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Trade Linkages in the OECD Trade System

Jérôme Brezillon,
Stéphanie Guichard,
Dave Turner

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ABSTRACT/RÉSUMÉ

Trade Linkages in the OECD Trade System

This paper describes the sources and methods used to construct the trade matrices of the OECD trade system. It also provides an overview of the trade relationships between countries, especially individual OECD countries and the main non-OECD economies, as well as their evolution between 2000 and 2005. It finally serves more broadly as a "ready reckoner" guide to the sensitivity to shocks that are transmitted through trade.

JEL classification codes: F10; F40
Keywords: Trade; trade matrices; bilateral trade flows

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Les relations commerciales dans le système de commerce de l'OCDE

Ce document décrit les sources et méthodes utilisées pour la construction des matrices de commerce du système de commerce international de l'OCDE. Il donne une vue d'ensemble des relations commerciales entre pays, et notamment entre les pays membres de l'OCDE et les principales économies non-OCDE, ainsi que leur évolution entre 2000 et 2005. Ce document sert aussi plus généralement comme guide "prêt-à-l'emploi" de la sensibilité aux chocs transmis par le commerce.

Classification JEL : F10 ; F40
Mots-clés : Echanges commerciaux ; matrices des échanges ; commerce bilatéral

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TRADE LINKAGES IN THE OECD TRADE SYSTEM

by

Jérôme Brézillon, Stéphanie Guichard and Dave Turner[1]

1. Trade linkages and trade global consistency are essential components of the projections published in the OECD *Economic Outlook*. The OECD system of trade linkages relies on a matrix of bilateral flows of goods and services between OECD countries and several non-OECD countries and zones.[2] The construction of such a matrix is not an easy task given limited data availability on bilateral trade flows for some countries and the need to combine different sources while keeping the matrix consistent with national trade data.

2. This paper first details the methodology and sources used to build the most recent trade matrix for 2005. It then compares the current trade matrix to the previous 2000 version in order to assess the evolution of global trade flows over this period.[3] As expected, it shows that the share of non-OECD countries, essentially Dynamic Asian economies and China, in world trade has increased, mostly at the expense of North America, and to a lesser extent of OECD Asian countries. OECD Europe as a whole has managed to maintain its market share. The paper also provides a very detailed review of each country's main trading partners. Annex 1 presents the geographical breakdown and country and zone abbreviations. Annex 2 presents some technical details on the construction of the 2005 trade matrix and Annex 3 presents some country details on the change in the geographical trade structure between 2000 and 2005.

1. The authors are members of Country Studies IV and the Macroeconomic Analysis Division of the OECD Economics Department. They would like to thank Richard Herd and Christian Gianella for helpful comments and discussions and Diane Scott for assistance in preparing the document. The views expressed in this paper are those of the authors and do not necessarily represent those of the OECD or its member countries.

2. The OECD trade system uses a fixed matrix which is updated by five years every five years. The advantage of a fixed matrix for competitiveness indicators is that it enables the assessment of the impact of changes in prices which can be isolated from changes in weights due to the change in countries' relative market share. One disadvantage is that for historical years far away from the base year the weights derived from the matrix do not reflect the prevailing structure of trade.

3. The 2000 matrix is described in Le Fouler *et al.* (2001).

1. Methodology and data sources of the bilateral trade matrix

3. The OECD trade system is based on a 45 by 45 matrix of bilateral trade flows of goods and services covering the 33 OECD countries as well as nine non-OECD economies and three non-OECD economics areas.[4] The matrix is used to build several indicators including those for export markets for goods and services and competitiveness (see Pain *et al*., 2005 and Box 1). These indicators in turn play an important role in analysing recent trade developments, in informing trade projections and in enforcing global trade consistency.

Box 1. Trade indicators based on the trade matrix

Export market for goods and services, volume, US$, 2000 prices (XMKT)

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

where: $XGS_{i \to p}$ = goods and services export values in 2005 from country i to country p

$\mathrm{MGSVD}_{\mathrm{p}}$ = import volume of country p, expressed in 2005 US$

Competitor's prices of goods and services exports (PXC)

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

Where, $PXGS_p$ = Exports of goods and services, deflator, national accounts basis of country p

$EXCHIN_i$ = Exchange rate, index of USD per local currency unit of country i

4. The geographical breakdown has evolved over time to follow the accession of new countries to the OECD and the extension of the coverage of the non-members. In particular, the system has recently increased from 30 OECD countries, China and five non-member zones to 33 OECD countries (following the accession of Chile, Slovenia and Israel in 2010) as well as nine non-OECD economies and three non-OECD economics areas (see Annex 1). For the sake of comparison with the 2000 system the updated 2005 system still includes an OECD30 zone including only the countries that were part of the OECD in 2000. Since Israel joined in September 2010 after most of the calculations in this paper were completed it is not included in some of the OECD aggregates.

Shadow price of non-commodity goods and services imports (PMSHX)

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

where $PXGSX_p$ = Price of non-commodity exports of goods and services of country p

Calculation of intra trade times series for the zones

Calculation of the share of extra and intra trade for each country

Since the trade goods and services matrix gives the share of imports and exports for a country with all countries in the world, the share of trade with a specific zone, and the share of trade with the rest of the world excluding this zone can be calculated. These shares are then applied to each export and import series (values and volumes in 2005 prices) of each country's total trade to obtain series for extra and intra trade for a given zone.

Aggregation of goods and services series for intra and extra trade

Using a chainlink method, with fixed weights in 2005 it is possible to obtained the extra trade imports and exports for a zone, the intra trade of imports and exports for a zone and the total trade of imports and exports for a zone defined as the sum of intra and extra trade.

For instance for exports of intra trade exports of zone i Xi is derived from a weighted average of the exports of the p countries belonging to the zone. The weights are the share of the zone in the exports of the country in 2005.

$$\frac{X_i[t]}{X_i[t-1]} = \sum_{\substack{p=1,\\ p \subset i}}^{N} \left(\frac{X_p[t]}{X_p[t-1]} * \frac{\sum_{\substack{k=1,\\ k \subset i}}^{N} X_{p->k}[2005]}{X_p[2005]} \right)$$

Unfortunately, using this method, there is no consistency between intra trade exports and intra trade imports. $Exports\ \ intra_i[t] \neq Imports\ in\,tra_i[t]$

This can be corrected using the formula:

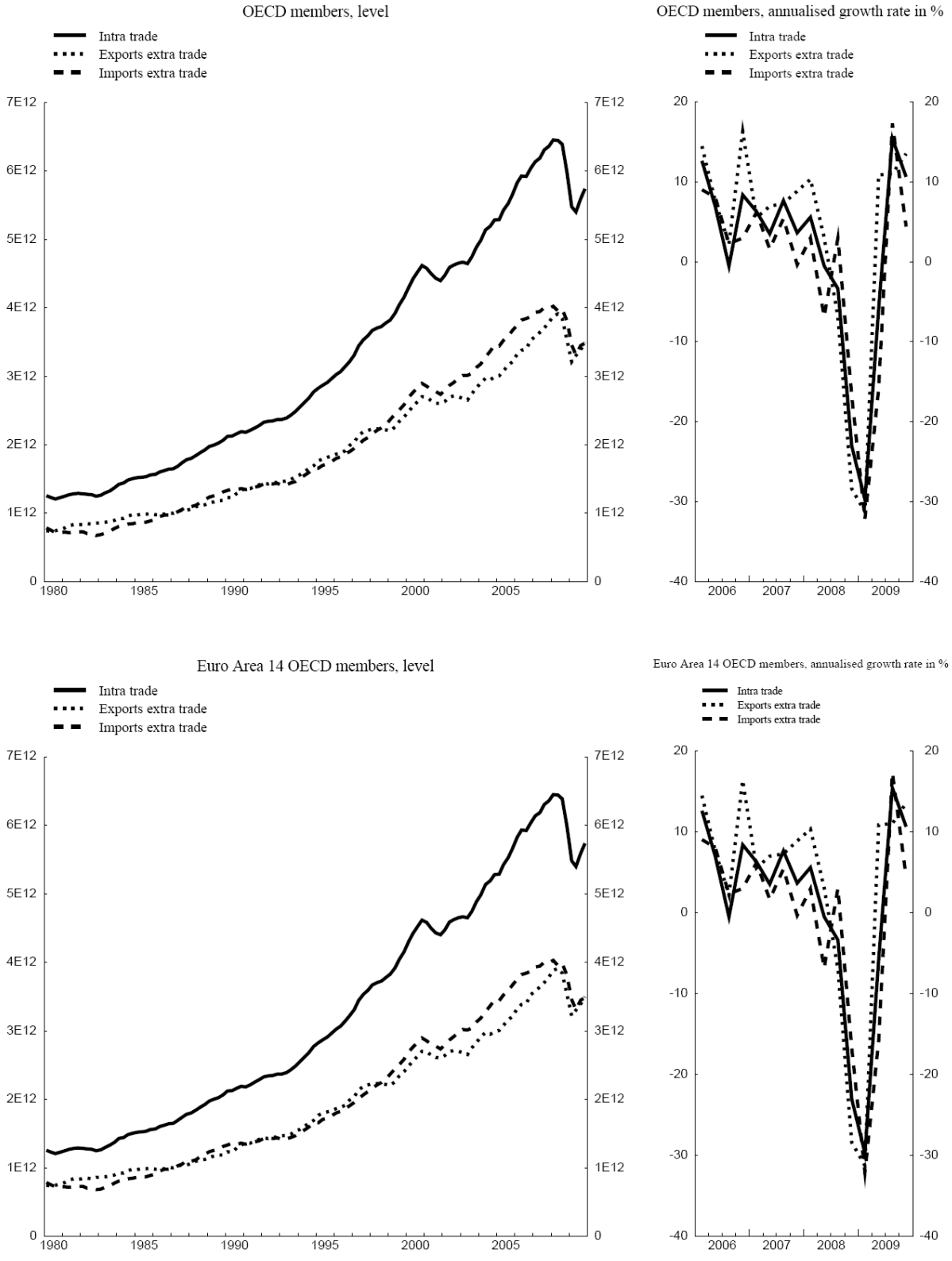
$$\begin{cases} Imports\ intra\ \ final_i[t] = \dfrac{Imports\ in\,tra_i[t] + Exports\ intra_i[t]}{2} \\ Exports\ in\,tra\ \ final_i[t] = \dfrac{Imports\ in\,tra_i[t] + Exports\ intra_i[t]}{2} \end{cases}$$

And extra trade can then be calculated as the difference between total trade and these adjusted intra trade series.

$$\begin{cases} Imports\ extra\ \ final_i[t] = TotalImports - Imports\ intra\ \ final_i[t] \\ Exports\ extra\ \ final_i[t] = Total\ Exports - Exports\ intra\ \ final_i[t] \end{cases}$$

The evolution of intra and extra trade of the OECD and the euro area is shown on the figure below. The first part of the 2000s is characterised by a growing deficit of the two zones with the rest of the world. In both case also, during the crisis exports to the rest of the world contracted before imports and intra trade.

Figure Box: Evolution of intra and extra trade for OECD and Euro 14 OECD members
Goods and services, volume



1.1 General principles

4. The coverage of trade in both goods and services implies the construction of two distinct matrices, one for bilateral merchandise trade and one for bilateral trade in services which are then aggregated. Merchandise trade still accounts for 81% of global trade and largely shapes the goods and services matrix and its evolution over time. While the quality of the data is relatively satisfactory for goods, statistics for exports or imports of services are not systematically available on the required bilateral basis even for OECD countries. Consequently, a number of assumptions have to be made to complete missing services data, using both the information given by the aggregate level of trade in goods or services and the share of bilateral trade of merchandise in total merchandise trade.

5. As a rule, the matrices are completed with export series for two reasons: first, export series are usually of much better quality and, second, import data are rarely available on a consistent free on board basis (f.o.b.). When export data are missing, the matrices are completed with mirror series whenever possible. A systematic procedure of cross-checking has been implemented, by comparing export/import series with mirror data from corresponding trading partners. For OECD bilateral merchandise trade, no substantial differences were found between export and their mirror series.

1.2 Data sources and methodology for compiling the goods matrix

6. There are two main international sources of bilateral merchandise trade: the data from the IMF's Direction of Trade Statistics (DOTS database, merchandise trade flows for more than 180 countries, customs-based) and the COMTRADE database from United Nation (also customs-based). While the two sets give comparable results for OECD countries, the quality of the data for non-OECD countries is better in the DOTS trade statistics and when aggregated at the country level, exports and imports from the DOTS are closer to national trade flows. The DOTS is therefore the main source used for the bilateral matrix of goods trade flows. [5]

7. Adjustments to the bilateral matrix to ensure that total exports and imports match national data are detailed in Annex 2.1.

1.3 Data sources and methodology for compiling the services matrix

8. For bilateral trade in services, the OECD Statistics on International Trade in Services is the only available source. Although many bilateral trade flows are missing and have to be estimated, the coverage has substantially improved in comparison with the data used for the 2000 matrix.[6]

9. A sub-matrix for OECD30 can be filled using the OECD Statistics on International Trade in Services. For the missing values of bilateral trade between OECD30 countries, cells can be completed using the relative share of merchandise trade as the corresponding weight (see Annex 2.2 for more details). For a few countries it appears that the sum of bilateral trade flows of services is well out of line with the

5. COMTRADE data are however used to take into account the role of Hong Kong as a shipping port (see below). Also data for Luxembourg and Chinese Taipei are taken from other sources.

6. Twelve OECD countries now have a complete breakdown of trade series (Austria, Denmark, France, Hungary, Ireland, Italy, Luxembourg, Netherlands, Poland, Portugal, Sweden and the United Kingdom) and seven others an almost complete breakdown (Australia, Belgium, Canada, Czech Republic, Finland, Japan and Norway).

total exports or imports obtained from MEI or national sources.[7] In these cases, further adjustments have to be made to obtain a row/column of the matrix coherent with aggregate series (see Annex 2.2). In addition, the same database is used to complete China's trade flows with OECD30, as a relatively complete set of mirror series for China is available. Missing values are completed as described in Annex 2.2.

10. For the other non-OECD countries and for Chile, Israel and Slovenia, it is not possible to use mirror series given the paucity of data and all bilateral trade flows countries and zones have to be estimated. The weights of merchandise trade have been applied to the matrix of services. Then adjustment to ensure that for each country the sum of reported value is equal total services trade by country is exactly the same as that presented for the goods matrix presented in Annex 2.1.

1.4 Correcting for transhipment via Hong Kong[8]

11. The role of Hong Kong as a shipping port for China and other Asian countries is a source of potential bias. Domestic exports (excluding re-exports) account for less than 5% of Hong Kong's total exports and domestic imports (*i.e.* not meant to be re-exported) account for about a quarter of Hong Kong's total imports. The re-export trade by Hong Kong has three components: shipment of goods to China from partner countries, shipment of Chinese goods to partner countries, and shipment of goods from countries other than China to countries other than China. Trade flows associated with the role of Hong Kong as a shipping port result therefore in an over-estimation of bilateral trade flows between the Dynamic Asia region (in which Hong Kong is included) and the other countries or zones and an under-estimation of bilateral flows between partner countries, and notably between China and other countries. In the absence of a correction, effective exchange rates derived from the trade matrix would also be biased, with the weight of China over-estimated in the effective exchange rate of Hong-Kong and under-estimated for all other countries, while the weight of Hong Kong would be over-estimated in the RMB effective exchange rate and the exchange rate of all other countries.

12. Re-export data are available in COMTRADE by destinations and there is some information provided by the Hong Kong authorities on the re-export by origins. The shipment of goods from countries other than China to countries other than China is very limited and was ignored, so that it is assumed that all re-exports of Hong Kong to countries other than China originated in China. The matrix has therefore been corrected and exports from China to Dynamic Asia and exports from Dynamic Asia to other countries than China have been reduced, and replaced by equivalent direct flows from China to other countries than China. Exports from countries other than China to Dynamic Asia and from Dynamic Asia to China were reduced and replaced by a flow from these countries to China. An 8 % export margin for re-exports from China to the rest of the world and a 32% export margin for re-exports from the rest of the world to China are assumed based on Wang *et al.* (2007). These changes to the matrix result in a lowering of the weight of Dynamic Asia as a trade partner of all countries. In the case of China, after the adjustment it represents only 12 % of exports and 26 % of imports (compared to 23 % and 37% before the adjustment respectively).

7. This concerns Mexico, the Netherlands, Switzerland and Turkey. The sum of bilateral trade in services for the United Kingdom also exceeds the aggregate number found in the balance of payments by a large amount, particularly on the import side. This discrepancy might reflect a different treatment of financial services.

8. This correction is not done for other countries with important shipping and re-export activity either because at the world level this activity remains negligible or because the data on bilateral re-exports necessary to do the correction is not available.

2. Keys trends since 2000

13. The evolution of the trade matrix between the 2000 and the 2005 matrices reflects recent trends in globalisation. First, the non-OECD share in world trade has increased markedly, from about one-quarter to close to one-third (Table 1). This corresponds to both an increase of trade within non-OECD zones and, to a lesser extent, a rise in trade between OECD and non-OECD countries. The counterpart has mainly been a decrease in NAFTA's share in world trade (Table 2). The loss of NAFTA's market share is observed on both the export and import side. The weight of the OECD Asia Pacific zone in world trade has also shrunk, but less markedly than the weight of NAFTA, while the weight of European countries has slightly increased. The increase in the weight of Europe was driven not only by goods by also by a strong increase in the share in world exports of services.

Table 1. The share of OECD and non-OECD countries in world trade of goods and services (2005)

Exporters \ Importers	OECD	Non-OECD	World
OECD	52.9% *(-4.8%)*	15.8% *(1.7%)*	68.6% *(-3.3%)*
Non-OECD	19.1% *(1.9%)*	12.3% *(1.4%)*	31.4% *(3.3%)*
World	72.0% *(-2.9%)*	28.0% *(2.9%)*	100.0%

Note: Changes since 2000 in Italics.

14. At the individual country level, the most important changes have been the rise in the share of China, which has jumped from the eighth rank in world exporters and ninth rank in world importers to the third in both between 2000 and 2005, at the expense mainly of the United States and Japan (Figure 1). Interestingly, the increase in the share of German exports in world exports has not been a matched by corresponding increase in the share of German imports in world imports. More details on the evolution of the breakdown of each country's imports and exports by partner are provided in Annex 3; they show notably the increase in share of Eastern European countries in the trade of Germany, France and Italy at the expense of trade between these three countries.

Table 2. The share of the main zones in world trade of goods and services (2005)

GOODS and SERVICES Matrix

Importers / Exporters	OECD30 Europe		NAFTA		OECD30 Pacific Asia		China		Other non-OECD30[1]		World	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
OECD30 EUROPE	29.4	29.9	5.2	4.7	1.5	1.4	0.5	0.8	5.5	6.9	42.0	43.7
NAFTA	4.3	3.2	9.7	7.4	2.2	1.5	0.4	0.6	3.7	2.8	20.3	15.5
OECD30 Pacific Asia	1.8	1.5	3.2	2.1	1.4	1.3	1.0	1.7	3.6	3.0	11.0	9.5
China	0.9	1.5	1.2	2.5	1.0	1.3	0.0	0.0	0.6	2.1	3.7	7.4
Other non-OECD30[1]	6.1	6.6	5.0	4.1	3.4	3.1	1.4	2.3	7.2	7.8	23.0	24.0
WORLD	**42.5**	**42.7**	**24.2**	**20.7**	**9.5**	**8.6**	**3.2**	**5.3**	**20.5**	**22.7**	**100.0**	**100.0**

GOODS Matrix

Importers / Exporters	OECD30 Europe		NAFTA		OECD30 Pacific Asia		China		Other non-OECD30[1]		World	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
OECD30 EUROPE	29.3	29.7	4.4	3.9	1.3	1.2	0.5	0.8	5.4	6.2	41.0	41.8
NAFTA	3.3	2.3	11.0	8.2	1.9	1.1	0.4	0.6	3.1	2.4	19.7	14.6
OECD30 Pacific Asia	2.0	1.5	3.4	2.1	1.5	1.3	1.2	1.9	3.8	3.0	11.8	9.9
China	1.0	1.7	1.5	3.0	1.1	1.5	0.0	0.0	0.4	2.2	4.0	8.4
Other non-OECD30[1]	6.1	6.7	5.1	4.5	3.4	3.2	1.4	2.5	7.5	8.3	23.6	25.2
WORLD	**41.7**	**42.0**	**25.4**	**21.8**	**9.2**	**8.3**	**3.5**	**5.8**	**20.2**	**22.1**	**100.0**	**100.0**

SERVICES Matrix

Importers / Exporters	OECD30 Europe		NAFTA		OECD30 Pacific Asia		China		Other non-OECD30[1]		World	
	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005	2000	2005
OECD30 EUROPE	29.7	30.6	8.2	7.9	2.1	2.3	0.2	0.6	6.0	9.8	46.2	51.2
NAFTA	8.4	6.8	4.7	4.1	3.6	2.9	0.3	0.4	5.8	4.6	22.8	18.8
OECD30 Pacific Asia	1.4	1.3	2.3	1.9	1.2	1.0	0.3	0.6	2.7	3.0	7.9	7.8
China	0.3	0.5	0.2	0.3	0.5	0.6	0.0	0.0	1.2	1.7	2.2	3.1
Other non-OECD30[1]	5.7	6.2	4.2	2.3	3.4	2.7	1.4	1.8	6.3	6.1	21.0	19.1
WORLD	**45.5**	**45.3**	**19.6**	**16.5**	**10.7**	**9.5**	**2.3**	**3.4**	**22.0**	**25.3**	**100.0**	**100.0**

1. Includes Chile, Israel, and Slovenia.

Source: OECD calculation.

Figure 1. Evolution of the share of individual countries in world trade

In percentage

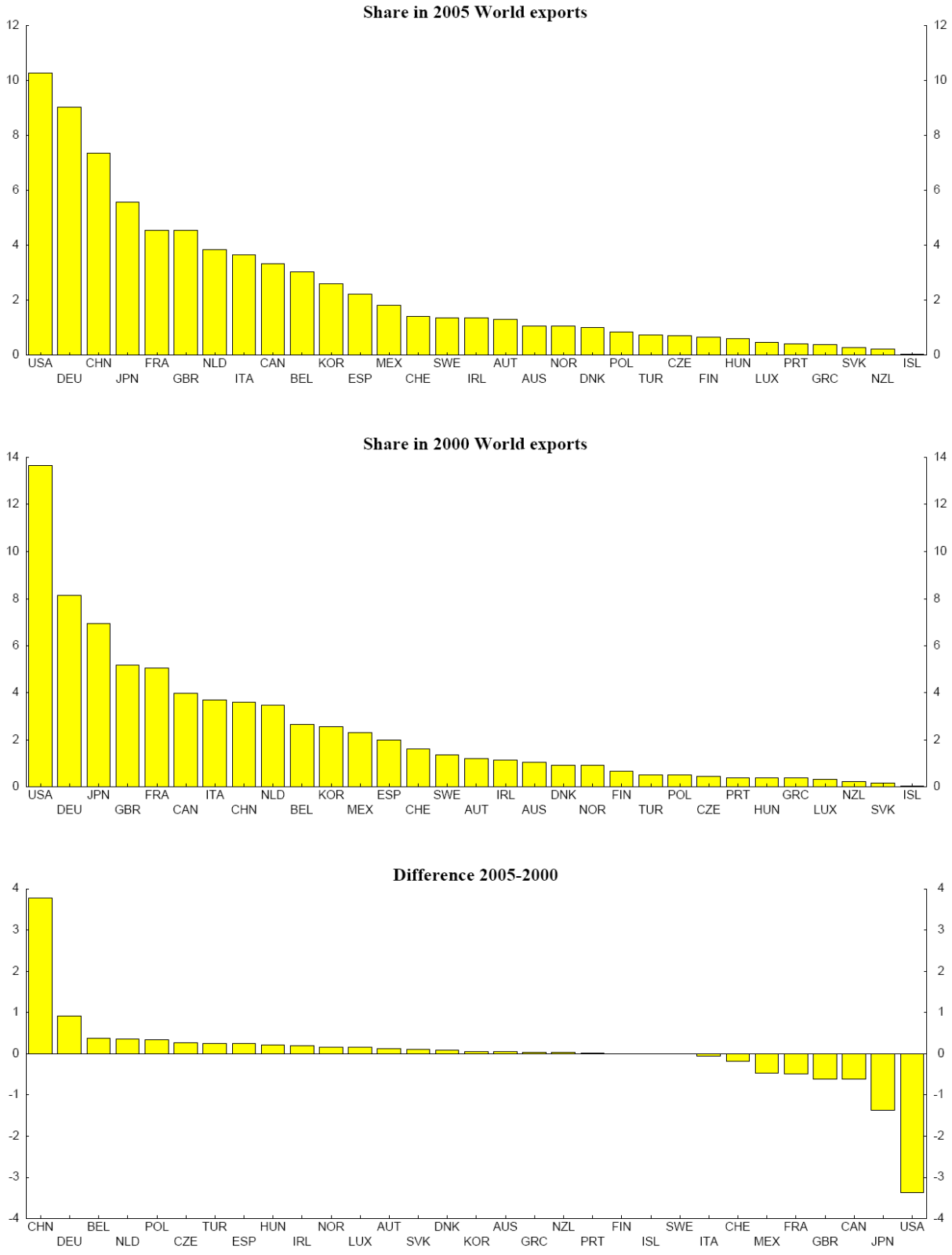
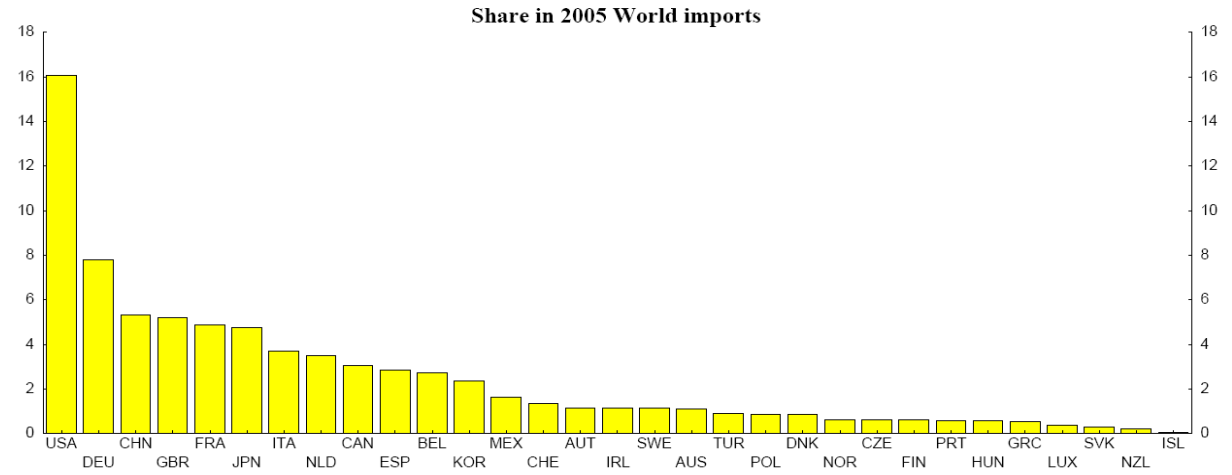
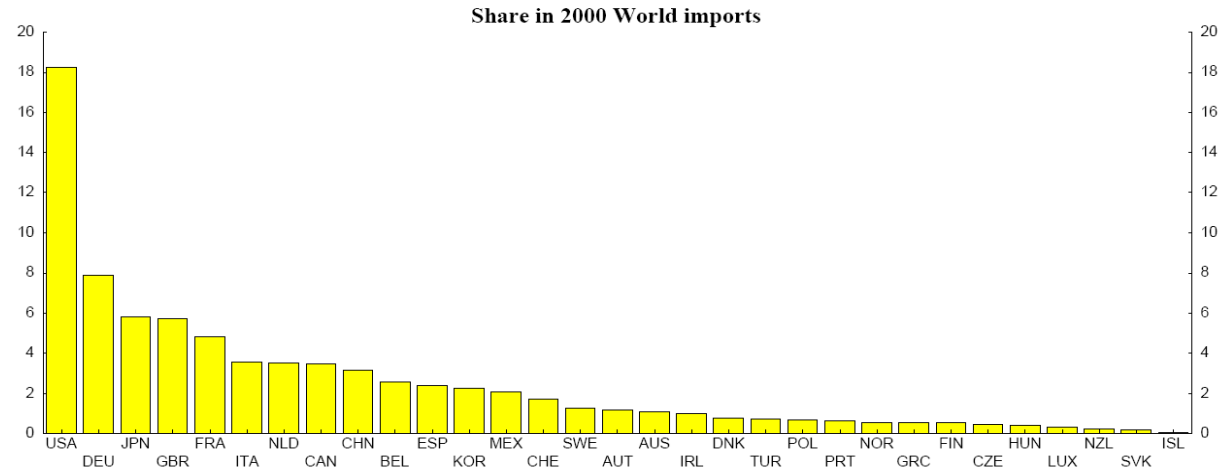
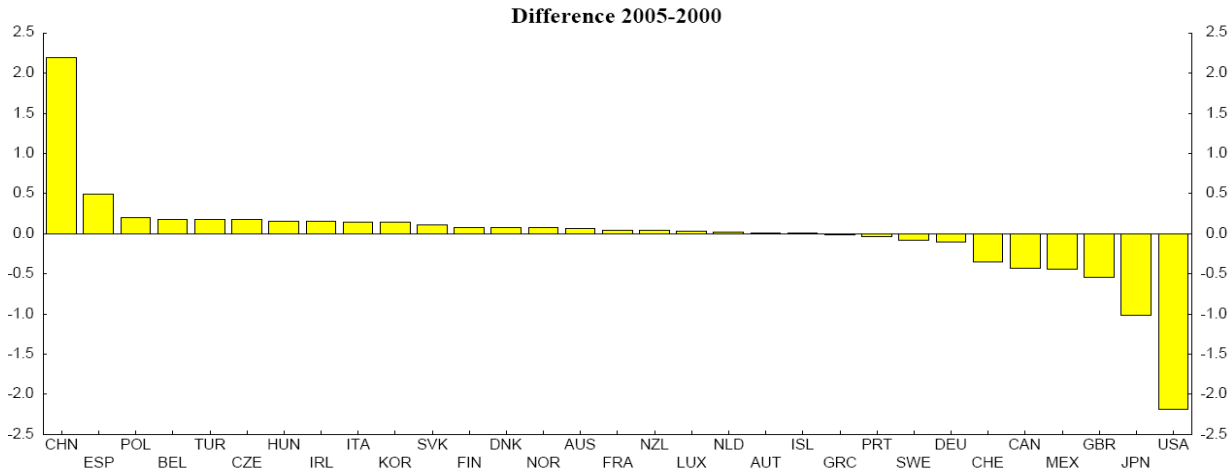


Figure 1. Evolution of the share of individual countries in world trade (cont'd)





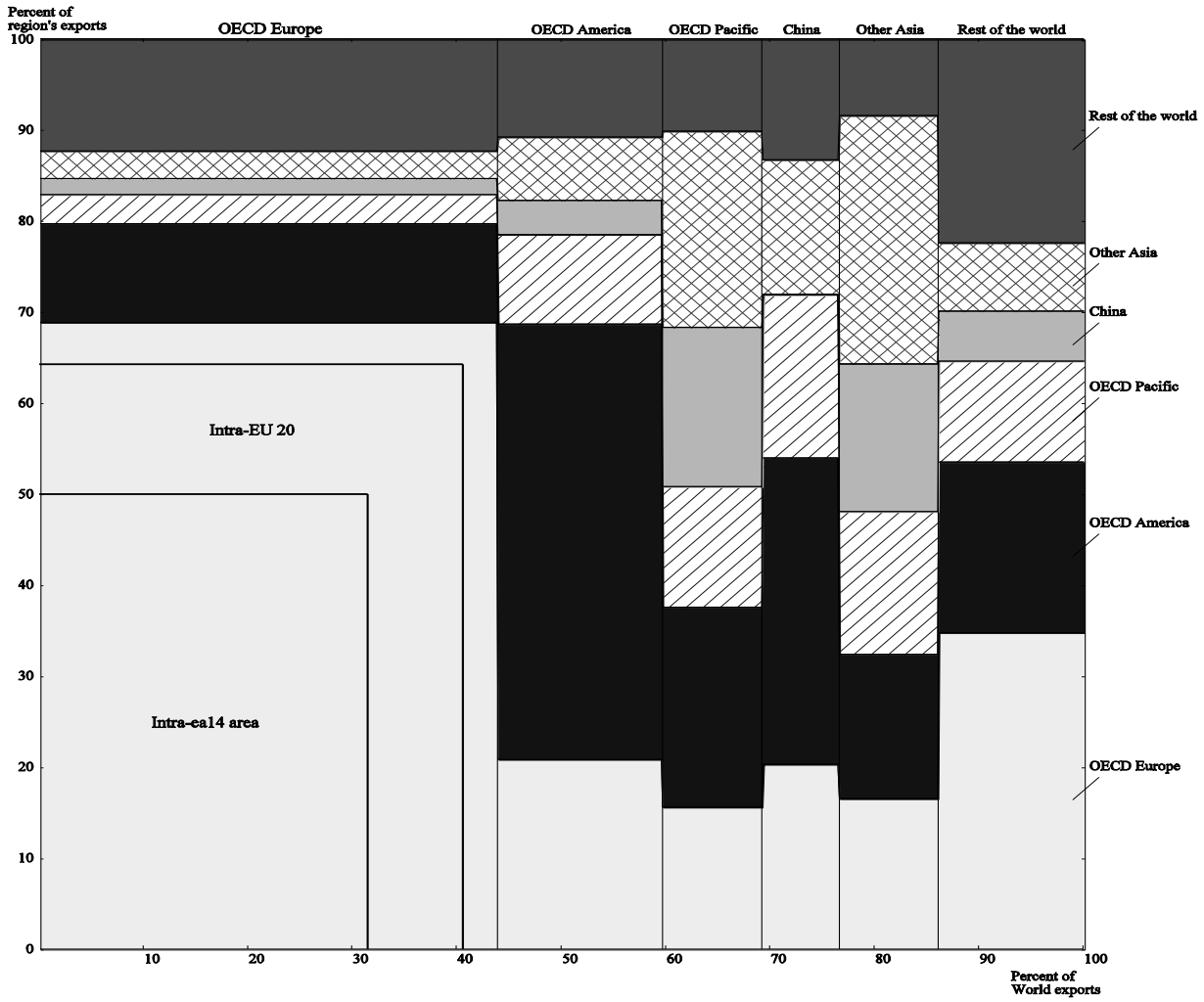


Source: OECD calculations.

