The New OECD International Trade Model

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by
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ABSTRACT/RÉSUMÉ

THE NEW OECD INTERNATIONAL TRADE MODEL

This paper provides a detailed description of recent research to re-estimate and re-specify the international trade volume and price equations that are used in the OECD Economics Department to analyse international trade developments. New panel data estimates of the factors affecting export performance, import penetration and exchange rate pass-through into trade prices are reported for both OECD and non-OECD economies. The model set out has already been used successfully to monitor the global consistency of the international trade projections in the *Economic Outlook.*

JEL Classification: F14, F17, F47
Keywords: international trade volumes, international trade prices, forecasting model

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LE NOUVEAU MODELE DU COMMERCE INTERNATIONAL DE L'OCDE

Cette étude présente de façon détaillée la respecification et la réestimation des équations de commerce extérieur (prix et volumes) qui sont utilisées par le Département des Affaires Économiques de l'OCDE pour analyser l'évolution du commerce mondial. L'impact des facteurs influençant la performance à l'exportation, le taux de pénétration des importations et l'effet du taux de change sur les prix du commerce extérieur des zones OCDE et non OCDE est estimé par le biais de données de panel. Le model présenté a déjà été mis en oeuvre avec succès pour assurer la cohérence globale des prévisions des échanges commerciaux publiées dans les *Perspectives Économiques de l'OCDE.*

Classification JEL : F14, F17, F47
Mots-clef: volumes du commerce extérieur, prix du commerce extérieur, modèle de prévision

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THE NEW OECD INTERNATIONAL TRADE MODEL

by

Nigel Pain, Annabelle Mourougane, Franck Sédillot and Laurence Le Fouler[1]

1.   Introduction and summary

1.   This paper provides a detailed description of the recent research that has been undertaken to re-estimate and re-specify the international trade volume and price equations that are used in the OECD Economics Department to analyse international trade developments. The model set out in this paper has already been used successfully to monitor the global consistency of the international trade projections made in the *Economic Outlook*. Relationships similar to those developed in this research will also form the basis for the international trade relationships in a significantly modified and updated version of the Interlink macroeconometric model.

2.   The immediate need for an updated international trade model arose as a result of a number of important changes to the procedures and data sets used in making projections for the *Economic Outlook*. As a result of these, the structure and level of detail in the previous trade model was simplified considerably. The main focus of attention is now on aggregate relationships for total trade in goods plus services, rather than separate relationships for manufacturing, non-manufacturing and services. This switch allows historical data for the OECD countries to be taken directly from National Accounts statistics rather than from a disparate set of customs and balance of payments sources. Data for the non-OECD economies continues to be drawn directly from their balance of payment statistics. Re-estimation has also been prompted by a move to using quarterly data for the *Economic Outlook*. The previous trade model was based on semi-annual data. The move to quarterly data offers a richer set of information to use in estimation, but also creates some modelling complications due to the greater noise in the underlying data.

3.   The opportunity has also been taken to update the bilateral global trade matrices that form the core of the international trade model to reflect trade patterns in the year 2000. The previous matrices, described in Le Fouler *et al.* (2001), were based on data for 1995. Simplification of the trade model has enabled greater use to be made of an alternative data source, IMF *Direction of Trade Statistics*, with a more comprehensive and timely coverage than the UN COMTRADE database used previously, especially for the non-OECD economies. Although the empirical work uses aggregate data for goods plus services, the new aggregate trade matrix has continued to be derived by combining separate matrices for goods and for services, reflecting the relative lack of statistics on bilateral trade in services. However, changes have been made to the methods used to calculate the bilateral services matrix, with use being made of balanced accounting techniques for the first time.

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4.   The combined effects of the move to a goods plus services basis for monitoring trade, the updating of the trade matrix weights and the greater use of national accounts data make little difference to the broad picture of aggregate world trade developments in volume terms. For example, Figure 1A shows the (annualised) quarterly growth rates of goods plus services trade volumes and the corresponding growth of merchandise trade derived from customs data, using the data available as of February 2004. The variation over time in these two series is clearly similar. However, the new measure has the additional advantage of a more comprehensive and timely coverage. Using a 60% cut-off rule (the world trade series is constructed providing at least 60% of the component data are published),[2] the goods and services aggregate runs to 2003 Q3, whereas the merchandise trade aggregate runs only to 2003 Q1. Figure 1B shows world trade in goods and services computed using the respective weights from the 1995 and 2000 trade matrices. Whilst individual country weights change, there is little change in the aggregate series itself. The bilateral trade matrix for 2000 is used for the derivation of key global aggregates for each economy, such as export market size, shadow prices and competitors' prices. These series are all used in the empirical work below and discussed further in Box A.

5.   The structure of the newly estimated trade relationships has several important features:

- The long-run specification of the equations has been chosen in order to help ensure coherent medium and long-run simulation properties. Static and dynamic price homogeneity are imposed in the price equations and the volume equations ultimately determine export market shares and the rate of import penetration.

- Behavioural equations with long-run equilibrium-correction terms have been estimated for both volumes and prices. In the previous version of the trade model the principal behavioural equations were for the manufacturing sector, with largely calibrated relationships being used for non-manufacturing and services. All the trade price equations were specified in first differences only and were partially calibrated for some smaller economies. Many of these equations had not been updated for several years.

- Use is made of non-linear deterministic trend functions to capture otherwise excluded factors in both the trade volume and the trade price equations. This had been done only for manufacturing export volumes in the former trade model. Such trends pick up non-price influences on export performance and import penetration in the trade volume equations, and also compositional factors underlying changes in relative trade prices through time. Within-sample, such effects are now captured using a combination of a linear and logarithmic trend. An exponential trend function has subsequently been fitted for export volumes and trade prices to ensure that the estimated trend effects diminish gradually over time out of sample.

- The revised specification of the import volume equations allows for differences in the marginal propensities to import from each component of final expenditure. Models with a single total final expenditure variable imply that the marginal propensity to import from each component of expenditure is identical, which is at odds with the stylised facts from input-output tables.

- The new behavioural price equations determine non-commodity goods and services trade prices. The aggregate deflator for goods plus services is derived as a weighted average of commodity and non-commodity prices.

6.   The main empirical results come from separate panel data sets for export and import volumes and prices for 24 OECD economies over 1982-2002. Cross-country restrictions were imposed in estimation

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2.   Missing data are then estimated using quarterly values from the last set of *Economic Outlook* projections.

where acceptable to the data. Separate estimations were made for the remaining OECD economies, China and the five other non-OECD regional aggregates used in the trade model, over a shorter sample period.[3] The main points to have emerged from the econometric work are:

- The estimated long-run marginal propensities to import from each component of final expenditure appear broadly consistent with the stylised facts in those economies for which input-output tables are available. The propensity to import from fixed investment is considerably higher than that from private consumption, and the propensity to import from private consumption is well above that from public consumption. In the majority of countries the propensity to import from exports is above that from private consumption, and in some small open economies is also considerably higher than that from fixed investment.

- The import volume equations with disaggregated expenditure effects also have the desirable property that adjustment following shocks to either expenditure or to relative prices is more rapid than it is for equations that use only a single, unweighted total expenditure variable. But the direct impact of relative import prices is found to be lower when using the separate expenditure terms.

- In almost all OECD economies a given change in the real exchange rate is found to have a larger direct long-run impact on export volumes (in the range 0.5-1.0%) than on import volumes (in the range 0.3-0.6%). The estimated price elasticities in both sets of volume equations for goods and services are generally smaller than those found previously for trade in manufactures. This is consistent with other studies that suggest that services trade is less price sensitive than manufactures trade.

- There is clear evidence of non-linear time effects on both volumes and prices in almost all OECD and non-OECD economies. In most countries (non-commodity) trade prices appear to have declined consistently relative to economy-wide prices. The decline is especially pronounced in those countries in which ICT-related products have a relatively high weight in the bundle of traded goods and services.

- By the end of the sample (2002), the estimated export volume equations imply a trend decline in aggregate OECD export market performance of approximately 0.5% per annum.[4] This is offset by an improved trend in market performance for the non-OECD economies. This is particularly marked for China, which is estimated to have a trend improvement in export performance of 7½ per cent in 2002.

- The extent of exchange rate pass-through effects on import prices and pricing to market effects on export prices varies considerably across countries. They are smallest for the United States, where the long-run pass-through elasticity on import prices is just over 0.3%. In the large euro area countries the pass-through elasticity typically lies between 0.5-0.6%, and is higher still in the United Kingdom and Canada.

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3. The five other non-OECD regional aggregates are for Latin America (LAT), non-OECD Europe (SEE), Africa and the Middle East (AFM), Dynamic Asia (ANC) and Other Asia (ASO). The Dynamic Asia bloc consists of Chinese Taipei; Hong Kong, China; Indonesia; Malaysia; the Philippines; Singapore and Thailand. India is included in the Other Asia bloc. The separate data for China exclude data for Hong Kong, China; data for the latter include re-exports.

4. Changes in export market performance refer to the difference between the rate of growth of export volumes and the rate of growth of export market size.

- In a majority of OECD countries, the direct impact of a nominal exchange rate change on trade prices is found to be smaller than that from an equivalent change in export prices in other countries.

- The new price equations imply that the extent of exchange rate pass-through via trade prices has declined over time in all economies. This reflects changes in the composition of trade over time, with a decline in the share of commodities, which have full pass-through, and a rise in non-commodity trade for which pass-through is often incomplete.[5]

7.   The structure of the rest of this paper is as follows. A short summary of the work undertaken to update the trade matrix is contained in the next two sections, along with a summary of some of the main changes that result. Section 4 contains a detailed overview of the empirical work and Section 5 sets out the main equations estimated. The empirical results and the properties of the estimated equations are then summarised in Section 6.

2.   Updating the trade matrices

8.   In the former system, the 1995 trade matrices for manufacturing and non-manufacturing were constructed using bilateral merchandise export data from the UN COMTRADE database. The non-manufacturing matrix was constructed from separate matrices for trade in food, raw materials and energy. Data for bilateral trade in services in 1995 was derived from a mixture of national and multilateral sources, supplemented by estimates of missing cells made using manufacturing export data (Le Fouler *et al.*, 2001).

9.   The move to a more simplified trade system and the decision to update the matrices to the year 2000 has enabled a number of changes to be made. Of these, the most important has been the construction of a single matrix for merchandise trade. The COMTRADE database had previously been used because it provided a good mixture of detail, both in terms of reporting countries and in the information on commodities. However, investigations suggested that its coverage of total trade in 2000 was less comprehensive than other readily available data sources, in particular the IMF *Direction of Trade Statistics* (DOTS) database. Thirty-eight countries who were non-reporters in COMTRADE reported data in DOTS. Another 13 countries who did not report data in COMTRADE in 2000, did so in DOTS. Whilst most of these countries are small, their inclusion is important, because of the relative lack of good data on intra-regional trade in the non-OECD regions. Of the 51 countries reporting (some) data in DOTS but not in COMTRADE, 21 were in Africa. One important gap in both databases is the absence of comprehensive data for Chinese Taipei. Missing information was obtained from the national Board of Trade website.

10.   The basic export data from DOTS was adjusted using alternative estimates of partner country trade where there was believed to be missing data or where there were significant discrepancies between the respective national statistics. The need for adjustments was identified by examining the discrepancies between aggregate trade levels in DOTS and national (or, for the non-OECD, regional) balance of payments statistics. Two countries for which considerable use had to be made of partner country data on imports were South Africa and Saudi Arabia. National information on the destination of Saudi exports in DOTS covered only 6¼ per cent of total exports in 2000. Other significant adjustments included corrections for under-reporting of exports to Belgium and Luxembourg and the Czech and Slovak Republics, and the use of Netherlands data on imports from Belgium in place of Belgium data on exports to the Netherlands ($18½ billion instead of $23¼ billion).

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5.   A similar conclusion is reached by Campa and Goldberg (2002) in their study of OECD trade prices, using a different methodology.

11.   In the continued absence of a detailed source on global bilateral trade in goods plus services, a separate bilateral services trade matrix has also had to be constructed for the year 2000. The aggregate goods and services trade matrix is derived by summation of the separate matrices for goods and services. The main primary data sources used for the services matrix have been OECD and Eurostat statistics on International Trade in Services. Although the coverage of these data is far from complete, the information available for 2000 is more comprehensive than that available for 1995. Data reported by the exporting partner were available for approximately 41% of the total cells of the (36 by 36) matrix; information from partner country figures brought the coverage up to around two-thirds of the total cells. One important gap was the absence of any direct information on services trade within the non-OECD regions.

12.   As with the construction of the 1995 matrix, initial estimates of the missing cells were made by allocating the difference between total services trade with all countries and total reported bilateral trade on a pro rata basis across those partner countries for which data was not reported. This was done using information on the distribution of merchandise trade between these countries/regions (manufactures trade for the 1995 matrix). One noticeable source of discrepancies was Switzerland, with exports (and imports) of services being considerably smaller than the mirror data reported by trade partners.[6]

13.   An innovation compared to previous practice was that this allocation was done separately for both total imports and total exports of services. Since there is a global discrepancy in services trade, use of the information from only one of these aggregates could mean that significant information was being discarded. The discrepancies between the completed matrices for exports and imports were then adjusted using a balancing procedure similar to that used in the construction of separate National Accounts estimates for the expenditure, output and income estimates of GDP (Stone, 1977). This uses prior estimates of the reliability of the respective series and adjusts them to remove discrepancies subject to satisfying the adding up constraints required to ensure equality of exports and imports.[7,8] A more detailed account of this procedure is given in Appendix A.

3.   Trends in trade shares

14.   Some of the important differences between the new matrix and that for 1995 are shown in Figures 2 to 4, derived using value data in US dollars for 1995 and 2000. Figures 2a-2f show the regional composition of goods and services trade in 1995 and 2000 for the world as a whole, three OECD and two non-OECD regions. Figures 3 and 4 show the shares of each country/region in the balanced estimate of world goods and services exports and imports in 2000.

15.   Looking at the regional distribution of goods and services trade, the share of the NAFTA members and the non-OECD economies rose between 1995-2000 whilst that of the other OECD economies, both in Europe and in the Asia-Pacific fell. The rise in the aggregate NAFTA share reflected an underlying increase in the shares of global exports and imports, whereas for the non-OECD economies it reflected only a rise in their share of global exports.

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6.   Part of the explanation for this is that Switzerland presently has only net export data for some components of services trade.

7.   For example, bilateral estimates for which there is a large discrepancy between the separate partner country data on exports and imports might be considered less reliable than those for which there is little, or no discrepancy.

8.   In principle a similar approach could be used to obtain a balanced estimate of trade in goods as well. In practice there is less need to do this, since missing data can often be traced from partner country data, even for trade between individual non-OECD countries or regions. There is also a need to adjust for country-specific estimates of the cost of insurance and freight, which are included in the merchandise import data from DOTS, but not the export data.

16.   A number of interesting regional differences lie behind these aggregate trends. In both NAFTA and OECD Europe there was a marked rise in the proportion of exports going to the NAFTA economies and an increase of the shares of exports from NAFTA and the non-OECD economies in total imports. But in the Asia-Pacific members of the OECD there was a fall in the share of imports from the NAFTA economies, with rapid growth in imports from the non-OECD economies, both inside and outside Asia. In the non-OECD economies there was a marked rise in the proportion of trade with the other non-OECD economies and a marked fall in the proportion of trade with the OECD European economies.

17.   Figures 3 and 4 show the shares of the individual OECD countries and non-OECD regions in total world exports and imports. There is a strong positive correlation in the country rankings in 1995 and 2000. Those countries that accounted for a large (small) proportion of global trade in 1995 continued to do so in 2000. On the export side, the largest absolute gains in share between 1995 and 2000 were for the Africa and the Middle East region (AFM), the United States, China and Mexico. The largest absolute declines were for Germany, Japan, Italy and France. On the import side, the largest absolute gains in share between 1995 and 2000 were for the United States, Mexico, Canada and China. The largest absolute declines were for Germany, France, Japan and Dynamic Asia. However, all of these countries/regions continued to account for the largest absolute shares of global trade after the United States, reflecting their relative size.

18.   Three important factors behind the observed swings in trade shares based on value data at market exchange rates between 1995 and 2000 are likely to have been the strength of the US dollar (and thus the currencies pegged to it), the relative buoyancy of domestic demand in the NAFTA economies in the late 1990s and the improved coverage of Africa and the Middle East in the 2000 matrix.

4.   Empirical work – an overview

19.   The empirical work described in this paper has been undertaken using a quarterly data set for trade in goods and services. The construction of the initial data set itself required considerable work, both because of the need to interpolate and link together different vintages and frequencies of national accounts data for many OECD countries and because of the need to construct new historical data for the non-member economies in order to be able to obtain detailed estimates of market size, shadow and competitors' prices over a long time span. Box A provides a summary of some of the different aggregate concepts used in the empirical work.

Box A. Key international aggregates

This Box summarises the formulae used to produce the three key international aggregates derived from the trade matrix: export market size, shadow prices and competitors' prices. They are similar to those presented in Durand and Giorno (1987). Export market size for country *i* is computed as a weighted average of imports in its *N* trade partners, using year 2000 weights:

$$XMKT_i = \left(\sum_{p=1}^{N} \frac{XGS_{i \to p}}{XGS_{wld \to p}} * MGSVD_p \right)$$

where: $XMKT_i$ = export market of country i

$XGS_{i \to p}$ = goods and services exports values in 2000 from country i to country p

$XGS_{wld \to p}$ = global goods and services exports values in 2000 to country p

$MGSVD_p$ = import volume of country p, expressed in 2000 US$

Foreign prices are computed as a weighted average of partner country trade prices. To avoid the cost of having several matrices for the model, the weights are based on aggregate good and services shares. A possible further step would be to re-weight and exclude non-manufacturing trade (as the prices used are corrected for commodity prices), but tests using the trade matrices for 1995 (Le Fouler *et al.*, 2001) suggested that this additional step would make little difference to the resulting aggregates.

For the import price model, the foreign price indicator for the country *i* is the shadow price of its N partner countries. It is computed as:

$$PMSHX_i = \left(\sum_{p=1}^{N} \frac{XGS_{p \to i}}{XGS_{wld \to i}} * PXGSX_p * EXCHIN_p \right) * \frac{1}{EXCHIN_i}$$

where: $XGS_{p \to i}$ = good and services exports values in 2000 from country p to country i

$PXGSX_p$ = non-commodity good and services export price for country *p*, 2000=1

$EXCHIN_p$: exchange rate for country p, index 2000=1

For the export price model, the foreign price is the competitors' price, which is calculated using a double weighting system to allow for competition on third markets:

$$PXCX_i = \left(\sum_{\substack{p=1 \\ p \neq i}}^{N} \frac{XGS_{i \to p}}{XGS_{wld \to p} - XGS_{i \to p}} * \frac{1}{XGS_{i \to wld}} * \sum_{\substack{r=1 \\ r \neq i,p}}^{N} XGS_{r \to p} * PXGSX_r * EXCHIN_r \right) * \frac{1}{EXCHIN_i}$$

Another competitors' price concept (PXC) based on aggregate goods and services prices, rather than measures that exclude commodities, is also used in deriving the relative export price series used in the estimation work on trade exports volume.

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20.   The majority of the empirical work has used a sample composed of data for 24 of the OECD countries for 1982-2002.[9] Equations for the four Central European OECD member states were estimated using a separate sub-sample over a much shorter time period, typically 1993-2002. Separate relationships for Iceland and Luxembourg were estimated over country-specific sample periods. Equations for the non-OECD economies were typically estimated using data for 1990-2001, with the non-OECD European region (SEE) sometimes included with the Central European bloc. All estimations have used quarterly data.

21.   In the rest of this section we first present the basic structure of the equations that have been estimated. A number of practical issues, including the treatment of commodity prices, the choice of econometric technique and the procedures used to capture any non-linearity in the underlying relationships are discussed subsequently in Section 5.

Export volumes

22.   The basic export volume equation used in estimation has the form:

$$\Delta \ln(X_{it}) = \alpha_{0i} + \alpha_{1i}\Delta \ln(X_{i,t-1}) + \alpha_{2i}\Delta \ln(W_{it}) + \alpha_{3i}\Delta \ln(W_{i,t-1}) + \alpha_{4i}\Delta \ln(RPX_{it}) + \alpha_{5i}\Delta \ln(RPX_{i,t-1})$$
$$+ \alpha_{6i}\left[\ln(X_{i,t-1}) - \ln(W_{i,t-1}) - \alpha_{7i}\ln(RPX_{i,t-1}) - \alpha_{ji}TREND_t\right] + \varepsilon_{it} \qquad [1]$$

where X denotes the volume of exported goods and services in country *i*, W is the measure of export market (XMKT, see Box A), RPX is the price of exported goods and services relative to competitors' prices (PXC, see Box A) and TREND is a deterministic function of time. A long-run coefficient of unity is imposed on export market size, so that the export market share is modelled ultimately. This specification is similar to that used previously to model manufactures trade (Murata *et al.*, 2000). The trend function of time is included to pick-up omitted factors such as changes in the variety and quality of the products produced in different countries. These can arise from factors such as enhanced innovation or changes in the location of production (Pain and Wakelin, 1998). The question of how these are best modelled, subject to the constraints arising from the need to make use of the estimated equations for simulation and projection analyses, remains open. As Murata *et al.* (2000) report there is evidence that the appropriate trend function is non-linear. The procedures used to capture otherwise unmodelled time-varying effects on both trade volumes and trade prices are described in detail in the final part of this section.

Import volumes

23.   The initial step was to re-estimate the longstanding import demand specification used at the OECD and elsewhere (see, for example, Meacci and Turner, 2001), in which import volumes are modelled using total final expenditure and relative prices. But in contrast to previous practice, a long-run elasticity of unity was imposed on total expenditure with a view to improving the overall coherence of longer-term model properties. As a result of this, a linear time trend was also included to capture long-term trend effects in import penetration.

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9.   Although data have been constructed for the 1970s as well, restricting the estimation period to one beginning in the early 1980s avoids the periods of large turbulence that followed the oil price shocks in 1973/74 and 1979/80 and the complications that can rise from linking together different, and potentially inconsistent, vintages of national accounts data for many countries.

24.   The properties of the resulting equations are summarised in Panel B of Table 10. In the short-term almost all the equations display considerable overshooting in response to a sustained rise of 1% in total final expenditure, and in many instances adjustment towards the long-run is very slow. Amongst the G7 economies, only Canada has complete adjustment after ten years. In several countries the prolonged adjustment reflects the fact that the long-run unit demand elasticity is not readily accepted by the data.

25.   A second property of this model that is difficult to defend is the fact that it implies that the marginal propensity to import out of each category of expenditure is identical. This is at odds with the stylised facts highlighted by input-output (I-O) tables.[10] Whilst cross-country comparisons from input-output tables are difficult to make, being sensitive to the level of industrial detail used in such tables, it is common to find that the import content of fixed investment and exports is higher than that of private and public consumption. Claus and Li (2003), in an input-output comparison of eight OECD countries in the mid-1990s, show that the import content of investment is roughly twice that of consumption. Their estimates suggest also that the import content of exports is higher than that of consumption, and in some small open economies, such as Belgium, is over 50%.

26.   Separate estimates for 10 OECD economies in OECD (2003, Table C.2.4) shows that the import content of exports rose between the early 1980s and late 1990s in half of them. This OECD study also highlights the wide variation in import propensities across countries, with the import content of merchandise exports in 1997 varying from over 40% in the Netherlands to a little over 10% in Japan and the United States. Further analysis of the underlying input-output tables for the United States, the United Kingdom, Canada and the Netherlands in that year confirms the basic differences in the import propensities of different expenditure components revealed in Claus and Li (2003), with the additional detail that the import content of government consumption is typically just over a third of that of private consumption.

27.   Appendix B presents several possible models of import demand which allow for different marginal import propensities for different components of total final expenditure. One seemingly attractive alternative, labelled Model 2 in Appendix B, is to use a weighted measure of final demand, with the weights being drawn from input-output tables. An approach of this kind can be found in a number of different macroeconomic models. Past and current examples include Gleed *et al.* (1986) and Jilek *et al.* (1993).

28.   However such an approach, whilst potentially feasible for a single country, is harder to implement across countries. National input-output tables may not be available for identical years and may differ in their level of detail. Even if tables are available for a number of years, it is not straightforward to construct time-varying import propensities for expenditure at constant prices because of the need to correct for relative price changes from one year to the next given that I-O data is at current prices.[11]

29.   An alternative approach, labelled Model 3 in Appendix B, is to model the share of imports in total final expenditure explicitly, as in a standard demand system. Pain and Westaway (1996) provide one example of this form of model. Their results for the United Kingdom confirm that there are significant differences in the propensity to import out of different expenditure components. Whilst this approach has sound theoretical foundations and allows each component of final expenditure to have different marginal

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10.   The former specification for manufacturing imports in Interlink went a small way towards overcoming this objection by imposing the assumption that the import content of government wage consumption is zero.

11.   It should also be noted that use of precise time-varying weights would obviate the need to include any separate relative price terms in estimation. This is because the weighted expenditure measure would, by construction, be equal to imports. All the influence of relative import prices would be subsumed within the separate expenditure coefficients.

import propensities and elasticities, it does not automatically ensure that the percentage response in import volumes to a common 1% rise in all expenditure components would be identical at all points in time.

30.   As it was felt desirable to maintain a model with constant expenditure elasticities, a specification based on that labelled Model 4 in Appendix B has been adopted. The basic equation used in estimation has the form:

$$\Delta \ln(M_{it}) = \beta_{0i} + \beta_{1i}\Delta \ln(C_{it}) + \beta_{2i}\Delta \ln(G_{it}) + \beta_{3i}\Delta \ln(I_{it}) + \beta_{4i}\Delta \ln(X_{it})$$

$$+ \beta_{5i}\Delta \ln(M_{i,t-1}) + \beta_{6i}\Delta \ln(M_{i,t-2}) + \beta_{7i}\Delta \ln(RPM_{it}) + \beta_{8i}\Delta \ln(RPM_{i,t-1})$$

$$+ \beta_{9i}\begin{bmatrix} \ln(M_{i,t-1}) - \beta_{10i}\ln(C_{i,t-1}) - \beta_{11i}\ln(G_{i,t-1}) - \beta_{12i}\ln(I_{i,t-1}) \\ - (1 - \beta_{10i} - \beta_{11i} - \beta_{12i})\ln(X_{i,t-1}) - \beta_{13i}\ln(RPM_{i,t-1}) - \beta_{ji}TREND_t \end{bmatrix} + \mu_{it} \quad [2]$$

where M denotes the volume of imported goods and services in country *i*, C and G are private and government final consumption, I is total fixed investment plus stockbuilding, RPM is the price of imported goods and services relative to domestically produced goods and services (as given by the GDP deflator) and TREND denotes a deterministic function of time. A long-run constraint is imposed on the expenditure parameters so that the weighted demand elasticity is unity if all components of expenditure increase at the same rate. Thus the equation can be viewed as one which ultimately pins down import penetration. The results reported in column [1] of Table 3, show that the long-run restriction required to give a weighted expenditure elasticity of unity in equation [2] can be imposed successfully in the majority of OECD countries, including five of the G7 economies. The inclusion of the trend function allows non-price factors behind the worldwide rise in import penetration, such as the growth of intra-industry trade, and trade creation resulting from the greater international fragmentation of production and improvements in market access, to be captured. The specification of the TREND function is discussed in greater detail below.

31.   A limitation of equation [2] is that housing and public investment are combined together with business investment. But it can be difficult to easily identify the different import propensities of these sub-components of investment from summary input-output tables, and inclusion of additional separate expenditure terms would complicate estimation still further. Similar considerations apply to private consumption of durables and non-durables.

32.   The impact and long-run marginal propensities to import from each component of final expenditure cannot be inferred directly from equation [2], as they are functions of both the estimated coefficients and the shares of imports and the expenditure components in total final expenditure. For example, using equations [2] and [B4b] in Appendix B, the long-run marginal import content of private consumption is given by $\beta_{10i}*(M_i/C_i)$, or, equivalently, $\beta_{10i}*(M_i/T_i)*(T_i/C_i)$, where T_i denotes total final expenditure in country *i*. The relative size of import propensities shown in the input-output tables for several countries imply the possible approximations:

$$2*\beta_{10i}*(M_i/C_i) = \beta_{12i}*(M_i/I_i)$$

and: $$\beta_{11i}*(M_i/G_i) = 0.4*\beta_{10i}*(M_i/C_i) \qquad\qquad [3]$$

Using the average values over 2000-2003 for (M_i/C_i), (M_i/I_i) and (M_i/G_i), these joint long-run restrictions, and the equivalent impact restrictions,[12] were tested for each of the 24 countries in the main panel data set.

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12. $2*\beta_{1i}*(M_i/C_i) = \beta_{3i}*(M_i/I_i)$ and $\beta_{2i}*(M_i/G_i) = 0.4*\beta_{1i}*(M_i/C_i)$ respectively.

As columns [2] and [3] of Table 3 show, the long-run restrictions could be accepted in 17 of the 24 economies, including all of the G7, and the short-run impact restrictions could be accepted in 18 economies, again including all of the G7.[13] Both sets of restrictions were rejected individually in four countries – Belgium, New Zealand, Portugal and Switzerland, and could be rejected collectively in a further two – Greece and Turkey.

33.   Given the relatively small number and size of the economies in which the restrictions on the import propensities of different expenditure components were rejected, imposing the restrictions across all countries prior to further estimation was judged to be a worthwhile simplification. Thus the basic import volume specification was amended to:

$$\Delta \ln(M_{it}) = \beta_{0i} + \beta_{1i}\left(\Delta \ln(C_{it}) + \beta_{SGi}\overline{G}_i \Delta \ln(G_{it}) + \beta_{SIi}\overline{I}_i \Delta \ln(I_{it})\right) + \beta_{4i}\Delta \ln(X_{it})$$

$$+ \beta_{5i}\Delta \ln(M_{i,t-1}) + \beta_{6i}\Delta \ln(M_{i,t-2}) + \beta_{7i}\Delta \ln(RPM_{it}) + \beta_{8i}\Delta \ln(RPM_{i,t-1})$$

$$+ \beta_{9i}\begin{bmatrix} \ln(M_{i,t-1}) - \beta_{10i}\left(\ln(C_{i,t-1}) + \beta_{LGi}\overline{G}_i \ln(G_{i,t-1}) + \beta_{LIi}\overline{I}_i \ln(I_{i,t-1})\right) \\ -\left(1 - \beta_{10i}(1 + \beta_{LGi}\overline{G}_i + \beta_{LIi}\overline{I}_i)\right)\ln(X_{i,t-1}) \\ -\beta_{13i}\ln(RPM_{i,t-1}) - \beta_{ji}TREND_t \end{bmatrix} + \mu_{it} \quad [4]$$

where, for the majority of countries $\beta_{LG} = \beta_{SG} = 0.4$ and $\beta_{LI} = \beta_{SI} = 2.0$, and $\overline{G}_i$ and $\overline{I}_i$ denote the respective average values of $(G/C)_i$ and $(I/C)_i$ over 2000-03.[14] This leaves the relative size of the effects from total (weighted) domestic expenditure and export volumes to be determined in estimation. It is important to check that the resulting marginal propensities lie between zero and unity.

34.   To date, the disaggregated expenditure model has been estimated only for the sample of 24 OECD economies. It has yet to be applied to Iceland, Luxembourg, and the four Central and Eastern European economies. The relatively short-sample of data available, and the reliability of the quarterly data for these economies may mean that a greater element of calibration will be needed if this approach is to be applied, so we report results only from models that relate import volumes to aggregate final expenditure.

Export and import prices

35.   The basic equations used to model export and import prices are shown in equations [5] and [6]. These can be seen as ones in which firms' pricing behaviour is modelled as a trade-off between the objectives of maximising profits and protecting market shares. An important refinement to these equations to allow for commodity price effects is discussed below.

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13.   Note that there are some minor differences in the relative short-run propensities that can be successfully imposed in Australia, Sweden and Turkey. See the footnotes to Table 3 for further details.

14. $\beta_{SG} = 0$ for Australia, Austria, Portugal and Spain, to avoid negative marginal impact propensities for government consumption, and $\beta_{SG} = 0.5$ for Sweden, Switzerland and Turkey to reflect comparatively high marginal impact propensities for government consumption in these countries. For Australia, Portugal, Spain, Sweden, Switzerland and Turkey $\beta_{IG} = 1.0$, reflecting comparatively high marginal propensities to import from current private consumption.

$$\Delta\ln(PX_{it}) = \gamma_{0i} + \gamma_{1i}\Delta\ln(PX_{i,t-1}) + \gamma_{2i}\Delta\ln(PW_{it}) + \gamma_{3i}\Delta\ln(PW_{i,t-1}) + \gamma_{4i}\Delta\ln(PGDP_{it})$$

$$+ (1 - \gamma_{1i} - \gamma_{2i} - \gamma_{3i} - \gamma_{4i})\Delta\ln(PGDP_{i,t-1}) + \gamma_{5i}\Delta\ln(EX_{it}) \qquad [5]$$

$$+ \gamma_{6i}\Big[\ln(PX_{i,t-1}) - \gamma_{7i}\ln(PW_{i,t-1}) - (1 - \gamma_{7i})\ln(PGDP_{i,t-1}) - \gamma_{ji}TREND_t\Big] + \omega_{it}$$

36.   PX denotes the price of exported goods and services in country i, PW denotes the price of competitors' on export markets (PXC, see Box A), PGDP is the GDP deflator in the domestic business sector and EX is the bilateral dollar exchange rate (dollars per unit of host currency).

$$\Delta\ln(PM_{it}) = \lambda_{0i} + \lambda_{1i}\Delta\ln(PM_{i,t-1}) + \lambda_{2i}\Delta\ln(PS_{it}) + \lambda_{3i}\Delta\ln(PS_{i,t-1}) + \lambda_{4i}\Delta\ln(PD_{it})$$

$$+ (1 - \lambda_{1i} - \lambda_{2i} - \lambda_{3i} - \lambda_{4i})\Delta\ln(PD_{i,t-1}) + \lambda_{5i}\Delta\ln(EX_{it}) \qquad [6]$$

$$+ \lambda_{6i}\Big[\ln(PM_{i,t-1}) - \lambda_{7i}\ln(PS_{i,t-1}) - (1 - \lambda_{7i})\ln(PD_{i,t-1}) - \lambda_{ji}TREND_t\Big] + \nu_{it}$$

37.   PM denotes the price of imported goods and services in country i, PS denotes the "shadow price" (PMSH, see Box A), PD is the total domestic expenditure deflator and EX is the bilateral dollar exchange rate (dollars per unit of host currency).

38.   These price equations allow for a variety of different types of behaviour, ranging from pricing fully to market ($\gamma_{7i} = 1$ in [5] and $\lambda_{7i} = 0$ in [6]) to pricing based purely on domestic costs ($\gamma_{7i} = 0$ in [5] and $\lambda_{7i} = 1$ in [6]). The separate dynamic term in the exchange rate permits a test of whether the initial response to nominal exchange rate fluctuations differs from the initial response to changes in shadow or competitors' prices. An extension would be to test for asymmetries in behaviour following a currency depreciation or an appreciation. In contrast to the price equations currently programmed in Interlink, based on the work reported in Herd (1987), [5] and [6] incorporate a long-run steady state for the price level, entering via the equilibrium-correction terms. The suggested specification is similar to the ones that can be found in most national and international macroeconometric models.

39.   The decision to condition on a measure of domestic output prices rather than domestic costs is partly a matter of convenience. In Interlink at present, there are behavioural equations in which business sector output prices are modelled as a function of input costs. Conditioning export prices on these domestic output price series ensures consistent feed-through of cost shocks in any modelling exercise. Whilst the structure of costs for producers of tradable and non-tradable goods and services may differ, it is not clear that it is worthwhile seeking to build this into a model in which no distinction is made between these types of producers (as it is based solely on the aggregate business sector, with a single production function).

40.   Two features of the price equations are the imposition of static and dynamic price homogeneity, and the inclusion of a trend functions of time. Price homogeneity is required in order to ensure coherent model properties; experiments suggest that the imposition can in fact be accepted by the data in approximately 70% of OECD countries.[15] The deterministic time trends might capture omitted behavioural

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15.   Long-run price homogeneity restrictions can also be derived at the microeconomic level for a profit maximising firm subject to decreasing returns of scale, perfect competition in factor markets and less than perfect competition in its product market (Deppler and Ripley, 1978). Dynamic price homogeneity is required in order to ensure that relative price levels are ultimately independent of the steady state rate of price inflation.

or measurement factors.[16] One example of a behavioural factor would be if producers had sought to progressively reduce price-cost mark-ups in order to gain, or maintain, export market share. An example of a measurement issue would be if trade prices had fallen relative to the aggregate (global or national) price of goods and services because of different in product composition. For instance, countries such as the United States, Finland and Sweden, with relatively high proportions of IT-related trade (OECD, 2003, Table B.7) might see their trade prices decline relative to the prices of the global bundle of traded goods and services. More generally, the prices of traded goods and services might fall relative to domestic business prices because of the higher weight of manufactured products in the former than in the latter. As with trade volumes we report evidence of significant non-linearity in the trend effects.

The treatment of commodity prices

41.   One important question concerns the extent to which an aggregate trade model would be suitable for simulations of commodity price shocks. Such shocks can have important effects on trade patterns and hence prices and output. Yet in the basic system set out above, there is no direct role for commodity prices, although they could still have an indirect effect by affecting production costs and hence domestic output prices. A practical alternative, which has been pursued in the work undertaken to date, is to treat the aggregate goods and services deflators as (geometric) price indices dependent on two separate deflators -- one for non-manufacturing merchandise trade and one for goods and services trade excluding non-manufactures. The latter has been modelled as the main behavioural equation for trade prices, specified in a similar fashion to equations [5] and [6], whilst the former has been modelled as a weighted average of the growth rates of the five separate commodity price series included in Interlink (oil plus HWWA indices for food, tropical beverages, agricultural raw materials and metals and minerals).

42.   The formal equations for the commodity price series can be expressed as:

$$(PXN_{it} / PXN_{it-1}) = \sum_{j=1}^{5} \omega_{Xij,t} (WPC_{jt} / WPC_{jt-1}) \quad \text{where} \quad \sum \omega_{Xij,t} = 1 \qquad [7a]$$

$$(PMN_{it} / PMN_{it-1}) = \sum_{j=1}^{5} \omega_{Mij,t} (WPC_{jt} / WPC_{jt-1}) \quad \text{where} \quad \sum \omega_{Mij,t} = 1 \qquad [7b]$$

where WPC_j denotes the world price of commodity *j* in domestic currency terms. The commodity weights are time varying and are taken from OECD *International Trade in Commodity Statistics*.[17,18] By design,

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16.   A time trend is incorporated in models of trade prices in a number of recent studies, including Anderton (2003) (for the euro area) and Uctum (2003) (for Japan). Olivei (2002) includes a constant in a model specified in first differences, implying trend effects in the price level. Trends are also present in the equations in the AMADEUS model for France (Prigent and Michaudon, 1998).

17.   In some countries the commodity composition of trade may differ considerably from the OECD average shares used as weights in the HWWA indices (Matthies, 2003). For instance, some agricultural products, such as non-processed meat, fish and dairy products, are not included in the HWWA series. In such cases it has been assumed that the price of such commodities moves in line with the closest aggregate HWWA index.

18.   A number of different specifications were also investigated before this procedure was finalised. They included the use of alternative commodity price aggregates from the IMF *International Financial Statistics* database and the direct estimation of the weights in [7a] and [7b] subject to the restriction that they sum to unity. Whilst this approach generally leads to a good fit (by construction) with the actual data, the procedure is not without significant drawbacks. In some countries, such as France and Korea, the commodity trade price data are not considered reliable and in others, such as Japan and Switzerland, it was

there is assumed to be full pass-through of exchange rate movements into the prices of imported commodities.

43.   The need to allow for direct commodity price effects is very important for some countries. As shown in Tables 1 and 2, commodities accounted for more than 20% of total goods and services exports in seven OECD members in 2000. They also represented more than 20% of total goods and services imports in seven countries.[19]

44.   After correcting for commodity prices, the principal behavioural equations for export and import price deflators now become:

$$\Delta \ln(PXX_{it}) = \gamma_{0i} + \gamma_{1i}\Delta \ln(PXX_{i,t-1}) + \gamma_{2i}\Delta \ln(PWX_{it}) + \gamma_{3i}\Delta \ln(PWX_{i,t-1}) + \gamma_{4i}\Delta \ln(PGDP_{it})$$

$$+ (1 - \gamma_{1i} - \gamma_{2i} - \gamma_{3i} - \gamma_{4i})\Delta \ln(PGDP_{i,t-1}) + \gamma_{5i}\Delta \ln(EX_{it}) \qquad [8]$$

$$+ \gamma_{6i}\Big[\ln(PXX_{i,t-1}) - \gamma_{7i}\ln(PWX_{i,t-1}) - (1 - \gamma_{7i})\ln(PGDP_{i,t-1}) - \gamma_{ji}TREND_t\Big] + \omega_{it}$$

$$\Delta \ln(PMX_{it}) = \lambda_{0i} + \lambda_{1i}\Delta \ln(PMX_{i,t-1}) + \lambda_{2i}\Delta \ln(PSX_{it}) + \lambda_{3i}\Delta \ln(PSX_{i,t-1}) + \lambda_{4i}\Delta \ln(PD_{it})$$

$$+ (1 - \lambda_{1i} - \lambda_{2i} - \lambda_{3i} - \lambda_{4i})\Delta \ln(PD_{i,t-1}) + \lambda_{5i}\Delta \ln(EX_{it}) \qquad [9]$$

$$+ \lambda_{6i}\Big[\ln(PMX_{i,t-1}) - \lambda_{7i}\ln(PSX_{i,t-1}) - (1 - \lambda_{7i})\ln(PD_{i,t-1}) - \lambda_{ji}TREND_t\Big] + v_{it}$$

where PXX, PMX, PWX and PSX correspond to PX, PM, PW and PS, but exclude commodities.

45.   The equations for the aggregate goods and services deflators are a weighted average of the predicted values from equations [7a], [7b], [8] and [9]:

$$\ln(PX_{it}) = \delta_{Xi}\ln(P\hat{X}N_{it}) + (1 - \delta_{Xi})\ln(P\hat{X}X_{it}) \qquad [10]$$

$$\ln(PM_{it}) = \delta_{Mi}\ln(P\hat{M}N_{it}) + (1 - \delta_{Mi})\ln(P\hat{M}X_{it}) \qquad [11]$$

46.   As with the commodity price expressions, the time varying weights (δ_{Mi} and δ_{Xi}) have been included in the combined trade model as separate variables. They are calculated using the ratio of non-manufacturing exports/imports on a customs basis to exports/imports of goods and services on a balance of payments basis.[20] Equations [10] and [11] imply that the extent of exchange rate pass-through in aggregate export and import prices can change over time even if it is constant (but different) for commodities and

found necessary to also include the domestic GDP deflator (a measure of home costs) in the export price relationship [7a] in order to obtain a satisfactory equation. Phillips-Hansen tests for the G7 economies also rejected the hypothesis that the resulting commodity price series provided an unbiased estimate of the actual price level. (In a regression of the actual level on an intercept and the estimated level, the joint test of a zero intercept and a unit coefficient on the estimated price level was rejected.)

19.   The time varying weights on individual commodity prices (ω_{Xj} and ω_{Mj}) have been included in the combined trade model as separate variables. They are fixed during the projection period.

20.   This ratio is then rescaled using the ratio of merchandise trade on a customs basis to merchandise trade on a balance of payments basis as a scaling factor.

non-commodities trade. The results we report below suggest that the gradual decline in the proportion of commodities within the aggregate export and import bundles is likely to reduce the extent of exchange rate pass-through, other things being equal. Campa and Goldberg (2002) obtain a related result.

47.   A further consequence of the separate identification of commodities is that two sets of shadow prices and competitors' prices are required. The behavioural price equation excluding commodities requires international measures of non-commodity prices. But the behavioural equation for trade volumes uses measures of the real exchange rate that are calculated inclusive of commodity prices. This is necessary because otherwise a shock to export prices resulting from a change in commodity prices will have no direct effect on export volumes.

Trade relationships for the non-OECD economies

48.   The estimated relationships for the non-OECD economies differ slightly from those set out above because domestic demand and the domestic price level are not modelled at present within Interlink. Thus trade prices for these regions are assumed to move in line with foreign prices with a long-term unit elasticity. Dynamic price homogeneity is ensured by imposing the restrictions that $\gamma_1+\gamma_2+\gamma_3=1$ in [8] and $\lambda_1+\lambda_2+\lambda_3=1$ in [9], with γ_4 and λ_4 set to zero.

49.   The import volume equations for the non-OECD economies in the new trade model follow the longstanding practice in external financing constraints are assumed to be such that the total value of expenditure on imports is set equal to the sum of export revenue, net inward financial transfers and net investment income. A side effect of this approach is that an improvement in the terms-of-trade of sufficient magnitude could depress import values, and possibly volumes, because of the negative impact it will have on export volumes. It would appear worthwhile to consider amending the model with measures of demand and domestic prices for the non-OECD members.[21]

5.   Estimation issues

50.   Equations [1], [4], [8] and [9] are expressed in a non-linear form allowing direct estimates of the long-run parameters and their associated standard errors. There are many ways in which this set of equations might be estimated, ranging from separate country regressions that allow all parameters and error variances to differ across countries, to conventional fixed effects panel estimators that impose common slope parameters and error variances but allow country-specific intercepts. Intermediate alternatives allow for common parameters and error variances to be imposed for subsets of countries as the data permits.

