEL	SWE	CZE	SWE	FIN	GRC	AUT	FIN	GRC	DNK	DNK	CZE	GRC	DNK	FIN	GRC	FIN
	-0.04-	-0.06-	-0.02-	-0.06-	-0.07-	-0.04-	-0.09-	-0.08-	-0.05-	-0.04-	-0.02-	-0.06-	-0.04-	-0.04-	-0.03-	-0.04-	-0.02-
5	FIN	CZE	DNK	IRL	SWE	SWE	IRL	IRL	IRL	CZE	SWE	GRC	SWE	SWE	SWE	SWE	SWE
	-0.04-	-0.09-	-0.07-	-0.07-	-0.07-	-0.05-	-0.11-	-0.09-	-0.12-	-0.08-	-0.04-	-0.07-	-0.05-	-0.06-	-0.05-	-0.05-	-0.05-
6	IRL	ESP	IRL	AUT	IRL	IRL	FIN	AUT	AUT	BEL	CZE	BEL	CZE	CZE	CZE	CZE	CZE
	-0.08-	-0.12-	-0.11-	-0.10-	-0.10-	-0.12-	-0.13-	-0.09-	-0.13-	-0.14-	-0.04-	-0.10-	-0.05-	-0.06-	-0.06-	-0.07-	-0.09-
7	AUT	AUT	ESP	GRC	AUT	BEL	BEL	CZE	BEL	PRT	AUT	PRT	BEL	BEL	GRC	BEL	BEL
	-0.10-	-0.14-	-0.14-	-0.12-	-0.13-	-0.13-	-0.14-	-0.12-	-0.13-	-0.16-	-0.10-	-0.11-	-0.11-	-0.10-	-0.10-	-0.09-	-0.10-
8	FRA	IRL	AUT	ESP	ESP	FIN	CZE	BEL	CZE	IRL	IRL	AUT	PRT	IRL	PRT	IRL	IRL
	-0.17-	-0.14-	-0.16-	-0.16-	-0.17-	-0.13-	-0.15-	-0.13-	-0.14-	-0.16-	-0.11-	-0.13-	-0.12-	-0.11-	-0.13-	-0.10-	-0.12-
9	POL	HUN	HUN	DNK	GRC	HUN	PRT	PRT	PRT	FIN	BEL	HUN	IRL	PRT	HUN	PRT	GRC
	-0.31-	-0.21-	-0.17-	-0.16-	-0.21-	-0.14-	-0.16-	-0.19-	-0.16-	-0.16-	-0.12-	-0.13-	-0.14-	-0.11-	-0.19-	-0.13-	-0.13-
10	PRT	GRC	NLD	NLD	NLD	NLD	NLD	NLD	FIN	HUN	FIN	DNK	HUN	HUN	NLD	AUT	PRT
	-0.34-	-0.34-	-0.25-	-0.31-	-0.24-	-0.15-	-0.21-	-0.25-	-0.19-	-0.17-	-0.13-	-0.17-	-0.15-	-0.17-	-0.20-	-0.14-	-0.13-
11	NLD	POL	GRC	POL	HUN	ESP	DNK	HUN	ESP	NLD	PRT	NLD	AUT	AUT	IRL	HUN	AUT
	-0.40-	-0.35-	-0.30-	-0.53-	-0.56-	-0.19-	-0.26-	-0.35-	-0.20-	-0.23-	-0.13-	-0.21-	-0.15-	-0.20-	-0.23-	-0.21-	-0.15-
12	GRC	BEL	BEL	HUN	POL	POL	HUN	ITA	HUN	ESP	NLD	ESP	NLD	NLD	BEL	ESP	HUN
	-0.41-	-0.37-	-0.42-	-0.53-	-0.62-	-0.33-	-0.38-	-0.73-	-0.20-	-0.28-	-0.24-	-0.23-	-0.21-	-0.21-	-0.24-	-0.39-	-0.22-
13	DNK	NLD	POL	PRT	BEL	AUT	POL	GRC	NLD	AUT	ESP	IRL	ESP	ESP	AUT	FRA	ESP
	-0.42-	-0.50-	-0.50-	-0.79-	-0.67-	-0.40-	-0.72-	-0.86-	-0.26-	-0.52-	-0.33-	-0.24-	-0.23-	-0.21-	-0.24-	-0.47-	-0.40-
14	ESP	DNK	ITA	ITA	ITA	ITA	ITA	POL	POL	DEU	ITA	ITA	ITA	ITA	ESP	NLD	FRA
	-0.49-	-0.52-	-0.51-	-0.93-	-0.93-	-0.70-	-0.89-	-0.95-	-1.14-	-0.68-	-1.25-	-1.11-	-0.89-	-0.89-	-0.33-	-0.68-	-0.41-
15	HUN	ITA	PRT	BEL	PRT	PRT	FRA	FRA	ITA	POL	POL	DEU	DEU	DEU	ITA	ITA	NLD
	-0.53-	-0.56-	-0.70-	-1.20-	-1.17-	-0.78-	-1.05-	-1.02-	-1.39-	-1.09-	-1.70-	-1.50-	-1.75-	-1.76-	-0.86-	-0.76-	-0.65-
16	ITA	PRT	GBR	FRA	GBR	GBR	ESP	ESP	DEU	ITA	DEU	POL	GBR	GBR	FRA	GBR	ITA
	-0.59-	-0.64-	-2.40-	-2.15-	-2.72-	-2.27-	-1.65-	-1.79-	-1.40-	-2.11-	-2.04-	-2.25-	-1.89-	-1.88-	-1.22-	-1.93-	-0.83-
17	DEU	FRA	FRA	GBR	FRA	FRA	GBR	GBR	FRA	FRA	FRA	FRA	POL	POL	POL	POL	POL
	-1.26-	-0.92-	-2.41-	-2.68-	-3.78-	-3.83-	-2.38-	-2.67-	-4.45-	-4.14-	-2.34-	-3.99-	-2.81-	-2.80-	-2.72-	-2.80-	-0.84-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.26: Ranking of the Efficient Specialization Ratio (E) in Leather, Leather and Footwear*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	DNK	DNK	DNK	DNK	DNK	DNK	DNK	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR
	104.54+	104.34+	104.55+	77.43+	106.34+	105.55+	90.62+	104.72+	108.86+	107.31+	103.83+	104.76+	105.36+	104.92+	103.84+	104.25+	103.60+
2	BEL	SWE	FIN	ITA	CZE	CZE	ITA	DNK	DNK	DNK	GRC	GRC	GRC	GRC	DNK	GRC	DNK
	-0.01-	-0.01-	-0.01-	29.13-	-0.01-	-0.00-	12.82-	0.02-	-0.00-	0.00-	-0.00-	-0.00-	-0.00-	-0.00-	-0.00-	-0.01-	-0.00-
3	FIN	FIN	SWE	FIN	FIN	SWE	SWE	FIN	SWE	GRC	DNK	CZE	DNK	CZE	CZE	DNK	CZE
	-0.01-	-0.01-	-0.01-	-0.01-	-0.01-	-0.01-	-0.00-	-0.01-	-0.01-	-0.00-	-0.00-	-0.02-	-0.01-	-0.02-	-0.01-	-0.01-	-0.01-
4	CZE	BEL	CZE	CZE	GRC	GRC	GRC	SWE	FIN	FIN	CZE	PRT	CZE	PRT	GRC	CZE	BEL
	-0.02-	-0.02-	-0.02-	-0.01-	-0.02-	-0.01-	-0.01-	-0.01-	-0.01-	-0.01-	-0.01-	-0.02-	-0.02-	-0.02-	-0.01-	-0.02-	-0.02-
5	SWE	GRC	BEL	GRC	SWE	FIN	FIN	AUT	PRT	CZE	HUN	DNK	PRT	BEL	PRT	IRL	PRT
	-0.02-	-0.02-	-0.02-	-0.02-	-0.02-	-0.01-	-0.01-	-0.03-	-0.04-	-0.02-	-0.02-	-0.03-	-0.03-	-0.03-	-0.03-	-0.03-	-0.03-
6	PRT	IRL	GRC	SWE	BEL	AUT	IRL	PRT	IRL	PRT	FIN	BEL	BEL	DNK	SWE	BEL	GRC
	-0.02-	-0.03-	-0.02-	-0.02-	-0.03-	-0.02-	-0.02-	-0.04-	-0.06-	-0.03-	-0.02-	-0.03-	-0.04-	-0.03-	-0.03+	-0.03-	-0.03-
7	IRL	AUT	IRL	BEL	IRL	IRL	CZE	IRL	BEL	SWE	PRT	SWE	SWE	SWE	ESP	PRT	IRL
	-0.02-	-0.03-	-0.02-	-0.04-	-0.03-	-0.04-	-0.03-	-0.05-	-0.06-	-0.04-	-0.03-	-0.06-	-0.05-	-0.05-	-0.04-	-0.03-	-0.03-
8	GRC	CZE	AUT	AUT	AUT	BEL	AUT	BEL	ESP	BEL	BEL	AUT	NLD	IRL	BEL	SWE	SWE
	-0.03-	-0.04-	-0.03-	-0.05-	-0.05-	-0.07-	-0.04-	-0.05-	-0.07-	-0.06-	-0.03-	-0.06-	-0.08-	-0.06-	-0.04-	-0.04+	-0.04+
9	AUT	PRT	NLD	IRL	ESP	NLD	PRT	NLD	NLD	IRL	SWE	NLD	ESP	NLD	NLD	ESP	FIN
	-0.04-	-0.06-	-0.06-	-0.05-	-0.06-	-0.09-	-0.04-	-0.09-	-0.07-	-0.07-	-0.04-	-0.08-	-0.08-	-0.06-	-0.05-	-0.04-	-0.04-
10	FRA	ESP	PRT	ESP	NLD	ESP	BEL	POL	AUT	NLD	AUT	ESP	HUN	ESP	AUT	FIN	AUT
	-0.08-	-0.08-	-0.06-	-0.09-	-0.07-	-0.10-	-0.05-	-0.11-	-0.08-	-0.09-	-0.06-	-0.09-	-0.09-	-0.07-	-0.06-	-0.06-	-0.05-
11	NLD	NLD	ESP	POL	POL	POL	NLD	GRC	CZE	POL	ESP	FIN	FIN	HUN	FIN	NLD	ESP
	-0.08-	-0.09-	-0.08-	-0.10-	-0.10-	-0.12-	-0.09-	-0.11-	-0.10-	-0.10-	-0.08-	-0.12-	-0.09-	-0.10-	-0.07-	-0.12-	-0.06-
12	POL	HUN	HUN	NLD	PRT	HUN	POL	ESP	POL	ESP	NLD	HUN	IRL	FIN	HUN	FRA	NLD
	-0.09-	-0.13-	-0.12-	-0.10-	-0.12-	-0.14-	-0.10-	-0.11-	-0.12-	-0.10-	-0.09-	-0.14-	-0.13-	-0.11-	-0.16-	-0.15-	-0.12-
13	ESP	POL	POL	PRT	HUN	PRT	FRA	FRA	FRA	FRA	IRL	IRL	AUT	AUT	FRA	AUT	FRA
	-0.16-	-0.14-	-0.16-	-0.10-	-0.34-	-0.44-	-0.12-	-0.13-	-0.58-	-0.47-	-0.11-	-0.23-	-0.23-	-0.19-	-0.18-	-0.24-	-0.14-
14	HUN	FRA	FRA	HUN	FRA	FRA	ESP	CZE	HUN	HUN	FRA	POL	POL	POL	IRL	HUN	HUN
	-0.30-	-0.15-	-0.30-	-0.32-	-0.53-	-0.47-	-0.14-	-0.20-	-0.65-	-0.49-	-0.13-	-0.23-	-0.27-	-0.29-	-0.20-	-0.34-	-0.20-
15	DEU	DEU	DEU	FRA	DEU	DEU	HUN	HUN	DEU	DEU	POL	FRA	FRA	FRA	POL	POL	POL
	-0.57-	-0.70-	-0.70-	-0.37-	-0.80-	-0.69-	-0.47-	-0.59-	-0.71-	-0.67-	-0.19-	-0.33-	-0.97-	-0.90-	-0.25-	-0.34-	-0.25-
16	GBR	GBR	GBR	DEU	GBR	GBR	DEU	DEU	ITA	AUT	DEU	DEU	DEU	DEU	DEU	DEU	DEU
	-1.15-	-1.02-	-1.03-	-0.86-	-1.85-	-1.45-	-0.90-	-0.92-	-2.67-	-2.45-	-0.89-	-0.75-	-1.03-	-0.93-	-0.85-	-1.28-	-1.06-
17	ITA	ITA	ITA	GBR	ITA	ITA	GBR	ITA	GRC	ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA
	-1.94-	-1.80-	-1.90-	-4.43-	-2.29-	-1.86-	-1.41-	-2.32-	-3.63-	-2.72-	-2.15-	-2.56-	-2.24-	-2.04-	-1.83-	-1.54-	-1.53-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.27: Ranking of the Efficient Specialization Ratio (E) in Wood and Products of Wood and Cork*

									Year								
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	BEL	GBR	GBR	GBR	GBR	DEU	BEL	DEU	DEU
	135.02+	125.41+	134.89+	125.44+	92.11+	124.31+	127.67+	126.73+	154.52+	126.04+	104.71+	89.03+	125.14+	140.87+	154.43+	144.63+	138.80+
2	IRL	CZE	DNK	IRL	DEU	IRL	IRL	IRL	IRL	GRC	BEL	DEU	GRC	GRC	DNK	IRL	BEL
	-0.06-	-0.14-	-0.09-	-0.08-	39.50+	-0.13-	-0.09-	-0.06-	-0.09-	-0.03-	22.56+	29.89+	-0.10-	-0.08-	-0.12-	-0.17-	2.85-
3	DNK	DNK	IRL	DNK	IRL	GRC	PRT	PRT	PRT	IRL	GRC	BEL	IRL	IRL	IRL	GRC	DNK
	-0.12-	-0.19-	-0.11-	-0.21-	-0.15-	-0.17-	-0.10-	-0.27-	-0.21-	-0.10-	-0.06-	-0.09-	-0.17-	-0.12-	-0.14-	-0.19-	-0.12-
4	CZE	PRT	PRT	GRC	DNK	DNK	GRC	FIN	FIN	PRT	HUN	PRT	DNK	PRT	HUN	DNK	IRL
	-0.44-	-0.23-	-0.27-	-0.26-	-0.15-	-0.23-	-0.23-	-0.27-	-0.23-	-0.21-	-0.17-	-0.21-	-0.24-	-0.22-	-0.29-	-0.21-	-0.22-
5	PRT	IRL	HUN	PRT	PRT	HUN	FIN	HUN	DNK	HUN	PRT	GRC	PRT	DNK	PRT	BEL	PRT
	-0.52-	-0.42-	-0.41-	-0.33-	-0.41-	-0.29-	-0.26-	-0.29-	-0.26-	-0.24-	-0.21-	-0.23-	-0.25-	-0.38-	-0.29-	-0.29-	-0.27-
6	GRC	GRC	GRC	HUN	GRC	FIN	DNK	DNK	HUN	CZE	IRL	IRL	FIN	BEL	FIN	PRT	HUN
	-0.55-	-0.45-	-0.43-	-0.56-	-0.49-	-0.35-	-0.30-	-0.31-	-0.28-	-0.25-	-0.22-	-0.27-	-0.39-	-0.40-	-0.40-	-0.30-	-0.32-
7	FIN	HUN	CZE	SWE	HUN	CZE	HUN	BEL	SWE	FIN	DNK	DNK	BEL	FIN	NLD	HUN	FIN
	-0.56-	-0.47-	-0.57-	-0.58-	-0.73-	-0.35-	-0.38-	-0.36-	-0.40-	-0.29-	-0.26-	-0.42-	-0.48-	-0.43-	-0.53-	-0.38-	-0.37-
8	HUN	SWE	FIN	CZE	BEL	BEL	BEL	SWE	CZE	DNK	FIN	FIN	NLD	NLD	SWE	FIN	SWE
	-0.73-	-0.48-	-0.64-	-0.66-	-0.78-	-0.53-	-0.43-	-0.44-	-0.53-	-0.33-	-0.58-	-0.46-	-0.61-	-0.57-	-0.66-	-0.43-	-0.68-
9	AUT	FIN	ESP	BEL	CZE	NLD	NLD	NLD	NLD	BEL	CZE	NLD	CZE	AUT	CZE	SWE	NLD
	-0.92-	-0.61-	-0.81-	-0.70-	-0.80-	-0.56-	-0.66-	-0.56-	-0.55-	-0.36-	-0.59-	-0.57-	-0.61-	-0.69-	-0.88-	-0.73-	-0.96-
10	BEL	ESP	NLD	FIN	FIN	PRT	CZE	CZE	AUT	NLD	NLD	SWE	SWE	CZE	AUT	CZE	CZE
	-1.09-	-0.64-	-0.82-	-0.80-	-0.88-	-0.61-	-1.03-	-0.57-	-0.56-	-0.54-	-0.65-	-0.68-	-0.67-	-0.71-	-1.67-	-0.86-	-1.04-
11	NLD	BEL	BEL	ESP	NLD	ESP	AUT	AUT	ESP	SWE	SWE	ESP	ESP	SWE	ESP	NLD	AUT
	-1.33-	-0.84-	-0.84-	-0.90-	-1.07-	-0.81-	-1.28-	-1.15-	-0.83-	-0.65-	-0.92-	-0.75-	-0.82-	-0.71-	-2.65-	-1.02-	-1.35-
12	FRA	AUT	AUT	AUT	ESP	AUT	ESP	GRC	GRC	AUT	AUT	HUN	HUN	ESP	ITA	AUT	GRC
	-1.92-	-1.29-	-1.38-	-1.05-	-1.24-	-0.93-	-2.18-	-1.72-	-1.70-	-1.02-	-0.97-	-0.94-	-1.04-	-0.78-	-2.97-	-1.11-	-2.21-
13	POL	NLD	ITA	NLD	ITA	SWE	SWE	ESP	POL	ESP	ESP	AUT	AUT	HUN	GRC	ESP	POL
	-2.41-	-1.56-	-2.83-	-1.05-	-3.79-	-1.13-	-2.28-	-2.19-	-4.23-	-1.32-	-2.50-	-1.13-	-1.11-	-1.15-	-3.47-	-2.67-	-2.33-
14	ITA	ITA	FRA	ITA	SWE	POL	POL	ITA	ITA	POL	POL	CZE	FRA	FRA	POL	POL	ESP
	-2.53-	-2.46-	-3.56-	-2.42-	-4.07-	-2.42-	-2.48-	-2.85-	-4.50-	-4.26-	-2.97-	-1.16-	-3.04-	-3.31-	-4.13-	-3.64-	-2.85-
15	ESP	FRA	POL	FRA	AUT	ITA	FRA	FRA	FRA	ITA	FRA	POL	POL	ITA	FRA	FRA	ITA
	-2.61-	-2.47-	-4.18-	-3.53-	-4.44-	-4.24-	-3.15-	-3.21-	-5.09-	-4.91-	-3.75-	-3.16-	-3.30-	-3.73-	-4.65-	-3.72-	-3.43-
16	SWE	POL	DEU	POL	FRA	FRA	ITA	POL	DEU	FRA	ITA	ITA	ITA	POL	DEU	ITA	FRA
	-8.44-	-2.74-	-7.56-	-4.54-	-6.16-	-4.81-	-3.31-	-3.53-	-7.23-	-5.12-	-4.48-	-4.23-	-3.98-	-3.79-	-5.96-	-3.91-	-3.83-
17	DEU	DEU	SWE	DEU	POL	DEU	DEU	DEU	GBR	DEU	DEU	FRA	DEU	GBR	GBR	GBR	GBR
	-10.79-	-10.43-	-10.39-	-7.77-	-6.45-	-6.75-	-9.53-	-8.95-	-27.83-	-6.39-	-8.93-	-4.61-	-8.31-	-23.79-	-25.62-	-24.99-	-21.67-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.28: Ranking of the Efficient Specialization Ratio (E) in Pulp, Paper, Paper, Printing and Publishing*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	POL	POL	POL	POL	POL	POL	POL	POL	POL	POL	POL	IRL	IRL	IRL	POL	IRL	IRL
	100.37+	87.00+	122.65+	124.73+	125.06+	121.86+	115.61+	123.76+	122.51+	122.42+	65.52+	65.28+	65.61+	61.89+	71.78+	79.42+	95.10+
2	PRT	IRL	CZE	CZE	CZE	CZE	CZE	CZE	CZE	GRC	IRL	POL	POL	POL	AUT	POL	POL
	23.37+	37.47+	-0.04-	-0.04-	-0.03-	-0.03-	8.10+	-0.04-	-0.04-	-0.03-	55.87+	54.22+	54.47+	57.86+	36.34+	35.50+	18.44+
3	CZE	ESP	ESP	ESP	ESP	GRC	GRC	BEL	GRC	CZE	HUN	CZE	GRC	GRC	IRL	DNK	DNK
	-0.03-	-0.07-	-0.08-	-0.11-	-0.12-	-0.11-	-0.15-	-0.17-	-0.06-	-0.03-	-0.03-	-0.10-	-0.06-	-0.07-	8.96+	-0.10-	-0.05-
4	FRA	CZE	DNK	GRC	DNK	HUN	BEL	AUT	DNK	DNK	GRC	GRC	BEL	BEL	DNK	BEL	BEL
	-0.25-	-0.19-	-0.23-	-0.19-	-0.18-	-0.18-	-0.20-	-0.23-	-0.09-	-0.15-	-0.03-	-0.10-	-0.11-	-0.10-	-0.05-	-0.10-	-0.10-
5	DNK	GRC	GRC	DNK	GRC	ESP	DNK	GRC	ESP	BEL	DNK	BEL	CZE	CZE	CZE	CZE	CZE
	-0.33-	-0.39-	-0.37-	-0.29-	-0.30-	-0.29-	-0.27-	-0.23-	-0.09-	-0.15-	-0.07-	-0.13-	-0.11-	-0.10-	-0.11-	-0.11-	-0.13-
6	AUT	FIN	FIN	AUT	AUT	DNK	AUT	DNK	AUT	ESP	CZE	DNK	DNK	ESP	HUN	GRC	AUT
	-0.34-	-0.42-	-0.41-	-0.33-	-0.32-	-0.34-	-0.29-	-0.25-	-0.37-	-0.32-	-0.10-	-0.19-	-0.13-	-0.11-	-0.30-	-0.13-	-0.26-
7	IRL	DNK	BEL	FIN	HUN	PRT	SWE	PRT	PRT	HUN	BEL	HUN	AUT	DNK	PRT	AUT	HUN
	-0.45-	-0.53-	-0.53-	-0.36-	-0.35-	-0.45-	-0.44-	-0.47-	-0.47-	-0.45-	-0.20-	-0.20-	-0.26-	-0.16-	-0.43-	-0.25-	-0.36-
8	GRC	FRA	SWE	IRL	BEL	SWE	PRT	HUN	HUN	AUT	AUT	ESP	ESP	HUN	ESP	HUN	FRA
	-0.49-	-0.55-	-0.60-	-0.71-	-0.52-	-0.51-	-0.48-	-0.56-	-0.55-	-0.52-	-0.22-	-0.23-	-0.27-	-0.40-	-0.47-	-0.39-	-0.41-
9	BEL	BEL	AUT	BEL	FIN	AUT	HUN	ESP	BEL	PRT	PRT	AUT	HUN	AUT	FIN	ESP	PRT
	-0.51-	-0.56-	-0.61-	-0.71-	-0.90-	-0.53-	-0.58-	-1.03-	-0.57-	-0.53-	-0.56-	-0.23-	-0.34-	-0.44-	-0.64-	-0.43-	-0.42-
10	FIN	AUT	IRL	FRA	IRL	BEL	ESP	FIN	SWE	SWE	ESP	PRT	PRT	PRT	SWE	PRT	FIN
	-0.53-	-0.61-	-0.65-	-0.99-	-0.98-	-0.66-	-0.87-	-1.16-	-1.20-	-1.02-	-0.63-	-0.52-	-0.63-	-0.51-	-0.80-	-0.47-	-0.47-
11	SWE	SWE	FRA	SWE	SWE	NLD	FIN	IRL	FIN	FIN	SWE	FIN	FIN	FIN	GRC	FIN	GRC
	-0.55-	-1.28-	-1.09-	-1.09-	-1.15-	-0.72-	-1.15-	-1.20-	-1.25-	-1.10-	-1.14-	-0.56-	-0.63-	-0.71-	-0.83-	-0.47-	-0.50-
12	ESP	HUN	HUN	HUN	FRA	FIN	IRL	SWE	IRL	IRL	FIN	SWE	SWE	SWE	BEL	FRA	ESP
	-0.69-	-1.28-	-1.21-	-1.63-	-1.71-	-1.12-	-1.20-	-1.54-	-1.40-	-1.44-	-1.28-	-1.09-	-0.90-	-0.85-	-0.96-	-0.52-	-0.73-
13	HUN	PRT	PRT	PRT	PRT	IRL	FRA	FRA	FRA	FRA	NLD	NLD	GBR	GBR	GBR	SWE	SWE
	-1.69-	-1.32-	-1.35-	-1.66-	-2.89-	-1.20-	-2.16-	-2.09-	-2.79-	-2.76-	-3.01-	-2.75-	-2.21-	-1.97-	-1.92-	-0.95-	-0.89-
14	NLD	ITA	NLD	NLD	NLD	FRA	NLD	ITA	DEU	NLD	GBR	GBR	NLD	NLD	FRA	NLD	NLD
	-1.87-	-3.35-	-1.63-	-3.03-	-2.94-	-3.06-	-3.09-	-2.86-	-3.07-	-2.92-	-3.10-	-2.85-	-2.76-	-2.67-	-2.03-	-1.58-	-1.66-
15	ITA	NLD	ITA	ITA	ITA	DEU	ITA	NLD	NLD	DEU	DEU	DEU	DEU	DEU	NLD	GBR	GBR
	-3.67-	-3.60-	-3.27-	-3.12-	-3.14-	-3.24-	-3.27-	-3.14-	-3.10-	-2.93-	-3.36-	-2.88-	-3.31-	-3.17-	-2.50-	-2.08-	-2.03-
16	GBR	DEU	DEU	DEU	DEU	ITA	DEU	DEU	ITA	GBR	FRA	ITA	ITA	ITA	ITA	DEU	ITA
	-4.43-	-3.76-	-3.77-	-4.32-	-3.46-	-3.91-	-3.91-	-3.76-	-3.73-	-3.79-	-3.83-	-3.60-	-3.65-	-3.53-	-2.87-	-3.56-	-2.13-
17	DEU	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	ITA	ITA	FRA	FRA	FRA	DEU	ITA	DEU
	-7.92-	-6.56-	-6.80-	-6.13-	-6.07-	-5.52-	-5.65-	-5.03-	-3.73-	-4.31-	-3.85-	-4.07-	-4.72-	-4.95-	-3.17-	-3.80-	-3.38-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.29: Ranking of the Efficient Specialization Ratio (E) in Coke, Refined Petroleum and Nuclear Fuel*

									Year								
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	HUN	CZE	CZE	HUN	HUN	ESP	PRT	PRT	PRT	PRT	ESP	ESP	ESP	AUT	NLD	NLD	NLD
	130.48+	131.31+	125.93+	122.56+	118.79+	127.88+	123.00+	120.82+	118.17+	119.62+	134.69+	134.16+	135.00+	135.00+	129.63+	123.51+	126.32+
2	IRL	IRL	DNK	IRL	DNK	FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN	FIN
	-0.13-	-0.07-	-0.06-	-0.16-	-0.09-	-0.07-	-0.09-	-0.13-	-0.05-	-0.05-	-0.04-	-0.08-	-0.06-	-0.08-	-0.04-	-0.02-	-0.03-
3	DNK	SWE	IRL	DNK	FIN	BEL	IRL	SWE	AUT	GRC	SWE	SWE	SWE	GRC	SWE	SWE	SWE
	-0.16-	-0.29-	-0.16-	-0.18-	-0.11-	-0.14-	-0.29-	-0.22-	-0.18-	-0.08-	-0.10-	-0.12-	-0.11-	-0.11-	-0.10-	-0.09-	-0.08-
4	POL	DNK	ESP	SWE	IRL	DNK	NLD	IRL	SWE	SWE	IRL	IRL	IRL	SWE	HUN	IRL	IRL
	-0.62-	-0.32-	-0.56-	-0.27-	-0.19-	-0.29-	-0.41-	-0.24-	-0.25-	-0.09-	-0.23-	-0.23-	-0.16-	-0.13-	-0.36-	-0.12-	-0.14-
5	BEL	ESP	GRC	ESP	GRC	IRL	DNK	HUN	IRL	AUT	GRC	NLD	NLD	IRL	BEL	BEL	BEL
	-0.66-	-0.69-	-0.56-	-0.71-	-0.28-	-0.31-	-0.41-	-0.29-	-0.32-	-0.37-	-0.24-	-0.35-	-0.33-	-0.14-	-0.38-	-0.37-	-0.36-
6	GRC	GRC	FIN	FIN	NLD	NLD	BEL	DNK	NLD	NLD	NLD	DNK	BEL	NLD	IRL	HUN	HUN
	-0.80-	-0.76-	-0.70-	-0.72-	-0.37-	-0.54-	-0.69-	-0.31-	-0.34-	-0.43-	-0.37-	-0.45-	-0.50-	-0.29-	-0.41-	-0.50-	-0.46-
7	FIN	BEL	BEL	BEL	ESP	SWE	SWE	BEL	HUN	IRL	BEL	BEL	GRC	DNK	AUT	DNK	DNK
	-1.05-	-0.79-	-0.75-	-0.86-	-0.82-	-0.62-	-0.88-	-0.51-	-0.36-	-0.55-	-0.47-	-0.46-	-0.58-	-0.44-	-0.42-	-0.60-	-0.51-
8	AUT	AUT	GBR	AUT	AUT	PRT	AUT	NLD	BEL	BEL	HUN	ITA	DNK	BEL	DNK	GRC	GBR
	-1.07-	-1.02-	-0.93-	-1.02-	-0.85-	-0.82-	-0.96-	-0.54-	-0.44-	-0.61-	-0.61-	-0.97-	-0.68-	-0.45-	-0.60-	-0.69-	-0.62-
9	ITA	ITA	AUT	GRC	GBR	AUT	POL	ITA	DNK	DNK	DNK	CZE	ITA	ITA	ITA	GBR	ITA
	-1.17-	-1.08-	-0.94-	-1.12-	-0.93-	-0.89-	-0.98-	-0.75-	-0.64-	-0.66-	-0.91-	-1.06-	-0.87-	-0.77-	-0.64-	-0.77-	-0.84-
10	GBR	FIN	ITA	PRT	SWE	CZE	HUN	AUT	GRC	HUN	ITA	AUT	CZE	CZE	GRC	ITA	CZE
	-1.36-	-1.10-	-0.99-	-1.27-	-1.11-	-0.90-	-1.04-	-0.83-	-0.66-	-0.70-	-1.05-	-1.24-	-1.04-	-1.02-	-0.85-	-0.90-	-1.04-
11	ESP	GBR	POL	CZE	ITA	GRC	GBR	GBR	GBR	ESP	CZE	HUN	AUT	ESP	GBR	CZE	AUT
	-1.38-	-1.34-	-1.12-	-1.29-	-1.15-	-1.01-	-1.05-	-0.88-	-0.85-	-0.91-	-1.21-	-1.25-	-1.17-	-1.13-	-1.01-	-0.91-	-1.13-
12	PRT	FRA	FRA	ITA	BEL	GBR	ITA	POL	ITA	ITA	AUT	GBR	HUN	GBR	CZE	AUT	ESP
	-1.39-	-1.79-	-1.42-	-1.36-	-1.16-	-1.04-	-1.07-	-0.90-	-0.92-	-1.16-	-1.36-	-1.29-	-1.45-	-1.23-	-1.02-	-1.08-	-2.03-
13	FRA	POL	HUN	POL	CZE	ITA	CZE	CZE	ESP	CZE	GBR	GRC	GBR	HUN	ESP	ESP	GRC
	-1.62-	-2.98-	-1.85-	-1.44-	-1.17-	-1.15-	-1.14-	-1.04-	-0.93-	-1.18-	-1.41-	-1.44-	-1.53-	-1.61-	-1.13-	-1.37-	-2.12-
14	DEU	HUN	NLD	FRA	POL	POL	GRC	GRC	POL	POL	POL	POL	DEU	POL	DEU	DEU	POL
	-2.93-	-3.19-	-2.99-	-1.82-	-1.44-	-1.57-	-1.54-	-1.84-	-1.18-	-1.42-	-2.58-	-3.08-	-2.80-	-3.17-	-2.44-	-2.64-	-2.76-
15	CZE	PRT	SWE	NLD	FRA	DEU	ESP	ESP	CZE	GBR	DEU	DEU	POL	DEU	POL	POL	DEU
	-3.22-	-3.29-	-3.58-	-2.50-	-2.88-	-3.46-	-1.94-	-2.14-	-1.34-	-1.49-	-2.92-	-3.37-	-3.43-	-3.44-	-2.87-	-3.50-	-3.01-
16	SWE	DEU	PRT	DEU	DEU	FRA	DEU	DEU	DEU	DEU	PRT	PRT	PRT	PRT	PRT	PRT	PRT
	-5.98-	-3.33-	-3.69-	-3.53-	-3.12-	-4.93-	-3.80-	-3.95-	-4.51-	-3.80-	-8.36-	-4.02-	-5.04-	-4.13-	-4.22-	-4.15-	-3.29-
17	NLD	NLD	DEU	GBR	PRT	HUN	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA	FRA
	-6.95-	-9.27-	-5.62-	-4.30-	-3.13-	-10.14-	-6.71-	-6.24-	-5.21-	-6.10-	-12.81-	-14.77-	-15.27-	-16.87-	-13.15-	-5.80-	-7.90-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.30: Ranking of the Efficient Specialization Ratio (E) in Chemicals and Chemical Products*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	NLD	NLD	PRT	IRL	IRL	IRL	IRL	IRL	IRL	IRL	FRA	FRA	FRA	FRA	IRL	NLD	NLD
	76.94+	88.65+	62.41+	66.28+	68.85+	82.02+	83.32+	82.44+	79.48+	77.45+	135.53+	134.24+	134.30+	133.65+	82.44+	138.49+	136.21+
2	IRL	PRT	IRL	PRT	PRT	FRA	FRA	FRA	FRA	FRA	GRC	GRC	DNK	DNK	FRA	GRC	DNK
	43.62+	56.76+	53.67+	64.85+	62.37+	62.72+	60.50+	58.81+	60.77+	65.90+	-0.05-	-0.17-	-0.37-	-0.24-	51.74+	-0.17-	-0.26-
3	PRT	IRL	NLD	NLD	FRA	GRC	GRC	FIN	FIN	GRC	DNK	PRT	GRC	PRT	DNK	FIN	GRC
	27.38+	0.63-	30.17+	22.21+	7.93-	-0.12-	-0.21-	-0.33-	-0.33-	-0.02-	-0.40-	-0.39-	-0.40-	-0.38-	-0.27-	-0.25-	-0.29-
4	CZE	CZE	DNK	SWE	FIN	FIN	FIN	AUT	DNK	DNK	PRT	DNK	FIN	FIN	GRC	DNK	FIN
	-0.25-	-0.24-	-0.64-	-0.52-	-0.55-	-0.29-	-0.31-	-0.45-	-0.34-	-0.38-	-0.42-	-0.45-	-0.45-	-0.49-	-0.42-	-0.35-	-0.32-
5	FIN	SWE	FIN	DNK	DNK	HUN	AUT	GRC	SWE	FIN	HUN	FIN	PRT	CZE	FIN	PRT	PRT
	-0.77-	-0.49-	-0.77-	-0.56-	-0.60-	-0.31-	-0.55-	-0.47-	-0.49-	-0.39-	-0.43-	-0.51-	-0.47-	-0.51-	-0.45-	-0.48-	-0.46-
6	AUT	FIN	CZE	CZE	CZE	CZE	CZE	SWE	GRC	HUN	FIN	CZE	CZE	GRC	PRT	CZE	SWE
	-0.82-	-0.84-	-0.80-	-0.61-	-0.65-	-0.55-	-0.69-	-0.51-	-0.50-	-0.59-	-0.52-	-0.61-	-0.53-	-0.64-	-0.46-	-0.56-	-0.64-
7	DNK	AUT	AUT	FIN	AUT	DNK	DNK	CZE	CZE	CZE	CZE	HUN	SWE	SWE	HUN	AUT	BEL
	-1.03-	-1.04-	-1.01-	-0.66-	-0.69-	-0.72-	-0.70-	-0.60-	-0.55-	-0.60-	-0.61-	-0.69-	-0.71-	-0.67-	-0.51-	-0.63-	-0.69-
8	BEL	ESP	HUN	AUT	SWE	SWE	SWE	HUN	HUN	AUT	AUT	AUT	AUT	IRL	CZE	BEL	HUN
	-1.43-	-1.18-	-1.25-	-0.78-	-0.81-	-0.90-	-0.74-	-0.67-	-0.68-	-0.67-	-0.62-	-0.73-	-0.79-	-0.67-	-0.54-	-0.66-	-0.70-
9	SWE	DNK	ESP	ESP	NLD	BEL	HUN	DNK	AUT	SWE	IRL	SWE	IRL	BEL	SWE	HUN	CZE
	-1.48-	-1.25-	-1.27-	-1.47-	-1.31-	-1.43-	-0.97-	-0.83-	-1.04-	-0.71-	-0.65-	-0.76-	-0.86-	-0.82-	-0.62-	-0.67-	-0.75-
10	POL	HUN	SWE	GRC	ESP	NLD	BEL	BEL	NLD	BEL	SWE	BEL	BEL	NLD	AUT	SWE	AUT
	-1.82-	-1.47-	-1.42-	-1.71-	-1.33-	-1.57-	-1.18-	-1.04-	-1.26-	-1.09-	-0.75-	-0.85-	-0.90-	-0.91-	-1.31-	-0.67-	-0.81-
11	HUN	POL	POL	POL	HUN	ESP	NLD	NLD	ESP	NLD	BEL	NLD	HUN	HUN	BEL	IRL	IRL
	-3.74-	-2.19-	-2.50-	-2.50-	-1.34-	-2.13-	-1.26-	-1.24-	-1.63-	-1.35-	-0.96-	-1.02-	-0.91-	-1.02-	-1.33-	-0.83-	-1.04-
12	ESP	FRA	GBR	HUN	POL	POL	GBR	GBR	BEL	ESP	NLD	IRL	NLD	AUT	NLD	GBR	GBR
	-3.91-	-4.38-	-4.00-	-3.05-	-2.07-	-3.26-	-3.22-	-3.17-	-2.10-	-1.60-	-1.18-	-1.11-	-0.98-	-1.32-	-1.67-	-1.45-	-1.43-
13	ITA	ITA	FRA	GBR	GBR	GBR	POL	ITA	PRT	PRT	ESP	ESP	ESP	ESP	GBR	ITA	POL
	-4.69-	-4.69-	-4.05-	-3.29-	-3.15-	-3.37-	-3.41-	-3.36-	-3.80-	-4.23-	-2.95-	-1.59-	-1.61-	-1.34-	-1.67-	-2.95-	-2.44-
14	FRA	GBR	ITA	FRA	GRC	ITA	ITA	POL	GBR	GBR	GBR	GBR	GBR	GBR	ITA	ESP	ITA
	-5.25-	-5.12-	-4.82-	-4.20-	-3.51-	-4.24-	-3.93-	-3.78-	-4.45-	-4.66-	-3.77-	-2.98-	-2.24-	-1.98-	-2.40-	-3.48-	-2.46-
15	GBR	BEL	GRC	ITA	ITA	AUT	PRT	PRT	POL	DEU	ITA	ITA	ITA	ITA	ESP	FRA	ESP
	-7.15-	-5.97-	-5.99-	-4.68-	-4.28-	-4.24-	-4.71-	-5.65-	-4.94-	-7.05-	-5.50-	-4.32-	-2.97-	-2.65-	-3.69-	-3.66-	-3.70-
16	DEU	GRC	BEL	DEU	BEL	PRT	ESP	ESP	ITA	POL	DEU	DEU	DEU	DEU	DEU	DEU	FRA
	-7.77-	-6.26-	-7.10-	-12.01-	-7.79-	-10.66-	-9.46-	-9.33-	-6.68-	-7.86-	-7.46-	-7.26-	-7.59-	-8.37-	-7.82-	-10.10-	-4.02-
17	GRC	DEU	DEU	BEL	DEU	DEU	DEU	DEU	DEU	ITA	POL	POL	POL	POL	POL	POL	DEU
	-7.82-	-10.90-	-10.62-	-17.30-	-11.07-	-10.96-	-12.46-	-9.83-	-11.45-	-12.14-	-9.26-	-10.81-	-12.54-	-11.64-	-11.00-	-11.58-	-16.20-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.31: Ranking of the Efficient Specialization Ratio (E) in Rubber and Plastics*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	GRC	GRC	GRC	BEL	GRC	PRT	ESP	ESP	DEU	ITA	POL	POL	POL	POL	POL	POL	DEU
	139.15+	136.31+	123.15+	148.44+	115.06+	119.31+	173.09+	184.55+	81.69+	158.11+	127.96+	151.07+	168.56+	162.32+	163.91+	164.34+	136.74+
2	DEU	BEL	BEL	GRC	BEL	AUT	GRC	PRT	ITA	POL	ITA	ITA	GRC	GRC	DNK	GRC	DNK
	5.12-	45.51+	56.48+	33.65+	68.73+	58.53+	-0.27-	-0.27-	59.69+	10.17+	38.89+	14.48=	4.90+	10.95+	-0.18-	-0.18-	-0.18-
3	CZE	CZE	CZE	CZE	CZE	GRC	PRT	GRC	POL	GRC	GRC	GRC	DNK	IRL	PRT	DNK	PRT
	-0.09-	-0.28-	-0.24-	-0.25-	-0.19-	-0.11-	-0.27-	-0.50-	13.50+	-0.01-	-0.04-	-0.16-	-0.32-	-0.28-	-0.36-	-0.29-	-0.35-
4	IRL	ESP	DNK	FIN	DNK	CZE	CZE	IRL	GRC	PRT	HUN	PRT	PRT	PRT	CZE	IRL	IRL
	-0.31-	-0.50-	-0.30-	-0.40-	-0.34-	-0.19-	-0.42-	-0.50-	-0.12-	-0.34-	-0.15-	-0.27-	-0.34-	-0.29-	-0.50-	-0.31-	-0.37-
5	SWE	FIN	FIN	DNK	IRL	DNK	IRL	CZE	PRT	CZE	PRT	IRL	IRL	CZE	FIN	PRT	FIN
	-0.41-	-0.52-	-0.45-	-0.44-	-0.62-	-0.61-	-0.62-	-0.57-	-0.28-	-0.35-	-0.28-	-0.43-	-0.36-	-0.43-	-0.54-	-0.40-	-0.44-
6	DNK	DNK	IRL	IRL	ESP	SWE	DNK	DNK	DNK	DNK	IRL	CZE	CZE	DNK	IRL	FIN	CZE
	-0.45-	-0.65-	-0.55-	-0.57-	-0.66-	-0.78-	-0.64-	-0.68-	-0.29-	-0.43-	-0.28-	-0.51-	-0.42-	-0.57-	-1.08-	-0.43-	-0.65-
7	FIN	IRL	ESP	ESP	HUN	IRL	SWE	BEL	CZE	IRL	DNK	FIN	FIN	FIN	GRC	CZE	GRC
	-0.48-	-0.70-	-0.57-	-0.63-	-0.83-	-0.86-	-0.70-	-1.46-	-0.56-	-0.64-	-0.31-	-0.76-	-0.51-	-0.64-	-1.26-	-0.51-	-0.84-
8	FRA	AUT	SWE	PRT	FIN	HUN	AUT	FIN	IRL	FIN	CZE	DNK	HUN	BEL	AUT	BEL	BEL
	-0.66-	-1.21-	-0.57-	-1.79-	-1.64-	-0.86-	-1.48-	-1.64-	-0.62-	-0.80-	-0.49-	-0.89-	-0.96-	-0.93-	-1.43-	-0.83-	-0.89-
9	BEL	PRT	AUT	AUT	SWE	ESP	BEL	AUT	FIN	BEL	FIN	ESP	BEL	HUN	HUN	FRA	FRA
	-0.69-	-1.26-	-1.14-	-1.81-	-1.66-	-1.13-	-1.59-	-1.65-	-0.67-	-1.36-	-1.00-	-0.98-	-1.02-	-1.08-	-1.49-	-1.26-	-1.35-
10	PRT	HUN	PRT	SWE	PRT	NLD	FIN	SWE	ESP	SWE	BEL	BEL	ESP	ESP	SWE	AUT	AUT
	-1.31-	-1.94-	-1.49-	-2.00-	-1.78-	-1.95-	-2.28-	-2.01-	-1.31-	-1.70-	-1.07-	-0.99-	-1.11-	-1.10-	-1.70-	-1.65-	-1.76-
11	AUT	SWE	NLD	HUN	AUT	POL	POL	NLD	BEL	ESP	AUT	HUN	AUT	SWE	BEL	SWE	SWE
	-1.61-	-2.11-	-1.89-	-2.31-	-1.82-	-2.71-	-2.63-	-2.72-	-1.95-	-1.73-	-1.31-	-1.18-	-1.58-	-1.98-	-1.74-	-1.93-	-1.92-
12	POL	POL	HUN	NLD	NLD	FIN	NLD	POL	SWE	NLD	SWE	AUT	SWE	NLD	NLD	HUN	HUN
	-1.95-	-2.45-	-1.93-	-3.23-	-2.62-	-3.08-	-2.85-	-3.61-	-2.11-	-2.47-	-1.92-	-1.49-	-1.92-	-2.02-	-1.93-	-2.09-	-1.99-
13	HUN	NLD	POL	POL	POL	DEU	HUN	HUN	NLD	HUN	ESP	SWE	NLD	AUT	ESP	ESP	ESP
	-2.19-	-4.14-	-3.23-	-3.38-	-3.39-	-5.16-	-3.95-	-3.68-	-2.68-	-2.83-	-2.22-	-1.82-	-2.16-	-3.22-	-2.81-	-2.78-	-2.53-
14	ESP	FRA	DEU	GBR	DEU	BEL	FRA	FRA	AUT	AUT	NLD	NLD	GBR	GBR	FRA	NLD	NLD
	-2.42-	-7.39-	-13.16-	-12.46-	-9.54-	-5.79-	-5.02-	-5.21-	-2.78-	-7.20-	-2.64-	-2.39-	-6.55-	-6.38-	-5.89-	-3.27-	-3.22-
15	NLD	GBR	GBR	FRA	GBR	ITA	GBR	GBR	HUN	GBR	GBR	GBR	ITA	ITA	GBR	ITA	ITA
	-2.78-	-14.65-	-17.05-	-16.06-	-14.94-	-12.34-	-14.93-	-13.43-	-3.47-	-9.79-	-9.06-	-6.80-	-9.36-	-8.99-	-7.07-	-5.38-	-5.89-
16	GBR	ITA	ITA	DEU	ITA	GBR	ITA	ITA	GBR	DEU	FRA	FRA	FRA	FRA	ITA	GBR	POL
	-10.23-	-19.76-	-17.13-	-16.48-	-20.33-	-15.11-	-16.57-	-17.92-	-9.83-	-13.10-	-11.08-	-23.33-	-13.75-	-12.98-	-8.53-	-8.73-	-6.22-
17	ITA	DEU	FRA	ITA	FRA	FRA	DEU	DEU	FRA	FRA	DEU	DEU	DEU	DEU	DEU	DEU	GBR
	-18.68-	-24.26-	-19.94-	-20.28-	-23.44-	-27.16-	-18.87-	-28.70-	-28.22-	-25.52-	-35.00-	-23.55-	-33.10-	-32.39-	-27.39-	-34.28-	-8.14-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.32: Ranking of the Efficient Specialization Ratio (E) in Other Non-Metallic Mineral*