15. Most of the trade of the OECD countries remains within the OECD, with about three-quarters of the OECD imports from the OECD and a bit more of exports going to OECD partners (Figure 1). Intra OECD trade accounts for a bit more than half of world trade. A third of world trade flows are between the OECD countries and non-OECD countries, with Asia (China and dynamic Asian Economies) the main economic partner area of the OECD and accounting for 13.6% of the OECD total imports (close to half the OECD imports from non-OECD countries) and 10.9% of its exports (again close half the OECD exports outside the OECD). Trade flows between non-OECD countries account for less than 15% of world trade flows.

Figure 2. Shares in world goods and services trade

Main world regions trade as per cent of world trade



Source: OECD calculations.

3 The main characteristics of the multilateral structure of trade

16. A more detailed decomposition of each country's trade partners is provided in Figures 3.1 to 3.46 which include all the 45 countries/zones covered in the 2005 trade matrix as well as the euro area OECD members. For instance for the United States (Figure 3.1), the two upper bar charts provide an indication of the sensitivity of each country's exports to a change in US import demand: the first one ranks countries according to the absolute size of US demand for their exports, whereas the second one ranks countries according to the relative importance of US demand for their exports. Thus, bar chart (a) shows that Canada, China, Mexico and Dynamic Asia together account for just under half of US imports, while in relative terms the second bar chart (b) shows that the United States is especially important as an export market for both Canada and Mexico, accounting for more than three-quarters of these countries' exports. The lower bar chart (c) provides an indication of the most important markets for US exports in absolute terms, whereas the bottom bar chart (d) shows those countries which are most reliant on US exports in relation to their total imports. China's imports come mainly from the rest of Asia, the United States and oil producing countries, and it accounts for more than 15% of total exports of its Asian partners (almost a quarter of exports from non OECD dynamic Asian economies) (Figure 3.36). The United States is by far the main export market for China and receives for about one-third of its exports. In addition Figure 3.3 shows the same breakdown for the euro area external trade.

17. The panel (c) of each figure also helps compare the geographical trade diversification of each country, highlighting the extreme cases of Canada and Mexico where more than 80% of exports go to a single partner: the United States. On the other hand German external trade appears among the most diversified with the two main trade partners France and the United States each accounting for only 10% of German exports.

Figure 3.1. Geographical structure of goods and services trade of the United States (USA)

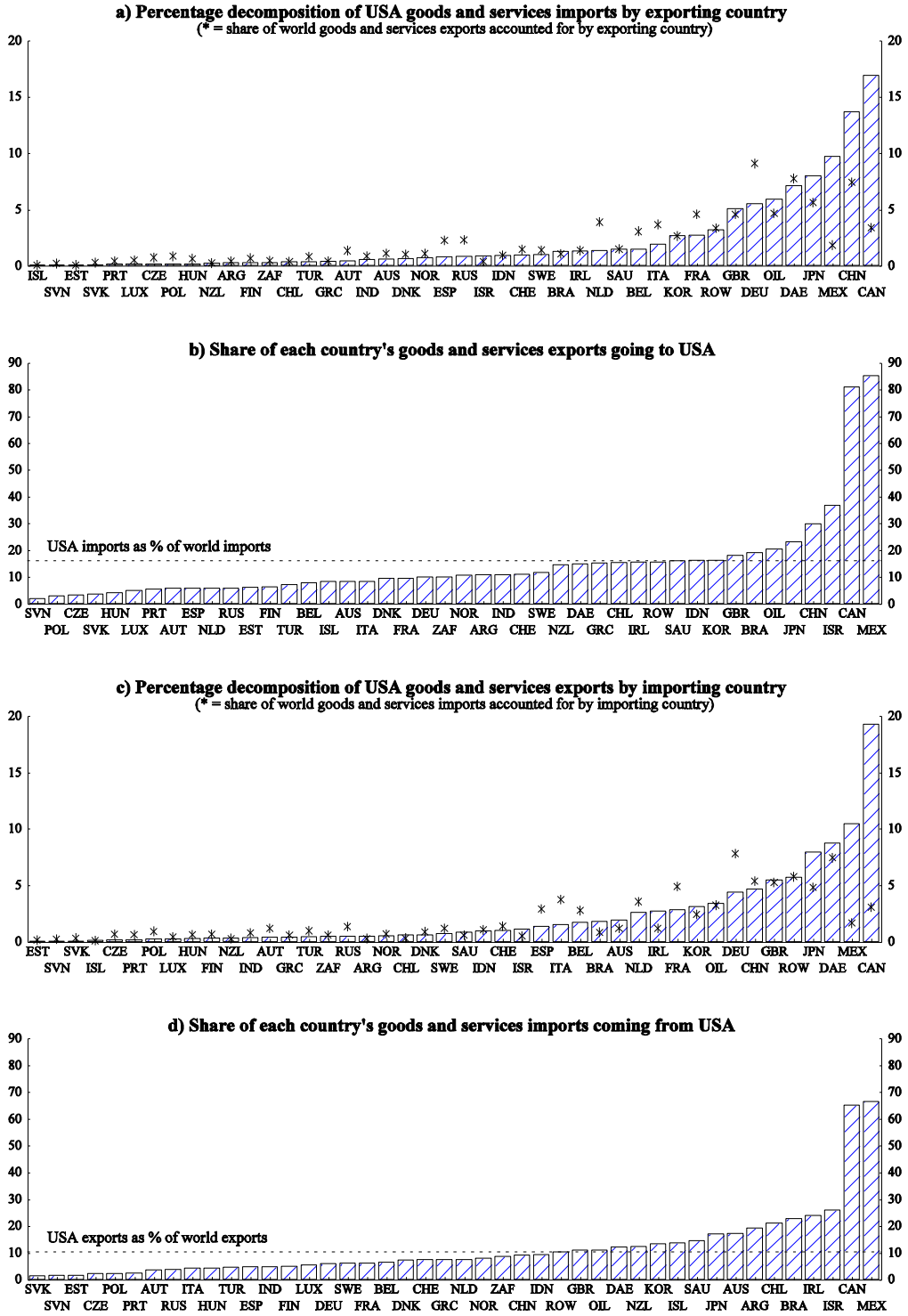


Figure 3.2. Geographical structure of goods and services trade of Japan (JPN)

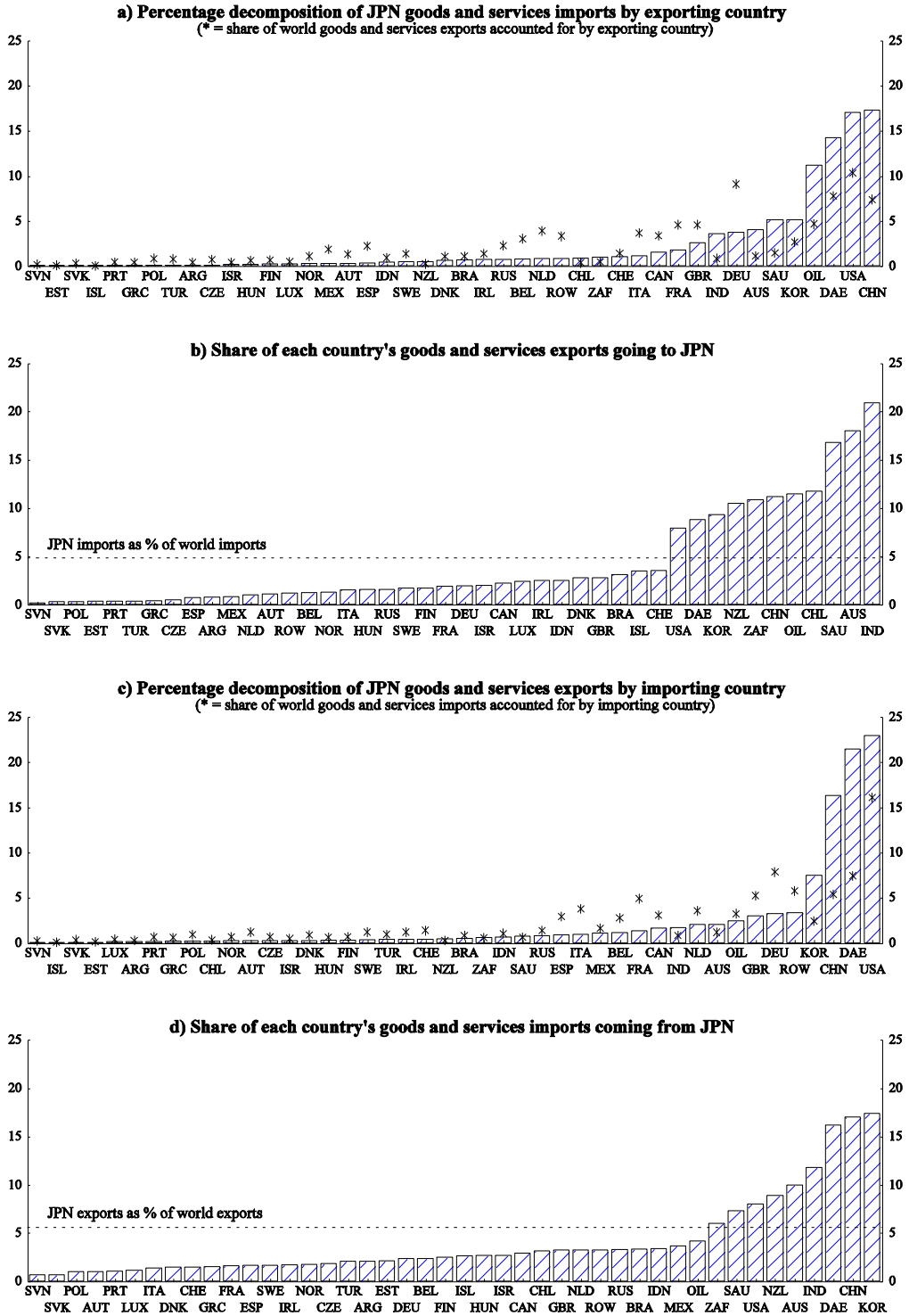
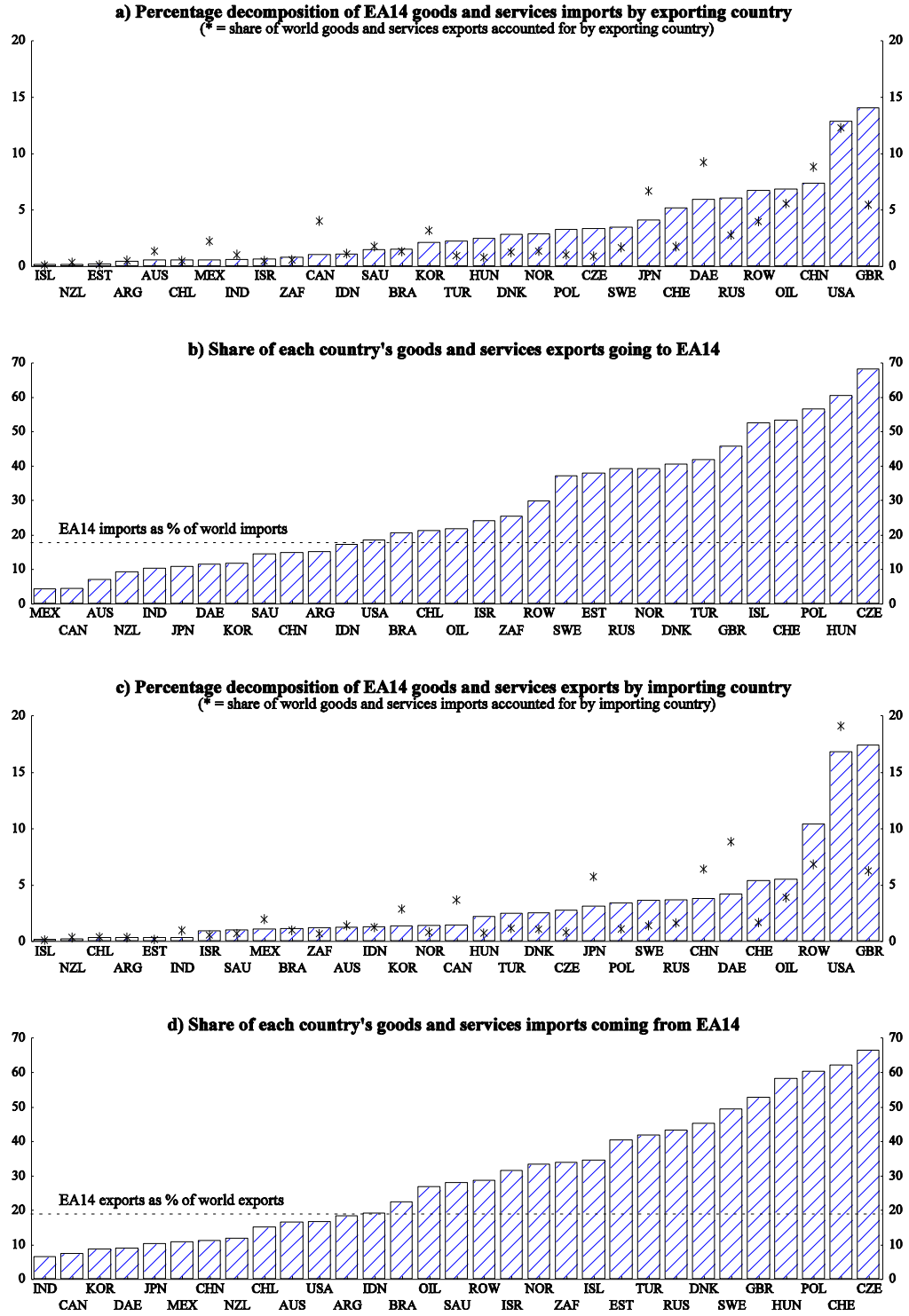


Figure 3.3. Geographical structure of goods and services trade of the Euro Area 14 (EA14), excluding intra-trade (1)



1. On this panel, world trade G&S excludes intra-euro area trade, which is set to zero.

Figure 3.4. Geographical structure of goods and services trade of Germany (DEU)

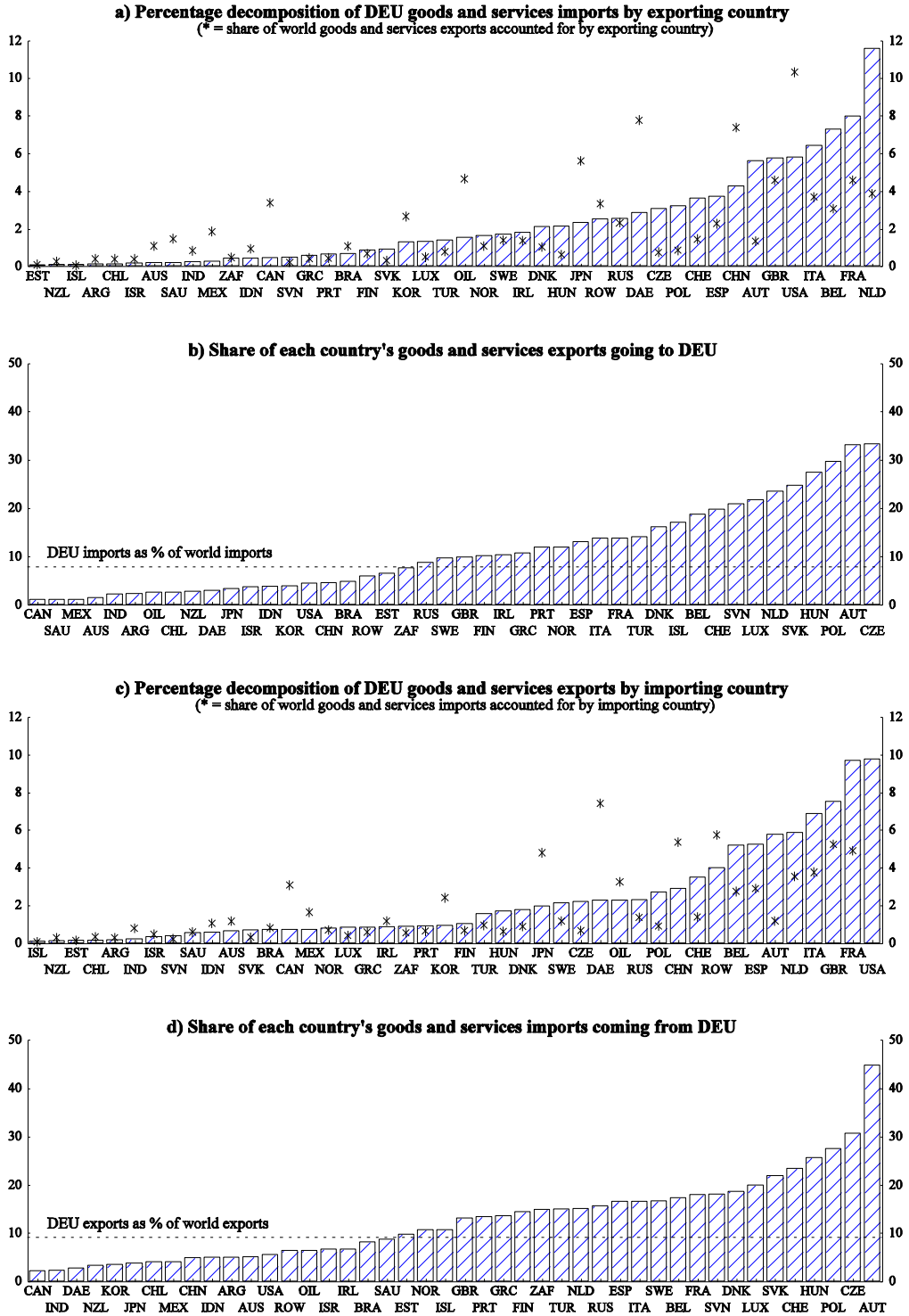


Figure 3.5. Geographical structure of goods and services trade of France (FRA)

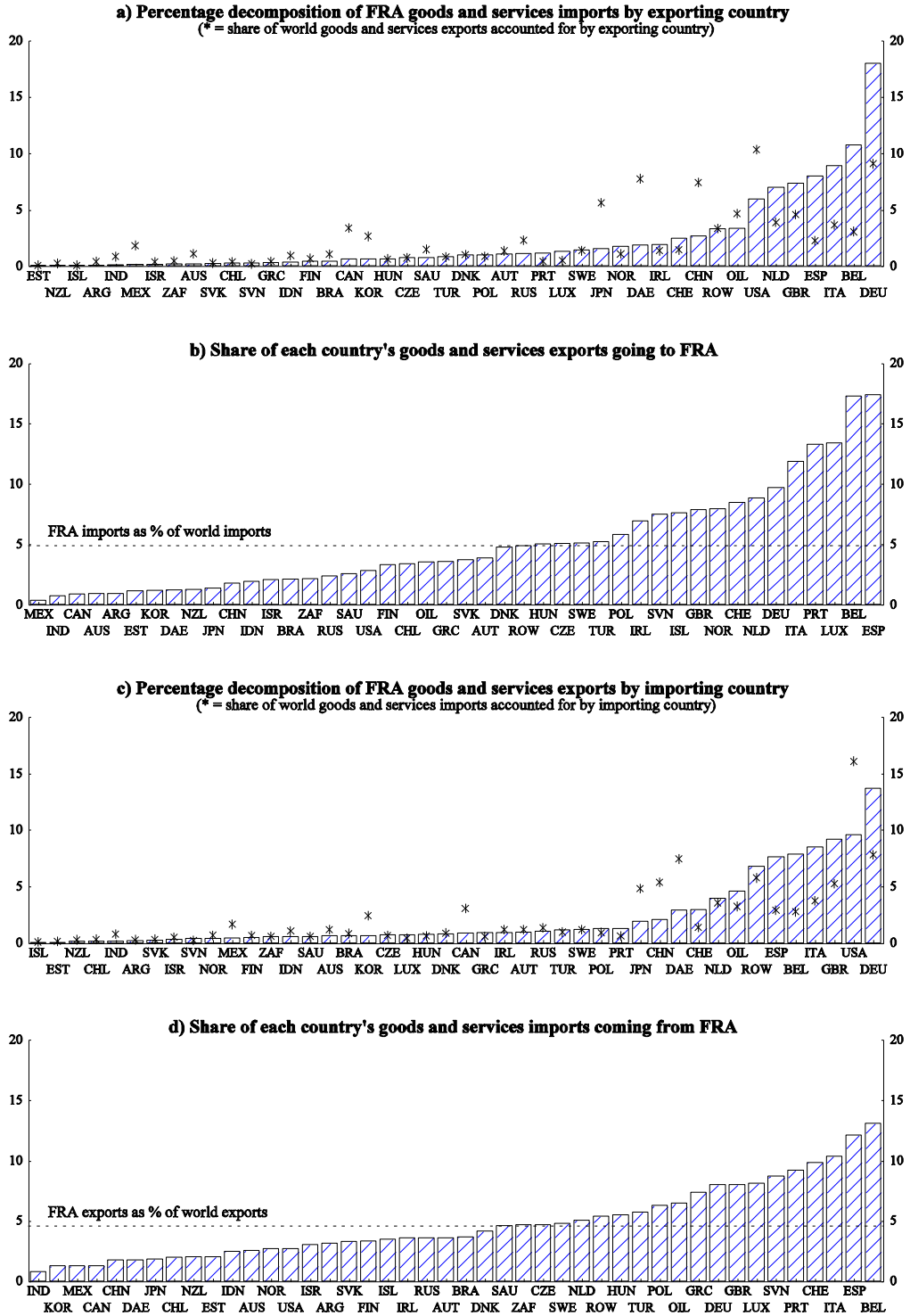


Figure 3.6. Geographical structure of goods and services trade of Italy (ITA)

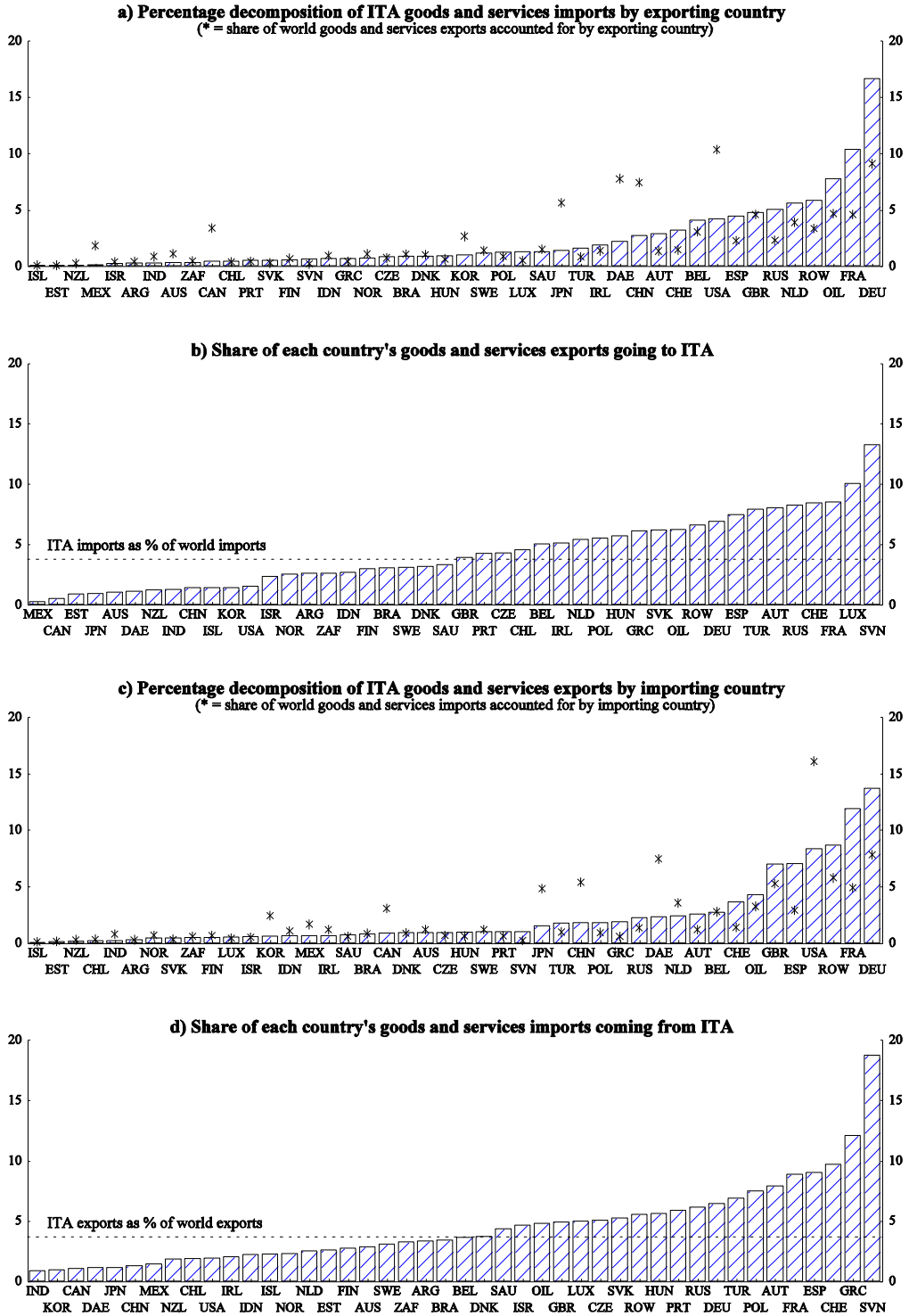


Figure 3.7. Geographical structure of goods and services trade of the United Kingdom (GBR)

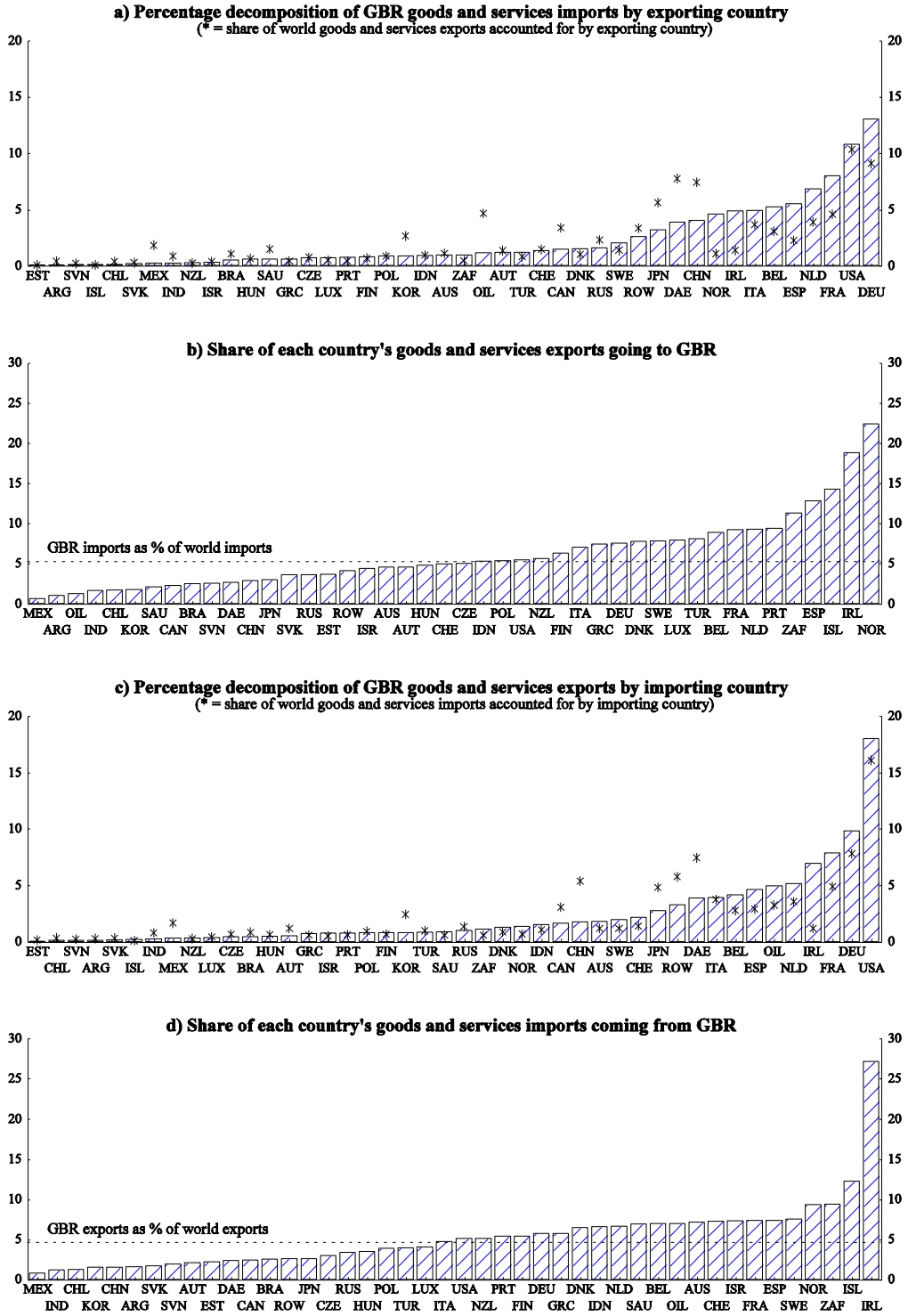


Figure 3.8. Geographical structure of goods and services trade of Canada (CAN)