51.   A further, more general, alternative is to use estimators such as the seemingly unrelated regression procedure (SUR), or more general systems maximum likelihood techniques, which allow for the possibility of non-zero covariances across the error terms in the separate country models. In principle, the validity of the implicit constraints on the variance-covariance matrix of estimation residuals imposed by the more restrictive estimation procedures can, and should, be tested to guard against invalid inference. In practice, the size of the problem resulting from attempts to estimate equations for all, or almost all, OECD countries simultaneously, places some computational constraints on what can be done.

52.   For both volumes and prices, the initial approach for the large panel of 24 countries was to seek to obtain a satisfactory single equation estimate for each country with plausible parameters that satisfied conventional diagnostic tests.[22] Panel and systems estimation techniques were then employed to test cross-

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21.   This would have the additional advantage of allowing consistent measures of world GDP to be calculated in projections and simulations.

22.   In practice this involved augmenting the basic equations with a small number of outlier dummies.

equation restrictions. It proved feasible to use an iterative SUR procedure to estimate the export volume and trade price relationships, both for the large panel of 24 OECD economies and for the smaller sub-panels of the four accession and non-member economies. A variance-covariance matrix (V) of residual errors was generated from an initial set of non-linear least squares parameter estimates for each country, and then the full system of parameters were jointly recomputed until convergence was achieved, conditional on V. Within this framework Wald tests were employed to test cross-country restrictions.

53.   For import volumes, the greater complexity and non-linearity in the unrestricted specification has presently precluded the use of a full systems estimator for all 24 economies. Instead use has been made of more conventional panel data techniques. Tests were undertaken to see whether common error variances could be imposed across all, or subsets, of the individual country equations.[23] For those sub-groups in which the restriction of a common error variance proved acceptable, further tests were then carried out to find data-acceptable sets of common long-run and dynamic parameters. In practice this resulted in the formation of five sub-groups (with group 1 having the lowest common error variance and group 5 the highest):

- Group 1: France, the United Kingdom, Belgium, Netherlands, Portugal and Switzerland

- Group 2: the United States, Germany, Canada, Ireland and Sweden

- Group 3: Japan, Austria, Denmark, Spain

- Group 4: Italy, Greece, Korea, Australia

- Group 5: Finland, New Zealand, Norway, Mexico, Turkey

A limitation of this approach is that whilst it is possible to test for cross-country restrictions within each group, it is not easy to do so across groups. It should also be noted that the groupings reflect statistical criteria rather than economic ones.

54.   Even within the general frameworks outlined above there remains a question of whether restrictions on the long-run parameters can be evaluated using conventional hypothesis tests, as many of the variables used are non-stationary series. Thus the distribution of the long-run parameters is not always standard, especially in relatively small samples. In the system and panel estimation procedures that have been employed, all the principal explanatory variables have been treated as strictly exogenous. Provided this assumption holds and that a valid long-run (cointegrating) relationship exists in both the unrestricted and restricted specifications, it is likely that Wald and likelihood ratio test statistics will follow conventional distributions when the short and long-run parameters are estimated jointly. In this respect it is encouraging to note that most of the equilibrium-correction terms in the final equations appear to be well determined, providing some evidence that statistically-valid long-run relationships have been found.

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23.   For example, the error variances of the equations for countries such as Mexico and Turkey were found to be similar but significantly different from those for most other OECD countries. Invalid restrictions would therefore have to be imposed if they were to be included in a conventional panel model with the other countries with a common error variance. However it is still possible to test for commonalities between Mexico, Turkey and any other countries with a high error variance in a sub-panel. Alternatively, if estimates for them are to be obtained simultaneously with those for other countries, an estimation technique that does not impose equality of error variances has to be used.

Non-linear trend effects

55.   Previous work at the OECD on modelling manufacturing exports (Murata *et al.*, 2000) has sought to capture non-linear trends in export market performance by using a trend function of the form:

$$\text{TREND}_t = \exp\left[\varphi(\text{TIME}_t - \kappa)^2\right] \qquad\qquad [12]$$

where TIME denotes a deterministic linear time trend. This function is equivalent to a Gompertz trend curve with an additional higher order power of time.[24] Provided $\varphi<0$, the function will ultimately tend to zero. This has the attractive property that any non-linear trend effects found within sample will begin to diminish and eventually disappear out of sample over the medium to longer-term. The disadvantage of [12] is that the extent of non-linearity makes it difficult to estimate a function of this form simultaneously with all the other parameters in the behavioural trade equations, especially when such equations are being estimated as a panel and cross-equation restrictions are being tested.

56.   A simple alternative means of capturing non-linearity is to include both a deterministic and a logarithmic trend in estimation:

$$\text{TREND}_t = \tau_1 \, \text{TIME}_t + \tau_2 \ln(\text{TIME}_t) \qquad\qquad [13]$$

Together, these two terms allow for smooth transitions around a single point of inflexion within sample. Their parameters are also simpler to estimate in a multivariate framework. They also provide a means of testing formally for the presence of non-linear effects, since τ_2 will be insignificantly different from zero if such effects are unimportant. As reported below, evidence of significant non-linear effects was found in almost all of the trade volume equations and around two-thirds of the trade price equations.

57.   The principal disadvantage of [13] is that there is no guarantee that the non-linear trend effects will gradually diminish outside of the sample period. Indeed it is quite possible that the trend effects out-of-sample will prove to be quite different to those within sample, since the logarithm of time will eventually tend towards some constant and so the rate of change in [13] will be driven by the linear trend component. A second difficulty with [13] is that the shape of the function, and hence the estimated parameters, will be very sensitive to the date for the starting point of the time trend ($\text{TIME}_t = 1$) as this affects the in-sample curvature of the logarithmic trend.

58.   A three-step procedure was therefore adopted in estimation. The first step was to select a starting point for TIME using a grid search over separate panels of unrestricted volume and price equations for 24 OECD economies, with the TREND function taking the form of [13]. The overall log-likelihood of these systems of equations was found to be maximised when TIME=1 in 1970Q1.[25] The second step was to then test and, where possible, impose cross-country parameter restrictions on the separate panels of equations, for import and export prices and volumes, including on the parameters of the trend function [13].

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24.   The Gompertz trend curve is frequently used to model market or technological developments (Young, 1993). Its most common form is: $Y_t = Le^{-\beta e^{-\lambda t}}$, where Yt is the process being modelled and L is the saturation limit.

25.   This is the case for all the trade volume equations. For trade prices TIME=1 in 1970Q1 for the large panel of 24 OECD economies, and 1982Q1 for the six remaining OECD economies and the six non-OECD economies.

59.   The final step was to replace the estimated trend functions in the restricted set of equations by fitted curves of the form of [12]. Thus the estimated function [13] was used as the dependent variable in a regression of the form:

$$\text{TREND}_{it} = \theta_{1i} + \theta_{2i} \exp(\theta_{3i}\text{TIME}_t^2 + \theta_{4i}\text{TIME}_t) + \varepsilon_{it} \qquad \text{with } \theta_{3i}<0 \qquad [14]$$

In a number of cases the parameter θ_{3i} was chosen after a grid search over a number of possible values, because of the difficulties of obtaining convergence given the degree of non-linearity in the specification.[26]

60.   This procedure has been followed for the export volume and trade price equations in order to ensure that in-sample trends in export market performance and the relative price of traded goods and services do not continue indefinitely out-of-sample. Over time it is reasonable to expect that export market shares and real exchange rates will begin to stabilise. In contrast, it is less obvious that past trends in import penetration should not be expected to continue into the future and so in this case the estimated trend function [13] has not been replaced by the Gompertz function [14].[27]

61.   An illustration of the differences that can arise from the use of different trend functions is shown in Figure 5. This is based on econometric results for export volumes from France. Panel A shows the trend function from an equation which uses two separate linear time trends, with the break point in 1992. The break is sharp, and out-of-sample it is clear that the trend function (which reflects export performance after controlling for relative price effects) would decline continuously. Panel B shows the results from using a trend function of the form of [13]. This supports the original finding of a change in the underlying trend of export performance between the 1980s and the 1990s, but allows the evolution to occur more smoothly. However, the estimated equation still implies a continuous decline out-of-sample, as illustrated in Panel C, where the trend function is projected forward to the year 2050. Within a few years the out-of-sample trend values are very different to the in-sample ones. The dotted line in Panel D shows the evolution of the estimated non-linear function [14]. In this particular case there is little difference from the estimated trend [13] over the first few years out-of-sample, but over the longer-term the non-linear function [14] converges on a fixed value. Convergence is quite slow in this example, but for other countries it can be quite quick, depending on the in-sample rate of change of the estimated function [13].

6.   Estimation results

Export volumes

62.   The estimation results for export volumes are reported in Table 5, with the implied cumulative responses of exports following a permanent 1% shock to either market size or the real exchange rate summarised in Panel A of Table 10. Static estimation residuals are shown in Figure 6. A long run elasticity of unity is imposed on export market size, as in [1], so that the long-run parameters ultimately determine export market performance. This constraint, needed to ensure coherent model properties, can in fact be accepted in the majority of countries.[28] Tests of the cross-country restrictions in each of the three groups of economies for which SUR estimates have been computed are reported in Table 4, and show that in all cases the set of long-run and dynamic restrictions are jointly accepted by the data.

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26.   Equation [14] can be related to [12] by noting that [14] can be rewritten with $\theta_{3i} = \varphi$, $\theta_{4i} = -2\varphi\kappa$ and $\theta_{2i} = \exp(\varphi\kappa^2)$.

27.   There are two exceptions to this, for Canada and Mexico, where the estimated functions [13] would imply an eventual post-sample decline in import penetration for given levels of demand and relative import prices. Further details are provided in the description of the estimation results.

28.   Using the dynamic OLS estimation procedure suggested by Saikonnen (1991).

63.   For most countries, the long-run real exchange rate elasticities are lower than those found for manufacturing exports by Murata *et al.* (2000). There is little evidence available for non-manufacturing or services trade, but there are grounds for believing that at least some forms of these types of trade may be less price sensitive (Pain and van Welsum, 2004). If so, the aggregate relative price elasticity for goods and services trade volumes would be lower than for manufactures trade alone.

64.   The largest long-run price effects are found in China, Korea and Turkey, who all have elasticities of approximately -1.5%. Japan, Canada, Mexico and Spain all have a common elasticity just above unity, and the Czech Republic, Poland and the Slovak Republic all have a unit elasticity. Most of the remaining countries have elasticities close to -0.5%. The United States, France, the United Kingdom and Italy share a common price elasticity of -0.6%. Germany has the smallest elasticity amongst the G7, of just under -0.5%.

65.   The results indicate clearly that there is significant variation over time in export performance which cannot be accounted for solely by movements in the real exchange rate. Statistically significant coefficients are obtained on the time trends in 30 out of the 36 countries/regions. In all of these economies there is also evidence of non-linear time varying effects, as the coefficient on the logarithmic time trend is significant. Of the OECD economies, only Denmark, Finland, Iceland, Luxembourg and Sweden are without any trend effects.

66.   The pattern of the underlying TREND function is shown in Figure 10. This shows the considerable flexibility offered by the functional form employed. It is of interest that the three large euro area economies all have a common point of inflexion in the early part of the 1990s. Five of the G7 economies are shown to have had small underlying trend improvements in export performance over the first half of the sample period, but to have lost market share since that time. The trend effects in Japan have becoming increasingly negative over time, as have those in Canada, although in the latter case the rate of change is clearly moderating towards the end of the sample period.

67.   There are some trend functions which clearly imply out of sample trend effects that are very different to those seen at any point within sample. This is because the impact of the logarithmic trend term on the overall rate of change of [13] will diminish over time. Thus the estimated trend function has been replaced in many cases by the exponential function [14]. The out-of-sample differences between the two functions over the years to 2010 are also illustrated in Figure 10. In some countries, notably the United States, the United Kingdom, Australia, Belgium and the Netherlands, the ongoing trend-induced decline in export performance is slowed quite markedly by the fitted exponential function. In other countries, such as France, Germany and Italy, it would be a further decade or more before the slope of the fitted exponential function [14] would moderate relative to that of the estimated trend [13], with the out-of-sample rate of change in both functions over the period to 2010 not being greatly different from that observed within sample.

68.   The contribution of the TREND components to the annual rate of export growth within-sample is summarised in Panel A of Table 11. For a given level of the real exchange rate, this provides an estimate of the steady state change in export market share that will take place from one year to the next. By 2002 for the OECD as a whole, the weighted trend contributions imply a trend decline of approximately 0.5% in export performance. The largest negative impact is in Japan, with the trend terms reducing export market performance by around 4¾ per cent per annum. The trend terms are also having a marked negative impact in Italy, Switzerland, New Zealand, Norway and Portugal, with export performance being reduced by between 2-3% per annum. This rate of decline has been seen for a decade or so in New Zealand, Norway and Switzerland, but has only been attained more recently in Italy and Portugal. The remaining five G7 economies all have a negative trend contribution of between 0.8-1.0% per annum.

69.   Amongst the OECD economies with an underlying trend improvement in export performance, the largest effects at the end of the sample period can be seen in Ireland, Hungary, Mexico, Poland, the Czech Republic, Turkey and Spain. In many instances these effects are likely to be related to the positive impact of inward foreign direct investment on export performance. It is possible that in some cases this might just be resulting in a once-for-all permanent shift in export market shares, rather than having an effect on export growth that will persist indefinitely. But, within-sample it is difficult to distinguish between these two alternative explanations.

70.   In the non-OECD economies, large positive trend contributions to export growth can be seen most clearly in China, at just over 7½ per cent per annum in 2002, and also in Other Asia (ASO) and South and Eastern Europe. Perhaps surprisingly, there is a sizable negative trend contribution to export performance in the Dynamic Asian economies (ANC). This reflects the marked deterioration in export performance in 2000-01, at the end of the short-sample period for the non-OECD economies in estimation. To the extent that this reflects their relative specialisation in ICT-related product, it might be argued that such a rate of decline is unlikely to persist into the medium-term.

71.   The existing semi-annual equation specification for exports of manufactures from Japan, based on the work in Murata *et al.* (2000), contains an additional term in the ratio of the cumulated stock of Japanese FDI outflows to the domestic capital stock. This term is intended to capture the impact on Japanese exports of the ongoing relocation of production from Japan to the rest of the world.[29] We found that it was not necessary to include this term in estimation in order to obtain a well-specified equation for Japan, that satisfied conventional diagnostic tests. Production relocation may well lie behind the trend effects obtained for Japan, but given that similar forces are potentially at work for many other countries as well, it would seem preferable to try and investigate this systematically, if it is to be done.

72.   The equilibrium-correction terms (coefficient α_6 in [1], labelled ECM in Table 5) are well determined for all countries, suggesting that a statistically significant long-run relationship exists. These terms, together with the separate dynamic terms in demand and the real exchange rate and past export growth determine the dynamic properties of the equations summarised in Panel A of Table 10. The figures in this table show the implied cumulative responses of exports over a period of 40 quarters to a permanent rise of 1% in the level of either market size (W) or the real exchange rate (RPX) for each individual country or region in turn.

73.   The adjustment to a demand shock is relatively rapid in most countries, being almost complete after two years (eight quarters) or less. Some overshooting can be seen in Finland, Ireland, Korea, Portugal and Sweden on impact, and in the United States, Japan, the Slovak Republic and Dynamic Asia by the second quarter. Thus, in the short-term these countries gain market share at the expense of others. Germany, Italy, Australia, Austria, Denmark, Norway and Spain all experience comparatively sluggish adjustments.

74.   Given that world exports should, in principle, sum to world imports, then it must be the case that sluggish adjustment to a demand shock, where demand is measured in terms of total import volumes, in some countries is offset by overshooting in others. However, formal adding up constraints have not been imposed in estimation to ensure this occurs period by period. There are two reasons for this. First, the measure of export market size (W) is different for each exporting country/region, because it weights together imports in other countries and regions according to their relative importance in total exports from that country/region. Second, as there is a long-standing global trade discrepancy, global exports and imports do not in fact add up over the estimation period. Thirdly, if an adding-up constraint was imposed,

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29.   Pain and Wakelin (1998) also report a significant negative impact from the stock of net outward FDI from Japan on Japanese merchandise export volumes.

it would be likely to severely curtail the available sample period over which to estimate the relationships for the OECD economies, given the relatively short span of data available for the non-OECD economies.

75.   The adjustment to a real exchange rate rise is also relatively quick, with over half the effect through in all countries after two years. In many cases nearly all of the long-run effect has come through by this time. The largest short-term responses appear in China, Africa and the Middle East, the four Central and Eastern European economies, Korea and Turkey. The performance of exporters from all these countries/regions is likely to depend heavily on their price competitiveness.

Import volumes

76.   The estimation results for import volumes are reported in Table 6A, with the resulting marginal import propensities for each component of expenditure reported in Table 7 and the cumulative responses of imports to permanent 1% shocks to all categories of expenditure and the real exchange rate summarised in Panel C of Table 10. Static estimation residuals are shown in Figure 7. As described in [4], restrictions are imposed to ensure the long-run property that import volumes will rise eventually by 1% if all components of final expenditure also rise by 1%. A number of cross-country restrictions have also been imposed within each of the five sub-groups of countries for which panel models have been estimated (see paragraph 53) to allow for common long-run and dynamic parameters. The summary test-statistics reported in Table 4 indicate that these restrictions are all accepted jointly by the data.

77.   In most countries the long-run import propensities appear to be broadly in line with the existant information from input-output tables. The import content of exports is estimated to be greatest in Belgium and Ireland, at over 60%, and smallest in the United States and Japan. Switzerland, Mexico, the Netherlands and Canada are also all found to have a high import content in exports, with imports comprising approximately one-half of exports. The relative size of the long-run propensities to import from investment and exports is mixed, with each being larger than the other in 12 economies. The marginal propensity to import from total final domestic expenditure is found to be greatest in the Netherlands and Belgium, followed by Portugal, Ireland, Sweden and Austria, and smallest in Japan and the United States. Amongst the remainder of the G7 there are relatively small differences in the propensity to import from domestic expenditure, although Canada and Germany have a higher import content of exports.

78.   The cross-country pattern of the individual expenditure elasticities is generally similar to that of the marginal import propensities. However it is of interest to note from Table 7 that the three countries with the highest long-run elasticities on the components of domestic final expenditure -- the United States, Japan and Australia -- all have low marginal import propensities. This reflects the relatively small ratio of imports to final demand in these economies.

79.   The extent of short-term overshooting following a common change of 1% in all categories of expenditure is far smaller than found when using a combined total final expenditure variable. In most G7 economies, with the notable exception of Germany, the short-run weighted expenditure elasticity is found to be around 1½ per cent, compared to elasticities of 2% or more obtained from the previous specification. Adjustment towards the long-run also appears be faster than before, as can be seen by comparing the upper parts of Panels B and C in Table 10. In the disaggregated expenditure model most of the adjustment is complete after three to four years. There are some smaller economies, such as Finland, Norway and New Zealand where there is little or no overshooting in imports in response to changes in expenditure. Only in Portugal and Spain does the short-run expenditure elasticity approach 2%. The equilibrium-correction terms (coefficient β_{9i} in [4], labelled ECM in Table 6A) are well determined for all countries, suggesting that a statistically significant long-run relationship exists.

80.   Whilst the faster adjustment of imports appears to be an argument in favour of the disaggregated expenditure approach, a less welcome feature is the smaller direct impact of changes in relative import prices. The dispersion of the long-run relative price elasticities is relatively narrow compared to that found for export volumes, with almost all countries having an elasticity in the range -0.3-0.6%.[30] In most of G7, the long-run relative price elasticity is around half of that found in the model using only total final expenditure, as can be seen by comparing the lower halves of Panels B and C in Table 10. However, it is of interest to note that in the short-term there are however relatively few differences in the speed of price response in the two different specifications. Australia, Korea, Spain and Portugal are the economies with the largest relative price elasticities.

81.   A notable feature of the export and import volume equations is that there are many economies for which the sum of the export and import price elasticities is less than unity. This is the case for all of the G7 economies, apart from Japan and Canada, and most of the smaller European economies. Under certain conditions this may mean that a nominal exchange rate depreciation would lead to a deterioration in their trade balances rather than an improvement.[31] It is certainly the case that any given change in the real exchange rate will have a larger direct impact on export volumes than on import volumes in almost all economies.

82.   Import penetration has risen steadily over time, a fact reflected in the long-run coefficients found on the trend terms in almost all countries. As for export volumes, there was clear evidence of significant non-linearity in the estimated trend function with significant coefficients being found on the logarithmic time trend in 22 out of the 24 economies. The sole exceptions were Greece, where only a linear trend proved significant, and Norway, where no significant trend effects could be found at all. In most countries a positive coefficient was obtained on the linear trend and a negative coefficient on the logarithmic trend. A property of this combination is that the contribution of the trend function to import volume growth has been increasing over time (as the weight of the log trend fades) and is likely to continue to do so out-of-sample.

83.   There are two exceptions, Canada and Mexico, both of which have a positive coefficient on the log trend and a negative coefficient on the linear trend. This combination has the property that the trend contribution to import growth will slow over time. In Mexico this process is only starting to begin, whereas in Canada the contribution of the trend function to import growth has already reached zero by the end of the sample period. To avoid a negative effect out-of-sample in these two economies, an exponential trend function of the form of [14] has therefore been fitted. The resulting differences to the out-of-sample evolution of the trend effects can be seen in Figure 11, which shows all the estimated trend functions in the import volume equations.

84.   The contribution of the TREND components to the annual growth rates of import volumes is summarised in Panel B of Table 11. At the end of the sample period the largest trend effects are in the

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30.   The exceptions are Austria and Denmark with an elasticity of less than –0.2%.

31.   The basic Marshall-Lerner condition is that an exchange rate depreciation will improve the trade balance if the sum of the absolute relative price elasticities in the trade volume equations exceeds unity. This is true under the assumption that there is a zero pass-through from a change in the exchange rate onto export prices (i.e. export prices depend solely on domestic costs) and a full pass through onto import prices (*i.e.* domestic currency import prices depend solely on foreign currency world prices). Neither would necessarily be the case in imperfectly competitive markets, and, as we show below, there is little empirical evidence in favour of either condition in most countries. To the extent that price setting behaviour also depends on other factors, such as domestic costs, which are affected by the exchange rate, it is more appropriate to evaluate the impact of an exchange rate change by examining the impact within the entire macroeconometric model in which the trade relationships are embedded.

United States and Turkey, with trend contributions of over 4% per annum, followed by Japan and Spain, with trend contributions worth 3¼-3½ per cent per annum. In the larger European economies the trend effects imply that import volumes are rising by about 2% per annum faster than might otherwise be expected given the composition of expenditure and relative prices. Over the sample as a whole, the largest cumulative trend effects can be seen in Mexico. An interesting feature of the trend functions is the common pattern that can be seen for many economies, with negative effects in the early 1980s before a marked acceleration and positive effects from the late 1980s onwards. In Europe, one possible explanation for this is that the function is picking up a break brought about by the improvements in market access resulting from the Single Market Programme and the creation of the European Economic Area.

85.   Import volume equations for the remaining six OECD economies are reported in Table 6B. These equations have the form of Model 1 in Appendix B, with import volumes related to a single activity variable, total final expenditure (TFE), the real exchange rate and a linear trend. No attempt has been made to estimate an equation with disaggregated expenditure terms for these economies, reflecting difficulties in obtaining consistent quarterly estimates of the main final expenditure components. One important difference with the form of the equations used previously in Interlink has been the imposition of a long-run coefficient on unity on TFE, so that import penetration is ultimately pinned down, as it is for the disaggregated expenditure import models.

86.   Several of the estimated equations in Table 6B display considerable overshooting following an increase in demand, as can be seen from Panel B in Table 10, with adjustment to the long-run being very protracted. There are large trend effects in both Poland and the Slovak Republic, with annual contributions of over 4%. A relative price elasticity of -0.5% is imposed in the Central European economies, reflecting the difficulties of finding a significant coefficient over the sample period used.

Export prices

87.   The estimation results for export prices are reported in Table 8, with the implied cumulative responses of prices following a permanent 1% shock to either competitors' prices or domestic prices summarised in Panel D of Table 10. Static estimation residuals are shown in Figure 8. Tests of the cross-country restrictions in each of the three groups of economies for which SUR estimates have been computed are reported in Table 4, and show that in all cases the set of long-run and dynamic restrictions are jointly accepted by the data.

88.   There is clear evidence of long-run pricing to market behaviour in all economies, with the coefficient on competitors' prices (coefficient γ_{7i} in [8]) being significantly different from zero. The evidence is consistent with the notion that exporters from large countries are likely to have some degree of monopoly power, as the smallest long-run elasticities on foreign prices are found in the United States (0.08%) and Germany (0.18%). The foreign price elasticity for the other G7 economies ranges from 0.28% in Japan and France to between 0.4-0.5% in Italy, the United Kingdom and Canada. These results appear broadly in line with evidence reported by the IMF (2003, Table 2) and by Uctum (2003). Exporters from some small open economies, such as New Zealand, Norway, Iceland, Hungary and Poland appear to be full price takers on world markets in the long-run, as are exporters from the non-OECD countries. Export prices in Mexico, Portugal and the Slovak Republic also appear to be largely determined by world prices. However there are some small economies in which world prices are found to have a comparatively weak long-run effect on export prices. Notable examples include Austria, Denmark, Finland, Ireland, Spain and Switzerland.

89.   The estimated TREND functions again show clear evidence of non-linear time effects. The logarithmic time trend is found to be significant in 20 OECD economies and also in four of the non-member economies. Two countries, the United States and Austria, have only a significant linear trend, and

10 economies do not have any significant time trend effects. In the majority of countries, including all of the G7 for which a trend is included, the coefficients imply an underlying trend decline in relative export prices in recent years. There are several countries in which the estimated within-sample trend functions ([13]) imply an increasing trend effect on prices. To alleviate this, an exponential trend function of the form of [14] has therefore been fitted. The resulting differences to the out-of-sample evolution of the trend effects can be seen in Figure 12. Over the period to 2010 the differences are relatively small, but thereafter the choice of trend function becomes increasingly important.

90.　　The negative time effects can be interpreted in a number of different ways. One is that export margins have fallen systematically over time as exporters increasingly seek to price-to-market (Olivei, 2002). A second interpretation is that the export bundles of these countries have a different composition to that of the overall bundle of goods and services traded on world markets, and their relative price has fallen. For instance, eight of the group of countries with negative trend effects have a relatively high proportion of ICT-related exports -- the United States, Japan, the United Kingdom, Ireland, Korea, Finland, the Netherlands and Sweden (OECD, 2003).[32] A third possibility is that export prices have fallen relatively to domestic prices and costs over time, either because the long-run coefficients on domestic and competitors' prices might be time-varying or, more generally, because of a general decline in the relative price of manufactures, which have a higher weight in the export bundle than they do in the business sector as a whole.[33]

91.　　The contribution of the TREND components to the annual growth rates of export prices is summarised in Panel C of Table 11. By the end of the sample period the largest negative trend effects in the G7 economies are found in the United States and the United Kingdom, generating an annual decline in relative export prices of between 1½-1¾ per cent, other things being equal. This decline feeds through into the export prices of all other countries and regions via the competitors' price term in their equations. A marked negative impact is also apparent in France, and smaller negative effects in Japan and Germany. In Canada the influence of the TREND terms has become negligible by the end of the sample period, but was considerable in the first half of the sample period. Amongst the rest of the OECD, there are particularly large negative trend effects on the growth rate of prices in Korea, Finland, the Netherlands, Sweden, Australia and Turkey. In contrast the TREND terms have a small positive impact on the rate of growth of prices in Iceland, Mexico, Hungary, Switzerland, Belgium and a number of non-OECD regions. The estimated TREND function for Norway has a large negative trend in the early part of the sample, but is increasingly positive towards the sample end. On balance, by the end of the sample, the level of non-commodity export prices is approximately 9% higher than might otherwise have been predicted given world prices.[34]

92.　　As far as possible, the estimated export price equations all follow the specification of equation [8], with insignificant parameters being set to zero. However there were a few cases where country-specific effects had to be allowed for in order to obtain an equation with satisfactory properties. In Canada, the rate of growth of the US GDP deflator was introduced into the equation (in place of the Δ ln (PWX_{it}) term in [8]), reflecting the extent to which Canadian exports are competing significantly with US producers on the US market. This term was found to dominate the aggregate change term in competitors'

32.　　However, this is also the case for Hungary and Mexico and both of these countries have positive trend effects.

33.　　A fourth explanation might be that the adjustment made to remove commodity price effects from the export price deflator via [7a] is imperfect because the range of agricultural products exported is broader than that allowed for in the HWWA commodity price indices.

34.　　It is not clear what accounts for the change in the sign of the TREND effect for Norway through the sample, although Norway was one of the economies for which there were difficulties in constructing consistent non-commodity trade price deflators through time.

prices, and the latter was dropped from the specification. In Mexico, an intercept shift was introduced after 1994 to capture the impact of the creation of NAFTA. This term had a significant negative coefficient, implying a one-time downward adjustment in profit margins.

93.   In all OECD countries and non OECD regions, the coefficient on the equilibrium-correction term (denoted γ_{6i} in equation [8] and labelled ECM in Table 8) is found to be negative and significantly different from zero, suggesting that a statistically significant long-run relationship exists. The restrictions that would be required to move to an export price equation specified only in first differences (a price inflation equation) would clearly be rejected by the data. For most countries the ECM coefficient lies between -0.15 and -0.30, with the speed of adjustment of prices being comparatively rapid. The coefficient is highest in Italy and Mexico, some of the Central European transition economies countries (Czech Republic and Poland) and some non OECD regions/countries. Amongst the G7 countries, Germany, France and Canada are found to have the smallest coefficients.

94.   The individual equation cumulative response functions to a sustained step change of 1% in either competitors' prices or domestic prices are shown in Panel D of Table 10. In general, the reaction of export prices appears relatively quick, with much, or all, of the adjustment complete after two years. A few countries exhibit a degree of overshooting following changes in either competitors' or domestic prices. Most notably, all of the G7 countries, with the exception of Canada, have stronger domestic price impacts at some point in the first year than they do in the long run, suggesting a greater degree of price-setting behaviour in the short term.

95.   In most countries the initial impact of a change in the nominal effective exchange rate will be given by the coefficient on the dynamic term in competitors' prices {the $\Delta \ln (PWX)$ term in Table 8; coefficient γ_{2i} in [8]}. This term is defined as the rate of change of world prices in domestic currency terms. So a nominal exchange rate appreciation will reduce the domestic currency value of any given foreign currency level of world prices, and hence export prices (in domestic currency terms). To test whether the response of export prices to such an exchange rate change is equal and opposite to that of a change in competitors' prices (in US dollar terms) a separate dynamic exchange rate term is included in [8] [labelled $\Delta \ln(EX)$ in Table 8]. The coefficient on this term (γ_{5i} in [8]) was found to be statistically significant for 24 OECD countries.[35]

96.   In 16 of these countries, the dynamic exchange rate coefficient is positive, but smaller than that on the dynamic term in world prices. This implies that the initial reaction of exporters from these countries to a change in the nominal exchange rate is smaller than that to an equivalent change in world prices. However in five countries -- Canada, Japan, Korea, Turkey and Mexico -- significant negative coefficients are found, implying that exporters react more strongly to movements in the nominal exchange rate than to movements in competitors' prices.

Import prices

97.   The estimation results for import prices are reported in Table 9, with the implied cumulative responses of prices to permanent 1% shocks to either shadow prices or domestic prices summarised in Panel E of Table 10. Static estimation residuals are shown in Figure 9. Tests of the cross-country restrictions in each of the three groups of economies for which SUR estimates have been computed are reported in Table 4, and show that in all cases the set of long-run and dynamic restrictions are jointly accepted by the data.

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35.   It was not included in the equations for the United States and the non-OECD economies as their export prices are expressed in dollar terms.

98.   As with export prices, there is again clear evidence of long-run pricing-to-market behaviour in almost all OECD economies, with the coefficient on domestic prices in the importing economy {(1-λ_{7i}) in [9]} being significantly different from zero.[36] The only exceptions to this, with complete exchange rate pass-through in the long run, are Canada, Korea, Hungary, Poland, the Slovak Republic and Turkey.[37] Amongst the G7, the largest degree of pricing to market occurs in the United States and (to a smaller extent) Japan and France, and the smallest in the United Kingdom and Canada.[38] In the Euro Area economies, the long-run pass-through elasticity (the weight on world prices) is approximately 60%, in line with the results for extra-Euro Area imports reported by Anderton (2003).[39] Amongst the smaller economies, the largest degree of pricing to market behaviour is found in the Netherlands and Greece.

99.   Even though the import price specifications are conditioned on export prices, via the shadow price terms, significant trend effects are found for 24 OECD economies, as well as five non-OECD regions. Again there is clear evidence of non-linearity in most of these countries, with the logarithmic trend being significant in 21 of the OECD countries and all five of the non-OECD ones. Three countries, Portugal, Spain and Iceland have only a significant linear time trend. In a majority of countries the trend terms have a negative impact on the rate of change in import prices, implying that import prices have declined more rapidly than a weighted average of exporters' prices and domestic prices in the importing economy. Trend effects are absent in only two of the G7 economies, Italy and Canada. Italy, Greece and New Zealand are the only countries without any significant trend terms in either the export or the import price equations.

100.   The contribution of the TREND function to the growth rate of import prices is summarised in Panel D of Table 11. The largest negative effects are in Finland and Korea, with prices declining by 3% per annum by the end of the estimation period, France, Turkey, the United States, Australia and the Netherlands. A significant positive trend effect is found in four of the non-OECD countries/regions, implying that (dollar) import prices in these regions were increasing more rapidly than world prices during the late 1990s.

101.   Again, as for export prices, there is also evidence that import prices respond differently in the short term to changes in nominal exchange rates than they do to changes in shadow prices. In 16 OECD economies there are significant coefficients on the contemporaneous dynamic exchange rate term (coefficient λ_{5i} in [9]) and 13 of these are positive. This implies that the initial reaction to nominal exchange rate fluctuations is smaller than it is to equivalent changes in shadow prices. Only in Canada, Korea and Australia is the reaction to exchange rate changes larger. Poland and, by design, the United States, are the only OECD countries in which the response of both export and import prices to a given absolute change in either the dollar exchange rate or world dollar prices is always identical.

102.   In all OECD countries and non OECD regions, the coefficient on the equilibrium-correction term (denoted λ_{6i} in equation [9] and labelled ECM in Table 9) is found to be negative and significantly different

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36.   As we do not have domestic prices, the possibility of pricing to market is automatically excluded for the non-OECD economies.

37.   For Canada this finding is what might be expected, given that the pass-through is set to one by construction in some merchandise import prices calculated by Statistics Canada, consistent with information from the Canadian Customs and Revenue Agency (Statistics Canada, 2003).

38.   The weight of 79% on world (shadow) prices and 21% on domestic prices in the United Kingdom contrasts markedly with the results of Herzberg *et al* (2003), who report weights of 36% on Major 6 costs and 64% on UK domestic prices. IMF (2003) obtain a long-run pass-through elasticity of 60%.

39.   The results for Germany and Spain in Table 9 are in line with those obtained by Warmedinger (2004), but in the Netherlands, France and Italy we find somewhat lower pass-through effects.

from zero, suggesting that a statistically significant long-run relationship exists. As found for export prices, the restrictions that would be required to move to an import price equation specified only in first differences (a price inflation equation) would clearly be rejected by the data. On average, the magnitude of the coefficients on the equilibrium-correction terms are broadly similar to those found for export prices, but there are several countries -- Australia, Belgium, Canada, Greece, New Zealand, the Slovak Republic and the United States -- where the coefficient, although significant, is below -0.1, implying somewhat protracted adjustments following any shocks.

103.   The individual equation cumulative response functions to a sustained step change of 1% in either shadow prices or domestic prices are shown in Panel E of Table 10. The adjustment of import prices appears relatively quick, with much, or all, of the adjustment again complete after two years, with some countries displaying a degree of overshooting in responses to changes in either one or the other of the two prices. There are many countries in which pricing-to-market appears to occur much more heavily in the very short term than in the longer term, including all of the G7 economies with the exception of the United States and Germany. This general picture is consistent with the findings of Campa and Goldberg (2002), amongst others, who find that exchange rate pass-through elasticities in most OECD countries are smaller in the short term than in the longer run.

Table 1. Composition of commodity trade and share of commodities in exports of goods and services

Percent

	Share in commodity exports															Commodities as % of goods and services		
	Food			Tropical beverages			Oil			Agricultural raw materials			Metals and minerals					
	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000
Australia	41.5	31.7	32.3	4.6	1.4	4.7	17.2	26.2	33.4	20.0	25.4	13.3	16.7	15.3	16.3	63.1	42.6	36.0
Austria	23.1	27.6	35.6	5.8	7.8	19.0	10.8	12.7	12.4	53.5	43.8	27.4	6.9	8.2	5.6	8.1	6.0	6.2
Belgium	38.6	48.7	49.0	9.4	10.6	13.8	34.6	22.4	19.7	11.1	11.7	11.9	6.3	6.6	5.6	17.2	12.5	13.2
Canada	22.5	22.4	24.9	2.3	2.3	3.6	30.4	29.0	36.1	27.9	32.6	29.3	16.9	13.7	6.1	41.4	28.9	23.8
Czech Republic	28.8	28.8	27.5	10.9	10.9	12.4	30.8	30.8	28.2	17.3	17.3	24.7	12.2	12.2	7.2	14.8	14.8	8.2
Denmark	68.9	70.6	67.4	5.6	6.1	6.4	8.9	8.5	13.8	15.0	12.7	11.0	1.6	2.2	1.5	31.0	25.8	20.7
Finland	8.3	9.4	10.6	3.0	3.6	5.1	11.0	6.3	21.9	76.0	77.1	58.4	1.8	3.5	4.0	22.8	11.8	10.5
France	46.1	51.8	49.9	18.5	22.4	25.2	16.5	10.3	13.7	12.6	10.1	7.8	6.4	5.4	3.3	17.1	15.7	12.5
Germany	32.4	43.5	43.6	10.9	14.7	17.7	32.3	16.5	15.7	16.5	15.8	15.3	7.9	9.4	7.6	9.5	6.7	6.5
Greece	42.9	48.0	39.0	13.8	12.1	14.7	23.4	12.7	21.5	8.4	18.5	20.5	11.5	8.7	4.3	24.7	20.7	14.4
Hungary	61.9	61.9	60.3	8.7	8.7	8.9	10.8	10.8	13.6	12.7	12.7	13.5	6.0	6.0	3.8	23.8	23.8	9.1
Iceland	92.3	95.7	95.2	0.0	0.3	0.2	0.0	0.0	0.2	6.7	3.1	3.2	1.0	0.9	1.2	60.2	59.9	43.4
Ireland	76.7	72.3	71.3	10.0	11.4	14.9	1.1	1.7	2.6	6.2	6.7	5.1	6.0	7.9	6.1	35.7	23.0	7.8
Italy	33.9	48.2	49.7	13.2	15.5	20.9	41.3	18.2	13.9	8.1	13.2	12.0	3.5	4.9	3.5	11.4	7.4	7.4
Japan	36.2	30.6	23.8	5.4	4.3	7.9	12.7	22.3	23.0	39.2	34.0	32.2	6.6	8.8	13.2	2.5	1.5	1.3
Korea	36.6	36.6	23.6	6.1	6.1	3.6	31.5	31.5	57.3	22.7	22.7	13.9	3.0	3.0	1.4	4.9	4.9	6.9
Luxembourg	45.0	45.0	45.0	39.2	39.2	39.2	0.9	0.9	0.9	10.0	10.0	10.0	5.0	5.0	5.0	2.7	2.7	2.4
Mexico	16.4	16.4	26.4	5.4	5.4	12.5	71.1	71.1	52.3	2.5	2.5	4.5	4.6	4.6	4.3	43.6	43.6	13.9
Netherlands	35.2	45.7	43.7	8.4	9.8	13.9	42.3	25.9	24.0	10.5	14.5	15.7	3.6	4.2	2.7	38.4	28.9	23.4
New Zealand	58.4	62.6	71.0	0.8	1.4	2.5	1.7	3.0	3.6	38.2	32.2	22.2	1.0	0.7	0.7	63.1	54.9	47.2
Norway	14.6	11.9	14.4	0.3	0.3	0.3	72.7	80.1	82.4	8.3	5.3	1.8	4.2	2.4	1.1	40.7	42.1	55.6
Poland	37.4	37.4	43.1	4.7	4.7	10.3	32.7	32.7	29.6	12.9	12.9	12.1	12.3	12.3	4.8	29.4	29.4	12.2
Portugal	26.5	18.5	28.0	27.0	14.9	23.1	0.4	16.2	14.4	40.6	38.9	27.7	5.6	11.5	6.8	19.5	15.0	10.2
Slovak Republic	23.6	23.6	23.0	9.8	9.8	8.2	35.3	35.3	38.9	23.0	23.0	21.3	8.3	8.3	8.6	10.7	10.7	11.2
Spain	57.6	50.8	59.5	14.4	10.3	13.0	8.7	18.8	11.9	15.5	14.4	11.1	3.9	5.6	4.5	16.0	15.2	13.3
Sweden	9.8	9.2	16.5	2.1	3.7	7.2	17.7	17.9	22.9	58.0	57.7	44.7	12.4	11.5	8.8	15.1	10.9	9.3
Switzerland	39.1	39.2	38.7	25.4	26.4	27.8	1.8	2.7	6.9	22.6	19.5	14.7	11.1	12.2	11.8	4.0	3.1	3.1
Turkey	58.8	51.3	55.4	12.2	15.6	18.3	0.1	6.9	6.6	21.0	14.3	11.6	8.0	11.8	8.1	58.8	18.8	10.3
United Kingdom	16.2	25.5	23.4	18.4	20.6	23.4	50.7	40.0	44.2	8.8	6.4	4.5	5.8	7.5	4.5	17.2	12.4	10.6
United States	53.4	45.5	51.3	5.1	8.4	10.3	10.7	13.6	12.8	22.2	23.5	19.2	8.6	8.9	6.3	24.8	14.8	8.4
China	27.1	41.6	48.2	0.9	2.2	2.9	50.5	33.0	30.8	1.2	1.0	0.5	20.3	22.3	17.5	9.1	9.1	9.1
Dynamic Asia	18.7	26.7	23.9	0.7	2.6	2.5	55.8	46.3	50.9	7.7	5.7	7.1	17.1	18.7	15.6	12.2	12.2	12.2
Other Asia	48.5	51.4	74.1	2.9	2.5	0.4	28.7	8.9	6.6	0.9	0.8	1.8	19.0	36.4	17.0	18.1	18.1	18.1
Latin America	44.8	44.8	44.8	3.0	3.0	3.0	31.8	31.8	31.8	10.9	10.9	10.9	9.6	9.6	9.6	46.3	46.3	46.3
Africa & Middle-East	9.2	9.2	9.2	1.2	1.2	1.2	82.8	82.8	82.8	3.9	3.9	3.9	2.9	2.9	2.9	59.1	59.1	59.1
Central & East Euro	7.6	7.6	7.6	2.1	2.1	2.1	71.9	71.9	71.9	10.2	10.2	10.2	8.2	8.2	8.2	33.8	33.8	33.8

Table 2. Composition of commodity trade and share of commodities in imports of goods and services

Percent

	Share in commodity imports															Commodities as % of goods and services imports		
	Food			Tropical beverages			Oil			Agricultural raw materials			Metals and minerals					
	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000	1980	1990	2000
Australia	11.6	23.3	25.9	12.4	11.9	11.4	52.3	39.8	48.0	17.8	19.4	11.9	5.9	5.6	2.8	17.7	9.8	11.2
Austria	16.8	22.4	33.6	7.9	9.5	11.4	47.6	34.8	29.2	15.4	21.8	20.9	12.3	11.6	4.9	21.2	12.3	10.0
Belgium	27.0	33.2	37.0	8.1	7.9	12.5	43.1	32.3	30.3	11.1	13.0	11.4	10.7	13.6	8.8	29.9	19.0	17.5
Canada	23.0	30.7	34.4	10.0	10.2	12.5	43.5	33.8	29.8	12.7	12.1	12.4	10.8	13.2	11.0	21.8	12.7	11.0
Czech Republic	22.7	22.7	24.9	9.0	9.0	11.0	46.3	46.3	43.3	12.8	12.8	14.3	9.2	9.2	6.5	18.9	18.9	15.0
Denmark	21.1	39.3	48.6	8.9	11.3	14.5	53.8	29.6	16.9	13.8	17.5	17.5	2.4	2.2	2.6	31.0	17.5	13.3
Finland	9.8	16.4	19.7	8.5	8.4	9.1	66.8	48.4	40.3	8.3	13.1	13.2	6.6	13.7	17.6	35.5	16.7	18.8
France	20.5	32.9	35.5	7.7	8.9	12.4	54.4	37.8	36.0	12.4	14.3	11.7	5.0	6.2	4.4	33.8	18.7	17.0
Germany	23.9	32.9	34.8	8.0	9.5	12.0	49.3	31.7	33.8	11.6	16.2	12.3	7.3	9.8	7.1	33.5	18.7	15.0
Greece	21.7	46.2	48.0	4.6	11.9	14.0	57.7	23.6	27.0	13.6	15.0	8.9	2.4	3.4	2.1	34.9	24.3	19.5
Hungary	16.5	16.5	18.5	6.2	6.2	8.8	61.2	61.2	54.0	12.7	12.7	14.6	3.4	3.4	4.1	19.5	19.5	11.5
Iceland	16.2	26.0	36.3	10.9	14.2	12.9	55.0	36.9	25.9	8.2	8.9	6.4	9.7	14.0	18.5	26.4	17.7	16.1
Ireland	30.7	41.7	43.8	11.3	13.5	17.1	43.9	29.0	23.9	12.4	11.2	10.5	1.7	4.6	4.7	26.0	15.4	7.2
Italy	24.0	33.8	31.5	5.2	6.0	7.4	46.9	31.4	36.7	17.5	20.7	18.6	6.4	8.0	5.8	43.4	23.8	22.0
Japan	16.4	26.2	33.1	3.3	4.8	5.9	54.9	41.2	42.2	15.9	17.4	11.2	9.5	10.5	7.5	62.1	36.1	29.4
Korea	14.8	14.8	14.2	3.6	3.6	2.6	51.4	51.4	61.2	19.9	19.9	12.4	10.3	10.3	9.6	24.6	24.6	28.5
Luxembourg	26.0	26.0	26.0	23.0	23.0	23.0	29.9	29.9	29.9	6.0	6.0	6.0	15.1	15.1	15.1	10.6	10.6	11.1
Mexico	44.9	44.9	48.1	11.8	11.8	4.1	16.1	16.1	22.8	19.7	19.7	19.0	7.5	7.5	6.0	18.3	18.3	7.5
Netherlands	25.8	35.5	36.3	9.7	9.5	11.2	50.1	37.0	34.8	9.5	11.4	12.8	4.8	6.6	4.8	35.3	22.9	19.1
New Zealand	9.3	26.6	30.6	11.6	14.8	14.4	58.6	35.6	37.8	8.8	9.2	7.5	11.7	13.9	9.8	24.7	12.9	15.4
Norway	15.0	23.7	30.5	10.3	11.1	11.3	50.1	20.9	19.0	9.5	12.5	14.4	15.1	31.8	24.8	26.3	13.3	11.5
Poland	23.4	23.4	26.0	9.0	9.0	11.8	50.2	50.2	42.7	9.7	9.7	12.8	7.6	7.6	6.7	30.7	30.7	16.9
Portugal	29.5	33.8	43.6	7.0	8.7	10.4	43.3	38.8	31.0	16.5	16.4	13.2	3.7	2.3	1.9	38.9	22.6	20.9
Slovak Republic	17.0	17.0	18.2	8.0	8.0	9.3	58.4	58.4	56.1	7.7	7.7	8.1	9.0	9.0	8.3	22.9	22.9	23.6
Spain	18.3	28.1	36.9	6.5	7.6	10.4	53.5	39.9	34.0	11.5	14.4	11.1	10.1	10.0	7.7	51.9	23.7	20.6
Sweden	13.6	23.0	31.0	7.9	10.0	11.2	64.9	41.7	38.3	7.9	14.5	12.8	5.7	10.8	6.6	29.2	13.6	13.6
Switzerland	23.4	32.2	34.9	12.4	15.5	19.2	49.5	30.4	27.3	11.6	17.1	13.9	3.1	4.8	4.7	20.5	11.9	10.4
Turkey	0.5	11.4	11.8	0.2	4.2	4.6	85.4	53.5	55.7	7.8	16.7	18.2	6.0	14.2	9.7	52.1	32.2	23.5
United Kingdom	29.2	35.9	42.7	12.5	13.5	18.6	35.5	25.4	18.9	15.6	17.8	13.3	7.2	7.4	6.5	26.8	16.9	11.4
United States	9.6	17.4	20.2	10.6	9.9	10.8	67.0	55.9	53.4	8.2	11.2	12.1	4.6	5.6	3.5	39.1	17.9	14.3
China	44.8	33.8	10.2	2.2	1.6	0.8	2.7	12.9	44.2	1.5	10.0	2.1	48.8	41.7	42.8	13.9	13.9	13.9
Dynamic Asia	21.5	25.1	23.2	2.4	5.7	4.1	55.2	44.8	53.7	2.5	1.4	1.1	18.4	22.9	18.0	11.4	11.4	11.4
Other Asia	10.3	12.0	16.4	0.0	0.1	0.1	62.1	67.2	58.6	14.0	5.5	10.3	13.6	15.2	14.7	25.2	25.2	25.2
Latin America	40.7	40.7	40.7	3.6	3.6	3.6	40.6	40.6	40.6	11.8	11.8	11.8	3.3	3.3	3.3	16.1	16.1	16.1
Africa & Middle-Eas	48.1	48.1	48.1	4.6	4.6	4.6	29.4	29.4	29.4	13.7	13.7	13.7	4.3	4.3	4.3	18.3	18.3	18.3
Central & East Euro	33.8	33.8	33.8	6.0	6.0	6.0	43.1	43.1	43.1	8.8	8.8	8.8	8.3	8.3	8.3	21.1	21.1	21.1

Table 3. **Tests of unit elasticity and weighted domestic expenditure propensities for import volumes (p-values)**

	[1]	[2]	[3]
	Long-Run Unit Demand Elasticity	**Weighted Domestic Expenditure Propensities**	
		Long-run	**Impact**
United States	0.173	0.648	0.248
Japan	0.623	0.726	0.631
Germany	0.069	0.125	0.114
France	0.549	0.434	0.464
Italy	0.000	0.493	0.596
United Kingdom	0.035	0.189	0.069
Canada	0.213	0.232	0.081
Australia	0.471	0.157	0.106[a]
Austria	0.402	0.426	0.009
Belgium	0.000	0.006	0.020[a]
Denmark	0.108	0.548	0.753
Finland	0.990	0.104	0.821
Greece	0.000	0.008	0.187
Ireland	0.000	0.000	0.377
Korea	0.076	0.175	0.376
Mexico	0.932	0.470	0.272
Netherlands	0.388	0.647	0.079
New Zealand	0.005	0.001	0.000
Norway	0.207	0.873	0.555
Portugal	0.000	0.000	0.001[a]
Spain	0.228	0.609	0.028[a]
Sweden	0.714	0.587	0.071[b]
Switzerland	0.060	0.019	0.001[b]
Turkey	0.000	0.000	0.063[b]

Notes: see text, equations [3a] and [3b] for details.

