Structural Change in OECD Comparative Advantage

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Abstract

In the post-war period, the goods composition of trade in OECD countries has changed considerably. We analyze the evolution of comparative advantage using a detailed trade data set and a new analytical tool: the harmonic (weighted) mass index, which enables us to identify periods of structural change. We then analyze which forces may be responsible for the main structural changes, which primarily took place in many OECD countries in the mid 1980s. We argue that neither the rise of China and India nor the deregulation programs in many OECD countries is likely to have been the main cause. Instead, the interaction between the real and monetary economy (possibly fuelled by nominal rigidities and delays in exchange rate pass through) as measured by the large swing in the real effective exchange rate of the dollar in the 1980s is our primary candidate. In view of similar recent large swings, we argue it is likely that the OECD countries will again go through substantial structural adjustments in the near future.

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1. Introduction

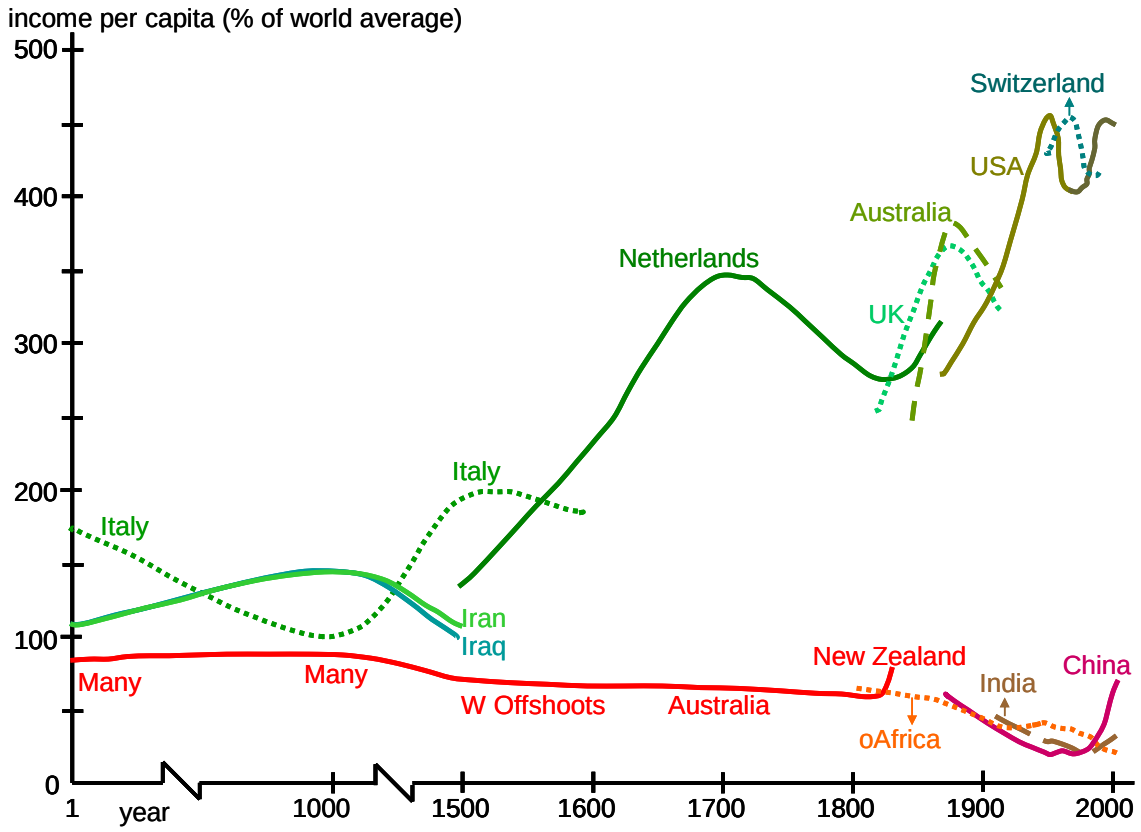
To economic historians it is a well-known fact that countries pass through phases of economic development (Rostow, 1960). The traditional idea is that countries move from producing primary products, to manufacturing goods, and finally to service activities. Associated with this broad categorization is the level of development of certain countries, where developing countries are associated with primary products and developed countries with manufacturing or service activities. These stages of development reflect themselves in trade patterns. In general, primary products are exported by developing countries, and manufacturing products and services by developed countries.

The association between stages of development and trade patterns is consistent with neo-classical trade theory. Trade theorists and empiricists, however, modify the descriptions in the sense that countries specialize according to comparative advantage, which is not necessarily associated with stages of economic development (see Feenstra, 2004 for a survey of the results). The Netherlands, for example, is strong in agriculture, but still a developed country (agricultural production is both capital intensive and skill intensive in this country). Furthermore, in practice the trade pattern might be undetermined in a world with more goods than factors of production (Bernstein and Weinstein, 2002). Despite these objections, factor endowments, by and large, seem to determine trade patterns (Davis and Weinstein, 2001). This also holds in a dynamic context (Grossman and Helpman, 1991-ch.7, Redding, 2002). For economic historians, like Landis (1998) or Maddison (2002), trade theorists miss the bigger picture by focussing on relatively short time periods in which these challenges to leadership are not clearly visible. In a fascinating account of economic history Landis (1998) points out how these two concepts, stages of growth and international specialization patterns are related: leading countries also dominate the structure of international trade, but over time the leaders swap places, as figure 1 illustrates.

In the year 1 Italy (Rome) was the leader, with an income level about 73 percent higher than the world average. The leading position was taken over by Iran and Iraq (44 percent above the average) in the year 1000, before it was regained by Italy (Venice, Florence) in 1500 (94 percent above the average). The Dutch trading power gained prominence from 1600 to about 1820, with a relative income peak in 1700

(246 percent above average). Since then, the lead has switched frequently, going first to the UK, then to Australia, followed by the USA, Switzerland, and again the USA. The highest relative peak (374 percent above average) is reached in 1999. Landis (1998) gives a qualitative account how trade patterns in the world evolve with this changing leadership.

Figure 1 Leaders and laggards in the world economy, 1-2003



Source: Brakman and van Marrewijk (2008; also for details and a discussion). The analysis is based on distinguishing 35 geographic entities (28 countries and 7 regions / groups of countries); oAfrica = other Africa; W Offshoots = Canada, USA, Australia, and New Zealand.

More formally, Brezis et al. (1993, p. 1211) show that "long periods of economic and technological leadership ... are not forever" and that technological growth finally results in a situation where (ibid, p. 1217) "… there must be an abrupt reversal of the trade pattern." This formalization shows that changes in trade patterns point towards structural economic changes in the economies involved.

We focus on structural changes in trade patterns. Although this paper does not have an all-embracing theme of stages of economic development, it tries to identify structural economic breaks by identifying structural changes in trade patterns. These

breaks might be a manifestation of structural breaks in the global division of labour. In this sense we use trade patterns to reveal encompassing structural economic breaks in the world economy.

The contribution of this paper is two-fold. First, we use a new method for identifying structural breaks in large data sets, the so-called Harmonic Mass Index (HM-index, see Hinloopen and van Marrewijk, 2005), and apply this method to a detailed analysis of trade patterns in OECD countries. Essentially, we describe trade patterns by analyzing revealed comparative advantage, using the Balassa index. This analysis indicates that the 1980s was a fundamental period for OECD countries, that is, most structural changes took place in this period. Second, We try to identify the causes of this change. We argue that neither the rise of China and India nor the deregulation programs in many OECD countries is likely to have been the main cause. Instead, the interaction between the real and monetary economy (possibly fuelled by nominal rigidities and delays in exchange rate pass through) as measured by large swings in the real effective exchange rate of the dollar in the 1980s is our primary candidate. In view of similar recent large swings, we argue it is likely that the OECD countries will again go through substantial structural adjustments in the near future.

2. Identifying structural breaks in large data-sets

Hansen (2001) surveys the standard approaches of identifying structural breaks. According to him, a structural break in essence is a change in the parameters α or ρ at some date in the following (most simple) dynamic model:

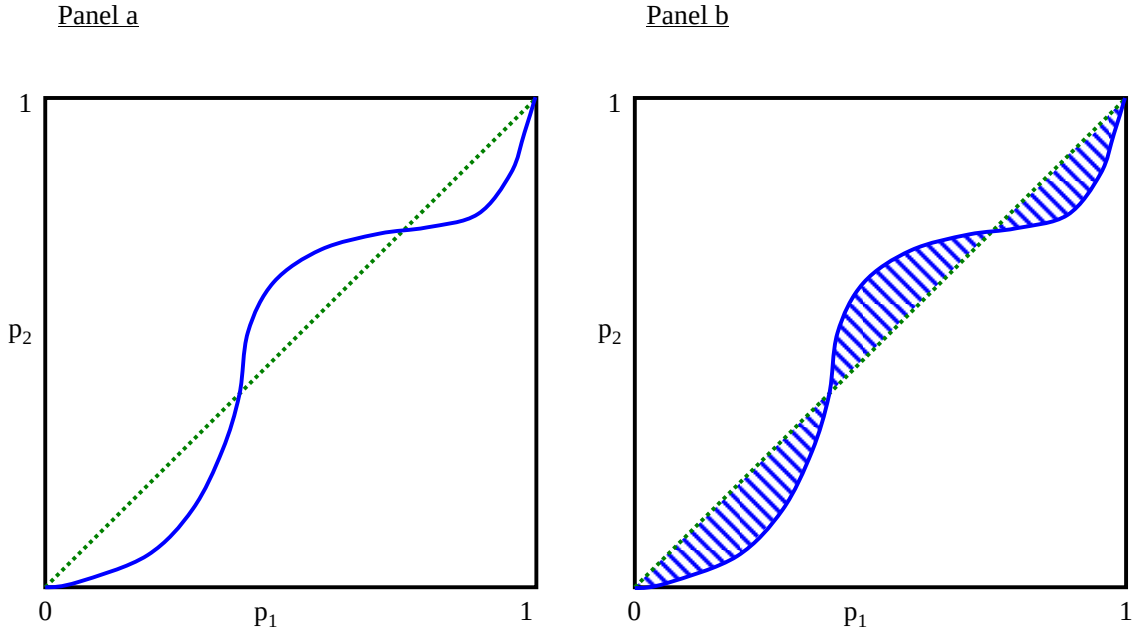
(1) $y_t = \alpha + \rho y_{t-1} + e_t$,

where y is a time series, and e_t the error term. The parameter α controls the mean, and ρ the serial correlation in y. One can revert to Chow tests to identify structural breaks, or test a random walk against a time trend. A disadvantage of these time series model is that in many applications we do not have specific information on the underlying model that generated the data, as described by the equation (1), and that a structural break is related to a time series of a single variable. In some case one is interested in the evolution over time of an entire distribution, as we are in this paper. In those cases one can rely on non-parametric methods, such as kernel estimates or Markov transition matrices. The disadvantage of the former is that differences between

histograms are hard to interpret or to evaluate statistically[2], and the disadvantage of the latter is that the data have to be divided into, ad hoc, grid cells (Redding, 2002).[3]

The method we apply here is the Harmonic Mass index developed by Hinloopen and van Marrewijk (2005).[4] The essence of this method is that the characteristic of the comparison of the entire distribution is translated into a number between 0 and 1, based on Probability-Probability (PP) Plots, see Figure 2 for a graphical illustration.

Figure 2 Theoretical PP-plot (panel a) and the associated HM-index (panel b)



Let $F_1(x)$ and $F_2(x)$ represent two distribution functions. By definition a distribution function indicates the probability that a random variable takes on a value smaller than x. Comparing two distributions only involves comparing the probability related to a certain value x in one distribution with the probability of that x in the other distribution. More formally, $p_1 = F_1(F_2^{-1}(p_2))$, if this results in $p_1 = p_2$ throughout the domain, the two distributions are identical. In Figure 2, panel *a* plots a theoretical PP-plot for two distributions that are not identical. If they would be identical this plot

[2] Also as far as kernel estimates are concerned, one has to make a choice between functional forms of the kernels, like a rectangular kernel, Epanechnikov, biweight, or triangular kernels.
[3] In Redding (2002) the industry-year data are divided into quintiles.
[4] Extended by Hinloopen, Wagenvoort, and van Marrewijk (2008), see this paper for details on the methodology and this extension.

would coincide with the 45° line. The HM-index calculates the area between the PP-plot of the actual distributions and the 45°-line.

$$(2) \qquad HM(F_1, F_2) = 2\int_0^1 \left| p - F_1(F_2^{-1}(p)) \right| dp$$

As the maximum value of the deviation of a PP-plot with the diagonal is reached when the curve never crosses, the maximum surface area between the two lines is ½, this is why the surface in equation (2) is multiplied by 2 in order to normalize the HM-index to a value between 0 and 1. The HM-index has many attractive properties for applied research: it is not susceptible to outliers in the data, is scale –invariant, and last but not least, there is no need for discrete approximations, as for example in applications using Markov transition matrices. Moreover, Hinloopen and van Marrewijk (2005) analytically derive exact, finite-sample critical values for the HM-index, which makes it more attractive than (variants) of kernel estimates.

3. Revealed Comparative Advantage

The next step is to interpret HM-index values. In this paper we apply the method described in section 2, to the analysis of structural - international trade - changes. We analyze the so-called Balassa Index (BI), which indicates the extent of a country's revealed comparative advantage in a certain sector:

$$(3) \qquad BI_s^c = \frac{export_s^c / export^c}{export_s^{ref} / export^{ref}}$$

Equation (3) defines the Balassa Index for country *c* in sector *s*, where *ref* indicates the group of reference countries. If the Balassa Index exceeds unity, the country is said to have a revealed comparative advantage in that sector; this occurs if the share of sector *s* in the total exports of country *c* is larger than the share of that sector in the exports of the group of reference countries ($BI_s^c > 1$).[5] If the BIs change over time the structure of international trade changes over time. We calculate BIs for the period 1962-2000, for 3-digit SITC commodities (in total 235 sectors) for OECD countries.[6]

[5] It is relatively straightforward to relate this measure to industry output, prices and factors of production using a GDP function approach (approximated by a translog function), see Kohli (1991, ch 6, and 7). Derivatives of the GDP function give output shares of sectors in the economy (including export sectors). Hillman (1980) gives a theoretical derivation for the relation between *revealed* comparative advantage and comparative advantage (now known as the Hillman condition).

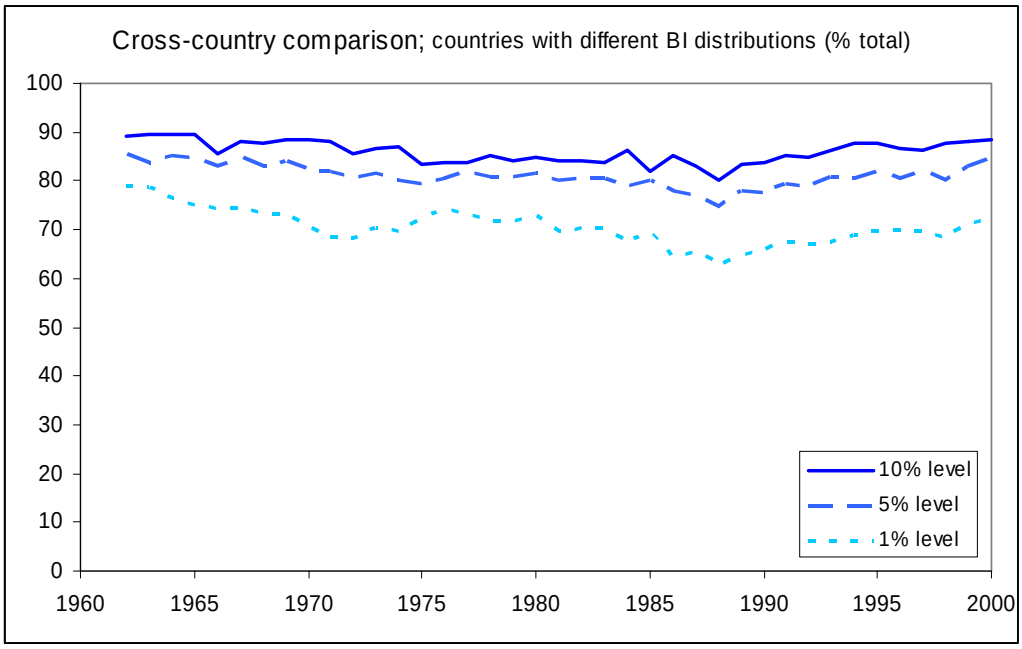
[6] The number of observations (SITC groups) is not always exactly 235; for some countries, and for some years the number of observations is smaller. This has no consequence for the application of PP-

The data are described in Feenstra *et al.* (2005). Two different types of comparison come to mind; first comparing country pairs, second comparing observations over time for the country itself. The first comparison is useful to determine if *countries* differ in their distribution at a point in time. The second comparison is useful for analyzing *structural changes* in the distribution over time *within* a country. We focus on the second application below, but we first provide some evidence on the between-country differences.