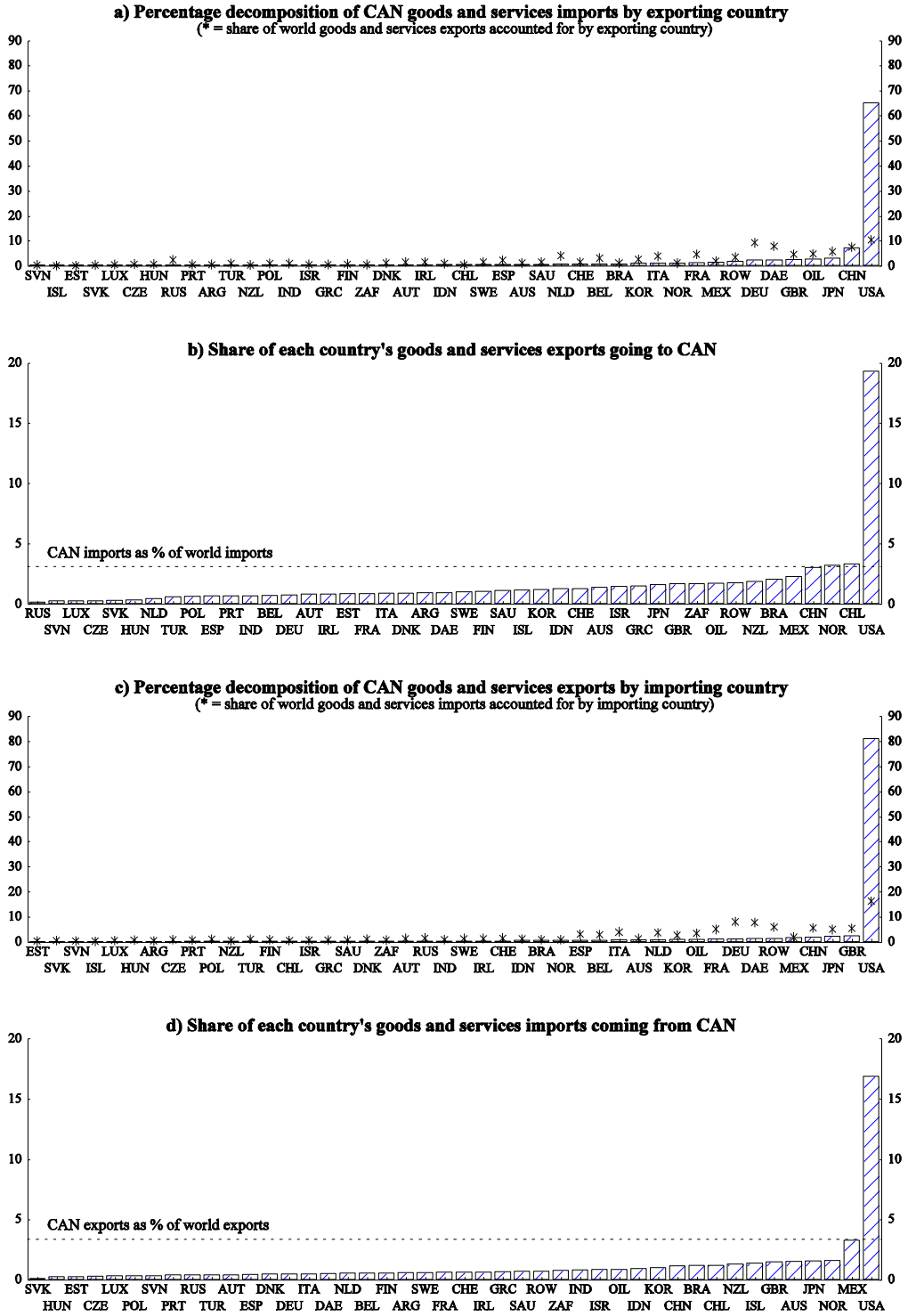


Figure 3.9. Geographical structure of goods and services trade of Australia (AUS)

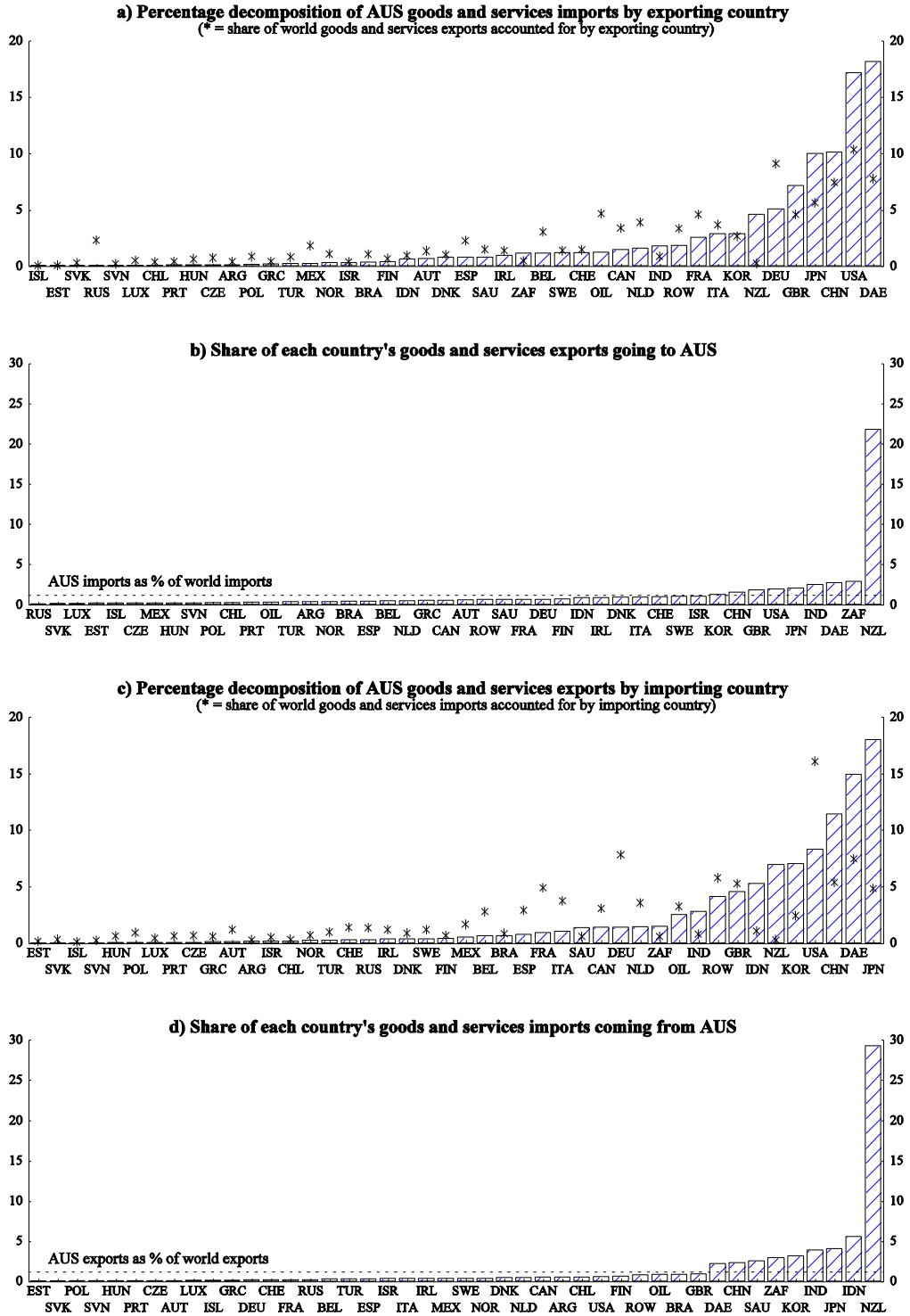


Figure 3.10. Geographical structure of goods and services trade of Austria (AUT)

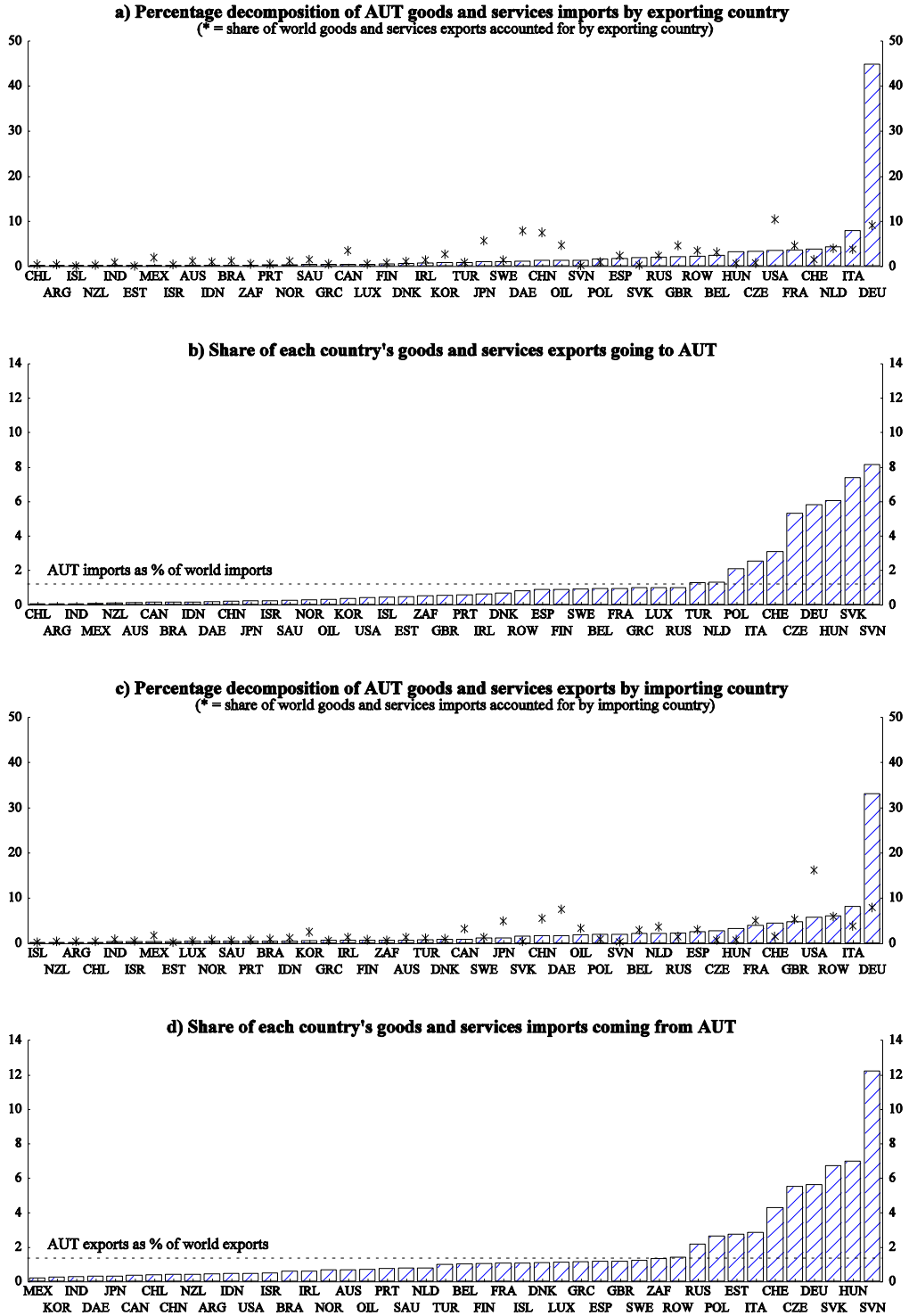


Figure 3.11. Geographical structure of goods and services trade of Belgium (BEL)

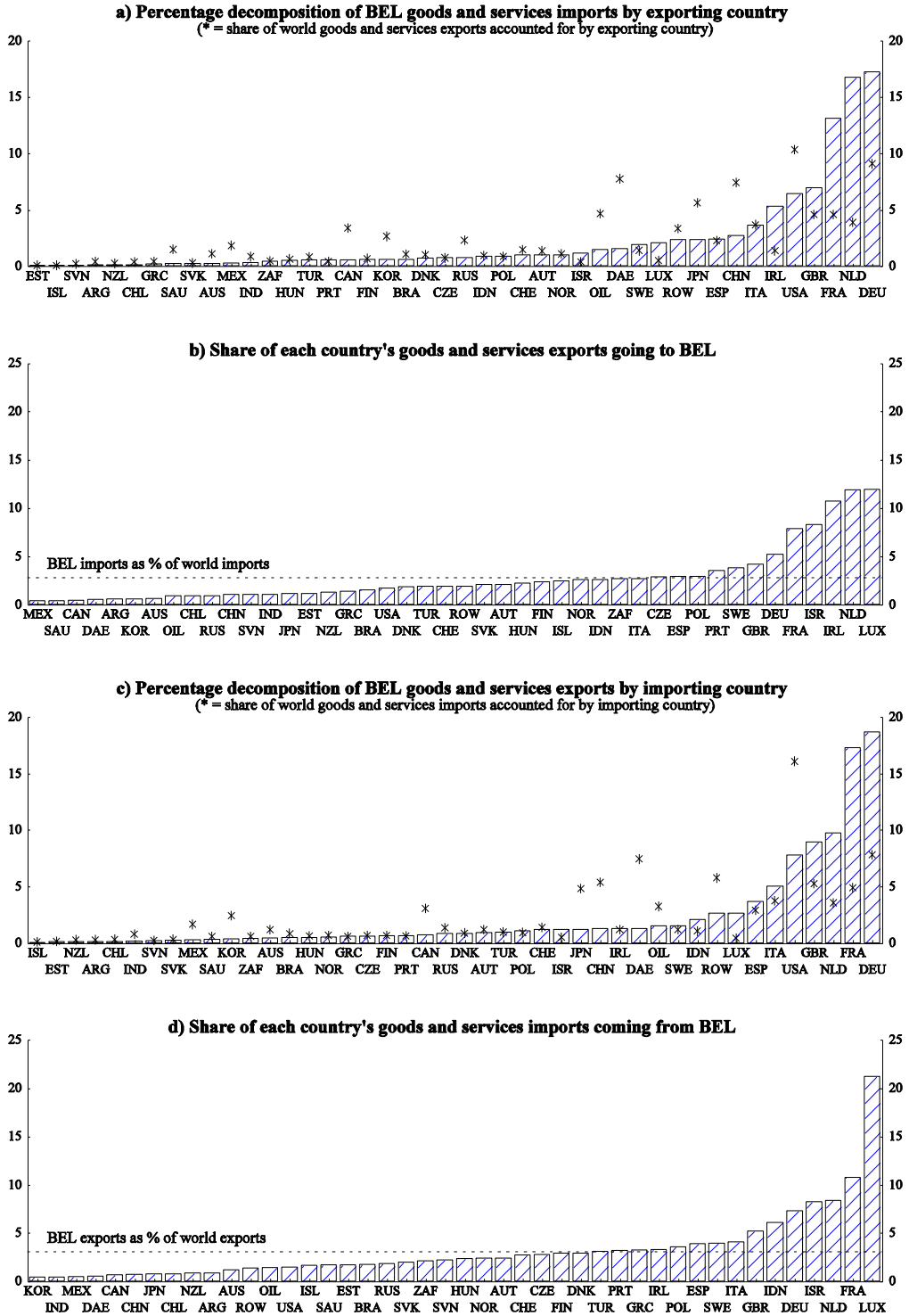


Figure 3.12. Geographical structure of goods and services trade of Chile (CHL)

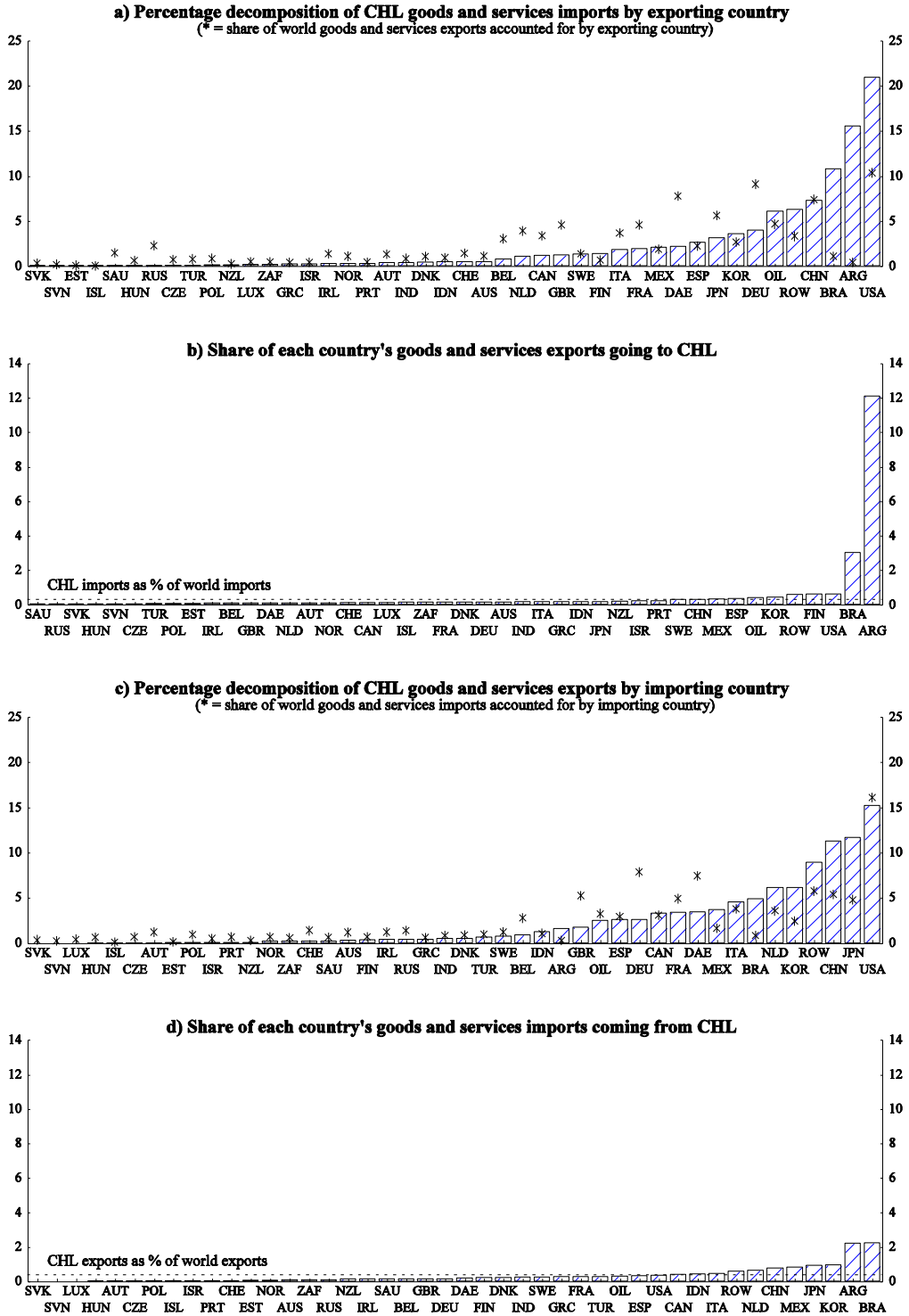


Figure 3.13. Geographical structure of goods and services trade of the Czech Republic (CZE)

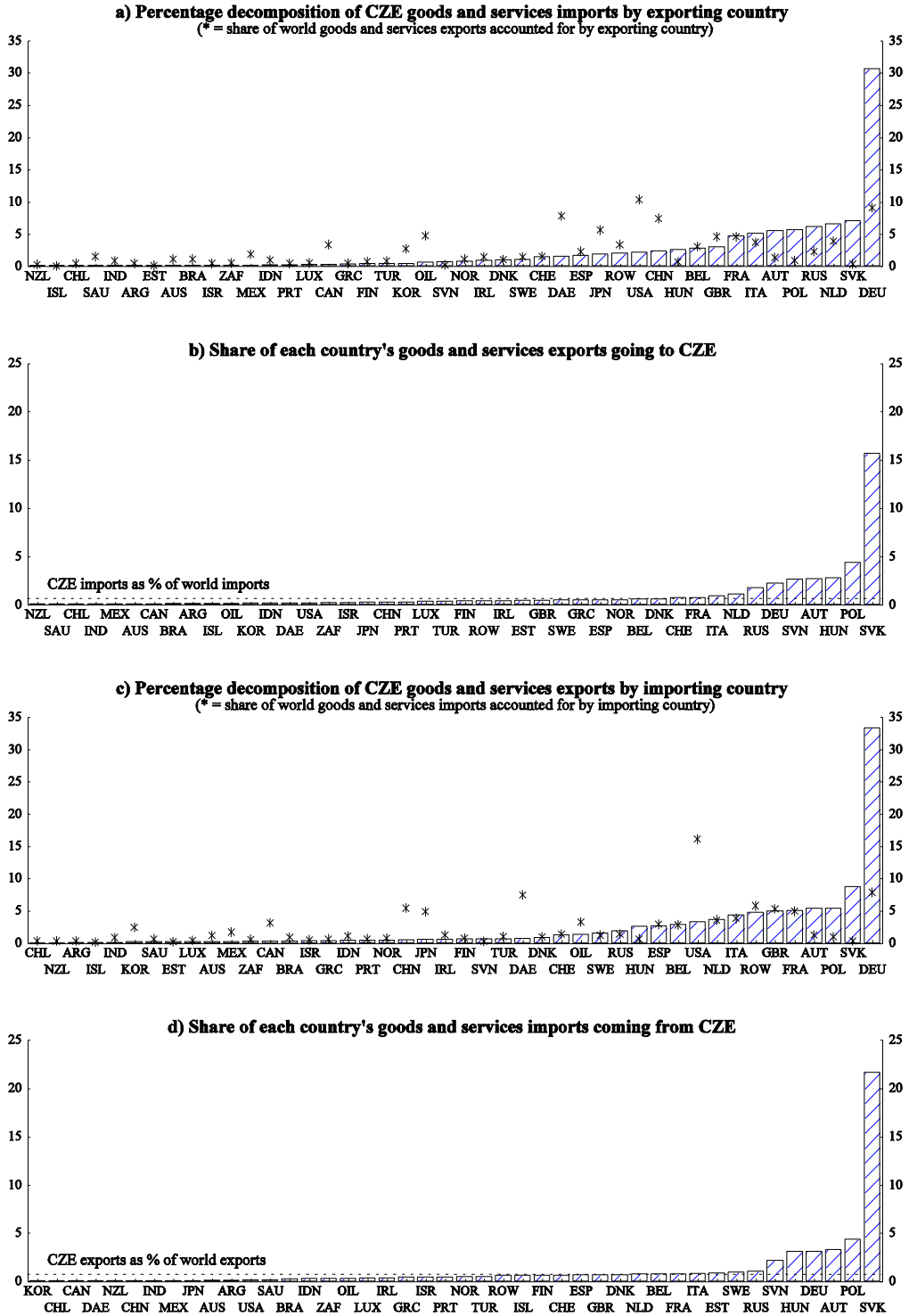


Figure 3.14. Geographical structure of goods and services trade of Denmark (DNK)

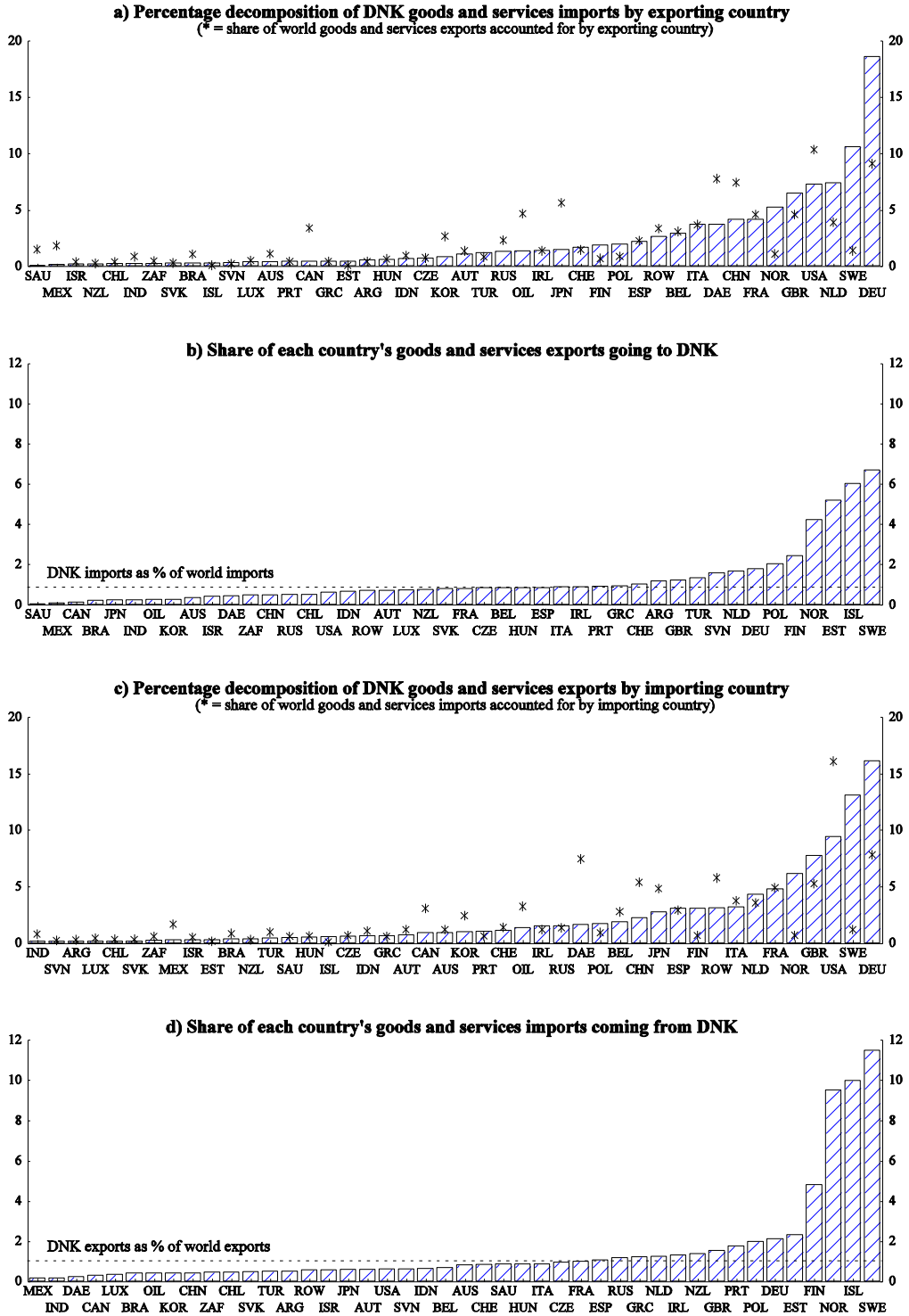


Figure 3.15. Geographical structure of goods and services trade of Finland (FIN)

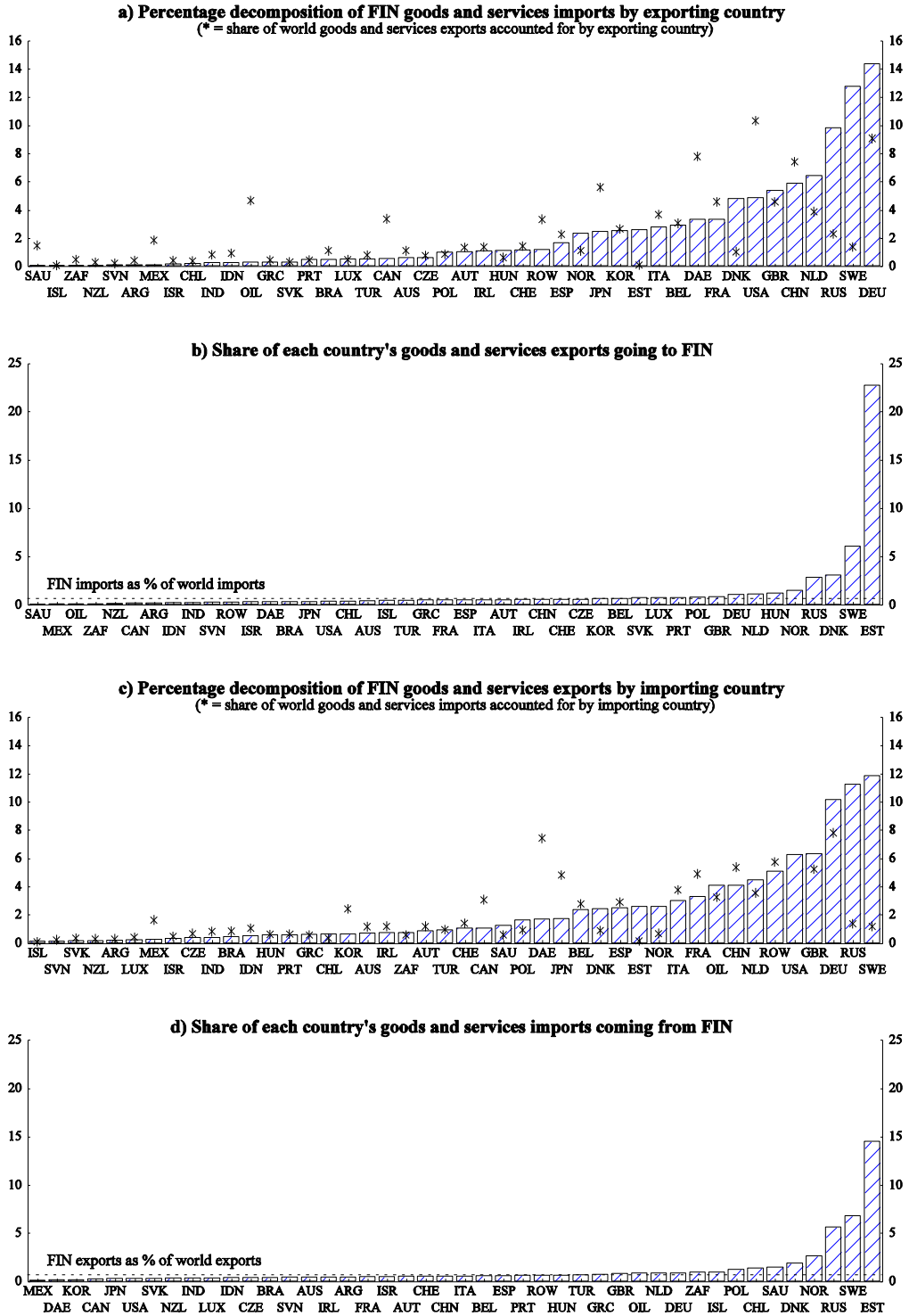


Figure 3.16. Geographical structure of goods and services trade of Greece (GRC)