									Year								
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	BEL	AUT	AUT	DEU	DEU	GRC	GRC	GRC	GRC	GRC	GRC	GRC	GRC	HUN	DEU	GRC	ESP
	91.78+	62.09+	68.42+	57.34+	116.90+	82.87+	83.03+	79.71+	101.91+	82.72+	81.69+	79.45+	64.65+	64.60+	86.83+	72.96+	121.75+
2	DEU	BEL	BEL	GRC	CZE	AUT	ESP	ESP	DEU	DEU	ESP	HUN	HUN	GRC	AUT	DEU	DNK
	20.47=	59.39+	51.91+	57.00+	-0.06-	41.21+	39.18+	42.71+	15.82=	35.90+	41.59+	46.21+	60.21+	60.73+	31.98+	48.16+	-0.08-
3	DNK	ESP	DNK	CZE	DNK	CZE	CZE	CZE	CZE	CZE	CZE	CZE	CZE	CZE	CZE	CZE	CZE
	-0.02-	-0.09-	-0.04-	-0.08-	-0.10-	-0.05-	-0.17-	-0.06-	-0.06-	-0.05-	-0.05-	-0.06-	-0.08-	-0.07-	-0.06-	-0.06-	-0.08-
4	CZE	DNK	ESP	ESP	ESP	FIN	FIN	FIN	DNK	FIN	HUN	FIN	DNK	IRL	DNK	IRL	IRL
	-0.06-	-0.19-	-0.11-	-0.11-	-0.12-	-0.22-	-0.20-	-0.14-	-0.17-	-0.17-	-0.07-	-0.16-	-0.13-	-0.09-	-0.06-	-0.10-	-0.12-
5	POL	IRL	CZE	IRL	IRL	DNK	IRL	IRL	FIN	IRL	DNK	IRL	IRL	DNK	FIN	DNK	FIN
	-0.12-	-0.20-	-0.14-	-0.18-	-0.20-	-0.23-	-0.20-	-0.16-	-0.18-	-0.19-	-0.12-	-0.27-	-0.13-	-0.16-	-0.20-	-0.14-	-0.20-
6	IRL	CZE	IRL	DNK	FIN	IRL	DNK	DNK	IRL	DNK	FIN	ESP	FIN	FIN	IRL	FIN	BEL
	-0.14-	-0.24-	-0.22-	-0.23-	-0.23-	-0.26-	-0.21-	-0.20-	-0.18-	-0.23-	-0.23-	-0.34-	-0.20-	-0.23-	-0.25-	-0.18-	-0.50-
7	PRT	GRC	POL	SWE	GRC	HUN	PRT	SWE	ESP	SWE	IRL	PRT	ESP	ESP	SWE	BEL	PRT
	-0.18-	-0.29-	-0.27-	-0.30-	-0.32-	-0.26-	-0.28-	-0.45-	-0.23-	-0.33-	-0.24-	-0.40-	-0.40-	-0.25-	-0.53-	-0.50-	-0.56-
8	GRC	SWE	GRC	BEL	HUN	PRT	POL	PRT	PRT	PRT	PRT	SWE	BEL	PRT	HUN	SWE	SWE
	-0.32-	-0.29-	-0.29-	-0.32-	-0.32-	-0.30-	-0.54-	-0.46-	-0.38-	-0.38-	-0.38-	-0.43-	-0.48-	-0.42-	-0.53-	-0.62-	-0.64-
9	SWE	PRT	SWE	POL	SWE	ESP	AUT	AUT	SWE	ESP	SWE	BEL	PRT	BEL	PRT	PRT	HUN
	-0.39-	-0.35-	-0.33-	-0.36-	-0.34-	-0.32-	-0.59-	-0.59-	-0.49-	-0.59-	-0.43-	-0.49-	-0.49-	-0.47-	-0.57-	-0.63-	-0.64-
10	FIN	POL	FIN	FIN	POL	SWE	SWE	HUN	GBR	HUN	BEL	AUT	SWE	SWE	BEL	GBR	GBR
	-0.41-	-0.38-	-0.39-	-0.37-	-0.41-	-0.69-	-0.62-	-0.64-	-0.69-	-0.70-	-0.54-	-0.67-	-0.51-	-0.56-	-0.90-	-0.65-	-0.64-
11	FRA	FIN	PRT	PRT	PRT	POL	HUN	BEL	HUN	POL	AUT	DNK	AUT	AUT	NLD	HUN	AUT
	-0.43-	-0.39-	-0.40-	-0.55-	-0.55-	-0.75-	-0.77-	-0.96-	-0.73-	-0.82-	-0.60-	-0.76-	-0.69-	-0.58-	-0.93-	-0.66-	-0.81-
12	NLD	HUN	NLD	HUN	BEL	NLD	BEL	NLD	BEL	BEL	GBR	GBR	NLD	NLD	GBR	AUT	NLD
	-0.72-	-0.77-	-0.65-	-0.88-	-0.61-	-0.89-	-1.15-	-1.12-	-0.86-	-0.96-	-0.92-	-0.82-	-1.02-	-1.00-	-1.12-	-0.75-	-0.82-
13	AUT	NLD	HUN	AUT	AUT	BEL	NLD	POL	POL	GBR	NLD	NLD	GBR	GBR	FRA	FRA	FRA
	-0.92-	-1.32-	-0.66-	-0.92-	-0.92-	-1.39-	-1.18-	-1.18-	-0.92-	-1.11-	-1.12-	-1.07-	-1.40-	-1.26-	-1.89-	-0.85-	-0.83-
14	HUN	FRA	GBR	NLD	NLD	GBR	FRA	FRA	NLD	NLD	POL	POL	FRA	FRA	GRC	NLD	GRC
	-0.96-	-1.36-	-2.21-	-1.09-	-1.04-	-2.11-	-1.59-	-1.59-	-1.11-	-1.12-	-2.59-	-3.13-	-3.05-	-2.99-	-1.92-	-0.85-	-1.31-
15	GBR	GBR	FRA	GBR	GBR	FRA	GBR	GBR	AUT	AUT	FRA	FRA	POL	POL	ESP	ESP	POL
	-0.97-	-2.06-	-2.97-	-1.51-	-2.03-	-5.17-	-2.27-	-2.00-	-1.47-	-2.08-	-2.86-	-4.72-	-3.62-	-3.77-	-2.02-	-2.24-	-2.02-
16	ESP	ITA	ITA	FRA	FRA	DEU	ITA	ITA	FRA	FRA	ITA	ITA	ITA	ITA	POL	POL	ITA
	-1.82-	-4.89-	-5.29-	-2.78-	-4.78-	-5.36-	-5.46-	-5.17-	-5.09-	-4.73-	-5.48-	-5.38-	-5.39-	-4.93-	-3.88-	-4.83-	-4.59-
17	ITA	DEU	DEU	ITA	ITA	ITA	DEU	DEU	ITA	ITA	DEU	DEU	DEU	DEU	ITA	ITA	DEU
	-4.78-	-8.66-	-6.36-	-4.65-	-4.89-	-6.09-	-6.98-	-7.71-	-5.17-	-5.17-	-7.67-	-6.96-	-7.27-	-8.55-	-3.96-	-8.06-	-7.91-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.33: Ranking of the Efficient Specialization Ratio (E) in Basic Metals and Fabricated Metal*

Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	ESP	DEU	DEU	DEU	DEU	DEU	BEL	DEU	DEU	DEU	ESP	DEU	AUT	GBR	ESP	ESP	ESP
	135.16+	151.96+	159.08+	133.65+	160.55+	152.35+	51.56+	98.36+	202.23+	147.70+	67.47+	96.62+	46.06+	83.26+	141.64+	142.68+	67.63+
2	AUT	FIN	FIN	AUT	AUT	SWE	SWE	BEL	BEL	BEL	AUT	AUT	GBR	DEU	GBR	BEL	ITA
	45.34+	31.37+	29.97+	49.83+	48.93+	51.92+	47.70+	45.93+	8.09+	45.62+	44.59+	44.99+	45.12+	42.95+	57.95+	42.79+	45.02+
3	FIN	AUT	AUT	FIN	BEL	CZE	AUT	AUT	CZE	GRC	BEL	BEL	BEL	BEL	CZE	AUT	AUT
	29.33+	13.69+	10.30+	36.29+	26.01+	-0.14-	46.06+	42.71+	-0.23-	-0.03-	36.34+	42.52+	43.95+	40.82+	-0.16-	38.65+	42.05+
4	IRL	IRL	DNK	IRL	CZE	GRC	DEU	CZE	IRL	CZE	DEU	CZE	DEU	IRL	DNK	IRL	BEL
	-0.13-	-0.14-	-0.19-	-0.20-	-0.17-	-0.29-	36.84+	-0.26-	-0.29-	-0.17-	15.00-	-0.16-	28.26+	-0.12-	-0.36-	-0.12-	38.17+
5	CZE	DNK	IRL	CZE	DNK	DNK	IRL	IRL	DNK	IRL	GRC	IRL	IRL	GRC	IRL	CZE	IRL
	-0.15-	-0.43-	-0.21-	-0.27-	-0.26-	-0.35-	-0.30-	-0.26-	-0.50-	-0.27-	-0.09-	-0.22-	-0.15-	-0.17-	-0.44-	-0.18-	-0.13-
6	DNK	GRC	CZE	DNK	IRL	IRL	CZE	DNK	GRC	PRT	IRL	GRC	GRC	CZE	BEL	GRC	CZE
	-0.29-	-0.76-	-0.35-	-0.29-	-0.28-	-0.36-	-0.31-	-0.46-	-0.50-	-0.69-	-0.12-	-0.28-	-0.16-	-0.18-	-0.52-	-0.39-	-0.20-
7	POL	SWE	BEL	GRC	GRC	POL	DNK	PRT	PRT	DNK	CZE	PRT	CZE	PRT	AUT	DNK	DNK
	-0.40-	-0.85-	-0.40-	-0.45-	-0.53-	-0.89-	-0.53-	-0.61-	-0.57-	-0.71-	-0.17-	-0.65-	-0.24-	-0.68-	-0.67-	-0.41-	-0.23-
8	FRA	ESP	GRC	SWE	POL	AUT	GRC	SWE	POL	POL	HUN	HUN	DNK	ESP	PRT	FRA	PRT
	-0.56-	-0.88-	-0.74-	-1.03-	-1.10-	-1.31-	-0.55-	-0.93-	-0.87-	-0.82-	-0.18-	-1.13-	-0.52-	-0.92-	-0.79-	-0.82-	-0.74-
9	PRT	HUN	ESP	BEL	SWE	HUN	PRT	ESP	SWE	HUN	DNK	NLD	PRT	HUN	GRC	PRT	GRC
	-0.94-	-1.01-	-0.94-	-1.06-	-1.21-	-1.36-	-0.58-	-1.09-	-1.01-	-1.61-	-0.47-	-1.84-	-0.83-	-1.20-	-1.22-	-1.02-	-0.80-
10	GRC	POL	HUN	ESP	ESP	FIN	POL	GRC	ESP	ESP	PRT	ESP	HUN	NLD	NLD	FIN	FRA
	-0.95-	-1.35-	-0.96-	-1.21-	-1.44-	-1.54-	-0.58-	-1.25-	-1.31-	-1.68-	-0.66-	-1.87-	-1.11-	-1.67-	-1.66-	-2.07-	-0.82-
11	SWE	BEL	POL	POL	NLD	ESP	FIN	POL	FIN	FIN	FIN	FIN	NLD	FIN	FRA	NLD	FIN
	-1.47-	-1.54-	-1.00-	-1.30-	-2.10-	-1.86-	-1.75-	-1.34-	-1.45-	-1.79-	-1.72-	-1.88-	-1.79-	-2.58-	-2.79-	-3.06-	-1.74-
12	NLD	CZE	NLD	HUN	FIN	PRT	NLD	FIN	HUN	NLD	NLD	DNK	ESP	POL	POL	POL	POL
	-1.88-	-1.65-	-1.32-	-2.07-	-2.14-	-2.53-	-2.12-	-1.69-	-1.79-	-1.92-	-1.95-	-2.31-	-2.06-	-2.74-	-2.82-	-3.98-	-2.03-
13	BEL	PRT	SWE	NLD	HUN	BEL	HUN	HUN	NLD	SWE	POL	POL	FIN	DNK	FIN	SWE	NLD
	-2.01-	-1.76-	-1.44-	-2.47-	-2.21-	-4.05-	-2.53-	-2.03-	-2.00-	-4.41-	-2.24-	-2.45-	-2.15-	-3.67-	-2.94-	-5.76-	-2.51-
14	HUN	NLD	PRT	PRT	PRT	NLD	FRA	NLD	AUT	GBR	SWE	SWE	POL	SWE	SWE	HUN	SWE
	-2.15-	-2.85-	-2.06-	-2.94-	-2.95-	-4.45-	-3.10-	-2.05-	-4.31-	-9.69-	-3.96-	-5.22-	-2.86-	-5.11-	-4.81-	-7.32-	-4.46-
15	GBR	GBR	GBR	GBR	GBR	GBR	ESP	FRA	GBR	AUT	FRA	GBR	SWE	FRA	HUN	ITA	HUN
	-8.57-	-9.90-	-10.05-	-10.71-	-10.40-	-10.36-	-4.42-	-3.14-	-9.50-	-9.88-	-5.09-	-8.97-	-5.32-	-5.57-	-4.98-	-9.39-	-6.31-
16	DEU	FRA	FRA	FRA	FRA	ITA	GBR	GBR	FRA	FRA	GBR	FRA	FRA	AUT	ITA	GBR	GBR
	-23.71-	-13.08-	-36.10-	-33.69-	-46.19-	-32.10-	-10.57-	-9.95-	-32.51-	-28.51-	-9.30-	-20.95-	-7.79-	-7.42-	-33.77-	-30.58-	-23.35-
17	ITA	ITA	ITA	ITA	ITA	FRA	ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA	DEU	DEU	DEU
	-66.63-	-60.82-	-43.59-	-62.07-	-64.49-	-42.68-	-54.79-	-61.94-	-53.49-	-31.13-	-37.44-	-36.20-	-38.41-	-35.02-	-41.65-	-59.02-	-49.55-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.34: Ranking of the Efficient Specialization Ratio (E) in Machinery, Nec*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	ITA	ITA	DEU	ITA	ITA	DEU	ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA	GBR	GBR
	105.02+	94.13+	59.84+	75.06+	95.11+	62.85+	85.09+	114.44+	117.58+	58.47+	81.01+	78.49+	79.19+	74.15+	85.95+	61.81+	59.47+
2	DEU	DEU	ITA	DEU	DEU	ITA	DEU	IRL	BEL	DEU	DEU	DEU	DEU	AUT	HUN	HUN	ITA
	5.35-	13.60-	49.36+	34.01=	16.82-	49.02+	23.96-	-0.13-	-0.08-	56.72+	28.72=	32.47=	29.47=	25.66+	22.03+	25.82+	32.66+
3	PRT	PRT	DNK	IRL	CZE	CZE	IRL	CZE	GRC	GRC	GRC	IRL	GRC	DNK	GBR	ITA	HUN
	-0.07-	-0.12-	-0.09-	-0.10-	-0.14-	-0.12-	-0.13-	-0.18-	-0.15-	-0.01-	-0.05-	-0.12-	-0.07-	10.68+	7.50=	12.99-	24.82+
4	IRL	ESP	IRL	BEL	IRL	IRL	PRT	PRT	IRL	IRL	HUN	GRC	IRL	GRC	GRC	DEU	DNK
	-0.08-	-0.15-	-0.11-	-0.16-	-0.14-	-0.17-	-0.24-	-0.21-	-0.19-	-0.18-	-0.06-	-0.18-	-0.13-	-0.05-	-0.09-	5.16-	-0.12-
5	CZE	HUN	HUN	CZE	DNK	BEL	GRC	DNK	PRT	CZE	IRL	PRT	NLD	IRL	DNK	AUT	IRL
	-0.08-	-0.16-	-0.14-	-0.16-	-0.15-	-0.19-	-0.26-	-0.23-	-0.20-	-0.20-	-0.09-	-0.22-	-0.21-	-0.10-	-0.15-	1.83-	-0.13-
6	DNK	DNK	PRT	PRT	PRT	DNK	CZE	BEL	DNK	PRT	DNK	NLD	DNK	NLD	IRL	IRL	GRC
	-0.12-	-0.19-	-0.14-	-0.17-	-0.18-	-0.21-	-0.26-	-0.26-	-0.24-	-0.24-	-0.19-	-0.25-	-0.21-	-0.19-	-0.16-	-0.09-	-0.24-
7	GRC	GRC	ESP	DNK	ESP	HUN	NLD	NLD	NLD	NLD	PRT	CZE	PRT	PRT	BEL	DNK	BEL
	-0.25-	-0.22-	-0.18-	-0.18-	-0.23-	-0.32-	-0.27-	-0.28-	-0.28-	-0.26-	-0.24-	-0.30-	-0.28-	-0.25-	-0.19-	-0.18-	-0.25-
8	POL	IRL	CZE	ESP	BEL	AUT	BEL	FIN	CZE	BEL	CZE	BEL	CZE	CZE	NLD	GRC	PRT
	-0.32-	-0.26-	-0.19-	-0.19-	-0.24-	-0.33-	-0.27-	-0.32-	-0.29-	-0.27-	-0.27-	-0.31-	-0.29-	-0.28-	-0.24-	-0.23-	-0.34-
9	BEL	BEL	GRC	FIN	GRC	GRC	FIN	SWE	SWE	DNK	BEL	HUN	BEL	BEL	AUT	BEL	CZE
	-0.35-	-0.27-	-0.22-	-0.28-	-0.28-	-0.38-	-0.36-	-0.33-	-0.30-	-0.29-	-0.28-	-0.34-	-0.32-	-0.29-	-0.30-	-0.25-	-0.40-
10	AUT	SWE	BEL	SWE	FIN	FIN	DNK	AUT	FIN	ESP	NLD	AUT	HUN	ESP	CZE	CZE	FIN
	-0.39-	-0.30-	-0.25-	-0.29-	-0.31-	-0.39-	-0.36-	-0.42-	-0.32-	-0.38-	-0.28-	-0.41-	-0.35-	-0.34-	-0.30-	-0.31-	-0.48-
11	FIN	FIN	FIN	AUT	AUT	PRT	AUT	GRC	ESP	HUN	AUT	FIN	AUT	HUN	PRT	PRT	AUT
	-0.41-	-0.37-	-0.37-	-0.37-	-0.36-	-0.53-	-0.41-	-0.43-	-0.33-	-0.40-	-0.44-	-0.51-	-0.42-	-0.42-	-0.37-	-0.37-	-0.48-
12	SWE	AUT	AUT	GRC	SWE	POL	HUN	POL	HUN	FIN	FIN	POL	FIN	POL	POL	FIN	POL
	-0.72-	-0.40-	-0.39-	-0.46-	-0.45-	-0.53-	-0.50-	-0.48-	-0.46-	-0.40-	-0.46-	-0.53-	-0.53-	-0.55-	-0.61-	-0.51-	-0.53-
13	HUN	CZE	NLD	NLD	NLD	ESP	SWE	HUN	AUT	POL	POL	ESP	POL	FIN	FIN	POL	NLD
	-0.84-	-0.52-	-0.53-	-0.51-	-0.48-	-0.55-	-0.60-	-0.50-	-0.53-	-0.47-	-0.53-	-0.61-	-0.53-	-0.63-	-0.62-	-0.60-	-0.60-
14	FRA	POL	POL	POL	POL	SWE	POL	FRA	POL	SWE	SWE	DNK	ESP	SWE	SWE	NLD	SWE
	-0.87-	-0.77-	-0.63-	-0.64-	-0.49-	-0.58-	-0.61-	-1.60-	-0.64-	-0.65-	-0.70-	-0.63-	-0.63-	-0.88-	-0.79-	-0.65-	-0.94-
15	NLD	NLD	SWE	HUN	HUN	NLD	FRA	GBR	GBR	GBR	FRA	SWE	SWE	FRA	FRA	SWE	FRA
	-0.94-	-0.81-	-0.66-	-0.86-	-1.03-	-0.60-	-1.48-	-1.74-	-1.66-	-2.14-	-1.61-	-0.69-	-0.85-	-1.55-	-2.11-	-0.89-	-1.68-
16	GBR	GBR	GBR	GBR	GBR	GBR	GBR	ESP	FRA	AUT	GBR	GBR	FRA	GBR	ESP	FRA	ESP
	-1.24-	-1.34-	-1.39-	-1.43-	-2.01-	-1.59-	-1.63-	-2.02-	-5.61-	-4.21-	-2.07-	-1.96-	-1.70-	-2.25-	-2.28-	-1.57-	-2.28-
17	ESP	FRA	FRA	FRA	FRA	FRA	ESP	DEU	DEU	FRA	ESP	FRA	GBR	DEU	DEU	ESP	DEU
	-3.70-	-1.84-	-3.91-	-3.27-	-5.43-	-5.39-	-1.68-	-5.30-	-6.29-	-5.09-	-2.46-	-3.91-	-2.14-	-2.71-	-7.28-	-1.95-	-8.49-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.35: Ranking of the Efficient Specialization Ratio (E) in Electrical and Optical Equipment*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	ITA	ITA	ITA	ITA	ITA	ITA	ITA	ITA	AUT	DEU	DEU	SWE	SWE	SWE	SWE	SWE	SWE
	112.52+	115.04+	116.18+	117.42+	99.13+	35.41+	72.74+	64.37+	29.89+	38.21+	40.32+	41.31+	40.39+	40.84+	41.14+	48.63+	52.56+
2	DNK	ESP	DNK	CZE	FIN	NLD	FIN	FIN	DEU	SWE	SWE	DEU	DEU	FIN	DEU	DEU	DEU
	-0.02-	-0.03-	-0.03-	-0.02-	20.70+	31.23+	21.32+	24.02+	27.90=	37.78+	40.26+	32.12=	37.56=	38.07+	38.18+	32.53=	30.65=
3	PRT	PRT	ESP	ESP	CZE	BEL	HUN	HUN	FIN	FIN	FIN	FIN	FIN	DEU	FIN	FIN	FIN
	-0.02-	-0.04-	-0.03-	-0.04-	-0.01-	30.69+	21.25+	19.71+	24.91+	26.14+	29.52+	29.74+	32.16+	32.41=	31.79+	30.42+	28.69+
4	CZE	HUN	CZE	PRT	ESP	FIN	CZE	POL	HUN	HUN	CZE	DNK	GRC	ESP	CZE	CZE	CZE
	-0.03-	-0.07-	-0.04-	-0.05-	-0.04-	22.41+	-0.09-	5.61+	19.74+	15.80+	-0.02-	9.18+	-0.06-	-0.04-	-0.03-	-0.03-	-0.04-
5	FRA	BEL	PRT	DNK	DNK	HUN	DNK	CZE	GBR	DNK	HUN	HUN	ESP	GRC	GRC	FRA	DNK
	-0.04-	-0.09-	-0.04-	-0.10-	-0.05-	0.21-	-0.17-	-0.02-	15.82+	1.39=	-0.03-	2.05-	-0.12-	-0.04-	-0.06-	-0.08-	-0.09-
6	BEL	DNK	HUN	FIN	PRT	CZE	POL	SWE	CZE	GRC	GRC	CZE	DNK	CZE	DNK	DNK	FRA
	-0.11-	-0.10-	-0.07-	-0.10-	-0.06-	-0.01-	-0.25-	-0.13-	-0.02-	-0.01-	-0.04-	-0.02-	-0.14-	-0.10-	-0.09-	-0.15-	-0.09-
7	IRL	SWE	BEL	BEL	IRL	DNK	AUT	DNK	ESP	CZE	DNK	ESP	HUN	HUN	AUT	GRC	GRC
	-0.17-	-0.12-	-0.08-	-0.11-	-0.25-	-0.10-	-0.26-	-0.17-	-0.04-	-0.02-	-0.15-	-0.11-	-0.18-	-0.17-	-0.10-	-0.20-	-0.18-
8	FIN	FIN	FIN	IRL	BEL	ESP	FRA	AUT	SWE	ESP	AUT	GRC	CZE	BEL	BEL	BEL	AUT
	-0.17-	-0.13-	-0.12-	-0.19-	-0.30-	-0.10-	-0.27-	-0.24-	-0.06-	-0.05-	-0.29-	-0.15-	-0.18-	-0.34-	-0.13-	-0.32-	-0.26-
9	POL	GRC	IRL	SWE	AUT	PRT	ESP	FRA	GRC	POL	BEL	AUT	AUT	POL	FRA	AUT	POL
	-0.18-	-0.23-	-0.19-	-0.19-	-0.33-	-0.12-	-0.28-	-0.31-	-0.11-	-0.35-	-0.35-	-0.22-	-0.24-	-0.38-	-0.30-	-0.34-	-0.31-
10	GRC	IRL	AUT	AUT	SWE	SWE	GRC	IRL	BEL	IRL	POL	POL	POL	NLD	POL	ESP	BEL
	-0.21-	-0.25-	-0.29-	-0.36-	-0.34-	-0.12-	-0.33-	-0.32-	-0.13-	-0.42-	-0.38-	-0.38-	-0.36-	-0.42-	-0.40-	-0.46-	-0.33-
11	HUN	AUT	GRC	POL	POL	AUT	SWE	GRC	DNK	BEL	ESP	BEL	BEL	IRL	NLD	POL	ESP
	-0.34-	-0.30-	-0.34-	-0.46-	-0.47-	-0.19-	-0.34-	-0.40-	-0.19-	-0.44-	-0.42-	-0.38-	-0.37-	-0.52-	-0.43-	-0.46-	-0.42-
12	AUT	POL	POL	HUN	NLD	IRL	IRL	BEL	IRL	NLD	NLD	NLD	NLD	FRA	ESP	IRL	IRL
	-0.39-	-0.62-	-0.43-	-0.49-	-0.62-	-0.36-	-0.36-	-0.47-	-0.36-	-0.57-	-0.55-	-0.46-	-0.43-	-0.58-	-0.45-	-0.48-	-0.55-
13	SWE	GBR	SWE	NLD	GBR	POL	BEL	ESP	POL	GBR	FRA	GBR	IRL	GBR	IRL	NLD	NLD
	-0.58-	-0.74-	-0.44-	-0.85-	-0.78-	-0.55-	-0.49-	-0.52-	-0.36-	-0.78-	-0.56-	-0.68-	-0.55-	-0.86-	-0.57-	-1.14-	-1.08-
14	GBR	CZE	NLD	GBR	HUN	GBR	NLD	NLD	NLD	PRT	IRL	IRL	GBR	DNK	GBR	ITA	PRT
	-0.68-	-0.95-	-0.63-	-1.18-	-1.02-	-0.80-	-0.65-	-0.53-	-0.54-	-1.36-	-0.66-	-0.78-	-0.70-	-1.10-	-1.10-	-1.27-	-1.79-
15	ESP	NLD	GBR	GRC	DEU	GRC	GBR	GBR	PRT	AUT	GBR	PRT	FRA	PRT	HUN	PRT	HUN
	-0.72-	-1.45-	-0.67-	-1.91-	-3.39-	-3.13-	-0.82-	-0.75-	-1.19-	-3.45-	-0.68-	-1.28-	-1.23-	-1.23-	-1.41-	-2.01-	-1.80-
16	NLD	FRA	DEU	DEU	GRC	DEU	PRT	PRT	ITA	ITA	PRT	ITA	PRT	AUT	PRT	HUN	GBR
	-1.15-	-2.91-	-5.62-	-5.67-	-3.70-	-5.94-	-1.04-	-1.00-	-5.86-	-3.77-	-1.47-	-4.28-	-1.42-	-1.66-	-1.81-	-2.01-	-2.42-
17	DEU	DEU	FRA	FRA	FRA	FRA	DEU	DEU	FRA	FRA	ITA	FRA	ITA	ITA	ITA	GBR	ITA
	-7.71-	-7.01-	-7.17-	-5.70-	-8.48-	-8.52-	-9.97-	-8.85-	-9.39-	-8.11-	-4.49-	-5.67-	-4.13-	-3.89-	-4.23-	-2.64-	-2.54-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.36: Ranking of the Efficient Specialization Ratio (E) in Transport Equipment*

									Year								
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	DEU	DEU	FRA	FRA	FRA	FRA	DEU	DEU	FRA	FRA	DEU	DEU	DEU	DEU	DEU	DEU	DEU
	103.27+	65.14+	103.80+	80.00+	103.71+	105.01+	103.25+	103.39+	83.16+	69.46+	103.09+	56.83+	97.05+	103.37+	103.58+	104.28+	104.64+
2	DNK	FRA	DNK	DEU	DNK	DNK	DNK	PRT	DEU	AUT	GRC	FRA	FRA	GRC	AUT	FIN	DNK
	-0.00-	38.22+	-0.00-	22.88-	-0.01-	-0.02-	-0.03-	-0.03-	19.76-	34.98+	-0.01-	46.33+	6.14-	-0.02-	-0.03-	-0.03-	-0.01-
3	PRT	PRT	PRT	DNK	PRT	AUT	PRT	DNK	PRT	GRC	HUN	PRT	GRC	PRT	PRT	PRT	PRT
	-0.01-	-0.01-	-0.02-	-0.01-	-0.02-	-0.04-	-0.03-	-0.03-	-0.03-	-0.00-	-0.02-	-0.02-	-0.02-	-0.02-	-0.03-	-0.03-	-0.03-
4	CZE	DNK	IRL	PRT	IRL	IRL	IRL	IRL	DNK	PRT	PRT	HUN	PRT	IRL	BEL	DNK	FIN
	-0.01-	-0.01-	-0.02-	-0.02-	-0.03-	-0.04-	-0.04-	-0.04-	-0.03-	-0.03-	-0.03-	-0.04-	-0.03-	-0.04-	-0.04-	-0.04-	-0.03-
5	IRL	GRC	GRC	IRL	AUT	GRC	FIN	AUT	GRC	DNK	DNK	IRL	DNK	FIN	GRC	IRL	GRC
	-0.01-	-0.02-	-0.02-	-0.03-	-0.04-	-0.05-	-0.05-	-0.05-	-0.03-	-0.03-	-0.03-	-0.06-	-0.04-	-0.05-	-0.04-	-0.05-	-0.03-
6	GRC	IRL	HUN	BEL	FIN	CZE	CZE	FIN	IRL	FIN	IRL	FIN	IRL	CZE	DNK	ESP	IRL
	-0.02-	-0.03-	-0.03-	-0.03-	-0.05-	-0.05-	-0.05-	-0.05-	-0.04-	-0.04-	-0.04-	-0.06-	-0.06-	-0.07-	-0.04-	-0.08-	-0.06-
7	AUT	HUN	CZE	GRC	CZE	HUN	AUT	GRC	FIN	IRL	FIN	GRC	FIN	FRA	FIN	GRC	FRA
	-0.05-	-0.04-	-0.05-	-0.04-	-0.06-	-0.06-	-0.06-	-0.08-	-0.06-	-0.05-	-0.05-	-0.06-	-0.07-	-0.10-	-0.04-	-0.08-	-0.08-
8	POL	CZE	BEL	FIN	GRC	FIN	POL	CZE	BEL	CZE	AUT	DNK	CZE	HUN	IRL	FRA	ESP
	-0.05-	-0.05-	-0.05-	-0.06-	-0.06-	-0.06-	-0.07-	-0.09-	-0.07-	-0.06-	-0.06-	-0.07-	-0.08-	-0.10-	-0.08-	-0.09-	-0.09-
9	BEL	BEL	AUT	AUT	BEL	POL	FRA	POL	CZE	ESP	CZE	CZE	HUN	ESP	ESP	CZE	BEL
	-0.06-	-0.05-	-0.05-	-0.06-	-0.08-	-0.08-	-0.07-	-0.09-	-0.08-	-0.08-	-0.07-	-0.10-	-0.09-	-0.12-	-0.09-	-0.09-	-0.10-
10	HUN	AUT	FIN	CZE	HUN	BEL	GRC	HUN	AUT	POL	BEL	AUT	AUT	BEL	CZE	AUT	AUT
	-0.08-	-0.05-	-0.07-	-0.06-	-0.10-	-0.12-	-0.08-	-0.11-	-0.09-	-0.10-	-0.11-	-0.10-	-0.11-	-0.12-	-0.10-	-0.10-	-0.12-
11	FIN	FIN	ESP	HUN	POL	ESP	ESP	FRA	POL	HUN	FRA	BEL	NLD	NLD	NLD	BEL	CZE
	-0.10-	-0.08-	-0.10-	-0.08-	-0.14-	-0.16-	-0.14-	-0.12-	-0.10-	-0.10-	-0.12-	-0.11-	-0.11-	-0.12-	-0.12-	-0.11-	-0.14-
12	FRA	ESP	POL	ESP	NLD	PRT	HUN	ESP	ESP	NLD	NLD	NLD	BEL	DNK	FRA	POL	POL
	-0.12-	-0.10-	-0.11-	-0.12-	-0.15-	-0.21-	-0.16-	-0.16-	-0.11-	-0.15-	-0.14-	-0.12-	-0.13-	-0.12-	-0.14-	-0.25-	-0.21-
13	SWE	POL	SWE	SWE	ESP	SWE	NLD	SWE	HUN	BEL	ESP	ESP	ESP	POL	POL	SWE	SWE
	-0.12-	-0.12-	-0.14-	-0.18-	-0.15-	-0.24-	-0.21-	-0.19-	-0.12-	-0.21-	-0.14-	-0.15-	-0.15-	-0.21-	-0.22-	-0.36-	-0.42-
14	ESP	SWE	NLD	POL	SWE	GBR	SWE	NLD	NLD	SWE	POL	POL	POL	AUT	SWE	ITA	HUN
	-0.14-	-0.13-	-0.33-	-0.20-	-0.24-	-0.53-	-0.22-	-0.19-	-0.17-	-0.27-	-0.15-	-0.17-	-0.20-	-0.28-	-0.27-	-0.36-	-0.47-
15	NLD	GBR	GBR	NLD	GBR	ITA	BEL	BEL	SWE	GBR	SWE	SWE	SWE	SWE	HUN	HUN	ITA
	-0.63-	-0.68-	-0.66-	-0.33-	-0.51-	-0.77-	-0.24-	-0.23-	-0.18-	-0.69-	-0.29-	-0.31-	-0.32-	-0.31-	-0.39-	-0.44-	-0.84-
16	GBR	NLD	ITA	GBR	DEU	NLD	GBR	GBR	GBR	ITA	GBR	GBR	GBR	GBR	GBR	NLD	NLD
	-0.69-	-0.83-	-0.94-	-0.51-	-0.90-	-1.27-	-0.60-	-0.55-	-0.53-	-1.21-	-0.66-	-0.66-	-0.64-	-0.59-	-0.77-	-1.08-	-0.95-
17	ITA	ITA	DEU	ITA	ITA	DEU	ITA	ITA	ITA	DEU	ITA	ITA	ITA	ITA	ITA	GBR	GBR
	-1.17-	-1.16-	-1.21-	-1.17-	-1.19-	-1.32-	-1.19-	-1.38-	-1.29-	-1.42-	-1.17-	-1.14-	-1.15-	-1.10-	-1.20-	-1.09-	-1.06-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.37: Ranking of the Efficient Specialization Ratio (E) in Manufacturing, Nec; Recycling*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR	GBR
	111.92+	110.11+	112.80+	111.69+	111.80+	114.00+	113.84+	115.50+	116.80+	117.21+	123.43+	116.73+	114.94+	113.43+	133.77+	131.48+	124.45+
2	CZE	PRT	DNK	CZE	DNK	CZE	PRT	CZE	CZE	GRC	GRC	GRC	GRC	GRC	CZE	CZE	CZE
	-0.02-	-0.04-	-0.02-	-0.03-	-0.03-	-0.01-	-0.07-	-0.03-	-0.03-	-0.00-	-0.00-	-0.02-	-0.01-	-0.01-	-0.02-	-0.02-	-0.03-
3	IRL	IRL	PRT	DNK	PRT	HUN	CZE	PRT	GRC	CZE	HUN	CZE	CZE	CZE	DNK	GRC	DNK
	-0.04-	-0.05-	-0.05-	-0.04-	-0.05-	-0.08-	-0.08-	-0.07-	-0.03-	-0.02-	-0.01-	-0.02-	-0.03-	-0.02-	-0.04-	-0.02-	-0.03-
4	FRA	ESP	HUN	IRL	IRL	DNK	IRL	IRL	DNK	DNK	CZE	PRT	PRT	PRT	PRT	IRL	GRC
	-0.04-	-0.05-	-0.05-	-0.05-	-0.06-	-0.08-	-0.10-	-0.08-	-0.06-	-0.06-	-0.02-	-0.05-	-0.06-	-0.05-	-0.06-	-0.05-	-0.05-
5	DNK	HUN	CZE	PRT	ESP	ESP	DNK	FIN	PRT	PRT	DNK	HUN	IRL	IRL	GRC	DNK	PRT
	-0.04-	-0.05-	-0.06-	-0.05-	-0.06-	-0.09-	-0.13-	-0.15-	-0.06-	-0.07-	-0.05-	-0.07-	-0.07-	-0.06-	-0.07-	-0.06-	-0.05-
6	BEL	DNK	IRL	ESP	CZE	IRL	GRC	DNK	ESP	ESP	IRL	IRL	DNK	HUN	IRL	PRT	IRL
	-0.10-	-0.07-	-0.06-	-0.06-	-0.09-	-0.09-	-0.14-	-0.17-	-0.08-	-0.11-	-0.06-	-0.07-	-0.07-	-0.10-	-0.14-	-0.06-	-0.06-
7	PRT	CZE	ESP	GRC	FIN	GRC	FIN	GRC	IRL	IRL	PRT	FIN	HUN	DNK	HUN	FRA	FRA
	-0.17-	-0.07-	-0.06-	-0.14-	-0.11-	-0.12-	-0.15-	-0.18-	-0.10-	-0.12-	-0.07-	-0.15-	-0.08-	-0.12-	-0.18-	-0.10-	-0.09-
8	HUN	BEL	BEL	BEL	GRC	FIN	HUN	HUN	FIN	FIN	FIN	DNK	FIN	FIN	FIN	FIN	FIN
	-0.17-	-0.11-	-0.13-	-0.16-	-0.15-	-0.12-	-0.22-	-0.22-	-0.14-	-0.14-	-0.16-	-0.15-	-0.16-	-0.19-	-0.19-	-0.12-	-0.12-
9	SWE	GRC	GRC	HUN	SWE	NLD	ESP	SWE	HUN	HUN	SWE	ESP	ESP	ESP	FRA	HUN	HUN
	-0.18-	-0.18-	-0.18-	-0.17-	-0.16-	-0.29-	-0.28-	-0.23-	-0.21-	-0.16-	-0.43-	-0.16-	-0.23-	-0.19-	-0.39-	-0.20-	-0.19-
10	GRC	SWE	SWE	FIN	HUN	BEL	FRA	FRA	SWE	SWE	POL	SWE	SWE	AUT	SWE	SWE	SWE
	-0.22-	-0.20-	-0.22-	-0.18-	-0.17-	-0.39-	-0.34-	-0.36-	-0.22-	-0.39-	-0.55-	-0.42-	-0.41-	-0.27-	-0.39-	-0.40-	-0.34-
11	NLD	FIN	FIN	SWE	BEL	POL	POL	POL	AUT	POL	NLD	NLD	NLD	SWE	AUT	POL	POL
	-0.32-	-0.36-	-0.33-	-0.22-	-0.44-	-0.48-	-0.39-	-0.49-	-0.26-	-0.43-	-0.59-	-0.56-	-0.56-	-0.41-	-0.40-	-0.79-	-0.59-
12	FIN	AUT	NLD	NLD	NLD	PRT	NLD	NLD	POL	NLD	FRA	POL	POL	NLD	BEL	NLD	BEL
	-0.41-	-0.38-	-0.37-	-0.50-	-0.46-	-0.64-	-0.69-	-0.72-	-0.49-	-0.60-	-0.72-	-0.63-	-0.76-	-0.53-	-0.45-	-0.99-	-0.85-
13	AUT	NLD	AUT	AUT	AUT	AUT	AUT	ESP	NLD	AUT	BEL	AUT	BEL	POL	NLD	ITA	NLD
	-0.48-	-0.54-	-0.45-	-0.62-	-0.61-	-0.72-	-1.21-	-0.78-	-0.64-	-1.36-	-1.28-	-1.50-	-1.04-	-0.81-	-0.58-	-1.25-	-0.90-
14	POL	POL	POL	POL	POL	SWE	BEL	AUT	BEL	BEL	AUT	BEL	FRA	BEL	POL	BEL	AUT
	-0.81-	-0.86-	-1.25-	-1.17-	-0.96-	-1.19-	-1.25-	-1.37-	-0.70-	-1.83-	-1.30-	-1.52-	-1.49-	-0.89-	-0.85-	-1.26-	-1.89-
15	ITA	FRA	ITA	ITA	ITA	ITA	SWE	BEL	ITA	ITA	ITA	ITA	AUT	FRA	ITA	AUT	ITA
	-2.21-	-1.30-	-1.98-	-2.22-	-2.24-	-1.77-	-1.25-	-1.45-	-2.68-	-2.26-	-2.27-	-2.19-	-1.82-	-1.14-	-2.20-	-1.60-	-3.60-
16	DEU	ITA	DEU	FRA	DEU	DEU	ITA	ITA	DEU	DEU	DEU	FRA	ITA	ITA	DEU	DEU	DEU
	-2.86-	-1.85-	-3.41-	-2.76-	-2.51-	-3.54-	-2.83-	-3.42-	-5.30-	-4.61-	-5.13-	-3.56-	-2.18-	-2.07-	-4.12-	-4.78-	-4.77-
17	ESP	DEU	FRA	DEU	FRA	FRA	DEU	DEU	FRA	FRA	ESP	DEU	DEU	DEU	ESP	ESP	ESP
	-3.83-	-4.02-	-4.21-	-3.32-	-3.71-	-4.39-	-4.72-	-5.77-	-5.80-	-5.06-	-10.78-	-5.65-	-5.98-	-6.59-	-23.70-	-19.77-	-10.89-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