3.1 Between country BI distribution comparisons

As there are 21 countries in our data set, we can construct $21 \times 20/2 = 210$ bilateral BI distribution comparisons at any point in time. Figure 3 summarizes our findings for these comparisons by illustrating the share of these comparisons that is deemed *different* between countries at various significance levels. Evidently, at any point in time almost all (around 90 percent) bilateral comparisons conclude that the BI distribution differs for the countries at the 10 percent significance level.

Figure 3 BI distribution differs significantly between countries



The lines plot the percentage of 210 HM indices exceeding the respective critical value in that year.

plots, because the number of observations in the distributions that are compared does not have to be equal. The OECD is used as the group of reference countries.

Over the 39 year period, only *one* bilateral BI distribution comparison, namely that of Denmark and Italy, *never* exceeds this critical significance level.[7] Usually, we must conclude that the distributions differ significantly between countries, indicating that any cross-country comparison of BI values must be treated with extreme caution. This implies that the various Balassa indices cannot be easily be compared between different countries. To enable such a comparison, it is necessary to provide a characterization of the distribution based on country- and/or sector-specific economic information. A first contribution in this respect, regarding the tail-index of the BI distribution, is provided by Hinloopen and van Marrewijk (2006).

3.2 Within country BI distribution comparisons

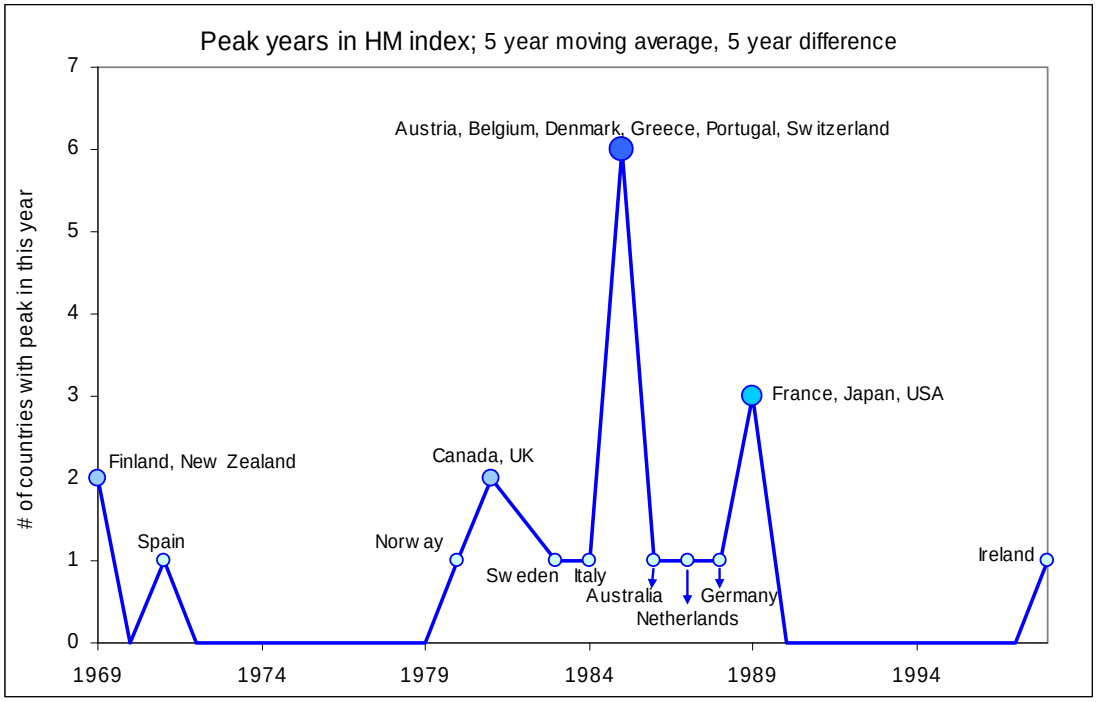
The application of the HM methodology is relatively straightforward. We start for a particular country in 1962, and compare the distribution of the BIs in 1962 with the distribution of the BIs for 1963. This results in a number for the HM index for this comparison. Given the critical value we can conclude whether or not the distributions are different.[8] Next we compare the 1962 distribution with 1964, etc until 2000. Then we move on to 1963, and repeat the exercise until the last year of observation (the year 2000). This procedure is repeated until we finally compare 1999 with 2000. To summarize this large number of comparison for each country, we focus first on comparing the current distribution with the distribution five years in the future and ask whether in that final year, the distribution is significantly different. Since the distributions can be volatile in individual years, we use a 5-year moving average.

Figure 4 shows in which years OECD countries showed their most notable change in comparative advantage. For example, the figure shows that Finland and New Zealand experienced this peak in 1969. This means the pattern of comparative advantage in these countries in the 5-year period centred around 1969 was substantially different from the pattern in the 5-year period centred around 1964. The key observation from this figure is that most structural changes occurred in the 1980s, with 17 of the 21 countries showing the largest change in trade pattern in that decade.

[7] For Denmark and Austria this occurs 3 times and for Sweden and Switzerland 4 times.

[8] For critical values, see Hinloopen and van Marrewijk (2005). If the number of observations N = 230 (slightly below the average of 232 observations), the critical values are: 0.0932 at the 10% level, 0.1086 at the 5% level, 0.1229 at the 2.5% level, and 0.1402 at the 1% level.

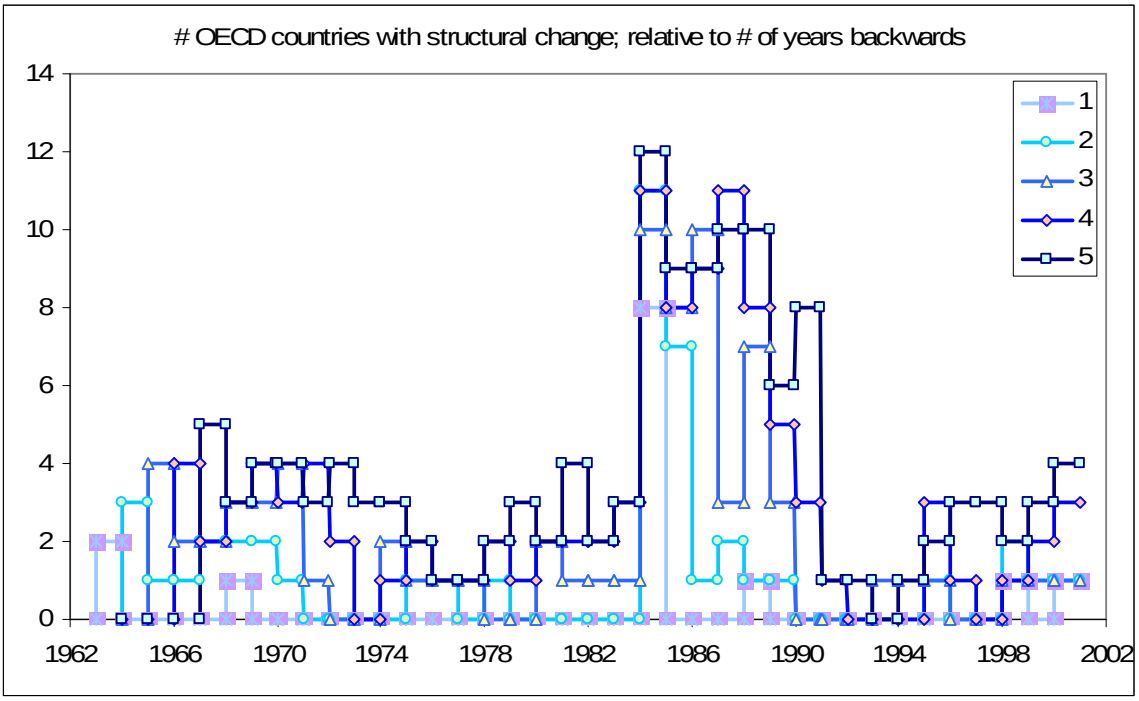
Figure 4 Peak years in HM index; 5 year moving average, 5 year difference



The reported difference is backward in time (a peak in 1984, for example, indicates large changes from 1979 to 1984)

This finding is not a result of comparing periods that are 5 years apart or focusing on the peak years in the HM index. Figure 5 shows that the 1980s were a period of exceptional structural change regardless of these choices. First, this figure shows the number of all significant breaks in a year. Second, it shows the significant breaks for 1-5 year differences rather than only peaks and only 5-year differences. The main observation from this figure is that most structural change occurred in the 1980s, in particular in the second half. In other words, compared to the early 1980s and earlier years, trade patterns were very different in the mid to late 1980s. This main finding does not rely on any particular way in which we analyze the HM indices. In the appendix we provide further robustness analysis. As was to be expected, the extent to which the trade pattern (distribution of Balassa indices) differs between years rises as the number of years in between rises.

Figure 5 Number of OECD countries with structural change



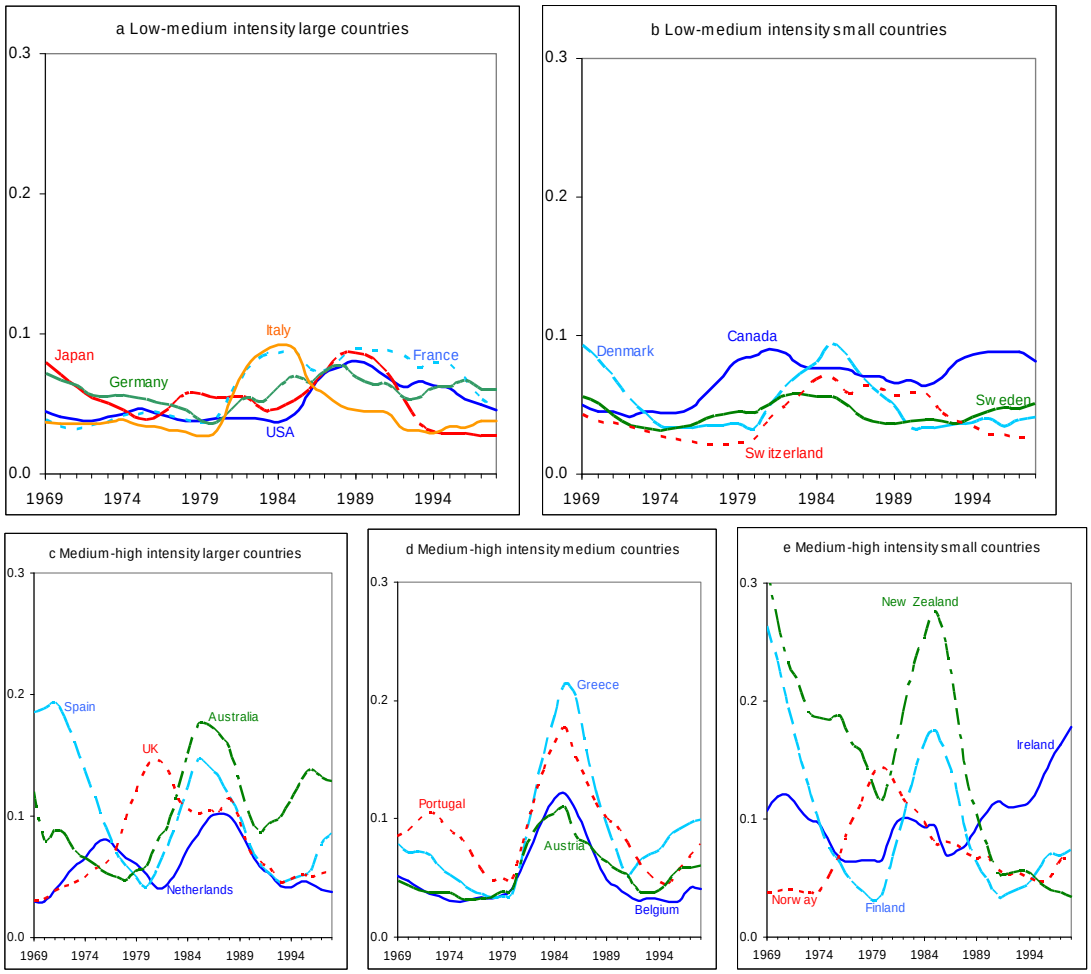
Significance at 10% level

Even though structural change is concentrated in the 1980s, Figure 5 also shows that not all structural change occurred then. Moreover, some OECD countries experienced very little change, while others showed frequent and substantial changes. Table 1 summarizes this information, first by grouping countries according to the number of peaks in their HM index and second by evaluating the intensity of change. Figure 6 illustrates for a number of countries how we grouped the countries by intensity of change. Although this grouping is necessarily arbitrary, we feel that it provides a useful summary of the information. As the table shows, nearly all countries had one or more peaks in their HM index. Large countries, like Germany and the US, tend to show fewer episodes of structural change and structural change tends to be less intensive, a result that might be expected. In fact, of the G7 countries, only the UK shows a medium-high intensive change. Now that we have identified structural breaks in trade patterns the next question is, what is the cause of the break. As we are analyzing *BIs* a natural starting point is to focus on the cut-off value; $BI = 1$. That is what we do in the next section.

Table 1 Structural change: intensity and peaks

Character of evolution HM index	Intensity of structural change: low	low-medium	medium-high	high
none-stable	Sweden Switzerland			
single-peak		Germany Italy USA	Austria Belgium Norway	Greece
double-peak		Canada Denmark France Japan	Australia Netherlands UK	Finland New Zealand
triple-peak				Ireland Portugal Spain

Figure 6 Five-year centred moving average of HM index



The reported difference is backward in time, the moving average is centred in the middle

4. Changing Comparative advantage

Economic historians already know that international specialization patterns change over time. For economists this is relatively new territory (Grossman and Helpman, 1991, Redding 2002). Our application of the HM indices show that indeed trade patterns are changing significantly for OECD countries. However, only identifying a structural break does not reveal the causes of these changes. A first potential answer can be found in neo-classical trade theory that links factor endowments to sectors that use those factors intensively. To this end we classified the 3-digit SITC commodities into five factor-abundance (Heckscher-Ohlin-Samuelson) type categories (on the basis of the International Trade Center information); classification I:[9]

- A: primary products – PP
- B: natural-resource intensive products – NRI
- C: unskilled-labour intensive products – ULI
- D: technology intensive products – TI
- E: human-capital intensive products – HCI

For each of these groups we identify the share of products in a group that has $BI > 1$. Changes in these shares indicate changes in trade patterns. Figure 7 shows some summary statistics for this exercise.[10] For each country and for each of the 5 HOS groups the figure shows the share of sectors in a category for 3 selected years, 1962, 1985, and 2000. The Netherlands for example, in the first panel of Figure 4 has seen a remarkable shift towards primary products from 1962, until 2000, while Japan has seen a decrease. Comparing this group with the other groups for the Netherlands indicates that from the 1960s the Netherlands has witnessed a change in revealed comparative advantage towards primary products and natural resource intensive products. It seems that this is at the expense of unskilled-labour intensive products. Similarly, Greece and Australia have witnessed an increase in natural-resource intensive products. Denmark, Greece, Italy, Spain, and Portugal have witnessed an increase in unskilled-labour intensive products (and Japan a sharp reduction). Japan and Italy have seen an increase in technology intensive products, while Denmark and Spain have seen an increase in human-capital intensive products. Details are given in Table 2 and the main character and changes per country in Table 3.

[9] See Appendix A for a complete list
[10] See appendix B for a summary of the evolution of the BIs for all years.