Tests in column [1] are for a long-run weighted demand elasticity in equation [2].

Tests in column [2] are for the joint restrictions that the long-run marginal propensity to import from investment is twice that from private consumption and that the marginal propensity to import from government consumption is 40 per cent of that from private consumption.

Column [3] has equivalent tests on impact propensities, except as indicated: (a) equal private consumption and investment propensities, zero government consumption propensity; (b) equal private consumption and investment propensities, government consumption propensity half of this

Table 4. **Wald tests of parameter restrictions**

Region/Group	Long-Run Parameters		Dynamics	
	Number of restrictions	P-value	Number of restrictions	P-value
A. EXPORT VOLUMES				
OECD 24	43	0.39	109	0.33
OECD 4	7	0.41	16	0.59
Non-OECD	7	0.84	22	0.66
B. IMPORT VOLUMES				
Group 1	17	0.08	31	0.19
Group 2	13	0.16	24	0.97
Group 3	15	0.05	10	0.92
Group 4	7	0.85	18	0.37
Group 5	13	0.46	27	0.32
C. EXPORT PRICES				
OECD 24	47	0.31	84	0.50
OECD 4	9	0.11	12	0.21
Non-OECD	4	0.49	7	0.61
D. IMPORT PRICES				
OECD 24	48	0.13	123	0.11
OECD 4	6	0.28	16	0.25
Non-OECD	5	0.20	5	0.15

Table 5. **Export volume equations**

	USA		JPN		DEU		FRA		ITA		GBR		CAN	
	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
cst	-0.573	6.7	0.241	3.5	-0.528	8.7	-0.424	7.8	-1.147	9.6	0.316	7.6	0.247	8.2
Long-Run														
ln(W[-1])	1.000	-	1.000	-	1.000	0.0	1.000	-	1.000	-	1.000	-	1.000	-
ln(RPX[-1])	-0.604	20.5	-1.047	10.1	-0.466	8.8	-0.604	20.5	-0.604	20.5	0.604	20.5	-1.047	10.1
Trend	-0.008	10.5	-0.02	13.4	-0.008	10.5	-0.008	10.5	-0.021	13.4	-0.008	10.5		
ln(Trend)	0.620	9.8	1.06	7.8	0.795	11.1	0.665	10.2	1.790	13.4	0.622	8.3	0.317	
Dynamics														
Δln(X[-1])	-0.144	6.7	-0.144	6.7	-0.337	15.2	-0.175	6.6	-0.337	15.2	0.337	15.2	0.175	6.6
Δln(W)	0.427	5.6	0.649	8.7	0.626	4.7	1.000	-	0.165	3.6	0.649	0.6	0.758	10.5
Δln(W[-1])	0.573	-	0.737	7.8	0.374	-			0.499	3.6	0.351	-	0.242	-
Δln(RPX)	-0.080	13.4	-0.159	13.4	-0.080	13.4	-0.080	13.4	-0.239	13.4	0.159	13.4	0.159	13.4
Δln(RPX[-1])					-0.130	6.3	-0.130	6.3	-0.239	13.4	0.080	13.4		
ECM	-0.277	9.7	-0.130	10.5	-0.195	13.6	-0.195	13.6	-0.195	10.5	0.130	10.5	0.130	10.5
SER (%)	1.33		1.26		1.49		1.15		2.15		1.36		1.65	
R2	0.71		0.75		0.76		0.62		0.69		0.59		0.65	
LM[1]	[0.21]		[0.51]		[0.06]		[0.38]		[0.10]		[0.87]		[0.13]	
LM[4]	[0.39]		[0.96]		[0.41]		[0.12]		[0.61]		[0.09]		[0.19]	
Normality	[0.90]		[0.84]		[0.48]		[0.27]		[0.33]		[0.99]		[0.34]	
Arch [1]	[0.42]		[0.09]		[0.95]		[0.62]		[0.42]		[0.52]		[0.72]	

	AUS		AUT		BEL		CZE		DNK		FIN		GRC	
	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
cst	-0.789	4.6	-0.614	9.2	-0.344	7.3	-0.164	0.9	0.287	10.7	-0.011	2.2	-0.791	7.3
Long-Run														
ln(W[-1])	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-
ln(RPX[-1])	-0.604	20.5	-0.604	20.5	-0.466	8.8	-1.000	-	-0.466	8.8	-0.604	20.5	-0.466	8.8
Trend	-0.008	8.6	-0.008	0.0	-0.009	12.5								
ln(Trend)	0.599	7.6	0.893	12.9	0.611	10.9	0.919	6.6					0.391	6.6
Dynamics														
Δln(X[-1])			-0.337	15.2					-0.175	-	-0.144	6.7	-0.144	6.7
Δln(W)	0.360	3.2	0.173	4.7	0.383	5.1	0.713	3.9	0.427	5.6	1.466	4.5	1.476	4.5
Δln(W[-1])			0.524	4.7	0.383	5.1					0.596	1.8	-0.476	-
Δln(RPX)	-0.159	13.4	-0.502	6.8	-0.080	13.4	-0.232	3.9	-0.080	13.4	-0.239	13.4	-0.080	13.4
Δln(RPX[-1])					-0.130	6.3	-0.232	3.9	-0.080	13.4	-0.239	-	-0.318	13.4
ECM	-0.591	11.8	-0.195	13.6	-0.195	13.6	-0.264	5.0	-0.130	6.3	-0.195	13.6	-0.429	
SER (%)	1.93		1.86		1.73		2.51		1.85		3.50		4.12	
R2	0.70		0.67		0.36		0.46		0.53		0.57		0.74	
LM[1]	[0.05]		[0.14]		[0.75]		[0.76]		[0.85]		[0.39]		[0.86]	
LM[4]	[0.18]		[0.08]		[0.71]		[0.30]		[0.31]		[0.00]		[0.01]	
Normality	[0.35]		[0.63]		[0.40]		[0.59]		[0.16]		[0.53]		[0.46]	
Arch [1]	[0.38]		[0.71]		[0.14]		[0.01]		[0.17]		[0.73]		[0.50]	

	HUN		ISL		IRE		KOR		LUX		MEX		NLD	
	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
cst	-1.453	-4.6	3.121	5.5	0.522	2.9	-0.213	2.2	-0.118	-61.9	1.045	2.9	-0.266	8.2
Long-Run														
ln(W[-1])	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-
ln(RPX[-1])	-0.500	-	-0.596	-3.9	-0.604	20.5	-1.463	10.3	-1.000	c	-1.047	10.1	-0.604	20.5
Trend					0.032	10.3	-0.021	13.4	0.013	c	0.026	3.0	-0.008	10.5
ln(Trend)	2.371	15.7			-1.312	5.1	2.211	16.5			-1.865	2.5	0.611	10.9
Dynamics														
Δln(X[-1])					-0.337	15.2	-0.144	6.7			-0.144	6.7	-0.144	6.7
Δln(W)	0.356	3.9			1.565	9.3	1.513	5.7	0.950	c	0.343	3.4	0.798	10.3
Δln(W[-1])	0.356	3.9									0.343	3.4	0.202	-
Δln(RPX)	-0.232	3.9			-0.080	13.4	-0.450	3.5	-0.100	c	-0.159	13.4	-0.130	6.3
Δln(RPX[-1])	-0.232	3.9			-0.239	13.4							-0.130	6.3
ECM	-0.264	5.0	-0.690	-5.5	-0.195	13.6	-0.195	13.6	-0.100	c	-0.130	10.5	-0.130	10.5
SER (%)	2.66		0.03		2.15		3.44		0.01		3.96		1.22	
R2	0.68		0.75		0.67		0.28		0.49		0.68		0.55	
LM[1]	[0.39]				[0.35]		[0.02]				[0.44]		[0.10]	
LM[4]	[0.32]				[0.30]		[0.23]				[0.20]		[0.19]	
Normality	[0.46]				[0.24]						[0.91]		[0.01]	
Arch [1]	[0.99]				[0.30]		[0.61]				[0.92]		[0.78]	

Variable Definitions: X – volume of exports of goods and services; W – export market size; RPX – relative price of exports; ECM - equilibrium-correction term. See also text equation [1].

Table 5. **Export volume equations** (cont'd)

	NZL Coef	t-stat	NOR Coef	t-stat	POL Coef	t-stat	PRT Coef	t-stat	SVK Coef	t-stat	ESP Coef	t-stat	SWE Coef	t-stat
cst	0.099	1.5	-0.404	5.1	-8.887	2.7	-1.798	7.6	0.747	2.7	-0.332	8.4	0.434	13.6
Long-Run														
ln(W[-1])	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-
ln(RPX[-1])	-0.604	20.5	-0.466	8.8	-1.000	-	-0.466	8.8	-1.000	-	-1.047	10.1	-0.604	20.5
Trend	-0.008	0.0	-0.021	0.0	-0.032	2.0	-0.021	13.4						
ln(Trend)	0.308	4.7	1.660	11.3	5.087	3.0	1.916	14.2	0.470	4.3	0.611	10.9		
Dynamics														
Δln(X[-1])	-0.175	6.6	-0.337	15.2	0.211	2.7	-0.175	6.6	0.211	0.0	-0.144	6.7	-0.337	15.2
Δln(W)	1.000	-	0.271	1.2	0.100	-	1.168	7.8	1.000	-	0.169	1.8	1.678	9.5
Δln(W[-1])					0.100	-					0.169	1.8		
Δln(RPX)	-0.318	13.4	-0.130	6.3	-0.897	17.2	-0.080	13.4	-0.897	17.2	-0.159	13.4	-0.080	13.4
Δln(RPX[-1])					0.347	4.3	-0.080	13.4	0.422	2.5			-0.239	13.4
ECM	-0.277	9.7	-0.130	10.5	-0.473	7.1	0.277	9.7	-0.473	7.1	-0.130	10.5	-0.195	13.6
SER (%)	2.61		2.90		2.70		2.04		3.56		2.24		2.27	
R2	0.46		0.52		0.92		0.52		0.48		0.49		0.46	
LM[1]	[0.29]		[0.05]		[0.95]		[0.71]		[0.26]		[0.97]		[0.76]	
LM[4]	[0.01]		[0.23]		[0.23]		[0.72]		[0.14]		[0.11]		[0.47]	
Normality	[0.86]		[0.44]		[0.93]		[0.79]		[0.81]		[0.58]		[0.10]	
Arch [1]	[0.55]		[0.45]		[0.41]		[0.86]		[0.31]		[0.63]		[0.92]	

	CHE Coef	t-stat	TUR Coef	t-stat
cst	-0.267	6.7	1.250	9.9
Long-Run				
ln(W[-1])	1.000	-	1.000	-
ln(RPX[-1])	-0.604	20.5	-1.463	10.3
Trend	-0.021	13.4		
ln(Trend)	1.451	10.6	0.832	6.4
Dynamics				
Δln(X[-1])	0.397	6.7	-0.175	6.6
Δln(W)	0.487	6.4	1.000	-
Δln(W[-1])				
Δln(RPX)	-0.080	13.4	-0.569	5.1
Δln(RPX[-1])	-0.080	13.4		
ECM	-0.065	10.5	-0.130	10.5
SER (%)	0.82		4.73	
R2	0.72		0.51	
LM[1]	[0.00]		[0.27]	
LM[4]	[0.00]		[0.07]	
Normality	[0.87]		[0.43]	
Arch [1]	[0.36]		[0.53]	

	AFM Coef	t-stat	ANC Coef	t-stat	ASO Coef	t-stat	CHN Coef	t-stat	LAT Coef	t-stat	SEE Coef	t-stat
cst	0.009	1.6	-9.303	-10.1	1.848	4.1	-4.923	9.8	-0.889	3.0	3.836	2.2
Long-Run												
ln(W[-1])	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-	1.000	-
ln(RPX[-1])	-0.640	7.8	-0.295	3.7	-0.295	3.7	-1.500	-	-0.640	7.8	-0.640	7.8
Trend			-0.062	21.2	0.045	5.0			-0.017	3.2	0.024	2.1
ln(Trend)			6.293	21.4	-3.66	4.0	2.52	37.0	1.629	3.1	-2.57	2.2
Dynamics												
Δln(X[-1])	0.143	4.1	0.143	4.1					0.785	13.7	0.392	13.7
Δln(W)	0.319	1.2	0.972	12.9	0.715	8.8	1.000	-	0.117	2.0	0.761	4.1
Δln(W[-1])			0.228	-							0.239	-
Δln(RPX)	-0.687	16.0	-0.167	6.5	-0.167	6.5	-0.687	16.0	-0.063	2.8	-0.511	5.8
Δln(RPX[-1])			-0.063	2.8	-0.167	6.5					0.380	4.5
ECM	-0.152	8.2	-0.409	-10.0	-0.152	8.2	-0.409	10.0	-0.152	8.2	-0.409	8.2
SER (%)	2.24		0.55		0.66		3.03		0.32		3.03	
R2	0.88		0.95		0.78		0.65		0.91		0.73	
LM[1]	[0.47]		[0.50]		[0.87]		[0.66]		[0.07]		[0.87]	
LM[4]	[0.69]		[0.34]		[0.06]		[0.08]		[0.15]		[0.00]	
Normality	[0.62]		[0.75]		[0.26]		[0.72]		[0.31]		[0.92]	
Arch [1]	[0.33]		[0.76]		[0.22]		[0.63]		[0.74]		[0.45]	

Variable Definitions: X – volume of exports of goods and services; W – export market size; RPX – relative price of exports; ECM - equilibrium-correction term. See also text equation [1].

Table 6A. **Import volume parameters**

	USA Coef	t-stat	JPN Coef	t-stat	DEU Coef	t-stat	FRA Coef	t-stat	ITA Coef	t-stat	GBR Coef	t-stat	CAN Coef	t-stat
Constant	0.234	3.0	0.360	4.2	0.458	5.4	0.025	2.8	0.388	3.0	0.034	3.6	-0.811	6.3
Long-Run														
ln(C[-1])	0.542	15.2	0.420	n.a.	0.271	15.2	0.359	7.3	0.386	7.9	0.359	7.3	0.230	15.2
ln(G[-1])	0.046		0.050		0.037		0.060		0.045		0.040		0.030	
ln(I[-1])	0.336		0.403		0.195		0.273		0.270		0.187		0.170	
ln(X[-1])	0.076	1.3	0.127	n.a.	0.497	15.0	0.308	3.2	0.300	3.4	0.415	5.2	0.569	20.1
ln(RPM[-1])	-0.328	4.9	-0.402	13.7	-0.328	4.9	-0.280	11.2	-0.368	4.6	-0.280	11.2	-0.328	4.9
Trend	0.020	12.2	0.018	14.3	0.010	12.2	0.007	5.8	0.012	7.9	0.007	5.8	-0.006	7.6
Log Trend	-1.047	7.3	-1.233	11.8	-0.631	8.8	-0.294	5.9	-0.715	5.7	-0.294	5.9	0.784	8.7
Dynamics														
Δln(C)	0.681	18.3	0.505	11.9	0.341	18.3	0.618	19.8	0.619	18.6	0.618	19.8	0.447	12.1
Δln(G)	0.057		0.061		0.046		0.104		0.072		0.069		0.059	
Δln(I)	0.422		0.485		0.245		0.470		0.433		0.321		0.331	
Δln(X)	0.292	5.1	0.357	7.5	0.455	11.6	0.420	10.2	0.571	19.5	0.633	17.0	0.655	13.5
Δln(M[-1])	0.127	3.4	0.093	2.2							-0.068	2.3		
Δln(M[-2])			0.093	2.2	0.127	3.4					-0.068	2.3		
Δln(RPM)			-0.068	2.4	-0.055	5.2	-0.076	7.7	-0.110	2.1	-0.076	7.7	-0.221	5.2
Δln(RPM[-1])	-0.221	5.2									-0.076	7.7		
ECM	-0.134	8.7	-0.149	6.7	-0.267	8.7	-0.086	5.5	-0.229	6.1	-0.086	5.5	-0.267	8.7
SER (%)	1.18		1.49		1.18		0.86		1.85		0.86		1.18	
R2	0.82		0.73		0.82		0.85		0.88		0.85		0.82	

	AUS Coef	t-stat	AUT Coef	t-stat	BEL Coef	t-stat	DNK Coef	t-stat	FIN Coef	t-stat	GRC Coef	t-stat	IRE Coef	t-stat
Constant	0.069	0.9	0.633	5.5	0.188	4.6	0.923	6.5	-0.509	4.8	-0.109	2.3	0.305	6.3
Long-Run														
ln(C[-1])	0.464	15.9	0.245	20.5	0.179	7.3	0.245	20.5	0.268	20.1	0.386	7.9	0.135	15.2
ln(G[-1])	0.056		0.032		0.029		0.053		0.045		0.031		0.016	
ln(I[-1])	0.344		0.206		0.140		0.240		0.220		0.278		0.114	
ln(X[-1])	0.137	2.5	0.518	22.0	0.652	13.6	0.463	17.6	0.467	17.7	0.306	3.5	0.735	42.2
ln(RPM[-1])	-0.610	8.7	-0.161	13.7	-0.280	11.2	-0.161	13.7	-0.307	31.5	-0.368	4.6	-0.328	4.9
Trend	0.009	8.4	0.009	14.3	0.007	5.8	0.009	14.3			0.003	2.1	0.006	7.6
Log Trend	-0.358	5.7	-0.534	11.0	-0.588	5.9	-0.576	12.2	0.128	4.9			-0.631	8.8
Dynamics														
Δln(C)	0.558	4.0	0.330	8.9	0.260	16.9	0.220	8.9	0.295	9.7	0.412	18.6	0.111	4.9
Δln(G)					0.069		0.047		0.050		0.033		0.013	
Δln(I)	0.206		0.277		0.203		0.215		0.242		0.297		0.093	
Δln(X)	0.341	5.1	0.357	7.5	0.826	23.5	0.497	11.2	0.422	5.5	0.571	19.5	0.936	11.2
Δln(M[-1])	0.144	6.4	0.259	4.4	-0.099	3.8	0.228	3.6	-0.130	6.0	0.144	6.4		
Δln(M[-2])	0.144	6.4					0.138	2.1	0.130	6.0			0.127	3.4
Δln(RPM)	-0.343	6.7	-0.384	6.2	-0.076	7.7	-0.136	2.4	-0.322	8.8			-0.055	5.2
Δln(RPM[-1])			0.269	2.9			-0.136	2.4	0.322	8.8	-0.232	4.9	-0.221	5.2
ECM	-0.329	7.2	-0.403	7.7	-0.086	5.5	-0.552	9.6	-0.696	7.9	-0.229	6.1	-0.134	8.7
SER (%)	1.85		1.49		0.86		1.49		2.88		1.85		1.18	
R2	0.88		0.73		0.85		0.73		0.83		0.88		0.82	

	KOR Coef	t-stat	MEX Coef	t-stat	NLD Coef	t-stat	NZL Coef	t-stat	NOR Coef	t-stat	PRT Coef	t-stat	ESP Coef	t-stat
Constant	1.519	4.2	-1.591	7.4	0.179	3.1	0.596	2.2	-0.067	7.7	-0.051	3.0	0.127	4.4
Long-Run														
ln(C[-1])	0.309	15.9	0.327	24.4	0.239	7.3	0.327	24.4	0.327	24.4	0.350	11.2	0.367	20.5
ln(G[-1])	0.020		0.018		0.044		0.039		0.059		0.042	11.2	0.044	
ln(I[-1])	0.303		0.209		0.205		0.242		0.301		0.308	11.2	0.308	
ln(X[-1])	0.367	9.2	0.445	19.6	0.512	7.6	0.392	15.7	0.313	11.1	0.301	4.8	0.281	8.0
ln(RPM[-1])	-0.610	8.7	-0.466	5.4	-0.280	11.2	-0.307	31.5	-0.307	31.5	-0.560	11.2	-0.602	13.7
Trend	0.018	6.1	-0.008	4.8	0.007	5.8	0.008	4.8					0.012	11.8
Log Trend	-1.431	5.7	1.460	9.1	-0.442	5.5	-0.466	3.2			0.133	3.5	-0.534	11.0
Dynamics														
Δln(C)	0.412	18.6	0.409	10.8	0.260	16.9	0.522	7.0	0.295	9.7	0.900	n.a.	1.011	11.9
Δln(G)	0.026		0.023		0.048		0.104		0.053					
Δln(I)	0.404		0.262		0.224		0.193		0.272		0.396		0.424	
Δln(X)	0.380	19.5	0.422	5.5	0.826	23.5	0.261	7.0	0.295	9.7	0.406	n.a.	0.497	11.2
Δln(M[-1])	-0.065	2.5	0.130	6.0					-0.130	6.0	0.161	3.3	0.129	4.4
Δln(M[-2])	0.065	2.5							0.130	6.0	-0.197	4.0		
Δln(RPM)	-0.232	4.9	-0.429	8.8	-0.076	7.7	-0.107	8.8	-0.429	8.8	-0.152	7.7	-0.384	6.2
Δln(RPM[-1])														
ECM	-0.329	7.2	-0.257	11.0	-0.122	4.6	-0.514	11.0	-0.514	11.0	-0.086	5.5	-0.149	6.7
SER (%)	1.85		2.88		0.86		2.88		2.88		0.86		1.49	
R2	0.88		0.83		0.85		0.83		0.83		0.85		0.73	

Variable Definitions: M – volume of exports of goods and services; C – private consumption; G – government final consumption; I - total fixed capital investment plus stockbuilding; RPM – relative price of imports; ECM – equilibrium-correction term. See also text equation [4].

Table 6A. **Import volume parameters** (cont'd)

	SWE		CHE		TUR	
	Coef	*t-stat*	*Coef*	*t-stat*	*Coef*	*t-stat*
Constant	0.324	4.1	0.229	3.6	1.085	6.4
Long-Run						
ln(C[-1])	0.271	15.2	0.239	7.3	0.327	24.4
ln(G[-1])	0.054		0.025		0.017	
ln(I[-1])	0.201		0.210		0.242	
ln(X[-1])	0.474	13.7	0.526	8.1	0.414	17.3
ln(RPM[-1])	-0.328	4.9	-0.560	11.2	-0.466	5.4
Trend	0.006	7.6	0.007	5.8	0.022	10.1
Log Trend	-0.416	5.5	-0.588	5.9	-1.460	9.1
Dynamics						
Δln(C)	0.681	18.3	0.900	n.a.	0.800	13.1
Δln(G)	0.170		0.117		0.052	
Δln(I)	0.252		0.396		0.296	
Δln(X)	0.555	19.1	0.633	17.0	0.400	13.1
Δln(M[-1])	0.088	1.6	-0.099	3.8	0.130	6.0
Δln(M[-2])			-0.099	3.8		
Δln(RPM)	-0.055	5.2	-0.304	7.7	-0.215	8.8
Δln(RPM[-1])						
ECM	-0.267	8.7	-0.122	4.6	-0.257	11.0
SER (%)	1.18		0.86		2.88	
R2	0.82		0.85		0.83	

Variable Definitions: M – volume of exports of goods and services; C – private consumption; G – government final consumption; I - total fixed capital investment plus stockbuilding; RPM – relative price of imports; ECM – equilibrium-correction term. See also text equation [4].

Table 6B. **Other import volume parameters**

	ISL		LUX		CZE		HUN		POL		SVK	
	Coef	*t-stat*	*Coef*	*t-stat*	*Coef*	*t-stat*	*Coef*	*t-stat*	*Coef*	*t-stat*	*Coef*	*t-stat*
Constant	-1.447	2.4	-0.076	15.7	-0.043	3.8	-0.061	5.7	-0.274	7.0	-0.125	7.1
Long-Run												
ln(T[-1])	1.000	c	1.000	c	1.000	c	1.000	c	1.000	c	1.000	c
ln(RPM[-1])	-1.036	4.7	0.360	c	-0.500	c	-0.500	c	-0.500	c	-0.500	c
Trend	0.005	2.5	0.004	12.8					0.029	7.8	0.010	c
Dynamics												
Δln(T)	1.665	4.8	0.800	c	1.781	12.5	2.215	29.8	3.141	24.5	2.337	34.1
Δln(T[-1])												
Δln(M[-1])	-0.141		0.500	c	-0.196							
Δln(RPM)			-0.050	c	-0.185	2.0			-0.251	6.7		
ECM	-0.782	2.8	-0.100	c	-0.054	6.3	-0.054	6.3	-0.054	6.3	-0.054	6.3
SER (%)	0.033		0.003		0.016		0.014		0.01		0.011	
R2	0.875		0.943		0.814		0.93		0.979		0.949	

Notes: ISL and LUX sample period 1982Q1-2001Q4; other countries 1994Q1-2001Q4;
LUX time trend zero prior to 1992

Variable Definitions: M – volume of exports of goods and services; T – total final expenditure; RPM – relative price of imports; ECM – equilibrium-correction term.

Table 7. **Marginal import propensities (and standard errors)**

	Impact Propensities				Long-Run Propensities			
	Private Consumption	Public Consumption	Investment	Exports	Private Consumption	Public Consumption	Investment	Exports
USA	**0.163**	**0.066**	**0.329**	**0.409**	**0.130**	**0.052**	**0.262**	**0.107**
	0.009	0.004	0.018	0.080	0.009	0.003	0.017	0.085
JPN	**0.080**	**0.032**	**0.160**	**0.282**	**0.066**	**0.026**	**0.133**	**0.101**
	0.007	0.003	0.013	0.038	n.a.	n.a.	n.a.	n.a.
DEU	**0.189**	**0.076**	**0.382**	**0.412**	**0.151**	**0.060**	**0.304**	**0.449**
	0.010	0.004	0.021	0.035	0.010	0.004	0.020	0.030
FRA	**0.309**	**0.123**	**0.615**	**0.394**	**0.179**	**0.071**	**0.357**	**0.289**
	0.016	0.006	0.031	0.039	0.025	0.010	0.049	0.089
ITA	**0.293**	**0.119**	**0.593**	**0.542**	**0.183**	**0.074**	**0.370**	**0.284**
	0.016	0.006	0.032	0.028	0.023	0.009	0.047	0.084
GBR	**0.285**	**0.113**	**0.501**	**0.572**	**0.166**	**0.066**	**0.291**	**0.375**
	0.014	0.006	0.025	0.034	0.023	0.009	0.040	0.073
CAN	**0.301**	**0.121**	**0.605**	**0.573**	**0.155**	**0.062**	**0.312**	**0.498**
	0.025	0.010	0.050	0.042	0.010	0.004	0.020	0.025
AUS	**0.207**	**0**	**0.205**	**0.349**	**0.172**	**0.069**	**0.342**	**0.140**
	0.052	n.a.	0.052	0.068	0.011	0.004	0.022	0.056
AUT	**0.302**	**0**	**0.605**	**0.345**	**0.224**	**0.090**	**0.448**	**0.499**
	0.034	n.a.	0.068	0.046	0.011	0.004	0.022	0.023
BEL	**0.399**	**0.267**	**0.799**	**0.795**	**0.274**	**0.111**	**0.550**	**0.628**
	0.024	0.016	0.047	0.034	0.038	0.015	0.076	0.046
DNK	**0.190**	**0.076**	**0.378**	**0.440**	**0.211**	**0.085**	**0.421**	**0.410**
	0.021	0.009	0.042	0.039	0.010	0.004	0.021	0.023
FIN	**0.199**	**0.079**	**0.399**	**0.329**	**0.180**	**0.072**	**0.362**	**0.365**
	0.020	0.008	0.041	0.060	0.009	0.004	0.018	0.021
GRC	**0.194**	**0.078**	**0.390**	**0.763**	**0.181**	**0.073**	**0.365**	**0.408**
	0.010	0.004	0.021	0.039	0.023	0.009	0.046	0.117
IRE	**0.204**	**0.082**	**0.407**	**0.786**	**0.250**	**0.101**	**0.498**	**0.617**
	0.041	0.017	0.082	0.070	0.016	0.007	0.033	0.015
KOR	**0.283**	**0.112**	**0.566**	**0.258**	**0.212**	**0.084**	**0.425**	**0.249**
	0.015	0.006	0.030	0.013	0.013	0.005	0.027	0.027
MEX	**0.217**	**0.089**	**0.431**	**0.459**	**0.174**	**0.071**	**0.345**	**0.485**
	0.020	0.008	0.040	0.084	0.007	0.003	0.014	0.025
NLD	**0.327**	**0.131**	**0.660**	**0.754**	**0.300**	**0.120**	**0.605**	**0.467**
	0.019	0.008	0.039	0.032	0.041	0.016	0.083	0.061
NZL	**0.274**	**0.183**	**0.275**	**0.249**	**0.171**	**0.069**	**0.345**	**0.373**
	0.039	0.026	0.039	0.036	0.007	0.003	0.014	0.024
NOR	**0.200**	**0.080**	**0.406**	**0.183**	**0.222**	**0.089**	**0.449**	**0.195**
	0.021	0.008	0.042	0.019	0.009	0.004	0.018	0.017
PRT	**0.642**	**0**	**0.641**	**0.524**	**0.250**	**0.100**	**0.498**	**0.388**
	n.a.	n.a.	n.a.	0.058	0.022	0.009	0.044	0.081
ESP	**0.558**	**0**	**0.556**	**0.534**	**0.203**	**0.081**	**0.404**	**0.301**
	0.047	n.a.	0.047	0.048	0.010	0.004	0.020	0.038
SWE	**0.563**	**0.282**	**0.568**	**0.440**	**0.224**	**0.090**	**0.452**	**0.376**
	0.031	0.015	0.031	0.023	0.015	0.006	0.030	0.027
CHE	**0.697**	**0.342**	**0.699**	**0.628**	**0.185**	**0.073**	**0.371**	**0.522**
				0.037	0.025	0.010	0.051	0.065
TUR	**0.434**	**0.218**	**0.442**	**0.393**	**0.177**	**0.071**	**0.361**	**0.407**
	0.033	0.017	0.034	0.030	0.007	0.003	0.015	0.024

Table 8. **Export price equations**

	USA		JPN		DEU		FRA		ITA		GBR		CAN	
	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
Constant	0.095	16.3	0.720	12.0	-0.011	-1.8	-0.009	-0.8	0.003	2.6	-0.676	-10.9	0.246	11.1
Long-Run														
ln(PWX[-1])	0.078	4.1	0.282	20.9	0.180	9.8	0.282	20.9	0.408	21.8	0.465	18.4	0.465	18.4
ln(PGDP[-1])	0.922		0.718		0.820		0.718		0.592		0.535		0.535	
Trend	-0.004	-37.7	0.004	37.7	-0.002	-11.1	-0.004	-37.7			-0.010	-32.8	0.004	37.7
Log Trend			-0.618	-37.6	0.057	6.0	0.112	6.2			0.716	26.4	-0.444	-18.8
Dynamics														
Δln(PXX[-1])	0.356	16.9			0.177	12.3	0.089	2.2	0.177	12.3			0.177	12.3
Δln(PWX)	0.054	9.3	0.054	9.3	0.091	6.5	0.177	12.3	0.143	5.5	0.207	8.7	0.784	7.0
Δln(PWX[-1])					0.054	9.3	0.091	4.0			0.108	4.4		
Δln(PGDP)	0.590	26.6	0.850	8.7	0.551	11.8	0.643	17.0	0.680	23.0	0.498	10.8	0.497	5.2
Δln(PGDP[-1])			0.096	1.0	0.127	2.8					0.187	3.9	-0.457	-4.5
Δln(EX)			-0.290	-25.8	0.054	9.3	0.138	10.4			0.054	9.3	-0.290	-25.8
ECM	-0.206	-19.1	-0.295	-12.8	-0.154	-13.9	-0.154	-13.9	-0.356	-16.9	-0.295	-12.8	-0.154	-13.9
SER	0.005		0.010		0.006		0.009		0.011		0.011		0.011	
R2	0.406		0.785		0.153		0.450		0.472		0.510		0.511	

	AUS		AUT		BEL		DNK		FIN		GRC		IRE	
	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
Constant	0.564	11.6	0.031	9.4	-0.205	-8.0	0.002	1.0	-0.298	-10.9	0.005	2.1	-0.122	-4.2
Long-Run														
ln(PWX[-1])	0.465	18.4	0.180	9.8	0.571	17.0	0.180	9.8	0.571	17.0	0.408	21.8	0.282	20.9
ln(PGDP[-1])	0.535		0.820		0.429		0.820		0.429		0.592		0.718	
Trend			-0.002	-11.1	-0.002	-11.1			-0.020	-14.6			-0.004	-37.7
Log Trend	-0.574	-13.9			0.256	9.4			1.373	12.2			0.190	9.4
Dynamics														
Δln(PXX[-1])	0.360	9.4	0.289	4.1			0.244	6.8	0.280	7.5	0.177	12.3	0.143	5.5
Δln(PWX)	0.280	7.5	0.140	6.3	0.489	11.6	0.467	8.0	0.185	6.8	0.070	3.7	0.352	5.3
Δln(PWX[-1])			0.048	2.4			0.226	6.1			0.177	12.3	0.177	12.3
Δln(PGDP)	0.965	c	0.446	7.3	0.292	1.8	0.063	1.0	0.381	6.1	0.576	17.0	0.328	4.5
Δln(PGDP[-1]	-0.606	-12.0	0.077	1.2	0.219	1.4			0.153	2.5				
Δln(EX)			0.054	9.3	0.138	10.4	0.396	12.7	0.054	9.3	0.261	10.5	0.261	10.5
ECM	-0.206	-19.1	-0.154	-13.9	-0.206	-19.1	-0.206	-19.1	-0.070	c	-0.070	-3.7	-0.295	-12.8
SER	0.028		0.005		0.011		0.015		0.010		0.016		0.017	
R2	0.499		0.035		0.508		0.611		0.341712		0.582		0.444	

	KOR		MEX		NLD		NOR		NZL		ESP		PRT	
	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat	Coef	t-stat
Constant	-0.641	-5.6	-0.183	-2.1	-0.344	-12.1	0.650	4.8	-0.010	-2.4	-0.111	-6.3	0.004	1.8
Long-Run														
ln(PWX[-1])	0.465	18.4	0.899	19.3	0.408	21.8	1.000	c	1.000	c	0.282	20.9	0.768	11.8
ln(PGDP[-1])	0.535		0.101		0.592		0.000		0.000		0.718		0.232	
Trend	-0.020	-14.6			-0.010	-32.8	0.020	14.6			-0.004	-37.7		
Log Trend	0.925	8.7	0.120	2.2	0.583	20.6	-1.373	-12.2			0.250	11.1		
Dynamics														
Δln(PXX[-1])			-0.177	-12.3					-0.065	-1.5				
Δln(PWX)	0.218	8.1	0.487	13.7	0.210	5.0	1.000	c			0.148	3.7	0.443	10.7
Δln(PWX[-1])	-0.097	-3.7							0.258	4.4	0.149	4.0	0.120	3.0
Δln(PGDP)	0.498	10.8	0.690	16.9	0.642	7.8			0.101	5.5	0.704	15.0	0.965	c
Δln(PGDP[-1]	0.381	7.0			0.147	1.8			0.707	9.8			-0.528	-10.3
Δln(EX)	-0.290	-25.8	-0.138	-10.4	0.290	25.8	0.444	6.2			0.138	10.4	0.138	10.4
ECM	-0.295	-12.8	-0.356	-16.9	-0.206	-19.1	-0.150	-5.3	-0.154	-13.9	-0.154	-13.9	-0.108	-5.3
SER	0.015		0.040		0.012		0.036		0.041		0.011		0.013	
R2	0.846		0.868		0.613		0.371		0.469		0.463		0.770	

Variable Definitions: PXX – non-commodity exports of goods and services deflator; PWX – competitors' non-commodity prices in domestic currency; PGDP – business sector GDP deflator in exporting country; ECM – equilibrium-correction term; EX – exporting country bilateral dollar exchange rate. See also text equation [8].

Note: Δln(PWX) term in Canadian equation refers to the change in the US GDP deflator (in Canadian dollar terms).

Table 8. **Export price equations** (cont'd)

	SWE Coef	t-stat	CHE Coef	t-stat	TUR Coef	t-stat	LUX Coef	t-stat	ISL Coef	t-stat
Constant	-0.378	-16.4	-0.041	-5.8	-0.398	-16.8	-0.074	-2.4	-0.137	-1.6
Long-Run										
ln(PWX[-1])	0.571	17.0	0.282	20.9	0.571	17.0	0.220	2.9	1.000	
ln(PGDP[-1])	0.429		0.718		0.429		0.780		0.000	
Trend	-0.010	-32.8			-0.010	-32.8			0.006	1.9
Log Trend	0.618	37.6	0.057	6.0	0.618	37.6	0.155	4.6		
Dynamics										
Δln(PXX[-1])	0.282	7.8	0.368	5.1	0.282	7.8	0.749	11.4	0.230	2.3
Δln(PWX)	0.256	10.6	0.101	5.5	0.643	17.0	0.077	3.1		
Δln(PWX[-1])					-0.356	-16.9	0.030	1.9	0.230	2.3
Δln(PGDP)	0.225	5.6	0.438	6.5	0.217	4.0	0.961	6.2	0.541	2.8
Δln(PGDP[-1])	0.237	6.2	0.093	1.4	0.215	4.5	-0.818	-5.0		
Δln(EX)			0.054	9.3	-0.138	-10.4	0.031	2.6	0.667	3.8
ECM	-0.206	-19.1	-0.154	-13.9	-0.206	-19.1	-0.098	-3.5	-0.162	-3.4
SER	0.010		0.006		0.038		0.003		0.090	
R2	0.506		0.464		0.791		0.900		0.370	

	CZE Coef	t-stat	HUN Coef	t-stat	POL Coef	t-stat	SVK Coef	t-stat	SEE Coef	t-stat
Constant	0.504	2.2	1.745	2.0	0.083	6.4	0.004	1.4	0.004	0.5
Long-Run										
ln(PWX[-1])	0.568	7.3	1.000	c	1.000	c	0.706	5.0	1.000	c
ln(PGDP[-1])	0.432		0.000		0.000		0.294		0.000	
Trend			0.038	2.2						
Log Trend	-0.242	-4.9	-2.547	-2.3						
Dynamics										
Δln(PXX[-1])			0.082	2.1			0.244	2.6		
Δln(PWX)	0.602	8.9	1.000	c	0.244	2.6	0.409	3.2	1.000	c
Δln(PWX[-1])			-0.444	-6.3						
Δln(PGDP)	0.175	2.3	0.455	8.6			0.347			
Δln(PGDP[-1])	0.222		-0.093		0.756					
Δln(EX)	0.148	3.2	0.509	7.7			0.249	3.1		
ECM	-0.483	-3.3	-0.213	-6.0	-0.678	-9.5	-0.361	-4.7	-0.381	-4.1
SER	0.008		0.010		0.065		0.016		0.050	
R2	0.720		0.870		0.800		0.320		0.570	

	CHN Coef	t-stat	ASO Coef	t-stat	ANC Coef	t-stat	LAT Coef	t-stat	AFM Coef	t-stat
Constant	-0.043	-2.0	0.494	3.1	-0.074	-1.7	-0.011	-1.7	2.348	1.8
Long-Run										
ln(PWX[-1])	1.000	c	1.000	c	1.000	c	1.000	c	1.000	c
ln(PGDP[-1])	0.000		0.000		0.000		0.000		0.000	
Trend			0.018	6.1					0.027	2.1
Log Trend	0.036	2.1	-0.702	-4.5	0.134	2.5			-1.498	-2.2
Dynamics										
Δln(PXX[-1])	0.629	11.8	0.629	11.82431	0.611	10.5	0.209	2.5		
Δln(PWX)	0.371	7.0	0.371	6.963401	0.389	6.7	0.381	2.9	0.371	7.0
Δln(PWX[-1])							0.410	2.9	0.629	11.8
Δln(PGDP)										
Δln(PGDP[-1])										
Δln(EX)										
ECM	-0.288	-6.8	-0.288		-0.118	-2.8	-0.152	-2.6	-0.520	-4.5
SER	0.009		0.013		0.010		0.030		0.320	
R2	0.680		0.080		0.510		0.460		0.070	

Variable Definitions: PXX – non-commodity exports of goods and services deflator; PWX – competitors' non-commodity prices in domestic currency; PGDP – business sector GDP deflator in exporting country; ECM – equilibrium-correction term; EX – exporting country bilateral dollar exchange rate. See also text equation [8].