Table 2.38: Ranking of the Efficient Specialization Ratio (E) in Electricity, Gas and Water Supply*

	Year																
Rank	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
4	POL	IRL	IRL	DNK	DNK	FIN	DNK	IRL	IRL	GRC	FIN	DNK	SWE	DNK	DNK	IRL	DNK
	-0.38-	-0.11-	-0.20-	-0.36-	-0.18-	-0.17-	-0.30-	-0.22-	-0.28-	-0.10-	-0.19-	-0.22-	-0.28-	-0.22-	-0.20-	-0.26-	-0.17-
5	CZE	PRT	PRT	CZE	IRL	IRL	IRL	DNK	DNK	FIN	DNK	SWE	DNK	IRL	SWE	DNK	CZE
	-0.38-	-0.39-	-0.46-	-0.40-	-0.22-	-0.33-	-0.34-	-0.30-	-0.28-	-0.16-	-0.21-	-0.31-	-0.29-	-0.27-	-0.26-	-0.29-	-0.33-
6	FIN	ESP	FIN	FIN	FIN	CZE	CZE	CZE	CZE	CZE	SWE	CZE	IRL	SWE	CZE	SWE	SWE
	-0.57-	-0.49-	-0.52-	-0.48-	-0.38-	-0.36-	-0.67-	-0.32-	-0.29-	-0.23-	-0.27-	-0.40-	-0.34-	-0.28-	-0.37-	-0.30-	-0.33-
7	AUT	FIN	ESP	SWE	CZE	BEL	HUN	HUN	HUN	DNK	HUN	IRL	GRC	GRC	BEL	CZE	IRL
	-0.90-	-0.56-	-0.55-	-0.57-	-0.45-	-0.65-	-0.73-	-0.46-	-0.48-	-0.25-	-0.32-	-0.45-	-0.80-	-0.45-	-0.52-	-0.33-	-0.36-
8	GRC	SWE	GRC	ESP	PRT	PRT	AUT	SWE	AUT	SWE	CZE	NLD	AUT	AUT	IRL	HUN	HUN
	-1.10-	-0.75-	-0.95-	-0.58-	-0.72-	-0.84-	-0.96-	-0.62-	-0.49-	-0.31-	-0.37-	-1.31-	-0.98-	-0.46-	-0.62-	-0.82-	-0.81-
9	PRT	GRC	CZE	PRT	ESP	AUT	NLD	AUT	SWE	IRL	GRC	AUT	NLD	ESP	HUN	FRA	AUT
	-1.25-	-0.91-	-1.08-	-0.64-	-0.75-	-1.13-	-1.26-	-0.94-	-0.57-	-0.31-	-0.48-	-1.44-	-1.21-	-1.01-	-0.74-	-1.06-	-1.10-
10	BEL	AUT	AUT	BEL	AUT	GRC	GRC	NLD	ESP	AUT	NLD	BEL	BEL	NLD	NLD	AUT	FRA
	-1.53-	-1.19-	-1.22-	-0.81-	-0.91-	-1.20-	-1.71-	-1.21-	-0.70-	-0.60-	-1.22-	-1.57-	-1.44-	-1.11-	-1.36-	-1.07-	-1.11-
11	FRA	BEL	BEL	AUT	GRC	SWE	BEL	BEL	BEL	ESP	BEL	GRC	ESP	BEL	AUT	BEL	BEL
	-1.57-	-1.28-	-1.35-	-0.83-	-1.23-	-1.24-	-1.81-	-1.44-	-0.75-	-0.83-	-1.29-	-1.66-	-1.84-	-1.38-	-1.66-	-1.08-	-1.13-
12	NLD	FRA	NLD	GRC	BEL	NLD	FRA	GRC	NLD	NLD	AUT	ESP	HUN	HUN	GRC	GRC	GBR
	-2.60-	-2.15-	-1.80-	-1.02-	-1.45-	-1.28-	-2.72-	-2.65-	-1.19-	-1.17-	-1.46-	-1.78-	-2.70-	-2.81-	-1.67-	-1.69-	-3.12-
13	GBR	NLD	HUN	NLD	NLD	FRA	ESP	FRA	GRC	BEL	POL	HUN	POL	POL	FRA	GBR	NLD
	-2.91-	-2.51-	-2.77-	-1.59-	-1.53-	-3.99-	-2.82-	-2.73-	-1.34-	-1.31-	-3.75-	-2.41-	-3.59-	-3.66-	-2.81-	-2.72-	-3.21-
14	ESP	GBR	FRA	FRA	FRA	GBR	POL	POL	FRA	FRA	ESP	POL	GBR	GBR	POL	NLD	POL
	-3.72-	-3.42-	-3.07-	-2.55-	-1.75-	-4.12-	-3.45-	-3.65-	-3.31-	-3.43-	-3.80-	-3.56-	-4.45-	-5.30-	-3.15-	-3.31-	-3.43-
15	ITA	HUN	GBR	ITA	GBR	ESP	GBR	GBR	POL	POL	FRA	FRA	FRA	ITA	GBR	POL	ITA
	-4.04-	-3.51-	-3.66-	-3.88-	-4.45-	-4.40-	-4.02-	-3.97-	-3.58-	-4.08-	-4.79-	-5.30-	-5.21-	-5.44-	-4.02-	-3.32-	-3.77-
16	DEU	ITA	ITA	DEU	ITA	ITA	ITA	ITA	ITA	ITA	ITA	DEU	ITA	FRA	ESP	ESP	ESP
	-5.87-	-3.89-	-4.25-	-7.08-	-4.74-	-6.23-	-5.13-	-4.91-	-5.82-	-6.54-	-5.81-	-5.99-	-5.65-	-5.51-	-4.30-	-3.60-	-4.98-
17	HUN	DEU	DEU	HUN	DEU	DEU	DEU	DEU	DEU	DEU	DEU	ITA	DEU	DEU	DEU	DEU	DEU
	-11.62-	-6.72-	-6.40-	-8.24-	-8.14-	-7.43-	-6.68-	-7.78-	-7.62-	-7.25-	-6.06-	-6.06-	-6.15-	-6.38-	-5.41-	-5.30-	-5.12-

*The ESR is computed as $\frac{y^E_{c,i,t}}{\sum_{i=1}^{n} y^E_{c,i,t}}$ and represents the share of European net output that each country should have produced to exploit its Comparative Advantages. The values are followed by a sign. The sign specifies whether the country should have improved (+) or reduced (-) its production, or whether it was close to the ESR (=). A country has been considered close to the ESR if the difference with the real share of European net production is lower than the 20% of the original share.

2.B.3 The Labour Mobility Index

In this section are presented the data relative to the following index.

$$lm_{i,c,y} = \frac{l^E_{i,c,t} - l_{i,c,t}}{\sum_{i=1}^{n} l_{i,c,t}} \times 100 \qquad (2.B.3)$$

where $l^E_{i,c,t}$ and $l_{i,c,t}$ are, respectively, the quantity of workers employed in sector i of country c at time t in the efficient scenario and in the original data set.

In words, the index shows the flows workers into or from specific Sectors. In this case the results in Sector 2 and Sector 12 are reported, because the quantity of data is much lower than in Tables 2.6-2.22 and reporting the full data does not worsen the clearness of Tables. If the index is positive, this means that the country should have increased the employment in the Sector considered in order to realize an Efficient Specialization Patterns. Therefore, a positive number is also an index of CA.

For example, in Austria most of the labour force should have been concentrated in Sector 12—see Tab. 2.39, which is the Sector in which Austria had the more stable and marked CA—see Tab. 2.6.

However, this way of evaluating CAs may lead to weigh in different ways the closeness of single sectors, or even of countries, to the efficient specialization pattern. This happens because adjusting the net output in one sector implies a reallocation of labour that involves all the system. This is due to the complexity of industrial relations assumed by the approach of subsystems.

It may happen that a slight adjustment of the net product of a sector i in country c involves more labour reallocation than a considerable net product adjustment in sector j in country d. It all depends on how tight are the linkages among the Sector considered and the rest of the system. For this reason, comparing the ESR and the RSR should be considered the proper way of evaluating CAs, while the lm may offer additional information on the distance of the single sectors of specific countries from the Efficient Specialization Pattern.

Table 2.39: Labour mobility index of Austria*

Sector	Year 1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-32.29	-31.87	-31.50	-30.85	-30.73	-30.44	-30.15	-30.41	-30.43	-30.34	-29.76	-29.06	-27.83	-30.44	-27.59	-26.20	-29.39
2	-0.80	-0.80	-0.79	-0.77	-0.74	-0.73	-0.70	-0.69	-0.69	-0.67	-0.64	-0.65	-0.66	-0.83	-0.77	-0.90	-0.81
3	-8.44	-8.47	-8.40	-8.24	-8.16	-8.08	-8.00	-8.04	-8.11	-8.19	-8.10	-8.18	-8.21	-7.10	-7.27	-7.87	-7.47
4	-4.01	-3.81	-3.64	-3.55	-3.40	-3.26	-3.17	-3.00	-2.81	-2.68	-2.51	-2.49	-2.33	-2.25	-2.10	-2.18	-1.96
5	-0.74	-0.73	-0.73	-0.73	-0.73	-0.68	-0.66	-0.65	-0.61	-0.59	-0.54	-0.52	-0.51	-0.49	-0.46	-0.48	-0.46
6	-3.65	-3.74	-3.79	-3.80	-3.80	-3.84	-3.85	-3.86	-3.90	-3.93	-3.93	-4.05	-4.19	-3.96	-3.96	-4.75	-4.62
7	-5.01	-5.13	-5.17	-5.20	-5.20	-5.18	-5.16	-5.20	-5.18	-5.18	-5.14	-5.28	-5.01	-4.59	61.78	-4.83	-4.41
8	-0.29	-0.27	-0.26	-0.25	-0.23	-0.21	-0.20	-0.19	-0.20	-0.18	-0.17	-0.17	-0.17	16.18	-0.30	-0.17	-0.25
9	-2.61	-2.67	-2.65	-2.67	-2.67	-2.64	-2.64	-2.74	-2.81	-2.79	-2.81	-2.86	-3.00	-2.61	-2.63	-2.50	-2.37
10	-2.69	-2.66	-2.60	-2.65	-2.76	45.55	-2.66	-2.85	-2.86	-2.82	-2.81	-2.88	-3.00	-3.06	-3.19	-2.95	-2.60
11	-3.77	62.55	71.00	-3.62	-3.61	47.87	-3.76	-3.74	-3.72	-3.72	-3.72	-3.70	-3.79	-3.14	30.58	-3.27	-3.02
12	90.59	24.24	15.62	90.04	89.98	-10.17	89.45	89.51	-10.52	-10.63	89.01	88.89	88.61	-11.89	-14.22	77.18	86.78
13	-7.15	-7.39	-7.51	-7.78	-7.86	-7.90	-8.09	-8.22	-8.28	-8.36	-8.55	-8.72	-9.02	74.56	-9.93	-1.45	-9.68
14	-7.84	-7.72	-7.70	-7.81	-7.77	-7.95	-8.10	-7.74	92.28	-7.46	-7.56	-7.66	-8.23	-8.53	-8.82	-8.48	-8.61
15	-2.73	-2.89	-3.25	-3.51	-3.74	-3.84	-3.95	-3.92	-4.00	95.76	-4.69	-4.62	-4.55	-4.36	-4.17	-4.04	-4.70
16	-5.38	-5.37	-5.36	-5.34	-5.28	-5.28	-5.22	-5.11	-5.00	-4.99	-4.86	-4.93	-4.94	-4.48	-3.64	-3.74	-3.30
17	-3.19	-3.26	-3.28	-3.28	-3.28	-3.24	-3.15	-3.14	-3.16	-3.22	-3.22	-3.11	-3.18	-3.00	-3.30	-3.36	-3.14

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.40: Labour mobility index of Belgium*

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Year																
1	-11.79	-11.67	-11.62	-11.60	-11.64	-11.31	-11.02	-11.20	-11.43	-11.67	-11.72	-11.66	-11.56	-10.77	-10.85	-10.75	-10.38
2	-0.52	-0.52	-0.51	-0.49	-0.49	-0.48	-0.43	-0.43	-0.44	-0.44	-0.44	-0.44	-0.45	-0.43	-0.49	-0.50	-0.50
3	-12.27	-12.51	-12.67	-12.68	-12.71	-12.60	-12.69	-12.87	-13.21	-13.43	-13.52	-13.52	-13.60	-13.70	8.62	-13.08	-13.21
4	-8.19	-7.79	-7.64	-7.55	-7.27	-6.99	-6.70	-6.46	-6.24	-5.99	-5.69	-5.45	-5.36	-5.12	-5.55	-5.38	-5.20
5	-0.50	-0.48	-0.41	-0.36	-0.34	-0.32	-0.30	-0.28	-0.27	-0.27	-0.26	-0.24	-0.23	-0.27	-0.27	-0.26	-0.25
6	-1.75	-1.75	-1.74	-1.76	-1.79	-1.85	-1.91	-1.92	79.04	-1.96	11.46	-1.81	-2.05	-1.93	76.84	-1.59	0.05
7	-6.44	-6.50	-6.57	-6.59	-6.71	-6.76	-6.77	-6.61	-6.56	-6.54	-6.52	-6.50	-6.46	-6.49	-6.19	-5.97	-5.94
8	-0.74	-0.76	-0.74	-0.70	-0.69	-0.69	-0.68	-0.78	-0.79	-0.87	-0.82	-0.81	-0.80	-0.77	-1.98	-2.10	-2.08
9	-8.72	-8.78	-8.85	-8.93	-9.13	-9.35	-9.30	-9.39	-9.61	-9.60	-9.73	-9.89	-9.89	-9.99	-9.51	-9.79	-9.99
10	-2.93	29.63	35.67	96.84	44.46	-3.26	-3.48	-3.48	-3.45	-3.53	-3.58	-3.51	-3.62	-3.50	-3.10	-3.36	-3.60
11	95.59	62.90	54.45	-4.50	-4.44	-4.37	-4.45	-4.45	-4.43	-4.37	-4.35	-4.28	-4.34	-4.54	-4.98	-4.79	-4.53
12	-13.59	-13.63	-11.15	-13.42	38.80	-13.52	86.64	86.09	4.98	85.76	72.17	85.33	85.18	84.95	-16.10	83.92	82.12
13	-5.33	-5.43	-5.51	-5.56	-5.46	-5.52	-5.63	-5.63	-5.55	-5.57	-5.62	-5.80	-5.99	-6.26	-6.13	-6.10	-6.27
14	-7.09	-7.06	-6.97	-6.99	-7.08	92.71	-7.38	-6.88	-6.58	-6.29	-6.24	-6.14	-6.23	-6.41	-6.56	-6.47	-6.38
15	-7.86	-7.87	-7.96	-7.98	-7.85	-8.19	-8.33	-8.15	-7.96	-7.85	-7.85	-7.87	-7.23	-7.20	-6.73	-6.66	-6.55
16	-4.39	-4.27	-4.22	-4.15	-4.11	-4.05	-4.16	-4.11	-4.02	-4.01	-3.93	-3.86	-3.74	-3.65	-3.16	-3.10	-3.13
17	-3.49	-3.52	-3.55	-3.56	-3.54	-3.46	-3.42	-3.47	-3.48	-3.40	-3.36	-3.54	-3.66	-3.92	-3.87	-4.03	-4.15

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l_{i,r}^{E}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.41: Labour mobility index of the Czech Republic*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	82.85	-16.27	67.36	84.93	85.52	86.30	66.04	87.47	87.66	88.09	88.55	88.82	79.39	82.77	88.52	88.87	89.91
2	-5.14	-4.85	-4.61	-4.26	-3.99	-3.69	-3.56	-3.15	-2.95	-2.85	-2.73	-2.80	-2.74	-2.87	-2.68	-2.69	-2.28
3	-8.33	-8.82	-8.89	-8.99	-8.82	-8.81	-8.70	-9.00	-8.94	-8.82	-8.58	-8.25	-8.26	-8.27	-9.30	-8.97	-8.79
4	-8.44	-7.87	-7.72	-7.84	-7.71	-7.47	-7.10	-6.87	-6.43	-6.18	-5.62	-4.87	-4.44	-4.12	-3.80	-4.15	-4.11
5	-1.82	-1.65	-1.45	-1.34	-1.22	-1.16	-1.11	-0.97	-0.81	-0.72	-0.65	-0.66	-0.54	-0.50	-0.46	-0.51	-0.53
6	-3.71	-3.72	-3.70	-3.75	-3.80	-3.89	-4.05	-4.29	-4.68	-4.69	-4.65	-4.82	-4.59	-4.64	-5.01	-4.80	-4.68
7	-3.25	-3.33	-3.22	-3.31	-3.25	-3.23	17.56	-3.67	-3.78	-3.77	-3.91	-3.80	-4.03	-4.01	-4.16	-4.01	-4.29
8	-0.57	25.95	16.78	-0.22	-0.21	-0.20	-0.21	-0.18	-0.19	-0.19	-0.19	-0.19	-0.18	-0.23	-0.23	-0.28	-0.36
9	-2.29	-2.40	-2.58	-2.65	-2.59	-2.55	-2.53	-2.48	-2.57	-2.53	-2.61	-2.48	-2.39	-2.34	-2.66	-2.71	-2.55
10	-2.11	-2.32	-2.71	-2.85	-3.01	-3.25	-3.53	-3.64	-3.92	-4.18	-4.44	-4.89	-5.20	-5.51	-5.26	-5.29	-5.72
11	-4.55	-4.64	-4.75	-4.71	-4.85	-5.02	-4.99	-4.95	-4.84	-4.78	-4.76	-4.67	-4.43	-4.28	-4.06	-4.16	-4.05
12	-13.29	-13.52	-13.56	-13.34	-13.61	-13.31	-13.37	-13.20	-13.35	-13.77	-13.90	-13.91	-14.18	-14.53	-13.87	-14.51	-15.05
13	-9.56	-9.39	-9.41	-9.30	-9.08	-8.98	-8.97	-8.88	-9.03	-8.97	-9.29	-9.63	-10.14	-10.00	-9.20	-9.02	-9.60
14	-6.82	-7.31	-7.71	-8.22	-8.94	-9.70	-10.07	-10.52	-10.78	-11.19	-11.26	-11.96	-11.86	-11.66	-11.15	-11.28	-10.77
15	-4.81	-4.83	-5.00	-5.01	-5.19	-5.86	-6.33	-6.62	-6.62	-6.78	-7.55	-7.81	-8.30	-8.29	-8.20	-8.00	-8.91
16	-3.86	-4.25	-4.65	-4.86	-5.01	-5.05	-5.08	-5.03	-4.86	-4.85	-4.74	-4.63	-4.56	-4.33	-4.75	-4.77	-4.52
17	-4.30	69.20	-4.18	-4.29	-4.24	-4.12	-4.00	-4.01	-3.90	-3.84	-3.67	-3.46	6.45	2.81	-3.71	-3.72	-3.72

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.42: Labour mobility index of Denmark*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-8.34	-5.43	-17.84	-17.47	-13.57	-16.66	-16.60	-16.95	52.55	43.55	54.65	-6.32	51.73	-15.87	71.25	45.00	59.90
2	-0.58	14.55	3.86	32.04	9.76	23.19	26.81	26.03	29.70	28.29	27.53	28.12	31.31	16.71	11.83	37.86	22.00
3	-14.48	-14.39	-14.21	-13.90	-13.72	-13.97	-14.16	-14.59	-14.66	-14.71	-14.21	-13.92	-13.37	-13.40	-14.83	-16.28	-15.83
4	-3.30	-3.00	-2.65	-2.58	1.63	3.22	-2.25	71.05	-2.05	-1.94	-1.83	-1.75	-1.65	-1.62	-1.40	-1.50	-1.50
5	89.42	71.77	94.96	67.17	81.80	70.06	72.38	0.10	-0.11	-0.09	-0.08	-0.07	-0.06	-0.06	-0.05	-0.06	-0.06
6	-2.51	-2.57	-2.62	-2.68	-2.67	-2.75	-2.67	-2.63	-2.61	-2.77	-2.94	-3.05	-2.94	-2.90	-2.58	-2.30	-2.25
7	-8.56	-8.86	-8.96	-9.25	-9.48	-9.48	-8.96	-8.89	-8.61	-8.45	-8.27	-8.04	-7.90	-7.98	-7.61	-8.09	-7.54
8	-0.15	-0.14	-0.14	-0.13	-0.13	-0.11	-0.12	-0.13	-0.13	-0.13	-0.14	-0.16	-0.16	-0.15	-0.57	-0.28	-0.41
9	-4.48	-4.36	-4.57	-4.61	-4.62	-4.52	-4.97	-5.01	-5.56	-5.76	-5.90	-5.79	-5.99	-6.11	-5.49	-5.36	-5.16
10	-3.31	-3.45	-3.54	-3.70	-3.82	-3.86	-3.92	-3.90	-4.11	-4.15	-4.09	-4.10	-4.17	-3.92	-3.73	-3.66	-3.34
11	-3.38	-3.29	-3.34	-3.52	-3.72	-3.53	-3.40	-3.20	-3.04	-3.05	-3.07	-3.22	-3.33	-3.49	-3.08	-3.31	-3.01
12	-9.30	-9.52	-9.55	-9.36	-9.44	-9.59	-9.77	-9.50	-9.47	-9.69	-9.71	-10.21	-10.72	-11.00	-8.90	-8.91	-9.38
13	-11.63	-11.94	-11.89	-12.20	-11.98	-12.05	-12.24	-12.16	-12.33	-12.36	-12.20	-12.37	-12.55	69.82	-13.31	-13.58	-13.57
14	-7.13	-7.43	-7.44	-7.73	-8.29	-8.56	-9.23	-9.48	-9.11	1.40	-9.30	51.36	-9.71	-9.85	-11.15	-11.15	-11.09
15	-3.74	-3.66	-3.60	-3.44	-3.23	-2.92	-2.83	-2.86	-2.56	-2.36	-2.67	-2.57	-2.71	-2.94	-3.26	-0.57	-0.64
16	-5.63	-5.44	-5.65	-5.72	-5.71	-5.66	-5.53	-5.31	-5.33	-5.21	-5.13	-5.11	-4.94	-4.31	-4.34	-4.84	-5.01
17	-2.90	-2.84	-2.85	-2.93	-2.80	-2.81	-2.55	-2.57	-2.58	-2.58	-2.65	-2.80	-2.85	-2.93	-2.78	-2.97	-3.11

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.43: Labour mobility index of Finland*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-26.79	-25.60	-24.62	-22.69	-22.64	-22.07	-21.27	-20.89	-21.18	-21.41	-21.34	-21.12	-21.02	-21.24	-19.96	-20.68	-20.02
2	-0.92	-0.93	-1.03	-0.93	-0.94	-0.93	-0.95	-0.98	-0.98	-0.95	-1.00	-1.10	-1.06	-1.09	-1.17	-1.24	-1.32
3	-7.69	-7.66	-7.41	-7.45	-7.19	-6.85	-6.76	-6.92	-7.14	-6.96	-6.82	-6.66	-6.60	-6.49	-6.42	-6.65	-6.80
4	-2.96	-2.86	-2.86	-2.91	-2.86	-2.71	-2.67	-2.65	-2.49	-2.34	-2.23	-2.15	-2.02	-1.80	-1.97	-1.85	-1.91
5	-0.65	-0.59	-0.53	-0.55	-0.54	-0.50	-0.49	-0.46	-0.46	-0.43	-0.43	-0.41	-0.38	-0.35	-0.38	-0.36	-0.37
6	-4.96	-4.81	-4.97	-5.08	-5.07	-5.13	-5.08	-5.13	-5.16	-5.29	-5.18	-5.25	-5.20	-4.93	-5.51	-5.63	-5.60
7	-12.20	-12.03	-11.89	-11.86	-11.87	-11.83	-11.79	-11.85	-11.84	-11.74	-11.22	-10.87	-10.29	-9.69	-10.41	-10.35	-10.44
8	-0.55	-0.57	-0.56	-0.55	-0.52	-0.60	-0.58	-0.56	-0.49	-0.52	-0.42	-0.43	-0.46	-0.43	-0.52	-0.52	-0.49
9	-3.13	-3.13	-3.04	-3.09	-3.04	-3.03	-3.09	-3.15	-3.24	-3.24	-3.17	-3.10	-3.16	-3.27	-3.43	-3.45	-3.46
10	-2.31	-2.39	-2.60	-2.79	-2.91	-3.06	-2.96	-3.04	-2.87	-2.90	-2.87	-2.79	-2.77	-2.80	-2.83	-2.80	-2.93
11	-2.30	-2.27	-2.33	-2.48	-2.58	-2.71	-2.68	-2.72	-2.76	-2.79	-2.91	-2.98	-2.97	-2.97	-2.81	-2.82	-2.79
12	92.40	91.91	90.96	90.76	-9.18	-9.46	-10.03	-10.21	-10.41	-10.48	-10.93	-11.20	-11.66	-11.82	-12.48	-12.23	-12.40
13	-9.27	-9.91	-9.81	-10.14	-9.76	-9.98	-10.30	-10.50	-10.62	-10.63	-10.96	-11.37	-11.64	-12.42	-11.07	-10.67	-11.45
14	-8.47	-9.07	-9.30	-10.09	89.02	88.77	88.67	88.97	89.30	89.09	88.84	88.95	88.82	88.92	88.72	88.72	89.34
15	-4.03	-3.97	-3.79	-3.86	-3.77	-3.95	-4.03	-4.03	-3.92	-3.64	-3.62	-3.78	-3.86	-3.98	-4.11	-3.85	-3.83
16	-2.81	-2.78	-2.98	-3.08	-3.06	-3.13	-3.14	-3.10	-3.07	-3.07	-3.01	-3.03	-3.08	-2.84	-2.60	-2.65	-2.64
17	-3.35	-3.35	-3.26	-3.21	-3.07	-2.84	-2.85	-2.77	-2.68	-2.69	-2.72	-2.73	-2.67	-2.80	-3.05	-2.97	-2.90

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.44: Labour mobility index of France*

Sector	Year																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	78.93	58.38	21.89	32.74	24.63	8.78	67.02	66.50	16.47	25.66	50.38	23.24	17.66	25.36	68.46	79.90	80.22
2	-1.02	-1.00	-0.94	-0.87	-0.81	-0.79	-0.64	-0.64	-0.65	-0.67	-0.69	-0.70	-0.71	-0.75	-0.75	-0.75	-0.75
3	-10.79	-11.08	-11.39	-11.60	-11.71	-11.76	-11.72	-12.19	-12.47	-12.48	-12.68	-12.93	-13.09	-13.96	-12.21	-12.64	-12.55
4	-5.66	-5.44	-5.28	-5.13	-4.89	-4.48	-4.28	-4.03	-3.84	-3.53	-3.27	-3.00	27.56	25.99	-2.85	-2.79	-2.56
5	-1.09	-1.04	-1.00	-0.95	-0.92	-0.88	-0.86	-0.82	-0.79	-0.73	-0.68	-0.67	-0.67	-0.68	-0.76	-0.74	-0.68
6	-2.00	-1.97	-1.93	-1.89	-1.86	-1.86	-1.85	-1.88	-1.92	-1.94	-1.90	-1.93	-1.95	-2.00	-1.83	-1.76	-1.77
7	-6.31	-6.28	-6.29	-6.33	-6.38	-6.37	-6.42	-6.32	-6.30	-6.33	-6.22	-6.12	-6.06	-5.96	-6.22	-6.29	-6.47
8	-0.67	-0.67	-0.64	-0.57	-0.53	-0.54	-0.55	-0.54	-0.57	-0.58	-0.59	-0.60	-0.58	-0.60	-0.50	-0.51	-0.71
9	-3.18	-3.14	-3.12	-3.10	-0.19	10.84	10.28	10.70	11.20	11.68	26.07	24.78	24.62	23.56	8.32	-3.30	-2.98
10	-3.89	-3.92	-3.95	-4.05	-4.14	-4.34	-4.46	-4.53	-4.59	-4.76	-4.77	-4.73	-4.69	-4.61	-4.55	-4.65	-4.49
11	-3.11	-3.10	-3.03	-3.01	-2.99	-2.98	-2.99	-2.98	-2.97	-2.99	-2.99	-2.92	-3.02	-3.12	-3.12	-3.01	-2.91
12	-11.66	-11.81	-11.87	-12.00	-12.13	-12.29	-12.46	-12.47	-12.38	-12.37	-12.34	-12.46	-12.57	-12.43	-11.95	-11.74	-13.53
13	-7.00	-7.01	-7.01	-6.99	-7.04	-7.00	-7.04	-6.84	-6.90	-7.02	-7.06	-7.02	-7.12	-7.22	-7.90	-7.75	-8.13
14	-8.47	-8.58	-8.55	-8.69	-8.83	-9.04	-9.14	-8.96	-8.65	-8.16	-7.98	-8.14	-8.20	-8.32	-6.99	-6.97	-7.43
15	-6.73	14.02	50.53	39.80	45.25	50.29	-7.19	-7.33	42.05	32.02	-7.49	21.07	-3.37	-7.31	-8.86	-8.77	-6.87
16	-3.88	-3.87	-3.89	-3.88	-3.96	-3.99	-4.05	-4.00	-4.01	-4.01	-3.99	-3.97	-3.89	-4.03	-3.79	-3.56	-3.64
17	-3.47	-3.48	-3.52	-3.47	-3.49	-3.60	-3.66	-3.69	-3.66	-3.77	-3.82	-3.88	-3.91	-3.94	-4.51	-4.67	-4.74

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.45: Labour mobility index of Germany*

Sector	Year																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-10.70	-9.99	-9.97	-10.02	-10.02	-9.88	-9.77	-9.76	-9.76	-9.82	-9.75	-9.66	-9.70	-8.35	-10.08	-10.47	-10.09
2	-1.93	-1.84	-1.63	-1.51	-1.42	-1.35	-1.11	-1.10	-1.10	-1.06	-1.03	-0.99	-0.94	-0.94	-0.77	-0.74	-0.57
3	39.76	-9.31	-9.57	-9.72	-9.94	-10.08	-10.07	-10.47	-10.85	-10.77	-10.79	-10.83	-10.58	-10.63	-9.06	-9.46	-9.10
4	-3.31	15.99	25.03	24.86	23.45	23.37	22.34	17.88	-2.18	-2.10	-2.01	-1.97	-1.85	-1.76	17.13	16.56	13.08
5	-0.43	-0.41	-0.40	-0.39	-0.36	-0.36	-0.35	-0.33	-0.31	-0.30	-0.26	-0.27	-0.27	-0.28	-0.27	-0.26	-0.25
6	-2.42	-2.44	-2.31	-2.24	0.57	-2.17	-2.04	-2.06	-1.92	-2.08	-1.89	0.91	-1.81	8.53	-1.38	8.81	8.08
7	-7.68	-7.81	-7.97	-7.96	-7.11	-7.21	-7.16	-7.17	-7.06	-6.98	-7.04	-6.95	-6.88	-6.17	-5.00	-5.24	-5.19
8	-0.25	-0.24	-0.23	-0.22	-0.25	-0.24	-0.25	-0.26	-0.24	-0.24	-0.23	-0.23	-0.23	-0.20	-0.18	-0.14	-0.15
9	-5.35	-5.67	-5.59	-5.39	-5.43	-5.37	-5.36	-5.35	-5.49	-5.22	-5.19	-5.22	-5.22	-5.22	-4.77	-4.86	-4.70
10	-0.48	-4.08	-4.20	-4.29	-4.32	-3.54	-3.15	-4.41	6.06	-4.48	-4.55	-4.41	-4.45	-4.73	-4.30	-4.60	16.15
11	0.73	-3.44	-3.30	6.39	15.62	-3.28	-3.16	-3.08	0.77	3.67	-2.88	-2.84	-2.81	-2.79	11.39	5.63	-2.51
12	-7.99	37.12	35.30	26.83	31.82	34.54	9.08	25.38	50.93	36.75	7.42	27.48	12.06	14.82	-13.96	-15.56	-16.20
13	-7.12	-3.69	13.11	3.28	-3.76	14.54	0.41	-10.64	-12.19	12.93	3.02	4.02	3.62	-11.14	-14.88	-7.48	-14.64
14	-11.53	-11.37	-11.51	-11.36	-11.36	-11.59	-11.79	-11.80	2.50	7.46	10.15	5.07	7.81	5.22	8.08	5.37	3.68
15	26.13	14.65	-9.39	-1.04	-10.43	-10.66	29.02	29.71	-2.73	-11.37	31.49	12.35	27.88	30.48	34.71	29.26	29.07
16	-3.79	-3.83	-3.77	-3.73	-3.70	-3.58	-3.50	-3.36	-3.20	-3.10	-3.17	-3.14	-3.36	-3.57	-3.12	-3.12	-3.01
17	-3.64	-3.66	-3.60	-3.50	-3.37	-3.14	-3.16	-3.19	-3.23	-3.29	-3.30	-3.31	-3.26	-3.28	-3.55	-3.73	-3.64

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.46: Labour mobility index of Great Britain*

Sector	Year																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-5.47	-11.01	-11.22	-10.67	-10.29	-10.00	-9.88	-10.26	-10.78	-11.48	-12.49	-12.43	-12.63	-13.66	-14.83	-14.35	-14.57
2	-1.79	-1.66	-1.62	-1.59	-1.58	-1.77	-1.87	-1.82	-1.69	-1.59	-1.55	-1.69	-1.89	-1.94	-1.97	-2.00	-1.98
3	-10.52	26.12	37.21	17.51	40.38	33.81	34.84	24.53	-11.20	-11.48	-11.37	-11.32	-11.23	-11.07	-10.90	-10.80	-10.93
4	44.45	12.71	-4.62	-4.47	-4.13	-3.78	-3.45	-3.13	39.49	35.15	35.58	35.52	-2.37	-2.34	-1.44	-2.22	1.75
5	-0.63	-0.55	-0.50	-0.47	-0.46	-0.41	-0.35	9.86	9.04	7.31	7.16	7.15	7.23	6.97	6.56	6.00	5.82
6	15.69	14.99	18.75	17.17	15.03	20.30	19.23	20.06	-1.16	20.68	17.58	15.89	22.24	-1.38	-1.36	-1.33	-1.14
7	-10.37	-10.09	-9.80	-9.99	-10.57	-10.77	-10.84	-10.83	-10.82	-10.80	-10.69	-10.64	-10.56	-10.41	-10.25	-9.55	-8.87
8	-1.45	-1.51	-1.45	-1.40	-1.53	-1.48	-1.41	-1.67	-1.70	-1.81	-1.79	-1.79	-1.77	-1.75	-1.72	-2.03	-2.51
9	-7.78	-7.65	-7.38	-7.18	-7.50	-7.57	-7.74	-8.08	-8.15	-8.15	-8.07	-8.03	-7.97	-7.86	-7.73	-6.90	-6.49
10	-3.90	-3.91	-4.02	-4.39	-4.48	-4.58	-4.66	-4.58	-4.65	-4.76	-4.71	-4.69	-4.65	-4.59	-4.52	-4.18	-4.09
11	-3.05	-3.02	-2.88	-2.86	-2.81	-2.86	-2.83	-2.91	-3.04	-3.11	-3.08	-3.07	-3.04	-3.00	-2.95	-2.86	-2.74
12	-10.85	-10.65	-10.61	-11.13	-10.86	-10.51	-10.30	-10.11	-10.04	-9.89	-9.79	-9.74	23.37	47.20	33.99	-9.58	-9.62
13	-7.61	-7.37	-7.50	-7.66	-7.50	-7.47	-7.39	-7.29	-7.34	-7.23	-7.16	-7.13	-7.07	-6.97	2.06	49.14	47.43
14	-10.30	-10.33	-10.42	-10.61	-10.87	-11.37	-11.11	-10.14	4.54	-8.95	-8.86	-8.82	-8.75	-8.63	-8.49	-8.23	-7.61
15	-9.46	-9.75	-10.08	-10.19	-10.00	-9.90	-10.05	-10.26	-10.38	-10.55	-10.44	-10.39	-10.31	-10.17	-10.00	-11.59	-11.92
16	25.86	26.61	28.98	29.50	29.94	31.08	30.73	29.60	29.04	28.71	31.71	31.26	32.61	32.85	36.90	33.87	30.84
17	-2.84	-2.94	-2.86	18.43	-2.78	-2.72	-2.91	-2.98	-1.16	-2.05	-2.03	-0.07	-3.22	-3.26	-3.35	-3.39	-3.36

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.47: Labour mobility index of Greece*

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Year																
1	-58.60	-58.10	-58.03	-57.39	-57.80	-57.21	-54.43	-54.10	-54.00	-50.93	-50.94	-50.37	-49.30	-45.87	-48.06	-49.12	-46.67
2	-1.11	-1.15	-1.13	-1.12	-1.00	-1.12	-1.19	-1.05	-1.17	-1.24	-1.20	-1.21	-1.23	-1.06	-1.33	-1.23	-1.32
3	-7.81	-7.95	-8.15	-8.12	-8.18	-8.51	-9.37	-9.84	-9.77	-9.99	-10.61	-11.11	-10.91	-11.33	90.22	-9.45	68.83
4	-8.18	-8.09	-7.80	-7.85	-7.74	-7.96	-7.37	-7.20	-7.30	-6.86	-6.41	-6.20	-6.39	-6.93	-7.44	-7.23	-7.47
5	-0.76	-0.77	-0.67	-0.67	-0.66	-0.64	-0.72	-0.57	-0.54	-0.65	-0.73	-0.64	-0.57	-0.40	-0.39	-0.38	-0.39
6	-1.85	-1.95	-1.91	-1.89	-1.90	-1.87	-1.76	-1.67	-1.65	-2.25	-2.27	-1.94	-1.78	-1.55	-1.43	-1.35	-1.12
7	-2.84	-2.90	-3.00	-3.08	-3.08	-2.99	-3.15	-3.25	-3.19	-3.77	-3.66	-3.94	-4.29	-5.12	-3.93	-3.98	-3.77
8	-0.34	-0.33	-0.31	-0.34	-0.33	-0.30	-0.38	-0.41	-0.41	-0.49	-0.51	-0.42	-0.37	-0.36	-0.61	-0.37	-0.32
9	-1.79	-1.77	-1.81	-1.86	-1.77	-1.82	-2.02	-2.15	-1.86	-2.47	-2.80	-2.84	-2.96	-3.31	-3.21	-2.17	-2.77
10	98.91	98.90	98.87	27.85	98.85	-1.09	-1.51	-1.52	-1.43	-1.70	-1.49	-1.52	3.89	10.61	-2.00	-3.07	-2.75
11	-2.36	-2.40	-2.47	68.44	-2.46	97.52	97.50	97.42	97.35	97.17	97.28	97.44	91.92	85.34	-2.41	97.63	-2.62
12	-3.13	-3.17	-3.15	-3.32	-3.39	-3.40	-4.36	-4.66	-4.78	-5.01	-4.78	-4.93	-5.10	-5.48	-7.42	-6.09	-6.15
13	-1.73	-1.79	-1.79	-1.87	-1.80	-1.85	-2.05	-1.74	-2.00	-2.48	-2.27	-2.32	-2.49	-2.44	-2.01	-2.01	-2.71
14	-0.93	-1.04	-1.02	-1.09	-1.13	-1.16	-1.51	-1.82	-1.82	-1.83	-1.85	-2.23	-2.35	-2.46	-1.84	-1.52	-1.40
15	-1.77	-1.68	-1.65	-1.68	-1.59	-1.59	-1.58	-1.53	-1.58	-1.71	-1.81	-1.90	-1.89	-2.45	-2.03	-2.38	-2.94
16	-3.15	-3.12	-3.23	-3.29	-3.31	-3.31	-3.42	-3.47	-3.57	-3.34	-3.56	-3.50	-3.71	-4.94	-3.89	-5.08	-5.36
17	-2.57	-2.68	-2.76	-2.72	-2.72	-2.71	-2.66	-2.44	-2.28	-2.45	-2.41	-2.38	-2.48	-2.24	-2.21	-2.20	18.92

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.48: Labour mobility index of Hungary*

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Year																
1	-36.75	-37.90	-36.56	-34.43	-34.08	-32.62	-30.39	-29.79	-27.27	-26.23	74.47	-24.99	-23.74	-24.28	-24.11	-26.02	-28.46
2	-2.09	-2.00	-1.66	-1.53	-1.46	-1.21	-0.84	-0.94	-0.88	-1.01	-1.09	-1.11	-1.09	-0.69	-0.60	-0.91	-0.49
3	80.13	89.37	89.61	83.84	-9.89	-10.00	-10.49	-10.84	-11.04	-10.07	-10.30	-11.10	-10.19	-12.77	-14.20	-12.53	-13.17
4	-8.28	-7.83	-8.35	-8.91	-8.38	-8.50	-8.29	-7.88	-8.06	-7.27	-6.38	-6.18	-5.55	-4.48	-4.50	-4.28	-3.75
5	-2.04	-2.14	-2.40	-2.41	-2.33	-2.28	-2.18	-2.28	-1.73	-1.29	-1.08	-1.10	-0.97	-0.81	-0.81	-0.77	-0.95
6	-2.15	-2.27	-2.34	-2.23	-2.49	-2.40	-2.34	-2.54	-2.55	-2.75	-2.88	-3.01	-3.17	-2.33	-1.99	-1.75	-1.46
7	-2.89	-2.89	-2.55	-2.68	-2.81	-2.80	-3.13	-3.18	-3.30	-3.30	-3.46	-2.93	-3.55	-3.79	-3.84	-4.22	-3.54
8	9.23	-0.36	-0.31	5.64	5.70	-0.41	-0.45	-0.46	-0.44	-0.36	-0.43	-0.46	-0.48	-0.63	-0.54	-0.70	-0.70
9	-3.99	-3.91	-3.58	-3.69	-3.72	-3.36	-3.07	-3.04	-3.33	-3.73	-3.90	-3.44	-3.46	-3.47	-3.61	-3.22	-3.05
10	-1.82	-1.78	-2.10	-2.13	-2.38	-2.90	-2.69	-2.98	-2.89	-3.07	-3.01	-3.27	-3.41	-3.90	-3.66	-3.78	-3.74
11	-2.13	-2.02	-1.83	-1.85	-1.95	-2.13	-2.41	-2.25	-2.57	-2.41	-2.33	85.80	97.84	97.55	-2.19	-1.83	-1.80
12	-5.77	-5.42	-5.68	-5.76	-6.10	-6.08	-6.62	-7.12	-7.55	-7.55	-7.89	-8.19	-8.39	-7.70	-7.80	-6.20	-6.31
13	-5.41	-4.86	-5.12	-5.10	-5.06	-4.22	-4.41	-4.26	-4.46	-4.48	-4.52	-4.81	-5.26	-5.35	94.46	93.36	91.62
14	-5.74	-6.26	-6.60	-7.57	-7.80	-5.87	88.93	89.20	88.27	80.27	-13.67	-1.46	-14.31	-12.81	-11.91	-13.30	-9.62
15	-2.08	-2.47	-2.53	-3.11	-3.30	-3.13	-3.57	-4.06	-4.28	-4.70	-5.29	-5.30	-6.25	-6.09	-5.77	-5.02	-6.04
16	-2.26	-1.86	-2.04	-2.17	-2.44	-2.97	-3.00	-2.84	-3.23	-3.50	-3.43	-3.38	-3.15	-3.12	-3.16	-2.66	-2.61
17	-5.96	-5.41	-5.96	-5.90	88.47	90.86	-5.05	-4.73	-4.69	1.44	-4.81	-5.06	-4.86	-5.33	-5.76	-6.15	-5.92