Figure 7 Share of sectors in category with BI>1; classification I

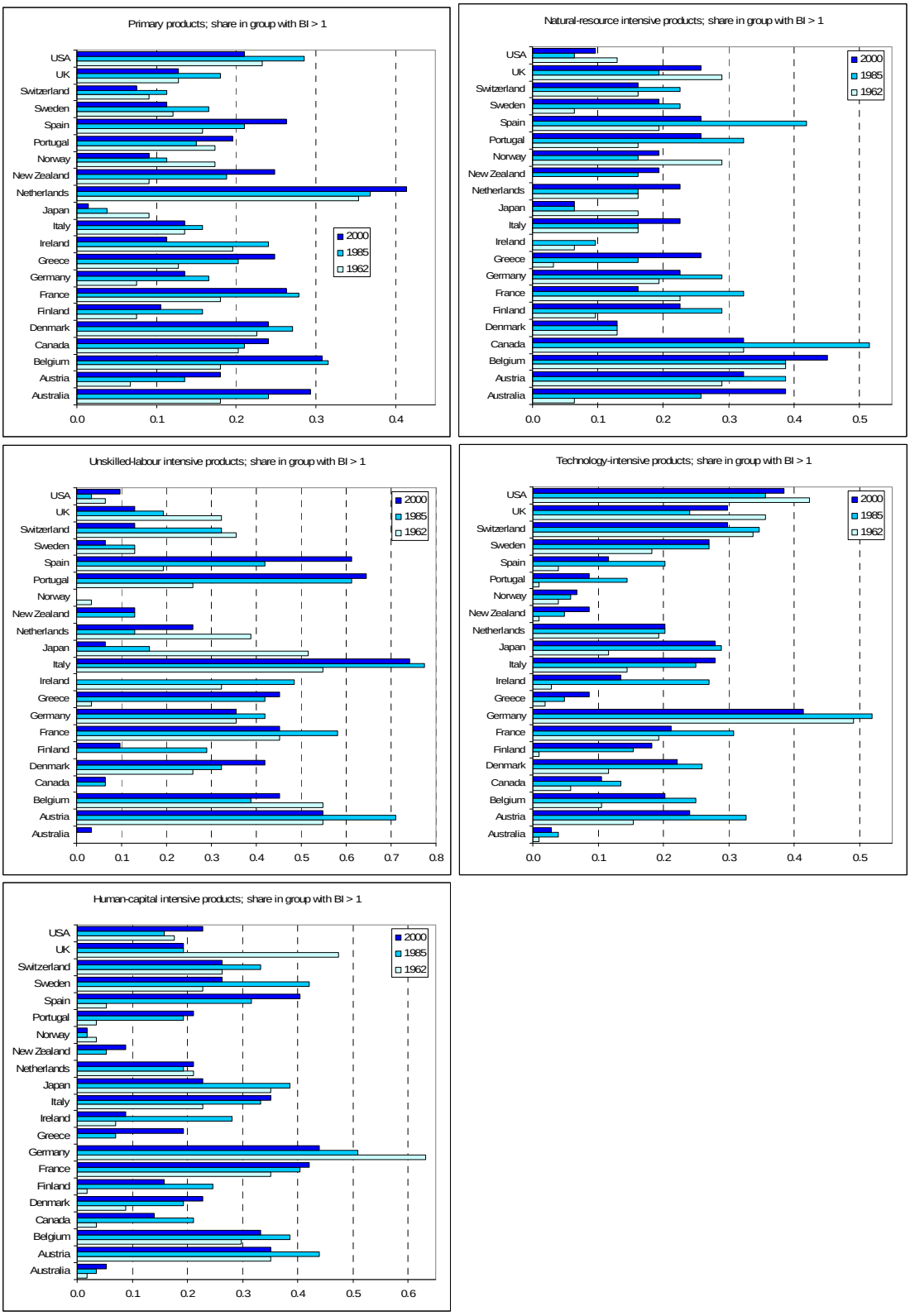


Table 2 Share of sectors in product group with $BI > 1$, classification I

	Primary products			Natural-resource int.			Unskilled-labour int.		
Country	1962	1985	2000	1962	1985	2000	1962	1985	2000
Australia	0.18	0.24	0.29	0.06	0.26	0.39	0.00	0.00	0.03
Austria	0.07	0.14	0.18	0.29	0.39	0.32	0.55	0.71	0.55
Belgium	0.18	0.32	0.31	0.39	0.39	0.45	0.55	0.39	0.45
Canada	0.20	0.21	0.24	0.32	0.52	0.32	0.00	0.06	0.06
Denmark	0.23	0.27	0.24	0.13	0.13	0.13	0.26	0.32	0.42
Finland	0.08	0.16	0.11	0.10	0.29	0.23	0.00	0.29	0.10
France	0.18	0.28	0.26	0.23	0.32	0.16	0.45	0.58	0.45
Germany	0.08	0.17	0.14	0.19	0.29	0.23	0.35	0.42	0.35
Greece	0.13	0.20	0.25	0.03	0.16	0.26	0.03	0.42	0.45
Ireland	0.20	0.24	0.11	0.06	0.10	0.00	0.32	0.48	0.00
Italy	0.14	0.16	0.14	0.16	0.16	0.23	0.55	0.77	0.74
Japan	0.09	0.04	0.02	0.16	0.06	0.06	0.52	0.16	0.06
Netherlands	0.35	0.37	0.41	0.16	0.16	0.23	0.39	0.13	0.26
New Zealand	0.09	0.19	0.25	0.00	0.16	0.19	0.00	0.13	0.13
Norway	0.17	0.11	0.09	0.29	0.16	0.19	0.03	0.00	0.00
Portugal	0.17	0.15	0.20	0.16	0.32	0.26	0.26	0.61	0.65
Spain	0.16	0.21	0.26	0.19	0.42	0.26	0.19	0.42	0.61
Sweden	0.12	0.17	0.11	0.06	0.23	0.19	0.13	0.13	0.06
Switzerland	0.09	0.11	0.08	0.16	0.23	0.16	0.35	0.32	0.13
UK	0.13	0.18	0.13	0.29	0.19	0.26	0.32	0.19	0.13
USA	0.23	0.29	0.21	0.13	0.06	0.10	0.06	0.03	0.10

	Technology int.			Human-capital int.		
Country	1962	1985	2000	1962	1985	2000
Australia	0.01	0.04	0.03	0.02	0.04	0.05
Austria	0.15	0.33	0.24	0.35	0.44	0.35
Belgium	0.11	0.25	0.20	0.30	0.39	0.33
Canada	0.06	0.13	0.11	0.04	0.21	0.14
Denmark	0.12	0.26	0.22	0.09	0.19	0.23
Finland	0.01	0.15	0.18	0.02	0.25	0.16
France	0.19	0.31	0.21	0.35	0.40	0.42
Germany	0.49	0.52	0.41	0.63	0.51	0.44
Greece	0.02	0.05	0.09	0.00	0.07	0.19
Ireland	0.03	0.27	0.13	0.07	0.28	0.09
Italy	0.14	0.25	0.28	0.23	0.33	0.35
Japan	0.12	0.29	0.28	0.35	0.39	0.23
Netherlands	0.19	0.20	0.20	0.21	0.19	0.21
New Zealand	0.01	0.05	0.09	0.00	0.05	0.09
Norway	0.04	0.06	0.07	0.04	0.02	0.02
Portugal	0.01	0.14	0.09	0.04	0.19	0.21
Spain	0.04	0.20	0.12	0.05	0.32	0.40
Sweden	0.18	0.27	0.27	0.23	0.42	0.26
Switzerland	0.34	0.35	0.30	0.26	0.33	0.26
UK	0.36	0.24	0.30	0.47	0.19	0.19
USA	0.42	0.36	0.38	0.18	0.16	0.23

Table 3 Character and dynamics of factor intensity classification I

Country	High BI group	Changes over time
Australia	primary products	gradual rise in primary products
	natural-resource intensive products	gradual rise natural-resource intensive products
Austria	unskilled-labour intensive products	falling unskilled-labour intensive products since 1990
	human-capital intensive products	fall human-capital intensive products since 1981
		peak technology intensive products 1980s
	natural-resource intensive products	rise primary products since 1994
Belgium	all except technology intensive products	rising primary products since 1980s
Canada	natural-resource intensive products	peak around 1985 in natural-resource intensive products
	primary products	peak around 1985 in unskilled-labour intensive products
Denmark	unskilled-labour intensive products	dip in unskilled-labour intensive products after 1985
	primary products	dip in natural-resource intensive products after 1985
Finland	natural-resource intensive products	fall in unskilled-labour intensive products since 1976
	initially also unskilled-labour intensive products	gradual rise in technology intensive products
France	unskilled-labour intensive products	fall in unskilled-labour intensive products after 1985, recovery after 1993
	human-capital intensive products	rise human-capital intensive products 1970-1983
		drop natural-resource intensive products after 1985
		drop technology intensive products after 1985
Germany	human-capital intensive products	gradual erosion human-capital intensive products
		gradual erosion technology intensive products
	technology intensive products	gradual erosion unskilled-labour intensive products
	unskilled-labour intensive products	peak natural-resource intensive products 1973-77 and 1980-86
Greece	unskilled-labour intensive products	rise primary products in 1980s
		rise natural-resource intensive products in 1980s
		rise human-capital intensive products since 1993

Table 3 continued

Country	High BI group	Changes over time
Ireland	unskilled-labour intensive products until 1987	sharp drop unskilled-labour intensive products since 1987
		fall primary products, technology intensive products, and human-capital intensive products since 1992
Italy	unskilled-labour intensive products	rise technology intensive products in 1980s
Japan	human-capital intensive products	gradual fall unskilled-labour intensive products
	technology intensive products	drop human-capital intensive products after 1985
	initially unskilled-labour intensive products	
Netherlands	primary products	rising primary products in 1980s
		fall unskilled-labour intensive products until 1984, rise thereafter
New Zealand	primary products	gradual rise primary products
		rise natural-resource intensive products 1970-74 and since 1989
		dip natural-resource intensive products and unskilled-labour intensive products after 1983
Norway	natural-resource intensive products	falling natural-resource intensive products 1973-84
Portugal	unskilled-labour intensive products	gradual rise unskilled-labour intensive products
		peak technology intensive products, human-capital intensive products, and natural-resource intensive products around 1985
Spain	unskilled-labour intensive products,	fall natural-resource intensive products since 1986
	technology intensive products	rise unskilled-labour intensive products, particularly after 1991
	initially natural-resource intensive products	rise human-capital intensive products 1970-78
		peak technology intensive products around 1985
Sweden	human-capital intensive products	fall human-capital intensive products since 1985
	technology intensive products	fluctuating rise technology intensive products
		long dip natural-resource intensive products after 1983

Table 3 continued

Country	High BI group	Changes over time
Switzerland	technology intensive products	fall unskilled-labour intensive products since 1983
	human-capital intensive products	
	initially unskilled-labour intensive products	
UK	all except primary products	fluctuating fall for all except primary products, with dip after 1980
USA	technology intensive products	rise and fall primary products after 1985
	primary products	

In conjunction with our observation on the peak in structural change in the 1980s, our detailed country descriptions in Table 3 indicate that many countries experience changes in certain categories in the 1980s. Note that these changes are in different sectors and in different directions for the various countries.

Classification II: imitation

An alternative factor abundance classification is used by Yilmaz (2003) in a European Union study on new entrants. The focus here is somewhat more neo-classical in the labour-intensive and capital-intensive categories on the one hand and focuses on the ease or difficulty with which research intensive products can be imitated on the other hand, leading to the following five categories:

- A: raw material intensive – RMI
- B: labour intensive products – LI
- C: capital intensive products – CI
- D: easy-to-imitate research intensive products – ETI
- E: hard-to-imitate research intensive products – HTI

Table 4 shows the distribution of the sectors over the two types of classification. The raw material intensive products are mostly primary products. The labour- and capital-intensive products are more distributed over the other classification I categories. The hard- and easy-to-imitate categories are mostly technology intensive, whera the human-capital intensive goods are either labour-intensive or capital-intensive.

Table 4 Comparability of factor int. classifications (SITC, 3-digit level, % of total)

		Classification I					
		Primary	Nat res	Unskilled	Technol	Hum cap	sum
Classification II	Raw	32.1	0.0	0.0	0.3	0.0	32.4
	Labour	2.8	4.5	8.8	0.9	5.7	22.7
	Capital	2.6	3.4	0.0	0.0	9.4	15.3
	Easy	0.0	0.9	0.0	9.9	0.9	11.6
	Hard	0.0	0.0	0.0	17.6	0.3	17.9
	sum	37.5	8.8	8.8	28.7	16.2	100

Primary = primary products; Nat res = natural-resource intensive products; Unskilled = unskilled-labour intensive products; Technol = technology-intensive products; Hum cap = human-capital intensive products; Raw = raw material intensive products; Labour = labour intensive products; Capital = capital intensive products; Easy = easy-to-imitate research intensive products; Hard = hard-to-imitate research intensive products.

Table 5 provides a similar overview for the various categories for all countries in the years 1962, 1985, and 2000. Table 6 discusses the main strong points for each country using classification II and the main changes over time for these categories. Again we see that many countries experience changes in certain categories in the 1980s, and again these changes are in different sectors and in different directions for the various countries.

Table 5 Share of sectors in product group with $BI > 1$, classification II

	Raw material int			Labour int.			Capital int.		
Country	1962	1985	2000	1962	1985	2000	1962	1985	2000
Australia	0.20	0.26	0.31	0.01	0.05	0.08	0.06	0.13	0.22
Austria	0.07	0.11	0.18	0.43	0.55	0.44	0.20	0.37	0.30
Belgium	0.17	0.32	0.32	0.40	0.34	0.35	0.35	0.50	0.43
Canada	0.24	0.24	0.27	0.05	0.18	0.10	0.15	0.28	0.22
Denmark	0.26	0.29	0.25	0.18	0.26	0.31	0.06	0.17	0.15
Finland	0.09	0.15	0.11	0.04	0.25	0.13	0.02	0.30	0.19
France	0.18	0.27	0.27	0.36	0.43	0.28	0.33	0.44	0.44
Germany	0.08	0.16	0.12	0.36	0.45	0.34	0.41	0.39	0.41
Greece	0.11	0.20	0.26	0.05	0.24	0.34	0.04	0.13	0.20
Ireland	0.19	0.24	0.11	0.23	0.36	0.04	0.04	0.20	0.07
Italy	0.12	0.16	0.13	0.41	0.51	0.50	0.13	0.22	0.28
Japan	0.09	0.04	0.01	0.41	0.18	0.09	0.13	0.22	0.13
Netherlands	0.35	0.39	0.44	0.30	0.14	0.18	0.19	0.26	0.30
New Zealand	0.10	0.21	0.26	0.01	0.14	0.15	0.00	0.04	0.11
Norway	0.18	0.13	0.11	0.09	0.01	0.01	0.11	0.11	0.13
Portugal	0.18	0.15	0.20	0.16	0.45	0.45	0.07	0.11	0.09
Spain	0.17	0.21	0.28	0.15	0.38	0.40	0.11	0.35	0.37
Sweden	0.12	0.18	0.12	0.14	0.23	0.15	0.19	0.35	0.24
Switzerland	0.07	0.07	0.07	0.33	0.38	0.21	0.15	0.24	0.17
UK	0.11	0.18	0.11	0.35	0.18	0.18	0.41	0.26	0.22
USA	0.23	0.30	0.20	0.11	0.11	0.18	0.20	0.13	0.19

	Easy-to-Imitate research int.			Difficult-to-Imitate research int.		
Country	1962	1985	2000	1962	1985	2000
Australia	0.02	0.05	0.07	0.00	0.03	0.02
Austria	0.07	0.22	0.12	0.24	0.38	0.29
Belgium	0.10	0.37	0.39	0.10	0.13	0.08
Canada	0.10	0.17	0.07	0.03	0.11	0.11
Denmark	0.02	0.15	0.15	0.17	0.30	0.27
Finland	0.00	0.15	0.15	0.02	0.14	0.21
France	0.27	0.41	0.32	0.10	0.21	0.16
Germany	0.46	0.39	0.27	0.56	0.56	0.46
Greece	0.02	0.02	0.05	0.02	0.05	0.06
Ireland	0.00	0.27	0.24	0.03	0.24	0.06
Italy	0.17	0.10	0.10	0.11	0.30	0.37
Japan	0.15	0.20	0.17	0.14	0.41	0.41
Netherlands	0.29	0.39	0.37	0.14	0.05	0.11
New Zealand	0.02	0.05	0.07	0.00	0.05	0.10
Norway	0.05	0.07	0.07	0.03	0.03	0.03
Portugal	0.02	0.20	0.07	0.00	0.11	0.13
Spain	0.05	0.24	0.10	0.02	0.13	0.13
Sweden	0.10	0.17	0.15	0.24	0.33	0.32
Switzerland	0.20	0.27	0.17	0.43	0.40	0.38
UK	0.27	0.29	0.41	0.41	0.16	0.22
USA	0.39	0.27	0.29	0.43	0.38	0.44