Table 9. **Import price equations**

	USA Coef	t-stat	JPN Coef	t-stat	DEU Coef	t-stat	FRA Coef	t-stat	ITA Coef	t-stat	GBR Coef	t-stat	CAN Coef	t-stat
Constant	-0.051	-8.6	-0.228	-14.7	-0.481	-18.8	-0.229	-10.4	0.002	1.3	-0.206	-14.5	-0.004	-6.1
Long-Run														
ln(PSX[-1])	0.364	8.7	0.511	29.8	0.647	19.2	0.511	29.8	0.553	26.0	0.793	49.0	1.000	c
ln(PD[-1])	0.636		0.489		0.353		0.489		0.447		0.207		0.000	
Trend	-0.008	-22.2	-0.002	-13.2	-0.011	-26.9	-0.011	-26.9			-0.002	-13.2		
Log Trend	0.310	22.3	0.198	20.9	0.866	27.6	0.564	20.1			0.198	20.9		
Dynamics														
Δln(PMX[-1])	0.228	19.5			0.138	26.0	0.084	2.5	0.167	25.0	-0.084	-2.5		
Δln(PSX)	0.198	20.9	0.335	25.0	0.228	19.5	0.228	19.5	0.337	19.2	0.410	21.2	0.310	22.3
Δln(PSX[-1])			-0.080	-14.3	0.138	26.0	0.051	6.8	0.167	25.0	0.075	2.8	0.091	5.2
Δln(PD)	0.205	21.2	0.985	c	0.155	14.8	0.960	c	0.960	c	0.741	7.4	0.300	21.7
Δln(PD[-1])	0.369	20.0	-0.240	-17.2	0.341	18.5	-0.323	-9.0	-0.632	-30.2	-0.141	-1.5	0.299	9.6
Δln(EX)					0.080	14.3	0.080	14.3	0.080	14.3			-0.481	-21.7
ECM	-0.080	-14.3	-0.335	-25.0	-0.167	-25.0	-0.155	-14.8	-0.167	-25.0	-0.310	-22.3	-0.051	-6.8
SER	0.009		0.021		0.009		0.009		0.012		0.011		0.005	
R2	0.318		0.468		0.489		0.449		0.617		0.602		0.863	

	AUS Coef	t-stat	AUT Coef	t-stat	BEL Coef	t-stat	DNK Coef	t-stat	FIN Coef	t-stat	GRC Coef	t-stat	IRE Coef	t-stat
Constant	-0.052	-9.0	-0.658	-15.8	-0.001	-0.6	-0.351	-13.7	-0.342	-12.2	0.006	2.5	-0.552	-12.3
Long-Run														
ln(PSX[-1])	0.817	85.4	0.511	29.8	0.793	49.0	0.647	19.2	0.793	49.0	0.400	c	0.511	29.8
ln(PD[-1])	0.183		0.489		0.207		0.353		0.207		0.600		0.489	
Trend	-0.008	-22.2	-0.011	-26.9			-0.008	-22.2	-0.020	-14.7			-0.008	-22.2
Log Trend	0.310	22.3	0.866	27.6			0.632	18.2	1.382	13.8			0.564	20.1
Dynamics														
Δln(PMX[-1])	-0.091	-5.2			0.138	26.0	0.167	25.0	0.138	26.0	0.276	26.0	0.051	6.8
Δln(PSX)	0.337	19.2	0.138	26.0	0.337	19.2	0.256	29.8	0.342	12.2	0.276	26.0	0.396	17.8
Δln(PSX[-1])	0.167	25.0					0.080	14.3						
Δln(PD)	0.410	21.2	0.862	161.9	0.960	c	0.310	22.3	0.316	18.2	0.997	c	0.553	26.0
Δln(PD[-1])	0.176	5.4			-0.436	-23.4	0.187	10.5	0.204	6.4	-0.550	-25.8		
Δln(EX)	-0.228	-19.5					0.080	14.3	0.167	25.0	0.321	12.2	0.080	14.3
ECM	-0.080	-14.3	-0.228	-19.5	-0.051	-6.8	-0.167	-25.0	-0.080	-14.3	-0.051	-6.8	-0.310	-22.3
SER	0.012		0.008		0.016		0.012		0.013		0.021		0.015	
R2	0.841		0.424		0.569		0.491		0.419		0.725		0.514	

	KOR Coef	t-stat	MEX Coef	t-stat	NLD Coef	t-stat	NOR Coef	t-stat	NZL Coef	t-stat	ESP Coef	t-stat	PRT Coef	t-stat
Constant	-0.951	-7.2	0.016	3.5	-0.622	-9.3	-0.590	-5.8	-0.002	-1.5	0.063	11.9	0.136	11.2
Long-Run														
ln(PSX[-1])	1.000	c	0.817	85.4	0.364	8.7	0.600	c	0.817	85.4	0.817	85.4	0.793	49.0
ln(PD[-1])	0.000		0.183		0.636		0.400		0.183		0.183		0.207	
Trend	-0.020	-14.7			-0.011	-26.9	-0.008	-22.2			-0.002	-13.2	-0.003	-12.0
Log Trend	1.382	13.8			0.633	19.3	0.525	16.2						
Dynamics														
Δln(PMX[-1])			0.410	21.2					-0.093	-2.7	0.080	14.3		
Δln(PSX)	0.454	16.6	0.689	29.2	0.080	14.3			0.396	20.9	0.167	25.0	0.310	22.3
Δln(PSX[-1])			-0.167	-25.0			0.219	3.1	0.276	26.0	0.170	2.8	-0.104	-4.3
Δln(PD)	0.310	22.3	0.268	3.3	0.985	c	0.621	10.3	0.561	8.6	0.985	c	0.793	49.0
Δln(PD[-1])	0.236	7.1	-0.200	-2.8	-0.065	-11.6	0.160	2.5	-0.141	-2.1	-0.402	-6.6		
Δln(EX)	-0.481	-21.7												
ECM	-0.217	-7.5	-0.793	-49.0	-0.349	-10.5	-0.363	-7.1	-0.080	-14.3	-0.228	-19.5	-0.480	-14.7
SER	0.017		0.033		0.013		0.019		0.015		0.020		0.017	
R2	0.900		0.937		0.383		0.306		0.777		0.516		0.732	

Variable Definitions: PMX – non-commodity imports of goods and services deflator; PSX – shadow non-commodity prices; PD - domestic demand deflator in importing country; ECM – equilibrium-correction term; EX – importing country bilateral dollar exchange rate. See also text equation [9].

Table 9. **Import price equations** (cont'd)

	SWE Coef	t-stat	CHE Coef	t-stat	TUR Coef	t-stat	LUX Coef	t-stat	ISL Coef	t-stat
Constant	-0.012	-1.1	-0.145	-11.5	-0.969	-10.9	-0.095	-1.6	-0.080	-2.5
Long-Run										
ln(PSX[-1])	0.793	49.0	0.553	26.0	1.000	c	0.494	2.6	0.412	3.5
ln(PD[-1])	0.207		0.447		0.000		0.506		0.588	
Trend	-0.002	-13.2	-0.005	-17.5	-0.020	-14.7			0.002	4.5
Log Trend	0.071	4.0	0.310	22.3	1.701	13.8	0.179	2.3		
Dynamics										
Δln(PMX[-1])	0.080	14.3	0.321	12.2					0.412	3.1
Δln(PSX)	0.402	15.5	0.228	19.5	0.690	49.6	0.414	5.1	0.208	2.0
Δln(PSX[-1])			0.155	14.8			0.176	2.6	0.168	2.0
Δln(PD)	0.204	4.1	0.720	5.0	0.310	22.3	0.410	4.6	0.705	5.4
Δln(PD[-1])	0.315	6.7	-0.425	-2.9					-0.494	-3.3
Δln(EX)	0.051	3.1	0.080	14.3			0.119	5.2	0.123	2.5
ECM	-0.155	-14.8	-0.155	-14.8	-0.167	-25.0	-0.113	-1.9	-0.382	-4.6
SER	0.009		0.009		0.038		0.008		0.017	
R2	0.717		0.586		0.772		0.500		0.870	

	CZE Coef	t-stat	HUN Coef	t-stat	POL Coef	t-stat	SVK Coef	t-stat	SEE Coef	t-stat
Constant	3.646	4.8	3.614	3.1	-1.468	-5.0	-0.158	-4.2	-11.058	-4.1
Long-Run										
ln(PSX[-1])	0.552	8.5	1.000	c	1.000	c	1.000	c	1.000	c
ln(PD[-1])	0.448									
Trend	0.015	4.0	0.069	5.4					-0.066	-5.4
Log Trend	-1.344	-5.4	-4.456	-5.4	0.590	6.8	0.581	6.7	4.456	5.4
Dynamics										
Δln(PMX[-1])	0.167	1.5	0.073	2.0						
Δln(PSX)	0.493	8.5	0.723	6.2	0.540	4.8	0.335	2.4	1.000	c
Δln(PSX[-1])	-0.145	-2.0	-0.328	-2.9			0.220	1.5		c
Δln(PD)	0.485	6.6	0.532	4.0	0.460	4.1	0.445	2.0		
Δln(PD[-1])										
Δln(EX)			0.225	2.0			0.153	1.5		
ECM	-0.776	-7.5	-0.256	-4.1	-0.581	-6.7	-0.066	-5.4	-0.776	-7.5
SER	0.009		0.021		0.039		0.023		0.046	
R2	0.768		0.846		0.782		0.182		0.390	

	CHN Coef	t-stat	ASO Coef	t-stat	ANC Coef	t-stat	LAT Coef	t-stat	AFM Coef	t-stat
Constant	0.177	2.7	0.623	3.3	-0.280	-6.2	1.908	3.0	-0.003	-1.3
Long-Run										
ln(PSX[-1])	1.000	c	1.000	c	1.000	c	1.000	c	1.000	c
ln(PD[-1])										
Trend	0.011	3.3	0.011	3.3			0.021	7.3		
Log Trend	-0.551	-3.1	-0.551	-3.1	0.100	15.6	-1.126	-7.1		
Dynamics										
Δln(PMX[-1])	0.174	2.0	0.134	1.9	0.457	4.9	0.365	2.5	0.304	4.8
Δln(PSX)	0.389	7.2	0.866	12.2	0.761	12.8	0.635	4.3	0.696	11.1
Δln(PSX[-1])	0.438	5.0			-0.218	-2.6				
Δln(PD)										
Δln(PD[-1])										
Δln(EX)										
ECM	-0.112	-3.4	-0.389	-7.2	-0.655	-6.6	-0.584	-3.5	-0.112	-3.4
SER	0.009		0.022		0.008		0.020		0.011	
R2	0.620		0.350		0.650		0.180		0.600	

Variable Definitions: PMX – non-commodity imports of goods and services deflator; PSX – shadow non-commodity prices; PD - domestic demand deflator in importing country; ECM – equilibrium-correction term; EX – importing country bilateral dollar exchange rate. See also text equation [9].

Table 10. **Individual equation cumulative response functions**

PANEL A
Export Volumes: Cumulative Responses 1% Demand Shift

Quarter	1	2	4	8	20	40	Long-Run
USA	0.43	1.10	1.00	1.00	1.00	1.00	1
JPN	0.65	1.34	1.19	1.12	1.03	1.00	1
DEU	0.63	0.86	0.86	0.92	0.99	1.00	1
FRA	1.00	0.82	0.90	0.95	0.99	1.00	1
ITA	0.16	0.77	0.74	0.85	0.97	1.00	1
GBR	0.65	0.83	0.83	0.88	0.96	1.00	1
CAN	0.76	0.90	0.90	0.94	0.98	1.00	1
AUS	0.36	0.74	0.96	1.00	1.00	1.00	1
AUT	0.17	0.80	0.76	0.86	0.98	1.00	1
BEL	0.38	0.89	0.93	0.97	1.00	1.00	1
CZE	0.71	0.79	0.89	0.97	1.00	1.00	1
DNK	0.43	0.43	0.55	0.72	0.93	0.99	1
FIN	1.47	1.76	1.48	1.23	1.03	1.00	1
GRC	1.48	0.58	0.89	0.98	1.00	1.00	1
HUN	0.36	0.88	0.94	0.98	1.00	1.00	1
ISL	0.00	0.69	0.97	1.00	1.00	1.00	1
IRE	1.56	0.93	1.05	1.04	1.01	1.00	1
KOR	1.51	1.19	1.16	1.08	1.01	1.00	1
LUX	0.72	0.97	1.07	1.04	1.01	1.00	1
MEX	0.34	0.72	0.74	0.84	0.96	1.00	1
NLD	0.80	0.91	0.92	0.95	0.99	1.00	1
NZL	1.00	0.82	0.92	0.97	1.00	1.00	1
NOR	0.27	0.27	0.42	0.61	0.88	0.98	1
POL	0.10	0.65	1.02	1.00	1.00	1.00	1
PRT	1.17	0.92	0.98	0.99	1.00	1.00	1
SVK	1.00	1.21	1.07	1.00	1.00	1.00	1
ESP	0.17	0.42	0.53	0.70	0.93	0.99	1
SWE	1.68	0.98	1.10	1.07	1.01	1.00	1
CHE	0.49	0.71	0.88	0.95	0.99	1.00	1
TUR	1.00	0.82	0.88	0.93	0.98	1.00	1
CHN	1.00	1.00	1.00	1.00	1.00	1.00	1
ASO	0.72	0.76	0.83	0.91	0.99	1.00	1
ANC	0.97	1.35	1.14	1.00	1.00	1.00	1
LAT	0.12	0.34	0.90	1.38	0.99	1.01	1
AFM	0.32	0.47	0.65	0.85	0.99	1.00	1
SEE	0.76	1.40	1.32	0.95	1.00	1.00	1

Export Volumes: Cumulative Responses 1% Real exchange rate Shift

Quarter	1	2	4	8	20	40	Long-Run
USA	-0.08	-0.21	-0.37	-0.52	-0.60	-0.60	-0.60
JPN	-0.16	-0.25	-0.43	-0.67	-0.97	-1.06	-1.06
DEU	-0.08	-0.26	-0.29	-0.37	-0.45	-0.47	-0.47
FRA	-0.08	-0.30	-0.37	-0.49	-0.59	-0.60	-0.60
ITA	-0.24	-0.47	-0.47	-0.53	-0.59	-0.60	-0.60
GBR	-0.16	-0.50	-0.46	-0.50	-0.57	-0.60	-0.60
CAN	-0.16	-0.25	-0.42	-0.66	-0.96	-1.06	-1.06
AUS	-0.16	-0.42	-0.57	-0.60	-0.60	-0.60	-0.60
AUT	-0.50	-0.35	-0.45	-0.52	-0.59	-0.60	-0.60
BEL	-0.08	-0.29	-0.35	-0.42	-0.46	-0.47	-0.47
CZE	-0.23	-0.67	-0.82	-0.95	-1.00	-1.00	-1.00
DNK	-0.08	-0.20	-0.24	-0.32	-0.43	-0.46	-0.46
FIN	-0.24	-0.51	-0.52	-0.56	-0.60	-0.60	-0.60
GRC	-0.08	-0.55	-0.47	-0.47	-0.47	-0.47	-0.47
HUN	-0.23	-0.53	-0.52	-0.51	-0.50	-0.50	-0.50
ISL	0.00	-0.41	-0.58	-0.60	-0.60	-0.60	-0.60
IRE	-0.08	-0.39	-0.40	-0.49	-0.59	-0.60	-0.60
KOR	-0.45	-0.58	-0.86	-1.17	-1.43	-1.46	-1.46
LUX	-0.10	-0.22	-0.44	-0.72	-0.96	-1.00	-1.00
MEX	-0.16	-0.25	-0.43	-0.67	-0.97	-1.06	-1.06
NLD	-0.13	-0.30	-0.35	-0.45	-0.57	-0.60	-0.60
NZL	-0.32	-0.34	-0.45	-0.55	-0.60	-0.60	-0.60
NOR	-0.13	-0.13	-0.20	-0.29	-0.41	-0.46	-0.46
POL	-0.90	-0.79	-0.95	-1.00	-1.00	-1.00	-1.00
PRT	-0.08	-0.25	-0.33	-0.42	-0.46	-0.47	-0.47
SVK	-0.90	-0.71	-0.92	-1.00	-1.00	-1.00	-1.00
ESP	-0.16	-0.25	-0.43	-0.67	-0.97	-1.06	-1.06
SWE	-0.08	-0.39	-0.40	-0.49	-0.59	-0.60	-0.60
CHE	-0.08	-0.23	-0.36	-0.47	-0.57	-0.60	-0.60
TUR	-0.57	-0.59	-0.78	-1.03	-1.35	-1.45	-1.45
CHN	-0.69	-1.02	-1.33	-1.48	-1.50	-1.50	-1.50
ASO	-0.17	-0.35	-0.34	-0.32	-0.30	-0.30	-0.30
ANC	-0.17	-0.31	-0.31	-0.30	-0.30	-0.30	-0.30
LAT	-0.06	-0.20	-0.55	-0.89	-0.63	-0.64	-0.64
AFM	-0.69	-0.78	-0.75	-0.69	-0.64	-0.64	-0.64
SEE	-0.51	-0.38	-0.54	-0.66	-0.64	-0.64	-0.64

Table 10. **Individual equation cumulative response functions** (cont'd)

PANEL B.   IMPORT VOLUMES WITH AGGREGATED EXPENDITURE
Cumulative Responses 1% Demand Shift

Quarter	1	2	4	8	20	40	Long-Run
USA	1.72	2.64	2.28	1.92	1.34	1.06	1
JPN	1.09	1.82	1.72	1.55	1.25	1.06	1
DEU	1.72	1.84	1.69	1.52	1.23	1.06	1
FRA	2.36	2.30	2.14	1.89	1.42	1.12	1
ITA	2.98	2.85	2.67	2.35	1.72	1.25	1
GBR	2.59	2.22	2.01	1.69	1.22	1.03	1
CAN	2.39	2.18	1.86	1.45	1.06	1.00	1
AUS	1.86	2.05	1.80	1.46	1.09	1.01	1
AUT	1.82	2.02	1.77	1.44	1.08	1.01	1
BEL	1.86	1.66	1.60	1.47	1.22	1.06	1
CZE	1.78	1.39	1.41	1.34	1.20	1.08	1
DNK	1.39	1.82	1.67	1.53	1.28	1.09	1
FIN	2.12	1.56	1.31	1.08	1.00	1.00	1
GRC	2.14	2.03	1.85	1.58	1.18	1.03	1
HUN	2.21	2.15	2.03	1.82	1.42	1.14	1
ISL	1.66	0.91	0.99	1.00	1.00	1.00	1
IRE	1.86	1.67	1.60	1.47	1.22	1.07	1
KOR	1.86	1.59	1.51	1.33	1.09	1.01	1
LUX	0.80	1.22	1.46	1.26	1.00	1.00	1
MEX	2.01	2.24	1.81	1.34	1.03	1.00	1
NLD	1.86	1.91	1.61	1.27	1.02	1.00	1
NZL	1.58	1.49	1.31	1.13	1.01	1.00	1
NOR	1.81	1.86	1.73	1.55	1.24	1.06	1
POL	3.14	3.03	2.81	2.45	1.75	1.25	1
PRT	1.58	2.21	1.94	1.68	1.26	1.05	1
SVK	2.34	2.27	2.13	1.91	1.47	1.15	1
ESP	1.72	2.21	1.82	1.37	1.04	1.00	1
SWE	1.86	2.08	1.93	1.75	1.40	1.14	1
CHE	2.47	2.09	1.74	1.43	1.09	1.01	1
TUR	2.01	1.99	1.83	1.58	1.20	1.04	1

Cumulative Responses 1% Real exchange rate Shift

Quarter	1	2	4	8	20	40	Long-Run
USA	0	-0.42	-0.41	-0.46	-0.55	-0.60	-0.61
JPN	-0.07	-0.12	-0.19	-0.32	-0.55	-0.69	-0.74
DEU	-0.03	-0.07	-0.14	-0.25	-0.45	-0.57	-0.61
FRA	-0.06	-0.07	-0.11	-0.17	-0.27	-0.34	-0.37
ITA	-0.07	-0.17	-0.22	-0.31	-0.51	-0.66	-0.74
GBR	-0.14	-0.18	-0.26	-0.37	-0.53	-0.60	-0.60
CAN	-0.14	-0.21	-0.32	-0.46	-0.58	-0.61	-0.61
AUS	-0.29	-0.35	-0.44	-0.57	-0.71	-0.74	-0.74
AUT	-0.29	-0.35	-0.44	-0.57	-0.71	-0.74	-0.74
BEL	-0.06	-0.07	-0.11	-0.17	-0.27	-0.34	-0.37
CZE	-0.18	-0.17	-0.20	-0.25	-0.36	-0.44	-0.50
DNK	-0.07	-0.17	-0.22	-0.32	-0.52	-0.67	-0.74
FIN	-0.16	-0.21	-0.29	-0.35	-0.37	-0.37	-0.37
GRC	-0.98	-0.95	-0.89	-0.80	-0.67	-0.62	-0.61
HUN	0.00	-0.03	-0.08	-0.16	-0.33	-0.44	-0.50
ISL	0.00	-0.81	-0.99	-1.03	-1.04	-1.04	-1.04
IRE	-0.19	-0.21	-0.27	-0.37	-0.56	-0.69	-0.74
KOR	-0.19	-0.21	-0.32	-0.46	-0.66	-0.73	-0.74
LUX	-0.05	-0.03	0.07	0.26	0.36	0.36	0.36
MEX	-0.53	-0.57	-0.63	-0.69	-0.73	-0.74	-0.74
NLD	-0.06	-0.04	-0.15	-0.27	-0.36	-0.37	-0.37
NZL	-0.16	-0.16	-0.19	-0.22	-0.24	-0.25	-0.25
NOR	-0.16	-0.29	-0.28	-0.30	-0.34	-0.36	-0.37
POL	-0.25	-0.26	-0.29	-0.33	-0.41	-0.47	-0.50
PRT	0.00	-0.23	-0.23	-0.27	-0.33	-0.36	-0.37
SVK	0.00	-0.03	-0.08	-0.16	-0.33	-0.44	-0.50
ESP	-0.32	-0.24	-0.36	-0.49	-0.60	-0.61	-0.61
SWE	-0.07	-0.10	-0.16	-0.27	-0.49	-0.65	-0.74
CHE	-0.24	-0.21	-0.26	-0.40	-0.56	-0.59	-0.59
TUR	-0.24	-0.25	-0.33	-0.45	-0.64	-0.72	-0.74

Note: For CZE, HUN, ISL, LUX, POL, SVK these are taken from the equations in Table 6B. Equivalent equations were estimated for the other OECD economies, but are not reported in this paper.

Table 10. **Individual equation cumulative response functions** (cont'd)

PANEL C. IMPORT VOLUMES WITH DISAGGREGATED EXPENDITURE

Cumulative Responses 1% Demand Shift

Quarter	1	2	4	8	20	40	Long-Run
USA	1.45	1.58	1.44	1.22	1.03	1.00	1
JPN	1.41	1.48	1.48	1.22	1.01	1.00	1
DEU	1.09	1.06	1.13	1.03	1.00	1.00	1
FRA	1.61	1.56	1.47	1.33	1.11	1.02	1
ITA	1.70	1.54	1.32	1.11	1.01	1.00	1
GBR	1.64	1.48	1.33	1.24	1.10	1.02	1
CAN	1.49	1.36	1.19	1.06	1.00	1.00	1
AUS	1.10	1.23	1.25	1.01	1.00	1.00	1
AUT	0.96	1.23	1.12	0.99	1.00	1.00	1
BEL	1.36	1.19	1.18	1.13	1.05	1.01	1
DNK	0.98	1.21	1.18	0.97	1.00	1.00	1
FIN	1.01	0.87	0.98	0.99	1.00	1.00	1
GRC	1.31	1.43	1.26	1.07	1.00	1.00	1
IRE	1.15	1.13	1.22	1.13	1.02	1.00	1
KOR	1.22	1.07	1.08	1.02	1.00	1.00	1
MEX	1.11	1.23	1.13	1.03	1.00	1.00	1
NLD	1.36	1.31	1.24	1.14	1.03	1.00	1
NZL	1.08	1.04	1.01	1.00	1.00	1.00	1
NOR	0.91	0.84	0.99	1.00	1.00	1.00	1
PRT	1.70	1.92	1.39	1.33	1.12	1.02	1
ESP	1.93	2.04	1.75	1.35	1.03	1.00	1
SWE	1.66	1.63	1.32	1.07	1.00	1.00	1
CHE	2.05	1.71	1.46	1.31	1.09	1.01	1
TUR	1.55	1.61	1.32	1.07	1.00	1.00	1

Cumulative Responses 1% Real exchange rate decline

Quarter	1	2	4	8	20	40	Long-Run
USA	0.00	-0.26	-0.32	-0.32	-0.33	-0.33	-0.33
JPN	-0.07	-0.12	-0.22	-0.33	-0.40	-0.40	-0.40
DEU	-0.06	-0.13	-0.24	-0.31	-0.33	-0.33	-0.33
FRA	-0.08	-0.09	-0.12	-0.17	-0.24	-0.27	-0.28
ITA	-0.11	-0.17	-0.25	-0.33	-0.37	-0.37	-0.37
GBR	-0.08	-0.16	-0.17	-0.20	-0.25	-0.27	-0.28
CAN	-0.22	-0.25	-0.29	-0.32	-0.33	-0.33	-0.33
AUS	-0.34	-0.48	-0.63	-0.62	-0.61	-0.61	-0.61
AUT	-0.38	-0.12	-0.09	-0.16	-0.16	-0.16	-0.16
BEL	-0.08	-0.09	-0.12	-0.16	-0.23	-0.27	-0.28
DNK	-0.14	-0.32	-0.24	-0.15	-0.16	-0.16	-0.16
FIN	-0.32	0.05	-0.21	-0.30	-0.31	-0.31	-0.31
GRC	0.00	-0.32	-0.38	-0.37	-0.37	-0.37	-0.37
IRE	-0.06	-0.31	-0.36	-0.35	-0.33	-0.33	-0.33
KOR	-0.23	-0.34	-0.50	-0.59	-0.61	-0.61	-0.61
MEX	-0.43	-0.49	-0.49	-0.47	-0.47	-0.47	-0.47
NLD	-0.08	-0.10	-0.16	-0.25	-0.32	-0.33	-0.28
NZL	-0.11	-0.21	-0.28	-0.31	-0.31	-0.31	-0.31
NOR	-0.43	-0.31	-0.32	-0.31	-0.31	-0.31	-0.31
PRT	-0.15	-0.21	-0.24	-0.33	-0.48	-0.54	-0.56
ESP	-0.38	-0.47	-0.52	-0.56	-0.60	-0.60	-0.60
SWE	-0.06	-0.13	-0.23	-0.31	-0.33	-0.33	-0.33
CHE	-0.30	-0.31	-0.34	-0.41	-0.52	-0.55	-0.56
TUR	-0.21	-0.31	-0.39	-0.45	-0.47	-0.47	-0.47

Table 10. **Individual equation cumulative response functions** (cont'd)

PANEL D.
Export Prices: Cumulative Responses 1% Competitor Prices Shift

Quarter	1	2	4	8	20	40	Long-Run
USA	0.05	0.08	0.09	0.08	0.08	0.08	0.08
JPN	0.05	0.12	0.20	0.26	0.28	0.28	0.28
DEU	0.09	0.18	0.19	0.19	0.18	0.18	0.18
FRA	0.18	0.30	0.30	0.29	0.28	0.28	0.28
ITA	0.14	0.26	0.37	0.41	0.41	0.41	0.41
GBR	0.21	0.39	0.43	0.46	0.46	0.46	0.46
CAN	0.78	0.87	0.76	0.59	0.47	0.46	0.46
AUS	0.28	0.42	0.50	0.48	0.46	0.46	0.46
AUT	0.14	0.24	0.25	0.21	0.18	0.18	0.18
BEL	0.49	0.51	0.53	0.55	0.57	0.57	0.57
DNK	0.47	0.75	0.58	0.28	0.18	0.18	0.18
FIN	0.19	0.26	0.34	0.42	0.53	0.57	0.57
GRC	0.07	0.28	0.34	0.36	0.39	0.41	0.41
IRE	0.35	0.56	0.43	0.31	0.28	0.28	0.28
KOR	0.22	0.19	0.33	0.43	0.46	0.46	0.46
MEX	0.49	0.55	0.73	0.85	0.90	0.90	0.90
NLD	0.21	0.25	0.31	0.37	0.41	0.41	0.41
NOR	1.00	1.00	1.00	1.00	1.00	1.00	1.00
NZL	0.00	0.41	0.55	0.76	0.96	1.00	1.00
ESP	0.15	0.32	0.31	0.30	0.28	0.28	0.28
PRT	0.44	0.60	0.63	0.68	0.75	0.77	0.77
SWE	0.26	0.39	0.51	0.56	0.57	0.57	0.57
CHE	0.10	0.17	0.23	0.27	0.28	0.28	0.28
TUR	0.64	0.45	0.45	0.54	0.57	0.57	0.57
LUX	0.08	0.18	0.32	0.34	0.20	0.22	0.22
ISL	0.00	0.39	0.69	0.89	1.00	1.00	1.00
CZE	0.60	0.59	0.57	0.57	0.57	0.57	0.57
HUN	1.00	0.64	0.76	0.92	1.00	1.00	1.00
POL	0.24	0.76	0.97	1.00	1.00	1.00	1.00
SVK	0.41	0.62	0.72	0.71	0.71	0.71	0.71
SEE	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CHN	0.37	0.79	1.28	1.02	1.00	1.00	1.00
ASO	0.37	0.79	1.28	1.02	1.00	1.00	1.00
ANC	0.39	0.70	1.07	1.16	0.99	1.00	1.00
LAT	0.38	0.96	1.10	1.05	1.00	1.00	1.00
AFM	0.37	1.33	1.08	1.00	1.00	1.00	1.00

Export Prices: Cumulative Responses 1% Domestic Price Shift

Quarter	1	2	4	8	20	40	Long-Run
USA	0.59	0.87	1.01	0.95	0.92	0.92	0.92
JPN	0.85	0.91	0.81	0.74	0.72	0.72	0.72
DEU	0.55	0.82	0.87	0.84	0.82	0.82	0.82
FRA	0.64	0.71	0.72	0.72	0.72	0.72	0.72
ITA	0.68	0.77	0.67	0.60	0.59	0.59	0.59
GBR	0.50	0.70	0.62	0.56	0.54	0.54	0.54
CAN	0.50	0.13	0.19	0.39	0.52	0.54	0.54
AUS	0.97	0.62	0.44	0.50	0.54	0.54	0.54
AUT	0.45	0.71	0.83	0.83	0.82	0.82	0.82
BEL	0.29	0.54	0.50	0.46	0.43	0.43	0.43
DNK	0.06	0.23	0.52	0.75	0.82	0.82	0.82
FIN	0.38	0.64	0.70	0.61	0.48	0.43	0.43
GRC	0.58	0.68	0.69	0.66	0.61	0.60	0.59
IRE	0.33	0.49	0.63	0.71	0.72	0.72	0.72
KOR	0.50	0.89	0.71	0.58	0.54	0.54	0.54
MEX	0.69	0.36	0.25	0.14	0.10	0.10	0.10
NLD	0.64	0.78	0.71	0.64	0.60	0.59	0.59
NOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZL	0.10	0.79	0.54	0.29	0.05	0.00	0.00
ESP	0.70	0.71	0.71	0.71	0.72	0.72	0.72
PRT	0.97	0.36	0.33	0.30	0.25	0.23	0.23
SWE	0.22	0.57	0.61	0.47	0.43	0.43	0.43
CHE	0.44	0.74	0.86	0.78	0.72	0.72	0.72
TUR	0.22	0.54	0.59	0.47	0.43	0.43	0.43
LUX	0.96	0.85	0.69	0.65	0.80	0.78	0.78
ISL	0.54	0.58	0.39	0.14	0.01	0.00	0.00
CZE	0.18	0.52	0.46	0.43	0.43	0.43	0.43
HUN	0.46	0.30	0.17	0.06	0.00	0.00	0.00
POL	0.00	0.76	0.08	0.00	0.00	0.00	0.00
SVK	0.35	0.41	0.35	0.29	0.29	0.29	0.29
SEE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASO	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 10. **Individual equation cumulative response functions** (cont'd)

PANEL E.
Import Prices: Cumulative Responses 1% Shadow Prices Shift

Quarter	1	2	4	8	20	40	Long-Run
USA	0.20	0.26	0.29	0.32	0.35	0.36	0.36
JPN	0.33	0.31	0.42	0.49	0.51	0.51	0.51
DEU	0.23	0.47	0.56	0.61	0.65	0.65	0.65
FRA	0.23	0.34	0.40	0.46	0.51	0.51	0.51
ITA	0.34	0.60	0.63	0.58	0.55	0.55	0.55
GBR	0.41	0.57	0.67	0.76	0.79	0.79	0.79
CAN	0.31	0.44	0.49	0.59	0.78	0.92	1.00
AUS	0.34	0.51	0.54	0.61	0.73	0.80	0.82
AUT	0.14	0.22	0.34	0.45	0.51	0.51	0.51
BEL	0.34	0.41	0.46	0.53	0.67	0.76	0.79
DNK	0.26	0.44	0.54	0.61	0.65	0.65	0.65
FIN	0.34	0.43	0.50	0.59	0.73	0.78	0.79
GRC	0.28	0.36	0.39	0.40	0.40	0.40	0.40
IRE	0.40	0.45	0.49	0.51	0.51	0.51	0.51
KOR	0.45	0.57	0.74	0.90	0.99	1.00	1.00
MEX	0.69	0.91	0.85	0.82	0.82	0.82	0.82
NLD	0.08	0.18	0.29	0.35	0.36	0.36	0.36
NOR	0.00	0.44	0.53	0.59	0.60	0.60	0.60
NZL	0.40	0.67	0.67	0.71	0.77	0.81	0.82
ESP	0.17	0.50	0.66	0.77	0.82	0.82	0.82
PRT	0.31	0.44	0.70	0.79	0.79	0.79	0.79
SWE	0.40	0.49	0.59	0.70	0.78	0.79	0.79
CHE	0.23	0.51	0.63	0.59	0.55	0.55	0.55
TUR	0.69	0.74	0.82	0.91	0.99	1.00	1.00
LUX	0.41	0.60	0.58	0.55	0.51	0.50	0.49
ISL	0.21	0.54	0.58	0.39	0.41	0.41	0.41
CZE	0.49	0.48	0.56	0.55	0.55	0.55	0.55
HUN	0.72	0.52	0.73	0.93	1.00	1.00	1.00
POL	0.54	0.81	0.97	1.00	1.00	1.00	1.00
SVK	0.34	0.60	0.65	0.73	0.88	0.97	1.00
SEE	1.00	1.00	1.00	1.00	1.00	1.00	1.00
CHN	0.39	0.96	1.08	1.05	1.01	1.00	1.00
ASO	0.87	1.03	1.03	1.00	1.00	1.00	1.00
ANC	0.76	1.05	1.10	0.99	1.00	1.00	1.00
LAT	0.63	1.08	1.12	0.99	1.00	1.00	1.00
AFM	0.70	0.94	1.05	1.03	1.00	1.00	1.00

Import Prices: Cumulative Responses 1% Domestic Price Shift

Quarter	1	2	4	8	20	40	Long-Run
USA	0.20	0.65	0.77	0.73	0.66	0.64	0.64
JPN	0.99	0.58	0.53	0.50	0.49	0.49	0.49
DEU	0.16	0.55	0.54	0.43	0.36	0.35	0.35
FRA	0.96	0.64	0.57	0.53	0.49	0.49	0.49
ITA	0.96	0.40	0.32	0.40	0.44	0.45	0.45
GBR	0.74	0.37	0.31	0.23	0.21	0.21	0.21
CAN	0.30	0.58	0.53	0.43	0.23	0.08	0.00
AUS	0.41	0.53	0.47	0.40	0.27	0.20	0.18
AUT	0.86	0.78	0.66	0.55	0.49	0.49	0.49
BEL	0.96	0.62	0.52	0.45	0.32	0.24	0.21
DNK	0.31	0.56	0.53	0.42	0.36	0.35	0.35
FIN	0.32	0.55	0.53	0.43	0.27	0.22	0.21
GRC	1.00	0.70	0.59	0.59	0.59	0.60	0.60
IRE	0.55	0.56	0.52	0.50	0.49	0.49	0.49
KOR	0.31	0.48	0.29	0.11	0.01	0.00	0.00
MEX	0.27	0.11	0.16	0.18	0.18	0.18	0.18
NLD	0.99	0.80	0.70	0.65	0.64	0.64	0.64
NOR	0.62	0.70	0.52	0.42	0.40	0.40	0.40
NZL	0.56	0.34	0.33	0.29	0.23	0.19	0.18
ESP	0.99	0.48	0.32	0.22	0.18	0.18	0.18
PRT	0.79	0.51	0.29	0.21	0.21	0.21	0.21
SWE	0.20	0.53	0.46	0.33	0.22	0.21	0.21
CHE	0.72	0.48	0.38	0.42	0.45	0.45	0.45
TUR	0.31	0.26	0.18	0.09	0.01	0.00	0.00
LUX	0.41	0.42	0.44	0.46	0.50	0.51	0.51
ISL	0.71	0.46	0.45	0.61	0.59	0.59	0.59
CZE	0.49	0.54	0.44	0.45	0.45	0.45	0.45
HUN	0.53	0.43	0.23	0.06	0.00	0.00	0.00
POL	0.46	0.19	0.03	0.00	0.00	0.00	0.00
SVK	0.44	0.42	0.36	0.28	0.12	0.03	0.00

Table 11. **The impact of the time trends on annual trade growth (%)**

PANEL A. EXPORT VOLUMES

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
USA	1.98	1.60	1.27	0.99	0.74	0.51	0.32	0.14	-0.02	-0.16	-0.29	-0.41	-0.52	-0.62	-0.72	-0.80	-0.88	-0.96	-0.95	-0.90	-0.83
JPN	0.42	-0.23	-0.79	-1.28	-1.71	-2.08	-2.42	-2.72	-2.99	-3.24	-3.46	-3.67	-3.86	-4.03	-4.19	-4.34	-4.48	-4.60	-4.69	-4.74	-4.76
DEU	3.41	2.92	2.50	2.14	1.82	1.53	1.28	1.05	0.85	0.66	0.50	0.34	0.20	0.07	-0.05	-0.16	-0.26	-0.36	-0.45	-0.54	-0.63
FRA	2.36	1.95	1.59	1.29	1.02	0.78	0.57	0.38	0.21	0.05	-0.09	-0.22	-0.33	-0.44	-0.54	-0.64	-0.72	-0.80	-0.88	-0.95	-1.02
ITA	6.40	5.29	4.34	3.52	2.80	2.16	1.59	1.08	0.62	0.20	-0.18	-0.52	-0.84	-1.13	-1.40	-1.65	-1.89	-2.10	-2.32	-2.50	-2.66
GBR	2.00	1.62	1.29	1.00	0.75	0.53	0.33	0.15	-0.01	-0.15	-0.28	-0.40	-0.51	-0.61	-0.71	-0.80	-0.88	-0.95	-0.95	-0.90	-0.83
CAN	-2.59	-2.39	-2.23	-2.08	-1.95	-1.84	-1.74	-1.65	-1.57	-1.49	-1.43	-1.36	-1.31	-1.26	-1.21	-1.16	-1.12	-1.08	-0.98	-0.93	-0.88
AUS	1.69	1.32	1.01	0.73	0.49	0.27	0.08	-0.09	-0.24	-0.38	-0.51	-0.62	-0.73	-0.83	-0.92	-1.00	-1.08	-1.15	-1.14	-1.12	-1.08
AUT	4.22	3.67	3.19	2.78	2.42	2.10	1.82	1.56	1.33	1.13	0.94	0.76	0.61	0.46	0.32	0.20	0.08	-0.02	0.06	0.04	0.03
BEL	1.41	1.03	0.70	0.42	0.18	-0.04	-0.24	-0.41	-0.57	-0.71	-0.84	-0.96	-1.06	-1.16	-1.26	-1.34	-1.42	-1.49	-1.32	-1.26	-1.18
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	0.00	0.00	0.00	0.00
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	0.00	0.00	0.00	0.00
GRC	3.19	2.95	2.74	2.56	2.41	2.27	2.14	2.03	1.93	1.84	1.76	1.68	1.61	1.55	1.49	1.43	1.38	1.34	1.20	1.14	1.09
IRE	2.01	2.82	3.52	4.12	4.65	5.12	5.54	5.91	6.25	6.56	6.83	7.09	7.32	7.53	7.73	7.92	8.09	8.24	8.30	8.35	8.37
KOR	9.83	8.47	7.30	6.28	5.38	4.60	3.89	3.26	2.70	2.18	1.71	1.29	0.89	0.53	0.20	-0.11	-0.40	-0.67	0.02	0.01	0.00
MEX	-4.64	-3.49	-2.50	-1.64	-0.88	-0.22	0.37	0.91	1.38	1.82	2.21	2.57	2.90	3.21	3.49	3.75	3.99	4.22	3.86	3.71	3.51
NLD	1.91	1.53	1.21	0.93	0.68	0.46	0.27	0.09	-0.06	-0.20	-0.33	-0.45	-0.56	-0.66	-0.75	-0.84	-0.92	-0.99	-0.94	-0.88	-0.81
NZL	-0.56	-0.75	-0.92	-1.06	-1.18	-1.29	-1.39	-1.48	-1.56	-1.63	-1.69	-1.75	-1.81	-1.86	-1.91	-1.95	-1.99	-2.03	-2.03	-2.04	-2.04
NOR	5.33	4.31	3.43	2.66	1.99	1.40	0.87	0.40	-0.03	-0.41	-0.76	-1.08	-1.38	-1.65	-1.90	-2.13	-2.35	-2.55	-2.54	-2.41	-2.23
PRT	7.42	6.24	5.22	4.34	3.57	2.88	2.28	1.73	1.24	0.79	0.39	0.02	-0.32	-0.64	-0.93	-1.19	-1.44	-1.67	-1.90	-2.10	-2.29
ESP	4.99	4.61	4.29	4.01	3.76	3.54	3.35	3.17	3.02	2.87	2.75	2.63	2.52	2.42	2.33	2.24	2.16	2.09	1.88	1.79	1.70
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	0.00	0.00	0.00	0.00
CHE	3.63	2.74	1.97	1.30	0.71	0.19	-0.27	-0.68	-1.05	-1.39	-1.70	-1.98	-2.24	-2.47	-2.69	-2.90	-3.09	-3.26	-2.99	-2.88	-2.72
TUR	6.79	6.28	5.84	5.46	5.12	4.82	4.56	4.32	4.11	3.91	3.74	3.58	3.43	3.29	3.17	3.05	2.94	2.84	2.56	2.43	2.31
CZE												3.95	3.79	3.64	3.50	3.37	3.25	3.14	3.00	2.87	2.73
HUN												10.20	9.78	9.39	9.03	8.70	8.39	8.11	7.77	7.45	7.14
POL												8.91	8.01	7.17	6.41	5.70	5.03	4.42	3.88	3.39	2.96
SVK												2.02	1.94	1.86	1.79	1.72	1.66	1.61	1.54	1.47	1.40
AFM										0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ANC										3.52	2.25	1.09	0.03	-0.95	-1.86	-2.70	-3.47	-4.20	-4.78	-5.07	-5.18
ASO										0.60	1.37	2.08	2.73	3.33	3.88	4.39	4.87	5.31	5.76	6.12	6.43
CHN										11.88	11.34	10.86	10.41	10.00	9.61	9.26	8.93	8.63	8.23	7.90	7.58
LAT										2.72	2.29	1.91	1.55	1.22	0.92	0.64	0.38	0.14	0.16	0.09	0.05
SEE										-2.50	-1.95	-1.45	-1.00	-0.58	-0.19	0.17	0.50	0.81	1.29	1.67	2.03