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.49: Labour mobility index of Ireland*

Sector	Year																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-35.70	-33.73	-32.37	-30.91	-31.04	-29.14	-28.17	-28.61	-28.30	-28.05	-28.11	-28.33	-28.31	-27.48	-25.45	-23.51	-18.13
2	-1.35	-1.21	-1.48	-1.46	-1.33	-1.48	-1.56	-1.63	-1.69	-1.81	-1.83	-2.08	-2.08	-2.13	-2.11	-1.88	-1.78
3	-12.00	-12.27	-11.88	-11.97	-11.88	-12.06	-13.00	-13.30	-13.70	-13.23	-13.32	-12.69	-12.49	-11.34	-11.87	-11.50	-12.99
4	-5.36	-5.02	-4.55	-3.98	-3.13	-2.83	-2.66	-2.50	-2.21	-1.89	-1.78	-1.59	-1.64	-1.78	-1.69	-1.50	-1.23
5	-0.36	-0.29	-0.29	-0.30	-0.25	-0.19	-0.20	-0.20	-0.17	-0.14	-0.12	-0.06	-0.08	-0.10	-0.10	-0.09	-0.07
6	-1.31	-1.35	-1.47	-1.46	-1.62	-1.79	-1.81	-2.04	-2.29	-2.05	-2.31	-2.26	-2.23	-2.07	-1.95	-2.29	-2.36
7	-5.49	90.70	-6.03	-6.26	-6.32	-6.27	-6.47	-6.55	-6.31	-6.42	93.87	94.15	94.08	93.42	9.52	93.83	94.91
8	-1.81	-1.90	-2.06	-2.16	-1.99	-2.28	-2.33	-2.44	-2.36	-2.54	-2.50	-2.72	-2.57	-6.03	-5.75	-5.09	-3.97
9	95.32	-1.44	94.71	94.56	94.33	94.29	93.73	93.33	93.40	93.24	-6.77	-7.03	-7.04	-6.55	77.53	-9.39	-9.84
10	-2.54	-2.77	-2.61	-2.76	-2.63	-2.77	-2.56	-2.58	-2.71	-2.80	-2.83	-2.73	-2.79	-2.56	-2.71	-2.32	-2.78
11	-2.73	-2.78	-2.85	-2.83	-2.91	-3.08	-2.97	-3.00	-2.78	-3.43	-3.40	-3.36	-3.37	-2.67	-2.58	-2.21	-2.64
12	-3.90	-4.22	-4.20	-4.47	-4.57	-5.06	-4.69	-4.95	-5.13	-5.09	-5.29	-5.47	-5.48	-5.65	-5.27	-5.05	-5.37
13	-3.91	-3.96	-4.03	-3.89	-3.98	-3.89	-3.97	-3.68	-3.47	-3.45	-3.37	-3.42	-3.41	-3.09	-3.62	-4.68	-5.34
14	-11.74	-12.46	-14.21	-15.10	-15.79	-16.86	-16.46	-14.88	-14.70	-15.01	-15.27	-15.80	-15.72	-16.38	-17.15	-18.19	-21.67
15	-2.50	-2.49	-2.39	-2.38	-2.42	-2.39	-2.57	-2.63	-2.77	-2.67	-2.60	-2.46	-2.50	-1.96	-3.05	-2.34	-2.87
16	-1.42	-1.45	-1.50	-1.64	-1.54	-1.29	-1.22	-1.21	-1.55	-1.25	-1.10	-1.02	-1.22	-0.96	-0.96	-0.85	-0.82
17	-3.20	-3.35	-2.77	-3.01	-2.93	-2.91	-3.09	-3.14	-3.27	-3.43	-3.29	-3.13	-3.14	-2.67	-2.79	-2.94	-3.03

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.50: Labour mobility index of Italy*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-19.97	-19.37	-19.16	-18.24	-17.57	-17.53	-17.67	-17.14	-16.13	-16.44	-16.48	-16.63	-16.21	-15.98	-15.86	-16.82	-16.10
2	-0.66	-0.64	-0.65	-0.66	-0.68	-0.65	-0.65	-0.71	-0.68	-0.66	-0.67	-0.65	-0.64	-0.64	-0.79	-0.71	-0.66
3	-7.41	-7.22	11.19	-7.67	-7.57	44.98	5.64	-3.72	21.96	36.59	40.19	43.18	44.65	44.62	31.04	79.30	28.00
4	-11.74	-11.46	-11.29	-11.28	-10.58	-10.50	-10.54	-10.53	-10.55	-10.26	-9.76	-9.16	-9.04	-9.25	-9.85	-9.42	-9.30
5	-3.62	-3.67	-3.67	-1.03	-3.51	-3.47	-2.25	-3.34	-3.34	-3.16	-2.92	-2.82	-2.86	-2.90	-2.86	-2.74	-2.91
6	-3.03	-2.89	-2.83	-2.88	-2.98	-3.01	-3.01	-3.06	-3.02	-2.97	-2.80	-2.79	-2.71	-2.54	-2.32	-2.31	-2.14
7	-4.26	-4.37	-4.24	-4.30	-4.39	-4.33	-4.33	-4.34	-4.38	-4.38	-4.37	-4.36	-4.29	-4.33	-4.20	-4.19	-4.12
8	-0.40	-0.40	-0.39	-0.41	-0.42	-0.43	-0.42	-0.38	-0.39	-0.40	-0.42	-0.42	-0.43	-0.42	-0.33	-0.60	-0.79
9	-3.29	-3.25	-3.31	-3.34	-3.41	-3.38	-3.36	-3.44	-3.35	-3.32	-3.39	-3.37	-3.36	-3.32	-3.52	-3.46	-3.72
10	-2.94	-3.08	-3.24	-3.38	-3.46	-3.51	-3.48	-3.48	7.54	21.74	4.40	0.70	-3.14	-3.24	-2.90	-2.90	-3.05
11	-3.97	-4.05	-4.02	-3.86	-4.01	-4.06	-4.19	-4.24	-4.21	-4.12	-4.22	-4.07	-4.20	-4.01	-3.53	-3.54	-3.47
12	-11.56	-12.20	-12.27	-12.53	-13.05	-12.95	-13.20	-13.34	-13.93	-13.77	-13.99	-14.54	-14.92	-15.06	-14.47	-14.39	21.86
13	37.40	34.32	14.37	26.80	35.04	14.94	32.13	46.87	49.60	20.36	34.04	34.61	36.89	36.54	47.90	-0.85	15.12
14	47.68	50.50	51.61	54.80	48.73	16.02	37.22	32.66	-7.43	-7.44	-7.68	-7.78	-7.86	-7.47	-6.98	-7.04	-6.40
15	-4.60	-4.61	-4.68	-4.65	-4.64	-4.61	-4.49	-4.41	-4.35	-4.44	-4.47	-4.53	-4.60	-4.49	-5.13	-4.96	-5.02
16	-5.14	-5.07	-4.99	-5.00	-5.21	-5.21	-5.18	-5.21	-5.20	-5.25	-5.34	-5.22	-5.18	-5.38	-5.46	-5.37	-5.07
17	-2.50	-2.53	-2.43	-2.36	-2.31	-2.28	-2.21	-2.19	-2.13	-2.08	-2.12	-2.15	-2.10	-2.13	-0.74	0.00	-2.23

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.51: Labour mobility index of Netherlands*

Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
	Year																
1	26.76	-21.29	32.06	-9.80	1.07	24.38	-20.87	-21.23	-21.50	-21.52	-21.57	-21.36	-21.10	-20.55	-21.03	-21.38	-20.81
2	3.03	-0.81	-0.76	-0.77	-0.74	-0.72	-0.69	-0.74	-0.73	-0.73	-0.64	-0.62	-0.62	-0.63	-0.62	-0.63	-0.60
3	-11.91	31.91	15.70	62.80	66.59	-11.68	88.49	88.49	88.57	88.62	88.63	88.67	88.84	88.30	80.34	-10.03	-0.14
4	-2.56	-2.32	-2.31	-2.20	-2.15	-2.11	-2.07	-1.95	-1.86	-1.72	-1.64	-1.62	-1.61	-1.56	-1.48	-1.45	-1.47
5	-0.39	-0.34	-0.34	-0.30	-0.27	-0.24	-0.25	-0.22	-0.21	-0.20	-0.19	-0.18	-0.17	-0.15	-0.14	-0.13	-0.13
6	-1.68	-1.69	-1.75	-1.76	-1.73	-1.71	-1.69	-1.66	-1.58	-1.60	-1.64	-1.62	-1.67	-1.69	-1.57	-1.48	-1.41
7	-10.90	-10.46	-10.28	-9.95	-9.86	-9.69	-9.33	-9.02	-9.06	-8.97	-8.95	-8.95	-8.89	-8.67	-8.13	-7.86	-7.99
8	-0.49	-0.53	-0.51	-0.50	-0.47	-0.45	-0.46	-0.48	-0.49	-0.52	-0.53	-0.52	-0.53	-0.62	6.87	4.46	4.58
9	43.09	51.03	13.87	9.37	-5.33	-5.33	-5.35	-5.50	-5.54	-5.52	-5.52	-5.54	-5.46	-5.19	-5.42	86.99	76.68
10	-2.38	-2.33	-2.45	-2.56	-2.61	-2.69	-2.73	-2.70	-2.71	-2.76	-2.78	-2.77	-2.79	-2.79	-2.64	-2.58	-2.72
11	-2.58	-2.59	-2.58	-2.74	-2.66	-2.69	-2.57	-2.52	-2.50	-2.46	-2.47	-2.49	-2.47	-2.48	-2.35	-2.26	-2.29
12	-9.29	-9.57	-9.55	-9.68	-9.85	-9.86	-9.86	-9.90	-9.78	-9.72	-9.81	-9.85	-10.08	-11.04	-10.29	-10.19	-10.37
13	-6.04	-6.24	-6.37	-6.81	-6.88	-6.96	-7.11	-6.95	-6.94	-7.06	-7.19	-7.32	-7.58	-7.38	-7.60	-7.29	-6.95
14	-7.53	-7.66	-7.71	-7.52	-7.39	47.61	-7.50	-7.38	-7.06	-6.96	-6.87	-6.94	-6.91	-6.83	-7.09	-7.18	-7.35
15	-4.19	-4.01	-3.93	-4.15	-4.23	-4.27	-4.21	-4.25	-4.25	-4.18	-4.07	-4.01	-4.08	-4.06	-4.29	-4.22	-4.19
16	-10.15	-10.40	-10.49	-10.85	-10.98	-11.17	-11.41	-11.53	-11.88	-12.22	-12.28	-12.42	-12.39	-12.13	-12.19	-12.35	-12.15
17	-2.80	-2.71	-2.60	-2.60	-2.53	-2.43	-2.38	-2.46	-2.47	-2.46	-2.49	-2.45	-2.49	-2.53	-2.36	-2.42	-2.68

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.52: Labour mobility index of Poland*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-50.60	-51.88	-51.66	-51.82	-53.55	-55.02	-44.62	-46.25	-44.78	-43.79	-42.74	-40.00	-38.24	-36.96	-37.47	-38.87	-35.17
2	-4.93	-4.61	-4.34	-4.07	-3.68	-3.36	-4.47	-4.45	-4.40	-3.96	-3.91	-4.11	-4.22	-3.93	-3.92	-3.94	-4.01
3	-7.19	-6.72	-7.43	-7.17	-7.11	-7.00	-8.34	-8.50	-9.24	-9.23	-9.07	-9.06	-9.36	-4.58	-9.45	16.89	74.43
4	-7.06	-6.44	-6.12	-6.24	-5.51	-4.83	-6.37	-5.90	-5.76	-5.63	-5.73	-5.65	-5.25	-5.39	-5.30	-5.33	-5.51
5	-1.23	-1.28	-1.09	-0.86	-1.07	-0.79	-1.01	-0.87	-0.80	-0.74	-0.79	-0.69	-0.85	-0.88	-0.86	-0.87	-0.99
6	-1.63	-1.83	-1.79	-1.81	-1.85	-2.11	-3.59	-3.45	-3.45	-3.03	-3.12	-3.33	-3.28	-3.37	-3.31	-3.52	-3.62
7	96.75	74.50	92.00	91.99	90.90	83.15	97.26	88.73	91.73	92.56	49.52	42.28	39.38	39.59	47.25	23.06	12.60
8	-0.29	-0.18	-0.26	-0.29	-0.23	-0.32	-0.51	-0.49	-0.28	-0.29	-0.28	-0.24	-0.29	-0.30	-0.29	-0.43	-0.53
9	-1.86	-1.75	-1.69	-1.63	-1.55	-1.61	-1.95	-1.95	-1.96	-2.06	-2.03	-2.10	-2.02	-2.07	-2.04	-2.21	-2.18
10	-1.58	-1.52	-1.59	-1.68	-1.76	-1.71	-2.21	-1.98	3.77	2.56	45.44	52.13	54.84	49.45	46.92	44.91	-3.10
11	-1.86	-1.99	-2.05	-2.15	-2.08	-2.42	-2.55	-2.71	-2.99	-2.75	-2.72	-2.75	-2.93	-3.00	-2.95	-3.03	-3.32
12	-5.21	-4.95	-5.02	-5.12	-4.60	-4.33	-5.60	-5.43	-5.44	-5.57	-6.10	-7.13	-7.04	-7.22	-7.10	-7.00	-8.33
13	-3.56	-3.64	-3.51	-3.37	-3.15	-3.22	-3.05	-2.92	-3.01	-3.16	-3.13	-3.23	-3.73	-3.83	-3.77	-3.69	-3.27
14	-2.20	-2.44	-2.42	-2.58	-2.90	-2.56	-2.63	6.25	-2.70	-2.95	-2.96	-3.21	-3.68	-3.78	-3.72	-2.93	-2.61
15	-2.52	-2.83	-2.61	-2.84	-2.41	-2.51	-2.73	-2.60	-3.00	-3.49	-3.91	-4.48	-4.76	-4.88	-4.81	-4.15	-4.61
16	-2.88	-2.75	-3.31	-3.23	-3.40	-2.72	-3.22	-2.93	-3.22	-4.57	-4.49	-4.52	-4.86	-4.99	-4.91	-4.51	-5.10
17	-2.15	20.33	2.90	2.88	3.96	11.38	-4.41	-4.56	-4.46	-3.90	-3.98	-3.90	-3.70	-3.87	-4.27	-4.37	-4.67

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.53: Labour mobility index of Portugal*

Sector	Year																
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-38.29	-38.32	-38.09	-36.91	-36.11	-37.11	-38.21	-37.79	-38.75	-38.41	-38.72	-38.76	-38.70	-39.00	-40.94	-42.05	-44.13
2	-0.87	-0.85	-0.93	-0.94	-0.97	-0.99	-1.00	-1.05	-1.03	-1.04	-1.07	-1.40	-1.39	-1.38	-1.34	-1.31	-1.29
3	-6.96	-6.98	-6.74	-7.04	-7.14	-7.11	-6.99	-7.06	-7.13	-7.31	-7.55	-7.52	-7.71	-7.67	-7.43	-7.28	-7.01
4	-17.12	-16.66	-16.49	-16.65	-16.58	-16.10	-15.70	-15.60	-14.99	-14.92	-14.38	-13.58	-13.20	-13.14	-12.73	-12.47	-12.00
5	-4.56	-4.46	-4.43	-4.34	-4.31	-4.13	-4.10	-4.08	-3.93	-3.80	-3.68	-3.25	-3.20	-3.18	-3.08	-3.02	-2.90
6	-3.79	-3.65	-3.72	-3.93	-3.84	-3.67	-3.61	-3.66	-3.63	-3.62	-3.67	-3.78	-3.75	-3.74	-3.62	-3.55	-3.41
7	46.34	-3.22	-3.21	-3.26	-3.21	-3.19	-3.05	-3.11	-3.14	-3.16	-3.22	-3.18	-3.14	-3.11	-2.98	-3.01	-2.94
8	-0.08	-0.08	-0.07	-0.01	-0.06	-0.06	2.33	0.89	0.99	2.42	-0.06	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13
9	49.10	98.54	98.52	98.54	98.57	-1.37	-1.31	-1.39	-1.39	-1.38	-1.41	-1.46	-1.48	-1.47	-1.43	-1.40	-1.34
10	-1.30	-1.34	-1.29	-1.36	-1.44	98.50	-1.48	-1.58	-1.57	-1.65	-1.68	-1.77	-1.79	-1.78	-1.72	-1.69	-1.63
11	-4.11	-4.15	-4.17	-4.24	-4.40	-4.33	-4.27	-4.26	-4.17	-4.22	-4.15	-4.10	-4.08	-4.06	-3.94	-3.86	-3.71
12	-5.14	-5.29	-5.44	-5.76	-6.00	-5.93	-5.92	-6.03	-6.05	-6.23	-6.28	-6.45	-6.69	-6.66	-6.45	-6.32	-6.08
13	-2.63	-2.60	-2.69	-2.62	-2.77	-2.74	-2.65	-2.75	-2.78	-2.83	-2.82	-2.98	-3.12	-3.11	-3.01	-2.95	-2.84
14	-3.07	-3.25	-3.41	-3.41	-3.54	-3.60	-3.46	-3.17	-3.02	-2.97	-2.95	-3.00	-3.03	-3.02	-2.93	-2.87	-2.76
15	-2.02	-2.12	-2.18	-2.32	-2.37	-2.44	-2.46	-2.53	-2.42	-2.40	-2.44	-2.55	-2.55	-2.54	-2.46	-2.41	-2.32
16	-3.70	-3.83	-3.94	-4.05	-4.11	-4.09	-4.23	-4.41	-4.47	-4.52	-4.48	-4.45	-4.39	-4.37	-4.24	-4.15	-3.99
17	-1.78	-1.72	-1.72	-1.70	-1.74	-1.66	96.09	97.59	97.49	96.04	98.57	98.38	98.37	98.36	98.42	98.47	98.48

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r}-l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.54: Labour mobility index of Spain*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-21.86	70.99	71.72	72.42	73.73	72.48	14.16	2.55	75.85	70.90	9.02	74.66	75.13	77.37	-24.19	-25.45	-25.55
2	-1.35	-1.30	-1.21	-1.10	-1.08	-1.01	-1.03	-1.05	-1.09	-1.13	-1.08	-1.07	-1.08	-1.02	-0.94	-0.95	-1.25
3	-11.15	-10.83	-10.66	-10.47	-10.47	-10.18	-9.97	-10.03	-10.41	-5.26	-10.90	-11.02	-11.05	-11.53	-13.04	-12.99	-12.70
4	-6.53	-6.46	-6.69	-6.77	-6.88	-6.69	-6.51	-6.11	-5.84	-5.43	-5.13	-4.88	-4.47	-4.14	-3.70	-3.82	-3.72
5	-1.99	-2.23	-2.17	-2.22	-2.07	-2.03	-1.88	-1.95	-1.87	-1.78	-1.67	-1.53	-1.51	-1.44	-1.29	-1.33	-1.46
6	-2.46	-2.50	-2.51	-2.59	-2.65	-2.74	-2.74	-2.79	-2.77	-2.83	-2.73	-2.82	-2.71	-2.68	-2.28	-2.22	-2.04
7	-4.76	-4.86	-5.06	-5.08	-5.12	-5.41	-5.27	-5.55	-5.57	-5.78	-5.87	-6.10	-6.06	-6.00	-6.31	-6.35	-6.52
8	-0.21	-0.22	-0.23	-0.22	-0.20	2.16	-0.19	-0.19	-0.19	-0.19	2.87	2.51	2.27	-0.47	-0.46	-0.47	-0.72
9	-3.85	-3.71	-3.76	-3.76	-3.79	-3.83	-3.88	-3.95	-4.05	-4.04	-4.06	-4.08	-4.17	-4.24	-4.70	-4.94	-4.90
10	-2.41	-2.54	-2.57	-2.64	-2.71	-2.88	43.59	49.13	-3.09	-3.08	-3.05	-3.04	-3.14	-3.33	-3.29	-3.01	-2.93
11	-4.50	-4.29	-4.34	-4.43	-4.67	-4.83	9.20	10.81	-5.13	-5.14	10.20	-5.46	-5.60	-5.25	-4.56	-4.17	38.49
12	83.56	-9.26	-9.42	-9.69	-10.08	-10.49	-11.05	-8.55	-11.48	-11.46	37.18	-11.89	-12.14	-11.84	88.83	89.29	46.93
13	-4.12	-4.25	-4.28	-4.46	-4.65	-4.86	-5.05	-5.21	-5.16	-5.18	-5.37	-5.41	-5.53	-5.48	-5.29	-5.17	-5.58
14	-4.39	-4.50	-4.49	-4.53	-4.59	-4.72	-4.86	-4.43	-4.27	-4.21	-4.22	-4.39	-4.46	-4.21	-3.89	-3.85	-3.48
15	-6.61	-6.56	-6.92	-6.94	-7.09	-7.18	-7.03	-7.08	-7.05	-7.31	-7.09	-7.30	-7.36	-7.38	-6.54	-6.78	-6.99
16	-5.17	-5.36	-5.40	-5.61	-5.86	-5.93	-5.98	-6.00	-6.04	-6.11	-6.01	-6.05	-5.89	-6.01	-5.53	-5.01	-4.74
17	-2.18	-2.11	-2.02	-1.91	-1.81	-1.85	-1.50	0.41	-1.83	-1.97	-2.07	-2.14	-2.23	-2.34	-2.82	-2.78	-2.84

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Table 2.55: Labour mobility index of Sweden*

	Year																
Sector	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	-15.20	-14.66	-13.80	-13.12	-13.07	-13.35	-12.41	-12.36	-11.90	-11.97	-11.58	-11.42	-11.06	-11.21	-12.82	-13.37	-12.85
2	-0.95	-0.88	-0.93	-0.92	-0.86	-0.79	-0.79	-0.84	-0.89	-0.90	-0.94	-0.96	-0.89	-1.00	-1.45	-1.37	-1.19
3	-7.14	92.90	3.92	92.72	69.75	-6.89	-7.23	92.42	92.49	-7.29	-7.11	-7.04	-6.81	-6.64	-6.86	-7.12	-6.95
4	-1.55	-1.49	-1.42	-1.39	-1.35	-1.33	-1.28	-1.30	-1.24	-1.20	-1.12	-1.12	-1.11	-1.11	-1.14	-1.14	-1.25
5	-0.16	-0.18	-0.17	-0.15	-0.14	-0.14	-0.14	-0.13	-0.13	-0.15	-0.16	-0.17	-0.15	-0.14	0.00	0.00	0.00
6	-4.12	-4.10	-4.25	-4.21	-4.17	-4.27	-4.33	-4.30	-4.37	-4.48	-4.55	-4.61	-4.61	-3.82	-3.19	-3.48	-3.19
7	-11.27	-11.13	-10.70	-10.48	-10.46	-10.28	-10.00	-9.89	-9.87	-9.84	-9.79	-9.68	-9.43	-9.67	-9.45	-10.26	-9.92
8	-0.30	-0.31	-0.30	-0.30	-0.29	-0.29	-0.28	-0.31	-0.33	-0.35	-0.42	-0.40	-0.39	-0.41	-0.24	-0.34	-0.43
9	-3.97	-4.03	-4.20	-4.42	-4.36	-4.36	-4.44	-4.65	-4.58	-4.46	-4.45	-4.47	-4.36	-4.23	-3.46	-3.66	-3.56
10	-2.67	-2.83	-2.78	-2.80	-2.80	-2.85	-2.83	-2.83	-2.94	-2.78	-2.74	-2.78	-2.74	-2.63	-2.47	-2.55	-2.63
11	-2.04	-2.09	-2.02	-1.99	-1.98	-1.99	-2.02	-2.09	-1.99	-1.97	-2.02	-2.08	-2.16	-2.25	-2.10	-2.17	-2.33
12	-11.24	-11.44	-12.00	-12.25	-12.15	86.72	78.02	-12.37	-12.60	-12.89	-13.14	-13.25	-13.67	-13.77	-13.92	-13.63	-14.22
13	-10.77	-10.72	-11.02	-11.11	-11.13	-10.80	-10.97	-11.31	-11.46	-11.46	-11.73	-11.94	-12.38	-12.32	-13.15	-11.75	-12.11
14	-10.09	-10.48	-10.58	-10.51	-10.79	-10.21	-11.49	-10.37	-9.76	90.69	90.69	90.77	90.59	90.12	89.62	90.70	90.69
15	-9.45	-9.65	-9.69	-10.23	-10.37	-10.39	-10.47	-10.82	-11.24	-11.68	-11.73	-11.64	-11.60	-11.38	-10.08	-9.98	-10.62
16	-5.82	-5.80	-5.72	-5.69	-5.74	-5.78	-5.86	-5.79	-5.70	-5.57	-5.48	-5.39	-5.44	-5.62	-4.92	-5.06	-4.58
17	96.75	-3.11	85.65	-3.16	19.90	-2.99	6.52	-3.06	-3.50	-3.71	-3.72	-3.81	-3.77	-3.91	-4.35	-4.81	-4.85

*The labour mobility index $lm_{i,t}$ is the percentage of workers that should exit or enter into sector i in order to reach the n-dimensional $NPPF$ and hence realize the efficient specialization pattern. Formally, is computed as $\frac{l^E_{i,r} - l_{i,r}}{\sum_{i=1}^{n} l_{i,t}}$—see (2.B.3)

Chapter 3

An Empirical Investigation on Environmental Preservation and Economic Efficiency

Michele Boglioni

Abstract

In this paper we show that, given a specific vector of net output of a group of countries, there are many specialization patterns that would allow its production and at the same time would allow substantial reductions of the global CO2 emissions.

Environmental benefits are not incompatible with improvements in terms of economic efficiency. Empirical estimates of these potential gains are provided using a set of 30 Input-Output tables during the period 1995-2009.

Therefore, with a proper coordination mechanism, the negative environmental impact of the economic activity could be improved maintaining fixed or even increasing the global net product.

Introduction

The reduction of carbon dioxide (CO2) emissions has been set as one of the goals of the Kyoto Conference of 1997[1]. Specifically, the Kyoto Protocol, which entered into force in 2005, had the objective of reducing the global emissions of CO2 and of five more gases[2] by the 5.2% with respect to the 1990 emissions[3].

The emissions of CO2 on a global scale are strictly linked to the available productive technologies in two different ways. On the one hand, the technological progress makes available productive technologies that allow to reduce energy consumption and pollution. On the other hand, as long as the technologies adopted by the single countries imply different CO2 emissions, the specialization patterns also affect the environment in different ways and intensities.

This second relation between technologies, specialization patterns and CO2 emissions is the main topic of this paper. Extending the approach based on Input-Output tables and subsystems developed in the first two chapters, we show that a specific vector of net product can be produced through many different specialization patterns. This implies that, once the vector of the final demand and the technologies are given, it is possible to identify the CO2-minimizing specialization pattern.

The methodology adopted here is similar to the one suggested by (Miller and Blair, 2009, p. 457), but the application of the notion of subsystem as in the Sraffa-Gossling-Pasinetti tradition is specific of our approach (Sraffa, 1960; Gossling, 1972; Pasinetti, 1980), as well as the algorithms built to perform the computation.

Using a set of Input-Output tables for 30 countries taken from the World Input-Output Database (Timmer et al., 2015), we compute the reduction of CO2 emissions for the case in which national productive specializations are allowed. We reach the conclusion that an improved coordination among countries may have a strong impact on the environment.

[1]I would like to thank very much professor Stefano Zambelli for his comments and suggestions. He is a virtual co-author of this chapter.

[2]Methane, nitrous oxide, sulphur hexafluoride, hydrofluorocarbons and perfluorocarbons.

[3]The first enforcing period of the protocol ended in 2012, but in december 2012, the parties of the Kyoto Protocol has adopted the Doha Amendment to the Kyoto Protocol, which basically revise some of the articles and renews the goals of the Protocol. The Doha Amendment sets new objectives for the participating countries, with the view to reduce the emissions of the six gases that were in the original Kyoto protocol plus a new gas—nitrogen trifluoride—by the 18% with respect to the 1990 levels during the period 2013-2020. The Doha amendment has not still entered into force.

This result is somewhat compatible with the conclusions of Carbone et al. (2009). Basing their analysis on a different theoretical ground with respect to the one adopted in this paper—General Equilibrium Models and Game Theory—they claim that international agreements on carbon emissions may be effective for reducing CO2 emissions. But here, based also on the results presented in the previous chapters, coordination may be desirable because of the demonstrated market inefficiency.

Several studies concerned with reduction of C02 emission address also the trade-off between environmental regulation and economic efficiency, which is a sort of conventional wisdom in economics (Rauscher, 2003, p. 1410). A version of this "orthodox" view has been provided by Palmer et al. (1995), according to which environmental regulations would result in a distorted set of prices, which must imply a damage for firms' profits and competitiveness, and hence a loss of wellbeing[4].

However, in this paper it is shown that such kind of trade-offs would emerge on a global scale only in the case in which the theory on Comparative Advantages (CAs) worked well. A key assumption of this theory suggests that if markets were left free to work, the "invisible hand" would naturally lead countries to specialize in those sectors in which they had a CA, in such a way that the overall net output would be maximized (Samuelson, 2001, p. 1205).

If this assumption of well functioning international trade markets and of efficient specializations could be proven to hold, any kind of intervention aiming at modifying the specialization patterns to reduce CO2 emissions would result in a lower net output and hence in a loss of economic efficiency. But since international trade markets and national economies seem not to be efficient, we show that there is scope for reducing CO2 emissions and improving the vector of net product at the same time.

The paper is structured in five Sections. In Section 3.1 the concept of subsystems, which is the fundamental tool of the minimization algorithm, is introduced, along with an explanation of how to use it to study specialization patterns. In Section 3.2 the concepts of Net Product Possibility Frontiers is presented and it is explained how to study CO2 minimizing specialization patterns. In Section 3.3 the dataset used is briefly described and in Section 3.4 the empirical results are discussed. The conclusions are devoted to a summary of the results and to some comments on their implications.

[4]The article by Palmer et al. (1995) came as a response to a series of studies summarized in Porter and van der Linde (1995), who argued that environmental regulations would result in an incentive to innovate that would fully offset the cost of complying with the regulation.

3.1 The enviromental impact of different specialization patterns

In order to explain how different specialization patterns affect the environment, it is convenient to start by way of an example from a hypothetical economic system as the following

Table 3.1: An hypothetical economic system

Sector	Input			Labour	Gross Output	Net Output	CO2
	Iron	Coal	Wheat				
Iron	2	3	2	2/5	16	3	5
Coal	5	4	2	2/5	14	5	6
Wheat	6	2	3	1/5	9	2	2
Tot	13	9	7	1	/	/	13

The three industries produce iron, coal and wheat using up the same three goods used as inputs plus labour. In order to produce this goods, the transformation process of the inputs into the outputs generates emissions, for example in CO2, which can be treated as an additional output of the system.

We want to study how this system would look like if it specialized in some sectors. In order to do this, it is convenient to introduce some mathematical symbols to represent a generic Input-Output system as the one in Tab. 3.1. We denote with $\mathbf{A}$ the input matrix, with $\mathbf{l}$ the labour vector and with $\mathbf{b}$ the gross output vector. It is useful to introduce the concept of social or national net product, which is that part of the national gross product that goes to the final demand, and it is denoted with $\mathbf{y}$. In matrix notation, the equation to compute the national net product is the following:

$$\mathbf{y} = (diag(\mathbf{b}) - \mathbf{A})'\boldsymbol{\iota} \tag{3.1.1}$$

where $diag(\mathbf{b})$ is a diagonal matrix with the gross output vector $\mathbf{b}$ on its main diagonal and $\boldsymbol{\iota}$ is the summation vector—i.e., all entries are equal to 1. In the case of the system above $\mathbf{y}' = [3, 5, 2]$.

As explained in Chapters 1 and 2, in the study of specialization processes, a fundamental concept is that of subsystem. The notion of subsystem was introduced by Sraffa in the first appendix of his work *Production of Commodities by Means of Commodities* as a "smaller self-replacing system the net product of which consists of only one kind of commodity" Sraffa (1960, p. 105).

Basically, in a subsystem, the means of production and the labour which is directly and indirectly necessary and barely sufficient to produce a specific net output in just one sector are considered. In order to compute a subsystem, each row of $\mathbf{A}$, as well as the relative amount of labour and gross output, must be reproportioned in such a way that each component of the net output vector is 0, except for the commodity in which we are interested. Denote with $\bar{\mathbf{y}}_i$ the vector $(0, ..., y_i, ..., 0)'$, where i identifies the sector. In order to find a subsystem, we have to compute a reproportioning vector $\mathbf{x}_i$ such that

$$(diag(\mathbf{b}) - \mathbf{A})'\mathbf{x}_i = \bar{\mathbf{y}}_i \tag{3.1.2}$$

from which we have

$$\mathbf{x}_i = ((diag(\mathbf{b}) - \mathbf{A})')^{-1}\bar{\mathbf{y}}_i \tag{3.1.3}$$

Then a subsystem is given by the triple

$$\begin{aligned} \boldsymbol{A}_i &= diag(\mathbf{x}_i)\mathbf{A} \\ \boldsymbol{l}_i &= diag(\mathbf{x}_i)\mathbf{l} \\ \boldsymbol{b}_i &= diag(\mathbf{x}_i)\mathbf{b} \end{aligned} \tag{3.1.4}$$

where the index i is relative to the different industries, sectors or produced commodities.

A fundamental property of subsystems is the "additive property": the sum of the subsystems gives back the original system—see Gossling (1972). Mathematically, if we have n sectors,

$$\begin{aligned} \sum_{i=1}^{n}\boldsymbol{A}_i &= \mathbf{A} \\ \sum_{i=1}^{n}\boldsymbol{l}_i &= \mathbf{l} \\ \sum_{i=1}^{n}\boldsymbol{b}_i &= \mathbf{b} \end{aligned} \tag{3.1.5}$$

Assuming that the vector of CO2 emissions, denoted $\mathbf{co2}$, are a linear function of the gross product vector $\mathbf{b}$, we can compute the CO2 emission vector $\mathbf{co2}_i$ in the same way, that is to say

$$\boldsymbol{co2}_i = diag(\mathbf{x}_i)\mathbf{co2} \tag{3.1.6}$$

$$CO2_i = \boldsymbol{co2}_i'\boldsymbol{\iota} \tag{3.1.7}$$

Adding up the elements of $\boldsymbol{co2}_i$ as in eq. 3.1.7, we can compute the total CO2 emission, directly and indirectly implied in the production of the net product y_i in Sector i. In this of the paper, the symbols in italic denote a matrix, a vector, or a scalar relative to subsystems.

The three subsystems with the CO2 relative to Tab. 3.1 are those reported in Tab. 3.2

Table 3.2: The subsystems relative to the economic system in Tab. 3.1

$\boldsymbol{A}_{iron}$			$\boldsymbol{l}_{iron}$	$\boldsymbol{b}_{iron}$	$\bar{\mathbf{y}}_{iron}$	$\boldsymbol{co2}_{iron}$
0.65	0.97	0.65	0.13	5.19	3	1.62
0.64	0.51	0.25	0.05	1.78	0	0.76
0.90	0.30	0.45	0.03	1.36	0	0.30
2.19	1.78	1.36	0.21	/	/	2.69

$\boldsymbol{A}_{coal}$			$\boldsymbol{l}_{coal}$	$\boldsymbol{b}_{coal}$	$\bar{\mathbf{y}}_{coal}$	$\boldsymbol{co2}_{coal}$
0.81	1.22	0.81	0.16	6.49	0	2.03
3.47	2.78	1.39	0.28	9.73	5	4.17
2.20	0.73	1.10	0.07	3.30	0	0.73
6.49	4.73	3.30	0.51	/	/	6.93

$\boldsymbol{A}_{wheat}$			$\boldsymbol{l}_{wheat}$	$\boldsymbol{b}_{wheat}$	$\bar{\mathbf{y}}_{wheat}$	$\boldsymbol{co2}_{wheat}$
0.54	0.81	0.54	0.11	4.32	0	1.35
0.89	0.71	0.36	0.07	2.49	0	1.07
2.90	0.97	1.45	0.10	4.34	2	0.97
4.32	2.49	2.34	0.28	/	/	3.38

Applying the of equations in 3.1.5 to the three subsystems in Tab. 3.2 we would obtain the values of the original system of Table 3.1. That is $\mathbf{A} = \boldsymbol{A}_{iron} + \boldsymbol{A}_{coal} + \boldsymbol{A}_{wheat}$, $\mathrm{l} = \boldsymbol{l}_{iron} + \boldsymbol{l}_{coal} + \boldsymbol{l}_{wheat}$ and $\mathrm{b} = \boldsymbol{b}_{iron} + \boldsymbol{b}_{coal} + \boldsymbol{b}_{wheat}$.

Please note that a superficial reading of Table 1 would indicate the iron sector as the one responsible of 5 units of CO2 emissions, but when we read the data in terms of subsystems we see that the production of the surplus in iron implies a much lower level of CO2 emissions (2.69), while the C02 emission associated to the production of coal goes from 6 to 6.93 and that of wheat from 2 to 3.38. The total amount of emissions would be the same, but the imputed values are different.

If we consider an autarkic situation, in order to reduce CO2 emissions the country has two possibilities. The first is to search for CO2 reducing new methods of production and the second is to change the production of the net output in favour of products which would imply lower CO2 emissions. In this paper we focus our attention on the second CO2 reducing factor. The primary non producible resources of the system is represented by labour.

Using the above information on the subsystems, we can analyze how the original system would look like if it specialized in the three sectors considered. In order to do this, it is sufficient to rescale all the elements of a subsystem for the reciprocal of the quantity of labour involved in it—the total quantity of labour has to be set equal to unity. For example, to simulate a complete specialization in iron, all the elements of the first subsystem must be divided by 0.21.

In order to identify a system in which a full specialization has occurred, we use the hat above the symbols. For example $\widehat{\mathbf{A}}_{iron}$ denotes the matrix of the physical inputs of a system in which the net product of iron has been maximized.

The specialized systems are reported in Tab. 3.3

Table 3.3: Specialized systems. The Table shows how the economic system in Tab. 3.1

$\widehat{\mathbf{A}}_{iron}$			$\hat{\mathbf{l}}_{iron}$	$\hat{\mathbf{b}}_{iron}$	$\hat{\mathbf{y}}_{iron}$	$\widehat{\mathbf{co2}}_{iron}$
3.08	4.62	3.08	0.62	24.62	14.24	7.69
3.02	2.42	1.21	0.24	8.46	0.00	3.63
4.29	1.43	2.14	0.14	6.43	0.00	1.43
10.38	8.46	6.43	1.00	/	/	12.75

$\widehat{\mathbf{A}}_{coal}$			$\hat{\mathbf{l}}_{coal}$	$\hat{\mathbf{b}}_{coal}$	$\hat{\mathbf{y}}_{coal}$	$\widehat{\mathbf{co2}}_{coal}$
1.58	2.37	1.58	0.32	12.63	0.00	3.95
6.77	5.41	2.71	0.54	18.95	9.74	8.12
4.29	1.43	2.14	0.14	6.43	0.00	1.43
12.63	9.21	6.43	1.00	/	/	13.50

$\widehat{\mathbf{A}}_{wheat}$			$\hat{\mathbf{l}}_{wheat}$	$\hat{\mathbf{b}}_{wheat}$	$\hat{\mathbf{y}}_{wheat}$	$\widehat{\mathbf{co2}}_{wheat}$
1.96	2.94	1.96	0.39	15.69	0.00	4.90
3.22	2.58	1.29	0.26	9.02	0.00	3.87
10.50	3.50	5.25	0.35	15.76	7.26	3.50
15.69	9.02	8.50	1.00	/	/	12.27

As can be noted, the total CO2 emissions in the three cases are different, and they would be minimized if the country fully specialized in wheat.

That is CO2 would be minimized if the consumption or surplus of the system would be only in wheat with the production of iron and coal limited only to the quantities necessary to produce wheat.

If we assume for simplicity that the actual produced net output is also the desired net output of the system, here we face a trade-off: a decrease in CO2, which may be considered to increase social welfare, would be associated with a change in consumption, which may be considered to decrease the social welfare of the system. For a country alone there is no way to reduce CO2, maintaining fixed its final demand vector. However, the insertion of another country in the framework opens new scopes.

Suppose that it exists a second country, which has exactly the same matrices $\mathbf{A}$, $\mathbf{l}$ and $\mathbf{b}$ of the first country, but they adopt techniques with a different environmental impact as in Tab. 3.4.

Table 3.4: The hypothetical economic system of country 2

Sector	**Input**			**Labour**	**Gross Output**	**Net Output**	**CO2**
	Iron	Coal	Wheat				
Iron	2	3	2	2/5	16	3	8
Coal	5	4	2	2/5	14	5	2
Wheat	6	2	3	1/5	9	2	2
Tot	13	9	7	1	/	/	12

The CO2 produced in the first and the second sector is different while, for the sake of the argument, the second country has the same means of production, same gross output and hence same net output of the first country.

Using the proper algorithm as the one explained in Appendix 3.A, we can study how they could specialize in order to keep fixed the sum of their surplus and, at the same time, have global lower emissions of CO2. The vectors of surplus of the two countries require that the overall surplus to be produced is 6 in iron, 10 in coal and 4 in wheat. Clearly, the total labour employed must be 1 for each country. The CO2 emissions in the non-specialized, autarkic case amounts to 25.

The CO2-minimizing specialization patterns of the two countries are reported in Tab. 3.5.

The symbol over the letters, as for example $\check{\mathbf{A}}^1$ identifies a specialization pattern in which the global CO2 has been minimized, while the superscript identifies the country.

The constraint on labour is satisfied, while summing up $\check{\mathbf{y}}^1$ to $\check{\mathbf{y}}^2$, we obtain a global surplus of 6 in iron, 10 in coal and 4 in wheat, which is the

Table 3.5: Co2-minimizing specialization patterns. The Table shows how the economic systems in Tab. 3.1 and in Tab. 3.4 should have to specialize in order to minimize the global CO2 emissions, maintaining fixed at the same time the sum of their original vectors of surplus.

$\breve{\mathbf{A}}^1$			$\breve{\mathbf{l}}^1$	$\breve{\mathbf{b}}^1$	$\breve{\mathbf{y}}^1$	$\widetilde{\mathbf{co2}}^1$
2.42	3.63	2.42	0.48	19.37	6.00	6.05
3.23	2.59	1.29	0.26	9.05	0.26	3.88
7.71	2.57	3.86	0.26	11.57	4.00	2.57
13.37	8.79	7.57	1.00			12.50

$\breve{\mathbf{A}}^2$			$\breve{\mathbf{l}}^2$	$\breve{\mathbf{b}}^2$	$\breve{\mathbf{y}}^2$	$\widetilde{\mathbf{co2}}^2$
1.58	2.37	1.58	0.32	12.63	0.00	6.32
6.77	5.41	2.71	0.54	18.95	9.74	2.71
4.29	1.43	2.14	0.14	6.43	0.00	1.43
12.63	9.21	6.43	1.00			10.45

original one. However, the total CO2 emission is now 22.95, the 91.8% of the original ones.