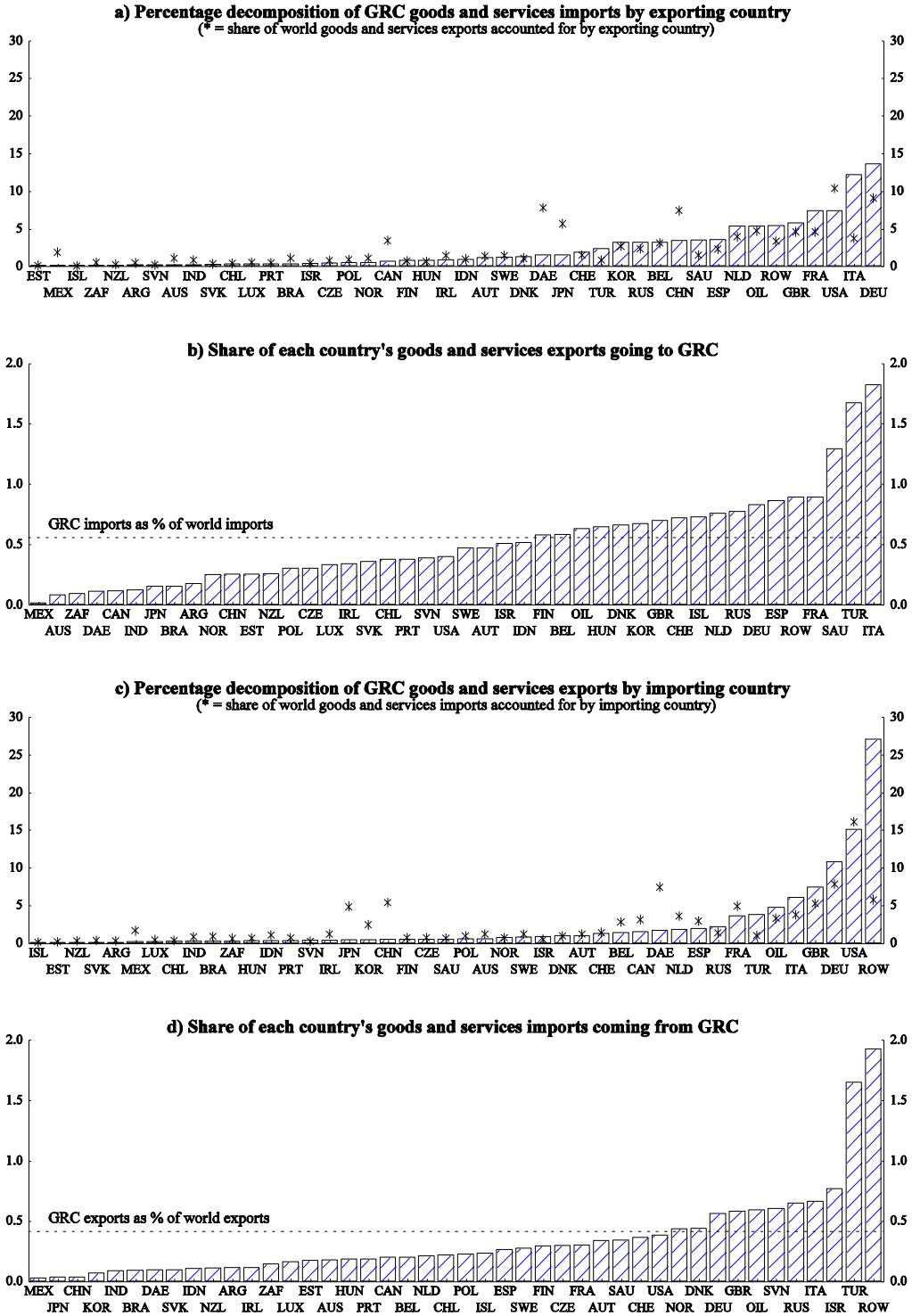


Figure 3.17. Geographical structure of goods and services trade of Hungary (HUN)

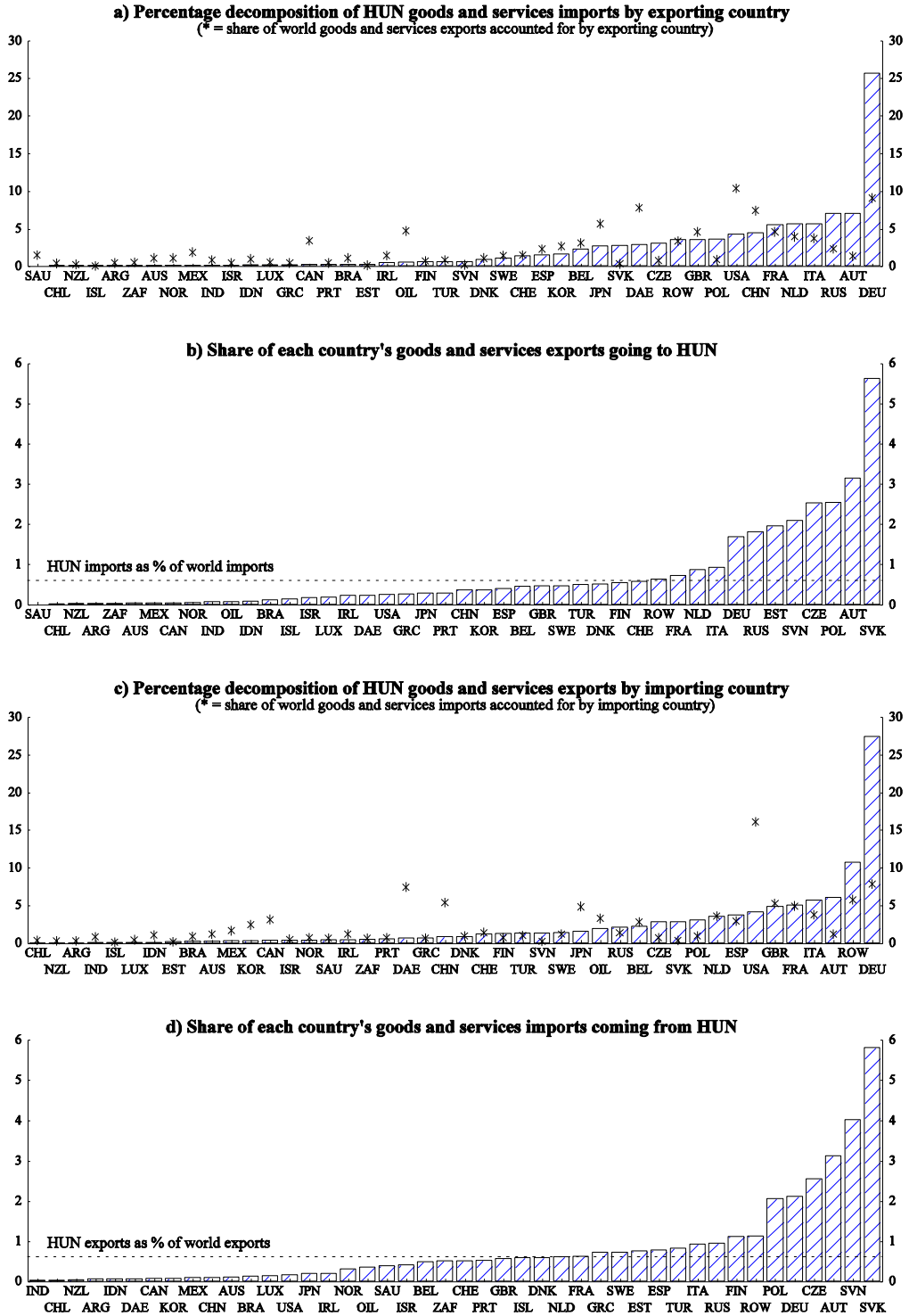


Figure 3.18. Geographical structure of goods and services trade of Iceland (ISL)

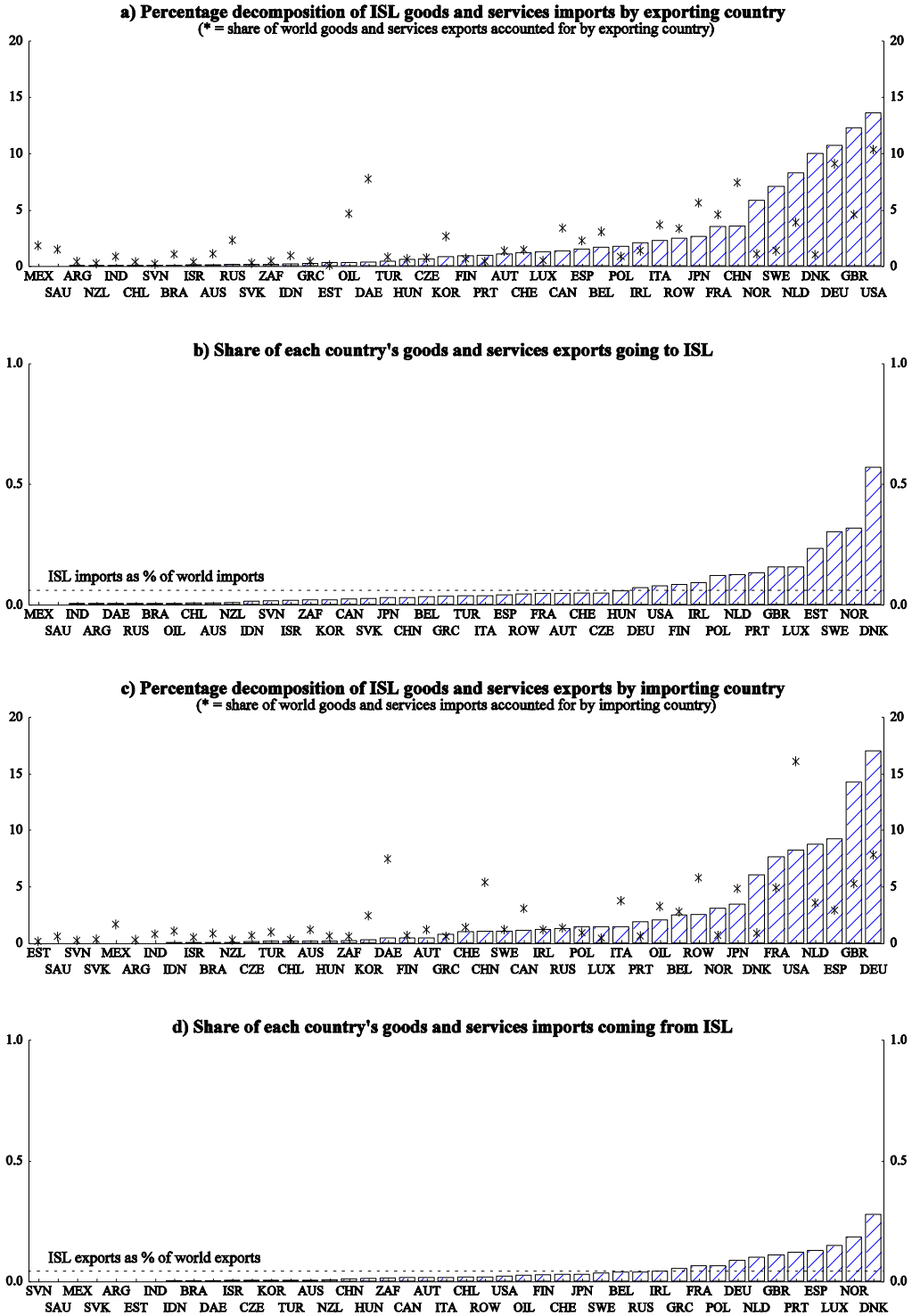


Figure 3.19. Geographical structure of goods and services trade of Ireland (IRL)

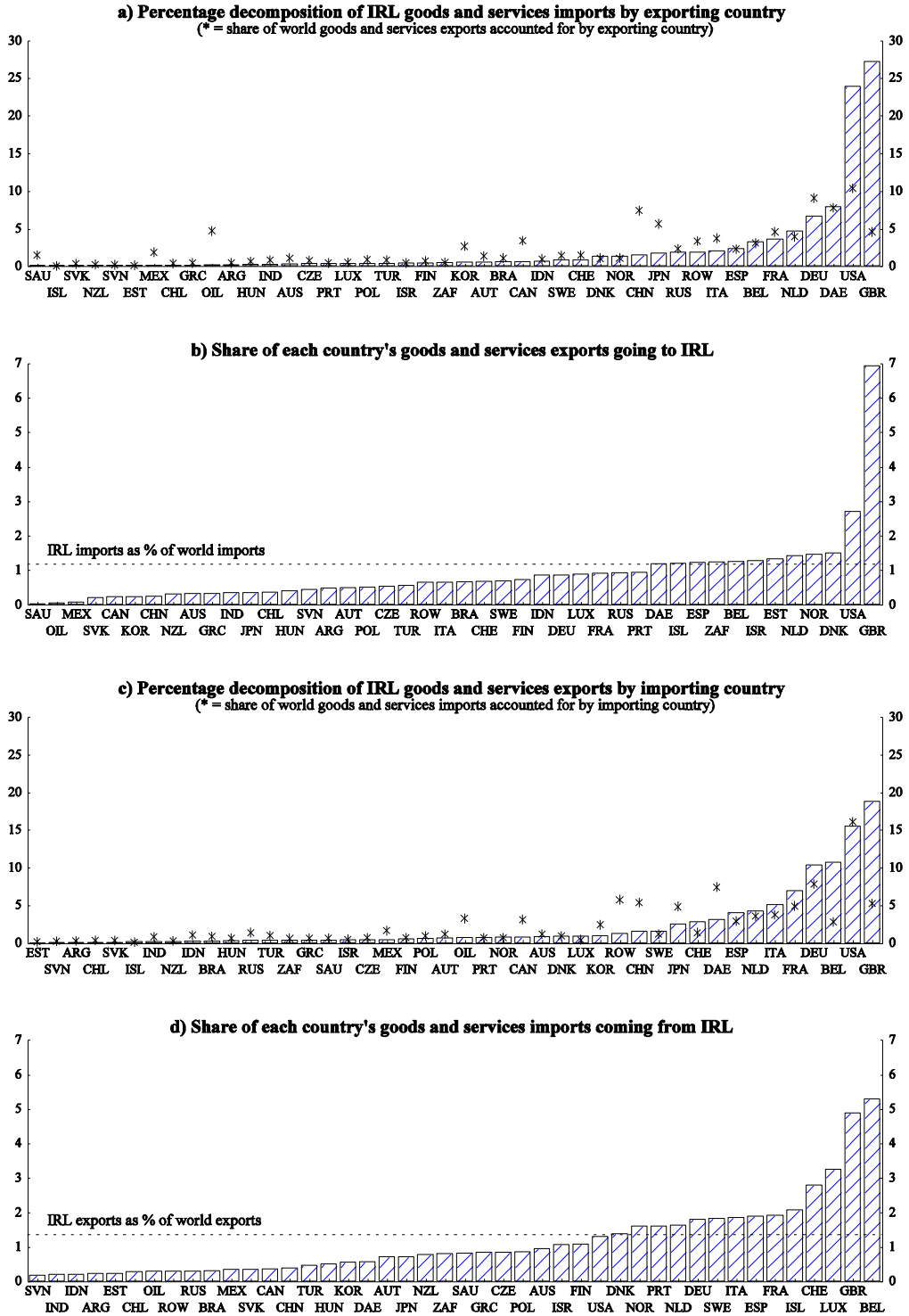


Figure 3.20. Geographical structure of goods and services trade of Korea (KOR)

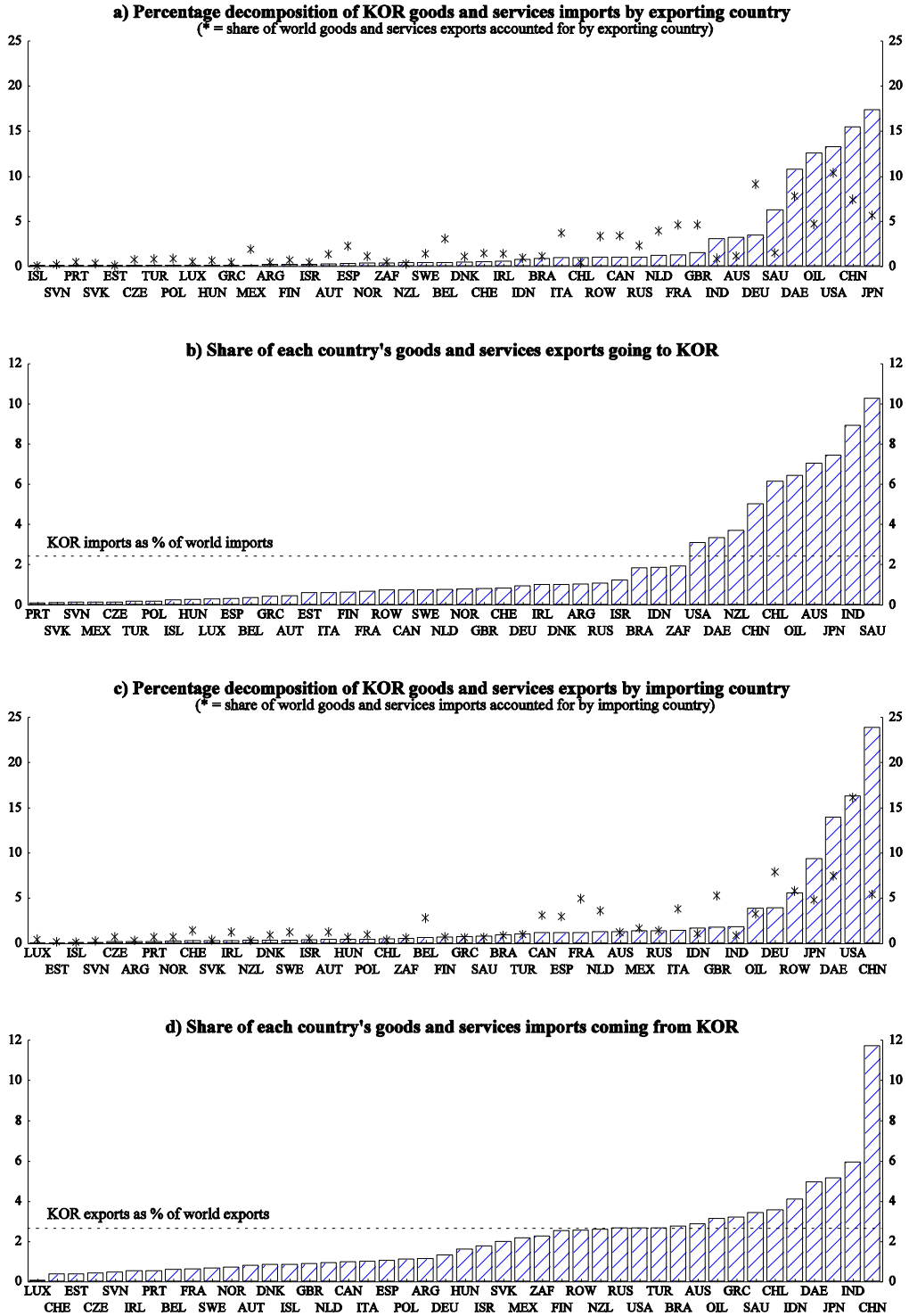


Figure 3.21. Geographical structure of goods and services trade of Luxembourg (LUX)

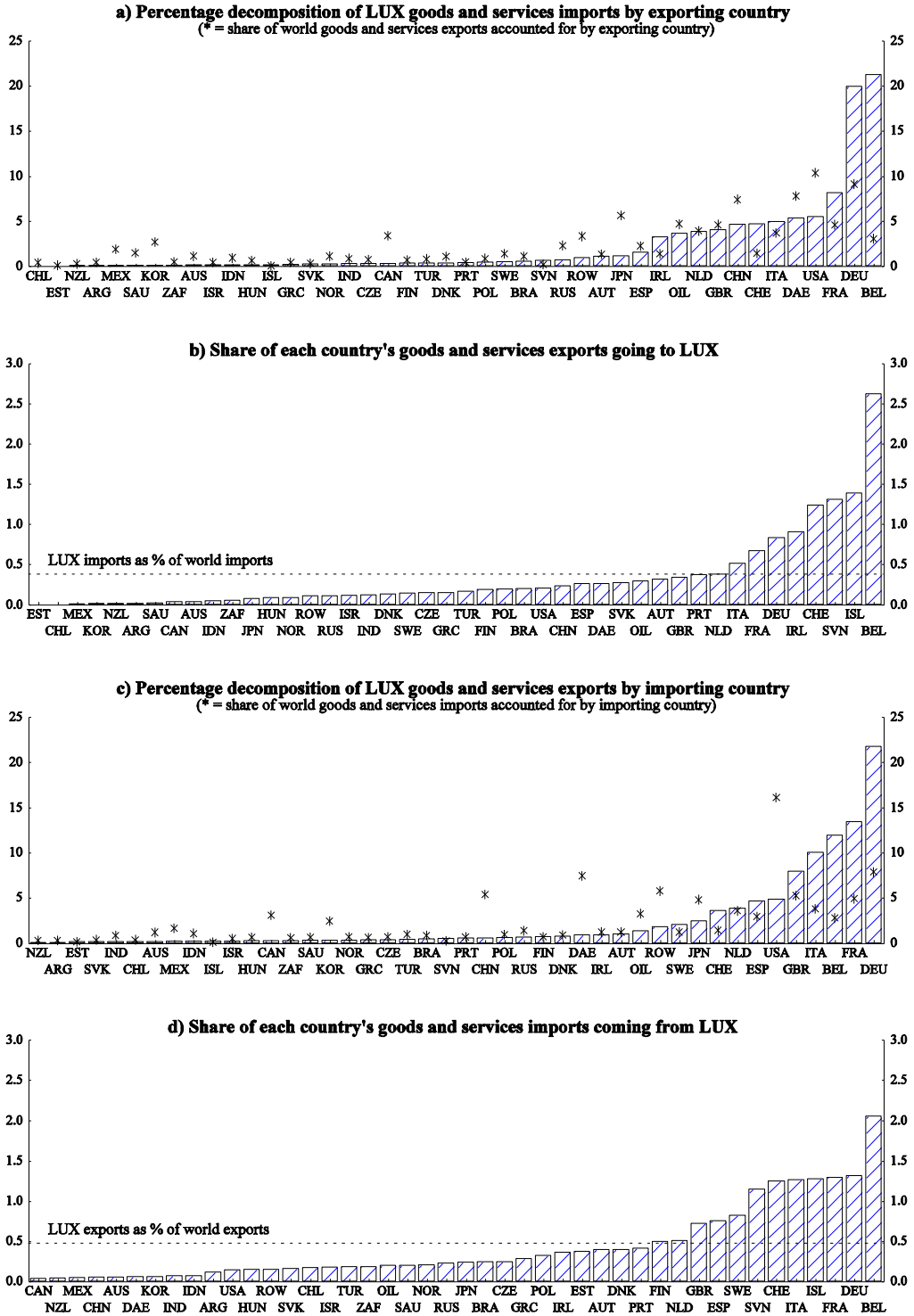


Figure 3.22. Geographical structure of goods and services trade of Mexico (MEX)

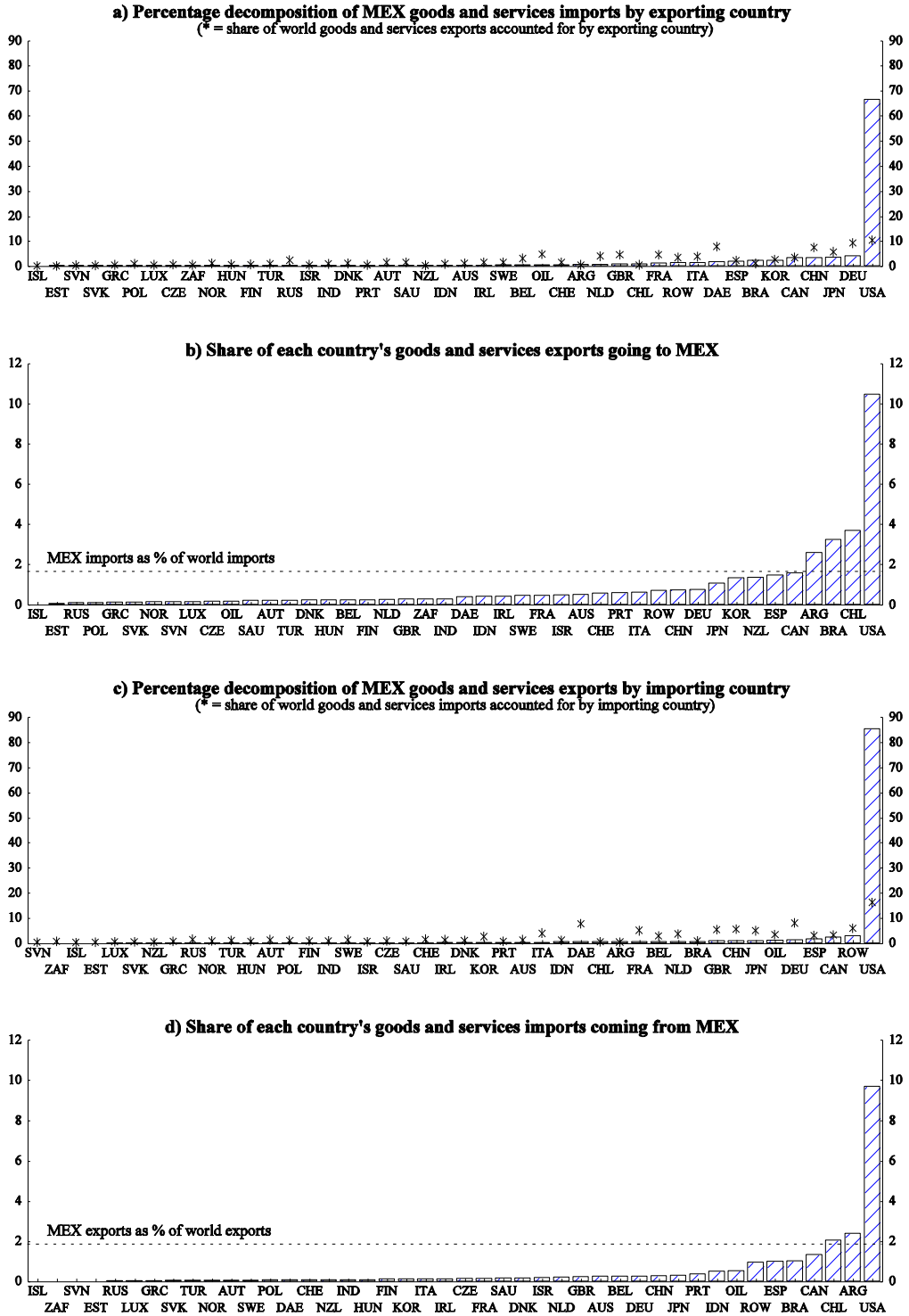


Figure 3.23. Geographical structure of goods and services trade of the Netherlands (NLD)

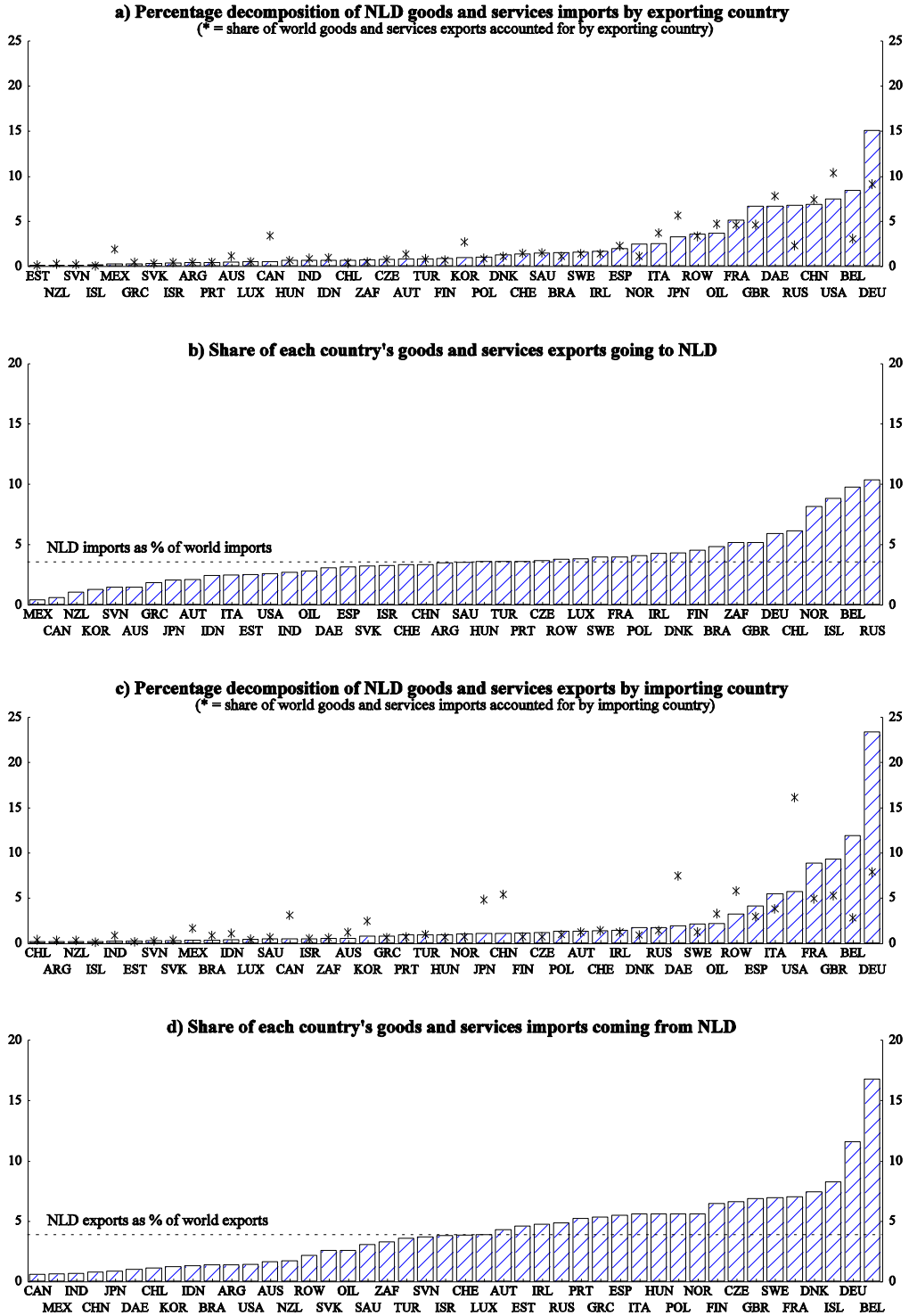


Figure 3.24. Geographical structure of goods and services trade of New Zealand (NZL)

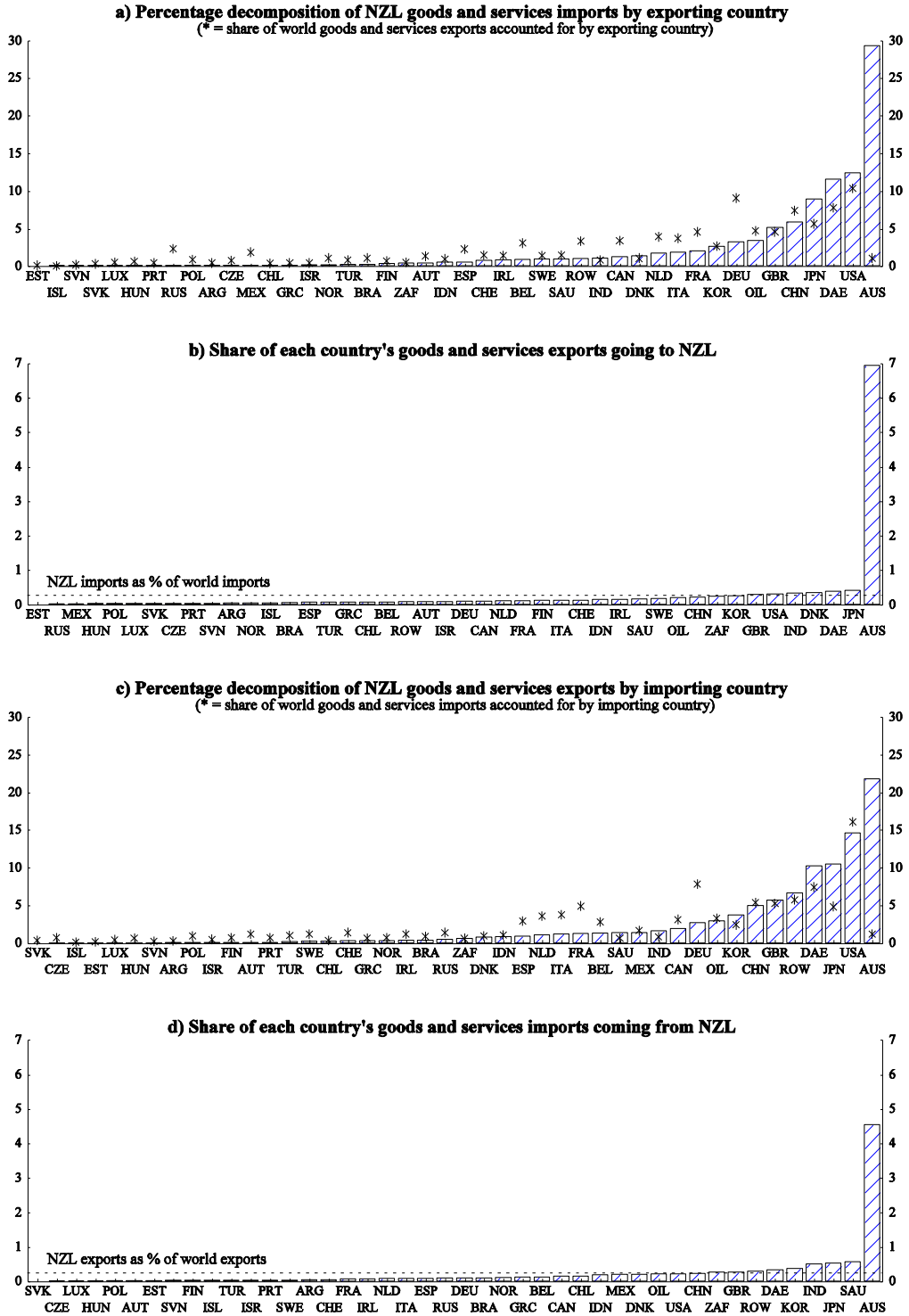


Figure 3.25. Geographical structure of goods and services trade of Norway (NOR)