Table 6 Character and dynamics of factor intensity classification II

Country	High BI group	Changes over time
Australia	raw material intensive products	rise raw material intensive products since 1980
		gradual rise capital intensive products
Austria	labour intensive products	rise easy-to-imitate products 1970-80, fall since 1990s
	hard-to-imitate products	
	capital intensive products	rise raw material intensive products since 1994
		peak hard-to-imitate products and capital intensive products around 1985
Belgium	capital intensive products	rise raw material intensive products 1970-85
	easy-to-imitate products	rise easy-to-imitate products 1970-80
Canada	capital intensive products	dip labour intensive products after 1986
	raw material intensive products	
Denmark	raw material intensive products	gradual rise easy-to-imitate products
		peak raw material intensive products after 1985
	hard-to-imitate products	
	labour intensive products	
Finland	intially labour intensive products	fall labour intensive products since 1976
		fluctuations capital intensive products
		sharp peak easy-to-imitate products around 1991
France	capital intensive products	rise capital intensive products 1970-84
	initially labour intensive products	peak easy-to-imitate products 1985
		fall labour intensive products since 1985
Germany	hard-to-imitate products	fall hard-to-imitate products since 1988; fall labour intensive products since 1986; rise raw material intensive products 1970-83 and peak in 1993
Greece	labour intensive products	gradual rise labour intensive products
		rise raw material intensive products since 1977
		rise capital intensive products since 1981
Ireland	easy-to-imitate products	rise easy-to-imitate products 1970-93
	initially labour intensive products	sharp drop labour intensive products since 1987
		fall raw material intensive products, capital intensive products and hard-to-imitate products since 1991
Italy	labour intensive products	gradual rise hard-to-imitate products
		gradual rise capital intensive products

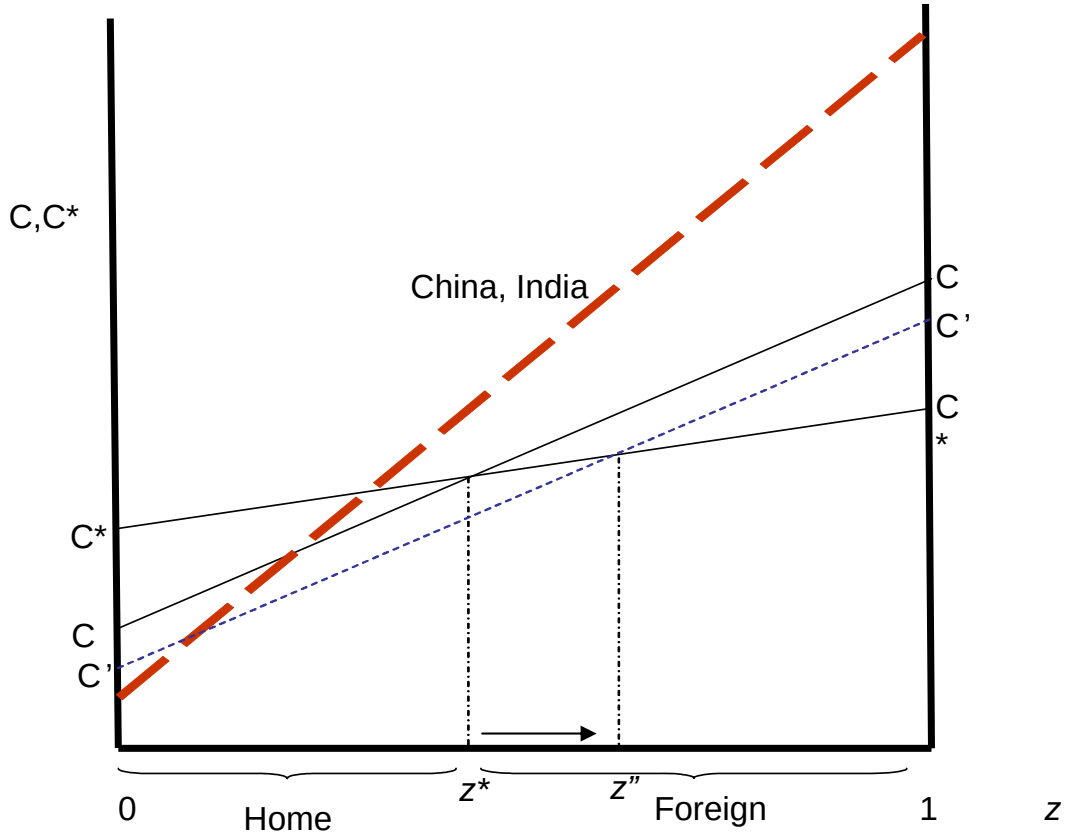
Table 6 continued

Country	High BI group	Changes over time
Japan	hard-to-imitate products	rise hard-to-imitate products 1970-83
	initially labour intensive products	gradual fall labour intensive products
Netherlands	raw material intensive products	gradual rise raw material intensive products
		gradual rise capital intensive products
	easy-to-imitate products	fall easy-to-imitate products 1971-83, sharp rise 1983-86
New Zealand	raw material intensive products	gradual rise raw material intensive products
		rise labour intensive products 1970-80
Norway	raw material intensive products	gradual fall raw material intensive products
		fall labour intensive products 1976-84
Portugal	labour intensive products	gradual rise labour intensive products
Spain	labour intensive products	rise labour intensive products 1970-78, dip after 1988
	capital intensive products	rise capital intensive products 1970-78, dip after 1985
Sweden	hard-to-imitate products	rise hard-to-imitate products 1970-78
	capital intensive products	
Switzerland	hard-to-imitate products	fall labour intensive products after 1985
	initially labour intensive products	
UK	easy-to-imitate products	fall hard-to-imitate products since 1978
	capital intensive products	fall labour intensive products since 1978
	initially hard-to-imitate products and labour intensive products	fall capital intensive products since 1978
		dip in all except raw material intensive products after 1980
USA	hard-to-imitate products	dip in hard-to-imitate products after 1984
		rise capital intensive products 1985-88
		dip easy-to-imitate products after 1991
		fall raw material intensive products after 1992

5 Possible explanations of structural change

We have seen drastic structural change taking place in the 1980s. This section discusses three possible causes for this peak in structural changes, namely (i) competition from low-wage countries, (ii) deregulation in OECD countries, and (iii) nominal – real interactions through exchange rate movements.

Figure 8 A model of a continuum of goods

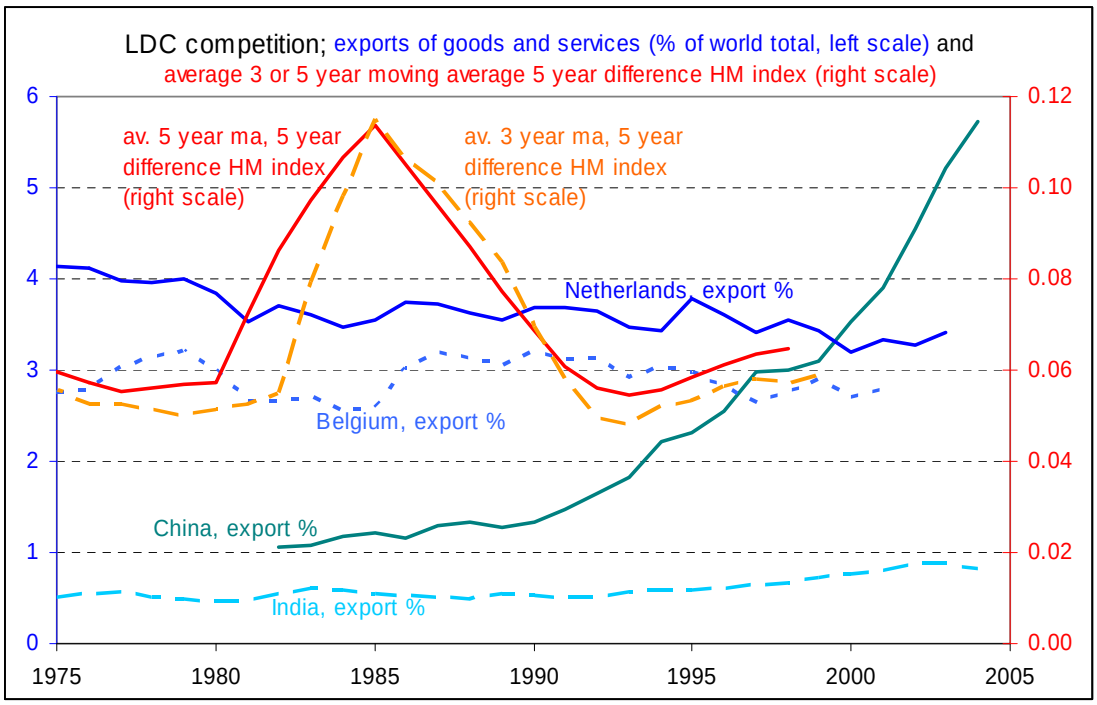


5.1 Competition from low-wage countries

A natural candidate to explain these shifts is an application of the Dornbusch, Fischer, Samuelson (1977) model. The model has two attractive properties: (i) it does not assume factor price equalization (FPE), and (ii) it allows for a greater number of products than factors of production. If FPE does not hold the pattern of trade is determined. The model can easily be summarized by Figure 8. Along the horizontal axis we have a variable z that indicates the range of goods by increasing order of capital or skill intensity, the index is normalized between 0 and 1. The C, and C^* are unit cost functions for Home and Foreign, that are functions of factor prices and z. If we assume that Foreign is relatively skill abundant the slope of C is larger than C^* (skill intensive products become more expensive in 'skill-poor' Home). The restrictions on the cost functions are limited (they do not even have to be continuous),

but we assume them to be well-behaved as is shown in Figure 8. Concentrate on the CC, and C*C* lines. Home is relative unskilled abundant and has lower unit costs in commodities that make intensive use of unskilled production factors, as products become more skill-intensive the cost advantage of Home is lost and Foreign becomes a producer and exporter of goods that have a higher index than z* - that is determined by the intersection point. In a dynamic world all kind of economic changes can happen, and two of these are illustrated in Figure 8. First, caused by changes in factor prices the unit cost curves can shift up- or downwards. Figure 8 illustrates a downward shift of the cost curve *CC* to *C'C'*. Due to cost decreases the range of commodities that can competitively be supplied increases for Home, as indicated by *z"*. Another possibility is an additional competitor on the world market, as indicated by the bold, dashed line 'China, India'. New entrants into the world market with different factor prices than incumbent trading partners might capture a part of world exports. As illustrated, un-skilled intensive sectors are captured by the new entrants. Obviously the exact combination of shifts determines changing trade patterns.

Figure 9 Structural change and competition from low-wage countries



The reported difference is backward in time, the moving average is centred in the middle. The export percentages (goods and services) are calculated based on data from the World Development Indicators.

Figure 9 provides an aggregate indicator for the degree of structural change in all countries by reporting the (centered) 3- and 5-year moving average of the 5-year difference HM indices. The peak in the 1980s is clear, as are the slight increases at the beginning and the end of the time frame in the figure. Figure 9 also illustrates why we do not think the "competition from low-wage countries" theory is very convincing as the main initiator of structural change in the 1980s by indicating the share of world trade for four countries, namely China and India as by far the largest upcoming low-wage competiton countries, and Belgium and the Netherlands as two small country nobody evidently thinks are substantial enough to cause large structural changes in other countries. In 1982 China exported 1.07% of the world total and India 0.55%. This is substantially smaller than the exports of both Belgium (2.67%) and the Netherlands (3.71%). Indeed, the *combined* exports of India and China were smaller than Belgian exports until 1996 and smaller than Dutch exports until 1997, while Chinese exports exceeded Dutch exports for the first time in the new millennium. The trade flows from China and India in the 1980s and 1990s are simply not substantial enough to be the main economic driver for structural change in the OECD countries.

5.2 Deregulation in OECD countries

Following the second oil crisis in 1989/90 industrial countries faced one of the deepest recessions in the post-WWII period. Some governments reacted by a more favorable attitude towards market mechanisms, while others avoided implementing market oriented policies. In general, market competition was stimulated in the OECD economies starting in the 1980s, as Nicoletti and Scarpetta (2003) and Conway and Nicoletti (2006) extensively document. Given the extent of these deregulation policies it might be expected that the sector composition of OECD exports is affected by these deregulations, which also have a bearing on international trade flows. However, we think that these system-wide changes cannot be the main explanation for our findings.

Although the deregulation reforms were OECD-wide, the pace at which the deregulation policies were or are implemented, the extent of the policies, and the industries that were targetted differ markedly between OECD countries. Nicoletti and Scarpetta (2003) find that increased competition, indeed, favors productivity increases and possible changes in comparative advantage. Reducing, for example, the share of state-controlled firms and stimulating productivity. However, in Finland, Greece,

Austria, France, and Italy a relatively large share of sectors is still publicly controlled, which negatively affects productivity increases. Also a reduction in entry barriers positively effects productivity. In Portugal, Greece and Italy a reduction in these entry barriers boosted productivity by 0.2% points. The same holds for the removal of administrative barriers in Germany, France, Italy and Greece, which also boosted productivity by 0.2%. Although reforms in some countries started during the supply-side revolution in the 1980s (Thatcher in the UK, for example), it is difficult to pin-point an exact date for the effects of these reforms to take place, notably as some of the reforms were initiated much later (think of the European Single Market program since 1992) and continue up to this date. Furthermore, as shown by Bernard et al. (2009), trade liberalization is more likely to effect the (export) product characteristics of firms than average total exports.

5.3 Nominal-real interaction and the exchange rate[11]

The *real* (bilateral) exchange rate between two countries A and B, say q_t, is the difference between the nominal exchange rate and the price indices of the two countries: $q_t \equiv s_t - (p_{B,t} - p_{A,t})$. This real exchange rate provides a measure of the deviation from purchasing power parity (PPP) between the two countries. As such, the real bilateral exchange rate is a measure of the evolution of one country's competitiveness (broadly measured) relative to another country. The real *effective* exchange rate calculates a weighted average of the bilateral real exchange rates. It plays an important role in policy analysis as an indicator of the competitiveness of domestic relative to foreign goods and the demand for domestic and foreign currency assets. As the real effective exchange rate is an index, the focus is on changes of the index relative to some base year, that is the policy focus is on relative and not absolute PPP.

The fall of the Shah of Iran in 1979 initiated a second oil shock, with prices rising rapidly from \$13 to \$32 per barrel.[12] This led to high inflation rates and a sharp recession with high unemployment rates in the oil importing countries, including the United States. In October 1979 Paul Volcker, Chairman of the Federal Reserve,

[11] Part of the discussion in this sub-section is based on van Marrewijk (2007, Chs 20 and 23).
[12] The first oil shock was in 1973.

announced a tightening of monetary policy to fight inflation. Ronald Reagan was elected president in November 1980 and kept his promise to lower taxes starting in 1981 (he also promised to balance the budget, but that is another matter). The combined effects of the tight monetary policy, high interest rates, and the fiscal expansion started to drive the value of the US dollar up on the foreign exchange markets from 1981 onwards, see Figure 10. The appreciation of the dollar made it easier to fight inflation, so monetary policy could be relaxed. Together with the continued fiscal expansion, the American economy started to grow rapidly and unemployment fell, which in turn led to a further appreciation of the dollar. Eventually, the dollar would reach its maximum real value in February 1985, about 46 per cent higher than it had been in June 1980. In the course of 1985 it was clear that the dollar was overvalued, which contributed to the American economic slow down which had started in 1984 and to mounting protectionist pressure in America. On 22 September 1985 the Reagan Administration no longer ignored this link between the strong dollar and mounting protectionism and announced at a meeting in the Plaza Hotel in New York that the Group of Five (G-5 = USA, Japan, Germany, Britain, and France) countries would jointly intervene in the foreign exchange market to reduce the value of the dollar. This led to a sharp fall the next day, which continued for about one and a half year until February 1987 when the real value of the dollar had reached a level about 30 per cent below its peak level of two years earlier. In a new meeting at the Louvre in Paris the G-5 declared that the dollar was “broadly consistent with underlying economic fundamentals”. For a while there was an implicit agreement to intervene in the foreign exchange market if the dollar would move outside of a band of plus or minus 5 per cent of certain parity rates relative to Germany and Japan. This period ended with the US stock market crash in October 1987, driving the real value of the dollar down until it reached a level in March 1988 about similar to the level it had been in December 1980.