PANEL B. IMPORT VOLUMES

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
USA	-0.58	0.04	0.58	1.04	1.45	1.82	2.14	2.43	2.69	2.93	3.15	3.34	3.53	3.69	3.85	3.99	4.13	4.25	4.37	4.48	4.58
JPN	-2.53	-1.80	-1.17	-0.62	-0.14	0.29	0.67	1.01	1.32	1.60	1.86	2.09	2.30	2.50	2.68	2.85	3.01	3.16	3.29	3.42	3.54
DEU	-1.15	-0.78	-0.45	-0.17	0.07	0.29	0.49	0.66	0.82	0.96	1.10	1.21	1.32	1.43	1.52	1.61	1.69	1.76	1.83	1.90	1.96
FRA	0.54	0.71	0.86	0.99	1.11	1.21	1.30	1.38	1.46	1.52	1.58	1.64	1.69	1.74	1.78	1.82	1.86	1.89	1.93	1.96	1.99
ITA	-0.90	-0.47	-0.10	0.21	0.49	0.74	0.96	1.16	1.34	1.50	1.65	1.79	1.91	2.02	2.13	2.23	2.32	2.41	2.49	2.56	2.63
GBR	0.54	0.71	0.86	0.99	1.11	1.21	1.30	1.38	1.46	1.52	1.58	1.64	1.69	1.74	1.78	1.82	1.86	1.89	1.93	1.96	1.99
CAN	3.73	3.27	2.87	2.52	2.21	1.94	1.70	1.48	1.28	1.11	0.94	0.79	0.66	0.53	0.42	0.31	0.21	0.19	0.14	0.11	0.08
AUS	0.55	0.76	0.95	1.11	1.25	1.37	1.48	1.58	1.67	1.75	1.82	1.89	1.95	2.01	2.06	2.11	2.16	2.20	2.24	2.28	2.31
AUT	-0.61	-0.29	-0.01	0.22	0.43	0.62	0.78	0.93	1.06	1.18	1.29	1.40	1.49	1.57	1.65	1.73	1.79	1.86	1.92	1.97	2.03
BEL	-1.82	-1.47	-1.17	-0.90	-0.67	-0.47	-0.29	-0.13	0.02	0.16	0.28	0.39	0.49	0.58	0.67	0.75	0.83	0.90	0.96	1.02	1.08
DNK	-0.94	-0.60	-0.30	-0.05	0.18	0.38	0.55	0.71	0.86	0.99	1.11	1.22	1.32	1.41	1.49	1.57	1.65	1.72	1.78	1.84	1.90
FIN	1.03	0.95	0.88	0.83	0.78	0.73	0.69	0.66	0.63	0.60	0.57	0.55	0.52	0.50	0.48	0.47	0.45	0.43	0.42	0.41	0.39
GRC	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
IRE	-2.51	-2.14	-1.81	-1.53	-1.29	-1.07	-0.87	-0.70	-0.54	-0.40	-0.27	-0.15	-0.04	0.07	0.16	0.25	0.33	0.40	0.47	0.54	0.60
KOR	-4.30	-3.45	-2.72	-2.08	-1.52	-1.03	-0.58	-0.19	0.17	0.50	0.79	1.06	1.31	1.54	1.75	1.95	2.13	2.30	2.46	2.61	2.75
MEX	8.51	7.65	6.90	6.25	5.68	5.17	4.72	4.31	3.95	3.62	3.31	3.04	2.78	2.55	2.33	2.13	1.95	1.77	1.61	1.46	1.32
NLD	-0.64	-0.38	-0.16	0.04	0.21	0.37	0.50	0.63	0.74	0.84	0.93	1.01	1.09	1.16	1.22	1.29	1.34	1.39	1.44	1.49	1.53
NZL	-0.55	-0.28	-0.04	0.17	0.35	0.51	0.66	0.79	0.90	1.01	1.11	1.19	1.27	1.35	1.42	1.48	1.54	1.60	1.65	1.70	1.74
NOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PRT	1.07	0.99	0.92	0.86	0.81	0.76	0.72	0.68	0.65	0.62	0.59	0.57	0.54	0.52	0.50	0.49	0.47	0.45	0.44	0.42	0.41
ESP	0.66	0.98	1.25	1.49	1.70	1.88	2.05	2.19	2.33	2.45	2.56	2.66	2.75	2.84	2.92	2.99	3.06	3.12	3.18	3.24	3.29
SWE	-0.79	-0.54	-0.33	-0.14	0.02	0.16	0.29	0.41	0.51	0.61	0.69	0.77	0.84	0.91	0.97	1.03	1.08	1.13	1.18	1.22	1.26
CHE	-1.82	-1.47	-1.17	-0.90	-0.67	-0.47	-0.29	-0.13	0.02	0.16	0.28	0.39	0.49	0.58	0.67	0.75	0.83	0.90	0.96	1.02	1.08
TUR	-3.09	-2.22	-1.47	-0.82	-0.25	0.26	0.71	1.11	1.48	1.81	2.11	2.39	2.64	2.88	3.09	3.29	3.48	3.65	3.82	3.97	4.11

Table 11. **The impact of the time trends on annual trade growth (%)** (cont'd)

PANEL C. EXPORT PRICES

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
USA	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69
JPN	-4.02	-3.68	-3.32	-2.99	-2.69	-2.41	-2.16	-1.93	-1.72	-1.54	-1.37	-1.21	-1.07	-0.95	-0.84	-0.74	-0.65	-0.57	-0.50	-0.44	-0.38
DEU	-0.21	-0.23	-0.26	-0.29	-0.32	-0.34	-0.37	-0.39	-0.41	-0.43	-0.44	-0.46	-0.47	-0.48	-0.49	-0.50	-0.51	-0.51	-0.51	-0.51	-0.51
FRA	-0.63	-0.69	-0.76	-0.82	-0.88	-0.94	-0.99	-1.03	-1.08	-1.12	-1.15	-1.18	-1.20	-1.22	-1.24	-1.25	-1.26	-1.26	-1.26	-1.25	-1.24
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	0.00	0.00	0.00	0.00
GBR	1.60	1.53	1.42	1.28	1.13	0.95	0.76	0.55	0.33	0.11	-0.12	-0.34	-0.56	-0.77	-0.96	-1.14	-1.29	-1.42	-1.53	-1.62	-1.67
CAN	-2.26	-2.13	-1.94	-1.73	-1.51	-1.29	-1.08	-0.89	-0.71	-0.56	-0.44	-0.33	-0.25	-0.18	-0.13	-0.09	-0.06	-0.04	-0.03	-0.02	-0.01
AUS	-4.67	-4.53	-4.36	-4.18	-4.01	-3.84	-3.66	-3.49	-3.31	-3.14	-2.97	-2.81	-2.65	-2.49	-2.34	-2.19	-2.05	-1.91	-1.78	-1.66	-1.54
AUT	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73	-0.73
BEL	1.66	1.51	1.35	1.21	1.08	0.97	0.86	0.77	0.68	0.60	0.53	0.47	0.42	0.37	0.32	0.28	0.25	0.22	0.19	0.16	0.14
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	0.00	0.00	0.00	0.00
FIN	2.89	2.67	2.38	2.04	1.67	1.26	0.83	0.39	-0.06	-0.51	-0.95	-1.38	-1.77	-2.14	-2.46	-2.75	-2.98	-3.17	-3.30	-3.39	-3.43
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	0.00	0.00	0.00	0.00
IRE	0.02	-0.06	-0.15	-0.24	-0.33	-0.41	-0.49	-0.57	-0.64	-0.70	-0.76	-0.81	-0.86	-0.90	-0.93	-0.95	-0.97	-0.98	-0.98	-0.98	-0.97
KOR	0.26	-0.11	-0.53	-0.95	-1.36	-1.75	-2.13	-2.49	-2.83	-3.14	-3.42	-3.67	-3.90	-4.09	-4.24	-4.37	-4.46	-4.52	-4.54	-4.54	-4.51
MEX	0.98	0.95	0.91	0.87	0.84	0.80	0.76	0.73	0.69	0.66	0.62	0.59	0.55	0.52	0.49	0.46	0.43	0.40	0.37	0.35	0.32
NLD	1.09	0.93	0.74	0.53	0.32	0.10	-0.13	-0.35	-0.57	-0.77	-0.96	-1.13	-1.29	-1.42	-1.52	-1.60	-1.66	-1.69	-1.70	-1.69	-1.66
NOR	-5.28	-4.26	-3.26	-2.41	-1.68	-1.05	-0.50	-0.01	0.43	0.82	1.17	1.49	1.78	2.05	2.29	2.52	2.73	2.92	3.10	3.26	3.42
NZL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	0.00	0.00	0.00	0.00
ESP	0.46	0.38	0.30	0.20	0.10	0.00	-0.10	-0.19	-0.29	-0.38	-0.46	-0.53	-0.60	-0.65	-0.69	-0.73	-0.75	-0.76	-0.76	-0.75	-0.73
SWE	1.23	1.09	0.92	0.74	0.54	0.33	0.11	-0.11	-0.33	-0.54	-0.74	-0.93	-1.10	-1.25	-1.37	-1.48	-1.56	-1.62	-1.65	-1.66	-1.65
CHE	0.45	0.44	0.43	0.41	0.40	0.38	0.37	0.35	0.33	0.32	0.30	0.28	0.27	0.25	0.23	0.22	0.20	0.19	0.17	0.16	0.14
TUR	1.23	1.09	0.92	0.74	0.54	0.33	0.11	-0.11	-0.33	-0.54	-0.74	-0.93	-1.10	-1.25	-1.37	-1.48	-1.56	-1.62	-1.65	-1.66	-1.65
ISL	2.22	2.29	2.37	2.44	2.49	2.54	2.58	2.61	2.62	2.63	2.64	2.63	2.61	2.59	2.56	2.53	2.48	2.44	2.38	2.33	2.26
LUX	1.26	1.22	1.18	1.13	1.08	1.04	0.99	0.94	0.89	0.85	0.80	0.76	0.71	0.67	0.63	0.59	0.55	0.52	0.48	0.45	0.41
CZE															-1.66	-1.57	-1.48	-1.39	-1.30	-1.22	-1.14
HUN															-2.09	-1.18	-0.26	0.66	1.57	2.48	3.35
POL															0.00	0.00	0.00	0.00	0.00	0.00	0.00
SVK															0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHN										0.34	0.33	0.32	0.30	0.28	0.26	0.24	0.22	0.19	0.17	0.14	0.11
ANC										1.35	1.26	1.18	1.10	1.02	0.95	0.87	0.80	0.74	0.68	0.62	0.56
ASO										-0.12	0.36	0.84	1.29	1.73	2.13	2.50	2.81	3.08	3.30	3.47	3.58
AFM										-2.50	-1.95	-1.38	-0.79	-0.20	0.39	0.98	1.57	2.13	2.68	3.20	3.69
LAT										0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SEE										0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

PANEL D. IMPORT PRICES

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
USA	-0.31	-0.44	-0.60	-0.74	-0.89	-1.02	-1.15	-1.27	-1.38	-1.49	-1.58	-1.66	-1.74	-1.80	-1.85	-1.89	-1.92	-1.94	-1.95	-1.95	-1.95
JPN	0.94	0.80	0.65	0.53	0.42	0.33	0.25	0.18	0.12	0.06	0.01	-0.03	-0.08	-0.12	-0.15	-0.18	-0.21	-0.24	-0.27	-0.29	-0.31
DEU	4.07	3.42	2.79	2.26	1.80	1.40	1.05	0.74	0.46	0.22	-0.01	-0.21	-0.39	-0.56	-0.71	-0.85	-0.98	-1.10	-1.22	-1.33	-1.43
FRA	0.55	0.36	0.14	-0.07	-0.29	-0.50	-0.71	-0.92	-1.11	-1.29	-1.46	-1.62	-1.77	-1.90	-2.01	-2.10	-2.18	-2.24	-2.29	-2.32	-2.33
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	0.00	0.00	0.00	0.00
GBR	0.94	0.80	0.65	0.53	0.42	0.33	0.25	0.18	0.12	0.06	0.02	-0.04	-0.08	-0.11	-0.15	-0.18	-0.21	-0.24	-0.27	-0.29	-0.31
CAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AUS	-0.31	-0.44	-0.60	-0.74	-0.89	-1.02	-1.15	-1.27	-1.38	-1.49	-1.58	-1.66	-1.74	-1.80	-1.85	-1.89	-1.92	-1.94	-1.95	-1.95	-1.95
AUT	4.07	3.42	2.79	2.26	1.80	1.40	1.05	0.74	0.46	0.22	0.01	-0.24	-0.39	-0.55	-0.70	-0.84	-0.98	-1.11	-1.22	-1.33	-1.43
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	0.00	0.00	0.00	0.00
DNK	2.99	2.52	2.06	1.67	1.33	1.04	0.79	0.56	0.36	0.18	0.02	-0.13	-0.26	-0.38	-0.50	-0.60	-0.69	-0.77	-0.87	-0.95	-1.02
FIN	5.35	4.31	3.31	2.45	1.72	1.08	0.53	0.03	-0.41	-0.80	-1.16	-1.48	-1.77	-2.04	-2.28	-2.51	-2.72	-2.93	-3.10	-3.24	-3.36
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	0.00	0.00	0.00	0.00
IRE	2.34	1.92	1.51	1.16	0.86	0.60	0.37	0.17	-0.01	-0.17	-0.31	-0.44	-0.56	-0.67	-0.77	-0.87	-0.95	-1.03	-1.10	-1.17	-1.22
KOR	5.35	4.31	3.31	2.45	1.72	1.08	0.53	0.03	-0.41	-0.80	-1.16	-1.48	-1.77	-2.04	-2.28	-2.49	-2.74	-2.93	-3.10	-3.24	-3.36
MEX	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NLD	1.14	0.96	0.73	0.50	0.25	-0.01	-0.26	-0.51	-0.75	-0.97	-1.18	-1.37	-1.53	-1.66	-1.77	-1.85	-1.90	-1.93	-1.93	-1.90	-1.86
NOR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NZL	1.09	1.00	0.88	0.74	0.59	0.43	0.26	0.08	-0.09	-0.27	-0.44	-0.60	-0.75	-0.88	-1.00	-1.11	-1.19	-1.25	-1.30	-1.33	-1.34
PRT	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01	-1.01
ESP	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97	-0.97
SWE	-0.31	-0.35	-0.39	-0.42	-0.46	-0.49	-0.52	-0.55	-0.58	-0.60	-0.62	-0.64	-0.66	-0.67	-0.68	-0.69	-0.70	-0.70	-0.70	-0.70	-0.70
CHE	1.13	0.90	0.67	0.48	0.32	0.17	0.05	-0.06	-0.16	-0.25	-0.33	-0.40	-0.47	-0.53	-0.58	-0.64	-0.69	-0.73	-0.76	-0.79	-0.82
TUR	8.42	7.15	5.91	4.86	3.96	3.17	2.49	1.88	1.34	0.85	0.42	0.02	-0.34	-0.67	-0.97	-1.25	-1.50	-1.74	-1.96	-2.17	-2.37
ISL	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
LUX	1.45	1.41	1.35	1.30	1.25	1.19	1.14	1.08	1.03	0.98	0.92	0.87	0.82	0.77	0.73	0.68	0.64	0.59	0.55	0.52	0.48
CZE															-3.45	-2.84	-2.30	-1.82	-1.42	-1.08	-0.81
HUN															-2.07	-0.68	0.71	2.10	3.44	4.72	5.91
POL															4.04	3.82	3.60	3.39	3.18	2.98	2.79
SVK															3.98	3.76	3.55	3.34	3.14	2.94	2.75
CHN										-0.75	-0.52	-0.29	-0.05	0.19	0.43	0.65	0.87	1.07	1.25	1.41	1.54
ANC										1.00	0.94	0.88	0.82	0.76	0.70	0.65	0.60	0.55	0.50	0.46	0.42
ASO										-0.75	-0.52	-0.29	-0.05	0.19	0.43	0.65	0.87	1.07	1.25	1.41	1.54
AFM										0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LAT										-1.62	-1.19	-0.73	-0.25	0.22	0.70	1.16	1.60	2.01	2.38	2.71	2.99
SEE															3.13	1.82	0.43	-0.98	-2.34	-3.60	-4.69

Figure 1.A. Goods and services and merchandise World trade
Percentage changes over one quarter, annualised

Figure 1.B. Goods and services World trade, 1995 and 2000 weights
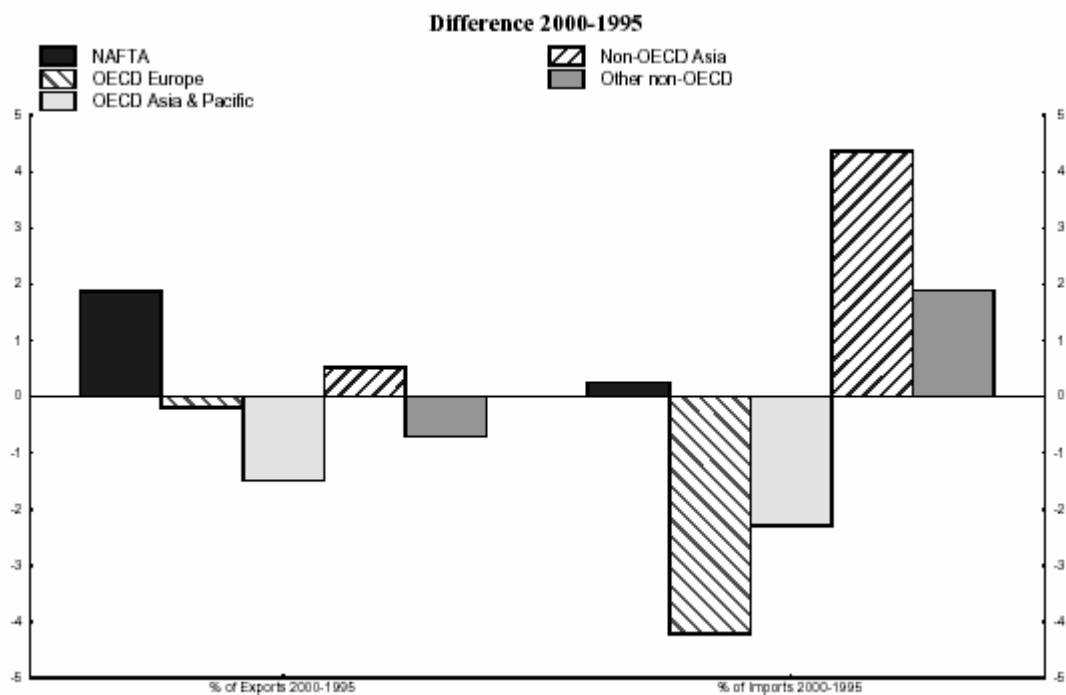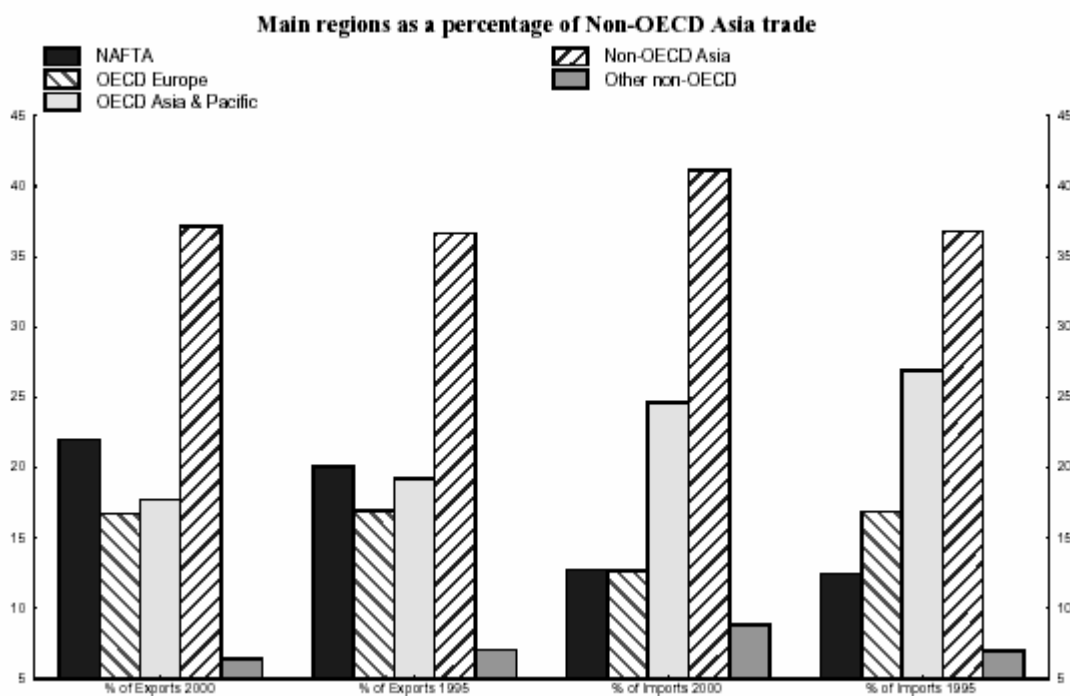Percentage changes over one quarter, annualised
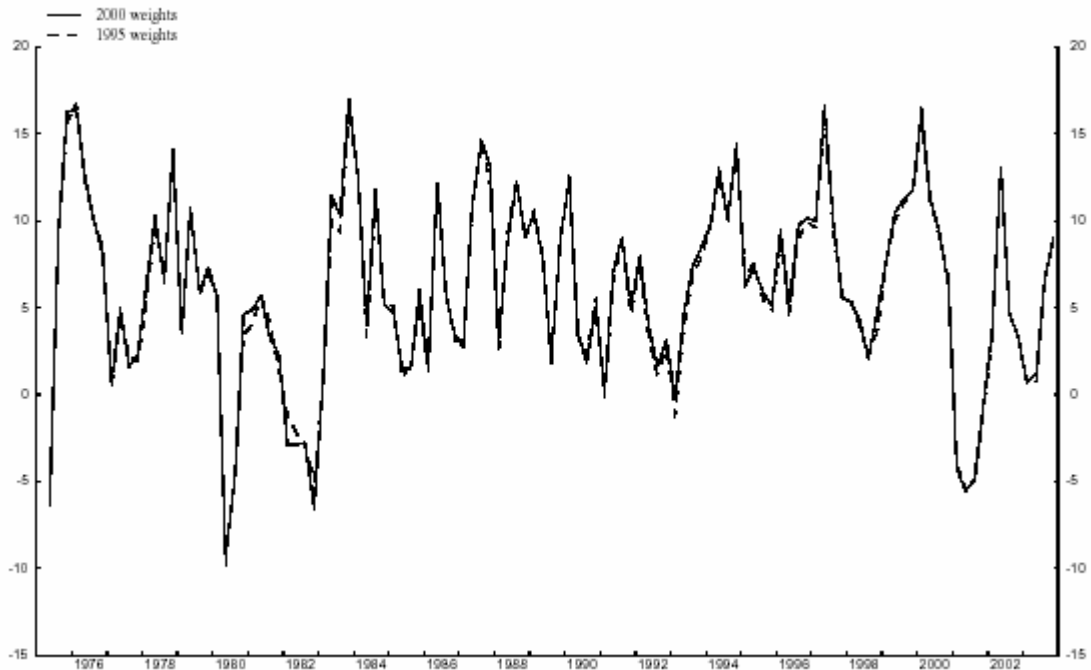
Figure 2.A. Composition of World goods and services trade by main regions

Main regions as a percentage of World trade

Difference 2000-1995
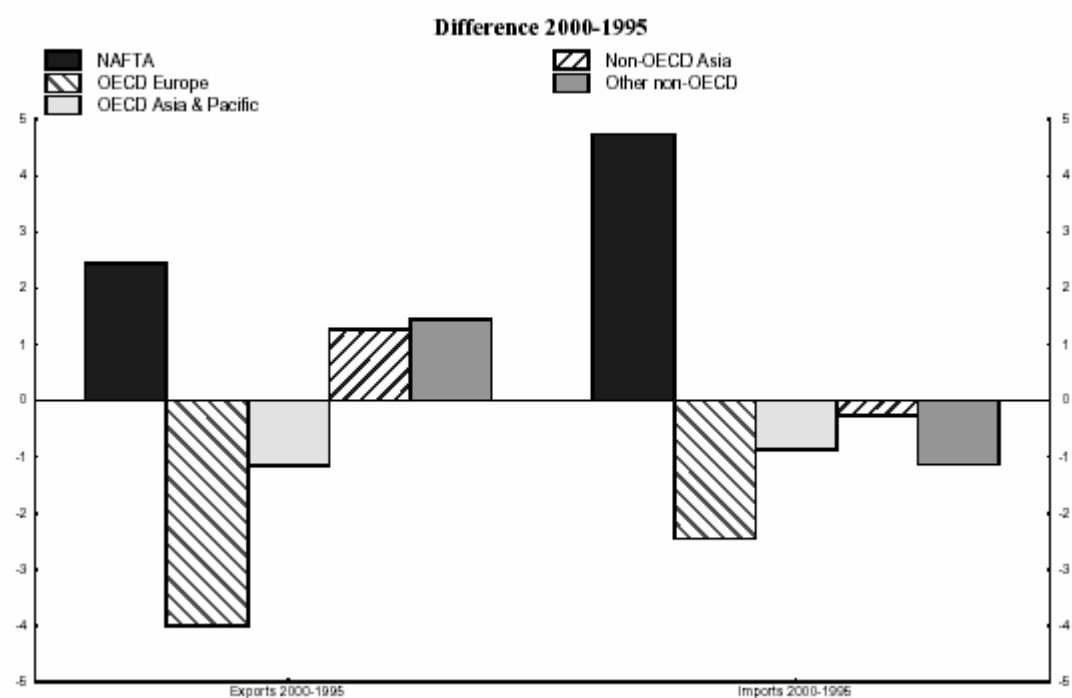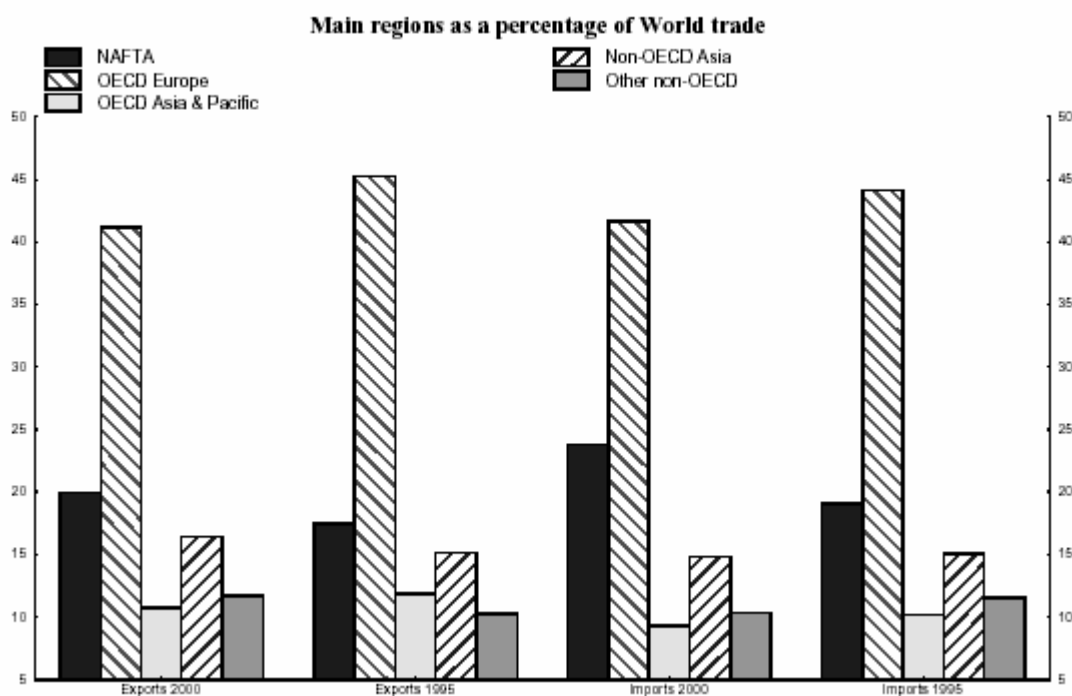
Figure 2.B. Composition of NAFTA goods and services trade by main regions

Main regions as a percentage of NAFTA trade

Difference 2000-1995
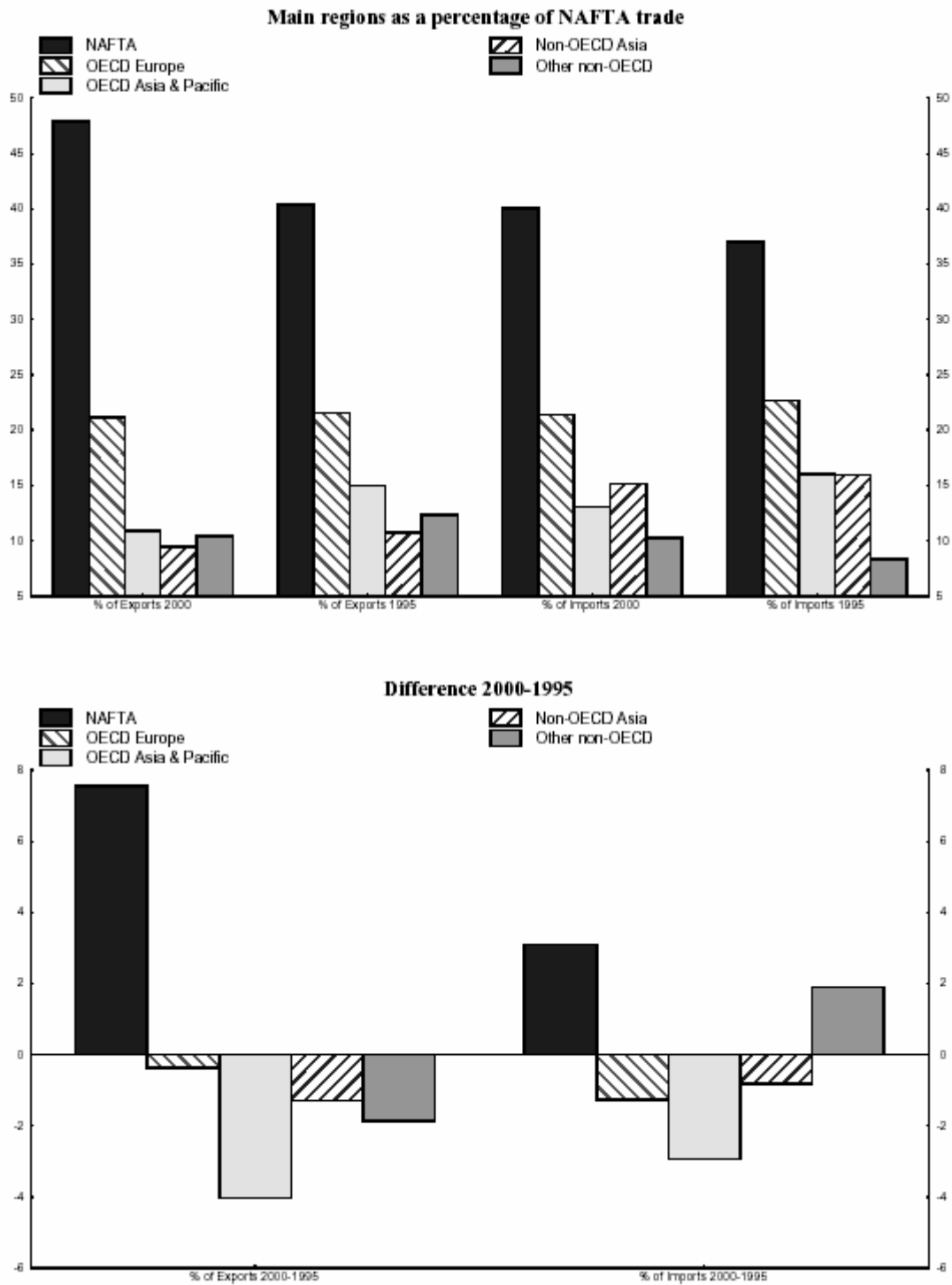
Figure 2.C. Composition of OECD Europe goods and services trade by main regions

Main regions as a percentage of OECD Europe trade

Difference 2000-1995
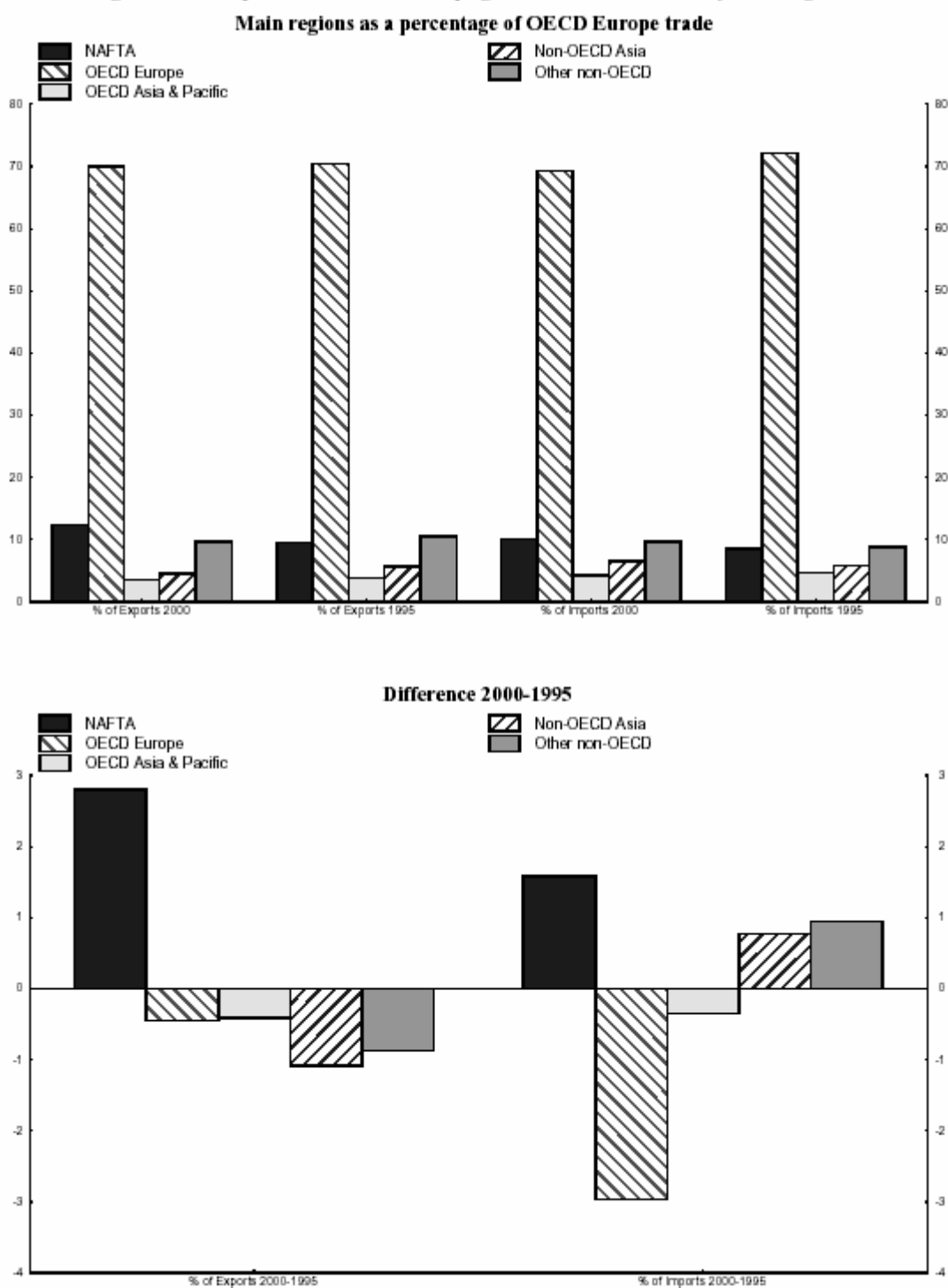
Figure 2.D. Composition of OECD Asia & Pacific goods and services trade by main regions

Main regions as a percentage of OECD Asia & Pacific trade

Difference 2000-1995
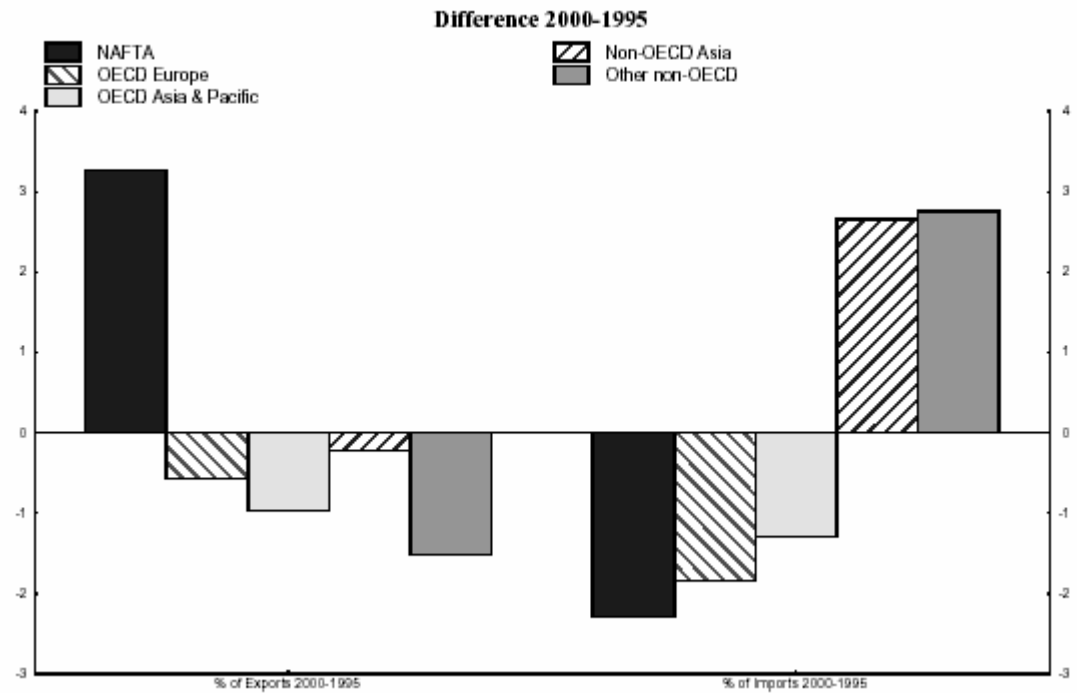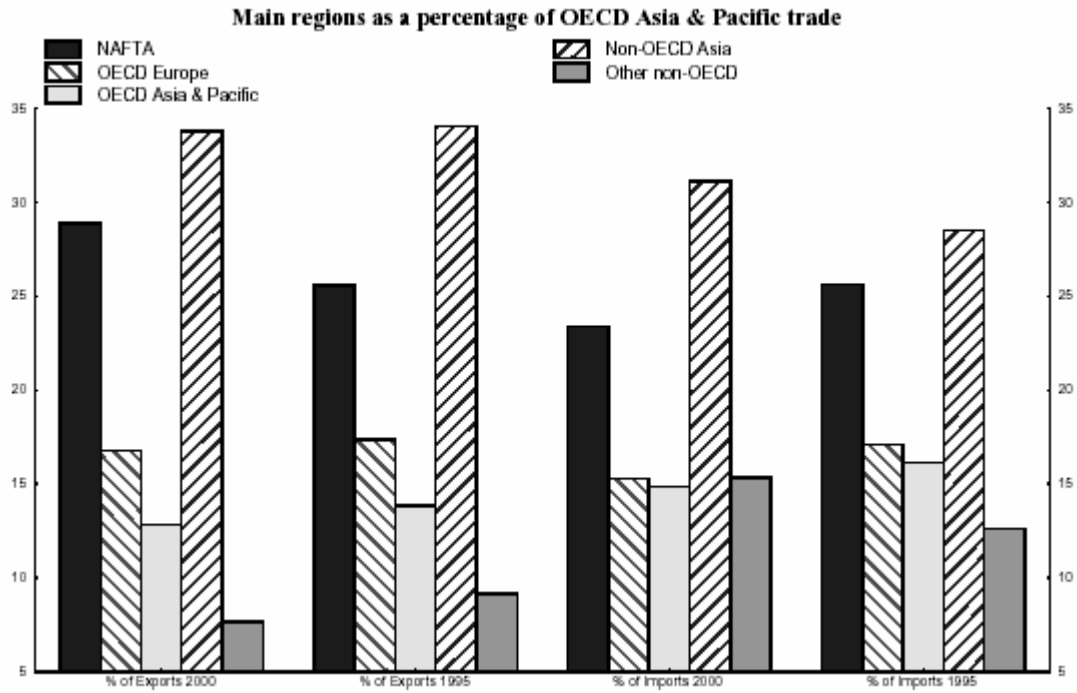
Figure 2.E. Composition of non-OECD Asia goods and services trade by main regions

Main regions as a percentage of Non-OECD Asia trade

Difference 2000-1995

Figure 2.F. Composition of other non-OECD goods and services trade by main regions