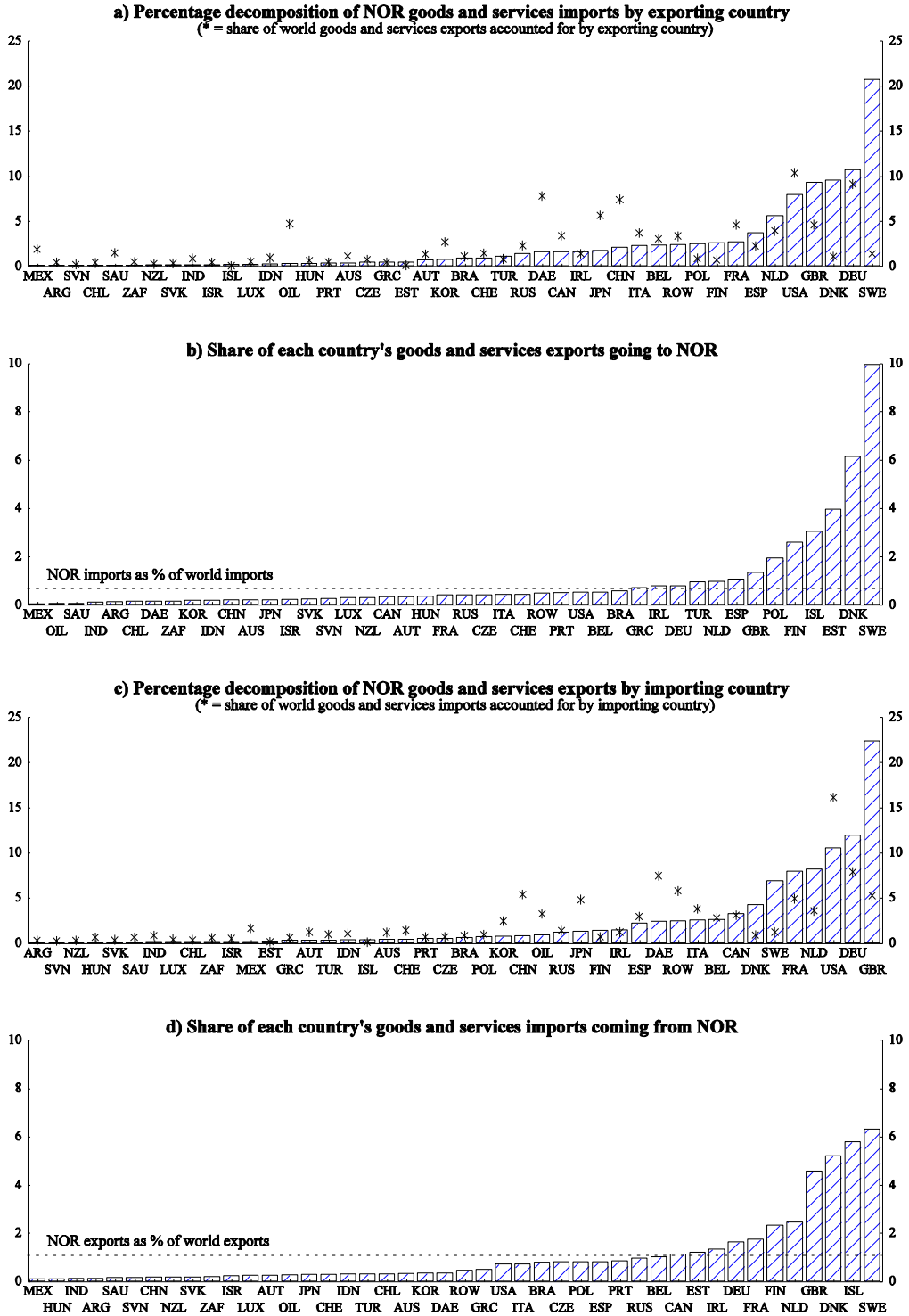


Figure 3.26. Geographical structure of goods and services trade of Poland (POL)

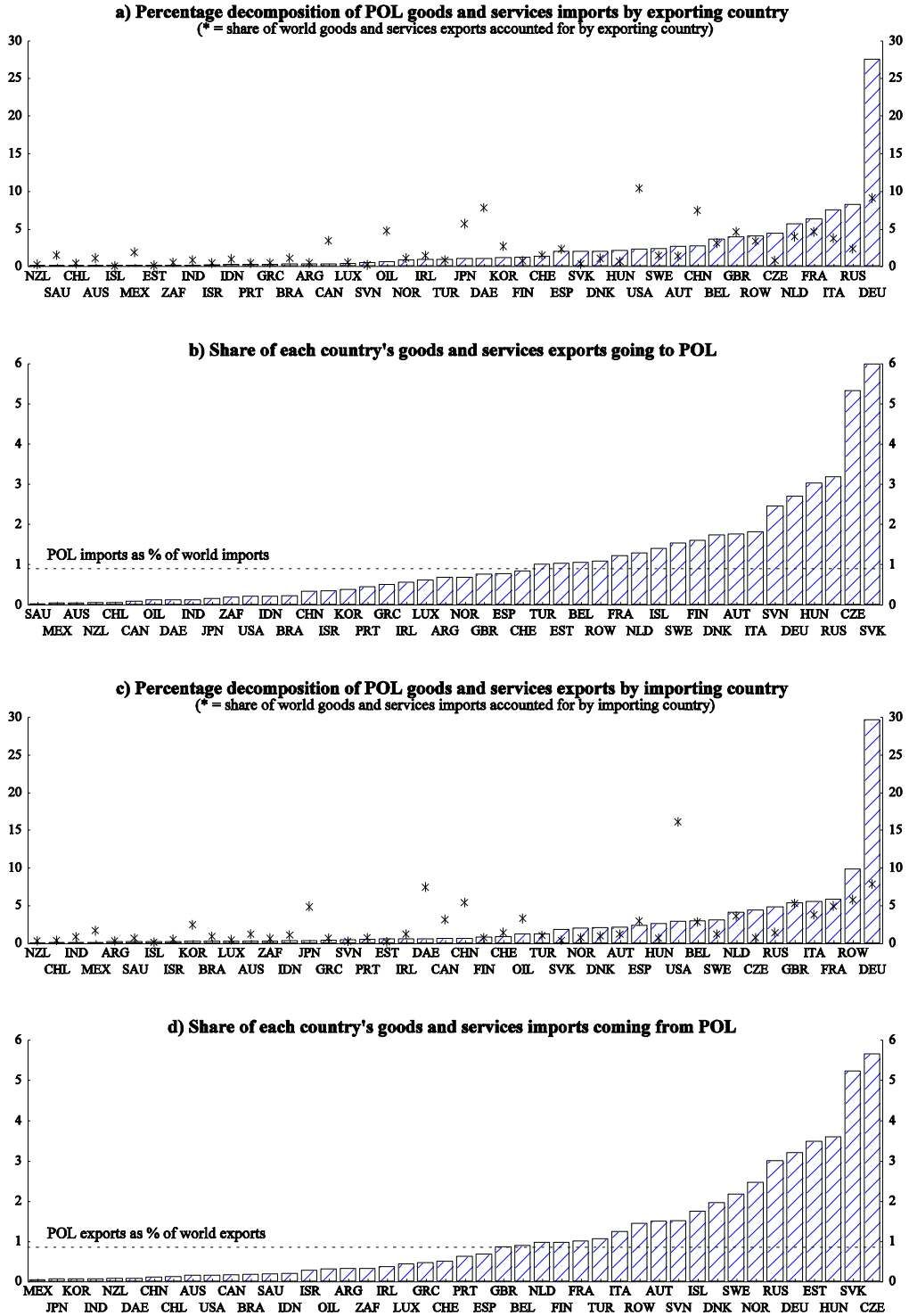


Figure 3.27. Geographical structure of goods and services trade of Portugal (PRT)

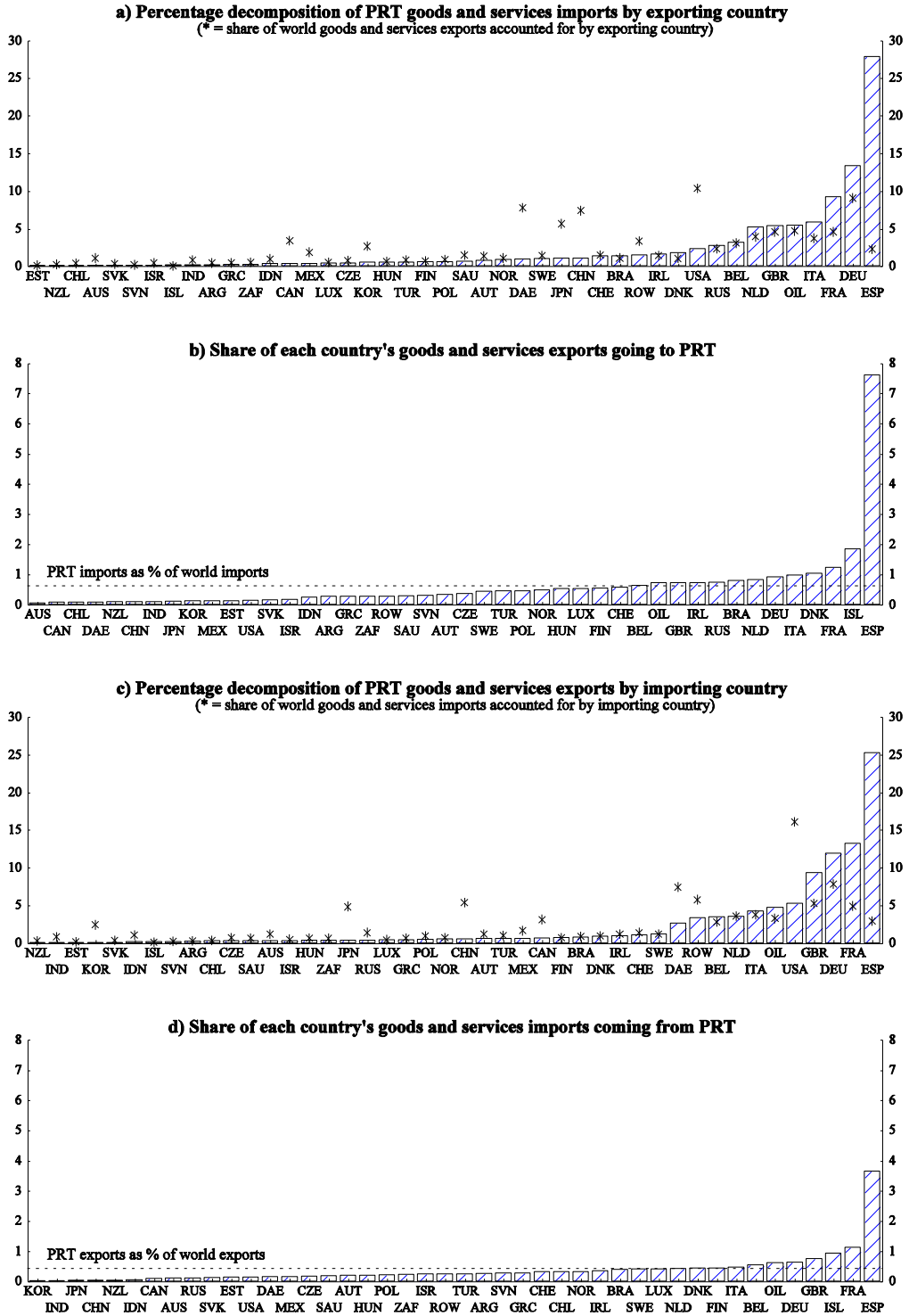


Figure 3.28. Geographical structure of goods and services trade of Slovak Republic (SVK)

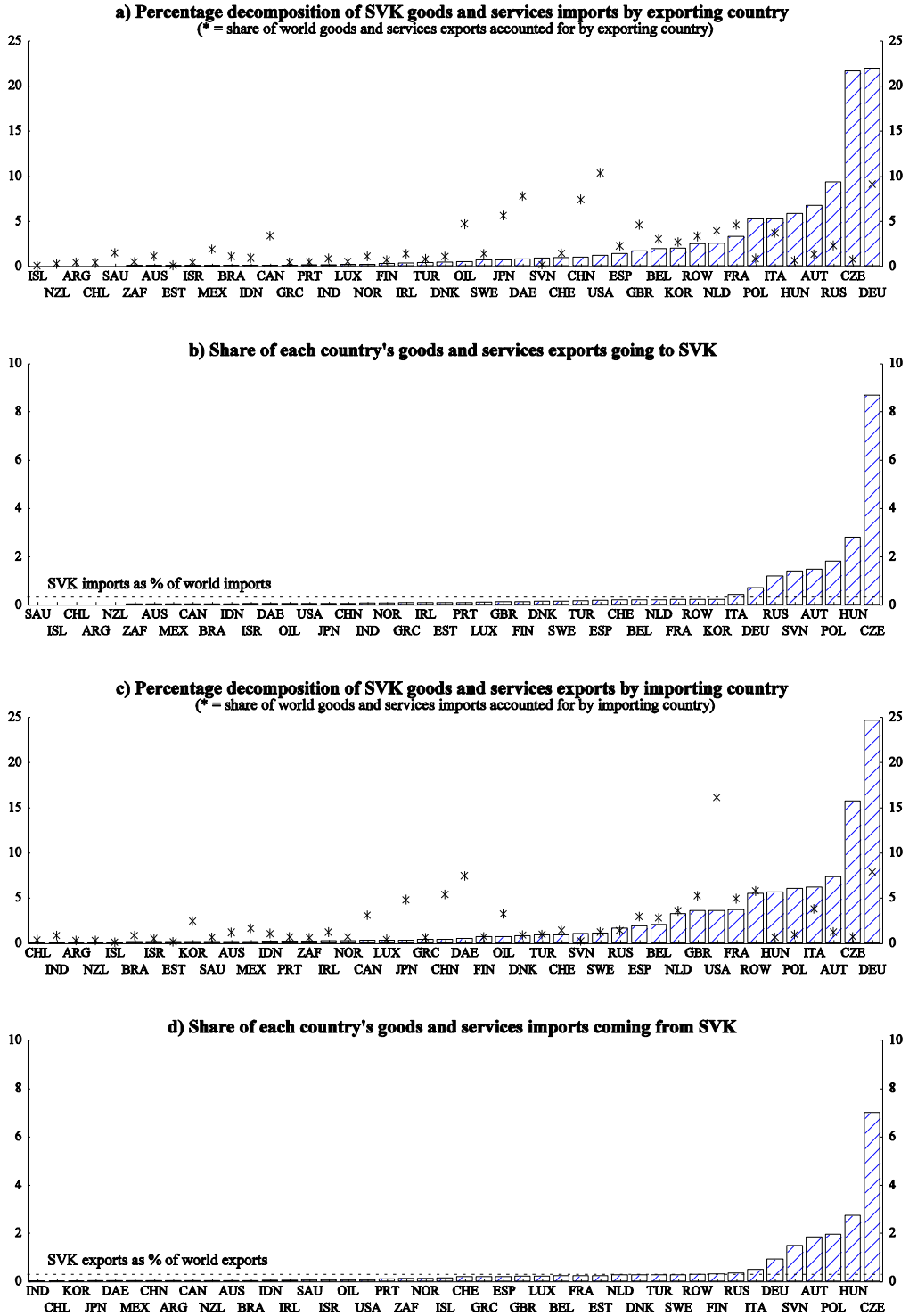


Figure 3.29. Geographical structure of goods and services trade of Slovenia (SVN)

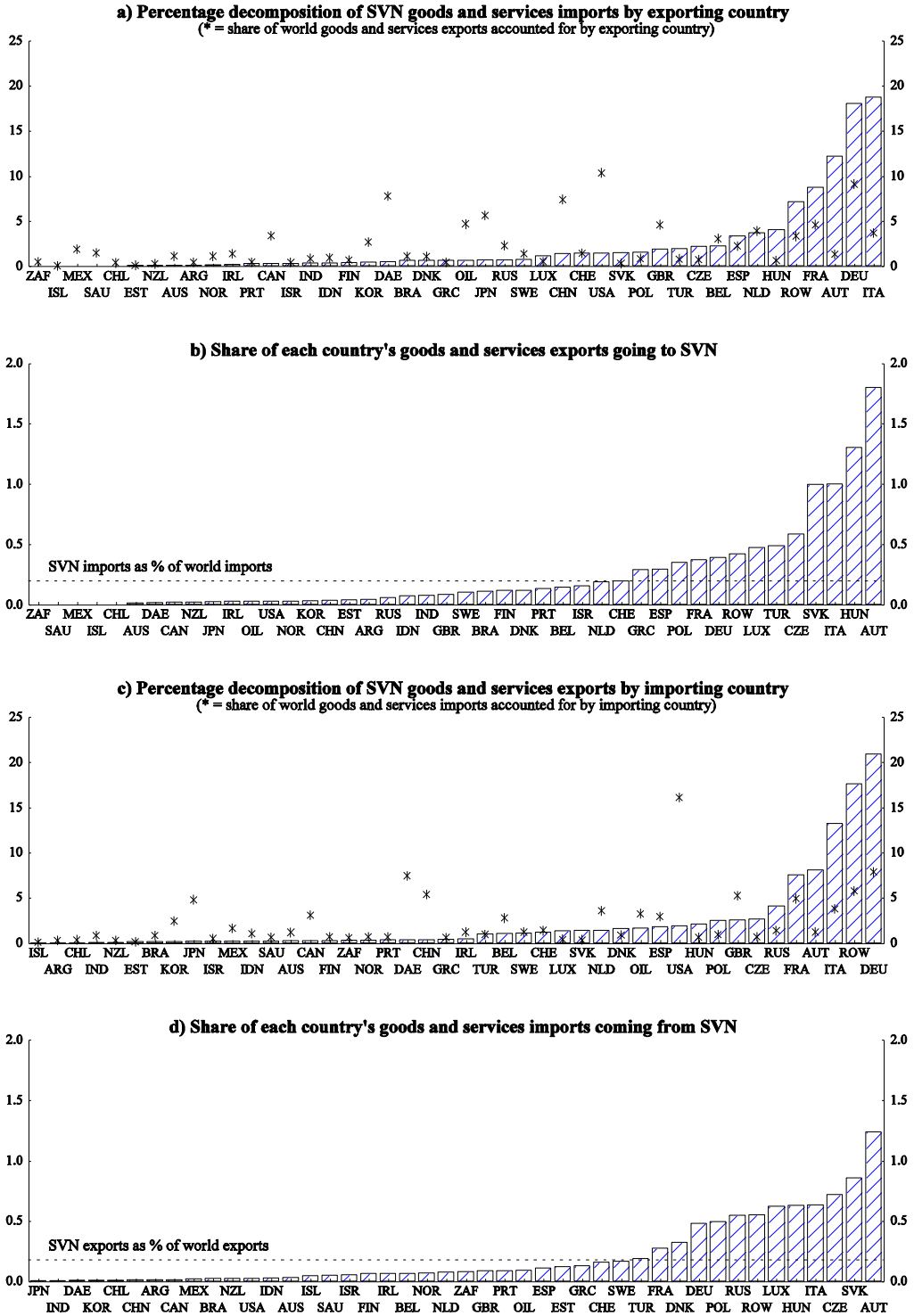


Figure 3.30. Geographical structure of goods and services trade of Spain (ESP)

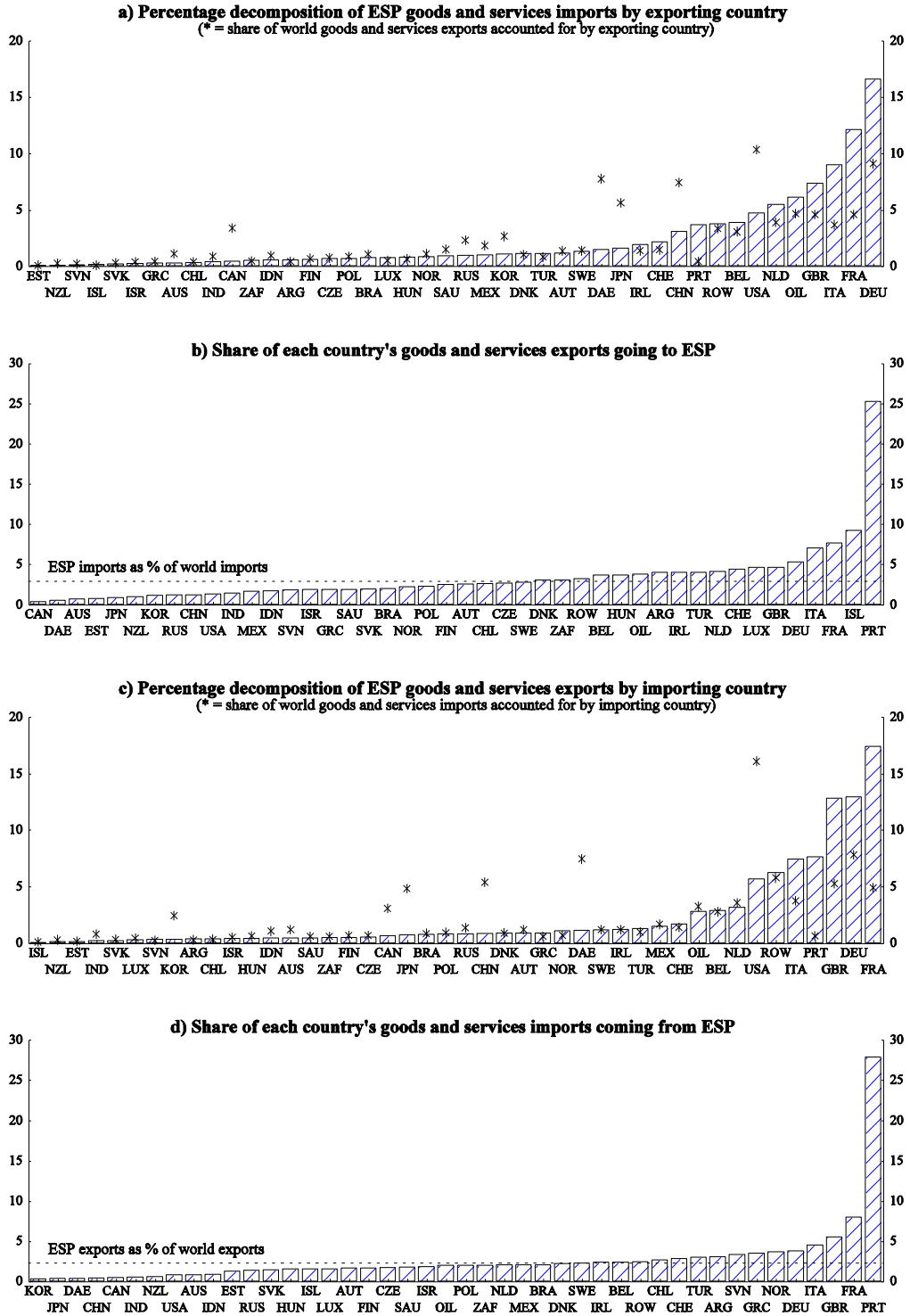


Figure 3.31. Geographical structure of goods and services trade of Sweden (SWE)

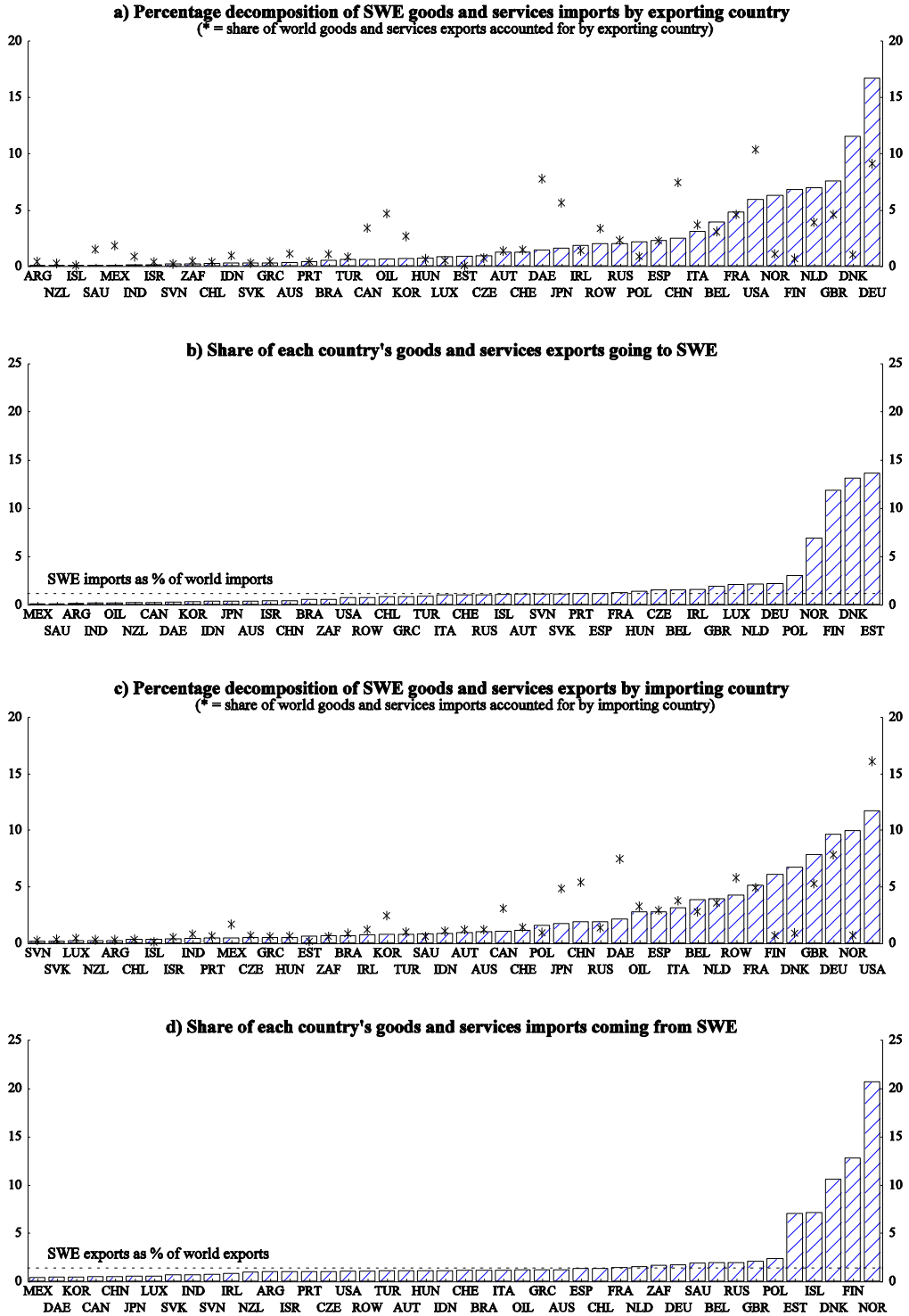


Figure 3.32. Geographical structure of goods and services trade of Switzerland (CHE)

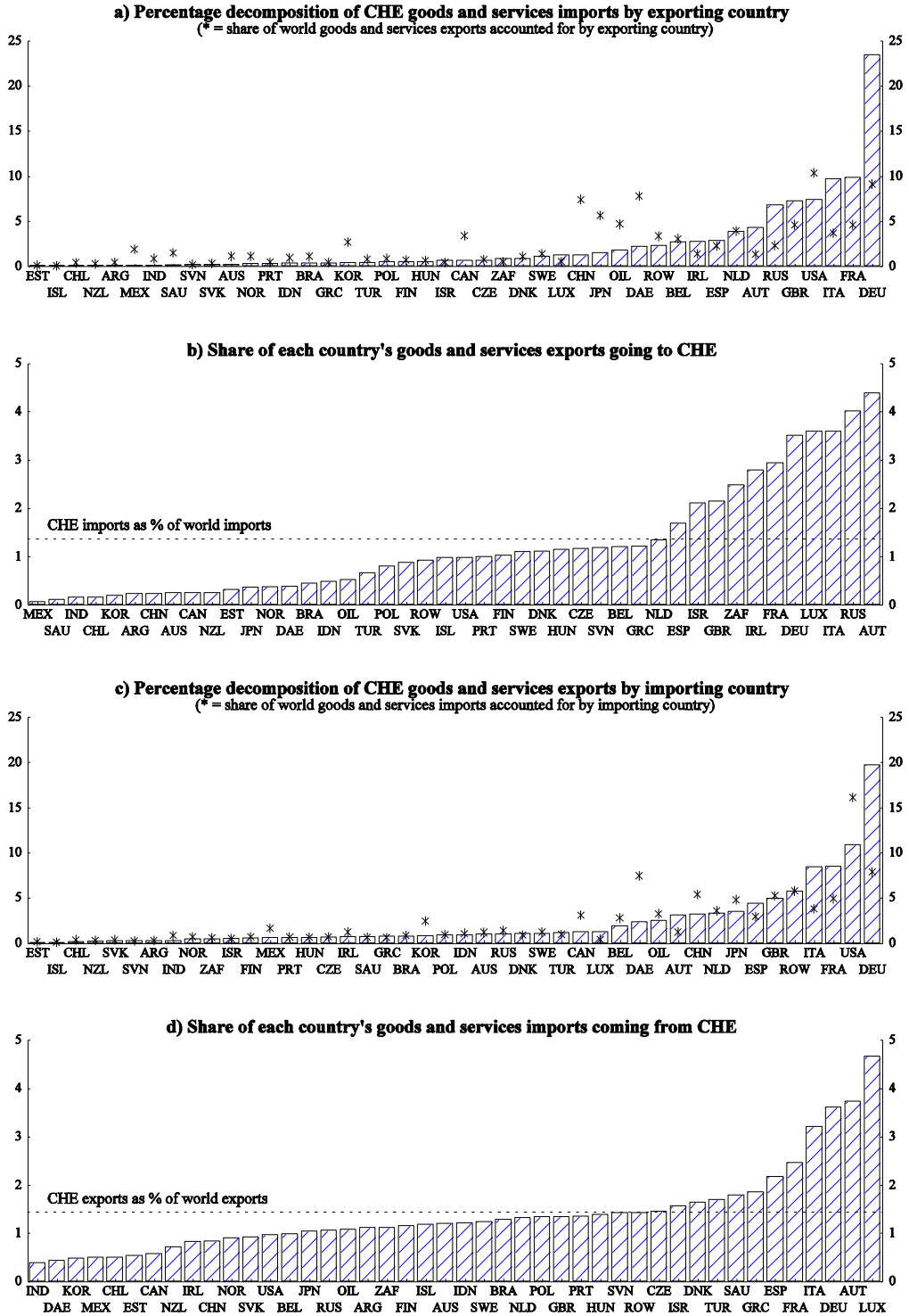


Figure 3.33. Geographical structure of goods and services trade of Turkey (TUR)