Figure 10 Nominal-real interactions and structural change

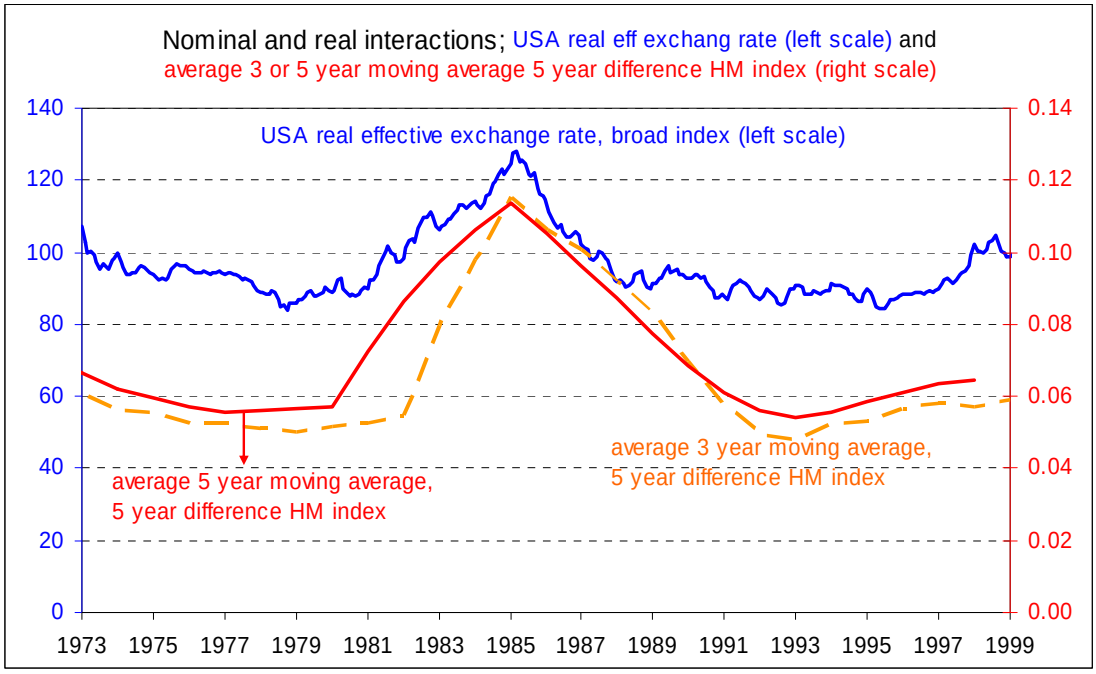


Figure 10 illustrates both the rise and fall in the real value of the american dollar and the virtually coinciding peak in structural adjustments in the OECD countries. Note that the real value of the dollar is also high at the beginning and the end of the period in Figure 10, again coinciding with higher structural adjustments in these periods. Supporting the view that fluctuation in the real exchange rate, caused by nominal rigidities and delays in exchange rate pass through, is the main candidate for the peak in structural adjustments, is the fact that different types of sectors are hurting or benefiting in different countries, see section 4. In view of the large swings in the real value of the dollar in the past couple of years, it is to be expected on the basis of this discussion that many sectors in the OECD countries are currently again going through substantial structural change.

6 Conclusion

In the post-war period, the goods composition of trade in OECD countries has changed considerably. We analyze the evolution of comparative advantage using a detailed trade data set and a new analytical tool: the harmonic (weighted) mass index, which enables us to identify periods of structural change. We then analyze which forces may be responsible for the main structural changes, which primarily took place in many OECD countries in the mid 1980s. We argue that neither the rise of China

and India nor the deregulation programs in many OECD countries is likely to have been the main cause. Instead, the interaction between the real and monetary economy (possibly fuelled by nominal rigidities and delays in exchange rate pass through) as measured by the large swing in the real effective exchange rate of the dollar in the 1980s is our primary candidate. In view of similar recent large swings, we argue it is likely that the OECD countries will again go through substantial structural adjustments in the near future.

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Appendix A Concordance of factor abundance groups

001	A	LIVE ANIMALS CHIEFLY FOR FOOD
011	A	MEAT,EDIBLE MEAT OFFALS, FRESH, CHILLED OR FROZEN
012	A	MEAT& EDIBLE OFFALS,SALTED,IN BRINE,DRIED/SMOKED
014	A	MEAT& EDIB.OFFALS,PREPJPRES.,FISH EXTRACTS
022	A	MILK AND CREAM
023	A	BUTTER
024	A	CHEESE AND CURD
025	A	EGGS AND YOLKS,FRESH,DRIED OR OTHERWISE PRESERVED
034	A	FISH,FRESH (LIVE OR DEAD),CHILLED OR FROZEN
035	A	FISH,DRIED,SALTED OR IN BRINE; SMOKED FISH
036	A	CRUSTACEANS AND MOLLUSCS,FRESH,CHILLED,FROZEN ETC
037	A	FISH,CRUSTACEANS AND MOLLUSCS,PREPAR. OR PRESERV.
041	A	WHEAT (INCLUDING SPELT) AND MESLIN, UNMILLED
042	A	RICE
043	A	BARLEY,UNMILLED
044	A	MAIZE (CORN),UNMILLED
045	A	CEREALS,UNMILLED (NO WHEAT,RICE,BARLEY OR MAIZE)
046	A	MEAL AND FLOUR OF WHEAT AND FLOUR OF MESLIN
047	A	OTHER CEREAL MEALS AND FLOURS
048	A	CEREAL PREPAR. & PREPS. OF FLOUR OF FRUITS OR VEG.
054	A	VEGETAB.,FRESH,CHILLED,FROZEN/PRES.;ROOTS,TUBERS
056	A	VEGETAB.,ROOTS & TUBERS,PREPARED/PRESERVED,N.E.S.
057	A	FRUIT & NUTS(NOT INCLUD. OIL NUTS),FRESH OR DRIED
058	A	FRUIT,PRESERVED,AND FRUIT PREPARATIONS
061	A	SUGAR AND HONEY
062	A	SUGAR CONFECTIONERY AND OTHER SUGAR PREPARATIONS
071	A	COFFEE AND COFFEE SUBSTITUTES
072	A	COCOA
073	A	CHOCOLATE & OTHER FOOD PREPTNS. CONTAINING COCOA
074	A	TEA AND MATE
075	A	SPICES
081	A	FEED.STUFF FOR ANIMALS(NOT INCL.UNMILLED CEREALS)
091	A	MARGARINE AND SHORTENING
098	A	EDIBLE PRODUCTS AND PREPARATIONS N.E.S.
111	A	NON ALCOHOLIC BEVERAGES,N.E.S.
112	A	ALCOHOLIC BEVERAGES
121	A	TOBACCO,UNMANUFACTURED; TOBACCO REFUSE
122	A	TOBACCO MANUFACTURED
211	A	HIDES AND SKINS (EXCEPT FURSKINS), RAW
212	A	FURSKINS, RAW (INCLUD.ASTRAKHAN,CARACUL, ETC.)
222	A	OIL SEEDS AND OLEAGINOUS FRUIT,WHOLE OR BROKEN
223	A	OILS SEEDS AND OLEAGINOUS FRUIT, WHOLE OR BROKEN
232	A	NATURAL RUBBER LATEX; NAT.RUBBER & SIM.NAT.GUMS
233	A	SYNTH.RUBB.LAT.;SYNTH.RUBB.& RECLAIMED;WASTE SCRAP
244	A	CORK,NATURAL,RAW & WASTE (INCLUD.IN BLOCKS/SHEETS)
245	A	FUEL WOOD (EXCLUDING WOOD WASTE) AND WOOD CHARCO
246	A	PULPWOOD (INCLUDING CHIPS AND WOOD WASTE)
247	A	OTHER WOOD IN THE ROUGH OR ROUGHLY SQUARED
248	A	WOOD,SIMPLY WORKED,AND RAILWAY SLEEPERS OF WOOD
251	A	PULP AND WASTE PAPER
261	A	SILK
263	A	COTTON
264	A	JUTE & OTHER TEXTILE BAST FIBRES,NES,RAW/PROCESSED

265	A	VEGETABLE TEXTILE FIBRES AND WASTE OF SUCH FIBRES
266	A	SYNTHETIC FIBRES SUITABLE FOR SPINNING
267	A	OTHER MAN-MADE FIBRES SUITABL.FOR SPINNING & WASTE
268	A	WOOL AND OTHER ANIMAL HAIR (EXCLUDING WOOL TOPS)
269	A	OLD CLOTHING AND OTHER OLD TEXTILE ARTICLES; RAGS
271	A	FERTILIZERS,CRUDE
273	A	STONE,SAND AND GRAVEL
274	A	SULPHUR AND UNROASTED IRON PYRITES
277	A	NATURAL ABRASIVES,N.E.S (INCL.INDUSTRIAL DIAMONDS)
278	A	OTHER CRUDE MINERALS
281	A	IRON ORE AND CONCENTRATES
282	A	WASTE AND SCRAP METAL OF IRON OR STEEL
286	A	ORES AND CONCENTRATES OF URANIUM AND THORIUM
287	A	ORES AND CONCENTRATES OF BASE METALS, N.E.S.
288	A	NON-FERROUS BASE METAL WASTE AND SCRAP, N.E.S.
289	A	ORES & CONCENTRATES OF PRECIOUS METALS;WASTE,SCRA
291	A	CRUDE ANIMAL MATERIALS,N.E.S.
292	A	CRUDE VEGETABLE MATERIALS, N.E.S.
322	A	COAL,LIGNITE AND PEAT
323	A	BRIQUETTES;COKE AND SEMI-COKE OF COAL,LIGNITE/PEAT
333	A	PETROL.OILS & CRUDE OILS OBT.FROM BITUMIN.MINERALS
334	A	PETROLEUM PRODUCTS,REFINED
335	A	RESIDUAL PETROLEUM PRODUCTS,NES.& RELAT.MATERIALS
341	A	GAS,NATURAL AND MANUFACTURED
351	A	ELECTRIC CURRENT
411	A	ANIMAL OILS AND FATS
423	A	FIXED VEGETABLE OILS,SOFT,CRUDE,REFINED/PURIFIED
424	A	OTHER FIXED VEGETABLE OILS,FLUID OR SOLID,CRUDE
431	A	ANIMAL & VEGETABLE OILS AND FATS,PROCESSED & WAXES
511	D	HYDROCARBONS NES,& THEIR HALOGEN.& ETC.DERIVATIVES
512	D	ALCOHOLS,PHENOLS,PHENOL-ALCOHOLS,& THEIR DERIVAT.
513	D	CARBOXYLIC ACIDS,& THEIR ANHYDRIDES,HALIDES,ETC.
514	D	NITROGEN
515	D	ORGANO-INORGANIC AND HETEROCYCLIC COMPOUNDS
516	D	OTHER ORGANIC CHEMICALS
522	D	INORGANIC CHEMICAL ELEMENTS,OXIDES & HALOGEN SALTS
523	D	OTHER INORGANIC CHEMICALS
524	B	RADIO-ACTIVE AND ASSOCIATED MATERIALS
531	E	SYNTH.ORG.DYESTUFFS,ETC.NAT.INDIGO & COLOUR LAKES
532	E	DYEING & TANNING EXTRACTS;SYNTH.TANNING MATERIALS
533	E	PIGMENTS,PAINTS,VARNISHES & RELATED MATERIALS
541	D	MEDICINAL AND PHARMACEUTICAL PRODUCTS
551	E	ESSENTIAL OILS,PERFUME AND FLAVOUR MATERIALS
553	E	PERFUMERY,COSMETICS AND TOILET PREPARATIONS
554	E	SOAP,CLEANSING AND POLISHING PREPARATIONS
562	D	FERTILIZERS,MANUFACTURED
572	D	EXPLOSIVES AND PYROTECHNIC PRODUCTS
582	D	CONDENSATION,POLYCONDENSATION & POLYADDITION PROD
583	D	POLYMERIZATION AND COPOLYMERIZATION PRODUCTS
584	D	REGENERATED CELLULOSE;CELLULOSE NITRATE,ETC.
585	D	OTHER ARTIFICIAL RESINS AND PLASTIC MATERIALS
591	D	DISINFECTANTS,INSECTICIDES,FUNGICIDESWEED KILLERS
592	D	STARCHES,INULIN &WHEAT GLUTEN;ALBUMINOIDAL SUBST.
598	D	MISCELLANEOUS CHEMICAL PRODUCTS,N.E.S.

611	B	LEATHER
612	B	MANUFACTURES OF LEATHER/OF COMPOSITION LEATHER NES
613	B	FURSKINS,TANNED/DRESSED,PIECES/CUTTINGS OF FURSKIN
621	E	MATERIALS OF RUBBER(E.G.,PASTES.PLATES,SHEETS,ETC)
625	E	RUBBER TYRES,TYRE CASES,ETC.FOR WHEELS
628	E	ARTICLES OF RUBBER,N.E.S.
633	B	CORK MANUFACTURES
634	B	VENEERS,PLYWOOD,IMPROVED OR RECONSTITUTED WOOD
635	B	WOOD MANUFACTURES,N.E.S.
641	E	PAPER AND PAPERBOARD
642	E	PAPER AND PAPERBOARD,CUT TO SIZE OR SHAPE
651	C	TEXTILE YARN
652	C	COTTON FABRICS,WOVEN
653	C	FABRICS,WOVEN,OF MAN-MADE FIBRES
654	C	TEXTIL.FABRICS,WOVEN,OTH.THAN COTTON/MAN-MADE FIBR
655	C	KNITTED OR CROCHETED FABRICS
656	C	TULLE,LACE,EMBROIDERY,RIBBONS,& OTHER SMALL WARES
657	C	SPECIAL TEXTILE FABRICS AND RELATED PRODUCTS
658	C	MADE-UP ARTICLES,WHOLLY/CHIEFLY OF TEXT.MATERIALS
659	C	FLOOR COVERINGS,ETC.
661	B	LIME,CEMENT,AND FABRICATED CONSTRUCTION MATERIALS
662	B	CLAY CONSTRUCT.MATERIALS & REFRACTORY CONSTR.MATE
663	B	MINERAL MANUFACTURES,N.E.S
664	C	GLASS
665	C	GLASSWARE
666	C	POTTERY
667	B	PEARLS,PRECIOUS& SEMI-PREC.STONES,UNWORK./WORKED
671	B	PIG IRON,SPIEGELEISEN,SPONGE IRON,IRON OR STEEL
672	E	INGOTS AND OTHER PRIMARY FORMS,OF IRON OR STEEL
673	E	IRON AND STEEL BARS,RODS,ANGLES.SHAPES & SECTIONS
674	E	UNIVERSALS,PLATES AND SHEETS,OF IRON OR STEEL
675	E	HOOP & STRIP,OF IRON/STEEL,HOT-ROLLED/COLD-ROLLED
676	E	RAILS AND RAILWAY TRACK CONSTRUCTION MATERIAL
677	E	IRON/STEEL WIRE/WHETH/NOT COATED,BUT NOT INSULATED
678	E	TUBES,PIPES AND FITTINGS,OF IRON OR STEEL
679	E	IRON & STEEL CASTINGS,FORGINGS & STAMPINGS;ROUGH
681	B	SILVER,PLATINUM & OTH.METALS OF THE PLATINUM GROUP
682	B	COPPER
683	B	NICKEL
684	B	ALUMINIUM
685	B	LEAD
686	B	ZINC
687	B	TIN
688	B	URANIUM DEPLETED IN U235 & THORIUM,& THEIR ALLOYS
689	B	MISCELL.NON-FERROUS BASE METALS EMPLOY.IN METALLGY
691	E	STRUCTURES& PARTS OF STRUC.;IRON,STEEL,ALUMINIUM
692	E	METAL CONTAINERS FOR STORAGE AND TRANSPORT
693	E	WIRE PRODUCTS AND FENCING GRILLS
694	E	NAILS,SCREWS,NUTS,BOLTS ETC.OF IRON.STEEL,COPPER
695	E	TOOLS FOR USE IN HAND OR IN MACHINES
696	E	CUTLERY
697	E	HOUSEHOLD EQUIPMENT OF BASE METAL,N.E.S.
699	E	MANUFACTURES OF BASE METAL,N.E.S.
711	D	STEAM & OTHER VAPOUR GENERATING BOILERS & PARTS