Main regions as a percentage of other non-OECD trade

Difference 2000-1995
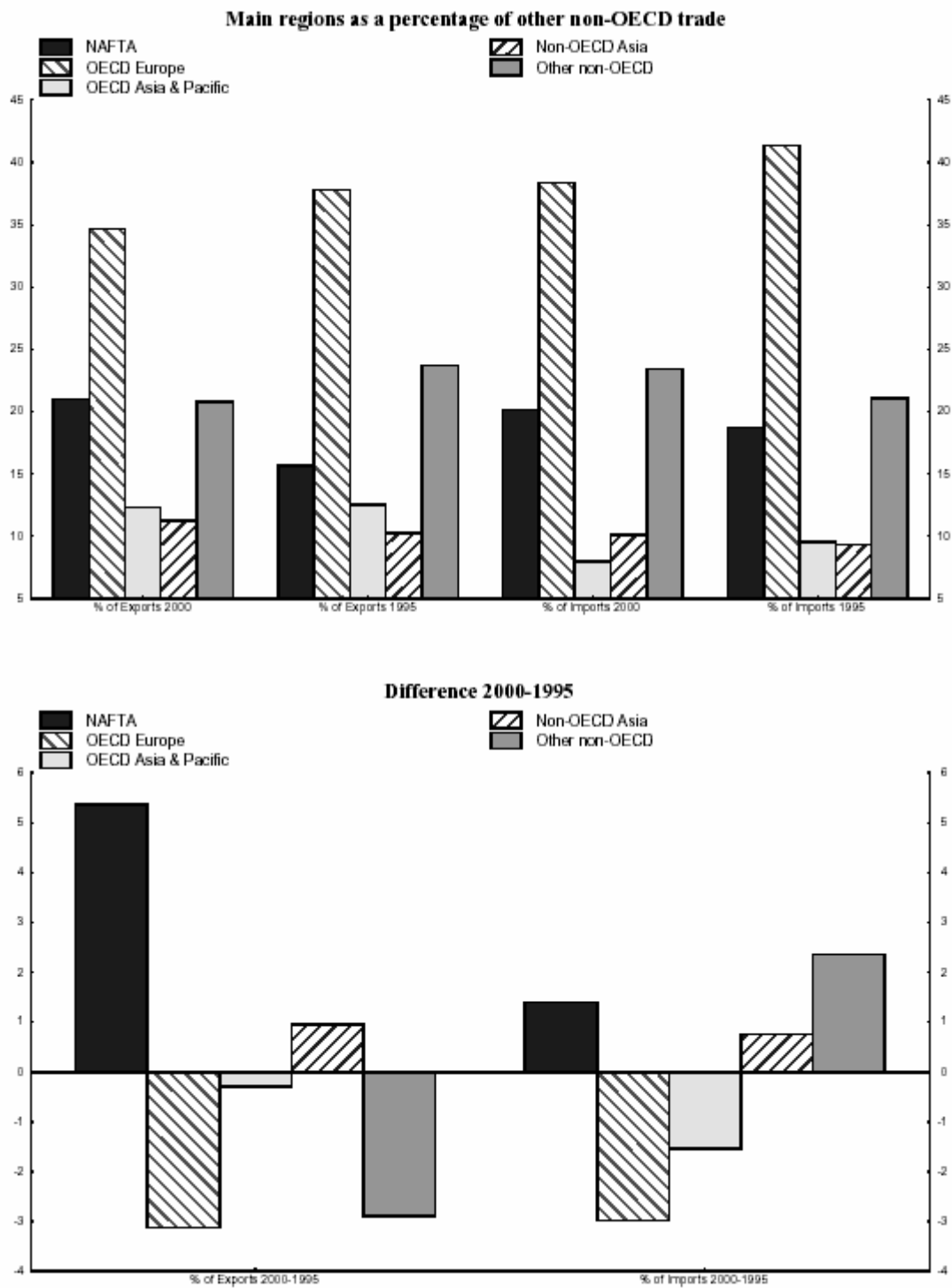
Figure 3. Rank in world exports by countries and non-OECD regions
Percentage
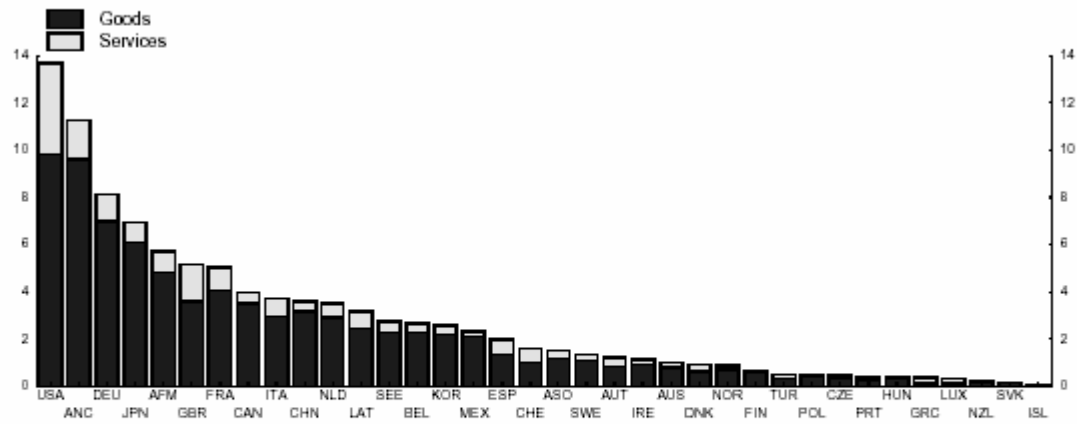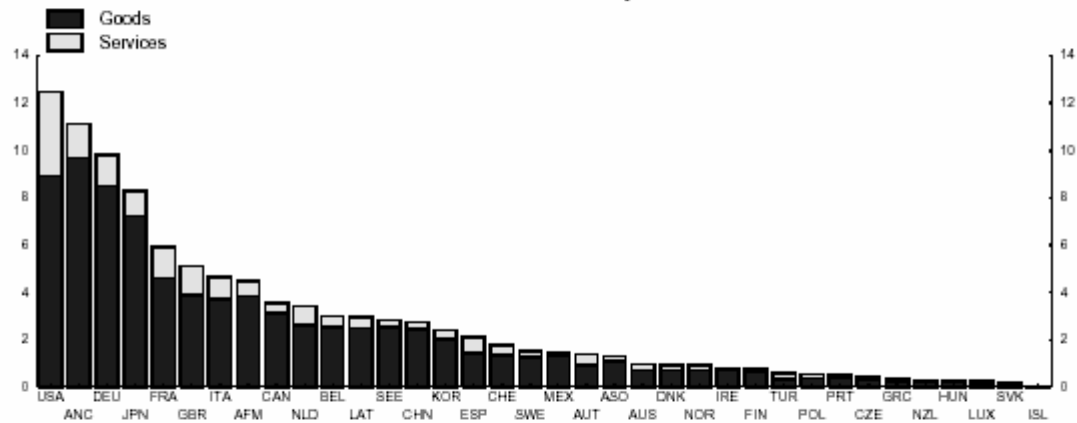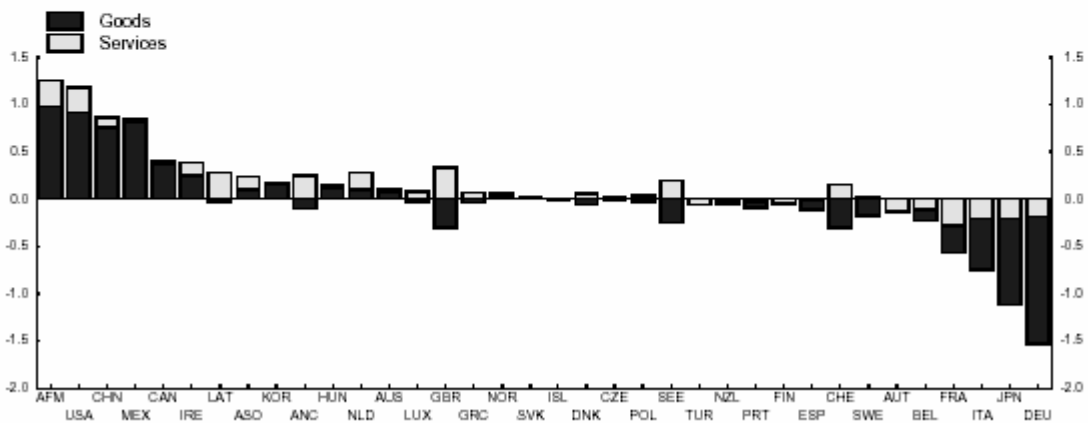
Figure 4. Rank in world imports by countries and non-OECD regions
Percentage
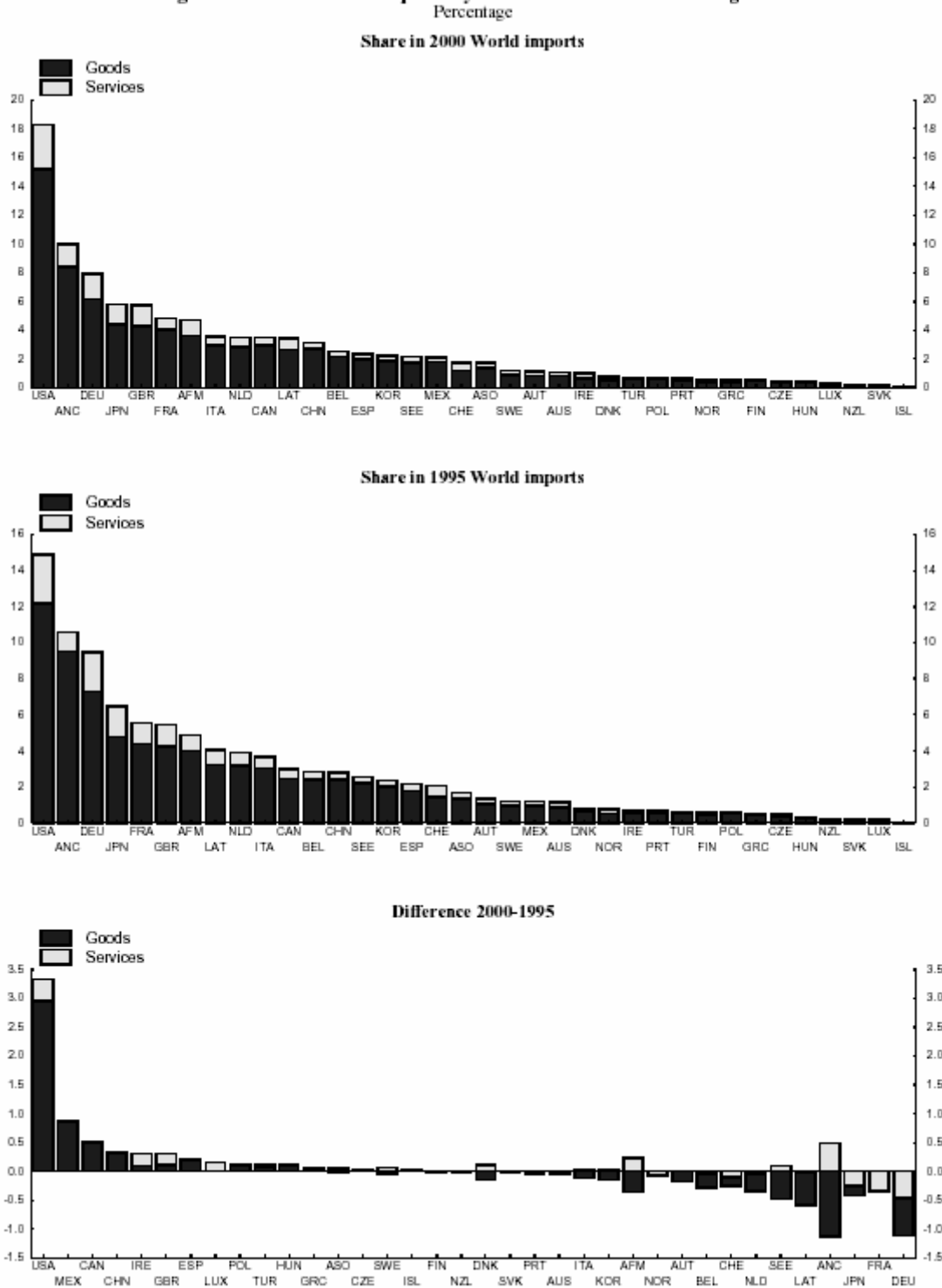
Figure 5. **An example of TREND specification approach: case of France exports volume**
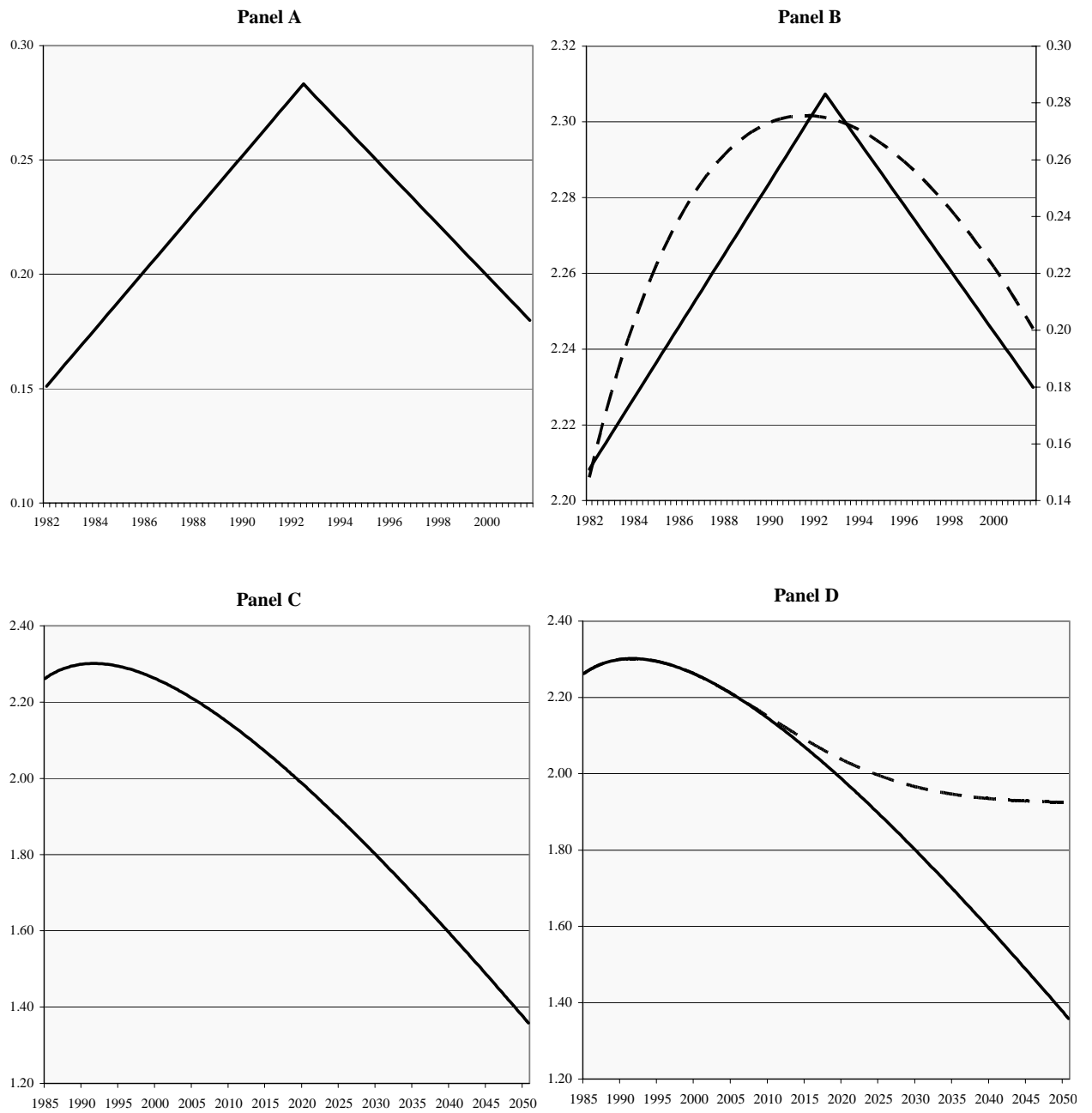
Figure 6. **Estimation residuals export volume equations (%)**
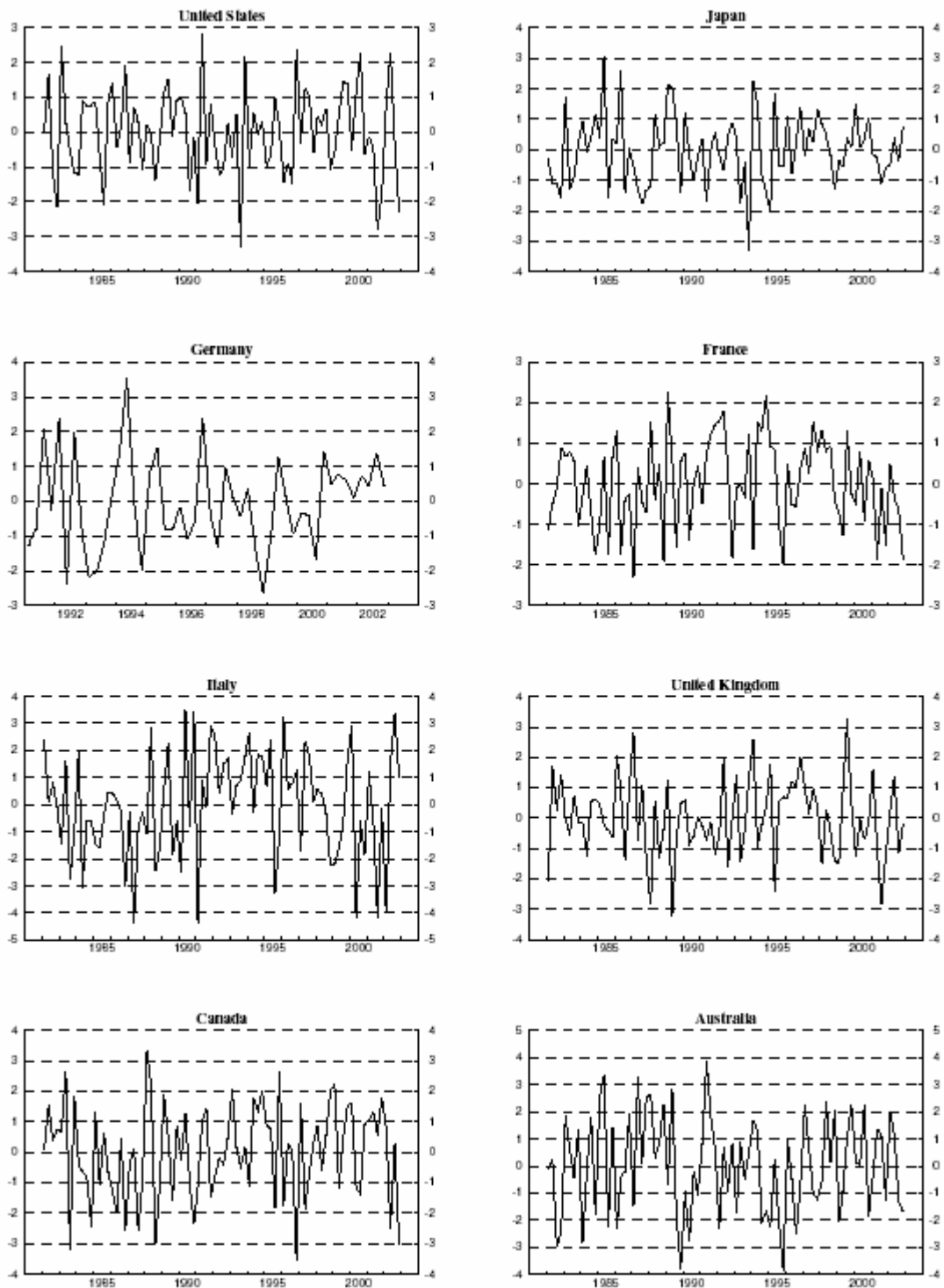
Figure 6. **Estimation residuals export volume equations (%)** (cont'd)
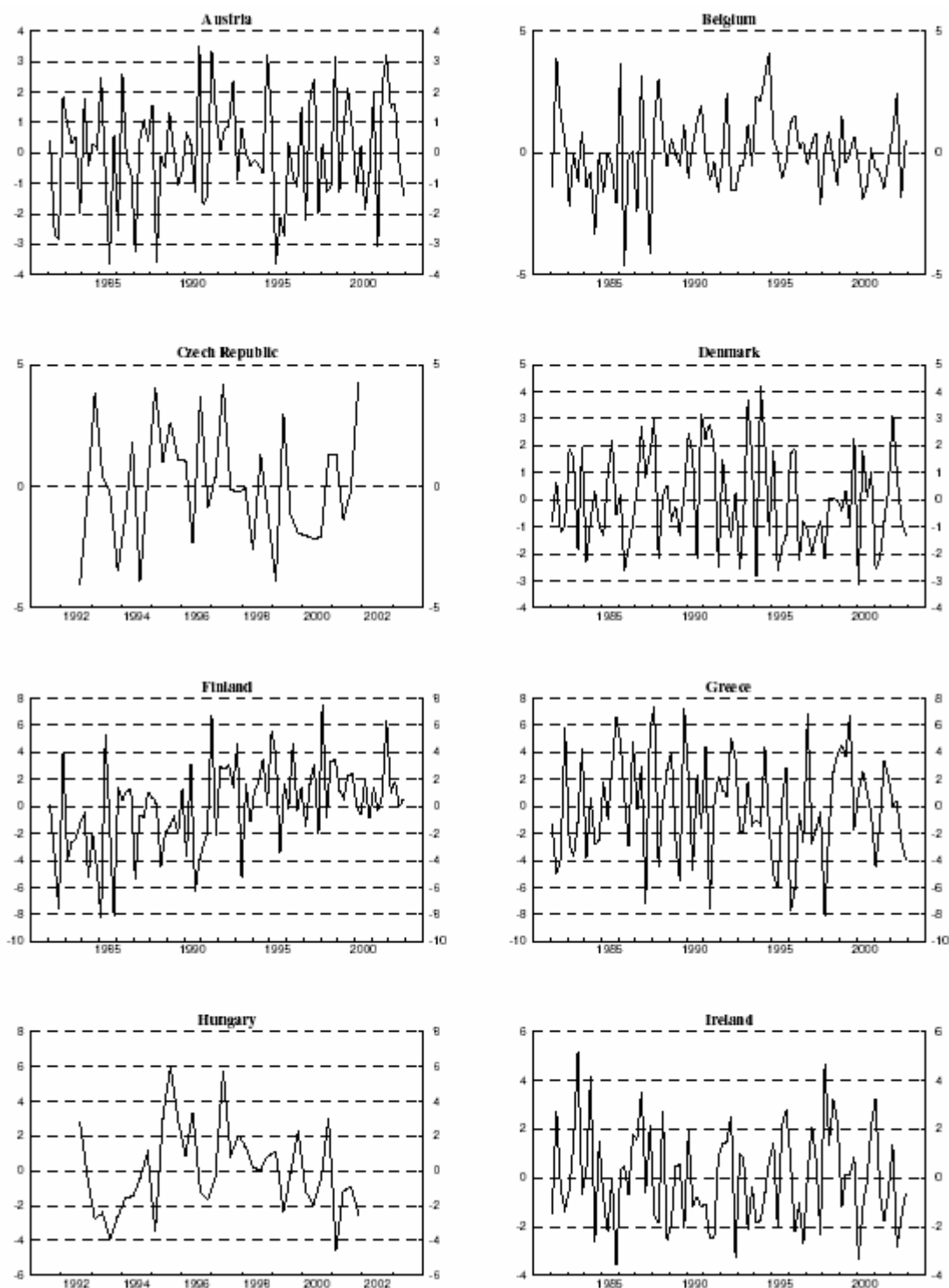
Figure 6. **Estimation residuals export volume equations (%)** (cont'd)
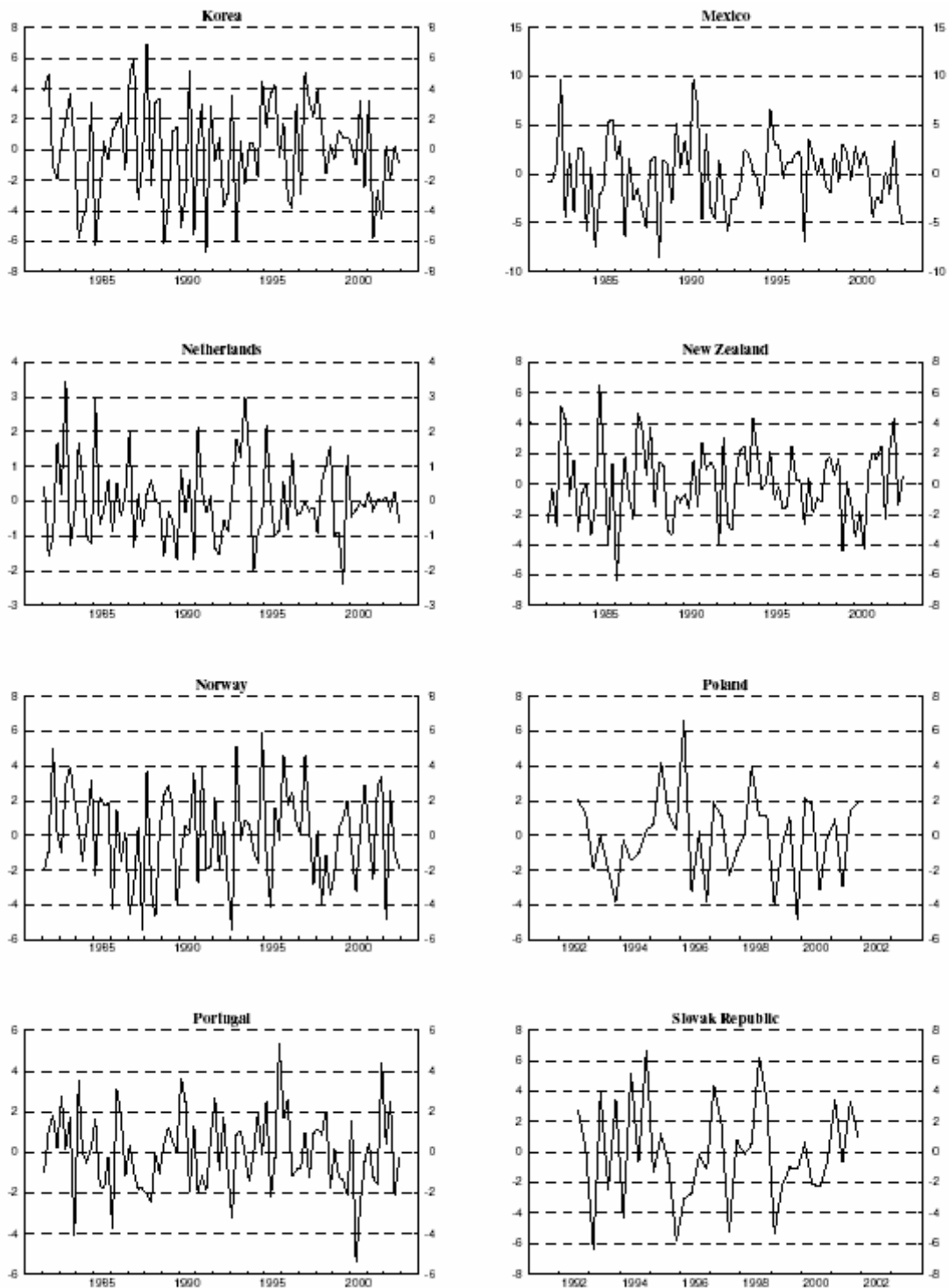
Figure 6. **Estimation residuals export volume equations (%)** (cont'd)
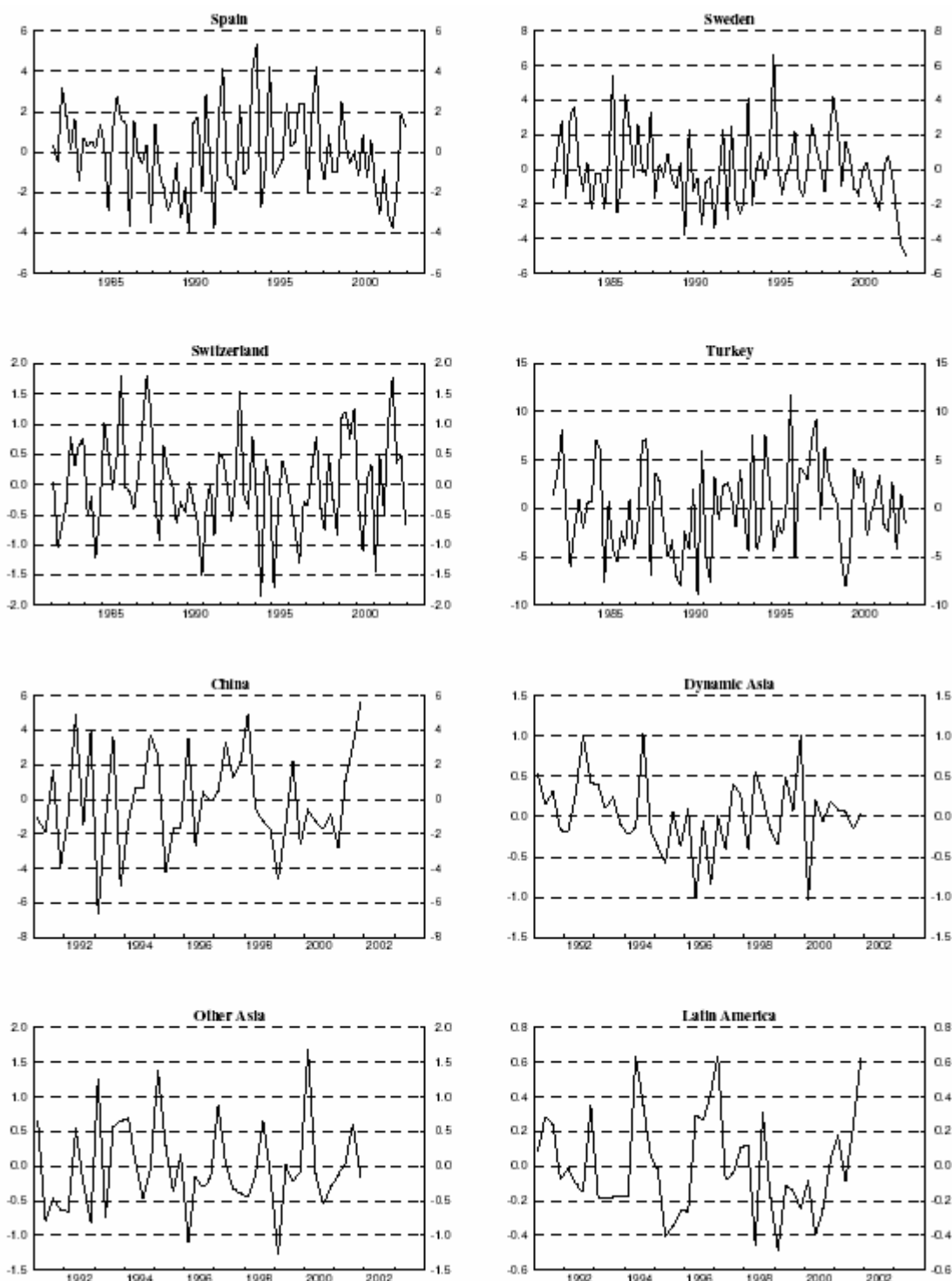
Figure 6. **Estimation residuals export volume equations (%)** (cont'd)
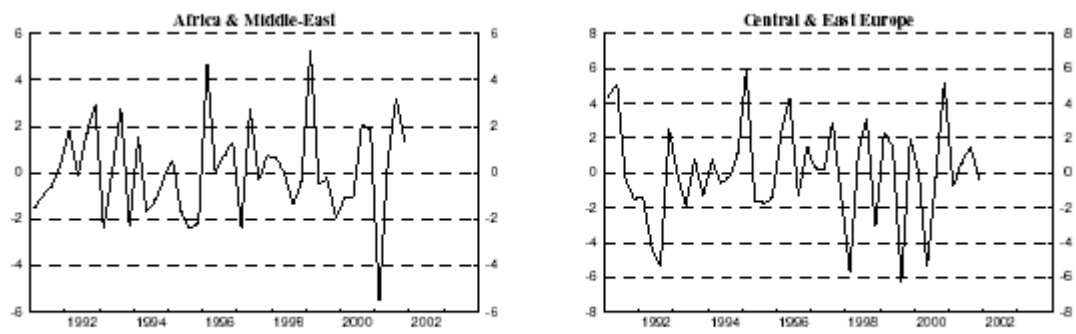
Figure 7. **Estimation residuals import volume equations (%)**
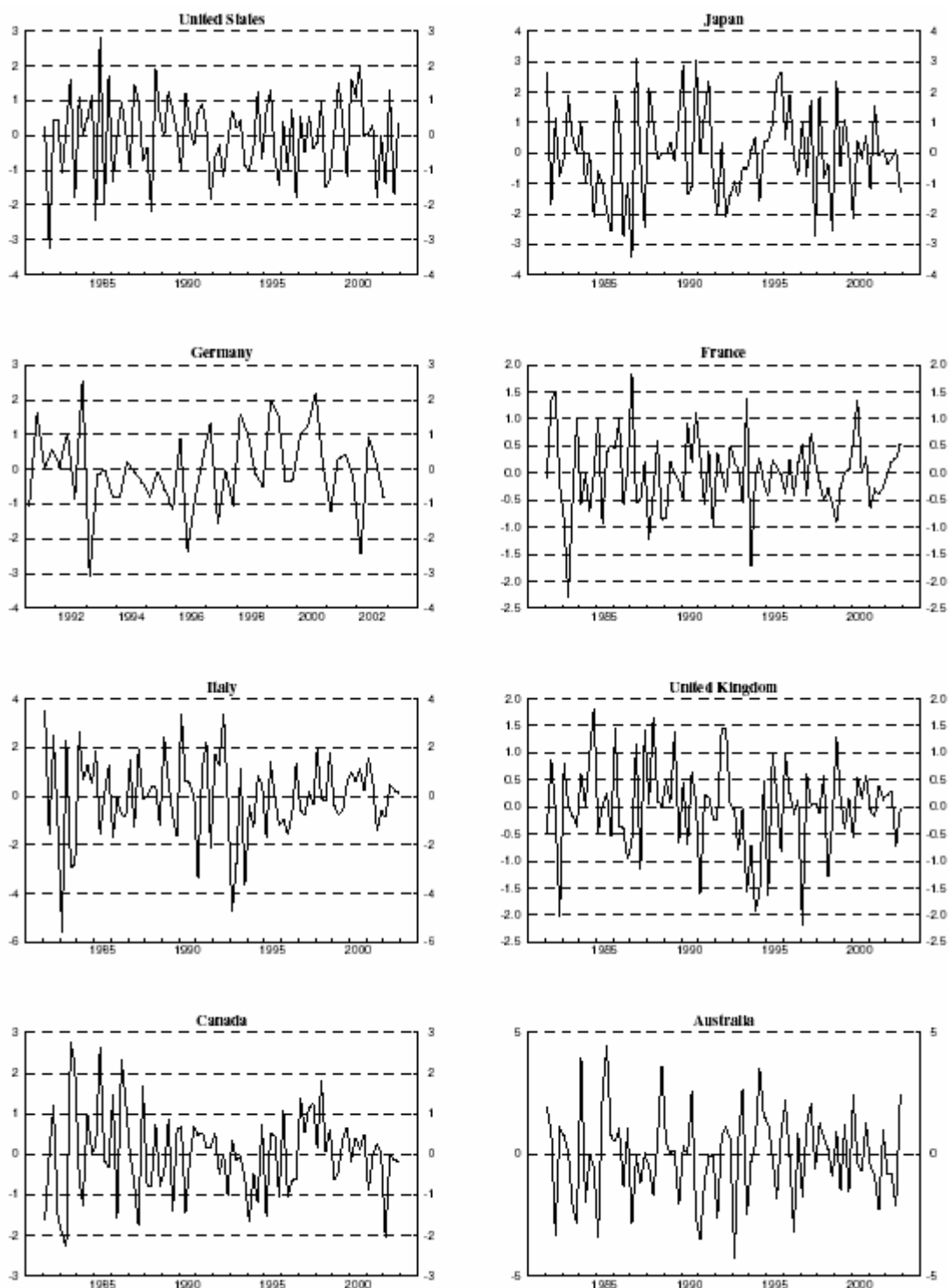
Figure 7. **Estimation residuals import volume equations (%)** (cont'd)
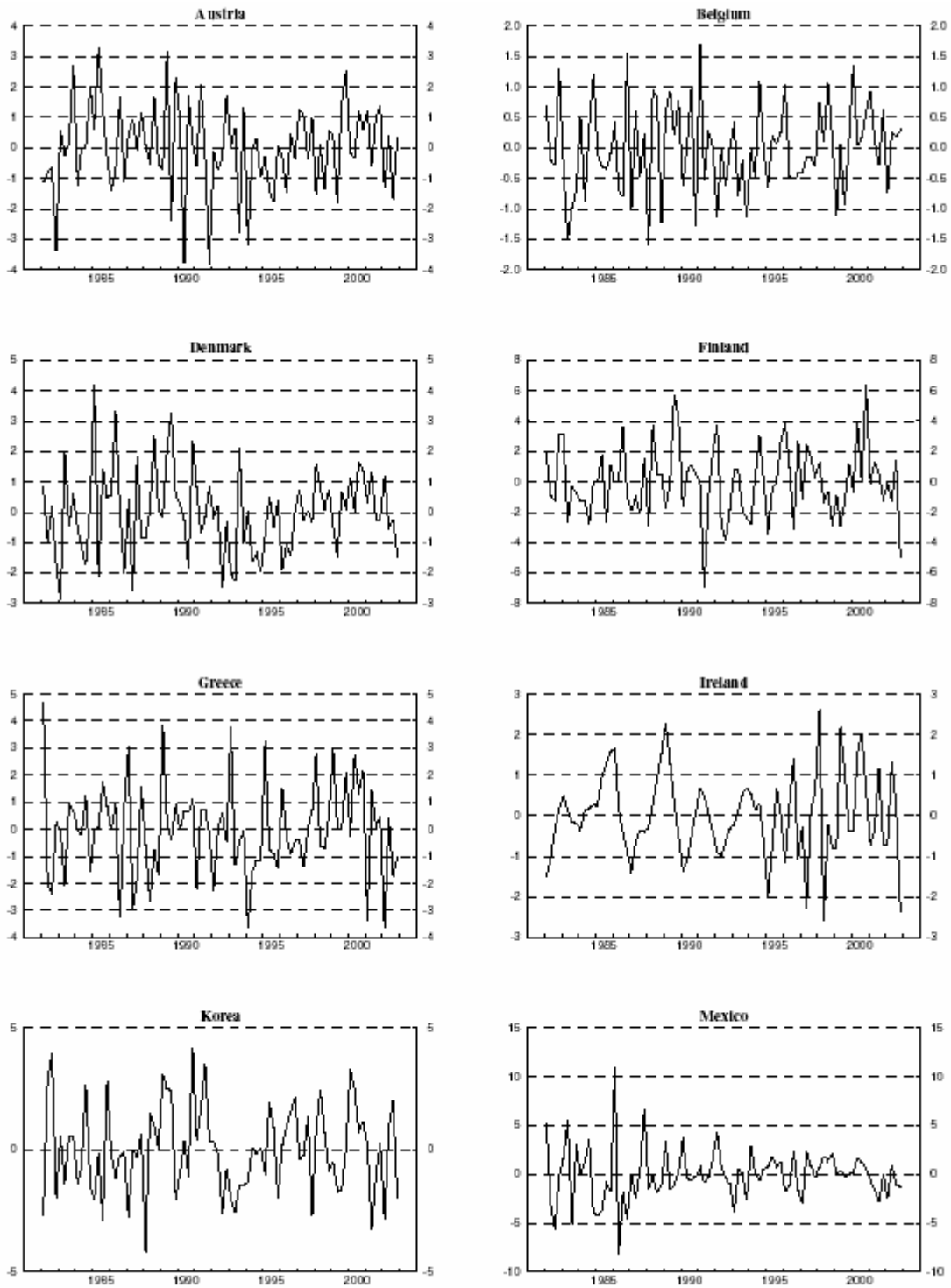
Figure 7. **Estimation residuals import volume equations (%)** (cont'd)
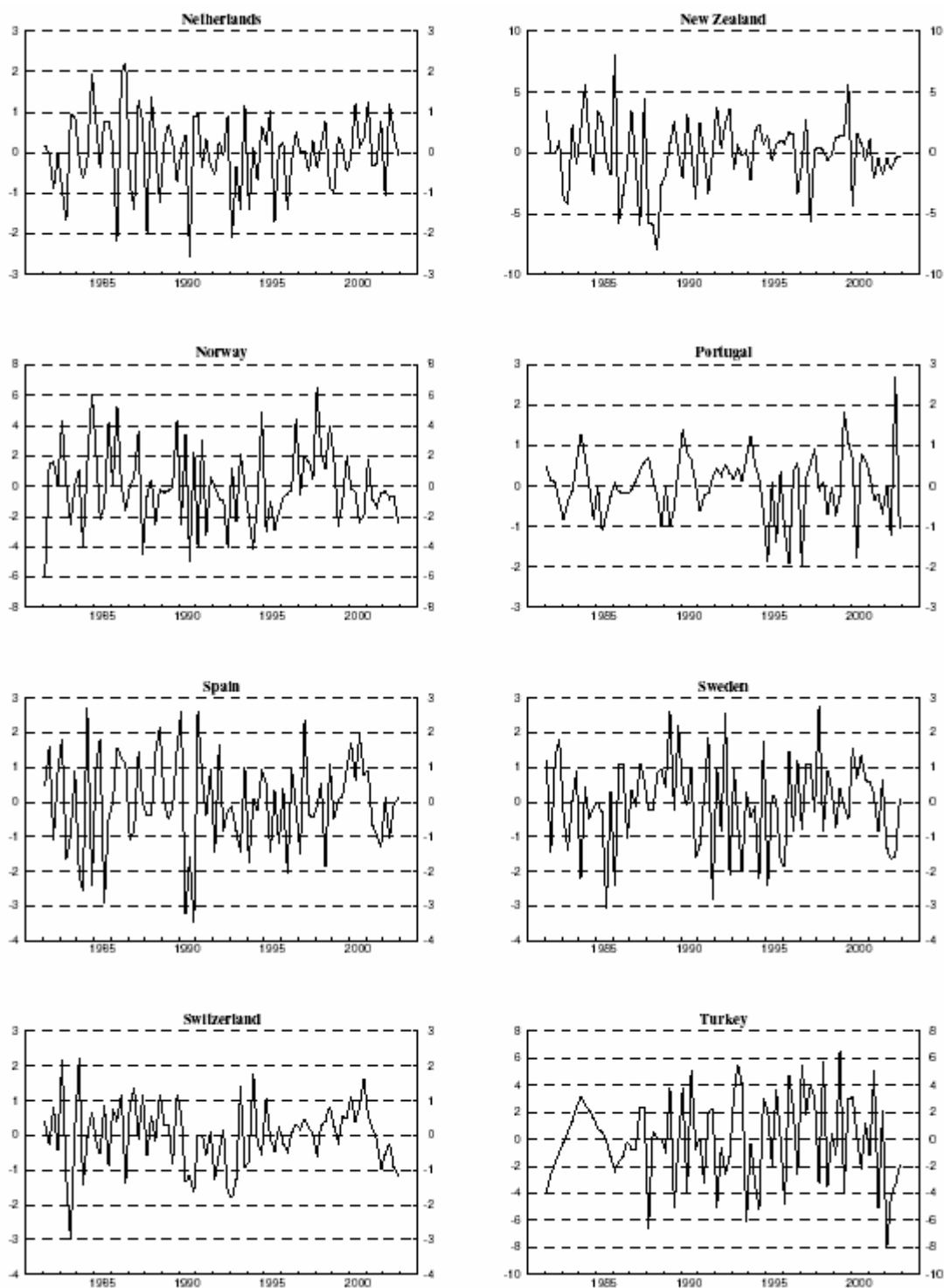
Figure 8. **Estimation residuals export prices equation (%)**
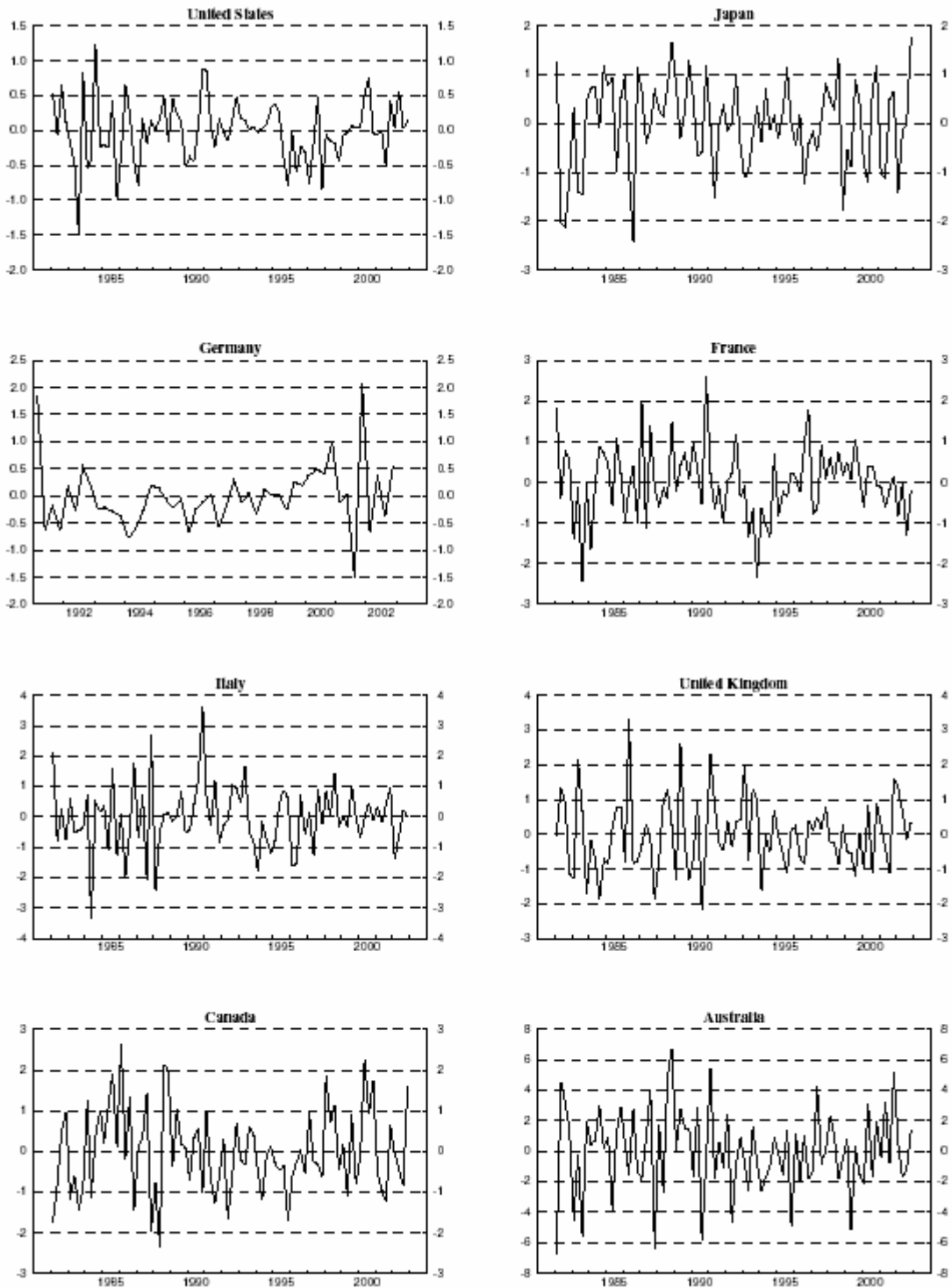
Figure 8. **Estimation residuals export prices equation (%)** (cont'd)
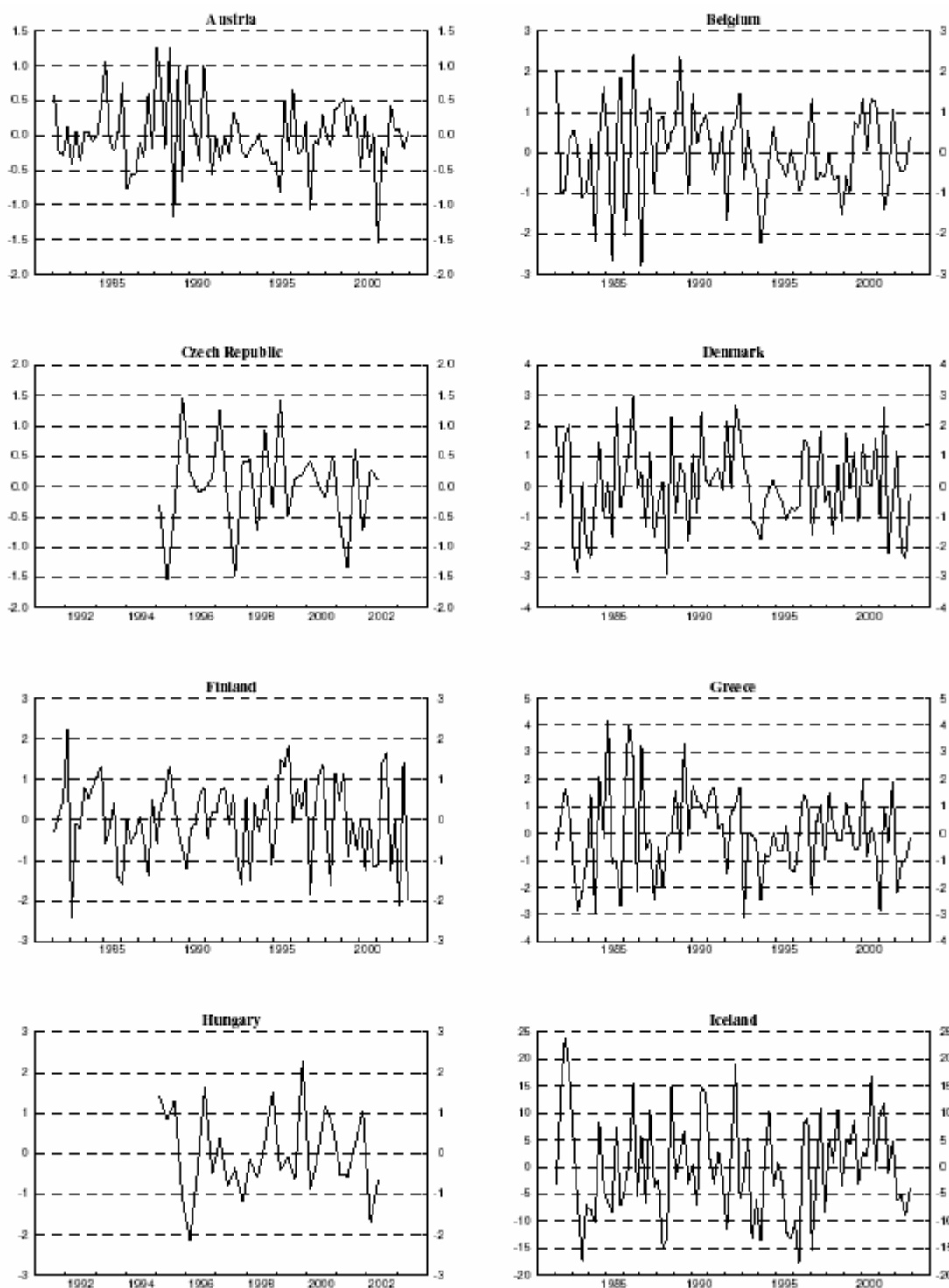
Figure 8. **Estimation residuals export prices equation (%)** (cont'd)
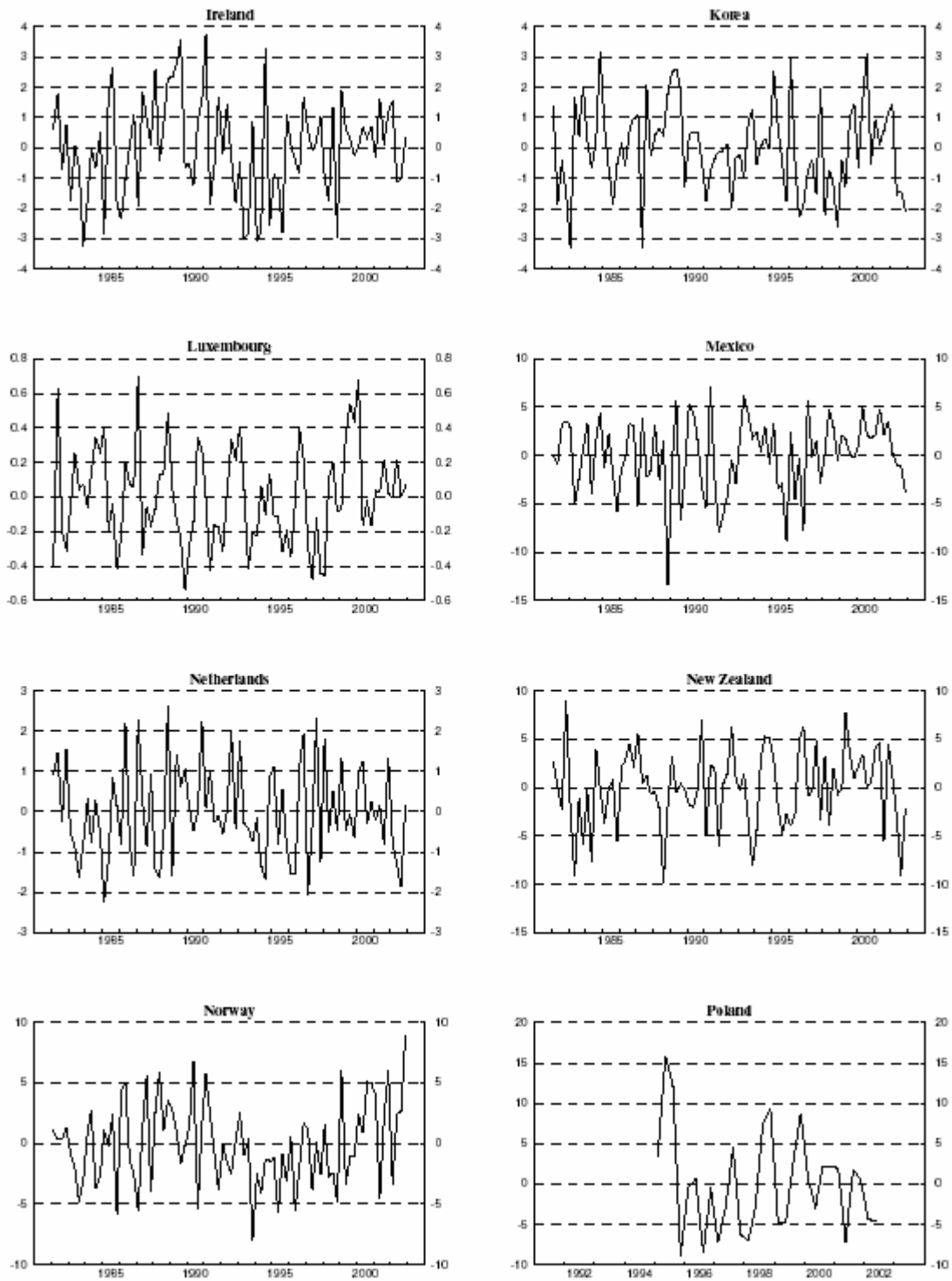
Figure 8. **Estimation residuals export prices equation (%)** (cont'd)
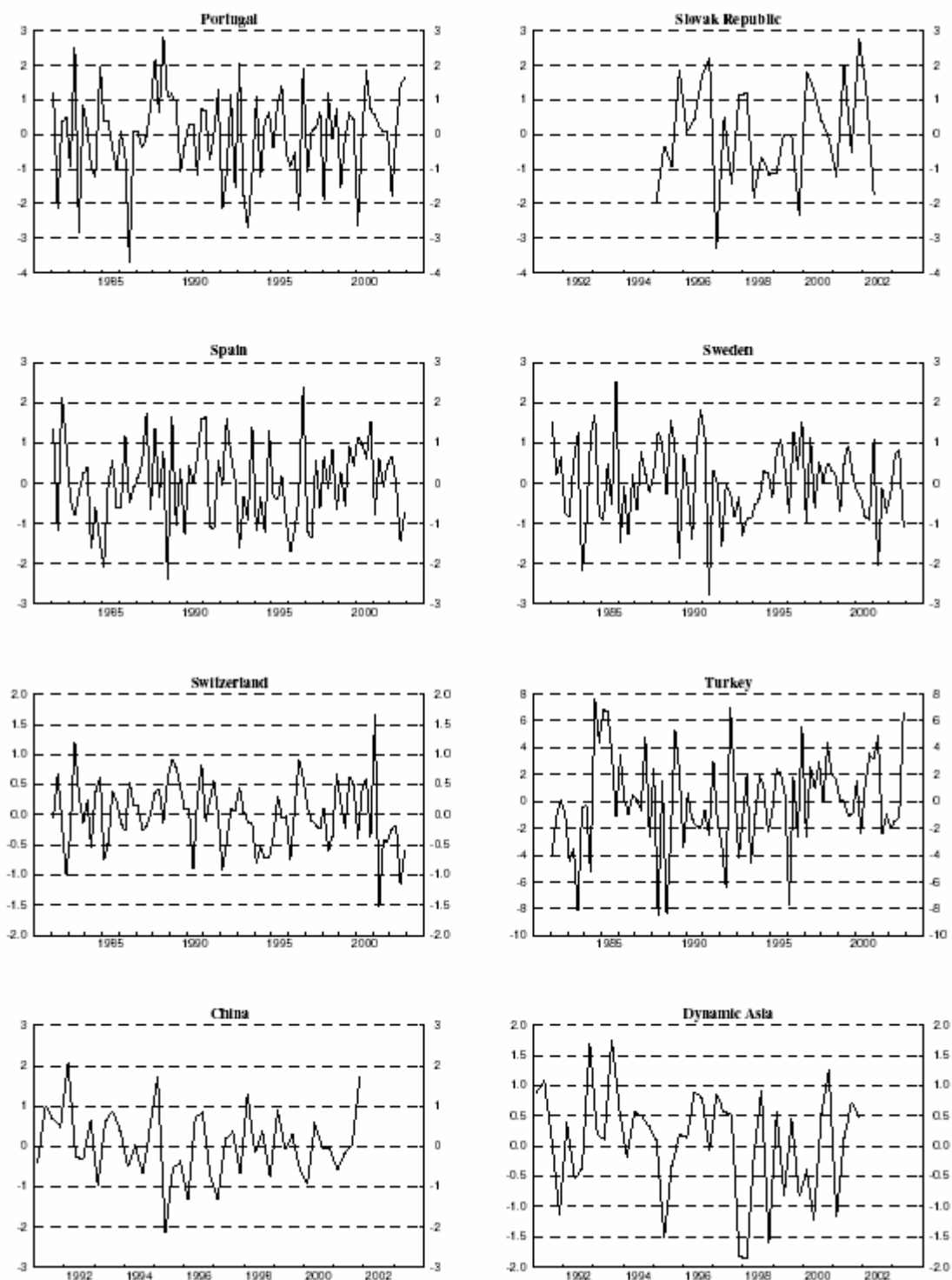