A solution of this kind is viable as long as the two countries can share somehow their net product in order to satisfy its original or autarkic domestic demand. Therefore, minimizing CO2 emission requires the existence of a mechanism that redistribute somehow the global net output. It is very likely that the decrease in CO2 emissions would be larger for the cases in which the methods of production of the different countries would be different.

3.2 Environmental preservation and Comparative Advantages

Suppose now that there are many countries and that there is a coordination mechanism that allows them to share their production. They can import the means of production or final consumption goods from each other, and they can specialize in one or two sectors, because they can give up part of their net product in exchange for that good they don't produce.

For the scope of this section, it does not really matter which redistribution mechanism we consider, it might be trade as well as a planned coordination mechanism. In order to be convenient for the countries involved, it is sufficient that the mechanism is successful in providing to each country amounts of commodities which are at least sufficient to cover the domestic demand each country would have realized in an autarkic context.

In this paper, we analyze how different specialization patterns of a group of countries may influence the environmental impact of carrying out productive activities. Considerations on how the institutional mechanism may redistribute the production among countries in a "satisfying" way are left for future studies.

Supposing that such a redistribution mechanism exists and it is implemented, the countries' productive system is not bound to produce domestically the amount necessary for the satisfaction of the domestic consumption demand. Consequently, countries are free to specialize in different sectors. This also implies that the same global net product, which is the sum of the vector of the surpluses of the single countries, could be produced in many different ways.

Given that $\mathbf{y}_c = [y_{c,1}, ..., y_{c,n}]'$, where n is the number of sectors, is the vector of the historically observed net output of country c, the matrix of the Net Products $\mathbf{Y}$ is the matrix of all the $\mathbf{y}$ considered, that is,

$$\mathbf{Y} = \begin{bmatrix} \mathbf{y}'_1 \\ \vdots \\ \mathbf{y}'_m \end{bmatrix} = \begin{bmatrix} y_{1,1} & \dots & y_{1,n} \\ \vdots & \ddots & \vdots \\ y_{m,1} & \dots & y_{m,n} \end{bmatrix} \tag{3.2.1}$$

where m is the number of countries.

Summing up all the sectoral net products of each country, i.e. the elements of each column of $\mathbf{Y}$, the vector of the Net Total Product $\mathbf{NTP}$ is obtained—see (1.4.3).

$$\mathbf{NTP} = \mathbf{Y}\iota = \begin{bmatrix} \sum_{c=1}^{m} y_{1,m} \\ \vdots \\ \sum_{c=1}^{m} y_{n,m} \end{bmatrix} = \begin{bmatrix} Y_1 \\ \vdots \\ Y_n \end{bmatrix} \tag{3.2.2}$$

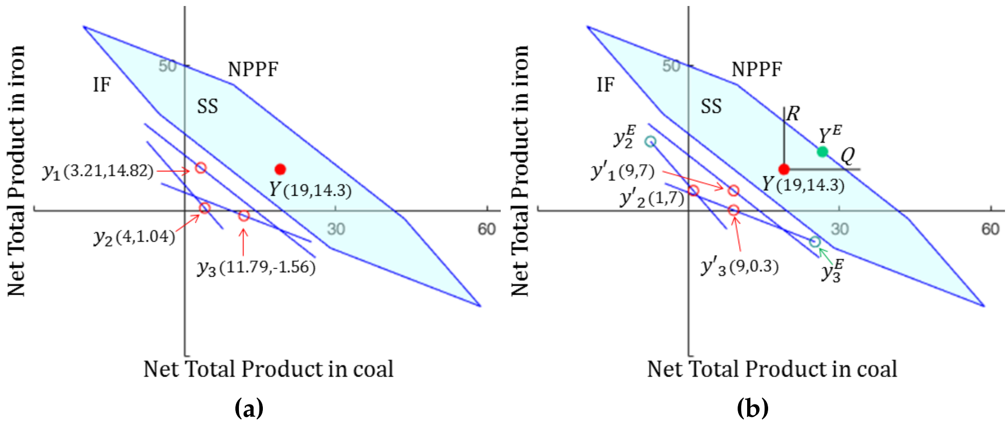
Given a specific $\mathbf{NTP}$ vector, there is a huge number of matrices $\mathbf{Y}$ that allows to produce it.

Suppose to denote with $\boldsymbol{L}$ the matrix of the direct and indirect labour associated with the subsystems producing the net output of matrix $\mathbf{Y}$.

$$\boldsymbol{L} = \begin{bmatrix} L_{1,1} & \dots & L_{1,n} \\ \vdots & \ddots & \vdots \\ L_{m,1} & \dots & L_{m,n} \end{bmatrix} \tag{3.2.3}$$

Given that we denoted with $\boldsymbol{l}_{c,i}$ the labour vector of the subsystem of good i in country c, we have that $L_{c,i} = \boldsymbol{\iota}'\boldsymbol{l}_{c,i}$.

Figure 3.1: An example of different specialization leading to the same NTP. The shaded area represents those vectors of net output that the three countries could jointly produce. Each point strictly inside the shaded area can be produced with an infinite combination of specialization patterns.



The sum by rows of the matrix gives the country employment, while the sum by columns gives the global employment necessary for the production of the global sectoral net output. The sum of all the entries of the matrix gives the global employment.

Furthermore, we denote with $\boldsymbol{CO2}$ the matrix of the direct and indirect emissions associated with the subsystems producing the net output of matrix $\mathbf{Y}$—see equations 3.1.6-3.1.7.

$$\boldsymbol{CO2} = \begin{bmatrix} CO2_{1,1} & \dots & CO2_{1,n} \\ \vdots & \ddots & \vdots \\ CO2_{m,1} & \dots & CO2_{m,n} \end{bmatrix} \tag{3.2.4}$$

The sum by rows of the matrix of CO2 emissions gives the individual countries CO2 emission, while the sum by columns gives global CO2 emissions divided by sectors (or commodities). The sum of all the entries of the matrix gives global emissions.

For each matrix $\mathbf{Y}$ there is an associated matrix $\boldsymbol{L}$ and an associated matrix $\boldsymbol{CO2}$, determined through subsystems. The use of of subsystems is extremely powerful. With the appropriate mathematical programming problem it is possible to find a matrix $\mathbf{Y}$ such that the sum by rows of the related matrix $\boldsymbol{L}$ is fixed and determined by the original endowment of labour, while the sum by rows and by columns of the related matrix $\boldsymbol{CO2}$ is minimized—see Appendix 3.A.

Fig. 3.1 helps to visualize how the same **NTP** can be reached in different ways. Consider the graph on the left—Fig. 3.1a. The graph shows a three countries example of a specific specialization pattern in the sectors of coal and iron. The segments below the shaded area are the national coal-iron frontiers for each country, that is to say, they represent the achievable combinations of net product of coal and iron of each country, keeping fixed the constraint on the labour employed[5].

Suppose that the domestic demand in coal and iron of the three countries is described by y_1, y_2 and y_3. As explained in Section 3.1, in autarky, the countries couldn't divert their production from these points without lowering welfare—assuming that the domestic demand is satisfied in y_1, y_2 and y_3. The **NTP** would be represented by point Y which, as explained in eq. 3.2.2, can be computed simply summing up the net products in coal and in iron of the single countries.

But if a redistribution mechanism of the kind explained above exists, countries would be free to shift their production point wherever it is more convenient. Suppose for example that shifting their surplus in y_1', y_2' and y_3' as in Fig. 3.1b, the CO2 emissions would be lower. As can be noted point Y is exactly the original one. What changes is just the proportion in which each country produces the net product in coal and in iron. More generally, the number of combinations—specialization pattern—that allow to reach point Y is most likely a large number. This makes possible, at least in principle, to realize the specialization pattern that minimizes CO2 emissions, without any consequence on the final demand and on the quantity of workers employed.

It might be even possible to increase the **NTP**, reducing at the same time CO2 emissions. The shaded area is called SS, which stands for Specialization Space, since it describes the area in which point Y can be moved with an appropriate specialization pattern. Suppose now that country 2 could shift its production to y_2^E and country to y_3^E in Fig. 3.1b. The new **NTP** becomes Y^E which is higher than Y in both the goods considered. Actually, point Y^E can be considered an efficient production point, in the sense that in Y^E the net total product of one good cannot be increased without increasing the net total product of another good.

All the points inside the triangle $\overline{YQR}$ represent points that achievable combinations of net total product that improve it both in coal and in iron. If the point is internal to the $\overline{YQR}$ area, than it is possible to find another point that improves the net product in both the goods. If the point lies

[5]For a description of how to compute the national frontiers, see Sections 1.2.1 and 2.2.1 in the case of mobility of the means of production, which is the case assumed in Fig. 3.1.

on the upper boundary of the $NPPF$, this is not possible, since improving the net total product would imply to decrease the net total product of the other good. This set of points is the Net Product Possibility Frontier ($NPPF$)[6]. As explained in Chapters 1 and 2, a Net Total Output vector with this characteristic can be reached when the countries considered exploit their Comparative Advantages.

Moreover, point Y^E has an additional interesting feature. Point Y_E is simply the original **NTP** represented by Y, multiplied by a factor greater than 1. That is to say that both iron and coal are increased by the same proportion.

Fig. 3.2 has been constructed to clarify this point. Point Y_E lies at the same time on the $NPPF$ and on the ray passing through the origin and point Y. For all the points Y^p that lie on segment $\overline{YY^E}$ we have that

$$GS^p = \frac{Y_1^p - Y_1}{Y_1} = \frac{Y_2^p - Y_2}{Y_2} \tag{3.2.5}$$

that is to say that all the points that lie on $\overline{YY^E}$ the percentage improvement in good 1 is equal to the percentage improvement in good 2.

Focusing the attention on segment $\overline{YY^E}$ is important for two reasons. Firstly, the points belonging to it allow, at least in principle, to redistribute to the single countries the additional surplus according to their preferences. The total produced net national product is along the ray greater than the actual historically realized production. A proper reallocation mechanism could allow higher consumption for countries. The motion along the ray do represent points where so called Pareto improvements are possible—on this, see Chapter 1. The second is that in these points, it is possible to measure the improvements in the **NTP** with a scalar number instead of a vector. This scalar number has been called GS—which stands for Gains from Specialization—index.

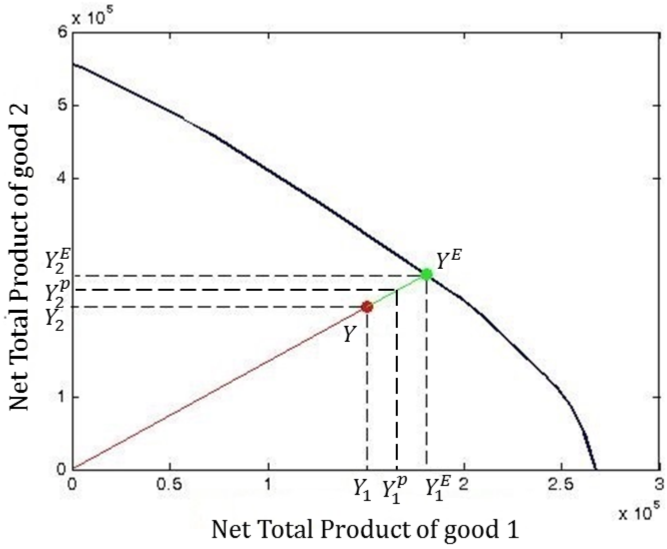
Therefore, to sum up, in a point like Y^E we have that:

- Comparative Advantages are exploited at best, so that the **NTP** vector is higher than the original one;

- The Net Total Product in both the goods considered is increased by the same proportion

[6]The set of points on the lower boundary of the SS form the Inefficient Frontier (IF). It is called the Inefficient Frontier because it describes those points in which the available resources are exploited in the worst possible way. If the quantity of workers in the subsystems of coal and iron is kept fixed, point Y cannot go below the IF. For a detailed description of how the national frontiers, the $NPPF$ and the IF can be constructed and their relations with Comparative Advantages theory see Chapters 1 and 2

Figure 3.2: The Gains from Specialization index. The graph shows how to compute the GS index–see eq. 3.2.5.



When the **NTP** reaches a point like that, the gains from specialization index reaches its maximum and it is called GSF.

Whether the CO2 emissions implied in a point like Y^E, in which Comparative Advantages are exploited and the **NTP** is efficient, are higher than the original ones, depends on the specific CO2 related to the subsystems in the original countries. This point is going to be developed further below for the case in which actual data is used.

3.3 The Data

The data used for this paper are taken from the World Input-Output Database (WIOD). The WIOD provides 35×35 Input-Output (I-O) tables for 40 countries for the period 1995-2011 and the related historical CO2 emissions for the period 1995-2009, so that the time span covered here is 1995-2009.

Among the 40 countries available, the 30 countries reported in Tab. 3.6 have been selected. The choice of excluding 10 countries is mainly due to their little dimensions or particular economic structure.

The number of sectors has been reduced from 35 to 17, and specifically to the primary and secondary sectors—see Tab. 3.7. This is because, as explained above, the underlying assumption in studying Net Product Possibility Frontiers and the related Specialization Space is that the goods considered can be standardized and exported. For this reason, the sectors included are those that enter the Standard International Trade Classification of the United Nations.

Another feature of the approach is that the $NPPF$ are constructed assuming to work with real quantities, while the I-O tables are constructed aggregating in industrial sectors a large number of goods through the use of market prices. The aggregation problem cannot be solved without having finely disaggregated I-O tables, but it is at least possible to deflate the I-O tables properly in order to take into account the fact that prices changes across countries and through the years. For a discussion of these problems and of the procedure adopted to deflate the I-O tables see Section 1.3.1 and Chapter 4.

3.4 CO2 emissions and specialization patterns: empirical results

3.4.1 The historical evolution of CO2 emissions

A first statistics that it is possible to construct using the subsystems approach is the CO2 emissions per unit of net output. The statistics is just the sum of the CO2 directly and indirectly involved in the production of a certain net product computed using the notion of subsystems as in (3.1.7), divided by the net output of the good under analysis.

The use of subsystems allow a very clear and theoretically well defined notion of CO2 total—i.e. direct and indirect—emissions associated to the production of individual commodities net output—see equations 3.1.6, 3.1.7 and 3.2.4.

The complete results are provided in the Tables 3.9-3.25. Each Table represents a Sector and it is reported the subsystems-CO2 per unit of net output, i.e. the CO2 that is directly and indirectly involved in the production of a net output, for each country.

That may be useful to analyze for each sector which are the countries that produce the lowest CO2 per unit of net output. For example the countries that emerge as environmentally virtuous in Sector 1 are Indonesia and India, although also as Austria or Sweden have fairly low emissions.

Tables 3.9-3.25 show that during the period 1995 to 2009 there has been in most cases a substantial decrease in the (direct and indirect) CO2 emissions for the production of the countries sectoral net output. This reduction could be attributed to technological improvements, but it could have to be attributed to reallocations as well.

These statistics may be interesting to compare countries for the point of view of the single Sectors, but it cannot give an overall view of how each country performed. This is provided by another index, which is the weighted average of the subsystems CO2-emission per unit of net output. The weights are given by the quantity of labour employed in each subsystem, over the total quantity of labour of each country. The formula is provided in eq. 3.4.1

$$\overline{\text{co2}}_{c,y} = \sum_{i=1}^{n} \frac{CO2_{i,c,t}}{y_{i,c,t}} \frac{L_{i,c,t}}{\sum_{i=1}^{n} L_{i,c,t}} \tag{3.4.1}$$

where i identifies the sector, c the country, t the year and n is the total number of sectors[7].

The full results of this statistics are reported in Tab. 3.8, while in Fig. 3.3 are reported some examples for each area considered—Europe, North America, Asia and Others.

In Fig. 3.3a are shown the three countries Germany, Italy and Poland, in order to represent Northern, Southern and Eastern European countries. The country that started with the highest emission was Poland, but it improves them at a fast pace especially during the 90s. Italy and Germany also had a positive trend, even if they started from a low level. The graph also shows the results for Europe, which have been computed summing up the I-O Tables and the related CO2 emissions of the 17 European countries that enters into this sample—see Tab. 3.6.

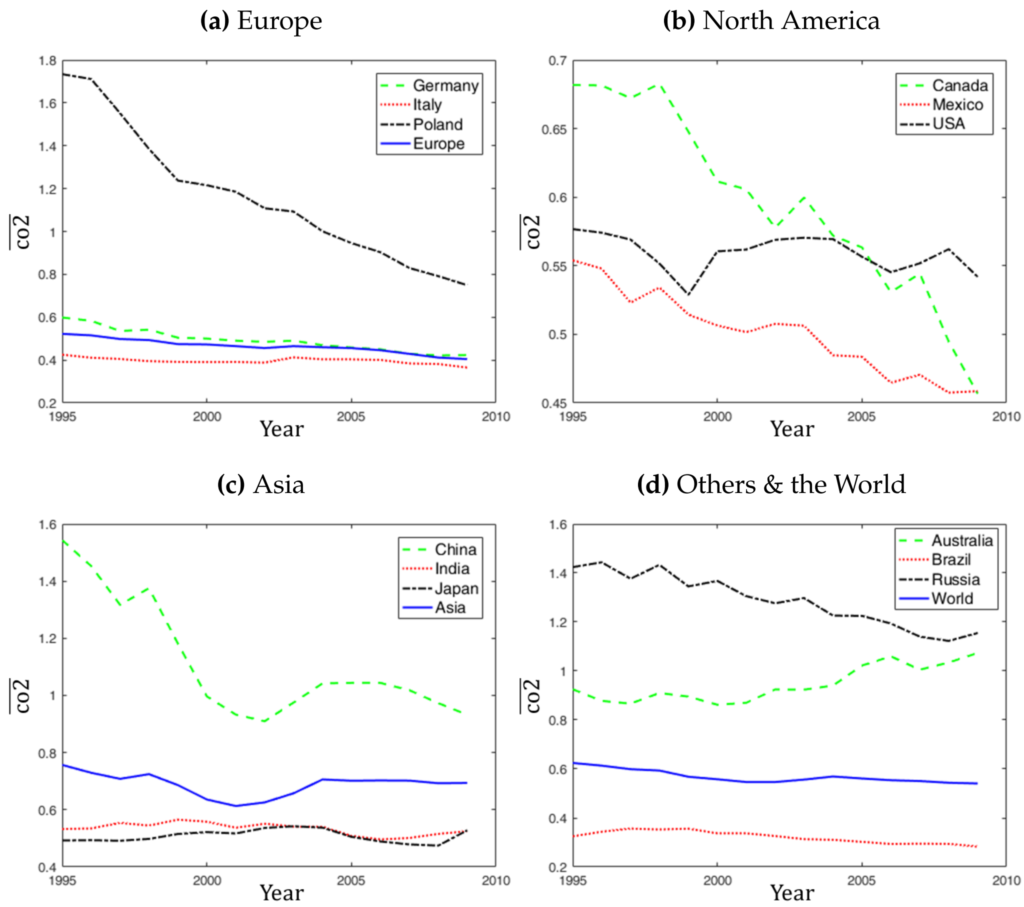
For what concerns the Northern American countries, they all started from low levels compared to the countries of other areas, but Mexico and Canada succeeded to improve their emissions, while the US didn't—see Fig. 3.3b.

In Asia—Fig. 3.3c—, China was by far the worst country in 1995—more or less on the same level as Poland in Europe. The emissions decreased constantly until the beginning of the 00s, but then the trend stopped. Japan is a country with low emissions and its trend was increasing until 2003 more or less, but then the trend reversed, so there is little difference between the values in 1995 and the values in 2009. Overall in "Asia", i.e. the group of the 5 Asian countries reported in Tab. 3.6 considered as a whole, the emissions in 2009 are slightly lower than those in 1995.

Finally, in Fig. 3.3d are reported the series for Australia, Brazil and Russia, along with the data for all the countries considered as whole (the World). Russia and Brazil stayed stable, while Australia increased its CO2 emissions.

[7]If a country is a net importer of a good, its net product is negative. The sectors with a negative net product have been excluded from the computation.

Figure 3.3: C02-emissions per unit of product. The graphs represents the cross-sector average of the emissions per unit of net output computed as in eq. 3.4.1. The results for the full sample are reported in Tab. 3.8.

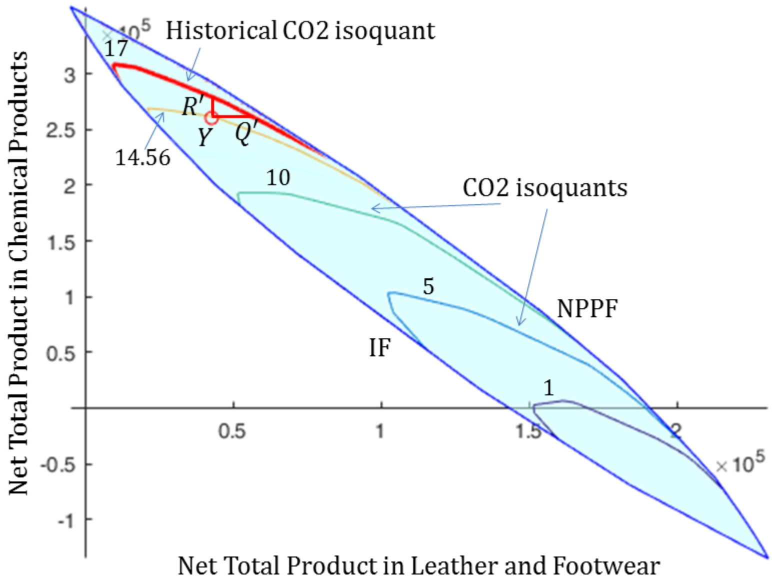


As the solid blue line shows, the overall trend for the World is slightly decreasing. There are some important countries as Japan or the US that did not improve sensitively, while others, as Australia, even increased the emissions with respect to the $\overline{\text{co2}}$ index. However, it has to be noted that these countries started from fairly low levels when compared to other countries that reduced the CO2 emission.

3.4.2 CO2 isoquants

Fig. 3.4 shows an $NPPF$ and the related Specialization Space built on the basis of real data. It has been constructed in order to study those combina-

Figure 3.4: The C02-emissions isoquants. Each curve inside the shaded area represents those combinations of net output that could have been produced in 1997 keeping fixed the—minimized—quantity of emissions of CO2. The scale of each isoquant is 10^4 kilotonnes of CO2.



tions that improve at the same time the **NTP** and the CO2 emissions. The two sectors considered are Sector 5—"Leather and Footwear"—and Sector 9—"Chemical products"—in 1997.

The vector **NTP** is represented by point Y. Inside the SS are drawn the "CO2 isoquants", that is to say, those combinations of net outputs in which the minimum emissions of CO2, computed with the algorithm explained in Appendix 3.A, are constant.

The values of CO2 reported are the values implied in the subsystems of Sector 5 and Sector 9 of all the 30 countries considered, computed with equations 3.1.6, 3.1.7 and 3.2.4.

The thickest CO2-isoquant, which is called "Historical CO2 isoquant" in the Figure, represents those combinations of net output that can be produced with an emission of CO2 equivalent to the historically recorded one. For all the points inside the SS that lie below the "Historical CO2 isoquant" can be produced with a quantity of CO2 emissions that are lower with respect to the historically observed ones.

It can be noted, for example, that the value of the CO2-isoquant passing through point Y is 14.56×10^4 kilotonnes of CO2. Since the value of the "Historical CO2 isoquant" is 17×10^4 kilotonnes of CO2, the figure shows that the original **NTP** in "Leather and Footwear" and "Chemical products" could have been produce with $14.56/17 * 100 = 85.65\%$ of the original emissions implied in the two subsystems. Please note that these benefits are reachable considering just two sectors. As shown below, when the number of sectors increases, the gains may be much higher.

Generally, all the combinations of net total output inside the triangle $\overline{YQ'R'}$ represent those combinations in which:

- the net total output is improved in both the sectors considered with respect to the original one, using the same amount of resources and exploiting the Comparative Advantages of each country;

- the CO2 emissions are lower than those historically recorded.

3.4.3 CO2 in an optimized framework: the case of Europe

As explained in Sections 3.2 and 3.4.2, the same vector of Net Total Product can be obtained through many different specialization patterns, each of which has a different environmental impact. With the appropriate algorithm, it is possible to identify the CO2 minimizing one and it may also be possible to improve the Net Total Product reducing, at the same time, the CO2 emissions.

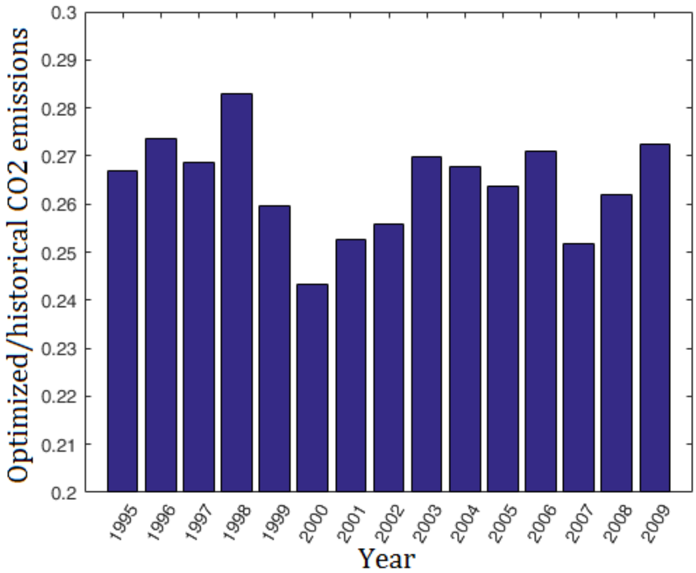
In this paper we apply the algorithm explained in Appendix 3.A. We start from a sub-sample composed by the 17 European countries that enters into Tab. 3.6, in order to study the CO2 emissions associated to the $NPPF$ used in Chapter 2.

Focusing on European countries is interesting also because of the presence of common European institutions that might facilitate the adoption of environmental-friendly policies. Therefore Europe, as any other area with common institutions, is a privileged case for studying potential CO2-reducing specialization patterns. What distinguishes Europe from other areas is data availability and the political power of the common institutions that could determine coordinated policies.

Fig. 3.5 shows which would be the CO2 emissions in an optimized framework as a ratio of the historical CO2 emissions in Europe. The results are striking: they suggest that the CO2 might be reduced to a 24%-28% of those actually produced.

There does not seem to be any trend—neither positive nor negative. This implies that there seems to be ample scope for coordinated policies to improve CO2 emissions through proper specialization processes, and that there was no improvement in this sense during the years considered.

Figure 3.5: Optimized CO2 emissions. In the graph it is represented the ratio between the CO2-emissions in the optimal framework and the historical CO2 emissions.



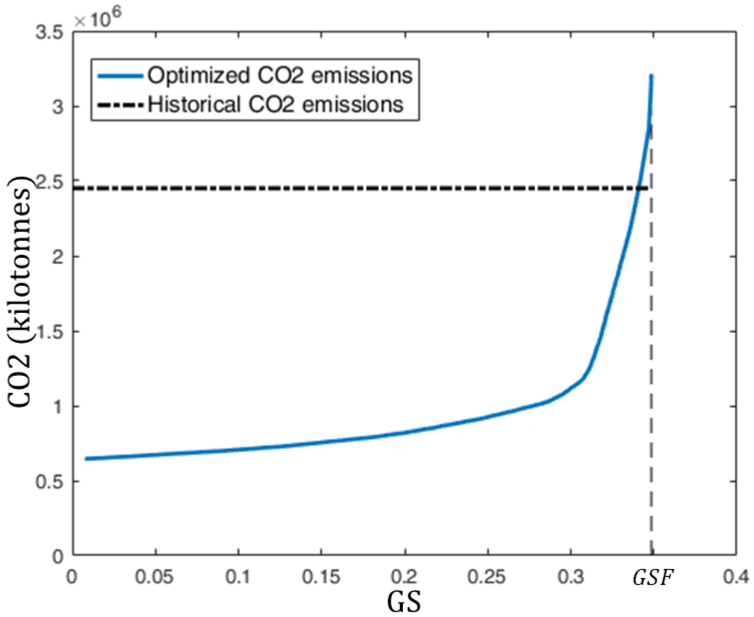
In order to study the achievable combinations of increased **NTP** and reduced CO2, it is useful to use the GS index. As explained in Section 3.2, the GS index is a scalar measure of how much the Net Total product of a group of countries could be improved thanks to the exploitation of Comparative Advantages. The maximum achievable GS, which represents the gains achievable when Comparative Advantages are exploited at best, is called GSF.

In Fig. 3.6 is reported a graph in which are shown all the possible combinations of GS and—minimized—CO2 in 2005. In other words, it describes how the minimized CO2 changes as the GS increases from 0 to its maximum level—the GSF—, which is represented by the vertical dotted line. The horizontal, thickest dotted line represents the historically recorded CO2 emissions.

As can be noted, the majority of the blue line stays below the historical emissions line. All those points represent achievable specialization patterns in which the **NTP** is improved and CO2 is reduced. As can be noted, the historical emissions line is crossed when the GSF—which is 0.35—is very close. A GS of 0.3 is achievable with CO2 emissions that are less than the half of those historically observed.

This implies that the European Net Total Product in 2005 could have been increased by the 30%, halving at the same time the CO2 emissions.

Figure 3.6: Gains from specialization and CO2 in Europe. The graph shows the combination of gains from specialization (GS) and CO2 emissions which was possible to reach in 2005 through an optimized specialization pattern among European countries. The ascissa reports the distance between the historically determined total net national product vector and the net national production vectors obtainable when specialization and reallocation is occurring.



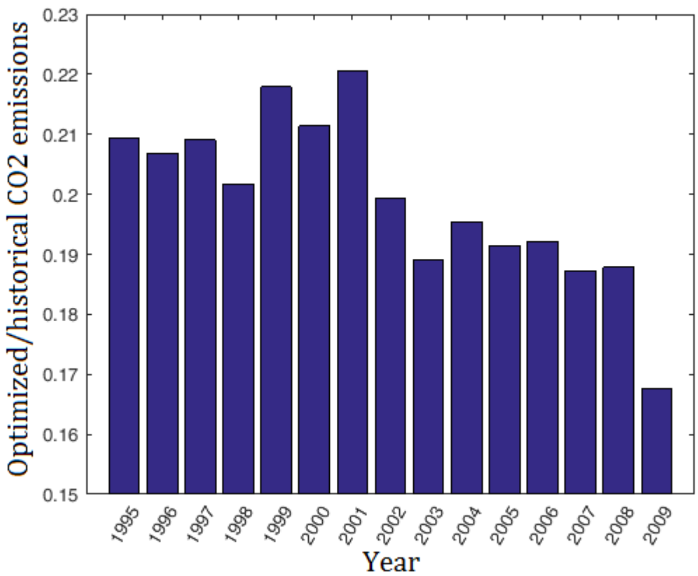
The case in Fig. 3.6 is just one of the 15 years considered, but the evolution is very similar in all the years.

Fig. 3.6 also shows that the solid blue line has a slight slope for most part of the domain of the GS index, while it starts to grow rapidly and crosses the historical emissions line just when the GSF is close.

This is due to the fact that when the GS is far from the GSF, the **NTP** vector is interior to the Specialization Space, and hence far from the $NPPF$—see Figures 3.1, 3.4 and 3.2. As explained in Section 3.1, this implies that there is a wide alternative of specialization patterns that realize a specific **NTP** vector, among which the one with the lowest CO2 can be chosen.

The more the GS get close to the GSF and the **NTP** to the $NPPF$, the more the constraints of the minimization problem become tight—see Appendix 3.A. In other words, close to the $NPPF$ the range of alternatives that allows to produce a specific **NTP** vector becomes narrower and, when the $NPPF$ is reached and CAs are exploited at best, this range is extremely limited, we have practically only one specialization pattern, and

Figure 3.7: Optimized CO2 emissions, full sample. The graph represents the optimized CO2 emissions as a percentage of the historical CO2 emissions when the full sample is considered.



in the majority of cases, it implies CO2 emissions higher than the original ones.

But since, as explained in Chapters 1 and 2, the European countries were far from exploiting CAs during the period 1995-2009, it seems to exist a wide range of specialization patterns that improves the Net Total Product and reduces the CO2 produced by the European countries at the same time.

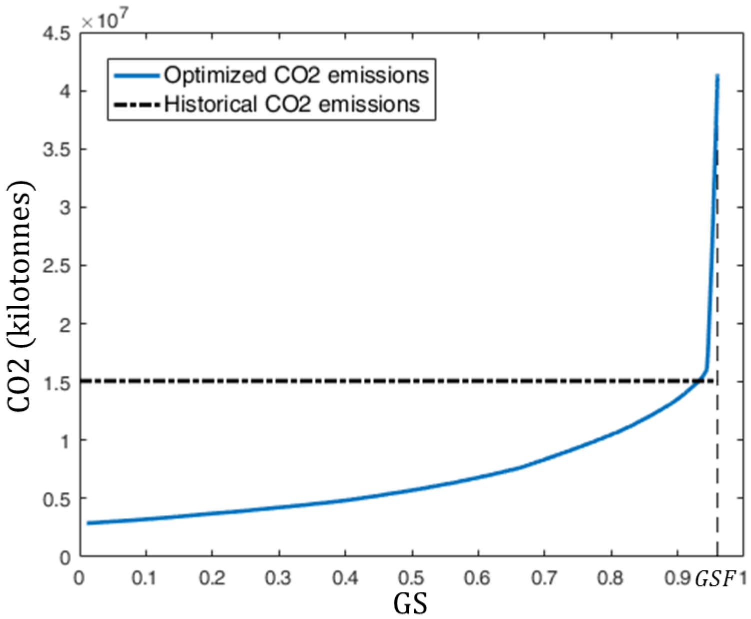
An additional result is that since, as it has been noted, CO2 emissions increase rapidly just when the GSF is close, even in the case CAs worked well, it would be possible to achieve substantial gains in terms of CO2 emissions, with a little loss in terms of efficiency.

3.4.4 CO2 in an optimized framework, full sample

Extending the computation to the full sample, the spaces for reducing CO2 emissions and improving gains from specialization are even wider. Fig. 3.7 shows the ratio between the minimized CO2 and the original emissions when the Net Total Product is kept fixed.

Between 1995 and 2001, an appropriate specialization pattern could reduce the CO2 emissions down to the the 20%-22% of the historical emissions. In the period 2002-2009 the percentage of emissions could have been even lower, with the lowest point in 2009, in which the emissions could

Figure 3.8: Gains from specialization and CO2, full sample. The graph shows the combination of gains from specialization (GS) and CO2 emissions which was possible to reach in 1998 through an optimized specialization pattern.



have been less than the 17%. Extending the sample, the benefits could have been even higher than those reachable in Europe.

This holds both for the environmental benefits and for the gains from specialization as it can be inferred from Fig. 3.8. The graph shows the achievable combinations of gains from specialization and minimized CO2 when the full sample is used.

The blue line is far below the historical emissions line for most part of the domain of the GS also in this case, but the maximum possible GS, the GSF, is much higher. It passes from 0.35 in the case of the European countries to almost 1. This means that if the countries of the full sample exploited their Comparative Advantages, the Net Total Product could have been almost doubled in 2005. This also implies that with the full sample, the 30% more of the Net Total Product could have been produced with more or less 1/3 of the original C02 emissions.

This evidence once again suggests that there are wide scopes for improving at the same time the economic efficiency and the environmental impact of the economic activity. The more countries are involved, the more seem to be the potential gains deriving from CO2 minimizing and/or economically efficient specialization patterns.

Conclusions

The results of this paper suggest that the group of countries considered here are far from specializing in such a way to minimize the environmental impact in terms of CO2 emissions. Through a proper specialization pattern, the emissions during the period 1995-2009 could have been more or less the 20% of those historically recorded. This is a very surprising and striking result. Further investigations on this point are therefore necessary and desirable.

Another important result is that these gains would not necessarily come at the expense of economic efficiency. Indeed, it seems possible to combine the gains from a better exploitation of Comparative Advantages (CAs), and from the reduction in pollution due to CO2.

The principle of CAs suggests that the net output of a group of countries depends on their choices in terms of allocation of resources. One key assumption of the theory on CAs implies that the "invisible hand" of free markets will push countries to allocate resources in such a way that the overall net output will be maximized (Samuelson, 2001)—taking the quantity of resources and the state of technology of each country as given.

In this paper it is shown that if this assumption were verified and countries exploited at best CAs, there would be a trade-off between economic efficiency and CO2 emissions. However, since there is poor evidence of the workings of CAs, there seem to be ample scopes for exploiting them better, and hence increasing the net output, reducing at the same time CO2 emissions—and without implying workers layoff.

Moreover, it is interesting to note that even in the case that CAs were fully exploited, it would be sufficient a little loss in terms of economic efficiency to reduce sensitively CO2 emissions. This once again reinforce the idea that interventions aiming at preserving the environment through proper specialization patterns is an idea that deserves to be further investigated.

The approach adopted here is based on the computation of Net Product Possibility Frontiers ($NPPF$), assuming that final goods and means of production can be traded across countries. As stressed in Chapter 2, this kind of approach consists in using as benchmark a scenario that implies a strong restructuring of the economies considered and it might seem an extreme scenario.

In Chapter 1 it has also been noted that the database might be improved because the Input-Output tables used for this study are fairly aggregated. More disaggregated Tables would improve the precision and reliability of the computation.

Nevertheless, the results presented here suggest that the scope for diminishing CO_2 emissions through a proper specialization of countries are so ample that it would be sufficient a slight improvement in the "right", i.e. CO_2 minimizing, direction to obtain substantial benefits for the environment.

Table 3.6: The list of countries*

1	AUS	Australia	16	IDN	Indonesia
2	AUT	Austria	17	IND	India
3	BEL	Belgium	18	IRL	Ireland
4	BRA	Brazil	19	ITA	Italy
5	CAN	Canada	20	JPN	Japan
6	CHN	China	21	KOR	Korea
7	CZE	Czech Republic	22	MEX	Mexico
8	DEU	Germany	23	NLD	Netherlands
9	DNK	Denmark	24	POL	Poland
10	ESP	Spain	25	PRT	Portugal
11	FIN	Finland	26	RUS	Russia
12	FRA	France	27	SWE	Sweden
13	GBR	Great Britain	28	TUR	Turkey
14	GRC	Greece	29	TWN	Taiwan
15	HUN	Hungary	30	USA	United States

*The countries excluded are Bulgaria, Cyprus, Estonia, Lithuania, Luxembourg, Latvia, Malta, Romania, Slovak Republic and Slovenia

Table 3.7: The list of sectors*

1	Agriculture, Hunting, Forestry and Fishing
2	Mining and Quarrying
3	Food, Beverages and Tobacco
4	Textiles and Textile Products
5	Leather, Leather and Footwear
6	Wood and Products of Wood and Cork
7	Pulp, Paper, Paper, Printing and Publishing
8	Coke, Refined Petroleum and Nuclear Fuel
9	Chemicals and Chemical Products
10	Rubber and Plastics
11	Other Non-Metallic Mineral
12	Basic Metals and Fabricated Metal
13	Machinery, Nec
14	Electrical and Optical Equipment
15	Transport Equipment
16	Manufacturing, Nec; Recycling
17	Electricity, Gas and Water Supply

*The sectors excluded are Construction; Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Wholesale Trade and Commission Trade, Except for Vehicles and Motorcycles; Retail Trade Except for Vehicles and Motorcycles, Repair of Household Goods; Hotels and Restaurant; Inland Transport; Water Transport; Air Transport; Other Supporting and Auxiliary Activities; Activities of Travel Agencies; Post and Telecommunications; Financial Intermediation; Real Estate Activities; Renting of M&Eq and Other Business Activities; Public Administration and Defense, Compulsory Social Security; Education; Health and Social Work; Private Households with Employed Persons.

Table 3.8: Cross-sectors average CO2 emissions. The Table shows the results of the index computed as in eq. 3.4.1, which is the cross-sector weighted average of the emissions per unit of net output of each country.

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.93	0.88	0.87	0.91	0.90	0.86	0.87	0.92	0.92	0.94	1.02	1.06	1.01	1.03	1.07
AUT	0.41	0.41	0.41	0.38	0.36	0.35	0.35	0.36	0.37	0.36	0.36	0.34	0.32	0.31	0.30
BEL	0.67	0.65	0.60	0.63	0.57	0.56	0.53	0.55	0.55	0.55	0.54	0.51	0.48	0.48	0.45
BRA	0.32	0.34	0.36	0.35	0.36	0.34	0.34	0.33	0.31	0.31	0.30	0.29	0.30	0.29	0.28
CAN	0.68	0.68	0.67	0.68	0.65	0.61	0.61	0.58	0.60	0.57	0.56	0.53	0.54	0.49	0.46
CHN	1.54	1.45	1.32	1.38	1.18	1.00	0.93	0.91	0.98	1.04	1.04	1.04	1.02	0.97	0.93
CZE	0.98	1.09	1.11	1.14	1.06	1.06	1.00	0.92	0.92	0.92	0.90	0.82	0.77	0.69	0.65
DEU	0.60	0.58	0.54	0.54	0.50	0.50	0.49	0.48	0.49	0.47	0.46	0.45	0.43	0.42	0.42
DNK	0.59	0.68	0.59	0.55	0.51	0.47	0.47	0.46	0.50	0.45	0.41	0.48	0.44	0.42	0.41
ESP	0.51	0.45	0.47	0.45	0.48	0.53	0.48	0.49	0.48	0.51	0.53	0.50	0.49	0.45	0.42
FIN	0.78	0.82	0.74	0.72	0.64	0.63	0.63	0.65	0.72	0.65	0.54	0.63	0.55	0.49	0.52
FRA	0.41	0.40	0.39	0.38	0.35	0.34	0.32	0.32	0.33	0.31	0.32	0.30	0.29	0.29	0.26
GBR	0.51	0.50	0.47	0.46	0.46	0.44	0.46	0.45	0.46	0.44	0.43	0.43	0.43	0.41	0.40
GRC	1.22	1.27	1.26	1.27	1.09	1.25	1.21	1.09	1.68	1.80	1.52	1.34	1.46	1.43	1.21
HUN	0.61	0.60	0.56	0.56	0.56	0.55	0.57	0.54	0.52	0.46	0.44	0.40	0.38	0.34	0.33
IDN	0.34	0.32	0.34	0.36	0.39	0.38	0.42	0.42	0.43	0.48	0.48	0.49	0.47	0.42	0.46
IND	0.53	0.53	0.55	0.54	0.57	0.56	0.54	0.55	0.54	0.54	0.51	0.50	0.50	0.52	0.53
IRL	0.67	0.67	0.61	0.64	0.69	0.64	0.62	0.59	0.54	0.54	0.48	0.39	0.36	0.38	0.33
ITA	0.43	0.41	0.41	0.39	0.39	0.39	0.39	0.39	0.41	0.40	0.40	0.40	0.38	0.38	0.36
JPN	0.49	0.49	0.49	0.50	0.52	0.52	0.52	0.54	0.54	0.54	0.51	0.49	0.48	0.47	0.53
KOR	0.82	0.83	0.84	0.79	0.75	0.79	0.93	0.87	0.80	0.83	0.86	0.79	0.76	0.78	0.77
MEX	0.55	0.55	0.52	0.53	0.51	0.51	0.50	0.51	0.51	0.48	0.48	0.46	0.47	0.46	0.46
NLD	0.47	0.47	0.45	0.44	0.41	0.40	0.39	0.39	0.40	0.39	0.39	0.36	0.36	0.36	0.34
POL	1.73	1.71	1.55	1.39	1.24	1.22	1.19	1.11	1.09	1.00	0.95	0.90	0.83	0.79	0.75
PRT	0.51	0.47	0.47	0.49	0.53	0.54	0.51	0.58	0.53	0.52	0.53	0.53	0.49	0.50	0.47
RUS	1.42	1.44	1.38	1.43	1.35	1.37	1.31	1.28	1.30	1.23	1.22	1.19	1.14	1.12	1.16
SWE	0.23	0.25	0.22	0.22	0.20	0.19	0.20	0.20	0.20	0.19	0.18	0.18	0.17	0.17	0.17
TUR	0.69	0.75	0.76	0.75	0.78	0.79	0.77	0.75	0.76	0.70	0.66	0.70	0.75	0.64	0.71
TWN	0.71	0.71	0.75	0.76	0.80	0.81	0.91	1.07	1.59	2.15	2.50	3.61	2.69	3.68	1.31
USA	0.58	0.57	0.57	0.55	0.53	0.56	0.56	0.57	0.57	0.57	0.56	0.55	0.55	0.56	0.54

Appendix 3.A The algorithm for the computation of a CO2 minimizing productive pattern

A key feature of the algorithm is that the CO2 emissions of a certain sector are supposed to be a linear function of the gross product of the same sector—see Section 3.1.