712	D	STEAM & OTHER VAPOUR POWER UNITS,STEAM ENGINES
713	D	INTERNAL COMBUSTION PISTON ENGINES& PARTS
714	D	ENGINES & MOTORS,NON-ELECTRIC
716	D	ROTATING ELECTRIC PLANT AND PARTS
718	D	OTHER POWER GENERATING MACHINERY AND PARTS
721	D	AGRICULTURAL MACHINERY AND PARTS
722	D	TRACTORS FITTED OR NOT WITH POWER TAKE-OFFS, ETC.
723	D	CIVIL ENGINEERING & CONTRACTORS PLANT AND PARTS
724	D	TEXTILE & LEATHER MACHINERY AND PARTS
725	D	PAPER & PULP MILL MACH.,MACH FOR MANUF.OF PAPER
726	D	PRINTING & BOOKBINDING MACH.AND PARTS
727	D	FOOD PROCESSING MACHINES AND PARTS
728	D	MACH.& EQUIPMENT SPECIALIZED FOR PARTICULAR IND.
736	D	MACH.TOOLS FOR WORKING METAL OR MET.CARB., PARTS
737	D	METAL WORKING MACHINERY AND PARTS
741	D	HEATING & COOLING EQUIPMENT AND PARTS
742	D	PUMPS FOR LIQUIDS.LIQ.ELEVATORS AND PARTS
743	D	PUMPS & COMPRESSORS,FANS & BLOWERS,CENTRIFUGES
744	D	MECHANICAL HANDLING EQUIP.AND PARTS
745	D	OTHER NON-ELECTRICAL MACH.TOOLS,APPARATUS & PARTS
749	D	NON-ELECTRIC PARTS AND ACCESSORIES OF MACHINES
751	D	OFFICE MACHINES
752	D	AUTOMATIC DATA PROCESSING MACHINES & UNITS THEREOF
759	D	PARTS OF AND ACCESSORIES SUITABLE FOR 751--OR 752-
761	E	TELEVISION RECEIVERS
762	E	RADIO-BROADCAST RECEIVERS
763	E	GRAMOPHONES,DICTATING,SOUND RECORDERS ETC
764	D	TELECOMMUNICATIONS EQUIPMENT AND PARTS
771	D	ELECTRIC POWER MACHINERY AND PARTS THEREOF
772	D	ELECT.APP.SUCH AS SWITCHES,RELAYS,FUSES,PWGS ETC.
773	D	EQUIPMENT FOR DISTRIBUTING ELECTRICITY
774	D	ELECTRIC APPARATUS FOR MEDICAL PURPOSES,(RADIOLOG)
775	D	HOUSEHOLD TYPE,ELECT.& NON-ELECTRICAL EQUIPMENT
776	D	THERMIONIC,COLD & PHOTO-CATHODE VALVES,TUBES,PARTS
778	D	ELECTRICAL MACHINERY AND APPARATUS,N.E.S.
781	E	PASSENGER MOTOR CARS,FOR TRANSPORT OF PASS.& GOOD
782	E	MOTOR VEHICLES FOR TRANSPORT OF GOODS/MATERIALS
783	E	ROAD MOTOR VEHICLES,N.E.S.
784	E	PARTS & ACCESSORIES OF 722-,781--,782-,783-
785	E	MOTORCYCLES,MOTOR SCOOTERS,INVALID CARRIAGES
786	E	TRAILERS & OTHER VEHICLES,NOT MOTORIZED
791	E	RAILWAY VEHICLES & ASSOCIATED EQUIPMENT
792	D	AIRCRAFT & ASSOCIATED EQUIPMENT AND PARTS
793	C	SHIPS,BOATS AND FLOATING STRUCTURES
812	C	SANITARY,PLUMBING,HEATING,LIGHTING FIXTURES
821	C	FURNITURE AND PARTS THEREOF
831	C	TRAVEL GOODS,HANDBAGS,BRIEF-CASES,PURSES,SHEATHS
842	C	OUTER GARMENTS,MENS,OF TEXTILE FABRICS
843	C	OUTER GARMENTS,WOMENS,OF TEXTILE FABRICS
844	C	UNDER GARMENTS OF TEXTILE FABRICS
845	C	OUTER GARMENTS AND OTHER ARTICLES,KNITTED
846	C	UNDER GARMENTS,KNITTED OR CROCHETED
847	C	CLOTHING ACCESSORIES OF TEXTILE FABRICS
848	C	ART.OF APPAREL & CLOTHING ACCESSORIES,NO TEXTILE

851	C	FOOTWEAR
871	D	OPTICAL INSTRUMENTS AND APPARATUS
872	D	MEDICAL INSTRUMENTS AND APPLIANCES
873	D	METERS AND COUNTERS,N.E.S.
874	D	MEASURING,CHECKING,ANALYSING INSTRUMENTS
881	D	PHOTOGRAPHIC APPARATUS AND EQUIPMENT,N.E.S.
882	D	PHOTOGRAPHIC & CINEMATOGRAPHIC SUPPLIES
883	D	CINEMATOGRAPH FILM,EXPOSED-DEVELOPED,NEG.OR POS.
884	D	OPTICAL GOODS,N.E.S.
885	E	WATCHES AND CLOCKS
892	E	PRINTED MATTER
893	D	ARTICLES OF MATERIALS DESCRIBED IN DIVISION 58
894	C	BABY CARRIAGES,TOYS,GAMES AND SPORTING GOODS
895	C	OFFICE AND STATIONERY SUPPLIES,N.E.S.
896	E	ART,COLLECTORS PIECES & ANTIQUES
897	E	JEWELLERY,GOLDSMITHS AND OTHER ART. OF PRECIOUS M.
898	E	MUSICAL INSTRUMENTS,PARTS AND ACCESSORIES
899	E	OTHER MISCELLANEOUS MANUFACTURED ARTICLES
941	A	ANIMALS,LIVE,N.E.S.,INCL. ZOO-ANIMALS
951	D	ARMOURED FIGHTING VEHICLES,ARMS OF WAR & AMMUNIT.

Figure A.1 Evolution of factor abundance; share in group with $BI_s^c > 1$

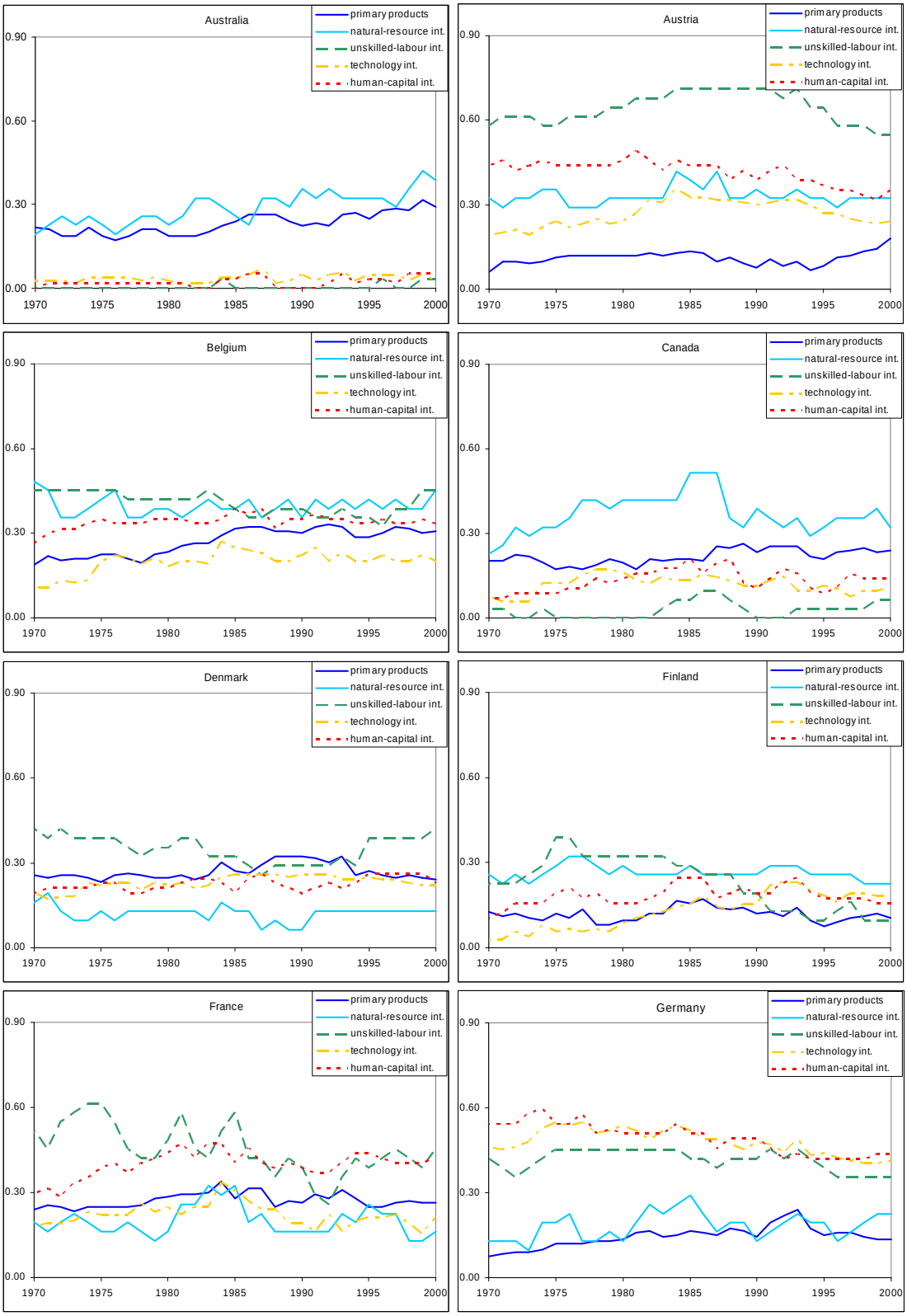


Figure A.1 continued

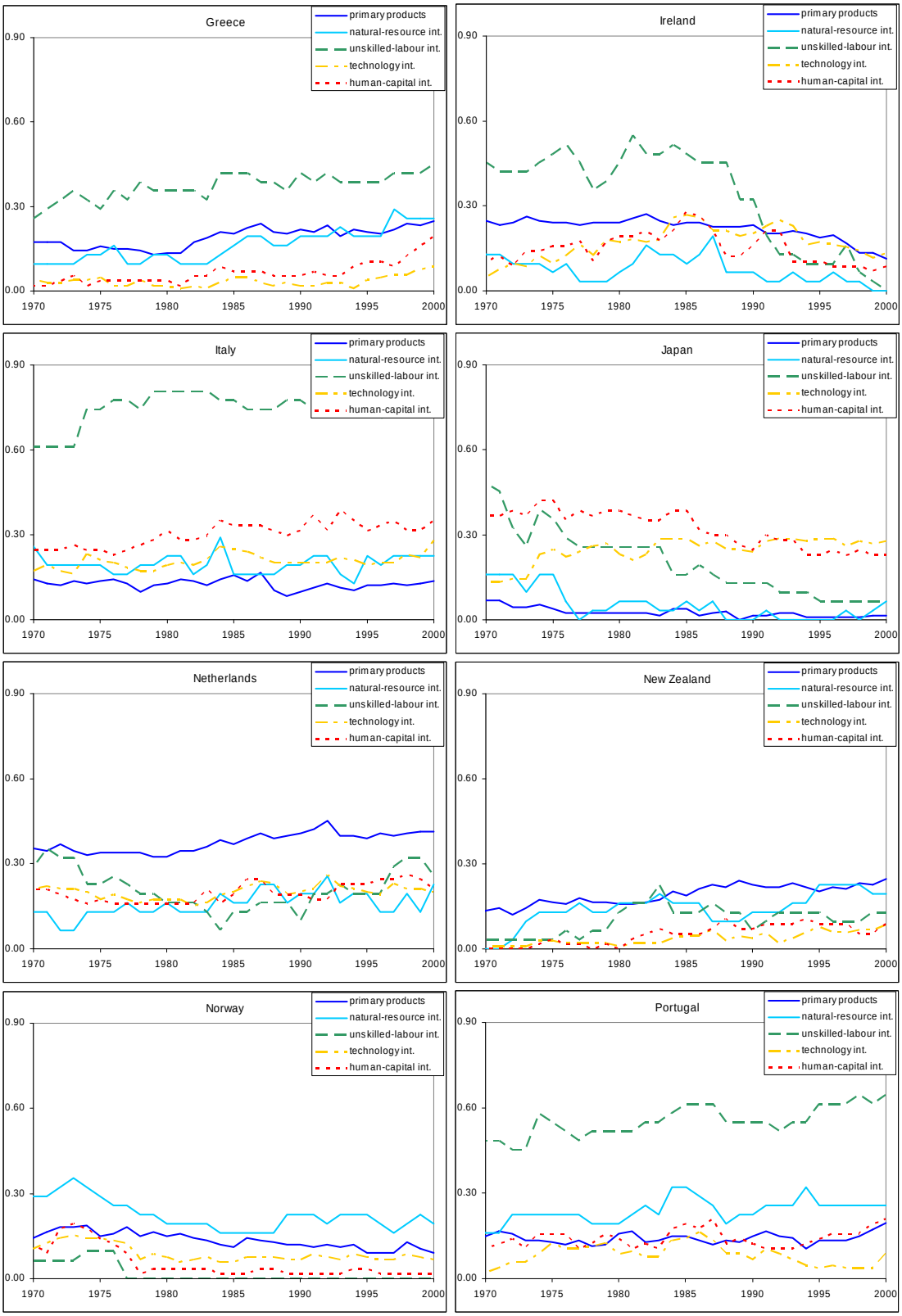
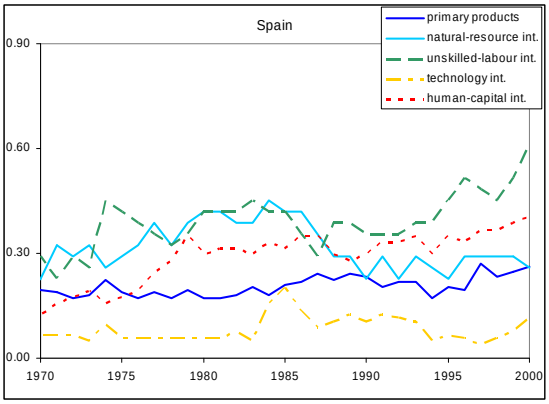
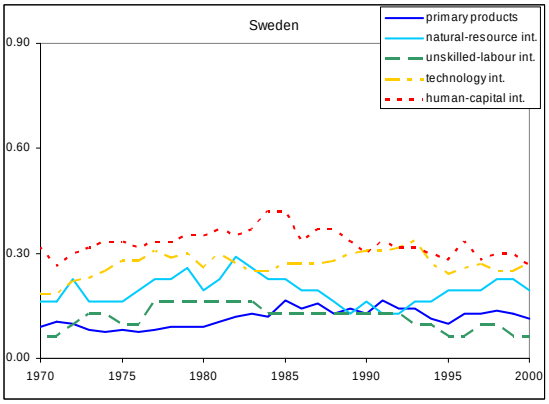
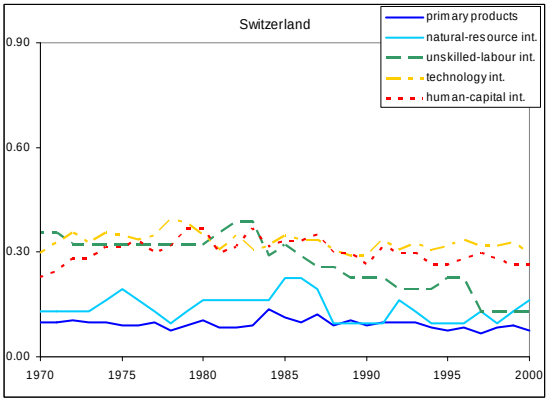
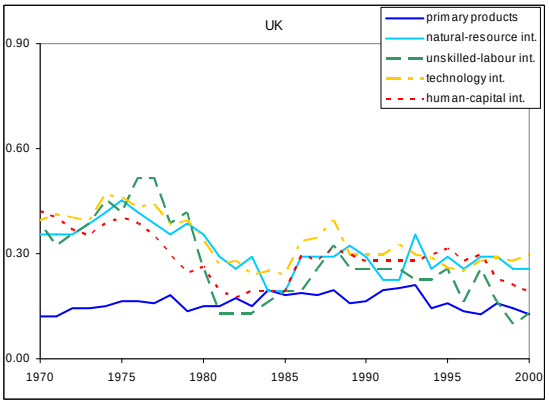