Figure 8. **Estimation residuals export prices equation (%)** (cont'd)
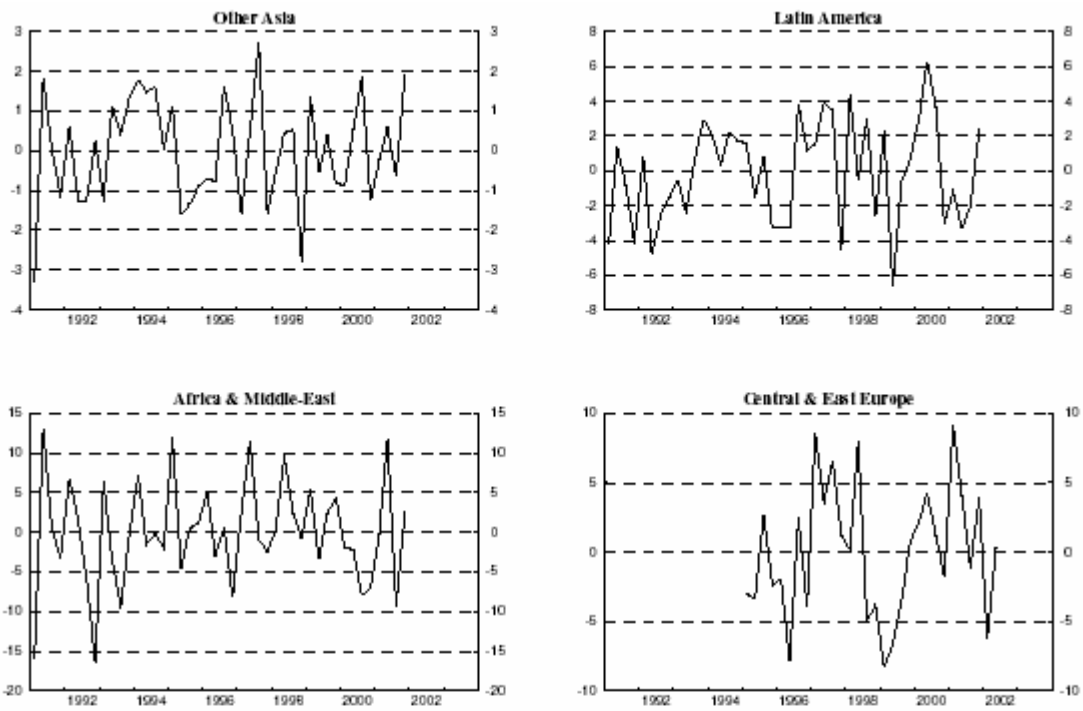
Figure 9. **Estimation residuals import prices equations (%)**
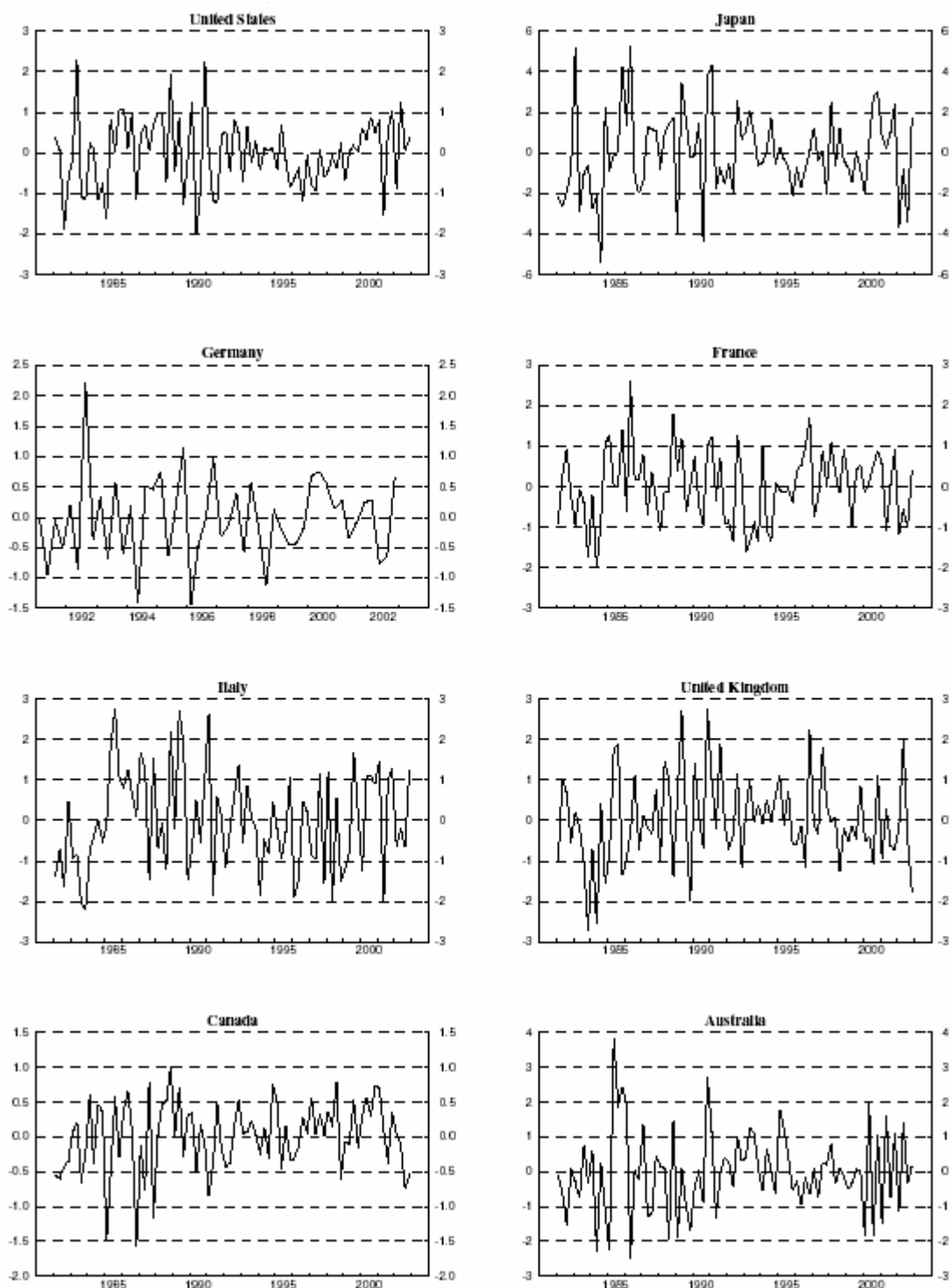
Figure 9. **Estimation residuals import prices equations (%)** (cont'd)
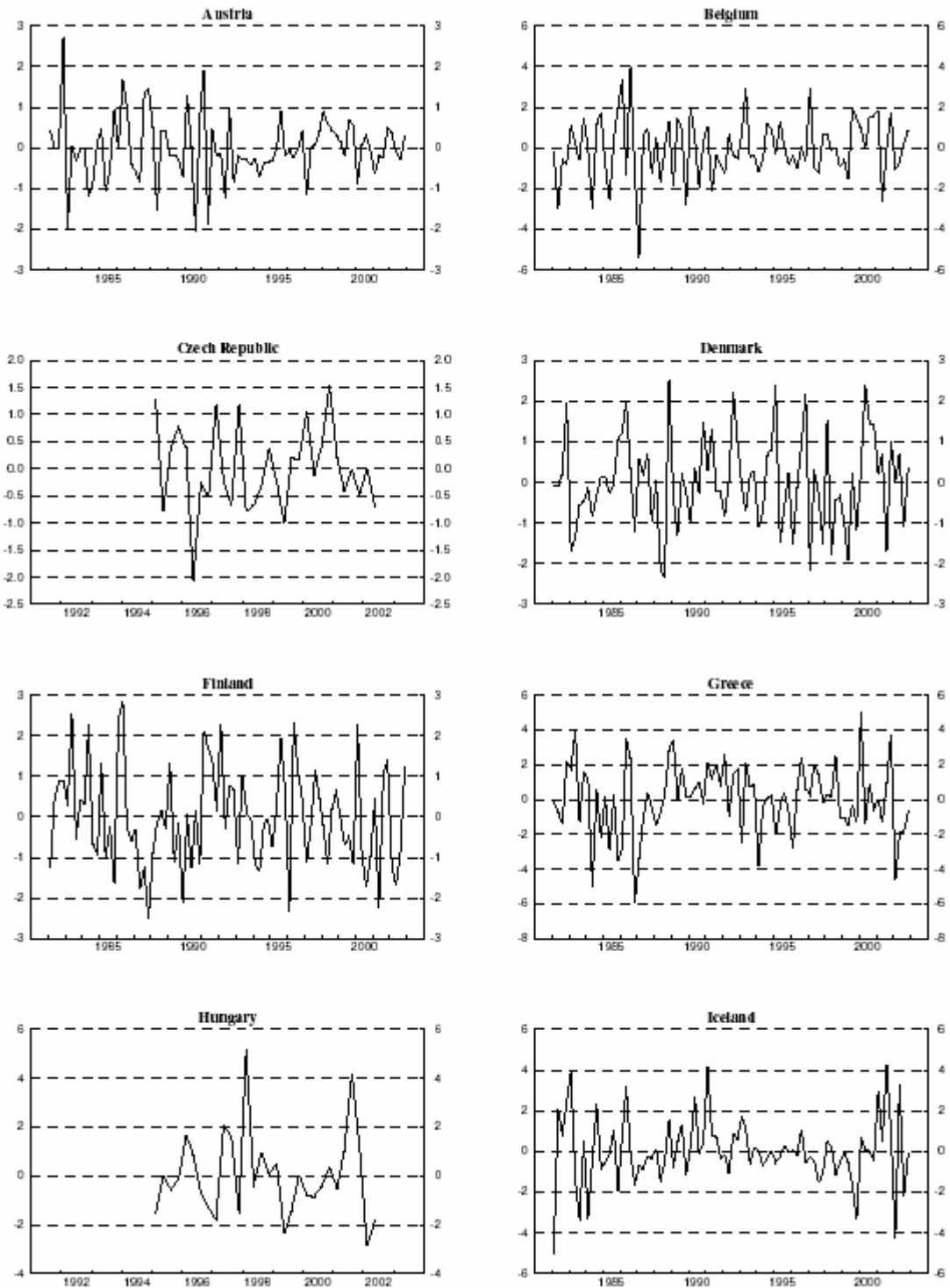
Figure 9. **Estimation residuals import prices equations (%)** (cont'd)
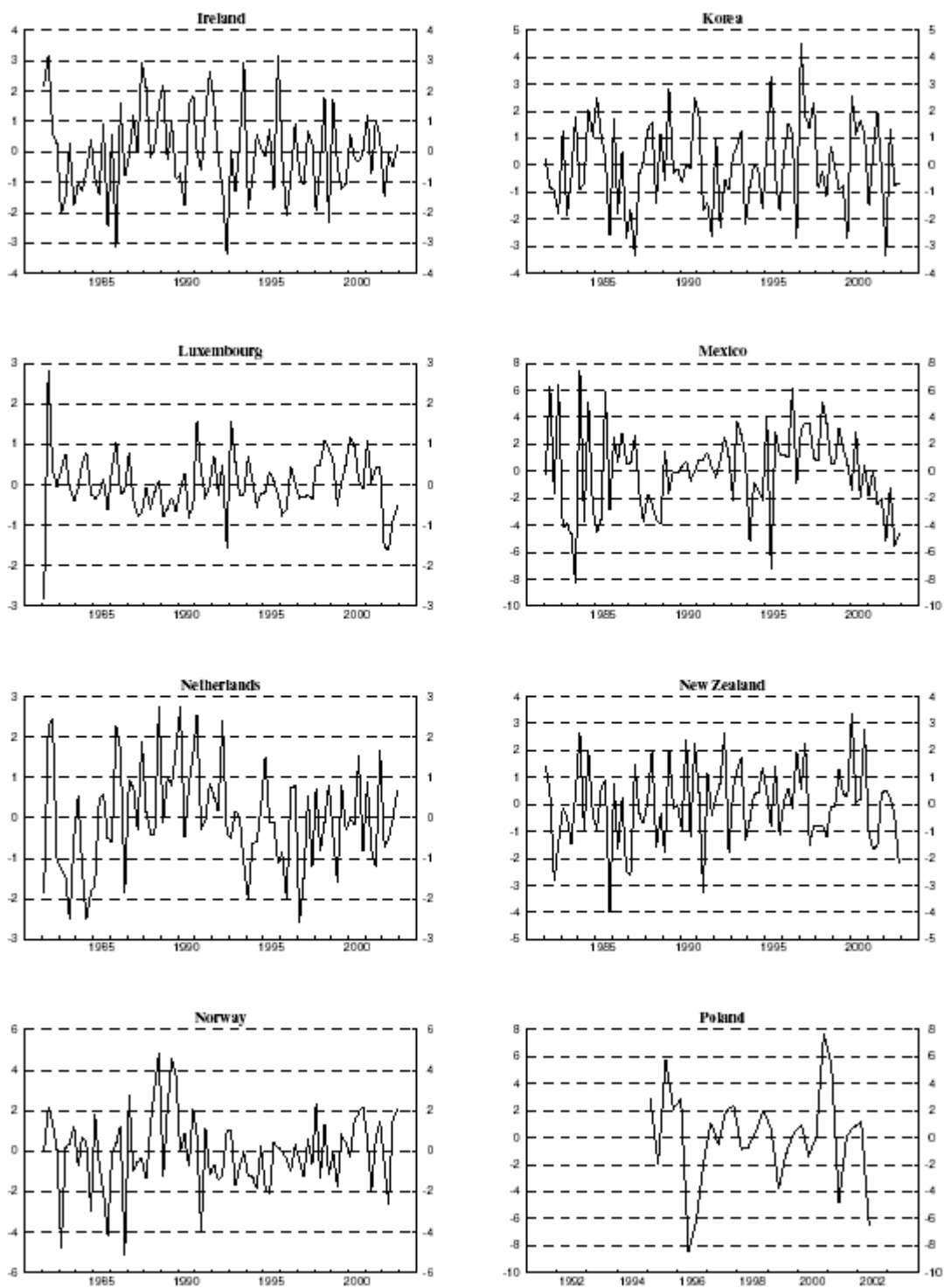
Figure 9. **Estimation residuals import prices equations (%)** (cont'd)
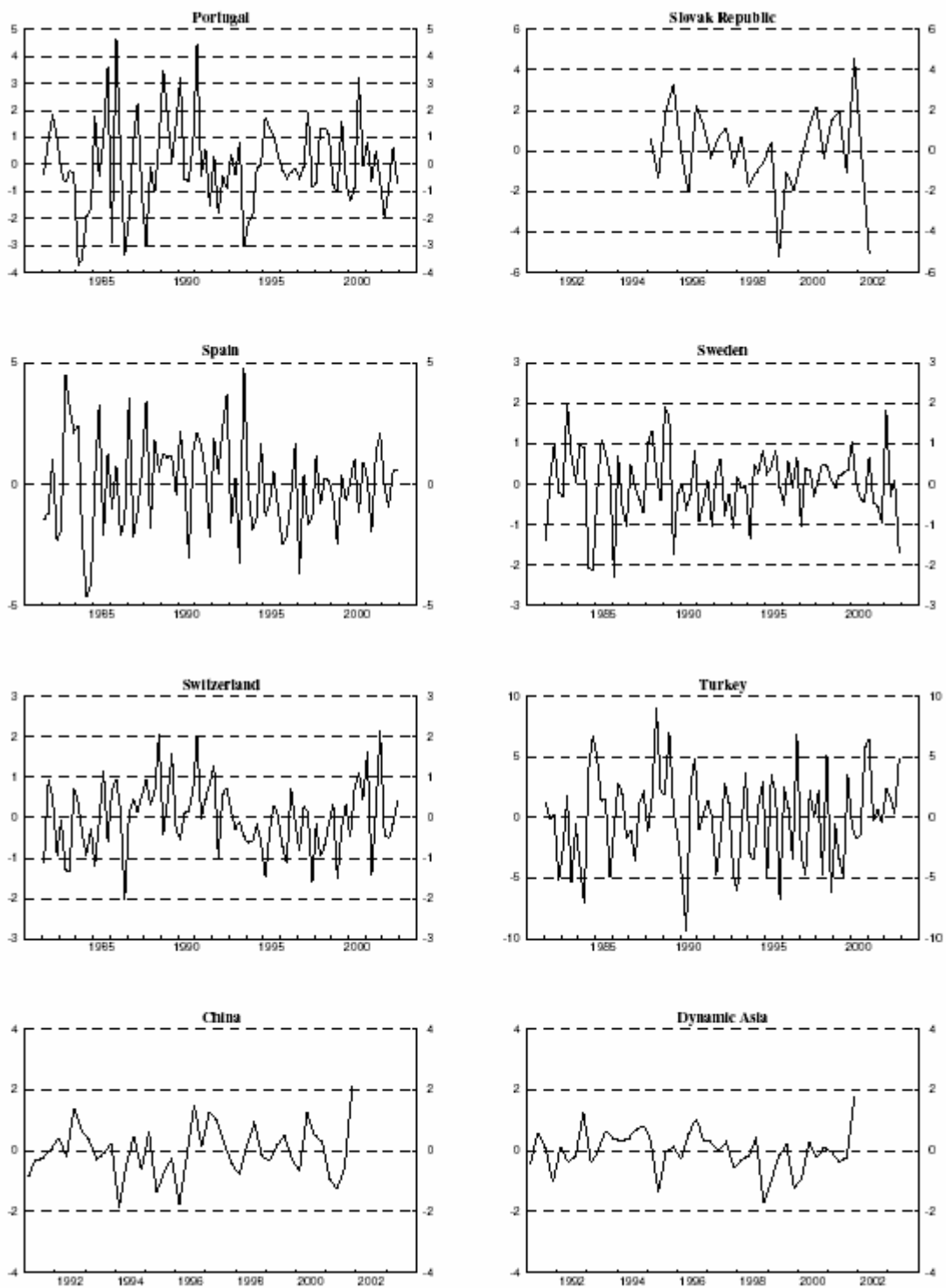
Figure 9. **Estimation residuals import prices equations (%)** (cont'd)
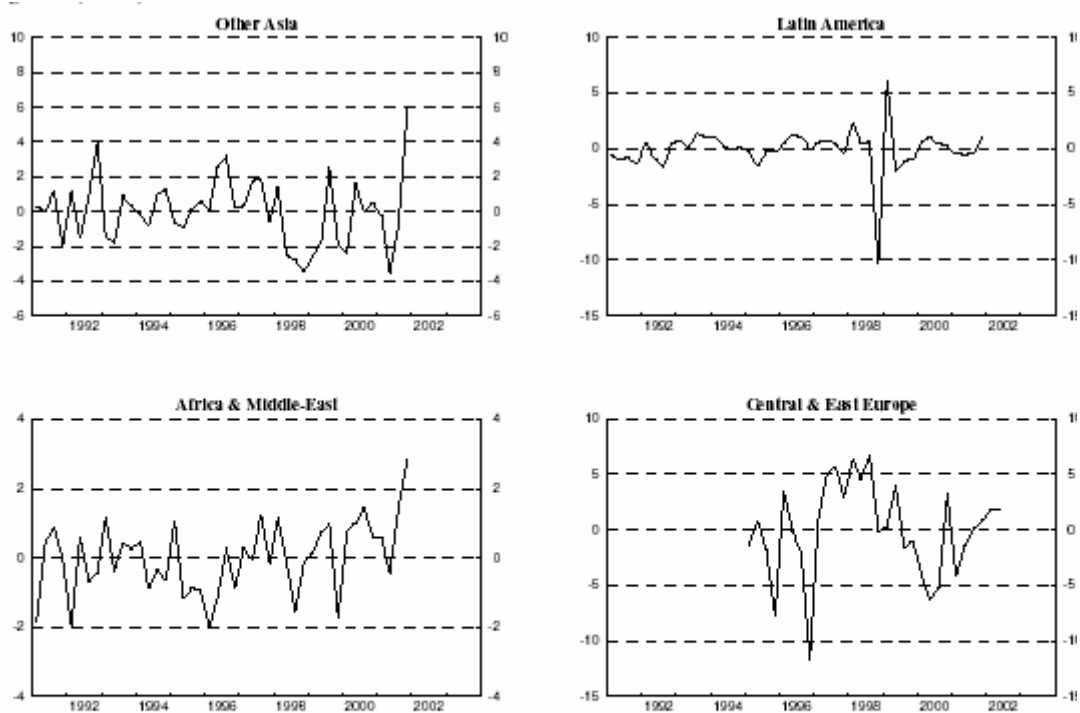
Figure 10. **Trend functions export volume equations**
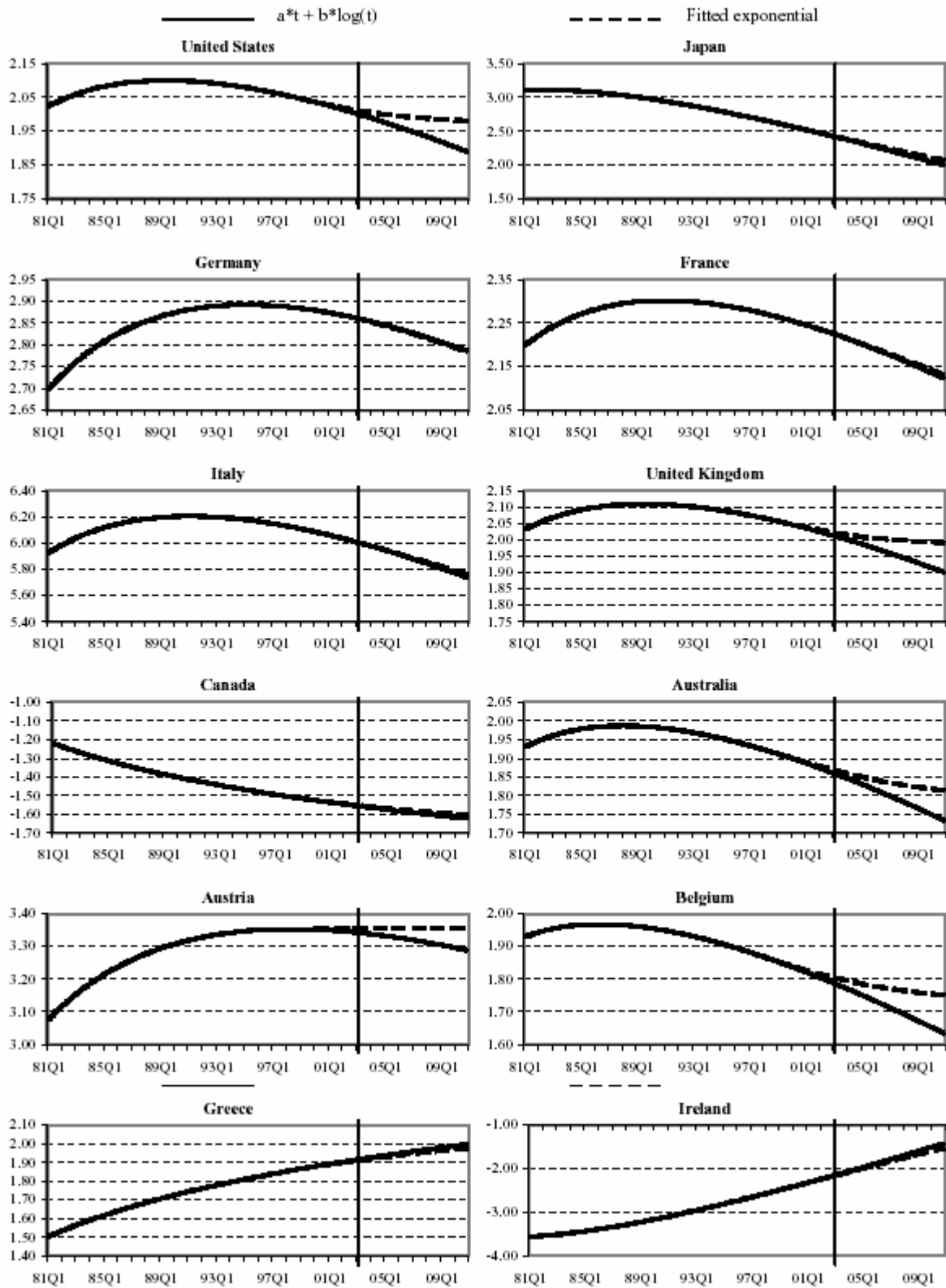
Figure 10. **Trend functions export volume equations** (cont'd)
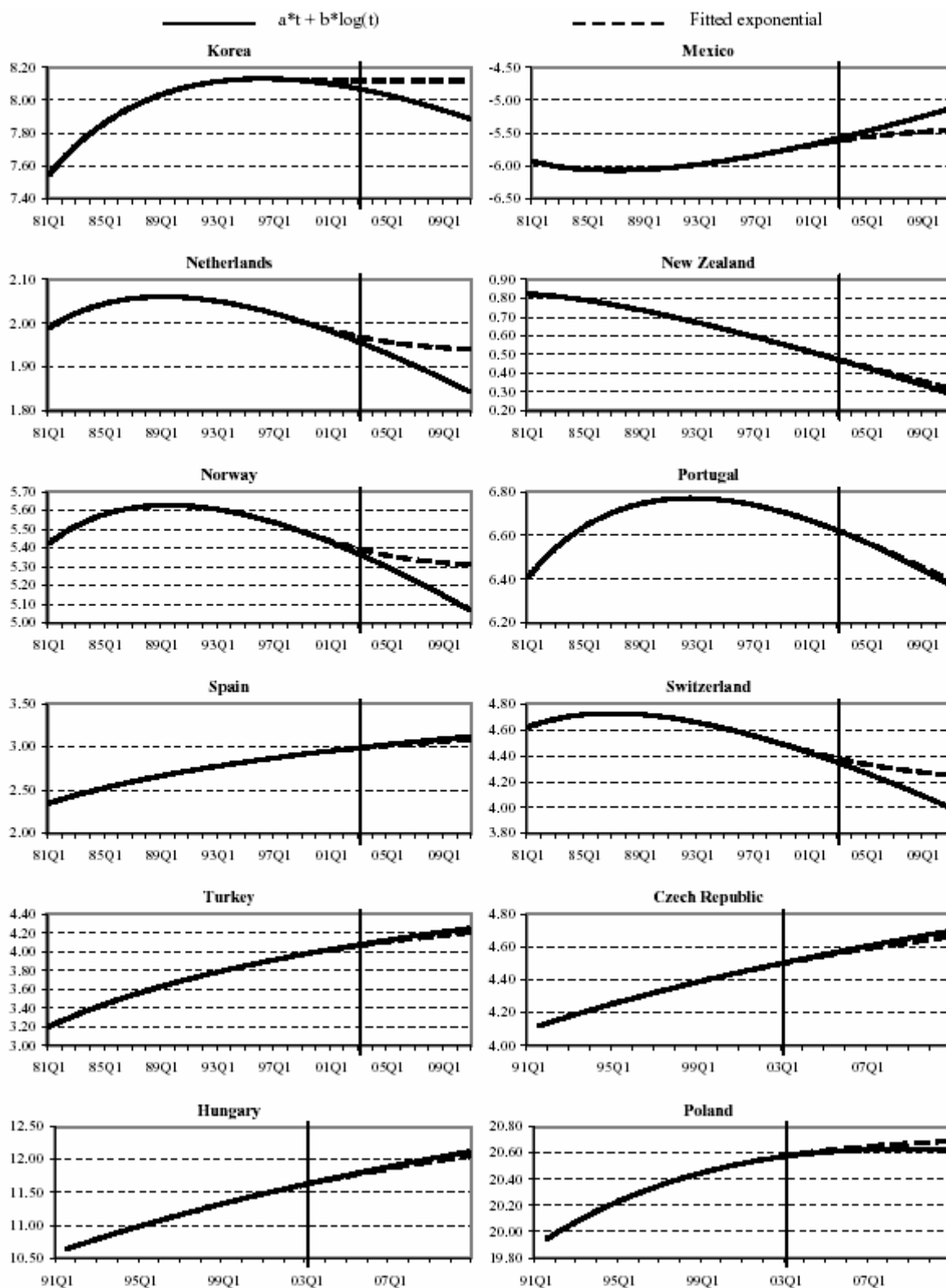
Figure 10. **Trend functions export volume equations** (cont'd)
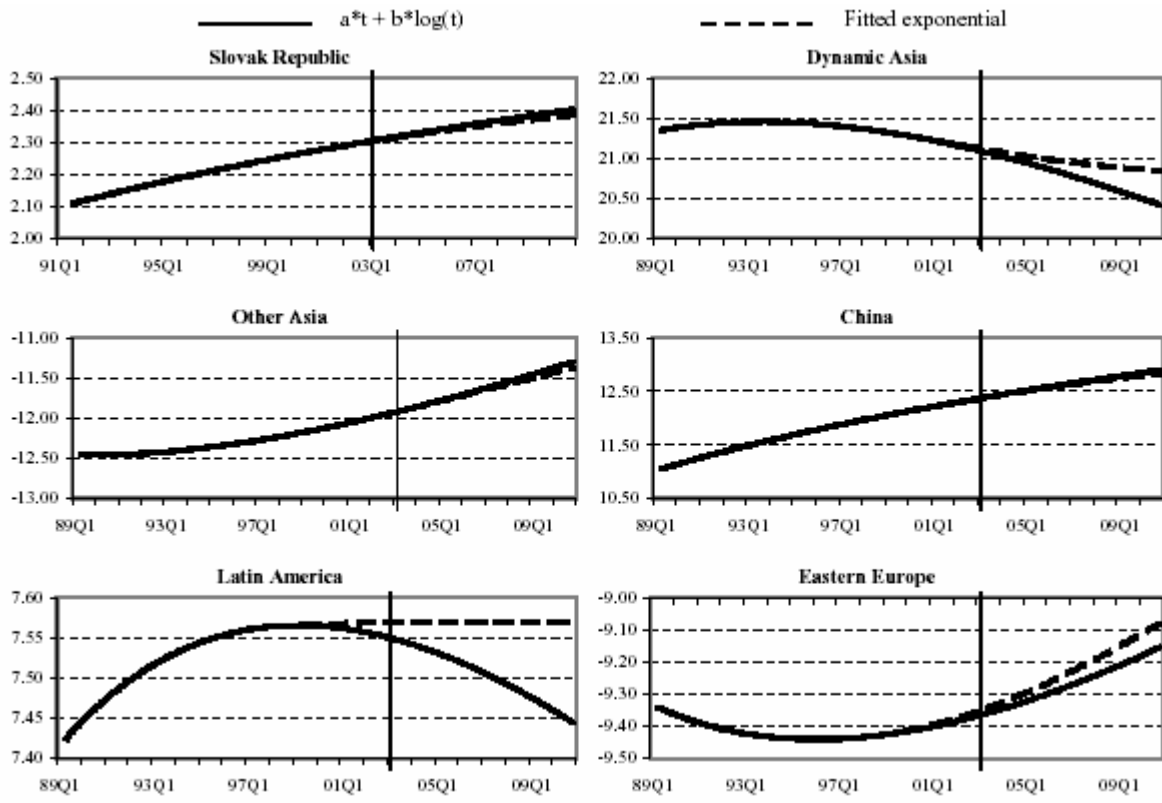
Figure 11. **Trend functions import volume equations (disaggregated expenditure)**
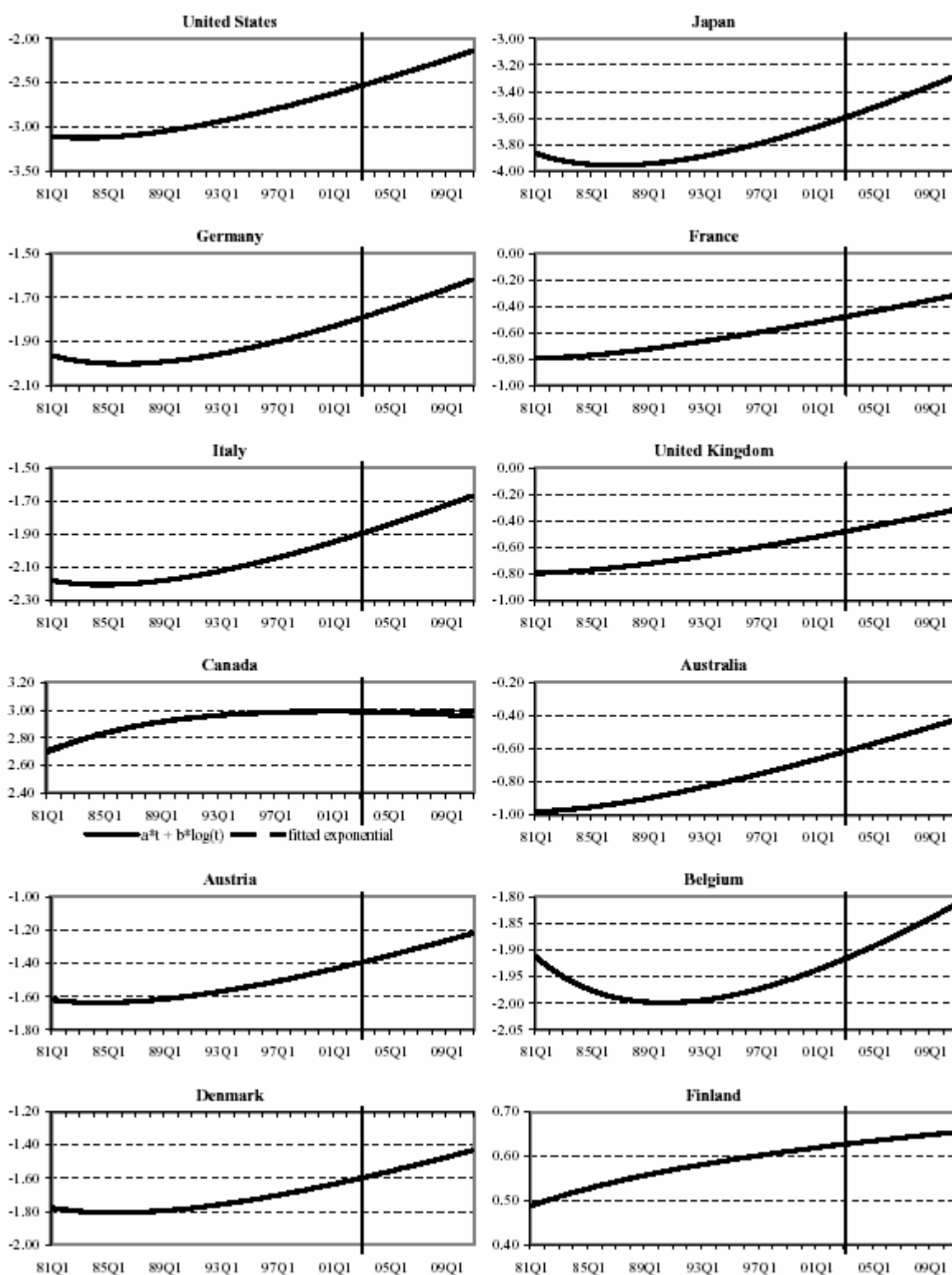
Figure 11. **Trend functions import volume equations (disaggregated expenditure)** (cont'd)
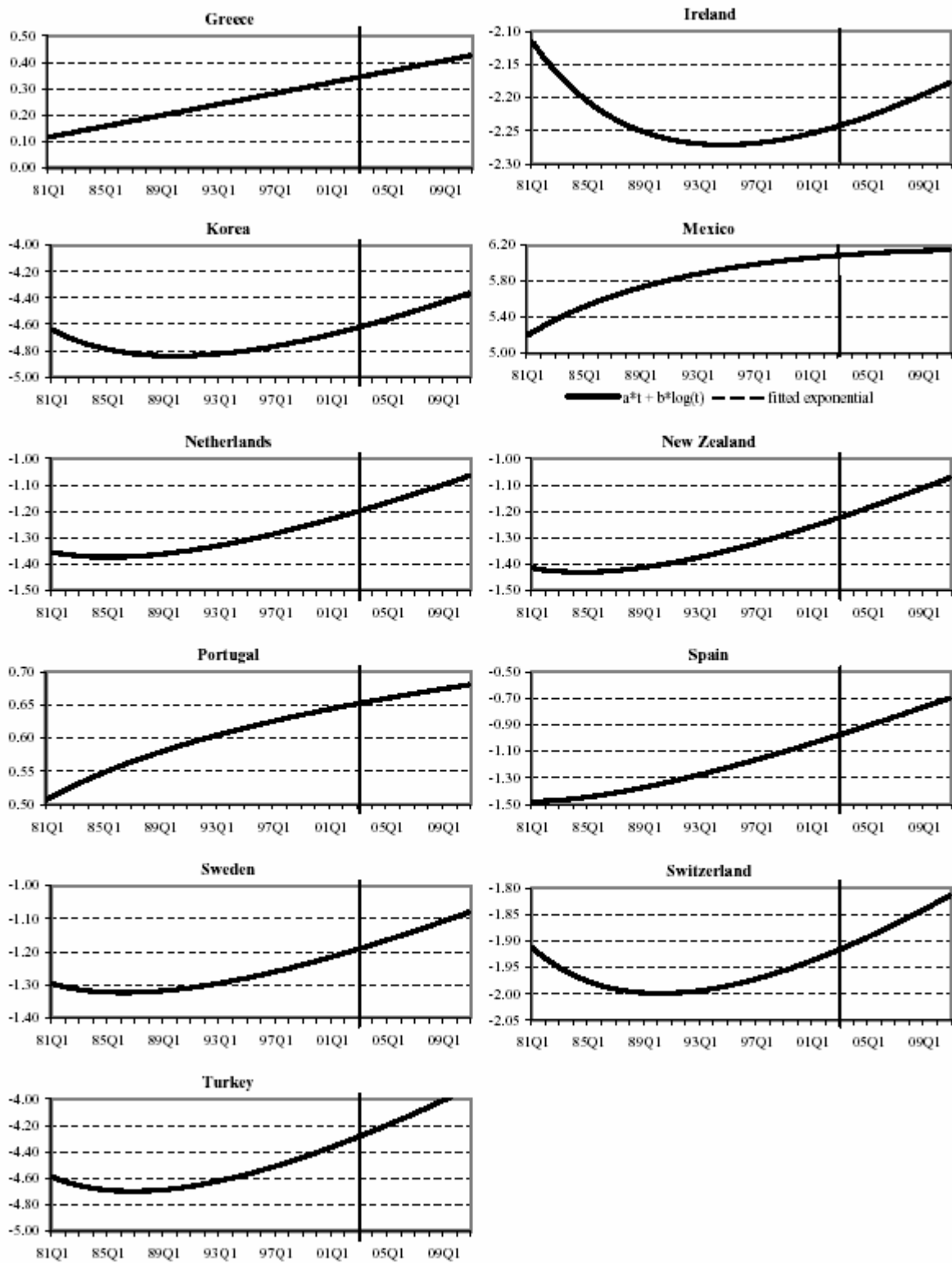
Figure 12. **Trend functions export price equations**
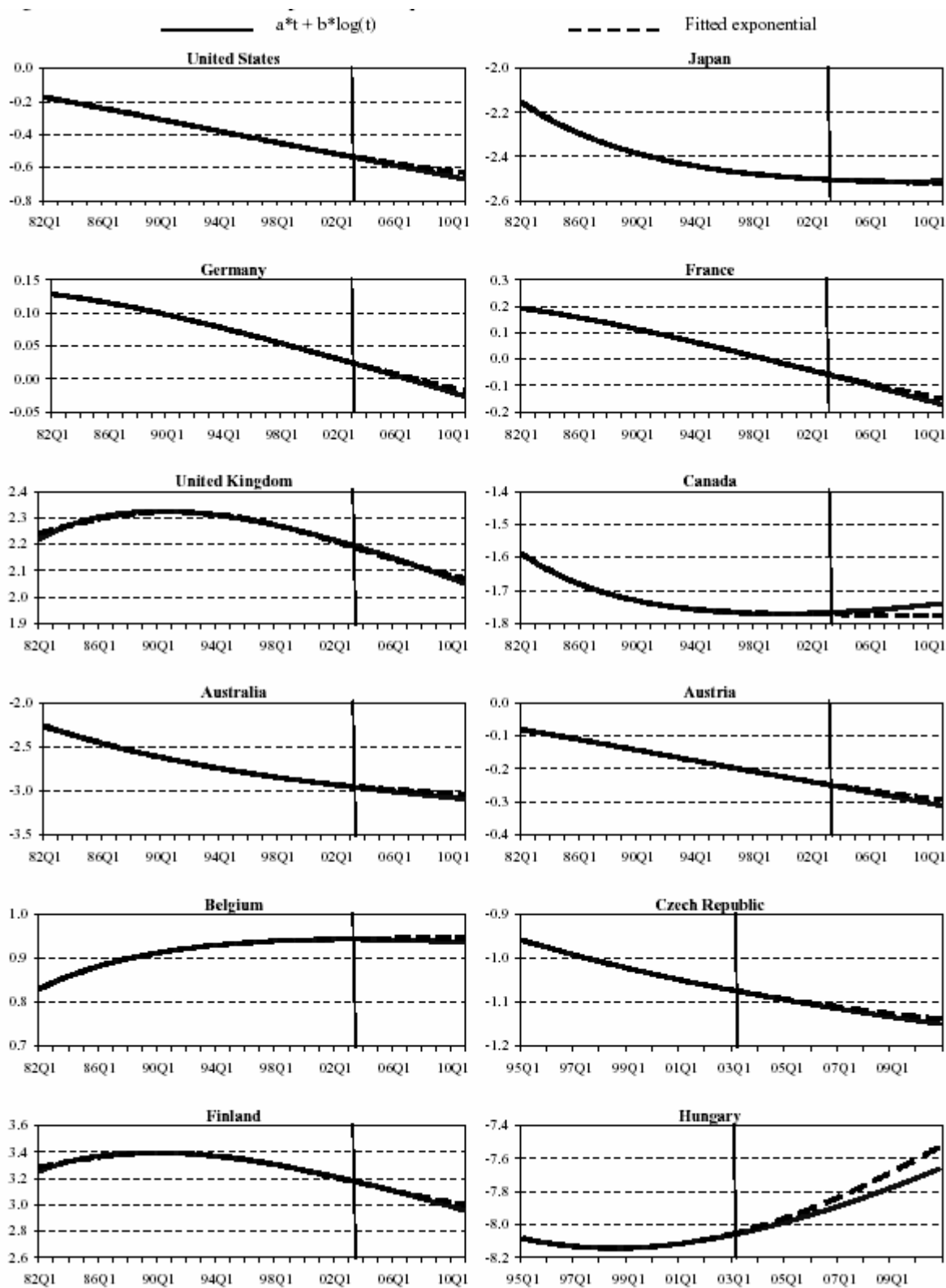
Figure 12. **Trend functions export price equations** (cont'd)
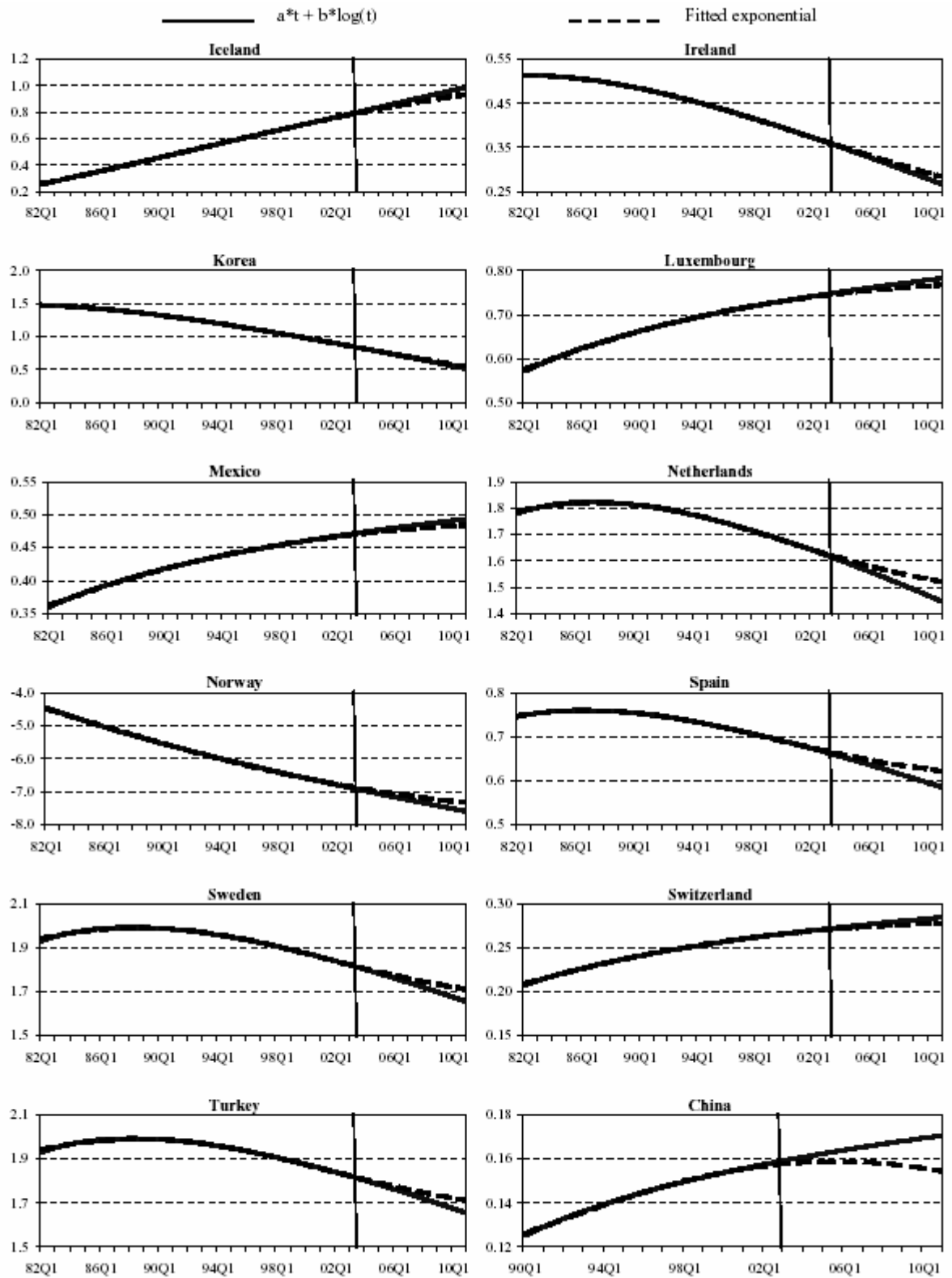
Figure 12. **Trend functions export price equations** (cont'd)
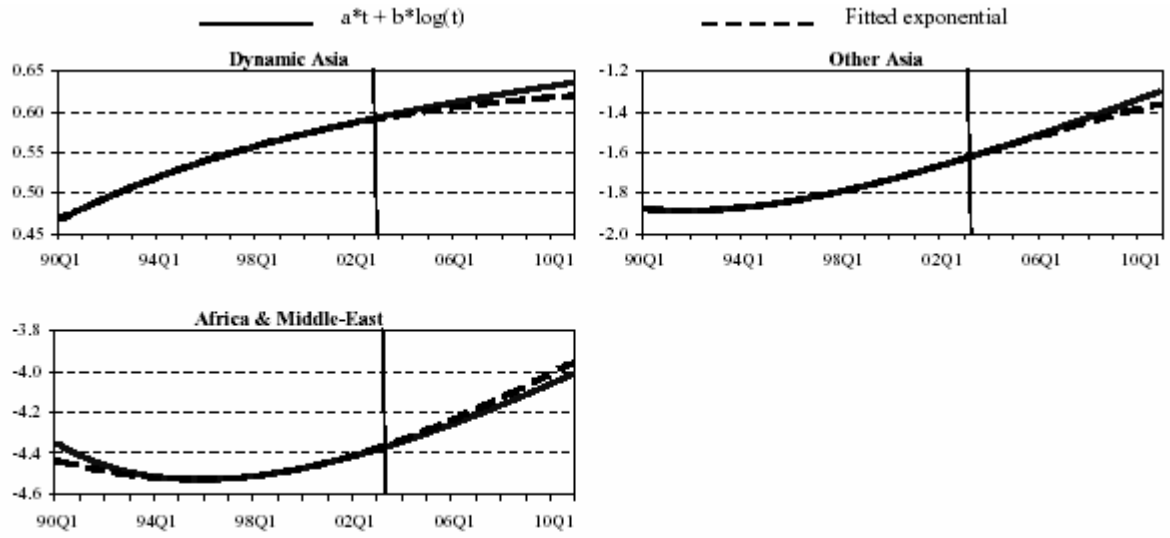
Figure 13. **Trend function import price equations**
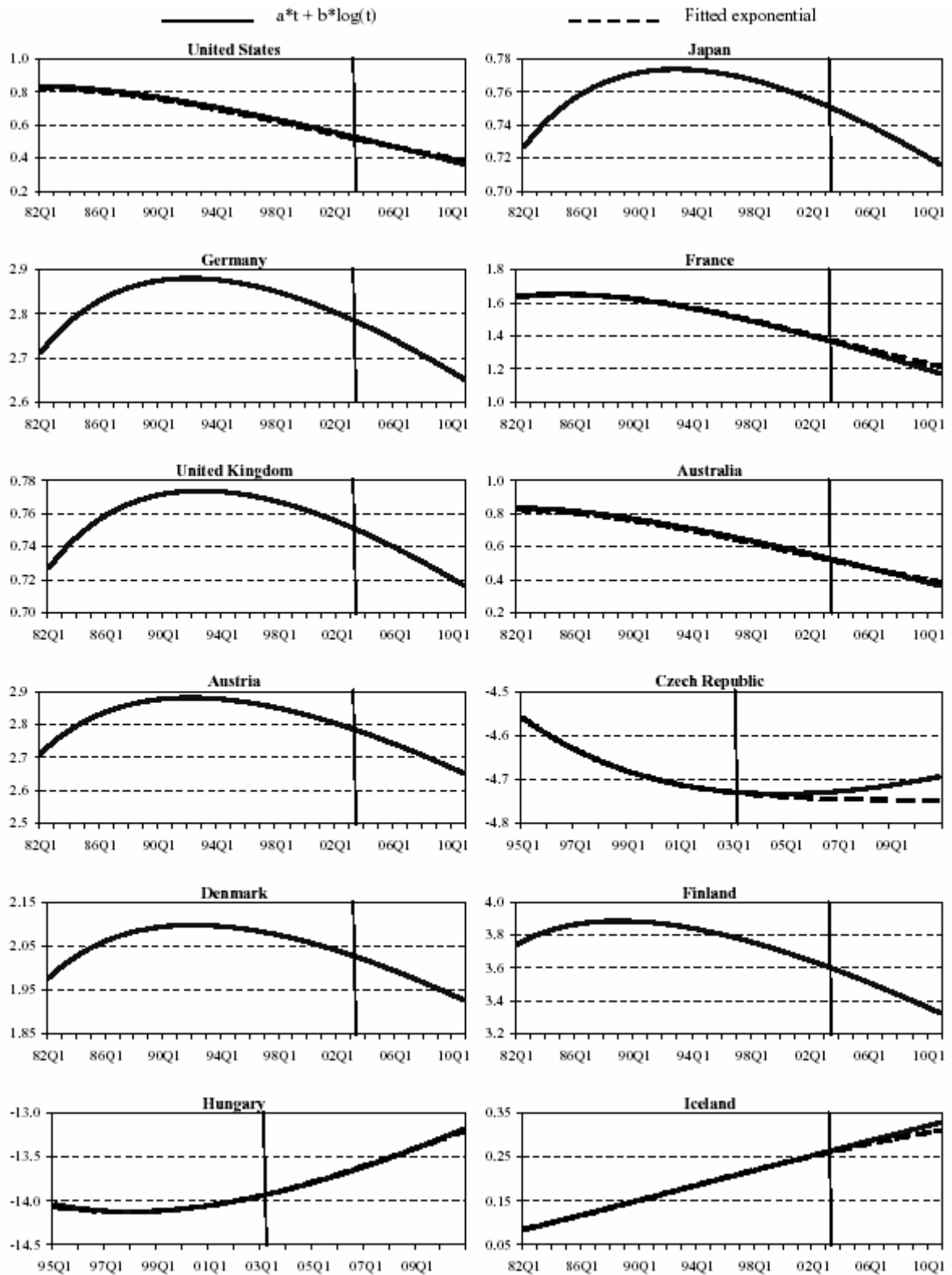
Figure 13. **Trend function import price equations** (cont'd)
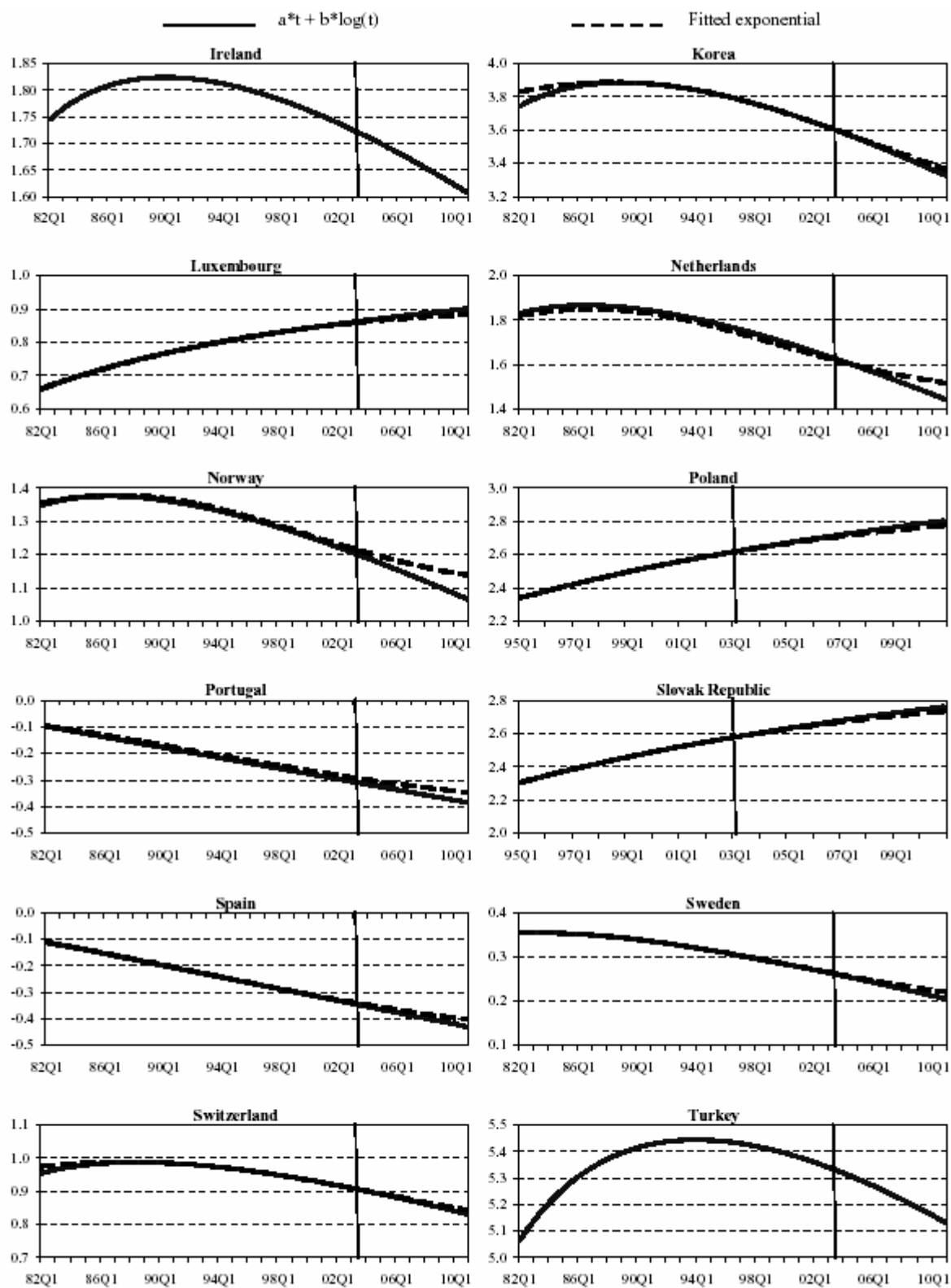
Figure 13. **Trend function import price equations** (cont'd)
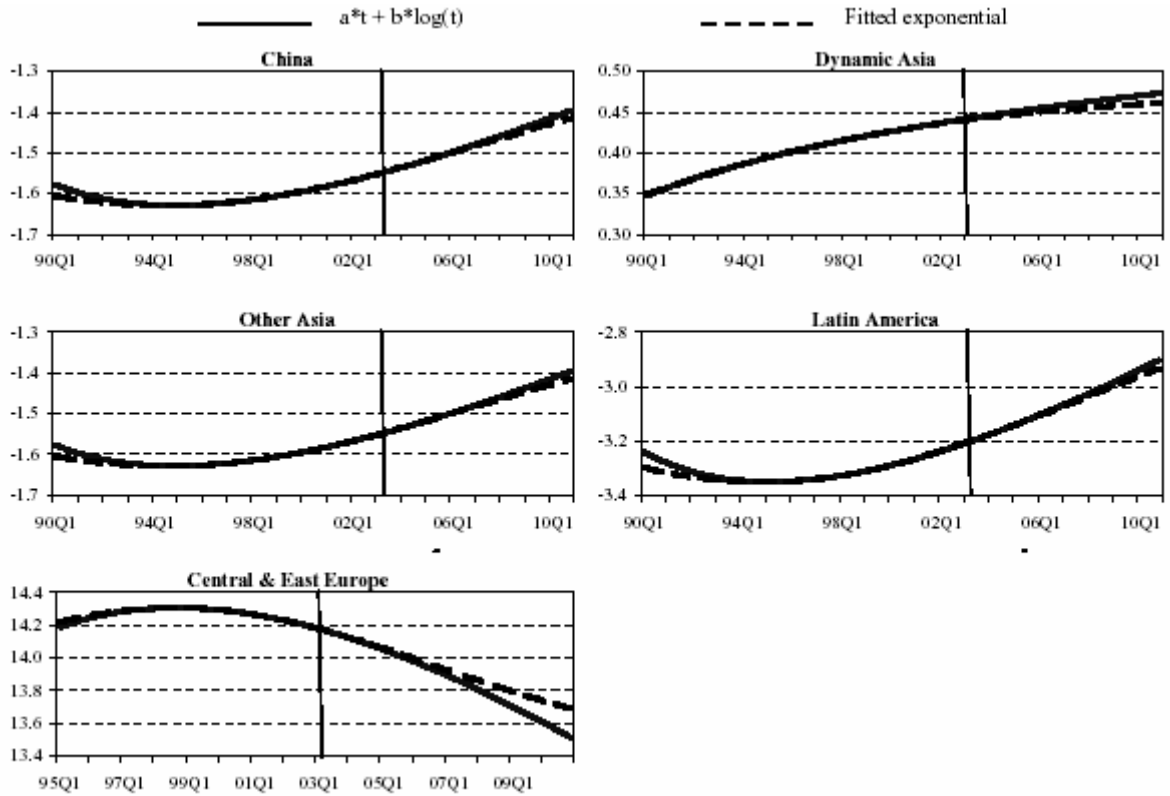
Figure 14. **Difference between original and adjusted services trade (%)**