As stressed in Chapter 2, the equations 3.1.2-3.1.3 used to compute the vector $\mathbf{x}_{i,c}$, which identifies the subsystem of good i for country c, are all linear equations. As a consequence, denoting with $CO2_{i,c}$ the total emissions related to subsystem i of country c, computed as in eq. (3.1.7), we conclude that $CO2_{i,c}$ is a linear function of the net output $y_{i,c}$ and hence that

$$CO2_{i,c} = e_{i,c} y_{i,c} \tag{3.A.1}$$

where $e_{i,c}$ is a scalar and it is a given parameter which may be called the environmental impact factor. It is convenient to organize the environmental impact factors in matrix $\mathbf{E}$.

$$\mathbf{E} = \begin{bmatrix} e_{1,1} & \dots & e_{1,n} \\ \vdots & \ddots & \vdots \\ e_{m,1} & \dots & e_{m,n} \end{bmatrix} \tag{3.A.2}$$

As a consequence, in matrix notation, we have that

$$\mathbf{CO2} = \mathbf{E} \circ \mathbf{Y} = \begin{bmatrix} \boldsymbol{co2}'_1 \\ \vdots \\ \boldsymbol{co2}'_m \end{bmatrix} = \begin{bmatrix} CO2_{1,1} & \dots & CO2_{1,n} \\ \vdots & \ddots & \vdots \\ CO2_{m,1} & \dots & CO2_{m,n} \end{bmatrix} \tag{3.A.3}$$

where matrix $\mathbf{Y}$ is the matrix of the net national product—see eq. 3.2.1. The symbol $\circ$ is the Hadamard product, that is to say that in $\mathbf{CO2}$, each element in the position ic of $\mathbf{E}$ is multiplied by the element in the same position of $\mathbf{Y}$, as explained in eq. 3.A.1.

We want to find a new matrix $\mathbf{Y}^*$, such that the sum by column and by row of the related matrix $\mathbf{CO2}^*$ is minimized, and such that

$$\mathbf{NTP}^* >= \mathbf{NTP} \tag{3.A.4}$$

In a mathematical context, this is a typical linear programming problem. The objective function and the constraints of the problem are explained step by step.

The objective function

In order to simplify the exposition of how to construct the minimization problem, suppose we have 3 countries and 3 goods. We can reorganize matrix $\mathbf{CO2}$ in a vector in order to obtain an objective function of the following type

$$\begin{aligned}&\boldsymbol{tco2} = [\boldsymbol{co2}_1', \boldsymbol{co2}_2', \boldsymbol{co2}_3'] = \\ &= [CO2_{1,1}, CO2_{1,2}, CO2_{1,3}, CO2_{2,1}, CO2_{2,2}, CO2_{2,3}, CO2_{3,1}, CO2_{3,2}, CO2_{3,3}]'\end{aligned} \quad (3.A.5)$$

$\mathbf{tco2}$ is the objective function of the minimization problem.

The Net Total Product constraint

Matrix $\mathbf{Y}$ can be reorganized in the matrix

$$\mathbf{YC} = \begin{bmatrix} y_{1,1} & 0 & 0 & y_{2,1} & 0 & 0 & y_{3,1} & 0 & 0 \\ 0 & y_{1,2} & 0 & 0 & y_{2,2} & 0 & 0 & y_{3,2} & 0 \\ 0 & 0 & y_{1,3} & 0 & 0 & y_{2,3} & 0 & 0 & y_{3,3} \end{bmatrix} \quad (3.A.6)$$

Basically the problem is to minimize $\mathbf{tco2}'\mathbf{x}$ with respect to $\mathbf{x}$, under the constraint

$$\mathbf{YCx} >= \mathbf{NTP} \quad (3.A.7)$$

Solving this problem, we would find a vector of reproportioning factors $\mathbf{x}$ which, applied to the respective subsystems, would minimize the environmental impact keeping fixed or higher the quantity of goods produced by the three countries in an autarkic context. However, there are two more constraints that should be satisfied in our problem. They are respectively the labour constraint and the non-negative values constraint.

The labour constraint

The first is the total amount of work for each country, which is supposed to be fixed. We call $L_{c,i} = \boldsymbol{\iota}'\boldsymbol{l}_{c,i}$ the total quantity of labour employed in subsystem i of country c, while $\mathrm{L}_c = \sum_{i=1}^{3} L_{i,c}$ the total labour employed by country c. Then $\mathbf{L} = [\mathrm{L}_1, \mathrm{L}_2, \mathrm{L}_3]'$ is the vector of total labour of the three countries. The labour employed in each subsystem can be organized in the following matrix

$$\mathbf{LC} = \begin{bmatrix} L_{1,1} & L_{1,2} & L_{1,3} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & L_{2,1} & L_{2,2} & L_{2,3} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & L_{3,1} & L_{3,2} & L_{3,3} \end{bmatrix} \tag{3.A.8}$$

The second condition to be respected is

$$\mathbf{LCx} = \mathbf{L} \tag{3.A.9}$$

The non-negative value constraint

As explained in Chapter 2, when the means of production are free to move, this means that a country can run a deficit in specific sectors. This would generate negative subsystems. Intuitively this should arise because, without further constraints, it may emerge the case in which a country imports more than it needs to run the production in the other sectors.

When this happens, it may emerge the case in which, summing up the subsystems in order to obtain the system—remind the additive property synthetized by equation 3.1.5—, we obtain negative coefficients in matrices $\mathbf{A}$ and in vectors $\mathbf{l}$ and $\mathbf{b}$. Therefore, we have to introduce another to avoid this possibility. In order to do this, suppose that a generic element of subsystem i of country c is called $s_{j,k,i,c}$, where j identifies the row and k the column of the subsytem.

What we want is that for every country c, the sum of the n subsystems gives non-negative inputs and non-negative outputs. We denote with a minuscule $a_{i,j,c}$, $l_{i,c}$ and $b_{i,c}$ a generic element of, respectively, the matrix of the inputs $\mathbf{A}$, of the labour vector $\mathbf{l}$ or of the gross output vector $\mathbf{b}$ of country c.

Moreover we identify with $s_{i,j,k,c}$ a generic element of the subsystem $\boldsymbol{S}_k$ of country c, defined as follows

$$\boldsymbol{S}_k = [\boldsymbol{A}_k | \boldsymbol{l}_k | \boldsymbol{b}_k | \boldsymbol{co2}_k] \tag{3.A.10}$$

Now, remind that

$$a_{i,j,c} = \sum_{k=1}^{3} s_{i,j,k,c} \tag{3.A.11}$$

for each $c = 1, 2, 3$.

In Appendix 2.A it has been showed that if the elements $s_{1,1,1,c}$, $s_{1,1,2,c}$ and $s_{1,1,3,c}$ have been determined such that the element $a_{1,1,c}$ of country c is 0, it necessary follows that the elements $a_{1,2,1}$, $a_{1,3,1}$, $l_{1,1}$ and $b_{1,1}$ will be also 0, and the same argument applies to $co2_{1,1}$. The same demonstration implies that if $a_{1,1} >= 0$, all the elements belonging to the same row will be non-negative.

Therefore, we just have to constrain the sum of the elements of the first column of each row to be non-negative in order to ensure that we will obtain non-negative $\mathbf{A}$, $\mathbf{b}$ and $\mathbf{l}$ for every $c = 1, 2, 3$. If we define a matrix $\mathbf{SC}$ as follows

$$\mathbf{SC} = \begin{bmatrix} s_{1,1,1,1} & s_{1,1,2,1} & s_{1,1,3,1} & 0 & 0 & 0 & 0 & 0 & 0 \\ s_{2,1,1,1} & s_{2,1,2,1} & s_{2,1,3,1} & 0 & 0 & 0 & 0 & 0 & 0 \\ s_{3,1,1,1} & s_{3,1,2,1} & s_{3,1,3,1} & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & s_{1,1,1,2} & s_{1,1,2,2} & s_{1,1,3,2} & 0 & 0 & 0 \\ 0 & 0 & 0 & s_{2,1,1,2} & s_{2,1,2,1} & s_{2,1,3,2} & 0 & 0 & 0 \\ 0 & 0 & 0 & s_{3,1,1,2} & s_{3,1,2,1} & s_{3,1,3,2} & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & s_{1,1,1,3} & s_{1,1,2,3} & s_{1,1,3,3} \\ 0 & 0 & 0 & 0 & 0 & 0 & s_{2,1,1,3} & s_{2,1,2,3} & s_{2,1,3,3} \\ 0 & 0 & 0 & 0 & 0 & 0 & s_{3,1,1,3} & s_{3,1,2,3} & s_{3,1,3,3} \end{bmatrix} \tag{3.A.12}$$

The non-negative value constraint is that

$$\mathbf{SCx} >= 0 \tag{3.A.13}$$

Appendix 3.B Tables on subsystems-CO2 emissions per unit of net output disaggregated for sectors

Table 3.9: Subsystems CO2 emissions per unit of net output in Sector 1 - Agriculture, Hunting, Forestry and Fishing

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.42	0.40	0.43	0.43	0.43	0.45	0.46	0.57	0.53	0.52	0.54	0.57	0.53	0.51	0.47
AUT	0.32	0.32	0.33	0.31	0.30	0.31	0.32	0.32	0.33	0.32	0.30	0.29	0.26	0.25	0.22
BEL	0.77	0.77	0.74	0.73	0.67	0.67	0.66	0.64	0.67	0.70	0.74	0.70	0.64	0.65	0.64
BRA	0.44	0.45	0.47	0.45	0.44	0.41	0.41	0.39	0.37	0.37	0.36	0.34	0.34	0.34	0.33
CAN	0.73	0.73	0.76	0.74	0.68	0.66	0.63	0.59	0.57	0.53	0.50	0.53	0.54	0.51	0.44
CHN	0.87	0.84	0.79	0.86	0.79	0.68	0.65	0.65	0.67	0.68	0.65	0.61	0.58	0.51	0.48
CZE	0.81	0.84	0.87	0.95	0.94	0.83	0.81	0.70	0.66	0.66	0.63	0.65	0.70	0.67	0.59
DEU	0.61	0.60	0.53	0.56	0.49	0.48	0.47	0.48	0.47	0.40	0.40	0.40	0.37	0.38	0.36
DNK	0.87	0.94	0.83	0.80	0.74	0.72	0.76	0.69	0.71	0.65	0.65	0.68	0.64	0.65	0.57
ESP	0.37	0.31	0.32	0.32	0.34	0.38	0.34	0.34	0.34	0.35	0.39	0.36	0.34	0.34	0.31
FIN	0.74	0.77	0.66	0.70	0.68	0.64	0.64	0.59	0.65	0.63	0.55	0.54	0.50	0.46	0.45
FRA	0.39	0.37	0.36	0.36	0.34	0.33	0.34	0.33	0.36	0.31	0.33	0.30	0.30	0.29	0.26
GBR	0.50	0.51	0.49	0.49	0.49	0.46	0.50	0.46	0.48	0.47	0.38	0.37	0.38	0.37	0.37
GRC	0.76	0.80	0.75	0.73	0.63	0.71	0.67	0.63	0.80	0.88	0.78	0.81	0.86	0.81	0.61
HUN	0.49	0.49	0.49	0.47	0.49	0.47	0.47	0.47	0.43	0.34	0.33	0.32	0.34	0.28	0.27
IDN	0.24	0.24	0.24	0.27	0.25	0.30	0.30	0.30	0.31	0.33	0.33	0.28	0.26	0.26	0.28
IND	0.28	0.24	0.25	0.24	0.27	0.28	0.27	0.30	0.31	0.30	0.29	0.29	0.28	0.28	0.30
IRL	0.40	0.34	0.33	0.34	0.35	0.35	0.36	0.34	0.35	0.33	0.43	0.43	0.39	0.40	0.32
ITA	0.39	0.38	0.36	0.36	0.33	0.33	0.34	0.35	0.37	0.33	0.35	0.35	0.33	0.33	0.33
JPN	0.70	0.69	0.66	0.66	0.68	0.59	0.59	0.56	0.58	0.60	0.56	0.52	0.48	0.43	0.47
KOR	0.70	0.73	0.74	0.73	0.72	0.75	0.85	0.83	0.80	0.74	0.73	0.68	0.63	0.57	0.56
MEX	0.60	0.62	0.60	0.59	0.58	0.58	0.56	0.56	0.57	0.54	0.54	0.52	0.50	0.51	0.53
NLD	0.78	0.84	0.74	0.76	0.70	0.69	0.68	0.65	0.65	0.63	0.63	0.59	0.58	0.60	0.59
POL	1.28	1.28	1.25	1.11	1.07	1.12	1.02	0.90	0.88	0.85	0.86	0.79	0.74	0.73	0.68
PRT	0.39	0.37	0.35	0.32	0.32	0.39	0.40	0.42	0.37	0.37	0.37	0.35	0.33	0.35	0.34
RUS	0.87	0.75	0.80	0.83	0.64	0.69	0.64	0.63	0.69	0.68	0.73	0.72	0.69	0.67	0.66
SWE	0.38	0.42	0.41	0.42	0.41	0.40	0.40	0.41	0.43	0.41	0.43	0.41	0.39	0.39	0.36
TUR	0.48	0.54	0.52	0.50	0.55	0.53	0.56	0.52	0.52	0.51	0.47	0.50	0.54	0.57	0.56
TWN	0.49	0.52	0.51	0.50	0.50	0.50	0.57	0.71	1.13	1.63	1.89	2.66	2.05	2.90	0.96
USA	0.65	0.63	0.61	0.58	0.58	0.58	0.62	0.60	0.51	0.55	0.53	0.53	0.53	0.49	0.43

Table 3.10: Subsystems CO2 emissions per unit of net output in Sector 2 - Mining and Quarrying

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.48	0.51	0.52	0.54	0.50	0.49	0.49	0.46	0.49	0.50	0.52	0.51	0.50	0.49	0.49
AUT	1.03	0.71	0.77	0.81	0.83	0.76	0.69	0.84	0.79	0.84	0.77	0.83	0.78	0.68	0.65
BEL	0.64	0.58	0.58	0.64	0.58	0.57	0.59	0.54	0.50	0.53	0.45	0.44	0.40	0.37	0.39
BRA	0.27	0.30	0.29	0.29	0.34	0.37	0.36	0.37	0.36	0.38	0.37	0.37	0.38	0.41	0.36
CAN	0.70	0.73	0.72	0.72	0.74	0.73	0.74	0.74	0.82	0.76	0.67	0.61	0.66	0.66	0.67
CHN	2.61	2.46	2.18	2.47	2.16	1.77	1.71	1.63	1.72	1.68	1.54	1.45	1.43	1.30	1.34
CZE	1.19	1.37	1.49	1.59	1.74	1.82	1.88	1.80	1.89	1.76	2.10	2.03	1.84	1.80	1.78
DEU	0.76	0.84	0.81	0.78	0.85	0.84	0.89	0.84	0.73	0.92	0.91	0.88	0.85	0.79	0.81
DNK	0.43	0.41	0.48	0.51	0.54	0.42	0.45	0.42	0.42	0.41	0.39	0.41	0.43	0.44	0.47
ESP	0.56	0.54	0.56	0.58	0.65	0.81	0.62	0.56	0.55	0.58	0.63	0.56	0.55	0.53	0.49
FIN	0.66	0.58	0.52	0.63	0.53	0.64	0.56	0.56	0.66	0.50	0.48	0.52	0.41	0.32	0.28
FRA	0.41	0.37	0.36	0.35	0.51	0.51	0.51	0.52	0.53	0.52	0.53	0.51	0.48	0.47	0.55
GBR	0.48	0.52	0.50	0.49	0.46	0.47	0.50	0.49	0.51	0.57	0.62	0.60	0.60	0.54	0.62
GRC	5.46	5.64	5.64	5.25	5.76	5.26	5.58	4.89	5.75	6.23	5.72	5.01	5.13	5.04	5.52
HUN	0.90	0.87	0.88	1.06	1.12	1.08	1.09	1.11	1.06	1.01	0.93	0.75	0.74	0.53	0.86
IDN	0.21	0.21	0.21	0.25	0.30	0.33	0.38	0.40	0.48	0.51	0.55	0.56	0.63	0.58	0.63
IND	1.27	1.35	1.28	1.22	1.33	1.34	1.32	1.19	1.11	1.37	1.28	1.32	1.38	1.52	1.78
IRL	0.45	0.52	0.39	0.48	0.52	0.51	0.54	0.44	0.38	0.36	0.34	0.26	0.36	0.38	0.33
ITA	0.36	0.34	0.34	0.33	0.36	0.34	0.36	0.37	0.41	0.41	0.40	0.42	0.38	0.37	0.32
JPN	0.94	0.91	0.99	0.98	1.03	0.94	1.09	1.18	1.29	1.50	1.47	1.47	1.51	1.84	2.00
KOR	0.56	0.69	0.72	0.73	0.52	0.59	2.52	2.90	2.04	2.48	2.82	2.60	2.45	2.66	3.11
MEX	0.34	0.34	0.31	0.33	0.34	0.35	0.36	0.35	0.34	0.34	0.38	0.39	0.43	0.45	0.46
NLD	0.14	0.14	0.15	0.16	0.15	0.16	0.15	0.16	0.17	0.16	0.33	0.31	0.30	0.29	0.31
POL	1.18	1.14	1.08	1.03	0.97	1.05	0.93	0.82	0.84	0.70	0.64	0.68	0.66	0.64	0.63
PRT	0.39	0.38	0.38	0.40	0.41	0.89	0.89	0.95	0.90	0.95	0.93	1.00	0.99	0.98	1.11
RUS	1.54	2.16	2.11	2.07	2.14	2.05	1.98	1.88	1.78	1.57	1.54	1.52	1.56	1.42	1.30
SWE	0.31	0.30	0.28	0.27	0.23	0.29	0.32	0.28	0.29	0.24	0.26	0.28	0.28	0.32	0.37
TUR	0.38	0.43	0.45	0.48	0.52	0.65	0.64	0.59	0.75	0.65	0.66	0.74	0.64	0.50	0.51
TWN	2.50	3.25	3.65	3.73	4.98	8.37	10.57	10.95	15.91	17.60	18.86	20.10	16.75	14.93	6.82
USA	0.39	0.42	0.49	0.48	0.49	0.47	0.40	0.38	0.41	0.40	0.44	0.41	0.42	0.42	0.33

Table 3.11: Subsystems CO_2 emissions per unit of net output in Sector 3 - Food, Beverages and Tobacco

Country	Year														
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.46	0.46	0.46	0.46	0.44	0.43	0.43	0.40	0.40	0.41	0.42	0.42	0.40	0.40	0.39
AUT	0.27	0.27	0.30	0.28	0.24	0.25	0.26	0.27	0.25	0.23	0.23	0.22	0.20	0.19	0.19
BEL	0.46	0.45	0.41	0.41	0.38	0.38	0.39	0.38	0.38	0.45	0.37	0.35	0.31	0.30	0.33
BRA	0.27	0.29	0.29	0.29	0.29	0.26	0.26	0.25	0.24	0.24	0.23	0.22	0.21	0.20	0.19
CAN	0.47	0.47	0.49	0.45	0.46	0.43	0.41	0.40	0.41	0.41	0.40	0.36	0.35	0.31	0.30
CHN	1.29	1.12	1.00	1.12	0.97	0.82	0.78	0.75	0.74	0.77	0.73	0.68	0.65	0.61	0.57
CZE	0.57	0.57	0.60	0.66	0.63	0.56	0.59	0.44	0.46	0.49	0.47	0.44	0.44	0.41	0.37
DEU	0.40	0.40	0.36	0.38	0.35	0.34	0.35	0.34	0.34	0.33	0.31	0.30	0.29	0.30	0.30
DNK	0.51	0.55	0.50	0.48	0.44	0.43	0.45	0.42	0.43	0.39	0.38	0.42	0.38	0.38	0.37
ESP	0.29	0.26	0.27	0.27	0.28	0.34	0.29	0.27	0.28	0.29	0.30	0.29	0.28	0.26	0.24
FIN	0.53	0.54	0.48	0.49	0.43	0.38	0.36	0.37	0.38	0.36	0.29	0.31	0.27	0.24	0.26
FRA	0.40	0.39	0.38	0.37	0.30	0.30	0.31	0.30	0.31	0.28	0.28	0.27	0.27	0.27	0.25
GBR	0.39	0.39	0.35	0.35	0.36	0.35	0.34	0.33	0.34	0.33	0.31	0.31	0.30	0.29	0.28
GRC	1.33	1.34	1.33	1.31	1.12	1.26	1.24	1.26	1.48	1.60	1.42	1.38	1.37	1.38	1.35
HUN	0.40	0.40	0.40	0.40	0.41	0.39	0.42	0.40	0.36	0.33	0.31	0.28	0.28	0.26	0.24
IDN	0.23	0.20	0.19	0.20	0.20	0.20	0.22	0.22	0.26	0.28	0.29	0.28	0.29	0.24	0.25
IND	0.54	0.73	0.75	0.78	0.82	0.75	0.73	0.70	0.67	0.65	0.63	0.60	0.63	0.68	0.73
IRL	0.47	0.43	0.43	0.42	0.41	0.44	0.41	0.34	0.28	0.26	0.27	0.25	0.21	0.21	0.18
ITA	0.30	0.29	0.28	0.29	0.30	0.29	0.30	0.31	0.33	0.32	0.32	0.32	0.30	0.31	0.28
JPN	0.37	0.37	0.37	0.37	0.42	0.36	0.35	0.36	0.36	0.36	0.35	0.33	0.32	0.32	0.35
KOR	0.69	0.69	0.68	0.68	0.63	0.64	0.70	0.66	0.62	0.61	0.60	0.56	0.53	0.50	0.51
MEX	0.34	0.35	0.33	0.34	0.33	0.31	0.31	0.31	0.31	0.28	0.28	0.27	0.27	0.26	0.27
NLD	0.40	0.41	0.39	0.37	0.36	0.34	0.32	0.31	0.31	0.30	0.29	0.27	0.27	0.26	0.25
POL	1.11	1.16	0.99	0.86	0.72	0.85	0.72	0.68	0.68	0.67	0.63	0.56	0.51	0.48	0.45
PRT	0.32	0.30	0.30	0.31	0.32	0.35	0.35	0.37	0.34	0.33	0.32	0.31	0.29	0.30	0.30
RUS	0.87	0.85	0.78	0.80	0.74	0.71	0.67	0.67	0.63	0.59	0.56	0.52	0.47	0.45	0.49
SWE	0.19	0.20	0.20	0.20	0.18	0.18	0.16	0.16	0.17	0.15	0.15	0.14	0.13	0.13	0.13
TUR	0.52	0.58	0.62	0.65	0.64	0.65	0.64	0.58	0.62	0.57	0.48	0.49	0.49	0.46	0.61
TWN	0.40	0.41	0.39	0.44	0.49	0.44	0.47	0.52	0.77	1.21	1.32	1.73	1.46	2.15	0.78
USA	0.43	0.44	0.45	0.44	0.43	0.46	0.49	0.48	0.46	0.48	0.45	0.43	0.45	0.48	0.43

Table 3.12: Subsystems CO_2 emissions per unit of net output in Sector 4 - Textiles and Textile Products

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.33	0.32	0.32	0.32	0.30	0.31	0.32	0.33	0.33	0.35	0.37	0.38	0.35	0.34	0.34
AUT	0.15	0.15	0.13	0.13	0.12	0.11	0.12	0.11	0.12	0.11	0.11	0.11	0.09	0.09	0.09
BEL	0.37	0.36	0.34	0.35	0.31	0.33	0.31	0.30	0.29	0.29	0.26	0.26	0.22	0.21	0.20
BRA	0.19	0.21	0.21	0.20	0.20	0.19	0.20	0.20	0.19	0.19	0.20	0.20	0.19	0.18	0.17
CAN	0.44	0.44	0.42	0.41	0.40	0.39	0.36	0.33	0.33	0.34	0.33	0.29	0.28	0.23	0.22
CHN	1.57	1.33	1.17	1.29	1.10	0.98	0.95	0.95	1.01	1.10	1.05	1.00	0.97	0.91	0.84
CZE	0.80	0.97	0.91	0.96	0.89	0.88	0.85	0.57	0.55	0.54	0.59	0.55	0.53	0.44	0.40
DEU	0.45	0.46	0.42	0.43	0.39	0.38	0.38	0.38	0.37	0.35	0.33	0.29	0.28	0.26	0.25
DNK	0.22	0.26	0.21	0.20	0.18	0.17	0.18	0.18	0.19	0.18	0.15	0.16	0.13	0.13	0.14
ESP	0.28	0.24	0.26	0.25	0.26	0.30	0.26	0.25	0.26	0.28	0.29	0.27	0.28	0.27	0.28
FIN	0.31	0.32	0.29	0.28	0.26	0.23	0.26	0.25	0.28	0.25	0.21	0.23	0.21	0.17	0.18
FRA	0.28	0.27	0.25	0.23	0.18	0.18	0.16	0.14	0.15	0.13	0.13	0.12	0.11	0.11	0.09
GBR	0.27	0.26	0.25	0.26	0.28	0.29	0.33	0.33	0.32	0.31	0.31	0.30	0.29	0.28	0.27
GRC	0.50	0.50	0.50	0.49	0.42	0.49	0.48	0.56	2.27	0.76	0.68	0.58	0.61	0.61	0.71
HUN	0.33	0.34	0.34	0.35	0.35	0.32	0.30	0.25	0.24	0.21	0.21	0.18	0.18	0.17	0.16
IDN	0.42	0.42	0.50	0.54	0.66	0.71	0.74	0.74	0.83	0.88	0.92	1.06	1.09	0.81	0.87
IND	1.01	0.96	0.99	1.00	0.99	0.91	0.85	0.78	0.71	0.70	0.65	0.61	0.60	0.63	0.59
IRL	0.31	0.35	0.33	0.30	0.31	0.31	0.32	0.27	0.26	0.22	0.20	0.21	0.19	0.20	0.23
ITA	0.39	0.40	0.40	0.33	0.34	0.35	0.33	0.32	0.35	0.33	0.32	0.32	0.29	0.29	0.27
JPN	0.29	0.28	0.30	0.34	0.37	0.37	0.38	0.39	0.40	0.44	0.42	0.37	0.35	0.31	0.34
KOR	0.69	0.69	0.67	0.71	0.66	0.67	0.77	0.70	0.70	0.76	0.76	0.69	0.65	0.64	0.65
MEX	0.38	0.39	0.37	0.39	0.34	0.36	0.35	0.36	0.36	0.35	0.35	0.36	0.36	0.34	0.36
NLD	0.29	0.28	0.28	0.27	0.24	0.25	0.21	0.22	0.22	0.23	0.21	0.19	0.18	0.18	0.17
POL	1.28	1.38	1.09	0.90	0.75	0.74	0.71	0.66	0.64	0.62	0.55	0.49	0.43	0.39	0.35
PRT	0.31	0.30	0.33	0.36	0.34	0.37	0.34	0.38	0.36	0.36	0.38	0.36	0.34	0.33	0.34
RUS	1.38	1.42	1.29	1.27	1.25	1.18	1.12	1.10	1.16	1.10	1.01	0.95	0.87	0.80	0.92
SWE	0.15	0.17	0.19	0.18	0.17	0.14	0.13	0.12	0.14	0.13	0.10	0.11	0.10	0.10	0.09
TUR	0.84	0.94	0.89	0.90	0.79	0.73	0.68	0.64	0.68	0.59	0.49	0.48	0.65	0.34	0.38
TWN	0.84	0.80	0.82	0.86	0.90	0.93	0.96	1.08	1.53	2.34	2.36	3.29	2.76	3.51	1.41
USA	0.41	0.41	0.40	0.40	0.39	0.43	0.44	0.44	0.44	0.37	0.38	0.37	0.36	0.37	0.38

Table 3.13: Subsystems CO2 emissions per unit of net output in Sector 5 - Leather, Leather and Footwear

Country	Year														
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.26	0.27	0.29	0.31	0.30	0.30	0.32	0.34	0.36	0.38	0.39	0.39	0.37	0.35	0.35
AUT	0.12	0.12	0.12	0.12	0.10	0.12	0.12	0.13	0.13	0.12	0.12	0.12	0.09	0.08	0.07
BEL	0.23	0.22	0.22	0.23	0.21	0.27	0.26	0.25	0.24	0.23	0.21	0.21	0.18	0.18	0.18
BRA	0.15	0.17	0.18	0.18	0.18	0.18	0.18	0.18	0.17	0.19	0.18	0.18	0.18	0.17	0.17
CAN	0.42	0.43	0.41	0.40	0.38	0.34	0.36	0.28	0.33	0.30	0.31	0.29	0.28	0.24	0.21
CHN	1.04	0.89	0.82	0.93	0.81	0.70	0.66	0.64	0.71	0.78	0.74	0.71	0.69	0.65	0.60
CZE	0.55	0.44	0.47	0.68	0.64	0.58	0.50	0.37	0.41	0.51	0.26	0.22	0.19	0.18	0.15
DEU	0.35	0.36	0.33	0.34	0.29	0.30	0.32	0.31	0.29	0.28	0.26	0.22	0.20	0.17	0.17
DNK	0.12	0.15	0.09	0.09	0.08	0.08	0.09	0.13	0.16	0.18	0.12	0.16	0.17	0.16	0.16
ESP	0.15	0.12	0.13	0.13	0.14	0.20	0.17	0.16	0.16	0.18	0.19	0.19	0.19	0.17	0.17
FIN	0.24	0.23	0.21	0.20	0.18	0.18	0.18	0.20	0.24	0.18	0.16	0.15	0.09	0.07	0.08
FRA	0.16	0.15	0.15	0.14	0.12	0.10	0.11	0.11	0.11	0.11	0.12	0.11	0.11	0.11	0.09
GBR	0.20	0.20	0.15	0.14	0.15	0.18	0.17	0.18	0.17	0.18	0.15	0.16	0.15	0.14	0.14
GRC	0.46	0.47	0.46	0.46	0.39	0.46	0.72	0.59	0.79	0.60	0.53	0.42	0.42	0.33	0.20
HUN	0.22	0.24	0.23	0.26	0.25	0.23	0.23	0.19	0.20	0.18	0.17	0.14	0.16	0.14	0.14
IDN	0.27	0.22	0.24	0.22	0.26	0.28	0.29	0.30	0.31	0.35	0.37	0.41	0.35	0.31	0.38
IND	0.48	0.48	0.46	0.47	0.46	0.43	0.40	0.38	0.36	0.35	0.34	0.32	0.31	0.33	0.32
IRL	0.40	0.40	0.38	0.37	0.37	0.40	0.42	0.40	0.38	0.33	0.29	0.28	0.25	0.25	0.35
ITA	0.15	0.15	0.15	0.15	0.16	0.15	0.15	0.15	0.16	0.15	0.15	0.15	0.14	0.14	0.13
JPN	0.24	0.23	0.25	0.28	0.31	0.30	0.28	0.29	0.28	0.28	0.25	0.23	0.21	0.21	0.27
KOR	0.45	0.46	0.48	0.50	0.48	0.50	0.57	0.54	0.50	0.53	0.52	0.47	0.45	0.44	0.44
MEX	0.29	0.29	0.27	0.28	0.26	0.26	0.25	0.26	0.25	0.24	0.24	0.24	0.23	0.23	0.24
NLD	0.15	0.15	0.14	0.13	0.12	0.13	0.11	0.11	0.10	0.10	0.10	0.08	0.08	0.09	0.08
POL	1.08	1.14	0.95	0.92	0.64	0.64	0.58	0.54	0.53	0.55	0.49	0.47	0.41	0.37	0.34
PRT	0.16	0.13	0.14	0.16	0.14	0.17	0.16	0.17	0.15	0.16	0.16	0.16	0.15	0.15	0.13
RUS	1.00	1.01	0.81	1.05	0.91	0.88	0.82	0.82	0.89	0.83	0.82	0.78	0.72	0.67	0.79
SWE	0.11	0.12	0.10	0.11	0.10	0.10	0.11	0.10	0.10	0.09	0.07	0.07	0.07	0.07	0.00
TUR	0.49	0.60	0.71	0.77	0.69	0.65	0.57	0.52	0.56	0.48	0.41	0.43	0.47	0.29	0.33
TWN	0.45	0.43	0.45	0.48	0.52	0.57	0.64	0.69	0.94	1.36	1.41	1.96	1.62	2.09	0.82
USA	0.29	0.29	0.28	0.26	0.27	0.28	0.28	0.29	0.33	0.28	0.29	0.27	0.25	0.23	0.21

Table 3.14: Subsystems CO2 emissions per unit of net output in Sector 6 - Wood and Products of Wood and Cork

Country	Year														
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.38	0.37	0.37	0.38	0.34	0.33	0.32	0.32	0.32	0.33	0.34	0.35	0.33	0.33	0.32
AUT	0.24	0.23	0.25	0.23	0.18	0.20	0.19	0.20	0.21	0.20	0.22	0.21	0.22	0.21	0.19
BEL	0.27	0.28	0.26	0.27	0.25	0.25	0.24	0.23	0.23	0.25	0.23	0.22	0.20	0.19	0.18
BRA	0.18	0.20	0.20	0.21	0.21	0.20	0.21	0.21	0.19	0.17	0.18	0.17	0.17	0.17	0.18
CAN	0.53	0.53	0.55	0.53	0.53	0.50	0.49	0.44	0.44	0.46	0.45	0.45	0.43	0.39	0.34
CHN	1.35	1.18	1.05	1.24	1.06	0.92	0.89	0.87	0.94	1.01	0.98	0.94	0.90	0.85	0.80
CZE	0.67	0.64	0.65	0.67	0.65	0.55	0.50	0.53	0.52	0.49	0.51	0.47	0.49	0.42	0.39
DEU	0.33	0.32	0.29	0.30	0.27	0.31	0.31	0.32	0.32	0.32	0.31	0.29	0.30	0.31	0.30
DNK	0.28	0.34	0.28	0.28	0.26	0.25	0.24	0.24	0.28	0.24	0.21	0.22	0.20	0.21	0.20
ESP	0.24	0.21	0.23	0.22	0.23	0.37	0.30	0.28	0.28	0.29	0.31	0.28	0.28	0.26	0.25
FIN	0.62	0.60	0.53	0.52	0.50	0.46	0.45	0.46	0.49	0.44	0.36	0.39	0.36	0.31	0.31
FRA	0.26	0.29	0.28	0.26	0.27	0.20	0.23	0.22	0.21	0.21	0.19	0.19	0.19	0.19	0.18
GBR	0.32	0.34	0.36	0.34	0.45	0.50	0.46	0.38	0.41	0.37	0.37	0.38	0.37	0.34	0.30
GRC	0.57	0.58	0.58	0.60	0.47	0.56	0.56	0.69	2.97	0.52	0.55	0.49	0.53	0.55	0.45
HUN	0.40	0.42	0.42	0.44	0.41	0.42	0.42	0.41	0.38	0.33	0.33	0.28	0.29	0.27	0.28
IDN	0.22	0.21	0.24	0.27	0.32	0.35	0.36	0.36	0.36	0.40	0.41	0.45	0.40	0.41	0.47
IND	0.85	0.84	0.86	0.89	0.79	0.77	0.72	0.66	0.53	0.58	0.75	0.74	0.80	0.94	1.03
IRL	0.58	0.55	0.51	0.49	0.46	0.47	0.48	0.43	0.39	0.35	0.35	0.32	0.28	0.30	0.28
ITA	0.26	0.25	0.25	0.23	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.24	0.23	0.23	0.21
JPN	0.31	0.30	0.30	0.33	0.37	0.35	0.34	0.35	0.36	0.36	0.33	0.32	0.32	0.32	0.37
KOR	0.57	0.58	0.57	0.60	0.55	0.59	0.65	0.61	0.58	0.64	0.62	0.58	0.57	0.58	0.58
MEX	0.48	0.48	0.46	0.47	0.40	0.42	0.40	0.39	0.38	0.37	0.37	0.37	0.36	0.34	0.37
NLD	0.22	0.23	0.22	0.21	0.20	0.21	0.19	0.20	0.20	0.20	0.19	0.18	0.17	0.17	0.20
POL	1.46	1.58	1.42	1.23	0.99	0.92	0.88	0.84	0.96	0.78	0.72	0.69	0.60	0.56	0.52
PRT	0.39	0.36	0.36	0.37	0.38	0.38	0.34	0.36	0.33	0.34	0.34	0.33	0.32	0.31	0.33
RUS	1.10	1.27	1.36	1.24	1.29	1.23	1.17	1.16	1.14	1.06	0.93	0.92	0.83	0.73	0.86
SWE	0.21	0.19	0.18	0.18	0.16	0.17	0.16	0.16	0.17	0.16	0.15	0.15	0.15	0.14	0.15
TUR	0.63	0.96	1.15	1.43	2.40	3.85	2.65	3.32	4.17	3.80	3.21	3.75	2.82	0.64	1.00
TWN	0.34	0.34	0.36	0.42	0.48	0.53	0.65	0.65	0.90	1.49	1.43	1.94	1.70	2.10	0.78
USA	0.47	0.47	0.48	0.48	0.48	0.48	0.48	0.45	0.42	0.41	0.39	0.38	0.37	0.43	0.42

Table 3.15: Subsystems CO2 emissions per unit of net output in Sector 7 - Pulp, Paper, Paper, Printing and Publishing

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.32	0.33	0.34	0.35	0.34	0.34	0.34	0.30	0.28	0.29	0.31	0.33	0.31	0.30	0.32
AUT	0.52	0.53	0.55	0.50	0.41	0.39	0.38	0.38	0.42	0.40	0.39	0.36	0.33	0.32	0.33
BEL	0.37	0.36	0.35	0.35	0.34	0.35	0.33	0.35	0.34	0.37	0.35	0.35	0.31	0.31	0.34
BRA	0.29	0.33	0.32	0.31	0.34	0.34	0.32	0.32	0.30	0.29	0.27	0.24	0.25	0.24	0.24
CAN	0.70	0.70	0.69	0.67	0.64	0.59	0.55	0.53	0.52	0.50	0.52	0.37	0.37	0.31	0.28
CHN	1.80	1.51	1.36	1.42	1.17	1.02	0.94	0.90	0.99	1.10	1.09	1.11	1.07	1.05	0.98
CZE	0.48	0.57	0.49	0.49	0.46	0.46	0.52	0.44	0.47	0.41	0.44	0.37	0.40	0.33	0.33
DEU	0.31	0.30	0.29	0.28	0.27	0.28	0.28	0.28	0.30	0.28	0.31	0.30	0.29	0.28	0.28
DNK	0.16	0.20	0.17	0.18	0.16	0.14	0.16	0.16	0.18	0.17	0.14	0.16	0.13	0.12	0.12
ESP	0.31	0.26	0.28	0.27	0.27	0.37	0.30	0.28	0.28	0.30	0.31	0.32	0.31	0.29	0.27
FIN	1.02	1.09	0.98	0.85	0.83	0.70	0.79	0.77	0.78	0.72	0.61	0.72	0.66	0.57	0.58
FRA	0.34	0.33	0.31	0.29	0.23	0.23	0.23	0.22	0.23	0.21	0.21	0.20	0.18	0.18	0.15
GBR	0.23	0.22	0.21	0.21	0.20	0.20	0.22	0.22	0.23	0.23	0.23	0.22	0.21	0.20	0.19
GRC	0.43	0.44	0.47	0.48	0.44	0.50	0.45	0.53	0.88	1.05	0.70	0.52	0.58	0.54	0.45
HUN	0.35	0.35	0.31	0.31	0.31	0.28	0.27	0.23	0.23	0.21	0.21	0.19	0.19	0.16	0.15
IDN	0.26	0.25	0.28	0.31	0.42	0.52	0.58	0.53	0.70	0.65	0.65	0.69	0.63	0.59	0.62
IND	1.27	1.30	1.29	1.23	1.15	1.15	1.25	1.13	1.00	1.00	0.94	0.89	0.89	0.87	0.88
IRL	0.11	0.10	0.09	0.08	0.07	0.07	0.07	0.06	0.06	0.06	0.05	0.06	0.05	0.05	0.04
ITA	0.32	0.33	0.33	0.33	0.31	0.33	0.33	0.33	0.35	0.35	0.35	0.35	0.35	0.33	0.34
JPN	0.35	0.36	0.36	0.34	0.37	0.38	0.37	0.38	0.38	0.36	0.34	0.35	0.36	0.35	0.35
KOR	0.65	0.61	0.58	0.57	0.54	0.50	0.59	0.58	0.58	0.64	0.67	0.58	0.55	0.53	0.58
MEX	0.36	0.40	0.35	0.37	0.37	0.37	0.37	0.37	0.36	0.34	0.35	0.32	0.32	0.30	0.33
NLD	0.20	0.21	0.20	0.19	0.18	0.18	0.18	0.18	0.18	0.19	0.20	0.19	0.17	0.16	0.15
POL	1.08	1.05	0.98	0.81	0.66	0.56	0.52	0.49	0.53	0.56	0.49	0.44	0.39	0.36	0.34
PRT	0.51	0.48	0.49	0.50	0.53	0.50	0.46	0.50	0.46	0.45	0.46	0.44	0.41	0.40	0.41
RUS	1.00	1.12	1.00	0.97	1.06	1.13	1.00	0.98	0.94	0.88	0.83	0.79	0.73	0.68	0.74
SWE	0.23	0.26	0.20	0.19	0.17	0.18	0.19	0.18	0.17	0.17	0.16	0.15	0.14	0.14	0.14
TUR	1.15	1.24	1.24	0.93	0.93	0.94	0.89	0.83	0.87	0.71	0.64	0.65	0.63	0.56	0.58
TWN	1.04	0.96	0.97	0.96	0.93	0.91	0.91	0.95	1.26	1.95	1.96	2.60	2.26	2.90	1.21
USA	0.31	0.31	0.29	0.29	0.28	0.32	0.32	0.32	0.32	0.30	0.30	0.28	0.30	0.31	0.29

Table 3.16: Subsystems CO2 emissions per unit of net output in Sector 8 - Coke, Refined Petroleum and Nuclear Fuel