Figure A.1 continued









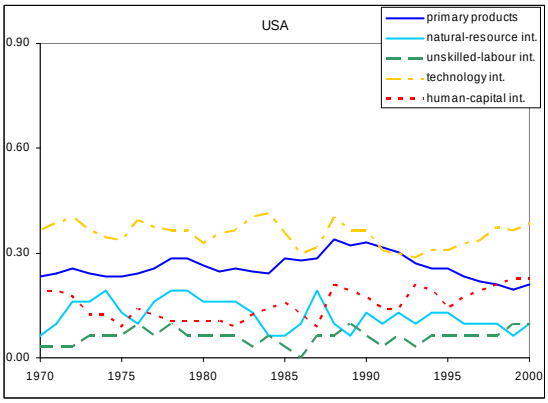


Figure A.2 Evolution of factor abundance; share in group with $BI_s^c > 1$*, version II*

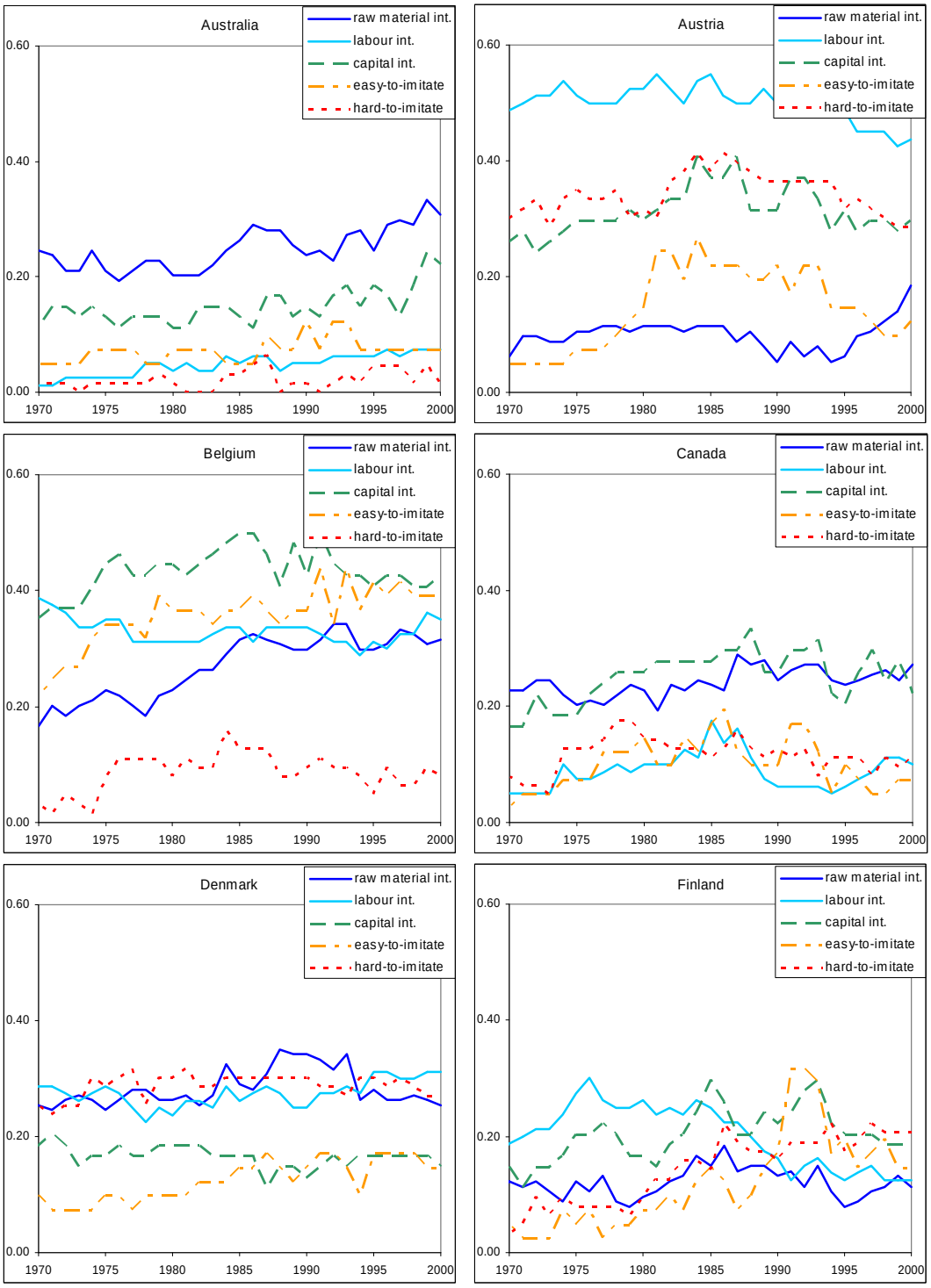


Figure A.2 continued

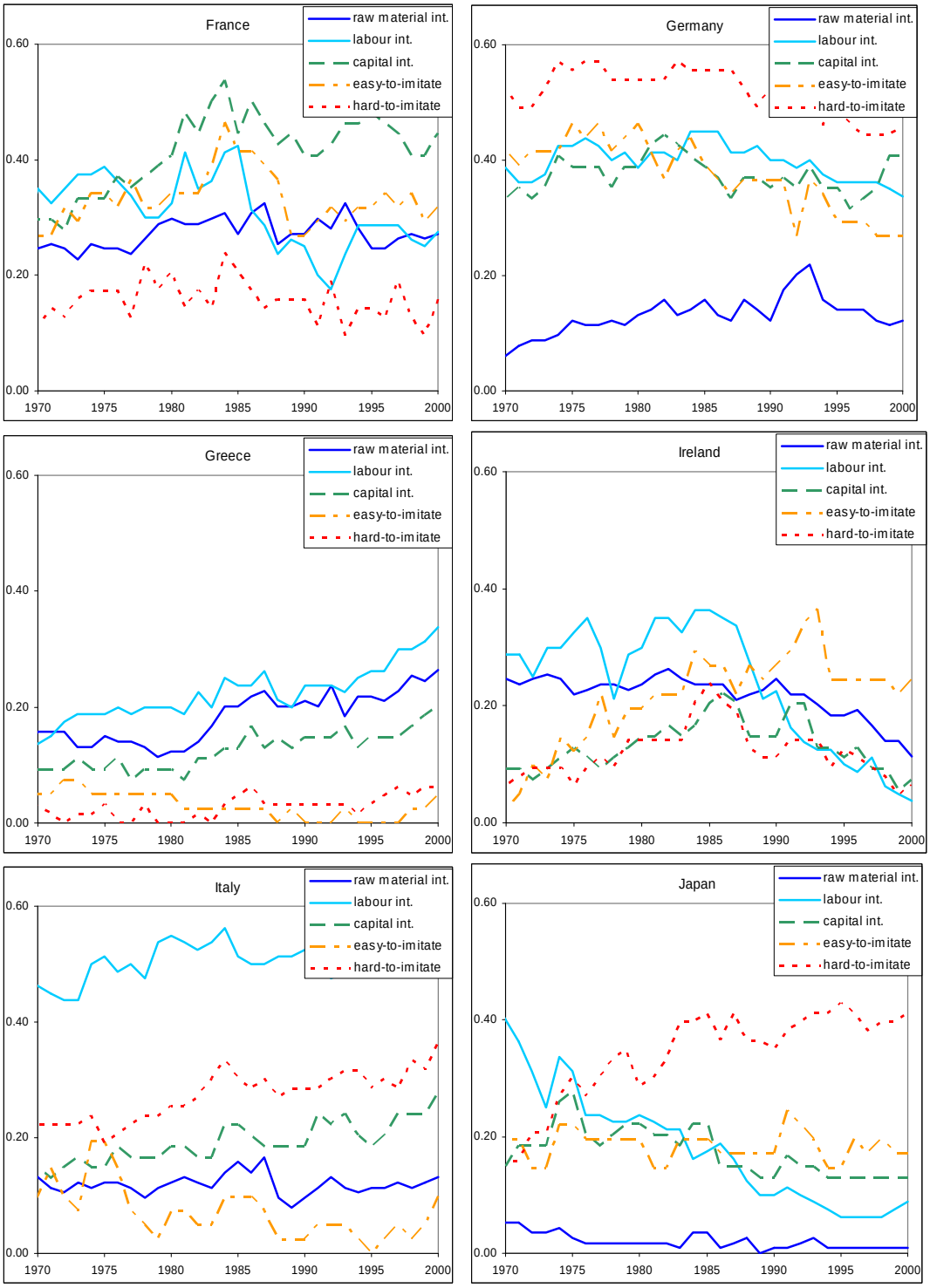


Figure A.2 continued

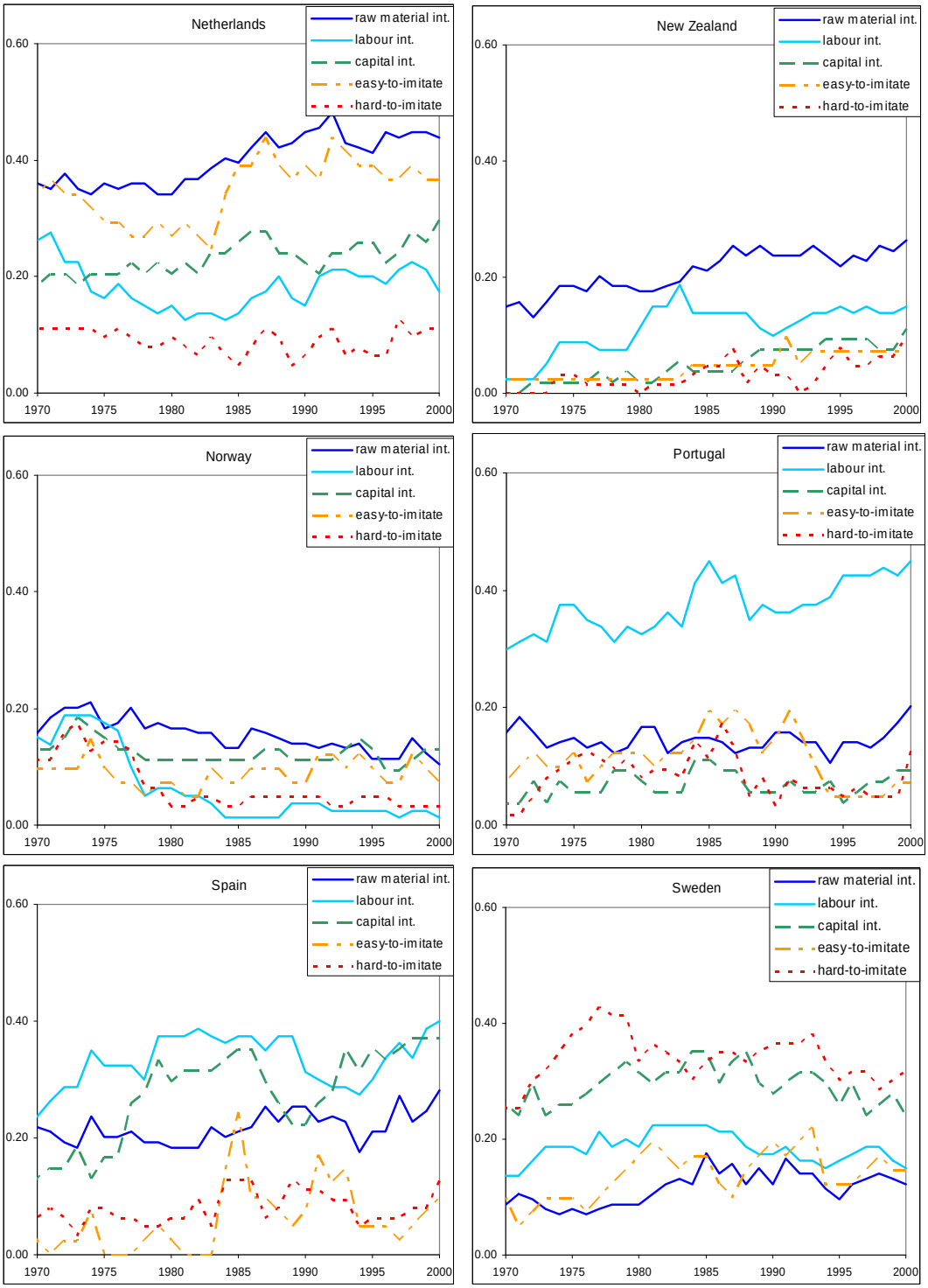
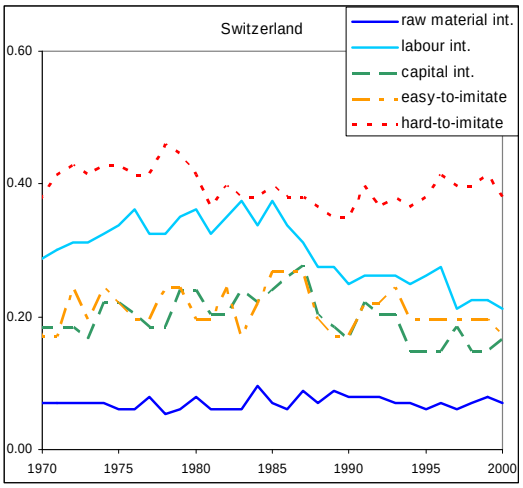
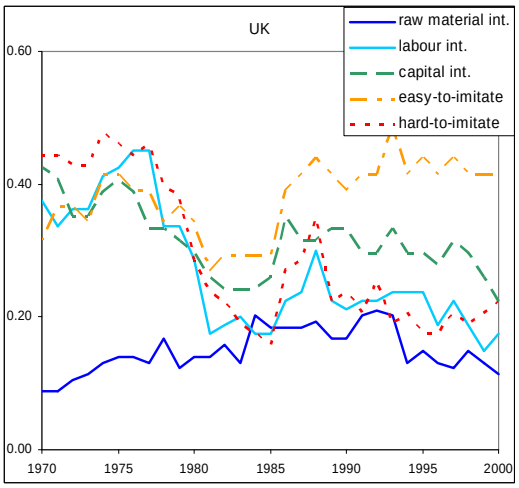
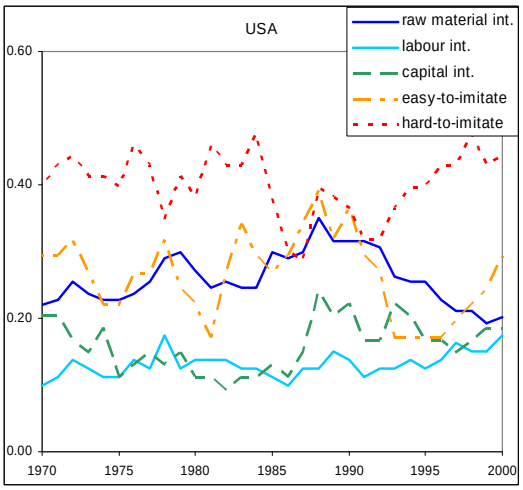