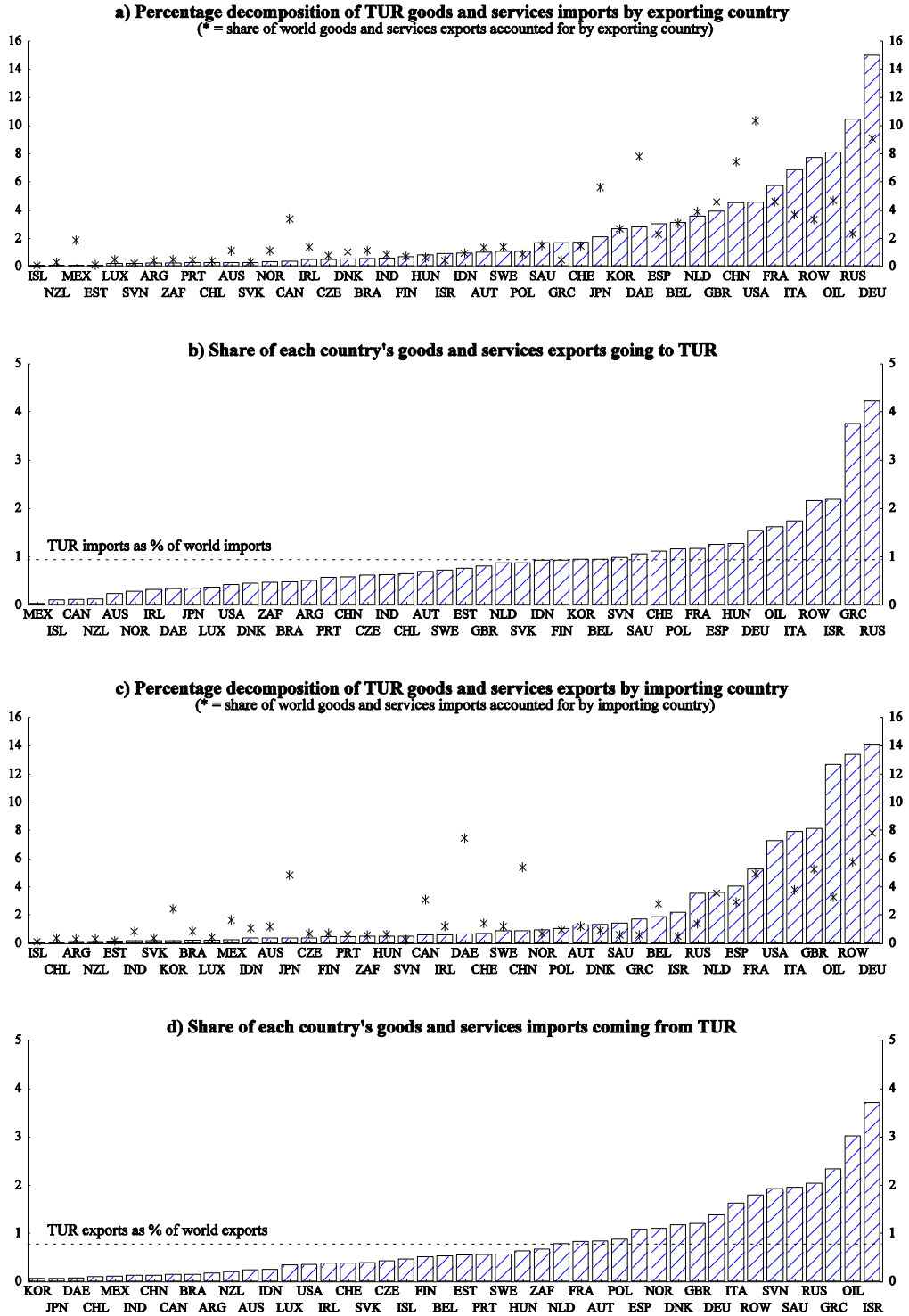


Figure 3.34. Geographical structure of goods and services trade of Argentina (ARG)

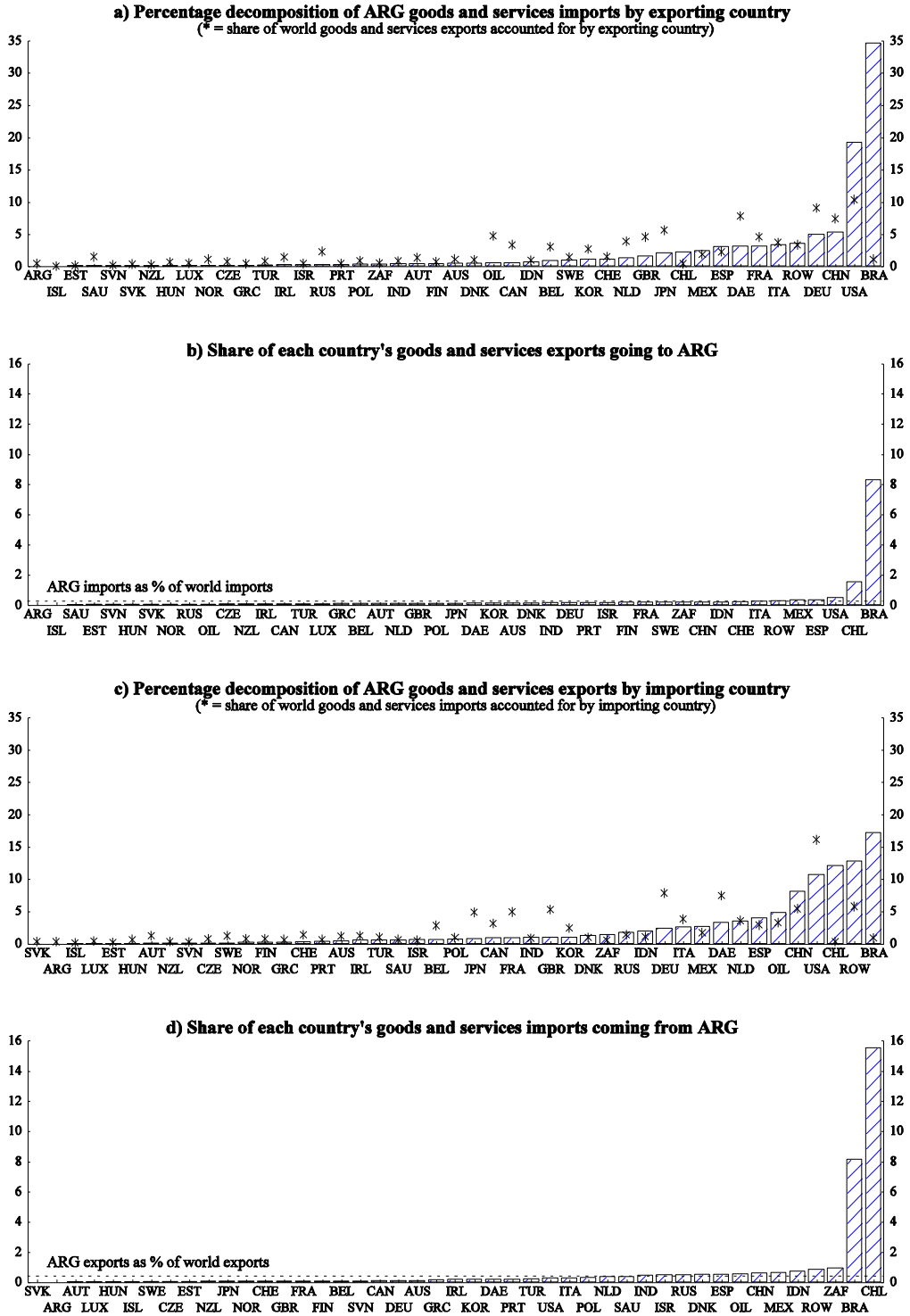


Figure 3.35. Geographical structure of goods and services trade of Brazil (BRA)

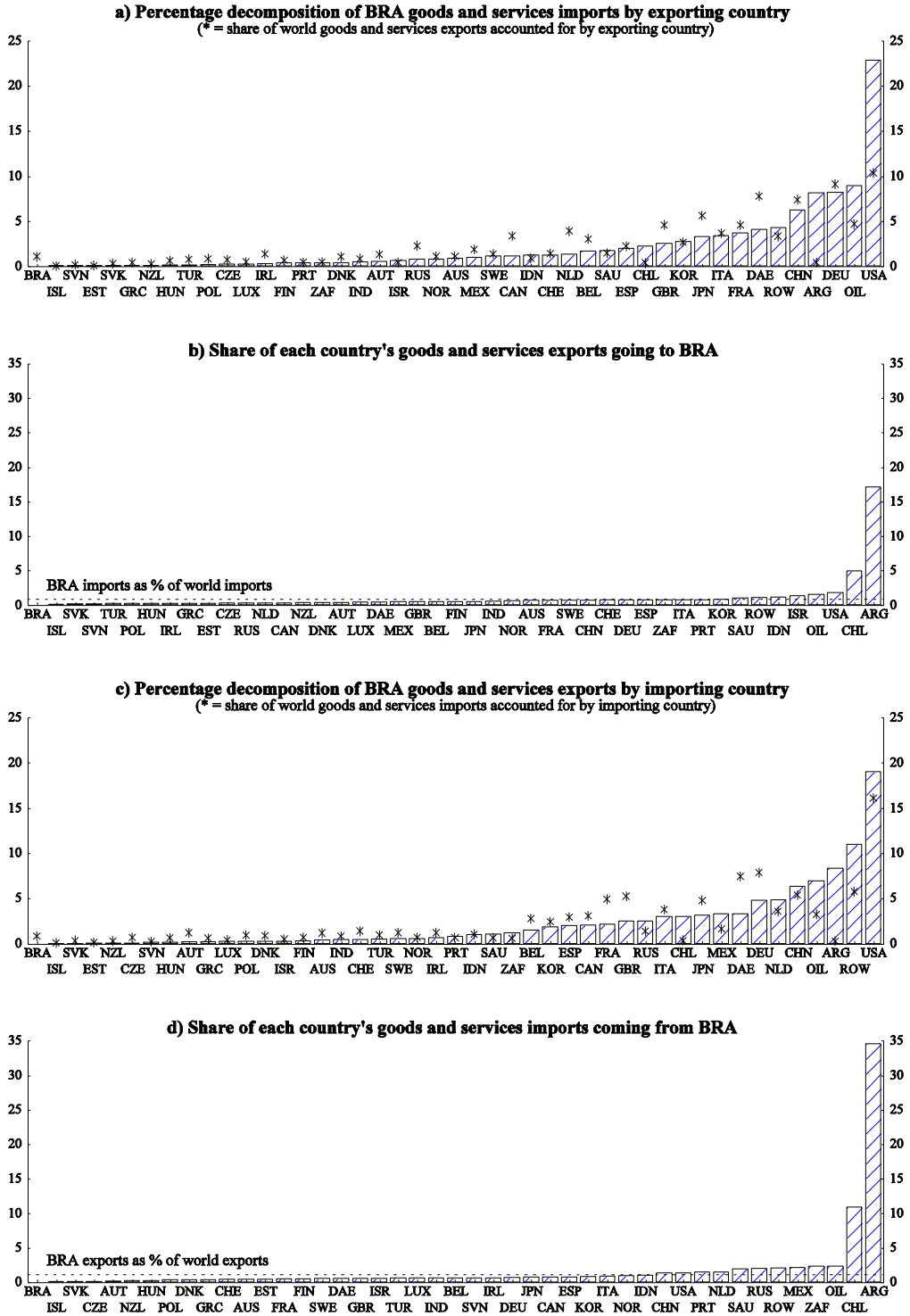


Figure 3.36. Geographical structure of goods and services trade of China (CHN)

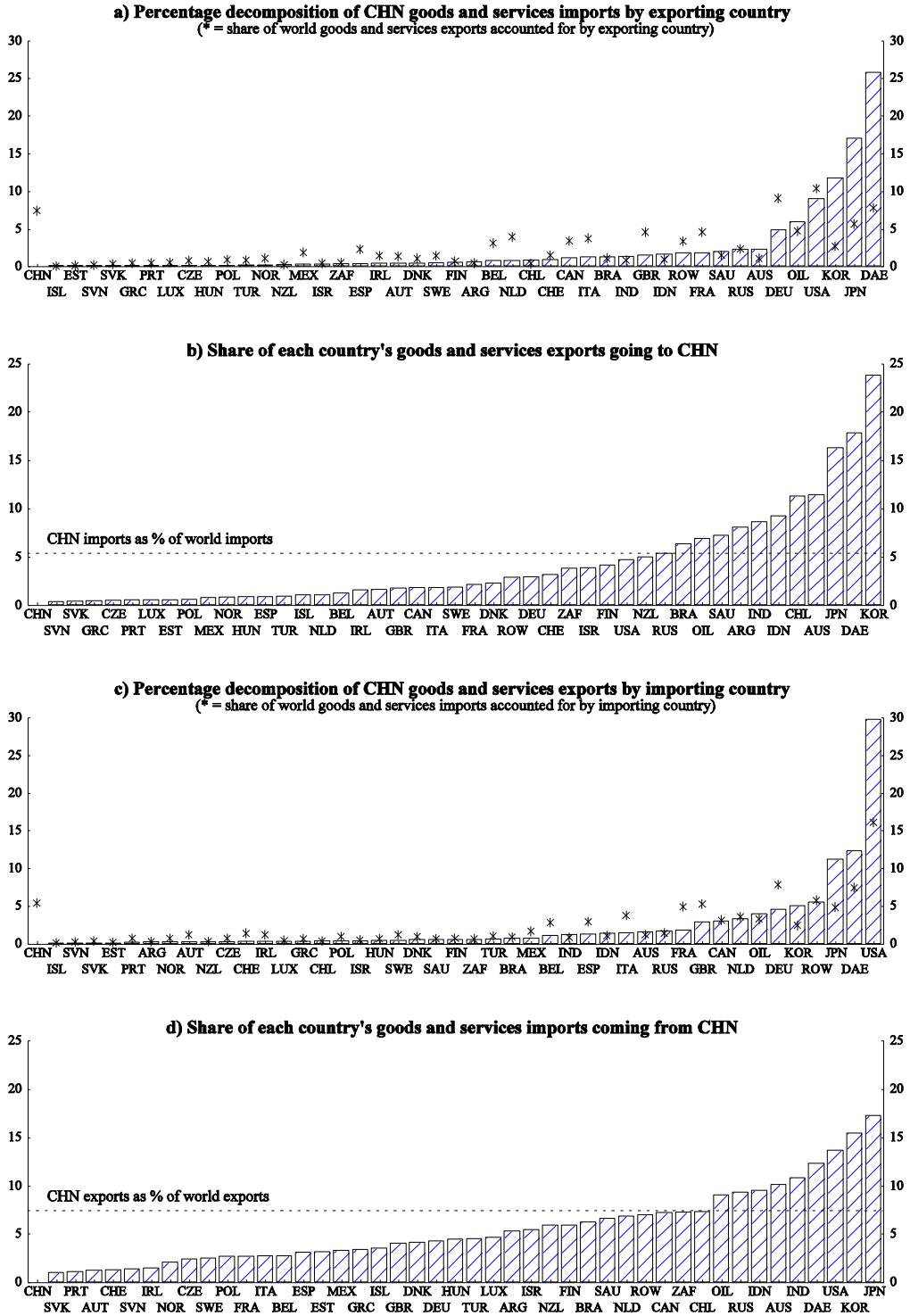


Figure 3.37. Geographical structure of goods and services trade of Estonia (EST)

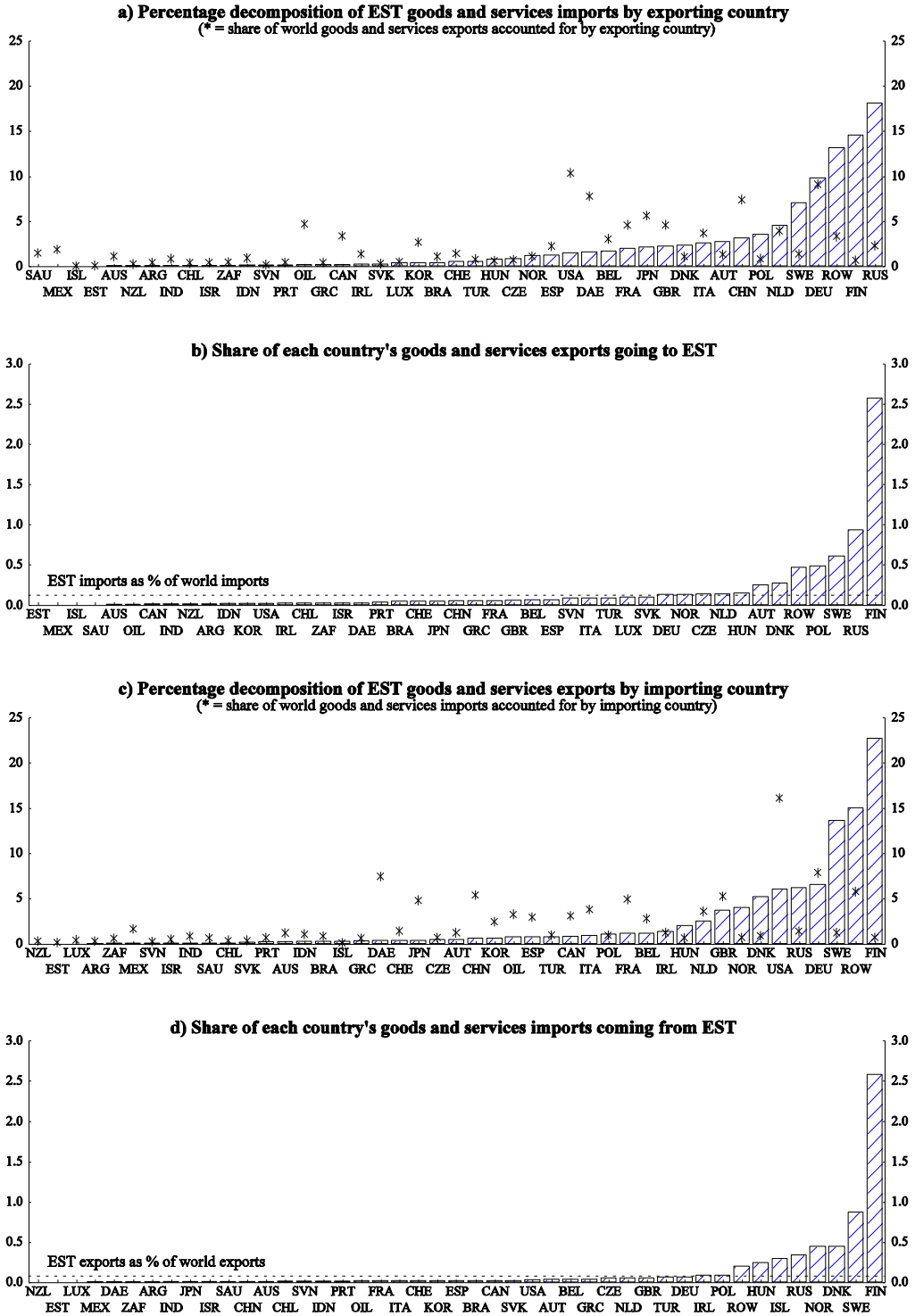


Figure 3.38. Geographical structure of goods and services trade of India (IND)

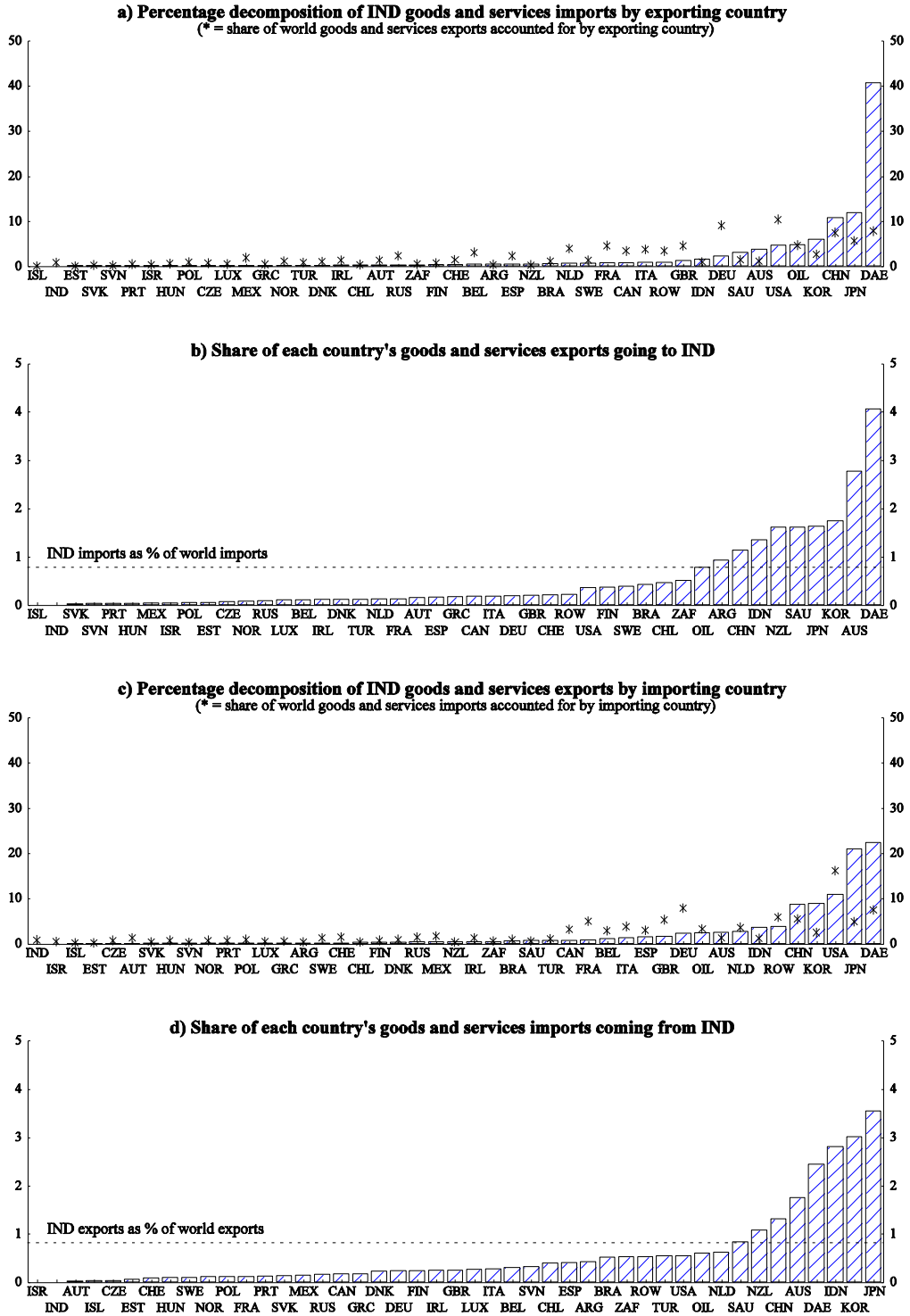


Figure 3.39. Geographical structure of goods and services trade of Indonesia (IDN)

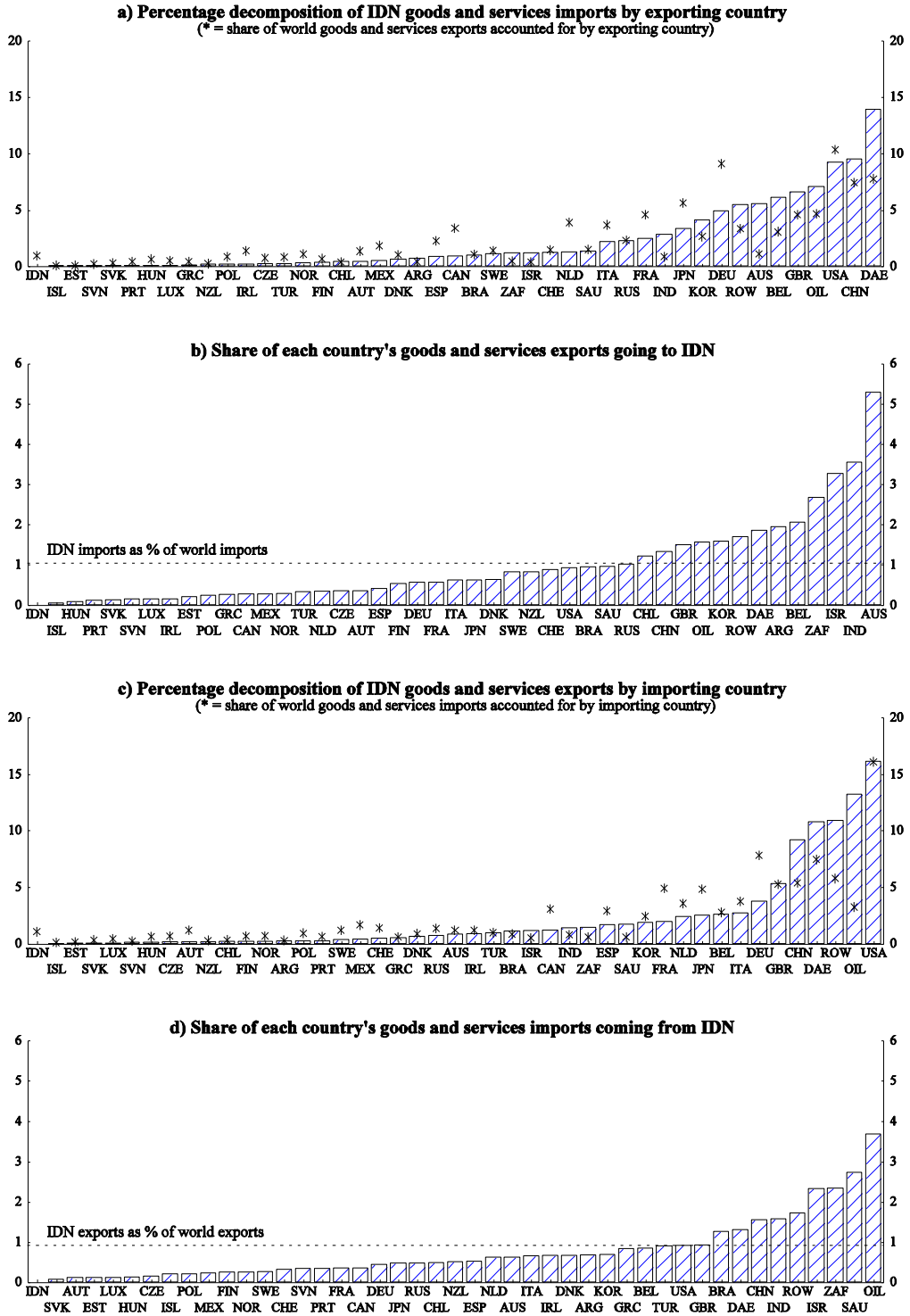


Figure 3.40. Geographical structure of goods and services trade of Israel (ISR)

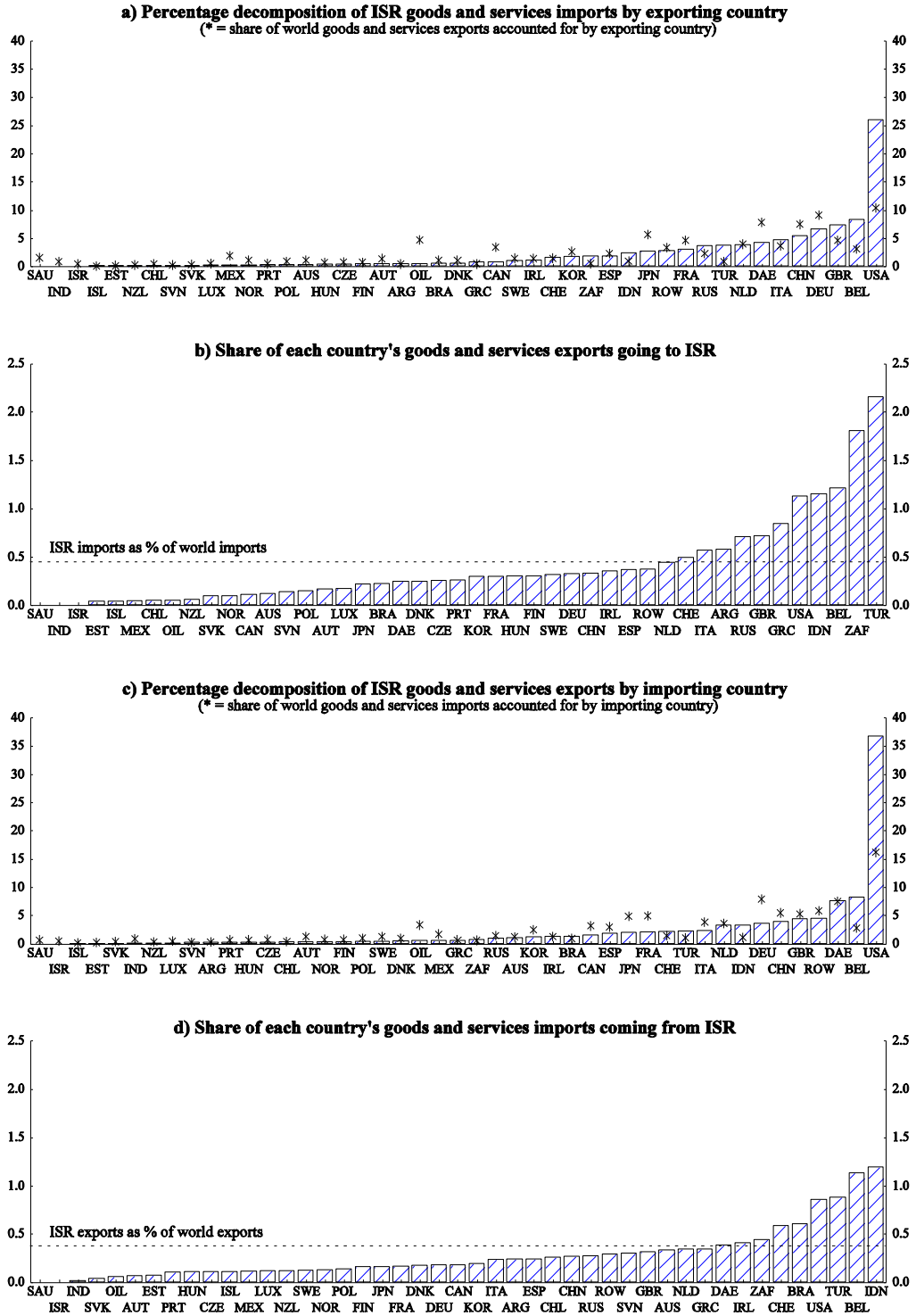


Figure 3.41. Geographical structure of goods and services trade of Russian Federation (RUS)