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	1.18	1.21	1.11	1.10	1.05	1.05	1.01	0.97	0.97	0.94	1.05	1.02	1.07	1.02	1.08
AUT	1.20	1.18	1.12	1.07	1.00	0.93	0.91	1.09	1.15	1.18	1.06	1.02	0.94	0.72	0.61
BEL	0.67	0.72	0.74	0.83	0.76	0.67	0.74	0.73	0.75	0.70	0.59	0.57	0.56	0.52	0.52
BRA	0.47	0.51	0.52	0.51	0.51	0.50	0.50	0.50	0.51	0.53	0.53	0.51	0.52	0.54	0.52
CAN	1.49	1.48	1.47	1.53	1.44	1.41	1.38	1.48	1.53	1.42	1.25	1.18	1.17	1.07	1.14
CHN	2.60	2.51	2.34	2.60	2.23	1.85	1.77	1.69	1.83	1.76	1.64	1.60	1.53	1.39	1.43
CZE	0.53	0.13	0.22	0.99	1.12	1.15	1.21	0.90	0.90	1.11	1.19	1.20	1.05	1.01	0.41
DEU	0.81	0.71	0.51	1.03	0.90	0.88	0.80	0.81	0.83	0.84	0.85	0.84	0.83	0.84	0.71
DNK	1.82	2.18	1.80	1.77	1.44	1.13	1.28	1.14	1.24	1.12	1.00	1.27	1.30	1.17	1.22
ESP	1.09	0.98	0.97	1.07	0.93	1.13	1.06	1.07	1.17	1.23	1.11	0.91	0.80	0.78	0.76
FIN	1.30	1.45	1.34	1.29	1.26	1.20	1.12	1.04	1.15	1.06	1.26	1.31	1.25	1.20	1.20
FRA	1.15	1.15	1.15	1.11	1.02	0.96	0.71	0.72	0.79	0.86	0.86	0.65	0.65	0.56	0.44
GBR	1.20	1.23	1.21	1.29	1.13	0.99	1.09	1.13	1.14	1.05	1.10	1.08	1.11	1.06	1.17
GRC	2.86	3.20	2.75	3.15	2.37	3.27	3.03	2.60	3.15	2.95	2.83	3.32	3.03	2.83	3.31
HUN	0.28	0.32	0.30	0.31	0.37	0.46	0.46	0.38	0.39	0.30	0.33	0.33	0.31	0.26	0.32
IDN	0.68	0.42	0.46	0.46	0.44	0.48	0.44	0.55	0.54	0.59	0.58	0.60	0.56	0.34	0.47
IND	1.10	1.10	1.18	1.08	1.29	1.29	1.22	1.10	1.04	1.08	0.98	0.96	0.94	1.00	1.07
IRL	0.95	0.91	0.83	1.01	1.08	0.98	0.98	1.05	1.07	0.84	0.69	0.56	0.59	0.68	0.62
ITA	0.77	0.80	0.84	0.81	0.86	0.87	0.84	0.85	0.86	0.81	0.87	0.88	0.87	0.93	1.12
JPN	0.70	0.67	0.70	0.75	0.81	0.77	0.85	0.91	1.02	1.15	1.11	1.10	1.08	1.14	1.28
KOR	0.90	0.98	0.99	1.01	0.83	0.88	2.10	2.26	1.82	2.05	2.28	2.05	1.88	2.03	2.18
MEX	1.00	0.97	0.97	1.09	1.09	1.07	1.09	1.09	1.12	1.12	1.18	1.19	1.22	1.24	1.22
NLD	0.71	0.70	0.76	0.79	0.76	0.76	0.80	0.76	0.78	0.75	0.87	0.84	0.80	0.75	0.56
POL	1.83	1.91	1.71	1.62	1.44	1.44	1.39	1.41	1.38	0.99	1.04	1.04	0.95	0.87	0.94
PRT	0.84	0.77	0.66	1.43	0.88	1.01	0.99	0.86	0.84	1.05	1.23	1.43	1.41	1.40	1.59
RUS	1.24	0.64	0.59	0.73	0.80	0.82	0.72	0.77	1.21	1.13	1.11	1.01	0.96	0.92	0.92
SWE	0.48	0.50	0.45	0.44	0.43	0.46	0.51	0.46	0.46	0.41	0.40	0.41	0.40	0.38	0.41
TUR	0.45	0.51	0.52	0.49	0.57	0.68	0.77	1.11	1.13	0.97	1.00	1.13	1.03	1.02	1.27
TWN	1.32	1.75	1.83	1.77	2.41	1.81	2.41	4.08	7.42	9.33	11.63	14.48	11.13	11.79	4.80
USA	0.96	0.97	0.99	0.96	0.97	0.93	0.85	0.84	0.79	0.71	0.74	0.76	0.76	0.75	0.68

Table 3.17: Subsystems CO2 emissions per unit of net output in Sector 9 - Chemicals and Chemical Products

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.71	0.70	0.69	0.73	0.69	0.70	0.72	0.78	0.84	0.85	0.84	0.92	0.88	0.85	0.84
AUT	0.59	0.58	0.58	0.53	0.54	0.47	0.49	0.47	0.51	0.48	0.46	0.42	0.34	0.35	0.30
BEL	0.74	0.72	0.69	0.73	0.65	0.62	0.60	0.58	0.56	0.57	0.64	0.60	0.56	0.52	0.53
BRA	0.41	0.45	0.48	0.45	0.47	0.43	0.46	0.45	0.43	0.42	0.41	0.41	0.41	0.38	0.34
CAN	1.12	1.12	1.07	1.09	1.07	1.00	0.90	0.88	0.87	0.92	0.87	0.83	0.82	0.80	0.72
CHN	3.24	3.00	2.65	2.85	2.41	2.10	1.94	1.88	1.93	1.86	1.81	1.78	1.67	1.60	1.51
CZE	2.65	2.43	2.06	2.33	2.10	2.47	2.20	1.80	1.80	1.79	1.80	1.54	1.63	1.52	1.83
DEU	0.60	0.59	0.56	0.55	0.53	0.51	0.49	0.48	0.45	0.44	0.42	0.40	0.40	0.38	0.43
DNK	0.33	0.38	0.29	0.26	0.23	0.21	0.20	0.20	0.20	0.18	0.15	0.15	0.14	0.13	0.13
ESP	0.49	0.43	0.47	0.43	0.44	0.53	0.47	0.44	0.46	0.47	0.49	0.47	0.45	0.43	0.39
FIN	0.94	0.95	0.88	0.77	0.75	0.67	0.74	0.71	0.77	0.67	0.62	0.60	0.57	0.52	0.47
FRA	0.70	0.69	0.64	0.61	0.49	0.43	0.41	0.36	0.38	0.36	0.38	0.34	0.33	0.31	0.28
GBR	0.57	0.54	0.53	0.51	0.48	0.47	0.46	0.43	0.44	0.43	0.42	0.40	0.39	0.37	0.36
GRC	0.67	0.69	0.69	0.77	0.68	0.82	0.65	0.66	1.34	2.56	1.49	0.79	0.98	1.00	0.44
HUN	0.80	0.72	0.71	0.67	0.74	0.80	0.77	0.73	0.97	0.78	0.80	0.72	0.80	0.76	0.77
IDN	0.78	0.66	0.70	0.65	0.71	0.68	0.72	0.71	0.72	0.71	0.71	0.73	0.74	0.66	0.73
IND	1.70	1.68	1.68	1.54	1.54	1.45	1.37	1.29	1.18	1.15	1.10	1.02	0.99	0.95	0.93
IRL	0.26	0.23	0.21	0.16	0.15	0.13	0.12	0.09	0.06	0.07	0.07	0.06	0.06	0.06	0.05
ITA	0.75	0.69	0.67	0.63	0.58	0.57	0.54	0.51	0.55	0.55	0.55	0.55	0.54	0.52	0.49
JPN	0.66	0.66	0.64	0.65	0.69	0.70	0.68	0.68	0.67	0.70	0.69	0.69	0.68	0.64	0.70
KOR	1.06	1.06	0.95	0.85	0.83	0.83	1.14	1.04	0.93	1.04	1.16	1.03	0.99	1.07	1.08
MEX	0.64	0.65	0.59	0.59	0.60	0.59	0.55	0.55	0.52	0.48	0.51	0.46	0.49	0.48	0.46
NLD	0.79	0.73	0.71	0.69	0.65	0.63	0.60	0.58	0.60	0.58	0.60	0.59	0.57	0.57	0.41
POL	3.09	2.92	2.57	2.44	2.24	2.44	2.21	1.92	1.78	1.75	1.56	1.36	1.21	1.19	1.20
PRT	1.21	1.04	1.12	1.25	0.98	1.15	1.21	1.23	1.24	1.28	1.27	1.33	1.35	1.24	0.86
RUS	2.77	3.23	3.06	2.87	2.72	3.65	3.35	3.27	3.18	2.86	2.68	2.71	2.67	2.66	3.25
SWE	0.23	0.25	0.23	0.22	0.17	0.17	0.17	0.17	0.15	0.17	0.16	0.15	0.17	0.17	0.17
TUR	1.61	2.24	2.12	2.64	1.75	1.69	1.49	1.34	1.52	1.45	1.22	1.15	0.86	0.47	0.53
TWN	1.30	1.31	1.34	1.41	1.57	1.62	1.78	2.20	3.32	4.38	5.28	7.60	5.95	7.49	2.71
USA	0.65	0.65	0.58	0.58	0.58	0.69	0.68	0.63	0.63	0.60	0.60	0.54	0.54	0.63	0.56

Table 3.18: Subsystems CO2 emissions per unit of net output in Sector 10 - Rubber and Plastics

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.42	0.42	0.41	0.44	0.42	0.40	0.40	0.40	0.40	0.41	0.41	0.43	0.41	0.40	0.39
AUT	0.25	0.24	0.23	0.20	0.19	0.19	0.20	0.19	0.20	0.19	0.19	0.19	0.17	0.17	0.15
BEL	0.36	0.36	0.35	0.37	0.32	0.30	0.29	0.28	0.26	0.27	0.25	0.24	0.21	0.19	0.17
BRA	0.20	0.22	0.23	0.23	0.25	0.23	0.25	0.25	0.24	0.25	0.24	0.24	0.24	0.22	0.21
CAN	0.62	0.62	0.60	0.62	0.58	0.54	0.50	0.46	0.48	0.47	0.42	0.43	0.43	0.38	0.35
CHN	2.08	1.90	1.69	1.86	1.60	1.37	1.29	1.25	1.34	1.40	1.37	1.35	1.30	1.25	1.17
CZE	0.94	0.98	0.90	1.01	0.95	1.01	0.95	0.78	0.78	0.78	0.76	0.70	0.67	0.56	0.54
DEU	0.35	0.34	0.31	0.33	0.30	0.29	0.28	0.28	0.28	0.27	0.26	0.24	0.23	0.22	0.22
DNK	0.22	0.28	0.23	0.23	0.21	0.19	0.20	0.19	0.22	0.19	0.16	0.16	0.15	0.15	0.17
ESP	0.31	0.25	0.28	0.26	0.26	0.37	0.28	0.26	0.26	0.27	0.30	0.29	0.28	0.26	0.24
FIN	0.42	0.43	0.39	0.35	0.34	0.29	0.33	0.33	0.39	0.33	0.28	0.30	0.27	0.24	0.23
FRA	0.33	0.33	0.31	0.32	0.25	0.25	0.23	0.21	0.21	0.20	0.20	0.18	0.17	0.16	0.13
GBR	0.45	0.45	0.44	0.38	0.37	0.37	0.40	0.36	0.37	0.37	0.39	0.35	0.35	0.32	0.29
GRC	0.52	0.47	0.52	0.59	0.51	0.67	0.78	0.72	0.79	1.26	1.07	0.79	0.82	0.79	0.65
HUN	0.70	0.77	0.69	0.66	0.62	0.62	0.92	0.90	0.51	0.35	0.34	0.35	0.33	0.31	0.30
IDN	0.36	0.34	0.39	0.38	0.46	0.46	0.49	0.50	0.47	0.53	0.52	0.55	0.51	0.47	0.49
IND	1.14	1.11	1.04	1.09	1.06	1.03	0.98	0.95	0.90	0.88	0.83	0.78	0.77	0.78	0.78
IRL	0.42	0.40	0.41	0.40	0.39	0.38	0.37	0.35	0.35	0.34	0.35	0.32	0.30	0.32	0.28
ITA	0.37	0.36	0.35	0.33	0.32	0.33	0.33	0.32	0.33	0.32	0.32	0.32	0.32	0.32	0.29
JPN	0.37	0.36	0.36	0.37	0.40	0.40	0.40	0.41	0.38	0.36	0.35	0.34	0.34	0.32	0.40
KOR	0.71	0.70	0.69	0.60	0.58	0.59	0.73	0.66	0.59	0.65	0.70	0.63	0.61	0.65	0.67
MEX	0.54	0.54	0.48	0.50	0.46	0.47	0.44	0.45	0.42	0.41	0.42	0.42	0.41	0.39	0.41
NLD	0.32	0.30	0.30	0.29	0.27	0.27	0.25	0.24	0.25	0.25	0.25	0.25	0.23	0.23	0.18
POL	1.30	1.45	1.26	1.08	0.94	0.96	0.88	0.79	0.76	0.82	0.69	0.63	0.57	0.54	0.50
PRT	0.51	0.45	0.46	0.53	0.46	0.51	0.48	0.50	0.49	0.53	0.55	0.55	0.54	0.50	0.42
RUS	1.51	1.63	1.40	1.46	1.52	1.63	1.48	1.47	1.52	1.41	1.37	1.30	1.29	1.23	1.40
SWE	0.11	0.12	0.10	0.10	0.08	0.09	0.10	0.08	0.09	0.10	0.09	0.09	0.09	0.08	0.08
TUR	0.92	1.25	1.32	1.55	1.46	1.77	1.46	1.49	1.69	1.45	1.26	1.41	1.12	0.59	0.84
TWN	0.66	0.59	0.60	0.61	0.64	0.80	0.73	0.91	1.50	2.41	2.73	4.10	3.47	4.32	1.47
USA	0.43	0.42	0.40	0.39	0.40	0.43	0.44	0.40	0.38	0.35	0.34	0.34	0.35	0.39	0.38

Table 3.19: Subsystems CO2 emissions per unit of net output in Sector 11 - Other Non-Metallic Mineral

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	2.60	2.51	2.51	2.56	2.44	2.27	2.20	2.04	2.02	2.05	1.98	1.96	1.94	1.86	1.76
AUT	1.18	1.16	1.25	1.21	1.11	1.07	1.07	1.10	1.13	1.17	1.11	1.11	1.12	1.14	1.18
BEL	1.95	1.91	1.87	1.90	1.81	1.86	1.71	1.77	1.73	1.76	1.94	1.91	1.84	1.79	1.56
BRA	1.30	1.33	1.42	1.49	1.56	1.56	1.62	1.59	1.51	1.51	1.45	1.47	1.53	1.50	1.45
CAN	2.77	2.54	2.41	2.32	2.40	2.20	2.03	2.02	1.87	1.88	1.77	1.64	1.36	1.25	1.02
CHN	4.31	3.85	3.47	3.76	3.30	2.93	2.73	2.74	2.96	3.37	3.17	2.99	2.74	2.82	2.65
CZE	1.69	1.64	1.45	1.46	1.40	1.35	1.44	1.21	1.19	1.22	1.27	1.33	1.27	1.12	1.11
DEU	1.49	1.50	1.50	1.49	1.42	1.41	1.34	1.32	1.37	1.38	1.31	1.25	1.30	1.27	1.39
DNK	1.89	2.08	2.08	1.94	1.89	1.87	2.01	1.96	2.04	2.16	1.81	1.83	1.83	1.66	1.69
ESP	2.53	2.53	2.50	2.43	2.34	2.38	2.09	2.07	2.12	2.09	2.03	1.96	1.91	1.75	1.84
FIN	1.25	1.21	1.10	1.04	1.10	1.04	1.04	1.05	1.11	1.04	0.92	0.99	0.91	0.88	0.83
FRA	1.92	1.88	1.77	1.76	1.48	1.39	1.42	1.42	1.38	1.37	1.35	1.31	1.31	1.30	1.21
GBR	1.43	1.45	1.46	1.49	1.40	1.35	1.32	1.31	1.24	1.17	1.17	1.19	1.21	1.10	1.02
GRC	2.38	2.29	2.31	2.36	2.08	2.27	2.65	1.91	3.09	4.05	3.59	2.53	3.01	3.11	2.03
HUN	2.47	2.36	2.35	2.15	2.22	2.10	2.22	2.32	2.17	1.98	1.66	1.49	1.43	1.21	1.21
IDN	3.57	3.11	3.32	4.61	5.56	2.69	4.14	3.77	3.65	3.90	3.68	3.84	3.94	3.94	4.03
IND	3.14	2.83	2.87	3.14	2.86	2.95	2.89	2.84	2.77	2.98	2.91	2.76	2.72	2.61	2.53
IRL	1.44	1.50	1.53	1.47	1.45	1.68	1.87	1.79	1.83	1.76	1.59	1.45	1.37	1.58	1.26
ITA	1.66	1.57	1.57	1.58	1.65	1.66	1.61	1.54	1.68	1.71	1.67	1.71	1.63	1.67	1.58
JPN	1.69	1.65	1.63	1.61	1.70	1.67	1.67	1.71	1.74	1.67	1.70	1.66	1.54	1.66	1.92
KOR	2.33	2.38	2.45	2.49	2.43	2.32	2.91	2.78	2.56	2.64	2.86	2.50	2.49	2.68	2.44
MEX	1.76	1.69	1.71	1.76	1.74	1.76	1.78	1.79	1.71	1.76	1.76	1.75	1.86	1.75	1.74
NLD	0.69	0.65	0.66	0.63	0.62	0.60	0.58	0.56	0.57	0.57	0.57	0.53	0.53	0.51	0.52
POL	6.05	5.35	4.64	3.89	3.28	2.96	2.57	2.33	2.33	2.25	2.13	2.04	1.96	1.74	1.68
PRT	2.68	2.45	2.42	2.44	2.46	2.33	2.17	2.35	2.30	2.37	2.43	2.29	2.25	2.16	2.02
RUS	3.93	5.48	5.31	5.29	5.14	5.12	4.95	4.90	5.15	4.80	5.02	4.70	4.11	4.19	4.76
SWE	1.32	1.37	1.32	1.40	1.33	1.38	1.35	1.26	1.29	1.26	1.20	1.15	1.06	1.06	1.09
TUR	5.48	5.64	5.33	5.05	4.64	4.78	4.05	3.76	3.60	3.27	3.13	2.99	3.11	3.58	3.75
TWN	3.28	3.38	3.33	3.44	3.69	4.05	4.48	5.14	6.46	6.99	7.24	8.58	7.72	8.48	5.23
USA	1.44	1.41	1.38	1.35	1.36	1.40	1.41	1.38	1.40	1.44	1.41	1.43	1.40	1.50	1.48

Table 3.20: Subsystems CO2 emissions per unit of net output in Sector 12 - Basic Metals and Fabricated Metal

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	1.83	1.79	1.78	1.76	1.77	1.66	1.50	1.40	1.37	1.50	1.46	1.37	1.27	1.30	1.17
AUT	0.91	0.86	0.88	0.79	0.76	0.79	0.76	0.83	0.83	0.82	0.86	0.81	0.76	0.77	0.65
BEL	1.28	1.23	1.06	1.15	1.04	0.97	0.93	0.91	0.91	0.86	0.82	0.77	0.67	0.72	0.47
BRA	0.57	0.61	0.64	0.69	0.77	0.76	0.72	0.76	0.78	0.80	0.80	0.80	0.81	0.79	0.79
CAN	1.20	1.18	1.12	1.16	1.05	0.92	0.88	0.85	0.88	0.73	0.78	0.73	0.78	0.71	0.62
CHN	4.28	3.97	3.77	4.10	3.61	3.03	2.91	2.81	2.82	2.79	2.81	2.50	2.32	2.16	2.09
CZE	1.67	1.59	1.59	1.58	1.45	1.61	1.22	1.35	1.57	1.68	1.49	1.46	1.38	1.26	1.28
DEU	0.79	0.79	0.78	0.78	0.72	0.73	0.70	0.72	0.71	0.71	0.67	0.65	0.63	0.63	0.58
DNK	0.19	0.24	0.20	0.19	0.18	0.17	0.18	0.16	0.18	0.17	0.15	0.17	0.16	0.16	0.16
ESP	0.53	0.47	0.51	0.50	0.50	0.57	0.47	0.45	0.44	0.46	0.49	0.44	0.45	0.43	0.38
FIN	1.16	1.10	1.09	1.02	1.04	0.96	0.97	0.99	1.11	0.97	0.86	0.87	0.77	0.73	0.71
FRA	0.58	0.55	0.56	0.55	0.46	0.45	0.41	0.42	0.43	0.42	0.41	0.38	0.36	0.35	0.31
GBR	0.86	0.89	0.87	0.85	0.88	0.75	0.74	0.68	0.73	0.71	0.70	0.71	0.69	0.67	0.57
GRC	1.74	1.74	1.81	1.87	1.61	1.80	1.92	1.62	2.70	3.88	2.74	1.39	1.85	2.12	1.31
HUN	1.55	1.55	1.20	1.24	1.21	1.08	1.11	1.11	1.05	0.96	0.90	0.77	0.75	0.70	0.95
IDN	2.28	2.01	2.21	2.44	2.58	2.71	2.48	2.40	3.05	2.97	3.20	4.72	3.77	3.00	2.97
IND	1.75	1.71	1.70	1.61	1.59	1.68	1.67	1.71	1.71	1.86	2.01	1.95	1.98	2.02	1.88
IRL	1.26	1.16	1.15	1.15	1.20	1.11	1.14	1.09	1.00	0.97	0.79	0.83	0.91	0.94	0.88
ITA	0.47	0.42	0.42	0.39	0.34	0.35	0.35	0.32	0.34	0.36	0.36	0.35	0.34	0.33	0.29
JPN	0.76	0.78	0.78	0.79	0.89	0.95	0.90	1.00	1.02	1.01	0.89	0.90	0.91	0.95	0.98
KOR	1.77	1.80	1.77	1.79	1.80	1.78	2.10	1.78	1.58	1.63	1.63	1.62	1.58	1.74	1.67
MEX	1.03	0.97	0.93	0.93	0.91	0.88	0.84	0.86	0.85	0.80	0.80	0.79	0.81	0.79	0.77
NLD	0.62	0.60	0.59	0.55	0.51	0.48	0.48	0.50	0.52	0.51	0.49	0.48	0.45	0.43	0.42
POL	4.01	3.60	3.26	2.78	2.48	2.76	2.43	2.01	1.84	1.60	1.38	1.39	1.29	1.14	0.90
PRT	0.47	0.45	0.45	0.46	0.51	0.48	0.44	0.32	0.31	0.31	0.33	0.32	0.30	0.28	0.27
RUS	4.30	4.23	3.73	3.77	4.08	4.00	3.80	3.72	3.83	3.59	3.50	3.41	3.26	3.32	3.57
SWE	0.43	0.43	0.38	0.39	0.38	0.36	0.37	0.38	0.38	0.37	0.34	0.32	0.32	0.30	0.27
TUR	1.53	1.60	1.58	1.67	1.53	1.45	1.36	1.06	1.22	1.14	1.06	1.14	1.16	1.21	1.15
TWN	1.35	1.32	1.47	1.50	1.50	1.66	1.99	2.05	2.69	3.47	3.54	4.42	3.93	4.84	2.22
USA	0.80	0.79	0.78	0.75	0.73	0.77	0.76	0.72	0.69	0.67	0.64	0.62	0.64	0.63	0.56

Table 3.21: Subsystems CO2 emissions per unit of net output in Sector 13 - Machinery, Nec

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.68	0.68	0.67	0.68	0.65	0.56	0.53	0.52	0.50	0.54	0.53	0.52	0.48	0.49	0.48
AUT	0.23	0.22	0.23	0.21	0.21	0.20	0.20	0.21	0.19	0.20	0.20	0.18	0.17	0.16	0.16
BEL	0.39	0.38	0.33	0.35	0.30	0.26	0.26	0.25	0.25	0.25	0.22	0.20	0.17	0.17	0.14
BRA	0.29	0.31	0.32	0.33	0.35	0.33	0.33	0.34	0.33	0.34	0.32	0.33	0.33	0.31	0.31
CAN	0.48	0.48	0.47	0.50	0.47	0.42	0.39	0.33	0.34	0.29	0.27	0.28	0.28	0.26	0.24
CHN	2.11	2.00	1.82	2.17	1.89	1.49	1.48	1.34	1.42	1.48	1.49	1.37	1.29	1.21	1.16
CZE	0.73	0.83	0.78	0.77	0.69	0.71	0.65	0.68	0.74	0.72	0.68	0.67	0.62	0.52	0.50
DEU	0.25	0.24	0.23	0.24	0.22	0.22	0.21	0.21	0.21	0.21	0.20	0.20	0.20	0.19	0.18
DNK	0.12	0.15	0.12	0.12	0.12	0.11	0.11	0.10	0.12	0.11	0.10	0.11	0.09	0.09	0.09
ESP	0.24	0.20	0.22	0.22	0.22	0.29	0.24	0.23	0.23	0.24	0.25	0.23	0.23	0.21	0.19
FIN	0.37	0.32	0.30	0.29	0.28	0.27	0.24	0.22	0.27	0.26	0.22	0.26	0.22	0.20	0.21
FRA	0.20	0.20	0.20	0.20	0.17	0.16	0.15	0.15	0.15	0.14	0.14	0.13	0.12	0.12	0.11
GBR	0.32	0.33	0.31	0.32	0.32	0.29	0.29	0.28	0.28	0.26	0.26	0.25	0.23	0.22	0.20
GRC	0.91	0.88	0.88	0.82	0.60	0.76	0.97	0.72	1.09	1.44	0.93	0.74	0.76	0.77	0.46
HUN	0.52	0.53	0.48	0.49	0.48	0.43	0.41	0.38	0.36	0.32	0.30	0.27	0.28	0.25	0.22
IDN	0.22	0.21	0.25	0.32	0.37	1.25	0.48	0.46	0.49	0.43	0.46	0.51	0.42	0.39	0.42
IND	1.10	1.07	1.07	1.05	1.00	0.96	0.93	0.92	0.86	0.84	0.83	0.77	0.78	0.77	0.77
IRL	0.54	0.51	0.51	0.49	0.50	0.50	0.48	0.41	0.43	0.45	0.41	0.39	0.39	0.40	0.37
ITA	0.23	0.21	0.22	0.21	0.21	0.20	0.20	0.20	0.21	0.21	0.21	0.20	0.19	0.19	0.17
JPN	0.33	0.32	0.32	0.32	0.36	0.33	0.32	0.35	0.33	0.31	0.27	0.26	0.26	0.24	0.27
KOR	0.67	0.68	0.68	0.58	0.65	0.66	0.77	0.66	0.58	0.63	0.65	0.61	0.58	0.63	0.62
MEX	0.42	0.41	0.38	0.41	0.40	0.39	0.37	0.38	0.37	0.36	0.35	0.35	0.35	0.34	0.35
NLD	0.17	0.17	0.16	0.16	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.12	0.11	0.11	0.11
POL	1.56	1.51	1.30	1.17	0.96	0.93	0.78	0.70	0.67	0.66	0.57	0.52	0.47	0.42	0.35
PRT	0.30	0.29	0.29	0.32	0.32	0.31	0.29	0.27	0.27	0.27	0.29	0.27	0.26	0.24	0.24
RUS	1.93	2.14	1.63	1.81	1.93	1.96	1.86	1.83	1.57	1.47	1.38	1.27	1.23	1.20	1.33
SWE	0.11	0.12	0.10	0.11	0.09	0.09	0.09	0.09	0.09	0.09	0.08	0.08	0.08	0.07	0.07
TUR	0.54	0.86	0.70	0.77	0.74	0.75	0.68	0.61	0.69	0.60	0.56	0.59	0.57	0.52	0.49
TWN	0.59	0.54	0.59	0.59	0.59	0.61	0.63	0.76	1.05	1.62	1.60	1.99	1.76	2.26	0.81
USA	0.35	0.35	0.35	0.33	0.35	0.36	0.36	0.34	0.31	0.28	0.27	0.26	0.27	0.24	0.19

Table 3.22: Subsystems CO2 emissions per unit of net output in Sector 14 - Electrical and Optical Equipment

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.55	0.52	0.54	0.58	0.55	0.49	0.47	0.43	0.40	0.42	0.42	0.42	0.39	0.39	0.38
AUT	0.18	0.17	0.18	0.16	0.15	0.16	0.16	0.15	0.15	0.17	0.16	0.16	0.14	0.14	0.13
BEL	0.30	0.30	0.26	0.28	0.24	0.20	0.20	0.19	0.18	0.19	0.17	0.17	0.13	0.13	0.11
BRA	0.24	0.26	0.26	0.27	0.28	0.27	0.27	0.27	0.25	0.25	0.22	0.23	0.23	0.23	0.23
CAN	0.36	0.36	0.35	0.36	0.32	0.26	0.29	0.28	0.30	0.23	0.25	0.25	0.25	0.23	0.21
CHN	1.69	1.62	1.56	1.91	1.62	1.19	1.16	1.06	1.13	1.20	1.22	1.13	1.08	1.02	0.97
CZE	0.67	0.78	0.68	0.64	0.55	0.52	0.47	0.47	0.43	0.43	0.41	0.37	0.34	0.29	0.27
DEU	0.25	0.24	0.23	0.24	0.21	0.20	0.20	0.19	0.18	0.18	0.18	0.17	0.16	0.16	0.15
DNK	0.12	0.15	0.13	0.12	0.11	0.13	0.14	0.11	0.12	0.11	0.11	0.11	0.10	0.08	0.08
ESP	0.20	0.17	0.19	0.18	0.18	0.30	0.24	0.23	0.22	0.24	0.25	0.22	0.23	0.21	0.18
FIN	0.34	0.27	0.25	0.23	0.21	0.13	0.13	0.13	0.12	0.11	0.09	0.09	0.08	0.07	0.08
FRA	0.18	0.18	0.18	0.18	0.15	0.14	0.13	0.13	0.13	0.12	0.12	0.12	0.11	0.11	0.10
GBR	0.23	0.22	0.21	0.22	0.20	0.17	0.17	0.18	0.19	0.18	0.17	0.17	0.16	0.15	0.14
GRC	0.77	0.73	0.74	0.67	0.47	0.58	0.69	0.56	1.00	1.43	1.06	0.76	1.00	1.12	1.02
HUN	0.37	0.33	0.30	0.30	0.28	0.26	0.26	0.24	0.21	0.19	0.16	0.15	0.17	0.15	0.17
IDN	0.34	0.34	0.41	0.48	0.66	0.73	0.64	0.59	0.61	0.61	0.54	0.62	0.53	0.46	0.48
IND	0.76	0.75	0.76	0.66	0.88	0.85	0.83	0.79	0.75	0.72	0.68	0.66	0.66	0.64	0.62
IRL	0.14	0.14	0.14	0.12	0.12	0.12	0.11	0.10	0.10	0.11	0.10	0.10	0.11	0.11	0.09
ITA	0.18	0.17	0.17	0.17	0.17	0.17	0.17	0.17	0.18	0.18	0.18	0.18	0.17	0.17	0.15
JPN	0.35	0.36	0.33	0.33	0.37	0.34	0.34	0.35	0.33	0.31	0.28	0.27	0.26	0.27	0.28
KOR	0.60	0.58	0.55	0.47	0.47	0.47	0.54	0.50	0.46	0.49	0.52	0.47	0.46	0.49	0.47
MEX	0.40	0.40	0.36	0.39	0.37	0.38	0.36	0.38	0.38	0.38	0.38	0.38	0.39	0.38	0.38
NLD	0.19	0.18	0.17	0.16	0.14	0.13	0.12	0.13	0.13	0.13	0.13	0.12	0.11	0.10	0.10
POL	1.02	0.99	0.88	0.79	0.63	0.78	0.60	0.53	0.51	0.52	0.44	0.43	0.40	0.37	0.32
PRT	0.19	0.15	0.15	0.17	0.18	0.21	0.19	0.19	0.18	0.19	0.19	0.17	0.16	0.15	0.14
RUS	1.63	1.89	1.29	1.59	1.76	1.76	1.64	1.62	1.53	1.46	1.40	1.34	1.32	1.29	1.42
SWE	0.10	0.09	0.08	0.08	0.06	0.07	0.06	0.06	0.06	0.05	0.04	0.04	0.04	0.04	0.03
TUR	0.52	0.58	0.62	0.77	0.64	0.66	0.62	0.55	0.61	0.53	0.48	0.51	0.47	0.40	0.41
TWN	0.49	0.44	0.47	0.46	0.49	0.47	0.53	0.58	0.81	1.26	1.35	1.95	1.71	2.16	0.86
USA	0.32	0.30	0.28	0.28	0.26	0.25	0.24	0.21	0.19	0.16	0.15	0.13	0.14	0.13	0.12

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Table 3.23: Subsystems CO2 emissions per unit of net output in Sector 15 - Transport Equipment

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.57	0.56	0.56	0.59	0.51	0.43	0.41	0.39	0.38	0.40	0.39	0.39	0.36	0.37	0.37
AUT	0.25	0.24	0.24	0.20	0.17	0.15	0.15	0.17	0.16	0.18	0.16	0.15	0.15	0.14	0.13
BEL	0.29	0.28	0.24	0.27	0.24	0.22	0.22	0.22	0.21	0.21	0.17	0.18	0.16	0.16	0.13
BRA	0.23	0.24	0.25	0.25	0.27	0.25	0.24	0.25	0.24	0.26	0.24	0.24	0.25	0.23	0.22
CAN	0.34	0.33	0.32	0.34	0.32	0.28	0.27	0.26	0.26	0.22	0.23	0.21	0.21	0.20	0.19
CHN	1.84	1.78	1.72	2.06	1.78	1.36	1.31	1.12	1.15	1.24	1.23	1.14	1.07	1.01	0.95
CZE	0.66	0.66	0.61	0.72	0.63	0.58	0.58	0.54	0.56	0.55	0.49	0.45	0.40	0.32	0.32
DEU	0.29	0.29	0.27	0.28	0.26	0.26	0.24	0.24	0.23	0.24	0.23	0.22	0.21	0.21	0.20
DNK	0.14	0.19	0.17	0.16	0.14	0.14	0.14	0.13	0.15	0.14	0.13	0.14	0.14	0.16	0.11
ESP	0.27	0.23	0.24	0.24	0.24	0.31	0.25	0.23	0.23	0.24	0.26	0.23	0.23	0.22	0.20
FIN	0.40	0.39	0.37	0.35	0.33	0.30	0.33	0.33	0.38	0.27	0.22	0.26	0.22	0.20	0.22
FRA	0.20	0.20	0.19	0.20	0.17	0.16	0.16	0.16	0.16	0.15	0.15	0.14	0.13	0.12	0.12
GBR	0.33	0.32	0.31	0.30	0.30	0.28	0.27	0.27	0.27	0.26	0.25	0.24	0.22	0.21	0.19
GRC	0.71	0.69	0.67	0.67	0.51	0.65	0.77	0.43	0.67	1.09	1.12	0.89	0.99	0.88	0.94
HUN	0.42	0.41	0.37	0.38	0.34	0.32	0.33	0.32	0.29	0.27	0.24	0.21	0.21	0.19	0.19
IDN	0.26	0.25	0.32	0.41	0.55	0.56	0.46	0.43	0.43	0.42	0.44	0.50	0.38	0.37	0.40
IND	1.16	1.15	1.15	1.16	1.14	1.10	1.06	1.03	0.99	0.97	0.89	0.85	0.86	0.86	0.81
IRL	0.46	0.43	0.45	0.44	0.45	0.43	0.44	0.40	0.41	0.43	0.41	0.33	0.34	0.35	0.28
ITA	0.28	0.26	0.26	0.24	0.23	0.23	0.23	0.22	0.24	0.24	0.23	0.23	0.22	0.22	0.19
JPN	0.29	0.31	0.33	0.33	0.36	0.35	0.34	0.35	0.36	0.35	0.32	0.30	0.29	0.30	0.32
KOR	0.61	0.62	0.63	0.58	0.65	0.64	0.73	0.65	0.57	0.61	0.62	0.58	0.55	0.58	0.56
MEX	0.29	0.28	0.25	0.29	0.29	0.27	0.26	0.27	0.26	0.24	0.25	0.24	0.24	0.23	0.23
NLD	0.20	0.18	0.17	0.16	0.14	0.14	0.15	0.15	0.15	0.15	0.14	0.13	0.12	0.12	0.11
POL	1.49	1.43	1.29	1.15	1.06	0.83	0.76	0.64	0.59	0.57	0.50	0.48	0.45	0.40	0.34
PRT	0.31	0.22	0.21	0.24	0.24	0.20	0.19	0.19	0.18	0.19	0.20	0.19	0.18	0.17	0.16
RUS	1.31	1.38	0.92	1.12	1.27	1.25	1.24	1.24	1.26	1.20	1.23	1.16	1.08	1.03	1.22
SWE	0.12	0.12	0.11	0.11	0.09	0.08	0.09	0.09	0.08	0.08	0.08	0.07	0.07	0.07	0.06
TUR	0.52	0.58	0.60	0.68	0.67	0.68	0.66	0.60	0.67	0.59	0.56	0.58	0.53	0.45	0.44
TWN	0.47	0.40	0.42	0.43	0.44	0.46	0.44	0.54	0.79	1.34	1.29	1.77	1.49	1.85	0.76
USA	0.34	0.34	0.34	0.33	0.34	0.35	0.35	0.32	0.31	0.28	0.26	0.25	0.24	0.25	0.23

Table 3.24: Subsystems CO2 emissions per unit of net output in Sector 16 - Manufacturing, Nec; Recycling

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	0.52	0.50	0.51	0.54	0.49	0.45	0.43	0.42	0.41	0.45	0.45	0.44	0.41	0.42	0.42
AUT	0.23	0.20	0.19	0.19	0.14	0.16	0.16	0.16	0.18	0.16	0.16	0.16	0.15	0.16	0.17
BEL	0.28	0.28	0.26	0.28	0.24	0.31	0.32	0.31	0.31	0.32	0.31	0.32	0.27	0.27	0.21
BRA	0.22	0.24	0.24	0.24	0.25	0.23	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.22	0.22
CAN	0.41	0.42	0.41	0.41	0.41	0.38	0.36	0.34	0.36	0.33	0.32	0.28	0.29	0.25	0.24
CHN	2.16	1.78	1.44	1.67	1.40	1.08	1.02	0.92	0.96	1.06	1.01	0.92	0.88	0.85	0.78
CZE	0.50	0.61	0.58	0.60	0.53	0.52	0.50	0.46	0.52	0.54	0.42	0.40	0.38	0.33	0.28
DEU	0.21	0.21	0.19	0.20	0.19	0.20	0.19	0.20	0.20	0.22	0.21	0.21	0.21	0.21	0.19
DNK	0.15	0.19	0.15	0.15	0.14	0.13	0.14	0.13	0.16	0.14	0.12	0.12	0.11	0.11	0.10
ESP	0.21	0.19	0.20	0.20	0.20	0.29	0.23	0.22	0.22	0.23	0.24	0.22	0.22	0.21	0.19
FIN	0.37	0.36	0.33	0.30	0.28	0.26	0.28	0.30	0.36	0.31	0.25	0.29	0.25	0.24	0.26
FRA	0.44	0.45	0.43	0.47	0.36	0.34	0.32	0.32	0.33	0.33	0.32	0.33	0.32	0.31	0.32
GBR	0.31	0.32	0.30	0.35	0.34	0.30	0.33	0.30	0.30	0.30	0.30	0.28	0.28	0.27	0.24
GRC	0.63	0.63	0.68	0.69	0.55	0.63	0.61	0.68	2.34	0.82	0.67	0.62	0.65	1.09	0.51
HUN	0.33	0.34	0.31	0.34	0.35	0.32	0.31	0.28	0.26	0.22	0.20	0.18	0.18	0.17	0.16
IDN	0.40	0.36	0.42	0.43	0.53	0.57	0.56	0.58	0.64	0.68	0.72	0.82	0.66	0.66	0.72
IND	1.25	1.23	1.19	1.16	0.95	0.87	0.76	0.62	0.45	0.42	0.41	0.37	0.37	0.37	0.39
IRL	0.75	0.78	0.72	0.81	0.93	1.02	0.96	1.02	0.85	0.83	0.78	0.70	0.67	0.70	0.59
ITA	0.20	0.19	0.19	0.18	0.17	0.17	0.18	0.17	0.18	0.18	0.18	0.17	0.17	0.17	0.15
JPN	0.38	0.39	0.40	0.44	0.46	0.43	0.40	0.40	0.40	0.40	0.36	0.35	0.34	0.36	0.41
KOR	0.56	0.58	0.61	0.56	0.57	0.58	0.69	0.62	0.56	0.62	0.64	0.59	0.58	0.62	0.60
MEX	0.56	0.56	0.52	0.53	0.48	0.48	0.45	0.47	0.49	0.49	0.49	0.48	0.47	0.46	0.48
NLD	0.16	0.16	0.16	0.15	0.14	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.11
POL	1.06	1.18	1.00	0.89	0.72	0.72	0.66	0.60	0.57	0.55	0.49	0.47	0.43	0.40	0.36
PRT	0.24	0.22	0.22	0.25	0.25	0.28	0.26	0.27	0.26	0.28	0.28	0.28	0.27	0.26	0.25
RUS	1.36	1.56	1.06	1.41	1.38	1.39	1.31	1.34	1.33	1.33	1.26	1.20	1.16	1.13	1.25
SWE	0.15	0.16	0.14	0.15	0.14	0.11	0.12	0.11	0.11	0.10	0.10	0.11	0.10	0.09	0.08
TUR	0.55	0.63	0.71	0.80	0.87	0.97	0.86	0.80	0.94	0.84	0.76	0.84	0.76	0.47	0.52
TWN	0.38	0.33	0.31	0.27	0.27	0.29	0.28	0.32	0.50	0.95	1.20	2.12	1.90	2.40	0.93
USA	0.39	0.38	0.37	0.41	0.37	0.42	0.41	0.32	0.30	0.25	0.22	0.21	0.22	0.23	0.20

Table 3.25: Subsystems CO2 emissions per unit of net output in Sector 17 - Electricity, Gas and Water Supply

	Year														
Country	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
AUS	6.92	7.11	6.97	7.55	7.69	7.65	8.20	8.68	8.46	8.69	8.96	9.21	8.78	8.76	8.41
AUT	1.68	1.74	1.71	1.53	1.48	1.39	1.37	1.27	1.45	1.35	1.35	1.30	1.16	1.06	0.98
BEL	3.18	2.86	2.69	3.02	2.64	2.89	2.56	2.73	2.90	2.92	3.04	2.82	2.68	2.54	2.81
BRA	0.27	0.29	0.31	0.32	0.47	0.44	0.50	0.41	0.38	0.43	0.42	0.40	0.37	0.46	0.31
CAN	2.87	2.81	3.11	3.62	3.46	3.54	3.73	3.39	3.46	3.22	3.13	2.96	3.26	3.00	2.50
CHN	11.94	12.91	11.64	11.37	10.23	10.12	9.51	9.43	9.84	8.31	8.02	9.34	8.25	7.54	7.56
CZE	4.00	3.75	4.41	4.45	4.42	4.57	4.36	4.57	4.32	4.47	3.73	3.54	3.89	3.36	3.47
DEU	5.81	5.49	5.35	5.18	4.89	5.13	5.21	5.05	5.08	4.66	4.53	4.65	4.54	4.28	4.20
DNK	7.70	9.71	7.80	6.93	6.20	5.52	5.68	5.78	6.56	5.17	4.46	6.06	5.42	4.77	5.02
ESP	3.53	2.77	3.19	3.04	3.49	3.47	2.84	3.11	2.81	2.94	3.01	2.60	2.72	2.16	1.90
FIN	6.24	7.15	6.56	5.62	5.46	5.09	6.23	6.48	7.57	6.74	4.45	6.96	6.29	4.90	5.38
FRA	0.55	0.60	0.55	0.69	1.16	1.02	0.77	0.88	0.92	0.85	0.97	0.89	0.87	0.79	0.82
GBR	3.34	3.22	2.96	2.74	2.95	2.98	3.15	2.99	2.96	2.87	2.51	2.73	2.68	2.41	2.52
GRC	9.90	9.60	10.05	9.85	8.70	9.19	9.48	8.02	8.41	8.65	8.13	7.64	8.05	8.26	8.10
HUN	1.39	1.42	1.50	1.62	1.67	1.57	1.61	1.66	1.69	1.46	1.42	1.24	1.35	1.26	1.26
IDN	10.24	8.71	8.30	7.03	6.11	5.40	5.81	6.34	6.78	6.86	6.81	6.61	6.30	5.86	5.36
IND	7.20	7.46	7.18	6.92	7.00	7.13	7.13	6.79	6.63	6.79	6.70	6.53	6.47	6.48	6.07
IRL	9.71	10.72	10.81	10.62	14.36	11.93	9.73	8.88	7.93	8.04	5.94	3.69	4.45	4.56	4.06
ITA	2.60	2.46	2.46	2.58	2.39	2.50	2.49	2.56	2.54	2.45	2.37	2.37	2.33	2.19	2.02
JPN	2.15	2.07	2.15	2.10	2.20	2.32	2.33	2.50	2.68	2.64	2.64	2.64	2.87	2.85	2.79
KOR	4.66	4.75	5.01	4.39	4.23	5.15	5.77	5.35	5.19	5.77	5.61	5.60	5.44	5.41	5.91
MEX	5.24	5.33	5.51	5.74	5.33	5.49	5.57	5.41	5.07	4.39	4.64	4.21	4.13	3.71	3.98
NLD	3.22	3.03	3.20	3.21	3.07	3.09	3.02	3.11	3.07	3.13	2.92	2.75	2.91	2.85	3.00
POL	5.66	5.79	5.42	5.30	5.04	4.48	4.33	4.49	4.76	4.33	4.05	4.27	4.09	3.79	4.02
PRT	3.69	2.83	2.82	3.08	3.84	3.05	2.91	3.34	2.62	2.72	2.92	2.42	2.01	1.90	2.16
RUS	4.72	4.62	4.84	4.42	4.45	4.37	4.23	4.05	4.18	3.94	3.93	3.80	3.77	3.77	3.66
SWE	0.62	0.82	0.64	0.67	0.54	0.43	0.48	0.55	0.64	0.58	0.50	0.53	0.47	0.47	0.54
TUR	8.50	7.57	7.72	7.31	8.48	8.03	7.62	6.00	5.61	5.28	5.39	5.56	6.33	8.01	7.80
TWN	4.95	5.06	5.43	5.70	5.95	6.32	6.99	7.46	9.00	10.61	11.42	13.04	11.96	12.99	7.88
USA	5.01	5.09	5.37	5.22	4.42	4.37	4.08	5.19	5.68	5.98	5.89	6.14	6.10	5.71	5.64

Chapter 4

Deflation procedures for Input-Output tables

Michele Boglioni

Abstract

Empirical investigations based on Sraffian Schemes requires data on the flows of real goods between industries on the structure of final demand. However, this data is not generally collected. A possibility is to use Input-Output tables, which represent the nominal value of flows relative to aggregated industries.