Figure A.2 continued



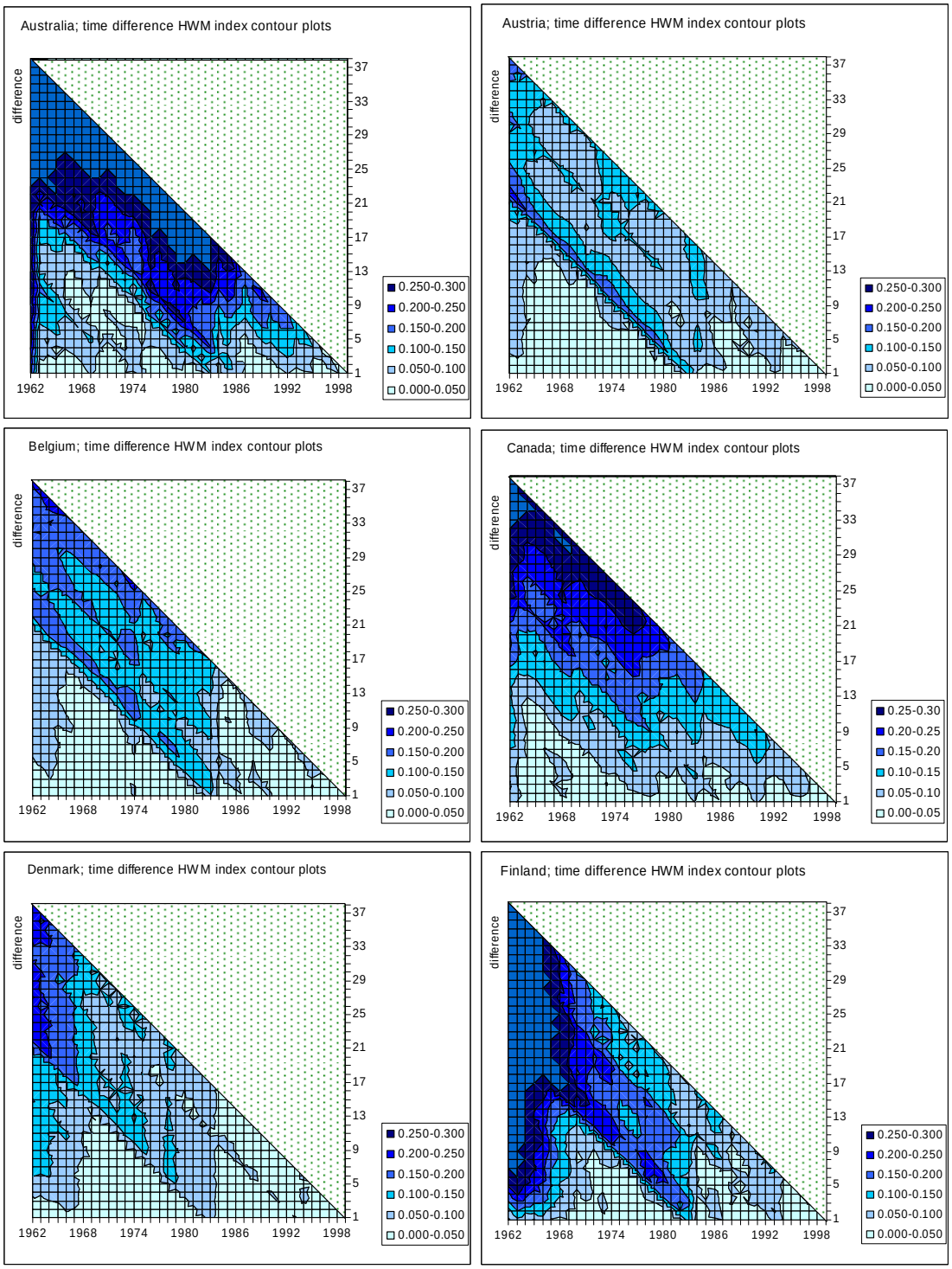




Further appendix material

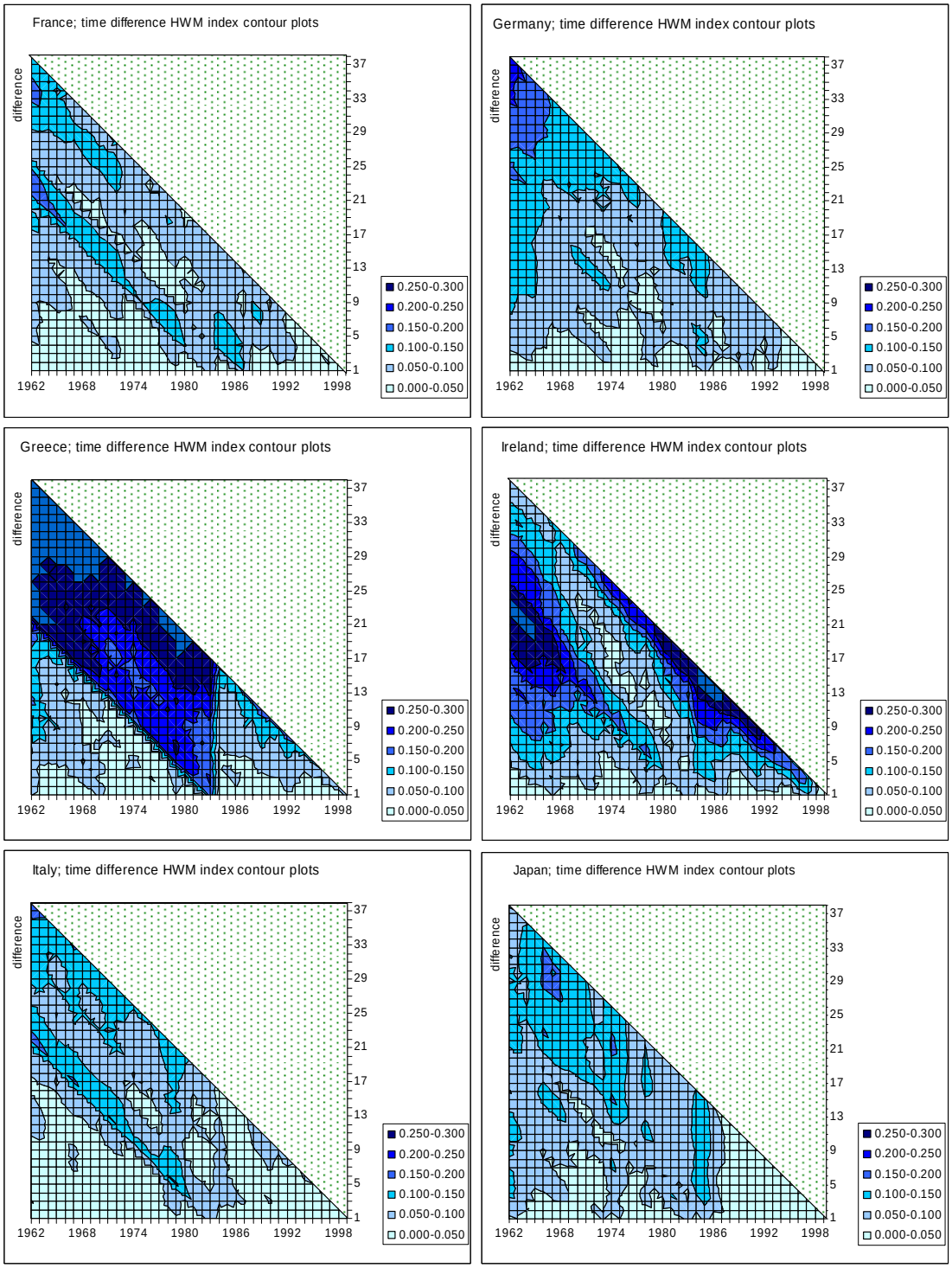
For each country we produce 741 HMs. This is a large number. One way of studying the outcomes is to draw contour plots of the HMs. The shading indicates the size of the HMs. Figure 3 shows for all OECD countries these contour plots. Take the first panel that shows HM indices for Australia. In the left bottom corner the first year of comparison is depicted, 1962. Moving in an upward direction gives the HM value of the comparison between 1962, and 1963, the next number gives the value of the HM index for the comparison of 1962 with 1964, etc until the final comparison of 1962 with 2000. The next column does the same for 1963, and finally the last column compares 1999 with 2000 (and thus shows only one entry). The shading shows which distributions differ significantly from each other. Given the critical values from footnote 7, we see for example that 1962 is rather special for Australia as 1962 is significantly different from all other distributions of BIs. More revealing is moving one or two columns to the right. This shows that the end of the 1980s and the beginning of the 1990s the distributions of the BIs structurally differs from the 1960s and 1970s.

Figure 3 HM indices for OECD countries



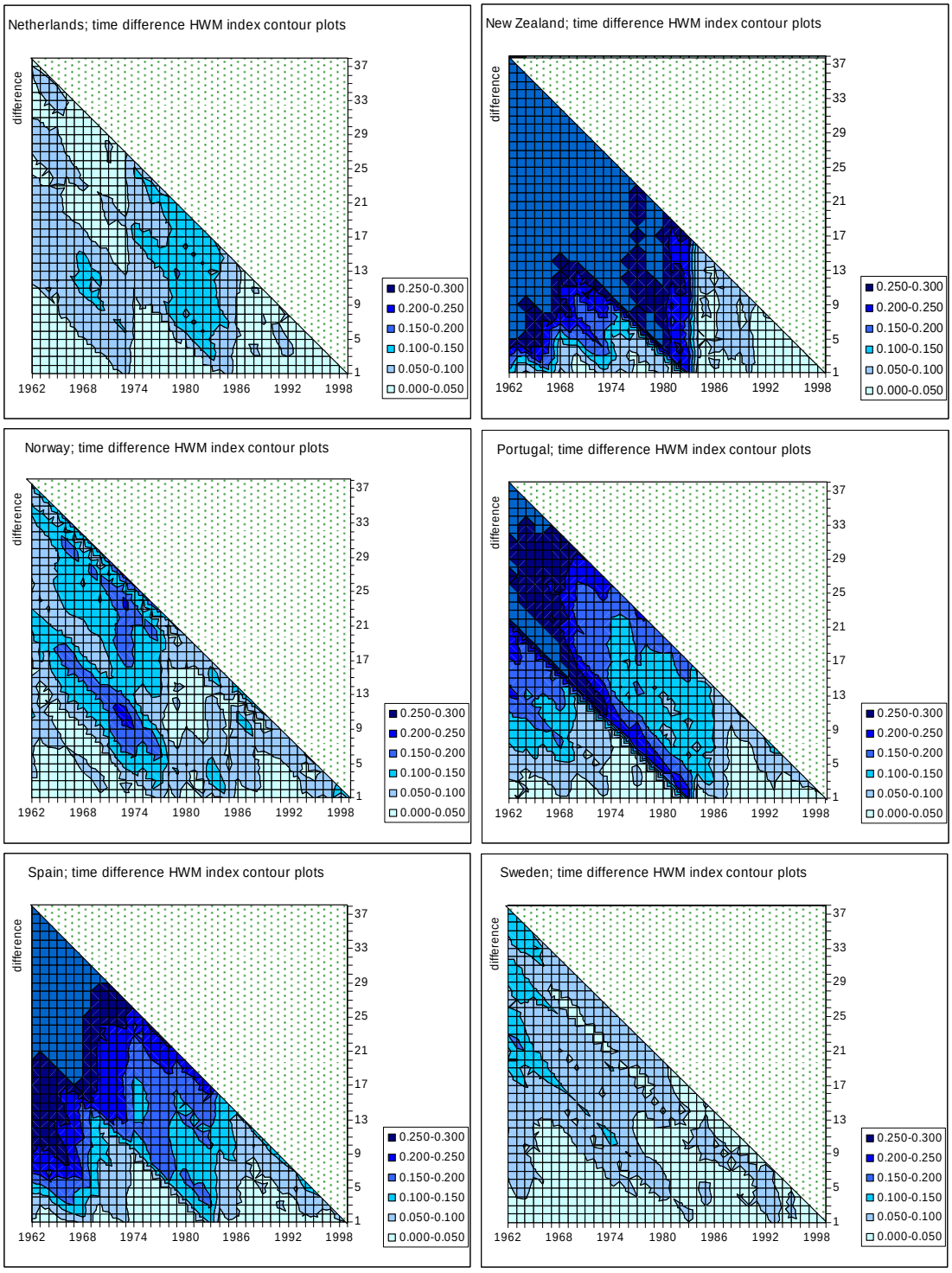
Australia, Austria, Belgium, Canada, Denmark, Finland

Figure 3 continued



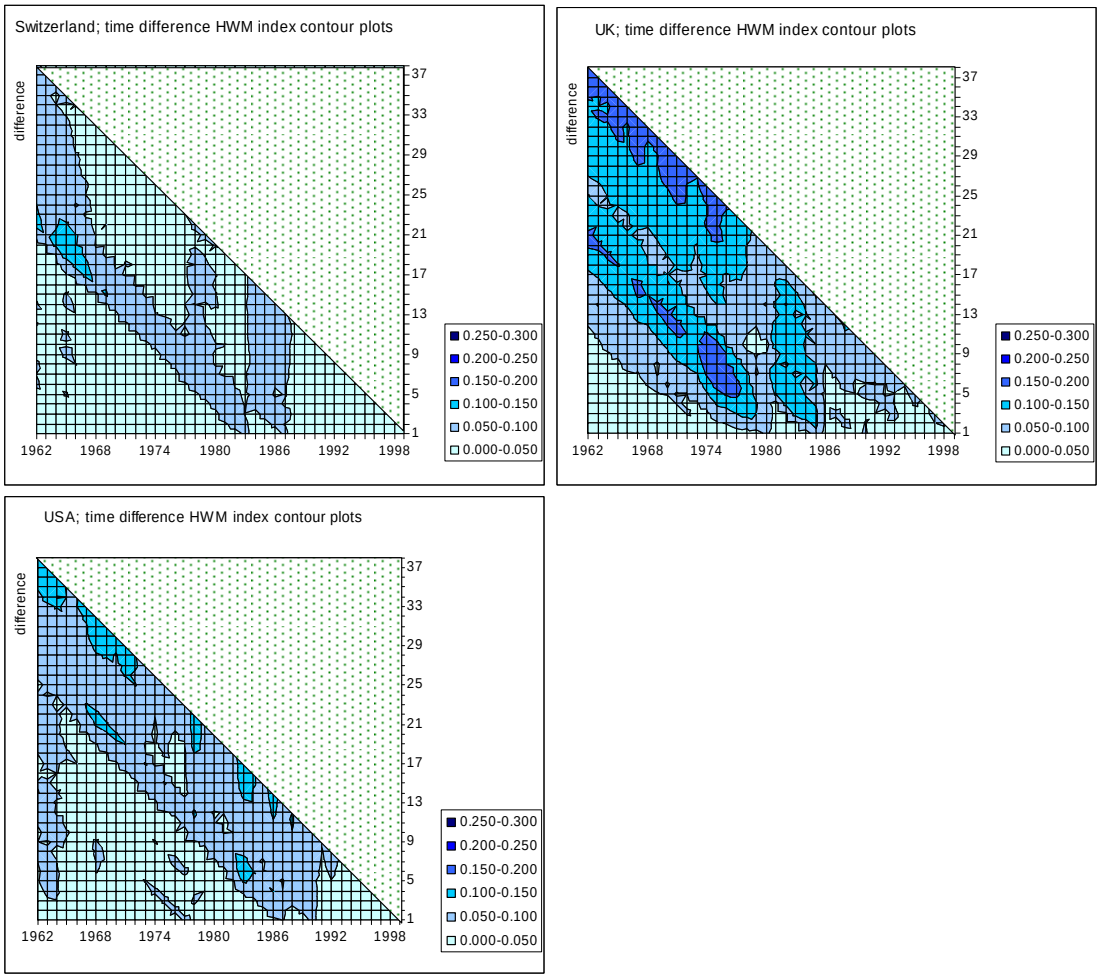
France, Germany, Greece, Iraland, Italy, Japan

Figure 3 continued



Netherlands, New Zealand, Norway, Portugal, Spain, Sweden

Figure 3 continued



Switzerland, UK, USA

Appendix Table 1, Number of OECD countries with structural change at 10% level and up

	Comparison with .. years in the past									
year	1	2	3	4	5	6	7	8	9	10
1963	2									
1964	0	3								
1965	0	1	4							
1966	0	1	2	4						
1967	0	2	2	2	5					
1968	1	2	3	3	3	7				
1969	0	2	3	4	4	5	8			
1970	0	1	4	3	4	6	7	11		
1971	0	0	1	4	3	7	7	9	11	
1972	0	0	0	2	4	4	6	7	9	12
1973	0	0	0	0	3	4	4	6	7	9
1974	0	0	2	1	3	6	7	6	7	9

1975	0	1	1	2	2	4	5	5	5	7
1976	0	1	1	1	1	1	5	5	5	6
1977	0	0	1	1	1	1	1	4	5	5
1978	0	1	0	2	2	2	2	1	3	6
1979	0	0	0	1	3	3	3	4	3	6
1980	0	0	2	2	2	3	3	4	6	6
1981	0	0	1	2	4	5	5	3	5	6
1982	0	0	1	2	2	4	6	5	5	5
1983	0	0	1	3	3	3	3	3	3	3
1984	8	11	10	11	12	14	15	14	15	16
1985	0	7	8	8	9	12	14	14	15	14
1986	0	1	10	9	9	9	13	14	11	12
1987	0	2	3	11	10	9	10	12	14	9
1988	1	1	7	8	10	9	8	6	10	9
1989	0	1	3	5	6	10	8	7	7	10
1990	0	0	0	3	8	10	8	8	8	8
1991	0	0	0	1	1	6	7	10	10	9
1992	0	0	0	0	1	1	6	8	10	11
1993	0	0	1	0	0	1	3	5	5	10
1994	0	0	1	0	1	2	1	3	5	7
1995	0	1	1	3	2	3	3	3	4	11
1996	0	0	0	1	3	3	5	5	5	7
1997	0	0	0	0	3	3	3	5	5	5
1998	1	2	1	1	2	3	5	4	4	5
1999	0	1	1	2	3	2	3	4	4	4
2000	1	1	1	3	4	5	6	6	7	8

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