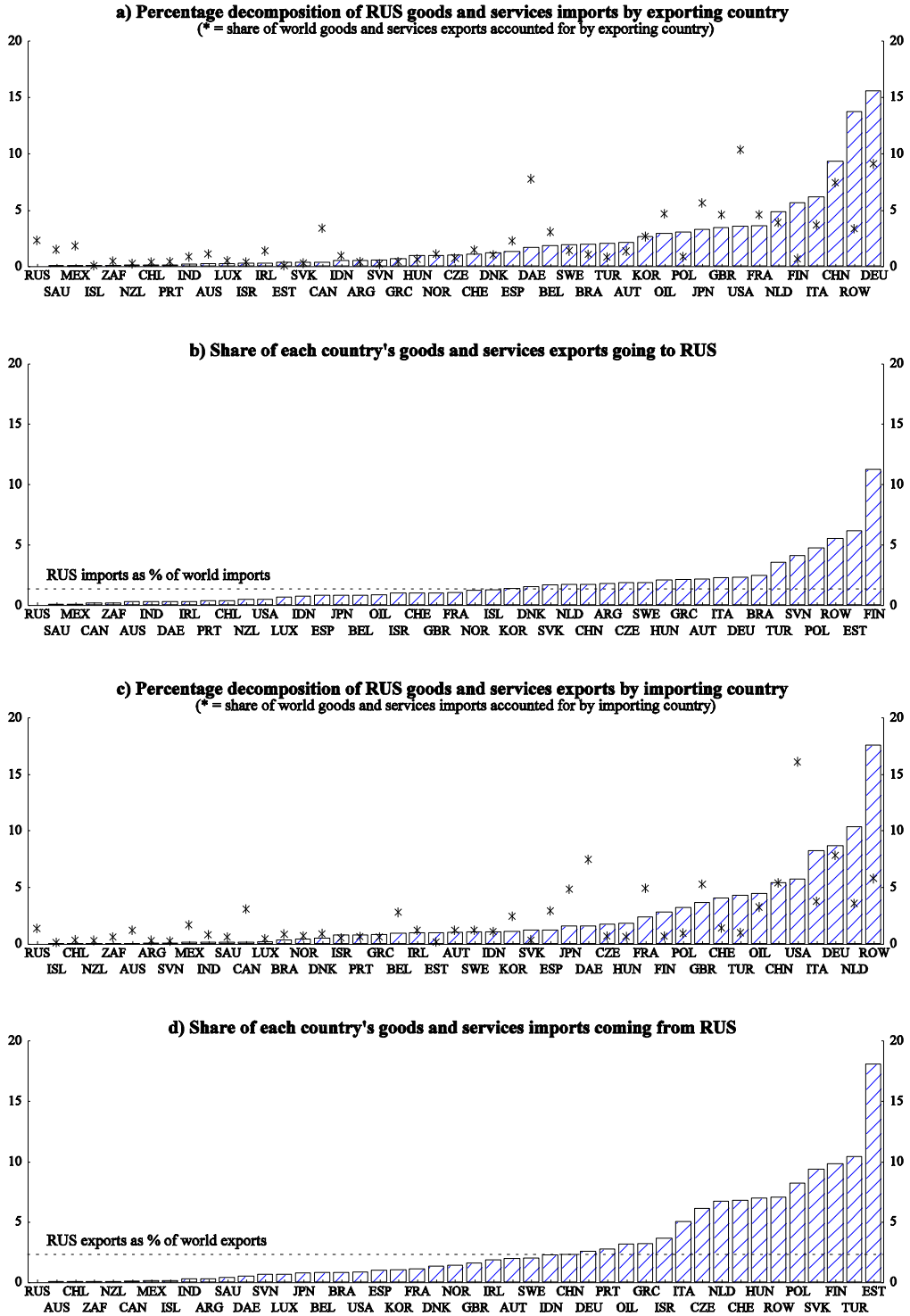


Figure 3.42. Geographical structure of goods and services trade of Saudi Arabia (SAU)

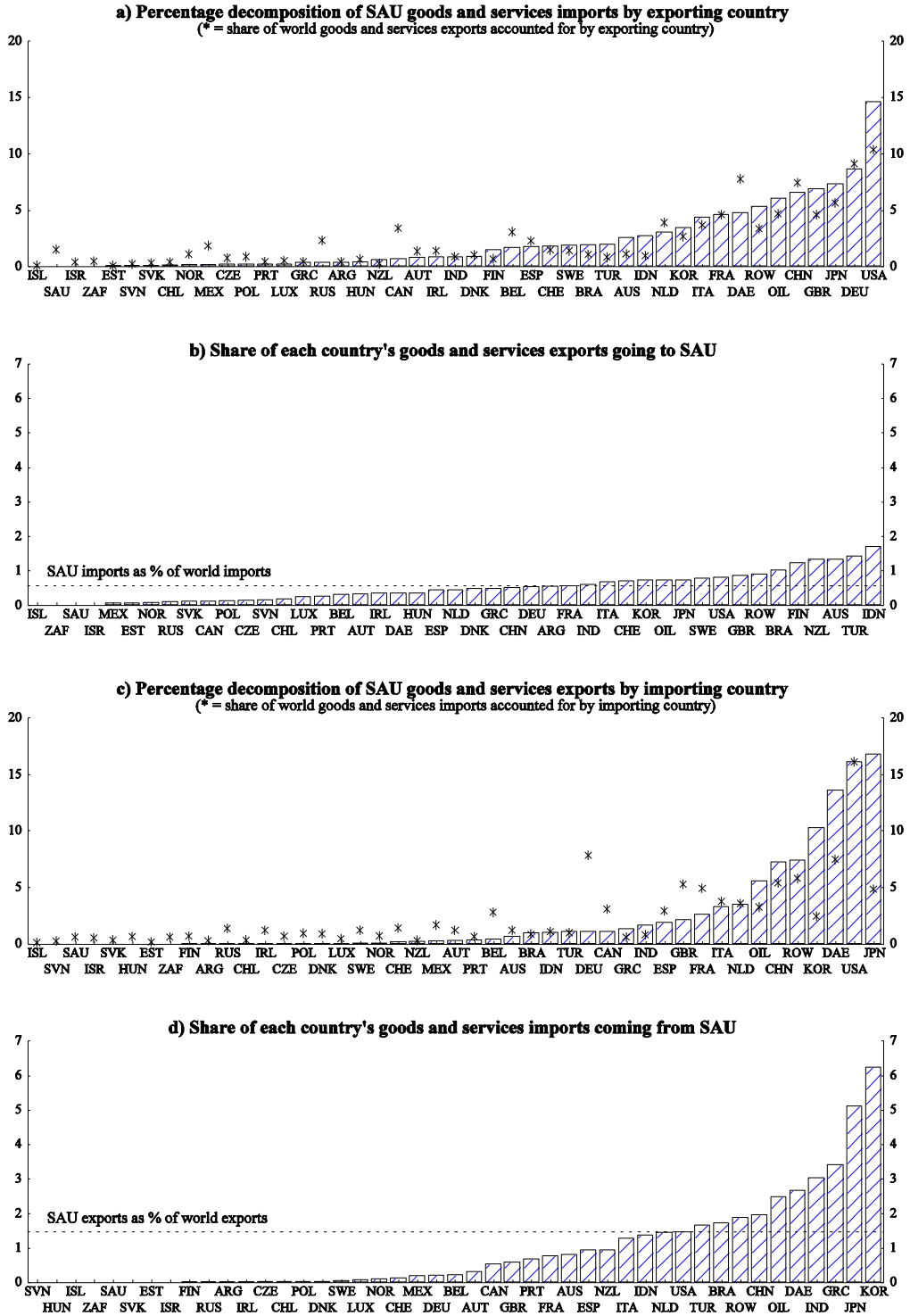


Figure 3.43. Geographical structure of goods and services trade of South Africa (ZAF)

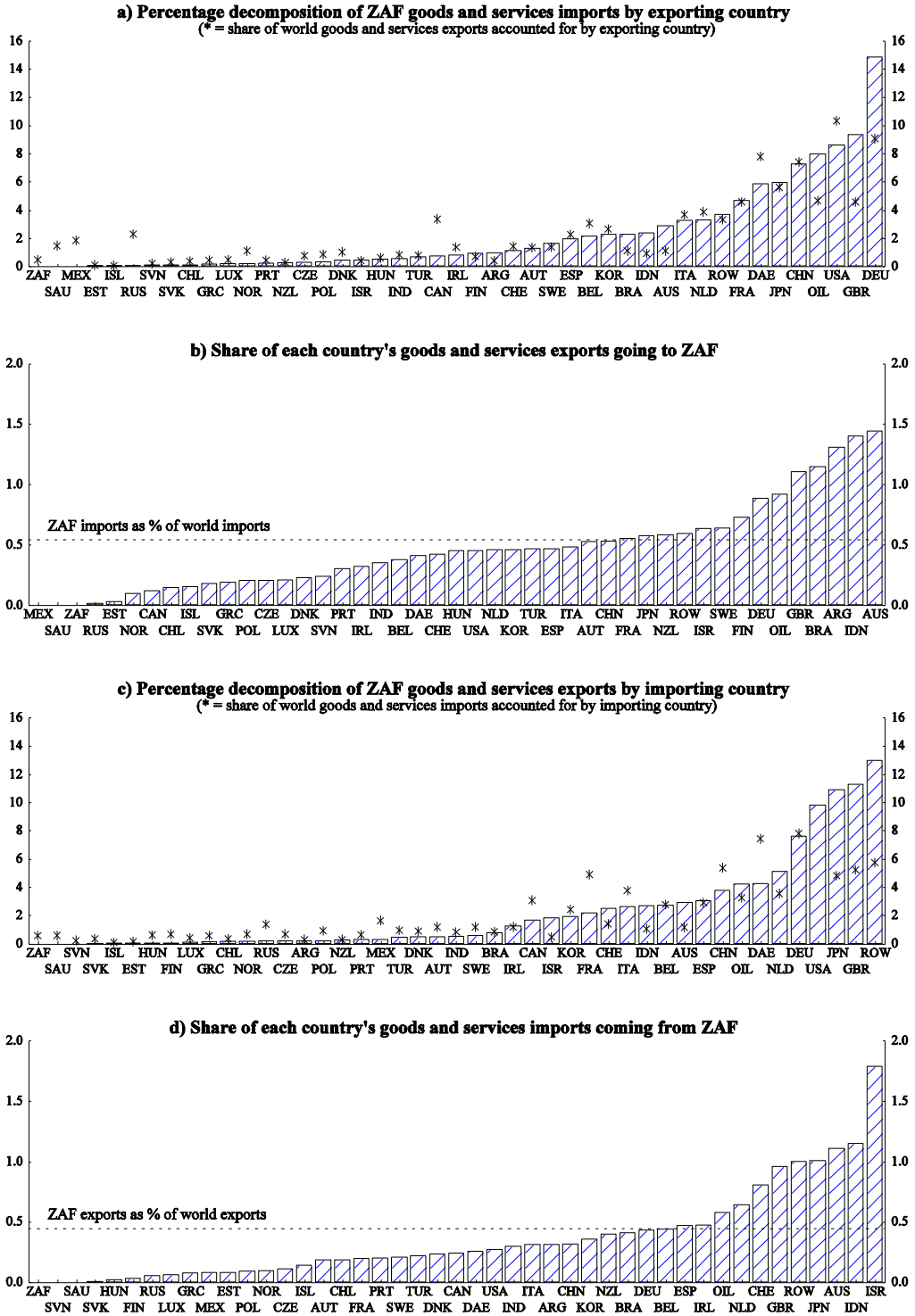


Figure 3.44. Geographical structure of goods and services trade of Dynamic Asia Economies (DAE)

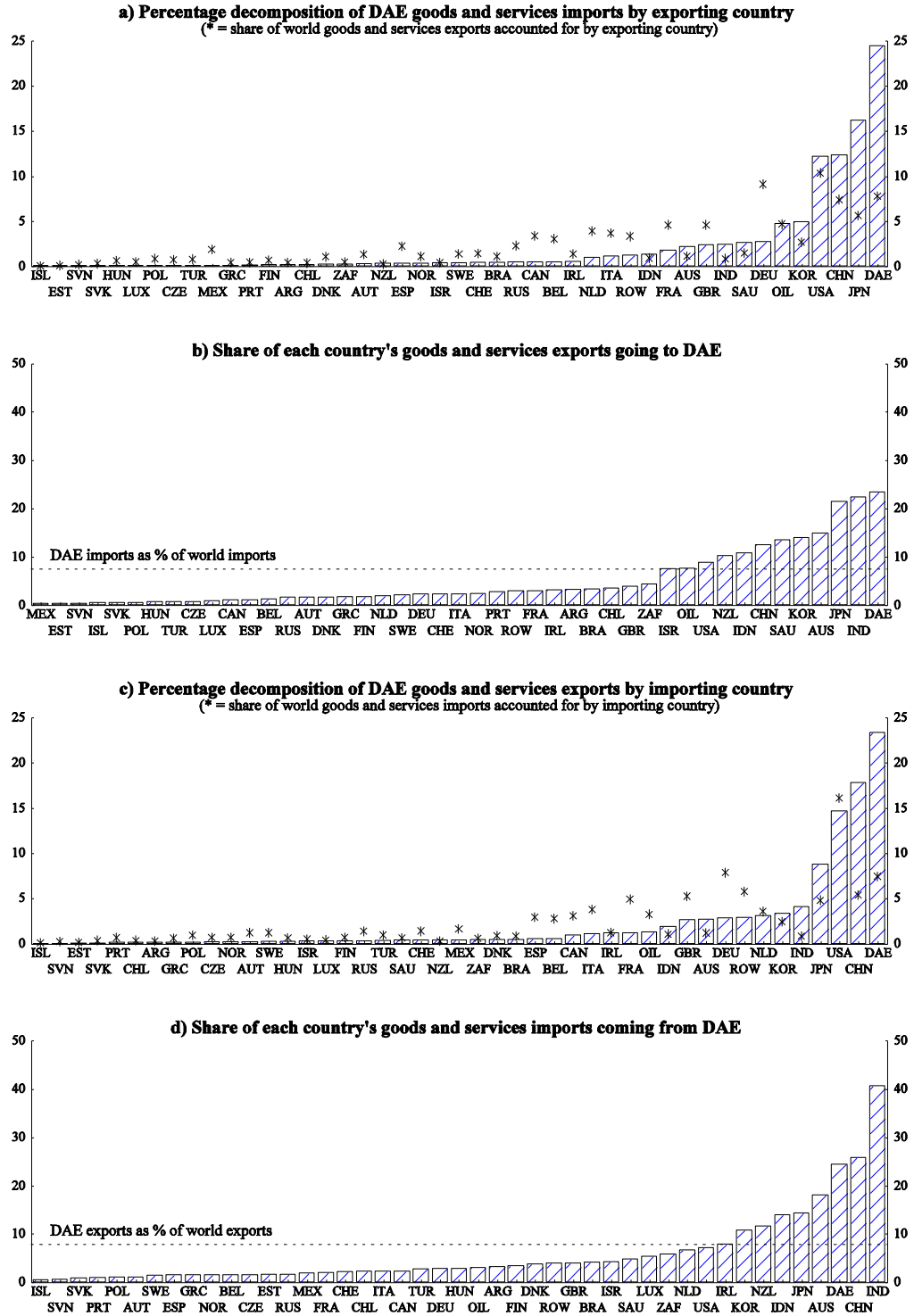


Figure 3.45. Geographical structure of goods and services trade of Oil producers (OIL)

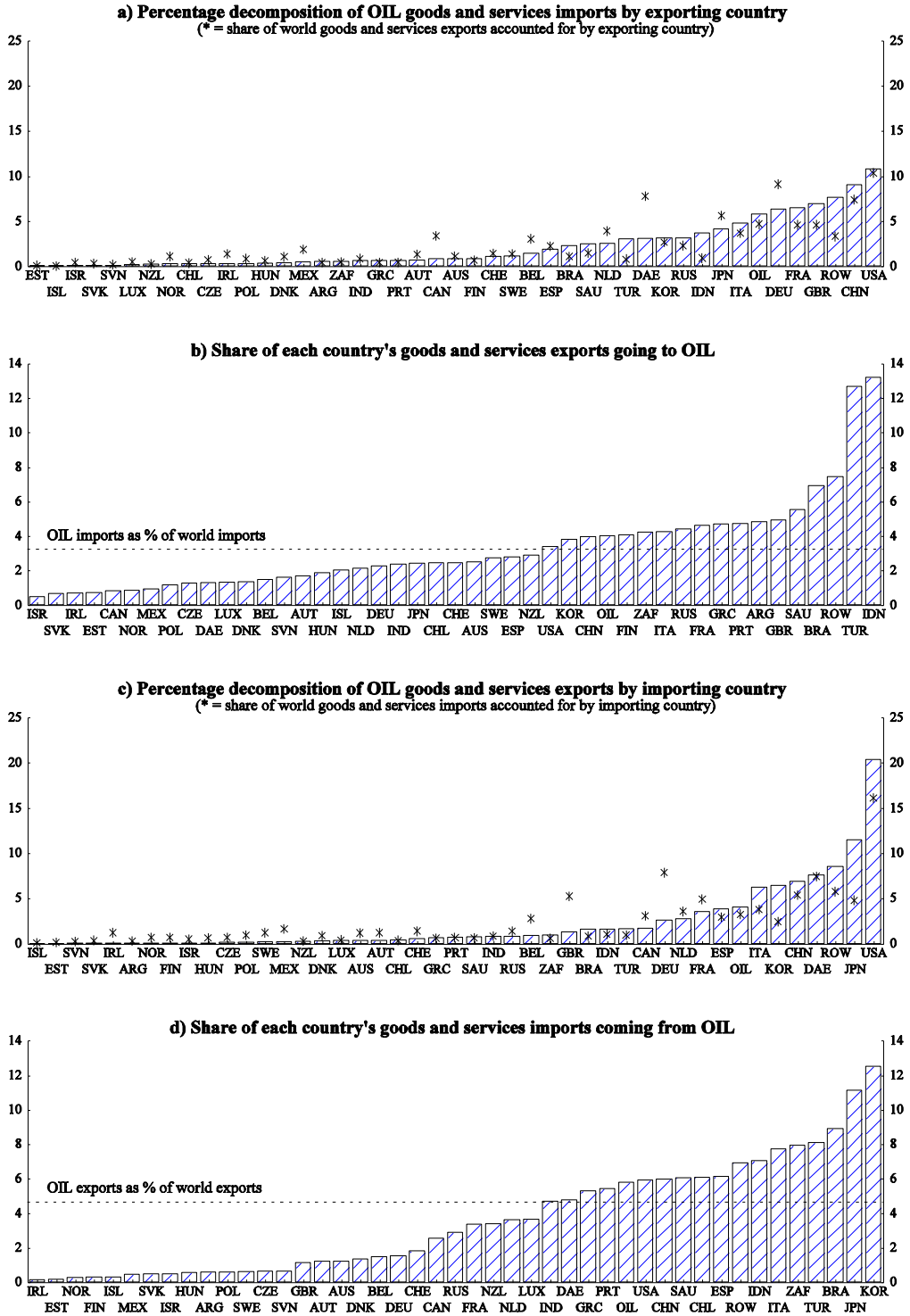
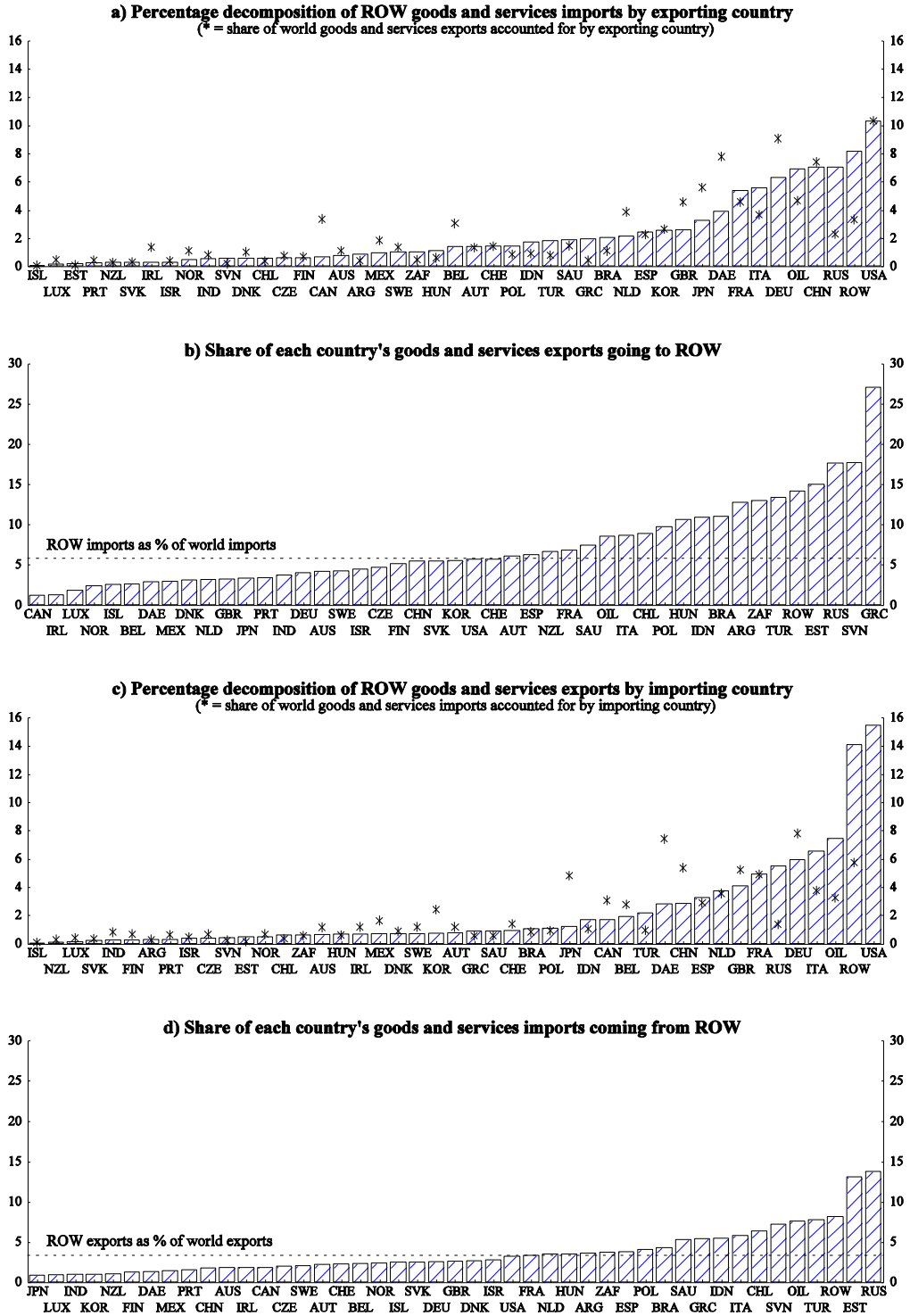


Figure 3.46. Geographical structure of goods and services trade of Remaining countries (ROW)



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ANNEX 1
KEY TO COUNTRY AND REGION ABBREVIATIONS USED IN FIGURES

The OECD trade system covers all 33 OECD Member countries as well as nine non-OECD economies and three non-OECD economics areas.

OECD countries:

AUS Australia
AUT Austria
BEL Belgium
CAN Canada
CHL Chile
CZE Czech Republic
DNK Denmark
FIN Finland
FRA France
DEU Germany
GRC Greece
HUN Hungary
ISL Iceland
IRL Ireland
ISR Israel
ITA Italy
JPN Japan
KOR Korea
LUX Luxembourg
MEX Mexico
NLD Netherlands
NZL New Zealand
NOR Norway
POL Poland
PRT Portugal
SVK Slovak Republic
SVN Slovenia
ESP Spain
SWE Sweden
CHE Switzerland
TUR Turkey
GBR United Kingdom
USA United States

OECD regions:

OECD America: USA, CAN, MEX, CHL.
OECD Pacific: JPN, KOR, AUS, NZL.
OECD Euro area members, EA14: AUT, BEL, FIN, FRA, DEU, GRC, IRL, ITA, LUX, PRT, SVK, ESP, SVN.
OECD European Union members, EU20: EA14, CZE, DNK, HUN, POL, SWE, GBR
OECD Europe, EUR: EA20, ISL, NOR, CHE, TUR,
OECD30: countries that were members in 2000 : OCDE- CHL – SVN – ISR

Non OECD countries:

ARG Argentina
BRA Brazil
CHN China
EST Estonia
IND Indonesia
IDN India
RUS Russian Federation
SAU Saudi Arabia
ZAF South Africa

Non-OECD regions:
DAE Dynamic Asian Economies: Chinese Taipei; Hong Kong, China; Malaysia; Philippines; Singapore; Thailand; Vietnam.
OIL Oil producers: Azerbaijan; Kazakhstan; Turkmenistan; Brunei; Timor-Leste; Bahrain; Iran; Iraq; Kuwait; Libya; Oman; Qatar; United Arab Emirates; Yemen; Ecuador; Trinidad and Tobago; Venezuela; Algeria; Angola; Chad; Rep of Congo.; Equatorial Guinea; Gabon; Nigeria; Sudan.
ROW: Rest of the world.
Total WLD World (Sum of OECD countries and non-OECD regions)

ANNEX 2
THE CONSTRUCTION OF THE MATRICES

Building the goods matrix[9]

Table A2.1 The goods trade matrix

Exports i \ *Imports j*		OECD30 + China (imports)				Chile, Israel ,Slovenia + Non OECD economies (imports)				WORLD exports
		1	…	30	31	32	…	44	45	
OECD30 + China (exports)	1	0								Sum(1,j)
	…		0				*X final (i,j)*			…
	30			0						Sum(30,j)
	31				0					Sum(31,j)
Chile, Isreal, Slovenia + Non-OECD economies (exports)	32					*0*	*X_Dyn (i,j)*			Sum(32,j)
	…		*M final (i,j)*			*M_Dyn (i,j)*	*0*			…
	44							*W_Dyn(44,44)*		Sum(44,j)
	45								*W_Dyn(44,44)*	Sum(45,j)
WORLD imports		Sum(i,1)	…	Sum(i,30)	Sum(i,31)	Sum(i,32)	…	Sum(i,44)	Sum(i,45)	World trade

First an initial matrix of bilateral matrix of goods trade flows between the 45 economies is built. Then while the flows between the OECD30 countries and China do not require further adjustment, the other parts of the matrix involving Chile, Israel and Slovenia as well as the -OECD countries other than China has to be adjusted to ensure consistency at the world level. In particular, in the initial matrix the sum of reported values is not equal to the total goods trade by country.

A second step consists therefore in adjusting imports from OECD30 countries and China (lower left, Ms) and exports to OECD30 and China (upper right, Xs) by the information on total trade flows and bilateral flows with the OECD30.

$$M\ final\ (\mathrm{i,j}) = \frac{\mathrm{M\ initial(i,j)}}{\sum_{noecd} Minitial(i,j)} * (\mathrm{M(world,j)} - \mathrm{M(OECD,j)})$$

$$X\ final\ (\mathrm{i,j}) = \frac{\mathrm{X\ initial(i,j)}}{\sum_{noecd} Xinitial(i,j)} * (\mathrm{X(world,j)} - \mathrm{X(OECD,j)})$$

9. All the data come from DOTS statistics expect for Luxembourg where data are extracted from STATEC and Chinese Taipei where they come from the National Board of Trade's website (http://cus93.trade.gov.tw/english/FSCE/FSC0011E.ASP). For consistency reasons, trade with Puerto Rico and US Virgin Islands has been integrated to trade with United States, and similarly trade with Guadeloupe, Martinique, Reunion and French Guiana has been integrated to trade with France. Another issue comes from the fact that a few countries provide only data for Belgium-Luxembourg together (or similarly for the former Czechoslovakia) and not for individual countries separately. In this case, export flows from these countries are adjusted and replaced by mirror series using a 1.1 CIF/FOB correction factor.

with X exports and M imports of country's *(i)* goods to country j .

For the lower right part of the matrix covering trade flows between non-OECD countries, Chile Israel and Slovenia, where there is no information of correct the bilateral level of imports or exports. The adjustment is based on the following calculations where the correction of the level is based on the import and export weights in the trade with the OECD30 and China.

Matrix 4 left: $M_Dyn\ (\mathrm{i,j}) = \frac{\mathrm{M\ initial(i,j)}}{\sum_{30\ OECD+china} Minitial(i,j)} * \sum_{30\ OECD+china} Mfinal(i,j)$

Matrix 4 right: $X_Dyn\ (\mathrm{i,j}) = \frac{\mathrm{X\ initial(i,j)}}{\sum_{30\ OECD+china} Xinitial(i,j)} * \sum_{30\ OECD+china} Xfinal(i,j)$

For zones, where there are intra-trade flows the diagonal is defined as:

Matrix 4 diagonal: $W_Dyn\ (\mathrm{i,j}) = \frac{\mathrm{Trade\ initial(i,j)}}{World\ trade\ initial(i,j)} * World\ Tradefinal(i,j)$

With this method based on the exports' weights on one hand and the imports' weights on the other hand, trade flows between non-OECD countries, Chile Israel and Slovenia are underestimated. Each coefficient in this matrix is therefore adjusted dynamically until the trade flows in the matrix are equal to the observed total (this requires three iterations).

Building the service matrix

Again, OECD30 countries are treated differently from Chile, Israel and Slovenia where coverage in Statistics on International Trade in Services is still limited.

Estimations of missing data for the OECD30 sub-matrix

Even for trade between OECD countries, the initial matrix derived from the OECD Statistics on International Trade in Services is not complete. Missing values are estimated on the basis of the weight of the 2005 goods matrix. Let's denote $\alpha_{OECD}^{Goods}(i,j)$ the share of country's *(i)* goods export to country j relative to its total export to OECD30 countries. In the simple example below, the export of services from country 3 to country 5 is estimated the following way:

$$X(3,5) = \frac{\alpha_{OECD30}^{Goods}\ (3,5)}{1 - \alpha_{OECD30}^{Goods}\ (3,5)} \sum_{j \neq 5} X(3,j)$$

	Imports	**OECD30 (imports)**					**Non OECD30 (imports)**			
Exports		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
OECD30 (exports)	**1**	0			X(1,4)					
	2		0		X(2,4)					
	3	X(3,1)	X(3,2)	0	X(3,4)	?				
	4				0					
	5				X(5,4)	0				
Non-OECD30 (exports)	**6**									
	7									
	8									
	9									

Adjustment of the total OECD30 trade

For a few countries, in particular where financial services play an important role, there is a large discrepancy between the sum of bilateral trade flows with OECD30 countries and the total exports or imports obtained from the MEI database (for Switzerland for instance, this sum was more than twice total Swiss exports of services). In this case, a correction has been made when the partial sum of exports/imports to OECD30 countries exceeded 95% of total exports (respectively imports) of the country. The option retained is to adjust the trade to OECD30 countries (export or import) of the problematic country to the total services trade given by the MEI database, by using the relative share of goods exports (respectively imports) in the OECD30 zone as a whole. More precisely, assuming that in the matrix above, the sum of bilateral imports from the country (4) are overestimating total imports of this country, the column of the OECD30 sub-matrix corresponding to this country is corrected the following way

$$X(i,4)\ adjusted = X(i,4) * \frac{M_{4\leftarrow world}^{Services\ MEI} * \frac{M_{4\leftarrow OECD30}^{Goods}}{M_{4\leftarrow world}^{Goods}}}{\sum_j X(j,4)}$$

Where $M_{4\leftarrow world}^{MEI}$ is total import of services of country (4) from the world obtained from the MEI database, $M_{4\leftarrow OECD30}^{Goods}$ is the total import of goods of country (4) from OECD30 countries in the 2005 goods matrix and $M_{4\leftarrow world}^{Goods}$ is the total import of goods of country (4) (in the 2005 goods matrix).

Calculation of services exports/imports between OECD30 and non OECD30 countries and zones

For non-OECD30 countries and zones, the overall information on service trade is relatively limited (except for China where a relative complete set of mirror series can be used). Data on aggregate services trade from MEI allows however to first deduct the total exports of OECD30 countries to non-OECD30 countries (B in the matrix below), and the total OECD imports from non-OECD countries (C in the matrix below).

<table>
<tr><td colspan="2">Imports
Exports</td><td colspan="5">OECD</td><td colspan="4">Non OECD zones</td><td rowspan="2">MEI total</td></tr>
<tr><td></td><td></td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>China</td><td>7</td><td>8</td><td>9</td></tr>
<tr><td rowspan="5">OECD</td><td>1</td><td colspan="5" rowspan="5">A</td><td colspan="4" rowspan="5">B?=$X_{OECD30\rightarrow world}^{MEI}$-A</td><td rowspan="5">$X_{OECD30\rightarrow world}^{MEI}$</td></tr>
<tr><td>2</td></tr>
<tr><td>2</td></tr>
<tr><td>4</td></tr>
<tr><td>5</td></tr>
<tr><td rowspan="4">Non-OECD zones</td><td>China</td><td colspan="5" rowspan="4">C?=$M_{World\rightarrow OECD30}^{MEI}$-A</td><td colspan="4" rowspan="3"></td><td rowspan="4"></td></tr>
<tr><td>7</td></tr>
<tr><td>8</td></tr>
<tr><td>9</td><td colspan="3">D= ?</td></tr>
<tr><td colspan="2">MEI total</td><td colspan="5">$M_{World\rightarrow OECD30}^{MEI}$</td><td colspan="4"></td><td></td></tr>
</table>

In a second stage, the rows and columns of the sub-matrices B and C are completed, again using total export/import values from MEI and, also, the weight from the previous 2000 services matrix. For example, exports of the OECD country (i) to non-OECD country (j) (noted B(i,j)) are completed the following way:

$$B(i,j) = \left[X_{i \to World}^{MEI} - \sum_{k \in OECD30} A(i,k) \right] * \frac{X_{i \to j}^{Services\,(2000)}}{\sum_{l \in OECD30} X_{i \to l}^{Services\,(2000)}}$$

where $X_{i \to World}^{MEI}$ denotes total services export of country) and $X_{i \to j}^{Services\,(2000)}$ the exports of country i to country j in the 2000 trade matrix.