In this paper it is shown that if Input-Output tables were finely disaggregated and the price of goods were uniform across countries and stable in time, working with nominal values instead of real quantities would not alter the results of Chapters 1 and 2 and 3.

While the level of aggregation of Input-Output tables depends on data availability, a proper deflation method can help to take into account the problem of variability of prices. The deflation method adopted in this thesis is then presented and discussed.

Introduction

As explained in Chapter 1 Net Product Possibility Frontiers are constructed on the basis of Sraffian Schemes, i.e. Input-Output (I-O) tables in which the inputs and the outputs are assumed to represent real quantities. However, the available data are generally standard, aggregated I-O tables, in which the inputs and the outputs of each industry are the result of the sum of the nominal value of many different goods.

This implies two problems. The first is the aggregation problem, i.e. the fact that one industry of an I-O table is not formed by one good. The second is the "nominal values" problem, i.e. the fact that the flows described by I-O tables do not really represent real quantities.

Without having data on the quantities of the single goods, the problem of aggregation cannot be solved, so that we have to work with index numbers which are assumed to represent real quantities. However, we can at least take into account the fact that the price of a good changes across countries and in time. In this paper it is shown that in the theoretical framework in which the price of a good is the same across countries and stable in time, there would not be differences in using real quantities or nominal values for the results provided in Chapter 1.

Therefore, the precision of the results depends on the accuracy of the prices deflators used, and on the procedure chosen to deflate the I-O Tables. In this chapter the alternative methodologies proposed by the literature on I-O are briefly examined and then the procedure adopted in this thesis is discussed.

The structure of the paper is the following. In Section 4.1 it is shown that, assuming that each industry of an I-O table represents a good (or commodity), if the prices of goods are uniform across countries and stable in time, the indexes used in Chapter 1 are not affected by the fact that we use nominal values instead of real quantities. In Section 4.2 the main approaches proposed by the literature to deflate I-O tables are discussed, while in Section 4.3 the peculiarity of the methodology chosen for this thesis is presented. The conclusions are devoted to some remarks with respect to the available methodologies and data for the empirical application of Sraffian Schemes.

4.1 Monetary or Physical Quantities?

One the problems in computing Net Product Possibility Frontiers and Comparative Advantages indexes is that we have to rely on Input-Output (I-O) tables in which goods are aggregated in Sectors. This also implies that the flows of goods between industries and to the final demand can just be expressed in nominal terms and not in real terms. Without having finely disaggregated tables, the problem of aggregation cannot be solved. However, we can at least deflate the I-O tables in order to take into account the variation of prices across countries and in time.

Consider an example with three countries and three goods. The three Sraffian Schemes are:

$\mathbf{A}_1$	$\mathbf{l}_1$	$\mathbf{b}_1$	$\mathbf{A}_2$	$\mathbf{l}_2$	$\mathbf{b}_2$	$\mathbf{A}_3$	$\mathbf{l}_3$	$\mathbf{b}_3$
2 3 2	2/5	17	3 1 2	2/5	17	6 2 5	3/7	13
5 4 2	2/5	16	1 2 5	1/2	10	3 3 4	1/7	14
6 2 3	1/5	9	4 6 1	1/10	20	1 2 4	3/7	15

where each matrix $\mathbf{A}_c$ represent the physical inputs of the production processes of country c, $\mathbf{l}_c$ the labour inputs and $\mathbf{b}_c$ the gross output.

As explained in Chapter 1, each row of a Sraffian scheme represents a sector, while in $\mathbf{A}$, goods are homogeneous by column. A Sraffian Scheme is basically an I-O Table, in which each element represents a real quantity and not a nominal value. Matrix $\mathbf{A}$ is the transposed of the Leontief matrix of the inter-industrial flows. Moreover, in Sraffian Schemes the labour vector is always represented, while in I-O tables it is not.

Matrix $\mathbf{Y}$, the matrix of the net products is the following

$$\mathbf{Y} = \begin{bmatrix} 4 & 9 & 3 \\ 7 & 1 & 7 \\ 2 & 12 & 2 \end{bmatrix} \tag{4.1.1}$$

From which we can compute the **NTP** vector

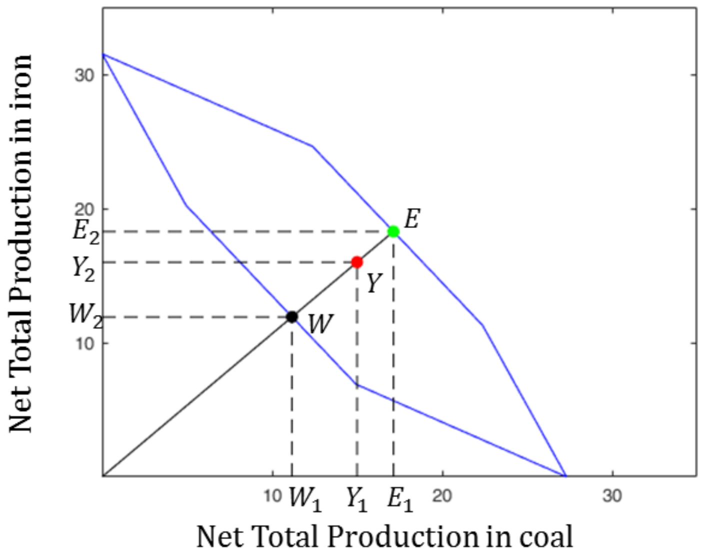
$$\mathbf{NTP} = \mathbf{Y}\boldsymbol{\iota} = \begin{bmatrix} 16 \\ 15 \\ 16 \end{bmatrix} \tag{4.1.2}$$

where $\boldsymbol{\iota}$ is the summation vector. As in the rest of the thesis, the three goods are iron, coal and wheat. We can observe the coal-iron $NPPF$ and IF in Fig. 4.1, along with the three points $Y = (15, 16)$, $E = (17.1385, 18.2810)$ and $W = (11.1732, 11.9181)$, which respectively represent the observed NTP, the efficient NTP and the most inefficient NTP in the two goods considered.

The index to measure the distance from the $NPPF$ is

$$GS = \frac{E_1 - Y_1}{Y_1} = \frac{E_2 - Y_2}{Y_2} = 0.1426 \tag{4.1.3}$$

Figure 4.1: The efficient and the most inefficient points of production. Point E represents which could be the net product if countries exploited fully their CAs, while Y represents the historical net product. Point W represents the net total product that would be obtained if countries specialized in the worst possible way.



meaning that the NTP in coal and wheat could be improved by the 14.26 % with an appropriate specialization pattern, while the distance from the IF is

$$LS = \frac{W_1 - Y_1}{Y_1} = \frac{W_2 - Y_2}{Y_2} = -0.2551 \quad (4.1.4)$$

meaning that with the worst possible specialization pattern the NTP in coal and wheat would be the 25.51 % lower than the observed one.

Suppose now that we cannot observe these quantities, but we can just observe quantities multiplied by prices. Suppose the vector of market prices is $\mathbf{p} = [2, 3, 1]'$.

The Sraffian Schemes become

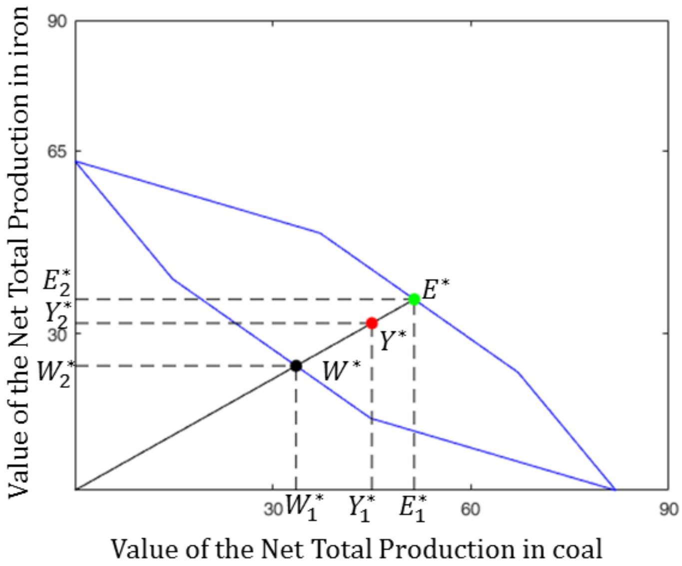
$\mathbf{A}_1^*$	$\mathbf{l}_1^*$	$\mathbf{b}_1^*$	$\mathbf{A}_2^*$	$\mathbf{l}_2^*$	$\mathbf{b}_2^*$	$\mathbf{A}_3^*$	$\mathbf{l}_3^*$	$\mathbf{b}_3^*$
4 9 2	2/5	34	6 3 2	2/5	17	12 6 5	3/7	26
10 12 2	2/5	48	2 6 5	1/2	30	6 9 4	1/7	42
12 6 3	1/5	9	8 18 1	1/10	20	2 6 4	3/7	15

and the new NTP

$$\mathbf{NTP} = \begin{bmatrix} 32 \\ 45 \\ 16 \end{bmatrix} \tag{4.1.5}$$

The new frontiers and the new $Y^* = (45, 32)$, $E^* = (51.4154, 36.5620)$ and $W^* = (33.5196, 23.8362)$ are shown in Fig. 4.2

Figure 4.2: The efficient and the most inefficient points of production in I-O tables expressed in prices. The graph represents the same frontier of Fig. 4.1, but transformed with a vector of prices.



Because of the effect of prices, the new frontiers are more flattened than before. Notwithstanding, the relative position of W^* and E^* inside the IF and the $NPPF$ seems similar. In fact, the new distance from the frontiers are

$$GS^* = \frac{51.4154 - 45}{45} = \frac{36.5620 - 32}{32} = 0.1426 \tag{4.1.6}$$

and

$$LS^* = \frac{33.5196 - 45}{45} = \frac{23.8362 - 45}{45} = -0.2551 \tag{4.1.7}$$

They are exactly the same. Basically, if the vector of prices is homogeneous across countries, all the points that form the new frontiers maintain certain proportions among them, in such a way that the distance from point Y^*, computed with the GS and the LS index, does not change.

In order to verify this property in an n-dimensional framework, the same test have been repeated on the deflated I-O Tables used in Chapters 1 and 2 and 3. That is to say, once the I-O Tables taken from the World Input-Output Database (WIOD) have been deflated with the procedure explained below, a vector of fictitious prices has been applied to them, to all the countries and for all the years. Then, the n-dimensional $NPPF$ and IF have been recomputed.

In the first vector of prices considered have been the following, the price of the first good has been increased by a 50%. The

$$\mathbf{p}^1 = [1.5, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]' \tag{4.1.8}$$

Then, the test has been repeated applying a randomly generated vector of prices, in which prices allowed to vary between 0.9 and 1.1. Specifically, the second vector of prices applied has been the following

$$\mathbf{p}^2 = [1.0629, 1.0812, 0.9254, 1.0827, 1.0265, 0.9195, 0.9557, 1.0094, ... \\ 1.0915, 1.0930, 0.9315, 1.0941, 1.0914, 0.9971, 1.0601, 0.9284, 0.9844]' \tag{4.1.9}$$

The results with respect in the GSF and in the LSF indexes computed with the deflated I-O and with the fictitious prices I-O are reported in the Tab. 4.1

As can be noted, until 2009, the difference between the original indexes and the indexes after the prices tests is at most 0.01%. In 2010 the LSF can varies by a 0.03% and in 2011 by a 0.05%. The maximum variation in the GSF is 0.03% in 2011.

Moreover, the coefficient of correlation between the original efficient specialization pattern and the efficient specialization pattern in the first prices test is 0.99996. The coefficient of correlation between the two efficient specialization patterns in the second prices test is 0.9998.

These computations confirm that if prices were all the same across countries and stable in time, working with prices or quantities would have no substantial importance for what concerns the definition of the efficient specialization pattern and the computation of the gains from trade.

4.2 The deflation procedure

The tables used in this thesis are the World Input-Output Tables (WIOTs) from the World Input-Output Database (WIOD). The WIOD research group has published I-O Tables computed in previous-years prices. In the technical report by Los et al. (2014) they have described the steps to be followed

Table 4.1: The main indexes in the prices tests. In the Table are reported the results obtained in the GSF index and in the LSF index in Chapter 1, and then the same indexes obtained after applying to the deflated I-O Tables the vectors of prices reported in eq. 4.1.8 and eq. 4.1.9

Year	GSF	GSF test 1	GSF test 2	LSF	LSF test 1	LSF test 2
1995	22.84%	22.84%	22.84%	-20.62%	-20.62%	-20.62%
1996	23.70%	23.71%	23.71%	-21.07%	-21.07%	-21.07%
1997	22.91%	22.90%	22.91%	-21.65%	-21.65%	-21.65%
1998	22.81%	22.80%	22.81%	-20.98%	-20.98%	-20.98%
1999	20.68%	20.68%	20.69%	-19.73%	-19.73%	-19.73%
2000	21.59%	21.60%	21.60%	-19.28%	-19.28%	-19.29%
2001	22.65%	22.65%	22.66%	-22.41%	-22.41%	-22.41%
2002	24.33%	24.32%	24.33%	-21.20%	-21.20%	-21.21%
2003	24.83%	24.83%	24.84%	-20.63%	-20.63%	-20.63%
2004	21.27%	21.27%	21.27%	-19.45%	-19.45%	-19.45%
2005	24.86%	24.86%	24.86%	-20.85%	-20.85%	-20.86%
2006	23.28%	23.28%	23.29%	-20.82%	-20.82%	-20.82%
2007	26.38%	26.38%	26.39%	-22.85%	-22.85%	-22.86%
2008	24.39%	24.39%	24.40%	-21.48%	-21.49%	-21.49%
2009	27.42%	27.42%	27.42%	-22.91%	-22.91%	-22.91%
2010	24.29%	24.29%	24.29%	-14.64%	-14.62%	-14.61%
2011	27.10%	27.13%	27.07%	-11.72%	-11.77%	-11.71%

to compute them. As they explain, there are two main strategies to deflate I-O Tables.

The first is called "double deflation" method. In order to explain how it works, suppose we have a matrix **Z** of means of productions or exchanges between industries, a matrix M of the imports of means of production, a final demand vector **f**, a vector of the imports for final demand $\mathbf{f}_m$, a gross output vector **x**, and a series of row reporting transport margins, taxes, the value added and other minor categories. For simplicity, in the following schemes these rows are grouped under the label $\mathbf{va}'$.

Table 4.2: The general structure of an I-O table

$\mathbf{Z}$	f	$\mathbf{x}$
$\mathbf{M}$	f_m	$\mathbf{m}$
$\mathbf{va}'$	0	va
$\mathbf{x}'$	f	/

It may be important to remind that in Section 4.1 and in Chapters 1, 2 and 3 the matrices are represented as in the Sraffian tradition, in which goods are homogeneous by column and the elements a_{ij}s are supposed to describe real quantities. A generic element $a_{ij} \in \mathbf{A}$ represent the quantity of good j used up as a mean of production in sector i

The procedure explained here have been developed in the Leontief tradition, in which goods are homogeneous by row, and a generic element $z_{ij} \in \mathbf{Z}$ is expressed in monetary values. If p_i is the price of good i, we have that $z_{ij} = a_{ji}p_i$. In matrix terms, we have that $\mathbf{Z} = \mathbf{A}'diag(\mathbf{p})$, where $\mathbf{p}$, as before is the vector of prices and $diag(\mathbf{p})$ is a diagonal matrix with vector $\mathbf{p}$ on its main diagonal.

In order to avoid confusion, we write $a'_{ij} = a_{ji}$, so that $z_{ij} = a'_{ij}p_i$. Moreover we have that a generic element $x_i \in \mathbf{x}$ is the monetary value of b_i, that is to say that $x_i = p_i b_i$. Finally, since in Section 4.1, y_i represents the quantity of good i that goes to the final demand, we have that a generic element $f_i \in \mathbf{f}$ is given by $f_i = p_i y_i$.

If we have a price deflator $p_{i,t}/p_{i,t-1}$ we can compute, applying the "double deflation" method consists in computing

$$z^d_{ij,t} = a'_{ij,t}p_{i,t}\frac{p_{i,t-1}}{p_{i,t}} \quad \forall \quad j = 1, ..., n \tag{4.2.1}$$

$$f^d_{i,t} = y_{i,t}p_{i,t}\frac{p_{i,t-1}}{p_{i,t}} \tag{4.2.2}$$

$$x^d_{i,t} = b_{i,t}p_{i,t}\frac{p_{i,t-1}}{p_{i,t}} \tag{4.2.3}$$

That is to say, the same price deflator can be applied to all the cell of a row in matrix $\mathbf{Z}$ and to the respective elements of vectors $\mathbf{f}$ and $\mathbf{x}$. For the matrix $\mathbf{M}$ and vectors $\mathbf{f}_m$ and $\mathbf{m}$ the same procedure can be applied, but taking into consideration that we should know the prices of the imports and the deflator for these prices. The vector $\mathbf{va}$ can be computed just by the difference between $\mathbf{x}$ and the sum by column of $\mathbf{Z} + \mathbf{M}$.

Although in theory there should not be any problem with this procedure, in practice it can lead to implausible Input-Output (I-O) tables. The main reason is that the composition of each cell in a row of an I-O table is not really homogeneous as assumed by the theory. The point has been highlighted by Dietzenbacher and Hoen (1998), who showed that the use of an alternative strategy, called RAS algorithm, could give more reliable results.

The basic idea of the RAS algorithm is that if you have prices deflators for the external columns of the I-O matrix, than the internal matrices and columns can be estimated through an iterative procedure.

For example, suppose that we have deflators for the gross product $\mathbf{x}$, for the total imports $\mathbf{m}$, for the final demand vectors $\mathbf{f}$ and $\mathbf{f}_m$ and for the value added vector $\mathbf{va}$. Therefore, we can compute the deflated vectors $\mathbf{x}^d$, $\mathbf{m}^d$, $\mathbf{f}^d$, $\mathbf{f}_m^d$ and $\mathbf{va}^d$ with equations analogous to those in 4.2.1, 4.2.2 and 4.2.3.

By construction we know that the sum by row of $\mathbf{Z}^d$, the matrix of the inter-industrial flows of goods at deflated prices, must be equal to $\mathbf{x}^d - \mathbf{f}^d$, that is to say that

$$\mathbf{Z}^d \boldsymbol{\iota} = \mathbf{x}^d - \mathbf{f}^d \tag{4.2.4}$$

where $\boldsymbol{\iota}$ is a summation vector of appropriate length.

In the same way, the following accounting identities must hold

$$\begin{aligned} \mathbf{M}^d \iota &= \mathbf{m}^d - \mathbf{f}_m^d && (4.2.5) \\ \boldsymbol{\iota}'\mathbf{Z}^d + \boldsymbol{\iota}'\mathbf{M}^d &= \mathbf{x}^d - \mathbf{va}^d && (4.2.6) \end{aligned}$$

The RAS algorithm multiplies recursively the rows and the columns of matrices $\mathbf{Z}$ and $\mathbf{M}$ until the constraints of the problem, i.e. the right-hand side of eq.s 4.2.4, 4.2.5 and 4.2.6, are verified. In Bacharach (1970) it is provided a mathematical treatment of the algorithm, while in Dietzenbacher and Hoen (1998) are discussed some variations based on the availability of different deflators. For example, instead of computing the deflated vectors $\mathbf{f}^d$ and $\mathbf{f}_m^d$, one could compute just the deflated scalar f^d—the sum of vector $\mathbf{f}^d$ plus the sum of vector $\mathbf{f}_m^d$—and then leave the algorithm to estimate $\mathbf{f}^d$ and $\mathbf{f}_m^d$ too. This is the version chosen by the WIOD research group although with a few important specifications.

As explained in (Los et al., 2014, p.1), the double-deflation method gave results for the value-added that were inconsistent with data published on other sources, and hence they chose to use a version of the RAS algorithm which, with the proper deflators, seems more coherent with the other available databases.

Specifically, the WIOD research group applies a variation of the RAS algorithm called GRAS suggested by Junius and Oosterhaven (2003) and subsequently revised by Lenzen et al. (2007). In the case of Chapters 1 and 2 and 3 we have applied the same algorithm, although the deflators used by the WIOD research group have been corrected to take into account the variability of countries across countries—see below.

The main feature of the GRAS is that it can deal with negative numbers, while the original RAS cannot. This is important since the final demand vector of the WIOTs is divided in its components, so that we have a column of inventories, which may be negative.

Specifically, in the WIOTs, the final demand is divided in 5 columns: final consumption by expenditure, final consumption by non-profit organizations serving households, final consumption by government, gross fixed capital formation, changes in inventories and valuables.

Therefore, they need five different deflators for each of the category of the final demand. As they explain, they took the deflators for final consumption expenditure, final consumption by government and gross fixed capital formation from the UN National Accounts database[1].

Although no explicit deflators have been found there, they publish the GDP for each of the categories considered in current prices and in 2005 prices, so that implicit deflators can be obtained simply as a ratio between the GDP at current prices and at constant prices.

In the case of inventories and final demand by non-profit institutions serving households, the deflators for the gross output have been used, although not in the standard way—for the details see Los et al. (2014).

The gross output deflators and the value added deflators for each country are provided by the WIOD itself for the period 1995-2009. The import deflators are just the gross output deflators of the exporting country. The deflators for the years 2010 and 2011 have been computed through a simple linear extrapolation based on the period 2006-2009, after modifying all the deflators in order to take into account the differences in prices across countries.

4.3 Deflators corrected for differences in prices across countries

As explained in Chapter 1, the WIOD research group provides just time-deflators, because their aim is to compute previous-year-prices tables. In this case the aim is different, because we need I-O tables in which prices are not just stable through time, but also uniform across countries.

In order to do this, we need indexes of the level of prices at the sectoral level for the countries considered. These have been taken from the International Comparison Program (ICP) of the World Bank, a survey of the prices of different goods across the world which have been realized in 2005 and 2011. Since the deflators for 2010 and 2011 are not provided by the WIOD, so that we had to estimate them, we used the data for 2005.

The ICP explains the price level index (PLI) with the “Big Mac Index” (International Comparison Program, 2008). Suppose a Big Mac in the US

[1]In the case of Taiwan, data has been taken from the national accounts provided by their government

costs 4.00 US dollars and in France 4.80 euros and suppose that the exchange rate is 1 US dollar for 0.67 euros. The price level index in France with respect to the US is $(4.80/0.67)/4.00 \times 100 \approx 179$. That is to say, we compute the price in dollars of a Big Mac in France and then we compute the ratio with the price in dollars of the Big Mac in the US. As it is easy to check, it does not matter whether you compute the ratio between prices in dollars or in euros, the result is still 179. That is to say, the price in euros of a Big Mac in the US is $4.00 \times 0.67 = 2.68$ euros. The PLI of France with respect to the US is $4.80/2.68 \approx 179$. The indexes provided by the ICP are computed having as a reference a measure of the World prices and not the US prices, but the concept is the same.

From the point of view of our paper, we are interested in deflating the I-O Tables in such a way that the monetary quantities we observe reflect the ratio between the quantities produced.

Using the example above, suppose that we observe the value of the quantity of Big Macs sold in France and in the US. For the sake of simplicity, suppose that the quantity of Big Mac sold in France is 2 and in the US is 3. What we would observe in the I-O tables expressed in US dollars would be $(4.80 \times 2)/0.67 \approx 14.33$ for France and $4 \times 3 = 12$ for the US. Therefore, if we apply the PLI of 179 to France we obtain $14.33/179 \times 100 \approx 8$. As it can be noted, the ratio 8/12 between the deflated value of the Big Macs sold in France and the value of the Big Macs sold in the US reflects the ratio among the quantities of Big Macs sold in the two countries (2/3).

In other words, with a well deflated I-O Tables, we can compute how the I-O tables would be if the same price would be applied everywhere, and this is a key feature to compute prices-robust indexes of specialization as explained in the Section 4.1.

This procedure cannot solve the problem that the mix of goods we have in the real I-O tables change from one cell to another. However, with the corrected deflators we can take a step towards the computation of I-O Tables that reflect the quantity of goods produced in each country, and making them more suited for analysis as those of Chapters 1 and 2 and 3.

For example, suppose to denote the gross output deflator of a certain country c of a sector i with $\mathbf{d}_{i,c} = [d_{1995,i,c}, ..., d_{2009,i,c}]$ where[2]

$$d_{t,i,c} = \frac{p_{t,i,c}}{p_{1995,i,c}} \tag{4.3.1}$$

The deflators provided by the WIOD are expressed in the currency of the respective country c, while the I-O Tables are expressed in US dollars, so that, they have to be corrected for the exchange rate. If the cost of 1 unit

[2]The default reference year for the deflators provided by WIOD is 1995

of national currency in terms of US dollars is expressed by e, in order to obtain a deflator expressed in dollars we have to compute

$$d^{\$}_{t,i,c} = \frac{p_{t,i,c}e_t}{p_{1995,i,c}e_{1995}} = \frac{p^{\$}_{t,i,c}}{p^{\$}_{1995,i,c}} \tag{4.3.2}$$

Moreover, we have the PLI in year 2005 for sector i of country c, that is

$$\mathrm{PLI}_{i,c} = \frac{p^{\$}_{2005,i,c}}{p^{w}_{2005,i,c}} \tag{4.3.3}$$

where $p^{w}_{2005,i,c}$ is the measure of the world prices taken as a reference by the ICP—see International Comparison Program (2008). As explained above, the currency in which the nominator is expressed does not really matter since what is important is just that for all the countries considered the same currency is used. Since the I-O Tables provided by the WIOD are expressed in dollars, we use dollars too.

The gross output deflator used by us is $\mathbf{d}^{w}_{i,c} = [d^{w}_{1995,i,c}, ..., d^{w}_{2009,i,c}]$ where

$$d^{w}_{t,i,c} = \frac{p^{\$}_{t,i,c}}{p^{\$}_{1995,i,c}} \frac{p^{\$}_{1995,i,c}}{p^{\$}_{2005,i,c}} \mathrm{PLI}_{i,c} = \frac{p^{\$}_{t,i,c}}{p^{w}_{2005,i,c}} \tag{4.3.4}$$

For all the other deflators, i.e. value added deflators and final demand deflators, the same procedure has been used, they have all been adjusted in order to use as reference prices a measure of the 2005 world prices. The only difference is that the final demand deflators were already expressed in US dollars, so they do not have to be adjusted for exchange rate variations.

The problem in correcting the deflators with the PLI is that while the WIOTs are constructed on the basis of industrial sectors, the PLI are collected mainly to compare the goods that enter into the basket of the households. Therefore, there is no perfect matching between the sectors considered by the WIOD research group and those considered by the ICP. The PLIs used for each Sector of the WIOTs are reported in Tab. 4.3, while the PLIs for the final demand categories are reported in Tab. 4.4.

Conclusions

In this paper it is shown that for some empirical applications of the Sraffian Schemes as those in Chapters 1 and 2 and 3, the reliability of the results can be improved applying the proper deflation procedure to the available Input-Output tables. The deflation procedure should aim at estimating how Input-Output tables on different countries and different years would look like if for each good the price would be uniform across countries and stable in time.

In order to do this there are two main procedures: the "double deflation" method and the methods based on the RAS algorithm. For the deflation of the tables provided by the World Input-Output Database (WIOD) , the GRAS algorithm, a variation of RAS, estimates previous-year-prices tables that are more coherent with other data sources.

However, this evidence does not constitutes a general rule. Even in the case of the WIOD, estimating previous-year-prices tables implies that it is taken into account the fact that prices change from one year to the other, but not the differences of prices across countries. In order to do this, the deflators provided by the WIOD must be corrected with indexes of the level of prices in different countries. We have no evidence that in this case the GRAS method would still offer the more reliable estimation. Therefore, further research on this topic seems to be necessary.

Moreover, as it is explained in the introduction, no deflation procedure can help in solving the aggregation problem, that is to say that the available Input-Output tables generally aggregate many goods in one single industry. For solving this problem there does not seem to be any solution but to collect data that allows to construct finely disaggregated Input-Output tables.

Table 4.3: The list of sectors used by the WIOTs and the match with the Price Level Indexes of the International Comparison Program*

#	WIOTS Sector	ICP Sector
1	Agriculture, Hunting, Forestry and Fishing	Food and Non-Alcoholic Beverages
2	Mining and Quarrying	Other Products
3	Food, Beverages and Tobacco	Food and Non-Alcoholic Beverages
4	Textiles and Textile Products	Clothing and Footwear
5	Leather, Leather and Footwear	Clothing and Footwear
6	Wood and Products of Wood and Cork	Other Products
7	Pulp, Paper, Paper, Printing and Publishing	Recreation and Culture
8	Coke, Refined Petroleum and Nuclear Fuel	Housing, Water, Electricity, Gas and Other Fuels
9	Chemicals and Chemical Products	Other Products
10	Rubber and Plastics	Other Products
11	Other Non-Metallic Mineral	Other Products
12	Basic Metals and Fabricated Metal	Machinery and Equipment
13	Machinery, Nec	Machinery and Equipment
14	Electrical and Optical Equipment	Machinery and Equipment
15	Transport Equipment	Machinery and Equipment
16	Manufacturing, Nec; Recycling	Machinery and Equipment
17	Electricity, Gas and Water Supply	Housing, Water, Electricity, Gas and Other Fuels
18	Construction	Construction
19	Sale, Maintenance and Repair of Motor Vehicles and Motorcycles	Transport
20	Wholesale Trade and Commission Trade, Except for Vehicles and Motorcycles	Individual Consumption Expenditure by Households
21	Retail Trade Except for Vehicles and Motorcycles, Repair of Household Goods	Individual Consumption Expenditure by Households
22	Hotels and Restaurants	Restaurants and Hotels
23	Inland Transport	Transport
24	Water Transport	Transport
25	Air Transport	Transport
26	Other Supporting and Auxiliary Transport Activities; Activities by Travel Agencies	Transport
27	Post and Telecommunications	Communication
28	Financial Intermediation	Miscellaneous Goods and Services
29	Real Estate Activities	Miscellaneous Goods and Services
30	Renting of M&Eq and Other Business Activities	Miscellaneous Goods and Services
31	Public Administration and Defense, Compulsory Social Security	Collective Consumption Expenditure by Government
32	Education	Education
33	Health and Social Work	Health
34	Other Community, Social and Personal Services	Miscellaneous Goods and Services
35	Private Households with Employed Persons	Individual consumption expenditure by households

Table 4.4: The list of the final demand categories used by the WIOTs and the match with the Price Level Indexes of the International Comparison Program*

#	WIOTS Sector	ICP Sector
1	Final consumption expenditure by households	Individual consumption expenditure by households
2	Final consumption expenditure by non-profit organizations serving households (NPISH)	Individual consumption expenditure by households
3	Final consumption expenditure by government	Individual consumption expenditure by government
4	Gross fixed capital formation	Gross fixed capital formation
5	Changes in inventories and valuables	GDP

Conclusions

The main issues analyzed in this work are the real effect of Comparative Advantages and the possibility of reducing CO2 emissions through proper specialization patterns.

Two chapters have investigated the effectiveness of Comparative Advantages in the context of Europe under different set of assumptions. The main objective was to provide an empirical check on the prediction of the theory, i.e. that the exploitation of Comparative Advantages should be, according to standard economic theory, the natural consequence of the action of the "invisible hand" of international free markets. The results are clear: there is no evidence that European markets succeeded in realizing such an outcome.

European countries seem to be far from specialization patterns compatible with Comparative Advantages. Moreover and most importantly, there is no trend suggesting a reduction of this distance during the period considered (1995-2011). This implies that there might be scopes for improving the economic efficiency of Europe through policies aiming at incentivizing the adoption of specialization patterns compatible with Comparative Advantages.

Somewhat unexpectedly we have found that this evidence has some important implications for CO2 emissions. The study of specialization patterns and related CO2 has led to the conclusion that the exploitation of proper specialization patterns may have a strong impact on the environment. The adoption of technologies that produce less CO2 than those actually employed is not the only way to contrast global warming. An improved coordination among countries to exploit CO2-reducing specialization patterns seems to be an alternative with high potential.

If Comparative Advantages were fully exploited it would not be possible to implement CO2-reducing specialization patterns without affecting the economic efficiency of the system—that is, without reduction of the total net national production produced. But since Comparative Advantages are far from being reached, lowering CO2 emissions is not an aim incompatible with economic efficiency. Quite on the contrary, ample scopes seem to exist, both in Europe and, even more, on a global scale, to improve economic efficiency and the environmental impact of the economic activity at the same time.

These results are preliminary and should not be taken as definitive. As explained in the Introduction and in last Chapter, one problem is that the existing databases have some important limits for the empirical application of Sraffian Schemes.

The available data do not comprise information about land, fixed capital and joint production and all the goods considered are basic goods, so that we have to work in a framework in which the production processes are simplified.

Even in this simplified framework, the available data are Input-Output tables expressed in nominal terms, while Sraffian Schemes are supposed to represent the flow of real goods. The estimation of deflated Input-Output tables is a viable strategy, but there is little evidence on the procedure to be followed to reach reliable estimations. However, this wouldn't solve the problem that the available Input-Output tables are often very aggregate and this affects the precision of the results provided here.

Therefore, constructing more disaggregated tables, comprising data on land, fixed capital and joint production, and investigating the most adequate procedure to deflate them would be important steps to refine the computation presented here. More generally, the empirical research on Sraffian Schemes would benefit from more reliable data on productive processes.

Leaving aside the problems related to data, the approach presented here offers many other possibilities of further developments. A first line of research consists in extending the uses of Net Product Possibility Frontiers, the benchmark used in Chapters 1 and 2 to evaluate the action of Comparative Advantages. The distance from the Net Product Possibility Frontier is a measure of how much a group of countries could increase its net product, exploiting a more efficient allocation of resources.

The Net Product Possibility Frontier has been computed under the assumption that techniques cannot be transferred from one country to the other and migrations are not possible—the total quantity of workers for each country is assumed to be fixed here. Both these assumptions can be relaxed, and this would offer new perspectives on the potential gains from achievable specializations, i.e. new scenarios would have to be studied.

An important question that has been left open is how the potential gains from a better specialization could be shared among the countries involved. Here it has been investigated how much the overall net output of a group of countries could be improved, but not how to redistribute it among the countries. An interesting matter would be to study the economic policies or mechanisms that would allow the so-called markets to find, at least in principle, a vector of prices that would make the efficient specialization pattern convenient for each country.

In a Sraffian framework prices depend on the distribution of surplus among wages and profits. This implies that there is a link between the internal distribution of the surplus among social groups and the international distribution of the surplus among the countries involved. This may also have important consequences for the balance of payments of the countries involved and hence for the sustainability of alternative specialization patterns, especially in the long run. The matter of the distribution of the surplus and the relations with the mechanism of the formation of prices is a multifaceted problem that has to be analyzed carefully.

Moreover, the two papers on Comparative Advantages and the paper on CO2 emissions compare the historically observed specialization patterns with alternative specialization patterns. In some sense, these studies are based on the static comparison of alternative scenarios. The analysis of the various problems related to the practical realization of a more efficient or CO2-saving specialization pattern is beyond the scope of this thesis.

The comparative static approach has been used because the aim was to check whether the available data is compatible with Comparative Advantages or to give a first measure of the potentialities of specialization patterns in reducing greenhouse gases emissions. If the aim is to build on this methodology in order to devise specific economic policies, all the problems related to the transition from a given economic structure to another, as for example financial and jobs-related problems, would have to be considered—besides the reliability of the available data, which has been discussed above.

Actually, such a process could be stimulated and financed in many different forms, e.g. through financial facilities, direct public intervention or tax policies. Each of these alternatives may have pros and cons that would have to be evaluated.

For what concerns the job market, realizing alternative specialization patterns implies a requalification of workers which, as it has been shown in Chapters 1, 2 and 3, may involve a high percentage of the workforce. As it has been noted in the conclusions to Chapters 2 and 3, these results are due to the fact that we make use of benchmark scenarios which may seem too extreme, because they would require to restructure heavily the economies involved.

However, the potential gains in economic efficiency and benefits in terms of environmental preservation discussed in this thesis seem so strong in the benchmark scenarios, that most likely slight movements in the “right” direction could achieve substantial improvements. Investigating how much we could gain in economic and environmental terms through acceptable reorganizations of the economic productive systems may be another important development of the empirical application of Sraffian Schemes.

Bibliography

Aspromourgos, T. (2004, April). Sraffian research programme and unorthodox economics. *Review of Political Economy 16*(2), 179–206.

Bacharach, M. (1970). *Biproportional Matrices & Input-Output Change*. Cambridge University Press.

Boglioni, M. and S. Zambelli (2016). European economic integration and comparative advantages. *Journal of Economic Surveys forthcoming*.

Carbone, J. C., C. Helm, and T. F. Rutherford (2009). The case for international emission trade in the absence of cooperative climate policy. *Journal of Environmental Economics and Management 58*, 266–280.

Chiodi, G. (1992). On Sraffas notion of viability. *Studi Economici 46*, 5–23.

Degasperi, M. and T. Fredholn (2010). Productivity accounting based on production prices. *Metroeconomica 61*, 267–281.

Dietzenbacher, E. and A. R. Hoen (1998). Deflation of input-output tables from the user's point of view: a heuristic approach. *Review of Income and Wealh 44*(1), 111–122.

Gandolfo, G. (2014). *International Trade Theory and Policy*. Berlin Heidelberg: Springer.

Gossling, W. F. (1972). *Productivity Trends in a Sectoral Macro-Economic Model*. London: William Cloves and Sons.

Han, Z. and B. Shefold (2006). An empirical investigation of paradoxes: reswitching and reverse capital deepening in capital theory. *Cambridge Journal of Economics 30*, 737–765.

International Comparison Program (2008). *Global Purchasing Power Parities and Real Expenditures*. World bank.

Jones, R. W. (1961). Comparative Advantage and the Theory of Tariffs: A Multy-Country, Multy-Commodity Model. *Review of Economic Studies 28*(3), 161–175.

Junius, T. and J. Oosterhaven (2003). The solution of updating or regionalizing a matrix with both positive and negative entries. *Economic Systems Research 15*(1), 87–96.

Kurz, H. D. (2000). *Critical Essays on Piero Sraffa's Legacy in Economics*. Cambridge: Cambridge: Cambridge University Press.

Kurz, H. D. and N. Salvadori (1995). *Theory of Production*. Cambridge: Cambridge University Press.

Kurz, H. D. and N. Salvadori (2006). InputOutput Analysis from a Wider Perspective: a Comparison of the Early Works of Leontief and Sraffa. *Economic Systems Research 18*(4), 373–390.

Lenzen, M., R. Wood, and B. Gallego (2007). Some comments on the GRAS method. *Economic Systems Research 19*(4), 461–465.

Leontief, W. (1951). *The Structure of American Economy 1919-1939: An Empirical Application of Equilibrium Analysis*. White Plains, NY: International Arts and Science Press.

Leontief, W. (1985). *Input-Output Economics*, Chapter Technological Change, Prices, Wages, and Rates of Return on Capital in the U.S. Economy, pp. 392–417. New York: Oxford University Press.

Los, B., R. Gouma, M. Timmer, and P. IJtsma (2014). Note on the construction of WIOTs in previous year's prices. Technical report, WIOD.

Mariolis, T. and L. Tsoulfidis (2011). Eigenvalue distribution and the production price-profit rate relationship: theory and empirical evidence, evolutionary and institutional. *Evolutionary and Institutional Economics Review 8*(1), 87–122.

Miller, R. E. and P. D. Blair (2009). *Input-Output Analysis. Foundations and Extensions.* Cambridge University Press.

Palmer, K., W. E. Oates, and P. R. Porteny (1995). Tightening Environmental Standards: The Benefit-Cost or the No-Cost Paradigm? *Journal of Economic Perspectives 9*(4), 119–132.

Pasinetti, L. (1980). The Notion of Vertical Integration in Economic Anaysis. In L. Pasinetti (Ed.), *Essays on the Theory of Joint Production*, Chapter 2, pp. 16–43. McMillan Press.

Pasinetti, L. (1989). *Lezioni di teoria della produzione*. Il Mulino, Bologna.

Porter, M. E. and C. van der Linde (1995). Toward a New Conception of the Environment-Competitiveness Relationship. *Journal of Economic Perspectives 9*(4), 97–118.

Rauscher, M. (2003). International Trade, Foreign Investment, and the Environment. In K.-G. Mäler and J. R. Vincent (Eds.), *Handbook of Environmental Economics*, Volume 3, Chapter 27, pp. 1402–1456. Elsevier, Amsterdam.

Samuelson, P. (1966). Market mechanisms and maximization. In J. Stiglitz (Ed.), *The Collected Scientific Papers of Paul A. Samuelson*, Volume 1, Chapter 33, pp. 425–492. Cambridge, Massachusetts: The M.I.T. Press.

Samuelson, P. A. (2001). A Ricardo-Sraffa Paradigm Comparing Gains from Trade in Inputs and Finished Goods. *Journal of Economic Literature 39*(4), 1204–1214.

Schefold, B. (2013). Approximate production functions. *Cambridge Journal of Economics 37*, 1161–1184.

Shaikh, A. (1988). The empirical strength of the labor theory of value. In R. Bellofiore (Ed.), *Conference Proceedings of Marxian Economics: A Centenary Appraisal*. MacMillan, London.

Shaikh, A. (2012). The empirical linearity of sraffas critical output-capital ratios. In C. Gerke, N. Salvadori, I. Steedman, and R. Sturn (Eds.), *Classical Political Economy and Modern Theory. Essays in Honour of Heinz Kurz*. Routledge.

Sraffa, P. (1960). *Production of Commodities by Means of Commodities*. Cambridge: Cambridge University Press.

Ten Raa, T. and P. Mohnen (2001). The Location of Comparative Advantages on the Basis of Fundamentals Only. *Economic Systems Research 13*(1), 93–108.

Timmer, M., E. Dietzenbacher, B. Los, R. Stehrer, and G. J. de Vries (2015). An Illustrated User Guide to the World Input-Output Database: the Case of Global Automotive Production. *Review of International Economics 23*(3), 575–605.

Velupillai, V. K. and S. Zambelli (1993). The International Comparisons Programme and Production Based Indices of Economic Performances. mimeo, World Bank, Washington.

Zambelli, S. (2017). The Aggregate Production Function is NOT Neoclassical. *Cambridge Journal of Economics forthcoming*.

Zambelli, S. and T. Fredholn (2010). An Algorithmic Measurement of Technical Progress. *ASSRU Discussion Paper, No. 6-2010, Algorithmic Social Sciences Research Unit, University of Trento*.

Zambelli, S., V. Ragupathy, and T. Fredholn (2014). Robust measurment of national technological progress. *ASSRU Discussion Paper, No. 4-2014/1, Algorithmic Social Sciences Research Unit, University of Trento*.