Export side differences

Import side differences
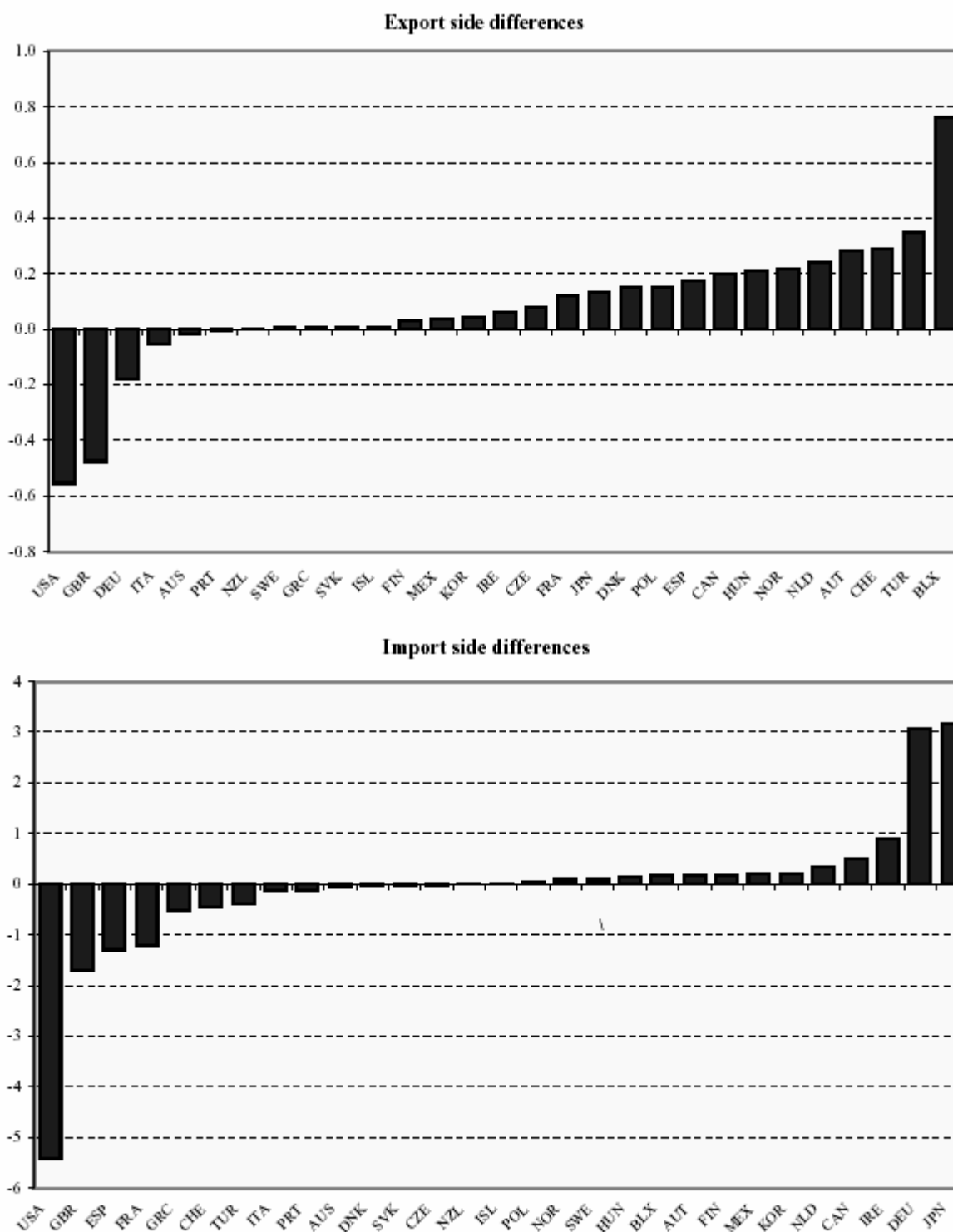
APPENDIX A. THE DERIVATION OF A BALANCED SERVICES TRADE MATRIX

A1. Overview

This Appendix outlines the method used to derive the bilateral services trade matrix used in the computation of total world goods and services trade. The reconciled services matrix is then combined with a separate bilateral goods matrix to obtain a single goods and services matrix.

Theoretically, exports from country i to country j should be equal to the imports from country j to country i. If so, then, at the global level world exports must sum to world imports. Unfortunately, a variety of factors ensure that this equality does not hold. This issue is not specific to the services sector. Global trade in goods is also subject to measurement errors. But trade in services suffers also from a lack of data, as some bilateral trading pairs are not available.

The approach set out in this Appendix allows the discrepancies between country bilateral trade estimates to be redistributed and eliminated. The intuition behind the method used is very simple, with the final data for each country pair i and j being a weighted average of exports of country i to j and imports of country j from i. The weights used represent the reliability placed on each of these two estimates. In principle, when time series data are available, such weights can be estimated by using information on the standard deviation of the respective series. But for the services series considered in this paper, only cross-sectional data were available. Thus, in all cases both mirror series were assumed to be equally unlikely, with a weighting of 0.5 placed on each component.

A2. Missing data

Before the balancing technique can be applied, the problem of missing bilateral data needs to be dealt with. In some cases, mainly for the non-OECD regions, there is no data at all on the extent of bilateral trade in services. For trade between an OECD country with published data and an economy with no data, the data from the OECD country (exports and imports) was also used for the corresponding mirror data (imports and exports).

A different approach is required when neither partner has any bilateral trade data. The solution adopted here, as in Le Fouler *et al.* (2001), is to make use of the information available from the merchandise trade matrix. For each country the initial estimates of missing shares are made by first calculating the difference between total services trade and all countries for which bilateral data exist, and then allocating this on a *pro rata* basis across those countries for which there is no data. The proportional allocation is proxied by the mirror proportions in the separate bilateral merchandise trade matrix. This is done for both exports and imports.

A3. The balancing technique

Having obtained initial estimates of exports and imports for each bilateral pair, the final step is to eliminate any discrepancy between them. The rest of this Appendix sets out the solution to the balancing problem in more detail, focussing on a specific algebraic example for three countries.

Let $x_{i,j}^*$ denote the "true" (unobservable / latent) exports of country i towards country j and $m_{i,j}^*$ the true (unobservable / latent) imports of country i from country j. If x_i^* and m_j^* represent the total exports of country i and the total imports of country j, the trade matrix from the export side is given by:

Table A1. **A hypothetical export trade matrix**

	Country 1	Country 2	Country 3	Sum of columns
Country 1	0	$x_{1,2}^*$	$x_{1,3}^*$	Export of country 1 $x_1^* = x_{1,2}^* + x_{1,3}^*$
Country 2	$x_{2,1}^*$	0	$x_{2,3}^*$	Export of country 2 $x_2^* = x_{2,1}^* + x_{2,3}^*$
Country 3	$x_{3,1}^*$	$x_{3,2}^*$	0	Export of country 3 $x_3^* = x_{3,1}^* + x_{3,2}^*$
Sum of rows	Import of country 1 $m_1^* = x_{2,1}^* + x_{3,1}^*$	Import of country 2 $m_2^* = x_{1,2}^* + x_{3,2}^*$	Import of country 3 $m_3^* = x_{1,3}^* + x_{2,3}^*$	World imports=World exports

By construction, this matrix is balanced. For any given row i, the sum of the columns gives the total exports of country i. For any given column, the sum of the rows gives what should bee country's j imports. However, world trade can also be represented using import data, the mirror trade matrix being:

Table A2. **A hypothetical import trade matrix**

	Country 1	Country 2	Country 3	Sum of columns
Country 1	0	$m_{1,2}^*$	$m_{1,3}^*$	Import of country 1 $m_1^* = m_{1,2}^* + m_{1,3}^*$
Country 2	$m_{2,1}^*$	0	$m_{2,3}^*$	import of country 2 $m_2^* = m_{2,1}^* + m_{2,3}^*$
Country 3	$m_{3,1}^*$	$m_{3,2}^*$	0	import of country 3 $m_3^* = m_{3,1}^* + m_{3,2}^*$
Sum of rows	Export of country 1 $x_1^* = m_{2,1}^* + m_{3,1}^*$	Export of country 2 $x_2^* = m_{1,2}^* + m_{3,2}^*$	Export of country 3 $x_3^* = m_{1,3}^* + m_{2,3}^*$	World exports=World imports

For any given row i, the sum of the columns gives the total imports of country i. For any given column j, the sum of the rows is equal to the total exports of country j.

These export and import matrices are related, with a total of six constraints: $x_{1,2}^* = m_{2,1}^*$, $x_{1,3}^* = m_{3,1}^*$, $x_{2,1}^* = m_{1,2}^*$, $x_{2,3}^* = m_{3,2}^*$, $x_{3,1}^* = m_{1,3}^*$, $x_{3,2}^* = m_{2,3}^*$. In the case of 36 countries / areas, the number of constraints is 1260 [$= n(n-1)$]. If the constraints are verified for each country pair then the following identity holds:

$$\sum_{j=1}^{36} x^*_{i,j} = \sum_{j=1}^{36} m^*_{j,i} \quad \forall i = 1...36 \tag{A1}$$

This equation states that the total amount of country i's export is equal to the sum of imports of country j from i. It follows immediately that there is no world discrepancy:

$$\sum_{i=1}^{36}\sum_{j=1}^{36} x^*_{i,j} = \sum_{i=1}^{36}\sum_{j=1}^{36} m^*_{j,i}$$

In this particular case, each bilateral pair is known and matrices from both the export and the import side give the same trade share, implying a zero world trade discrepancy. However there are a number of reasons why this identity is unlikely to hold. In particular, differences in data sources and data collection methods mean that the trade share derived from the export side often differs from that derived from the import side, implying the existence of a discrepancy at the global level.

The final problem, concerning differences in the level of trade estimated using exports or imports is dealt with by balancing the separate export and import matrices. Balancing techniques were originally developed for use with large data systems such as Social Accounting Matrices or Input-Output Tables. Their usefulness for balancing national accounts was highlighted by Stone (1977) and extended by Byron (1978). The technique has also been made use of by Vos and de Jong (1995), for the derivation of a World Accounting Matrix (a balanced current account matrix), and Weale (1992) to extract a unique real GDP series from two different estimates (supply and demand) of the same aggregate (GDP).

The balancing method aims to minimise the difference between the observed data (z) and the final unknown series (z^*) using a set of accounting constraints. Let z^* denote the vector of the "true" bilateral unobservable country pairs. In the specific example with three countries:

$$z^* = \begin{pmatrix} x^*_{1,2} & m^*_{2,1} & x^*_{1,3} & m^*_{3,1} & x^*_{2,1} & m^*_{1,2} & x^*_{2,3} & m^*_{3,2} & x^*_{3,1} & m^*_{1,3} & x^*_{3,2} & m^*_{2,3} \end{pmatrix}'.$$

The constraint is written as $Az^* = 0$, where the matrix A is:

$$A = \begin{pmatrix} 1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & -1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & -1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & -1 \end{pmatrix}$$

The objective is to minimise a loss function W (which is a square matrix of 12 by 12 in this example) relating to the differences between the initial and final trade estimates, and subject to the set of constraints given by A:

$$\min \frac{1}{2}(z^* - z)' W (z^* - z) \tag{A2}$$

subject to $Az^* = 0$

The Lagrangian is:

$$L(z^*, \lambda) = \frac{1}{2}(z^* - z)' W(z^* - z) - \lambda' A z^* \qquad [A3]$$

In the three countries case, there are 12 variables and 6 constraints (and therefore six Lagrange multipliers). The W matrix represents the metric associated with the loss function. When W is the identity matrix, the loss function is quadratic (sum of the squares). In the absence of any time series information, assumptions have to be made about the reliability of the data for each bilateral pair.

Under the assumption that W is block diagonal, with a common arbitrary weight given to each element of a bilateral pair of countries (the export and import estimates) and setting $x = z^* - z$, allows [A3] to be written as:

$$L(x, \lambda) = \frac{1}{2}(x)' W(x) - \lambda' A(x + z) \qquad [A4]$$

$$\frac{\partial L}{\partial x} = 0 \Leftrightarrow Wx - A'\lambda = 0$$
$$\frac{\partial L}{\partial \lambda} = 0 \Leftrightarrow A(x + z) = 0 \qquad [A5]$$

From [A5], the solution is given by:

$$\begin{pmatrix} W & -A' \\ A & 0 \end{pmatrix} \begin{pmatrix} z^* \\ \lambda \end{pmatrix} = \begin{pmatrix} Wz \\ 0 \end{pmatrix} \qquad [A6]$$

This expression can be rearranged to obtain estimates of the latent balanced series that are given by a linear combination of observable data:

$$z^* = \left(I - W^{-1} A' \left(A W^{-1} A' \right)^{-1} A \right) z \qquad [A7]$$

The linear combination is a country-by-country weighting scheme given by the particular structure of the matrix of constraints A and the assumption that W is block diagonal.

For example, in the three country case, with each country having two bilateral pairs, the matrix $A_i \quad \forall i = 1, 2, 3$ is:

$$A_i = \begin{matrix} 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 \end{matrix} \qquad [A9]$$

and the matrix W_i is given by :

$$W_i = \begin{pmatrix} a_i & 0 & 0 & 0 \\ 0 & b_i & 0 & 0 \\ 0 & 0 & c_i & 0 \\ 0 & 0 & 0 & d_i \end{pmatrix} \qquad [A10]$$

The matrix $W^{-1}A'\left(AW^{-1}A'\right)^{-1}$ can be partitioned into separate matrices for each country i with the form: $W_i^{-1}A_i'\left(A_iW_i^{-1}A_i'\right)^{-1}$. Each of these separate matrices contains the weights to be applied to all the bilateral data pairs for that country:

$$W_i^{-1}A_i'\left(A_iW_i^{-1}A_i'\right) = \begin{pmatrix} \dfrac{b_i}{a_i+b_i} & 0 \\[2mm] \dfrac{-a_i}{a_i+b_i} & 0 \\[2mm] 0 & \dfrac{d_i}{c_i+d_i} \\[2mm] 0 & \dfrac{-c_i}{c_i+d_i} \end{pmatrix} \quad\quad [A11]$$

For country 1, multiplying [A11] by $A_1 z_1$ to get $-(z*-z)$:

$$A_1 z_1 = \begin{pmatrix} x_{1,2} - m_{2,1} \\ x_{1,3} - m_{3,1} \end{pmatrix} \quad\quad [A12]$$

It follows that: $W_1^{-1}A_1'\left(A_1W_1^{-1}A'1\right)^{-1}A_1z_1 = \begin{pmatrix} \dfrac{b_1}{a_1+b_1}\left(x_{1,2}-m_{2,1}\right) & 0 \\[2mm] \dfrac{-a_1}{a_1+b_1}\left(x_{1,2}-m_{2,1}\right) & 0 \\[2mm] 0 & \dfrac{d_1}{c_1+d_1}\left(x_{1,3}-m_{3,1}\right) \\[2mm] 0 & \dfrac{-c_1}{c_1+d_1}\left(x_{1,3}-m_{3,1}\right) \end{pmatrix}$ [A13]

Each element of W_1 has to be interpreted by pair (a_1,b_1) and (c_1,d_1). When $a_1=b_1$, then the difference between the exports of country 1 to country 2 and the imports of country 2 from country 1 is distributed in equal amounts to both countries. Such a case would occur for example, if the reliability of each country's data was judged to be similar. This result holds whatever the value of (a_1,b_1), because of the particular nature of the accounting constraint. As both elements of each bilateral pair have to be equal, each element of final weighting matrix is scaled by the sum of these elements.

Alternatively, suppose that one component of the data pair is thought to be reliable (imports) and the other component is thought to be unreliable (exports). This situation can be represented for instance, by a value of b_1 ten times greater than the value of a_1 (or in other words the confidence placed in the import source is ten times higher than that placed in the export source). Then, if it is still assumed that c_1 and d_1 are equal, [A13] yields:

$$W_1^{-1}A_1'\left(A_1W_1^{-1}A'1\right)^{-1}A_1z_1 = \begin{pmatrix} 0.91\left(x_{1,2}-m_{2,1}\right) & 0 \\ -0.09\left(x_{1,2}-m_{2,1}\right) & 0 \\ 0 & 0.5\left(x_{1,3}-m_{3,1}\right) \\ 0 & -0.5\left(x_{1,3}-m_{3,1}\right) \end{pmatrix}$$

In this instance 90% of the discrepancy between exports and the mirror import data would be deducted from exports and 10% would be added to imports. Thus the final number will be close to the observed import figure, reflecting the greater confidence put on that source. Conversely, if the value of a_1 was ten times that of b_1, the final balanced estimate would be close to the original export estimate.

The differences between the adjusted services data for each country and the original data are shown in Figure 14. Most of the adjustment appears to fall on the import data, with sizable upward revisions in imports into the United States, the United Kingdom, Spain and France, and large downward adjustments in Japan, Germany and Ireland.

APPENDIX B. SOME ALTERNATIVE IMPORT DEMAND SPECIFICATIONS

This appendix provides a short overview of the properties of five different potential models of import volumes. For simplicity it is assumed that there are two components of total final expenditure, X and Z, and two categories of goods, imports (M) and domestic value added (Y). Thus, X+Z = M+Y. All other influences, such as the real exchange rate, dynamics and trend effects are ignored.

Model 1

$$\ln(M) \ = \ \alpha \ln(X + Z) \qquad\qquad\qquad\qquad [B1a]$$

$$\frac{\partial \ln(M)}{\partial \ln(X)} \ = \ \alpha \frac{X}{X + Z}; \quad \frac{\partial \ln(M)}{\partial \ln(Z)} \ = \ \alpha \frac{Z}{X + Z} \qquad\qquad [B1b]$$

$$\frac{\partial M}{\partial X} \ = \ \frac{\partial \ln(M)}{\partial \ln(X)} * \frac{M}{X} \ = \ \alpha \frac{M}{X + Z}; \quad \frac{\partial M}{\partial Z} \ = \ \alpha \frac{M}{X + Z} \qquad [B1c]$$

This model corresponds to the one currently in use for trade monitoring, and is similar to that in Interlink, with imports related to total final expenditure. The elasticity of imports with respect to each category of expenditure is different, as shown in [B1b]. Weighted across categories, the aggregate expenditure elasticity is α. The limitation of this model is that the marginal propensity to import from each category of expenditure is identical, as shown in [B1c]. It should also be noted that both the elasticities and the marginal import propensities of different categories of expenditure are time-varying, even though the aggregate total expenditure elasticity is constant.

Model 2

$$\ln(M) \ = \ \alpha \ln(\beta X + \lambda Z) \qquad\qquad\qquad\qquad [B2a]$$

$$\frac{\partial \ln(M)}{\partial \ln(X)} \ = \ \alpha \frac{\beta X}{\beta X + \lambda Z}; \quad \frac{\partial \ln(M)}{\partial \ln(Z)} \ = \ \alpha \frac{\lambda Z}{\beta X + \lambda Z} \qquad [B2b]$$

$$\frac{\partial M}{\partial X} \ = \ \frac{\partial \ln(M)}{\partial \ln(X)} * \frac{M}{X} \ = \ \alpha \frac{\beta M}{\beta X + \lambda Z}; \quad \frac{\partial M}{\partial Z} \ = \alpha \frac{\lambda M}{\beta X + \lambda Z} \qquad [B2c]$$

This model corresponds to that used by Jilek *et al.* (1993), with imports related to a single weighted expenditure term. The usefulness of this model depends on whether information on the coefficients β and λ can be obtained from input-output tables. If it is not, [B2a] is difficult to estimate because it is highly non-linear. The advantage of this model is that it allows each category of expenditure to have a different marginal import propensity [B2c], as well as a different elasticity [B2b]. Weighted across categories, the aggregate expenditure elasticity is always α. As with Model 1, both the elasticities and the marginal import propensities for the individual components of final expenditure are time-varying.

Model 3

$$\frac{M}{X+Z} = \beta \ln(X) + \lambda \ln(Z) \qquad\qquad\qquad [\text{B3a}]$$

$$\frac{\partial M}{\partial X} = \beta \frac{X+Z}{X} + \frac{M}{X+Z}; \quad \frac{\partial M}{\partial Z} = \lambda \frac{X+Z}{Z} + \frac{M}{X+Z} \qquad [\text{B3b}]$$

$$\frac{\partial \ln(M)}{\partial \ln(X)} \cong \frac{\partial M}{\partial X} * \frac{X}{M} = \beta \frac{X+Z}{M} + \frac{X}{X+Z}; \quad \frac{\partial \ln(M)}{\partial \ln(Z)} = \lambda \frac{X+Z}{M} + \frac{Z}{X+Z} \qquad [\text{B3c}]$$

This model corresponds to the specification used by Pain and Westaway (1996) and that implemented in NiDEM (2000). The dependent variable is the share of imports in total expenditure, using a specification similar to that adopted in Almost Ideal Demand System models. Each category of expenditure has a different elasticity and a different marginal import propensity (if at least one of β and λ is non-zero). These are both time-varying. Restrictions can be imposed on β and λ to ensure that the aggregate weighted expenditure elasticity is 1 (β+λ=0). Note that unless this restriction is imposed (or unless β=λ=0), the aggregate weighted expenditure elasticity will also be time-varying, in contrast to Models 1 and 2.

Model 4

$$\ln(M) = \beta \ln(X) + \lambda \ln(Z) \qquad\qquad\qquad [\text{B4a}]$$

$$\frac{\partial \ln(M)}{\partial \ln(X)} = \beta; \quad \frac{\partial \ln(M)}{\partial \ln(Z)} = \lambda \qquad\qquad [\text{B4b}]$$

$$\frac{\partial M}{\partial X} = \frac{\partial \ln(M)}{\partial \ln(X)} * \frac{M}{X} = \frac{\beta M}{X}; \quad \frac{\partial M}{\partial Z} = \frac{\lambda M}{Z} \qquad [\text{B4c}]$$

This model is clearly similar to model 1, but cannot be directly derived from it. It allows each category of expenditure to have a different elasticity and a different marginal import propensity. The marginal propensities are time-varying, but the elasticities are not, in contrast to the previous models. A restriction can be imposed on β and λ to ensure that the aggregate weighted expenditure elasticity is 1 (β+λ=1).

Model 5

$$\frac{M}{X+Z} = \alpha + \beta \frac{X}{X+Z} + \lambda \frac{Z}{X+Z} \qquad\qquad [\text{B5a}]$$

$$\frac{\partial M}{\partial X} = \alpha + \beta; \quad \frac{\partial M}{\partial Z} = \alpha + \lambda; \qquad\qquad [\text{B5b}]$$

$$\frac{\partial \ln(M)}{\partial \ln(X)} = \frac{\partial M}{\partial X} * \frac{X}{M} = [\alpha + \beta] * \frac{X}{M}; \quad \frac{\partial \ln(M)}{\partial \ln(Z)} = [\alpha + \lambda] * \frac{Z}{M} \qquad [\text{B5c}]$$

As with Model 3, this model ensures that each category of expenditure has a different elasticity and a different marginal import propensity if at least one of β and λ is non-zero. But in this case the elasticities are time varying, but the marginal propensities are not. A practical difficulty with this specification is that a non-linear restriction on α, β and λ would be required to ensure the aggregate weighted expenditure elasticity was 1 at a particular point in time. Almost certainly, the weighted expenditure elasticity would be time varying.

Summary

Overall, Models 3 and 4 appear to be the best approaches. Model 3 has a firmer theoretical foundation than Model 4, but the latter is easier to estimate and maintains the long-standing property of a constant weighted demand elasticity. Model 1 does not have different marginal propensities for each category of expenditure, and Models 2 and 5 both require non-linear estimation techniques and the latter would be unlikely to have a constant weighted expenditure elasticity over time.

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