For China, the same procedure is applied. Values for its total export and import of services are drawn from the IMF Balance of Payment database and the bilateral trade with OECD countries from OECD Statistics on International Trade in Services data. Before that procedure was applied, missing values were completed according to the same methodology as described above for OECD members. In this particular case, weights from the 2000 services matrix were used in order to avoid large distortions linked to the dramatic changes in merchandise trade for this country.

Computation of bilateral trade between non-OECD countries, Chile, Israel and Slovenia

For intra non-OECD30 countries bilateral trade flows, only limited information is available and therefore the total non-OECD30 intra-trade (excluding China) needs first to be estimated. This estimation is carried out by using the ratio of services trade to goods trade calculated for a subset of non OECD countries (for which such variables were available in the IMF Balance of Payments database). This ratio multiplied by the non-OECD intra-trade in the 2005 goods matrix is taken as the estimated value for the sub-matrix (D) above. In a second stage, each cell is completed using the bilateral weights of the corresponding goods sub-matrix.

ANNEX 3
DETAILS ON THE EVOLUTION OF TRADE PARTNERS

Figure A3.1 United States export breakdown by destination

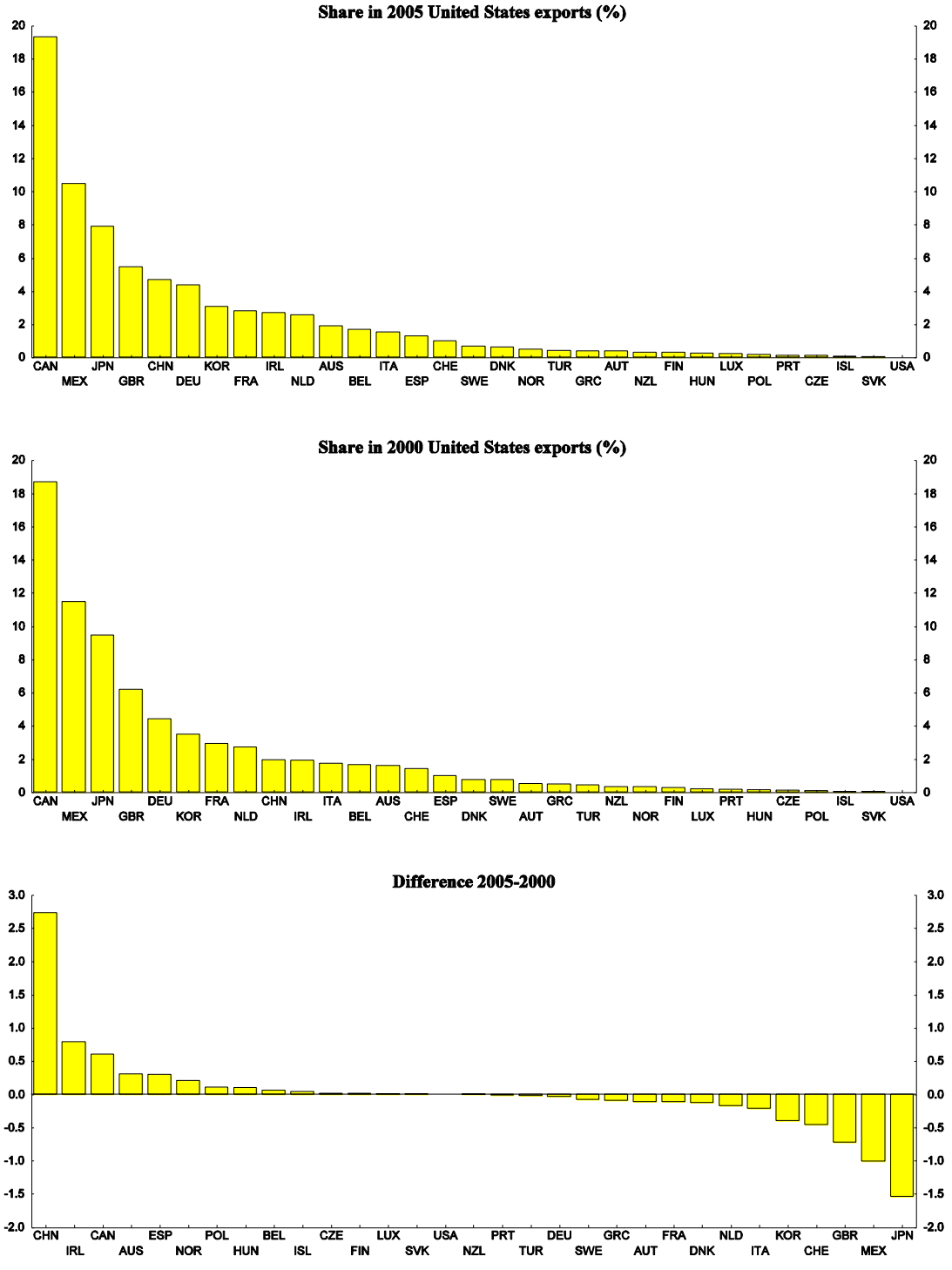


Figure A3.2 United States import breakdown by origin

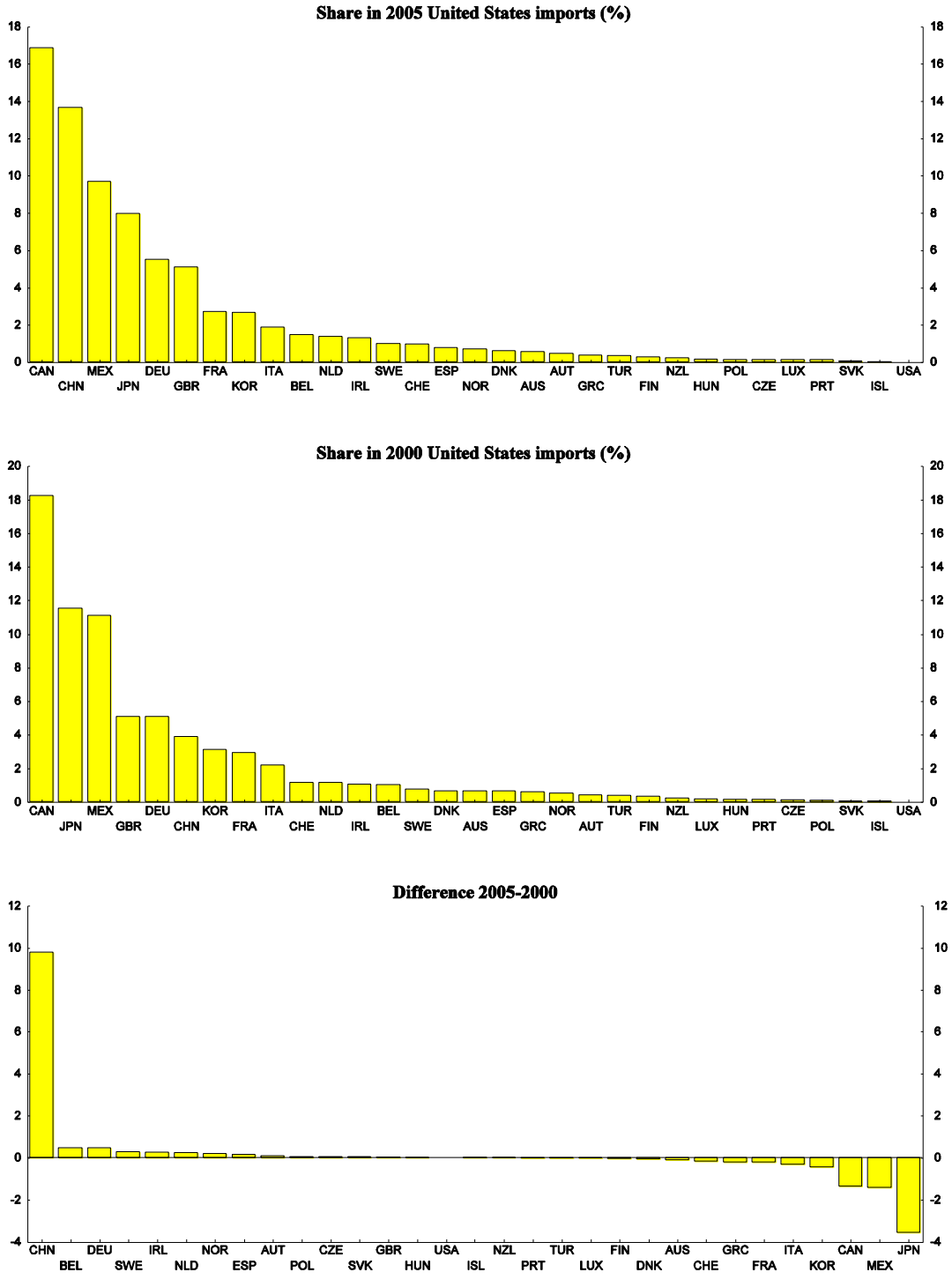


Figure A3.3 Japan export breakdown by destination

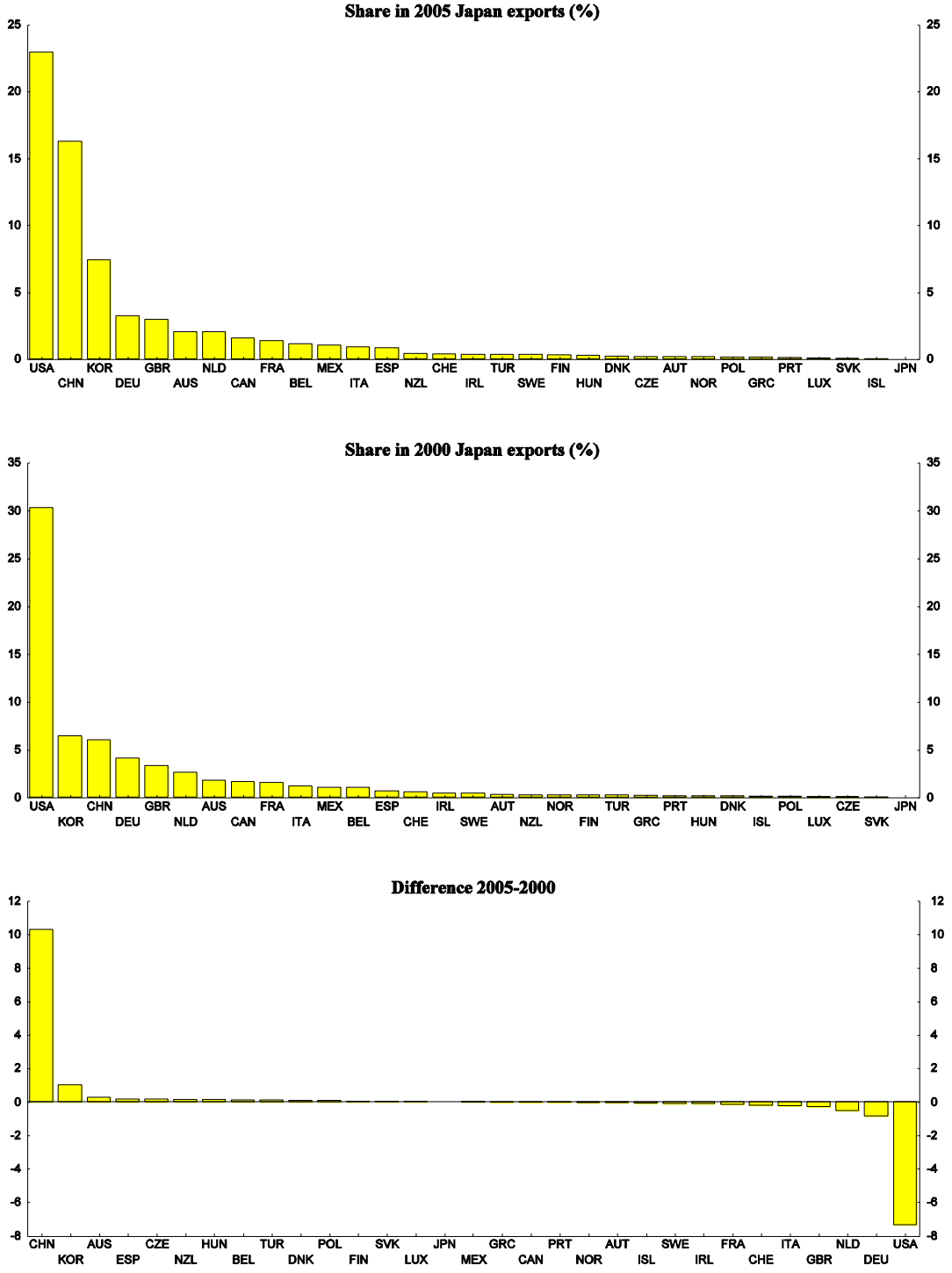


Figure A3.4 Japan import breakdown by origin

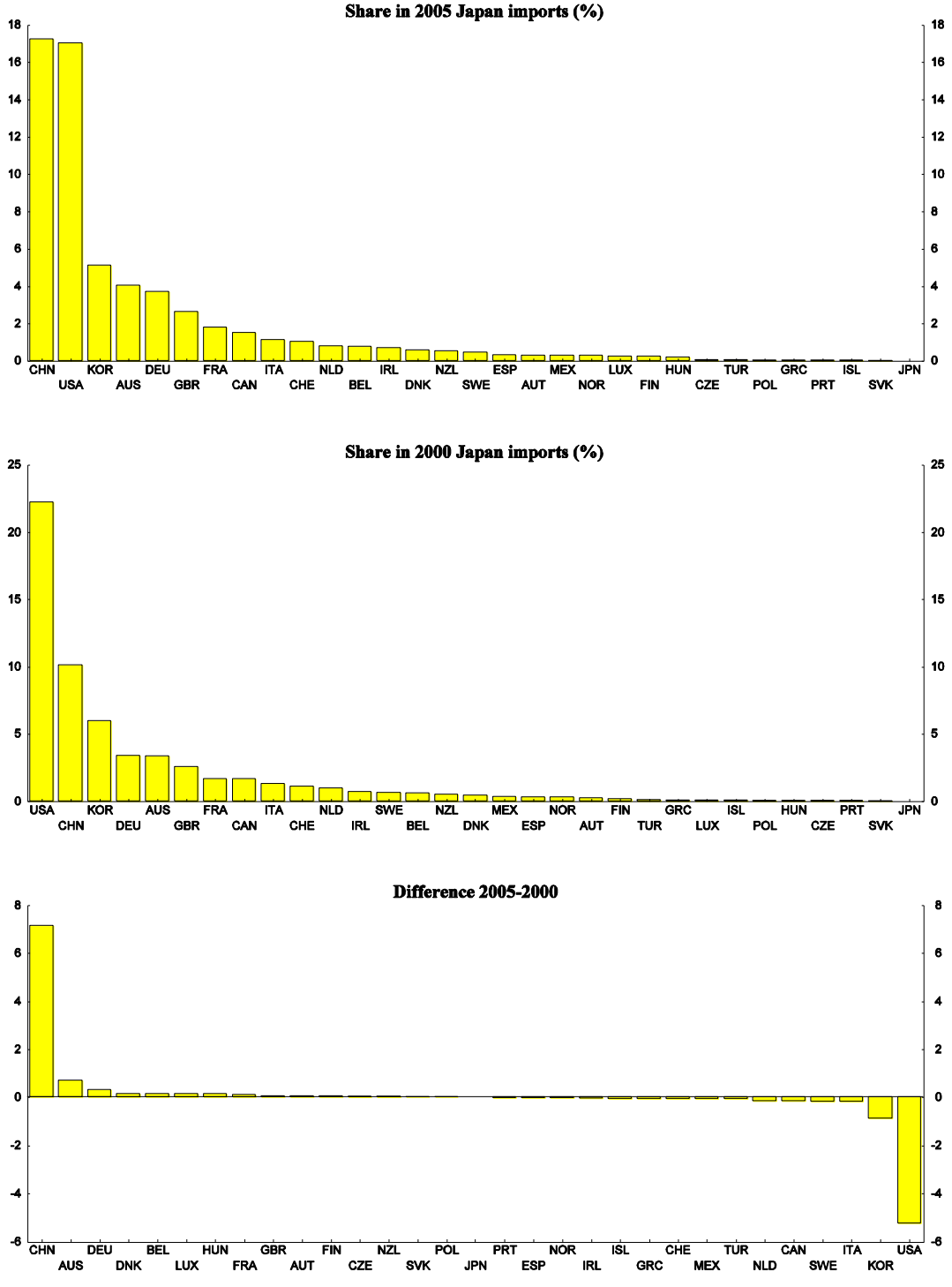


Figure A3.5 Canada export breakdown by destination

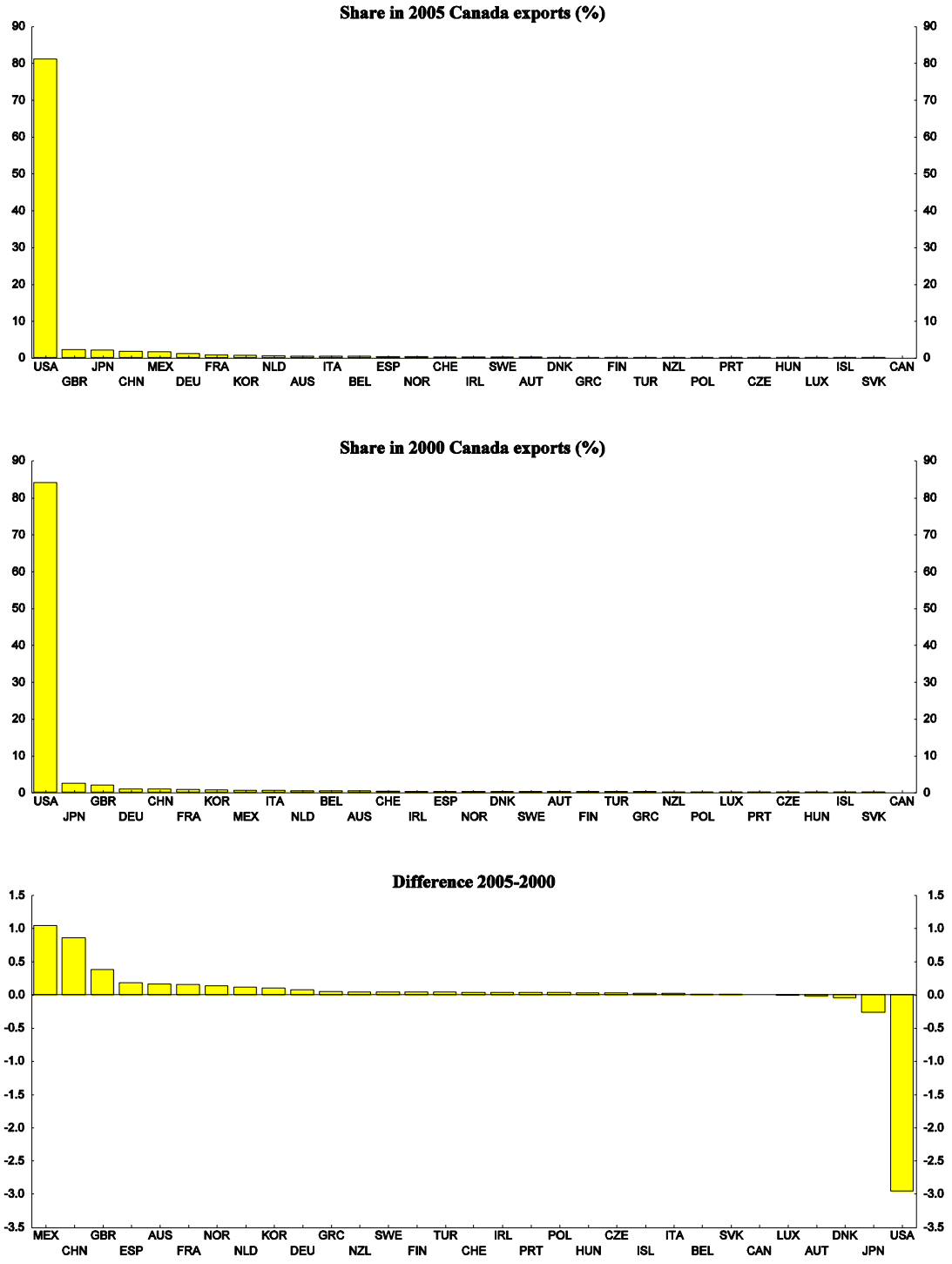


Figure A3.6 Canada import breakdown by origin

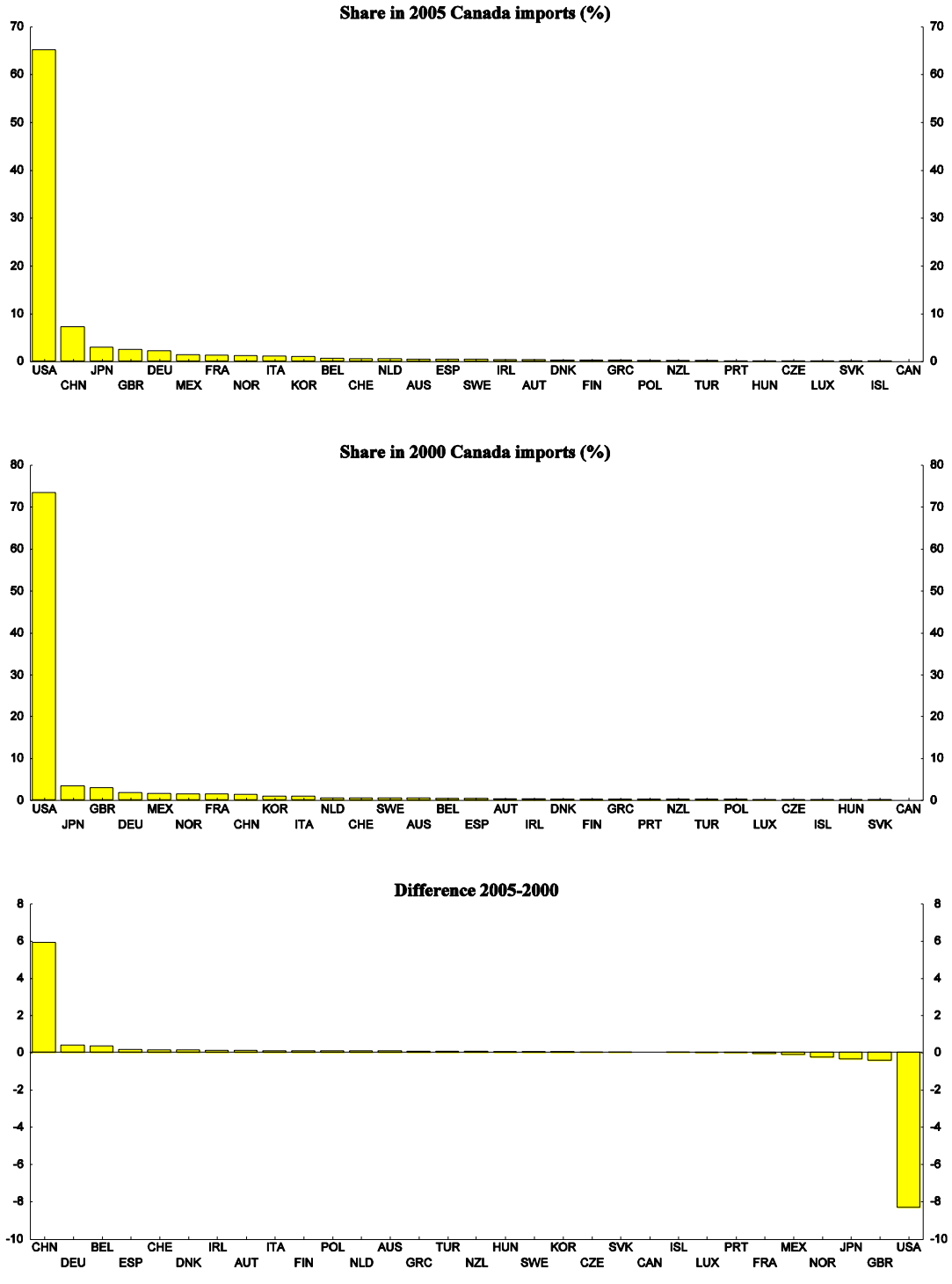


Figure A3.7 Germany export breakdown by destination

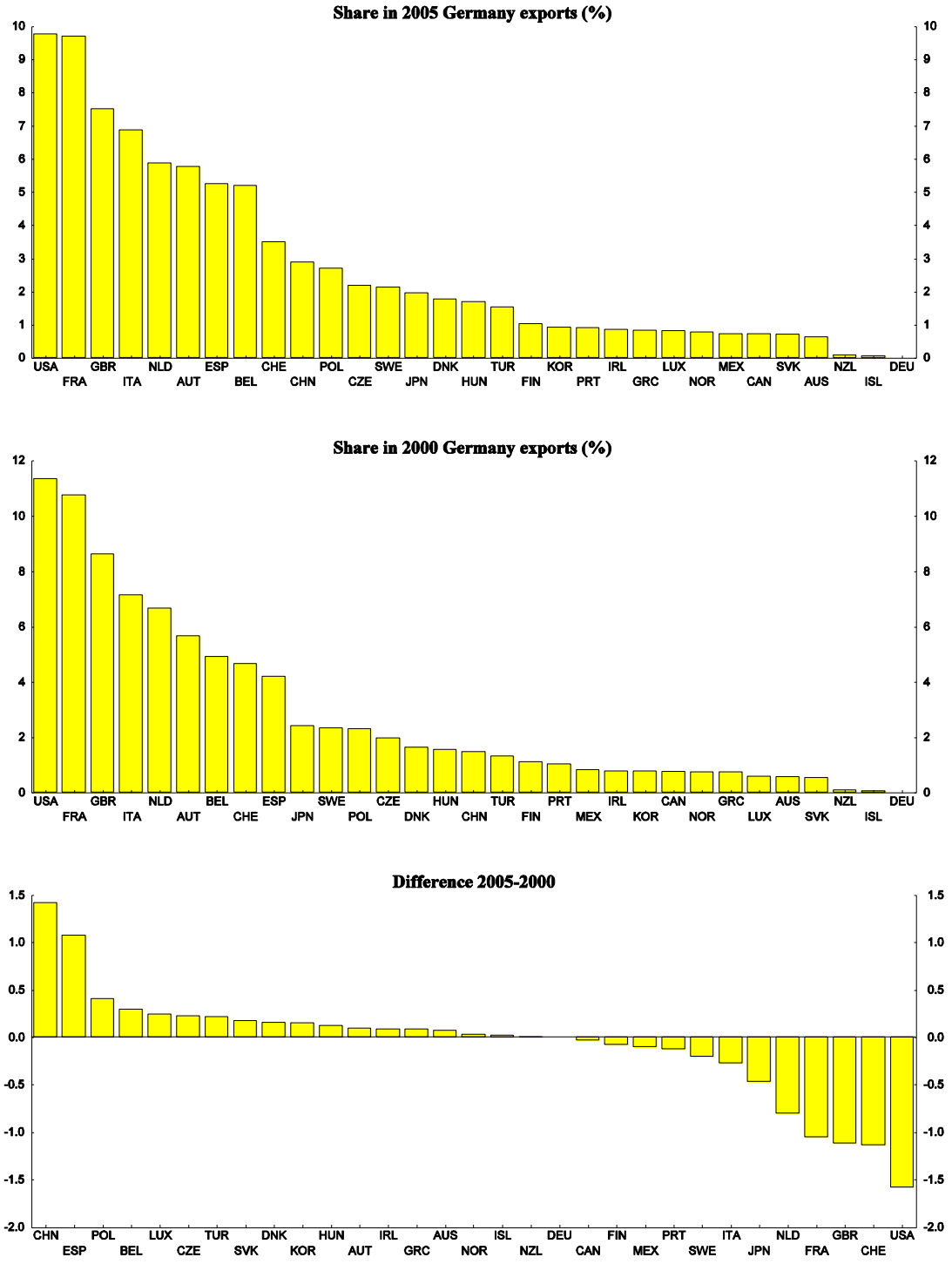


Figure A3.8 Germany import breakdown by origin

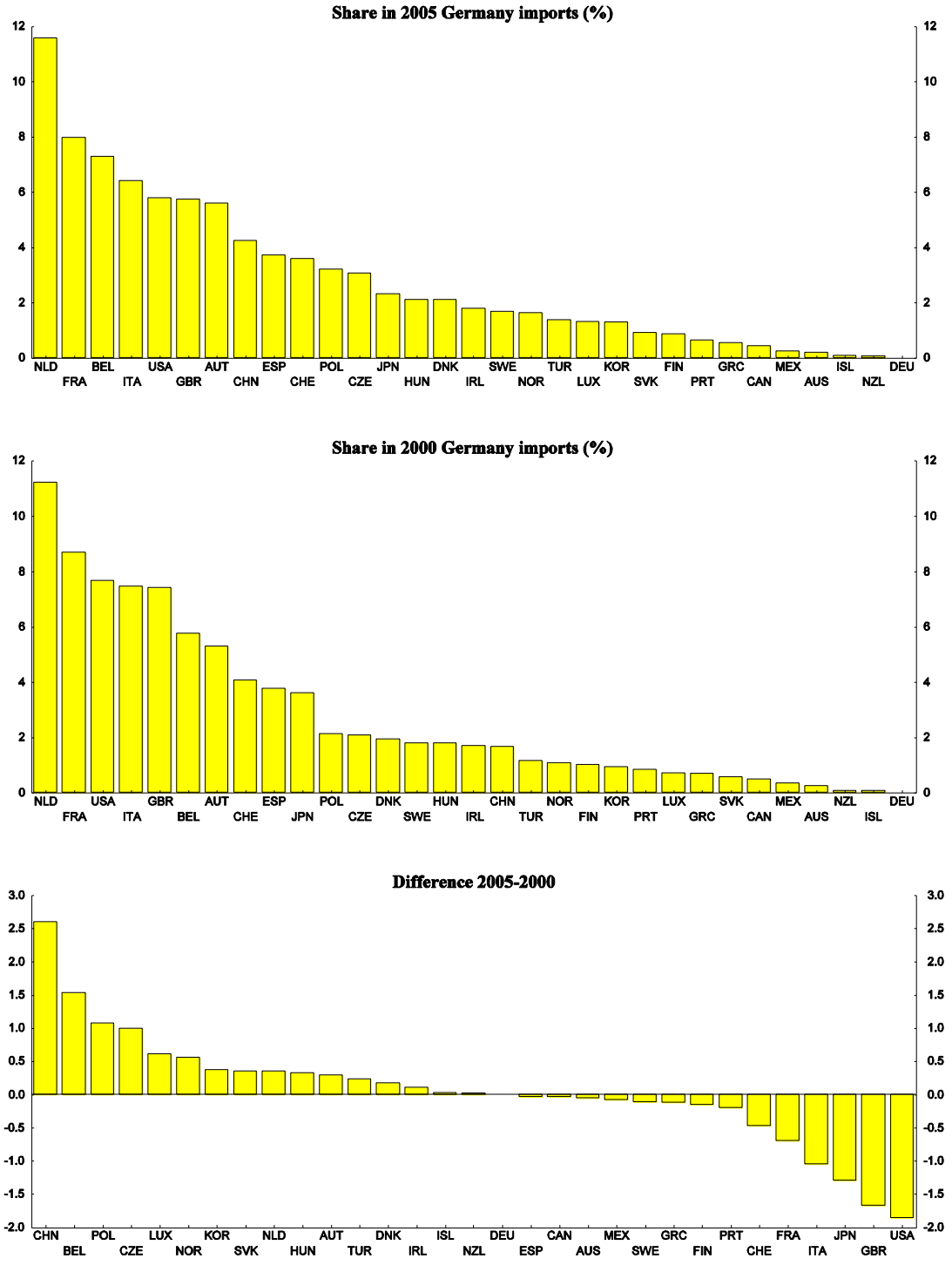


Figure A3.9 France export breakdown by destination

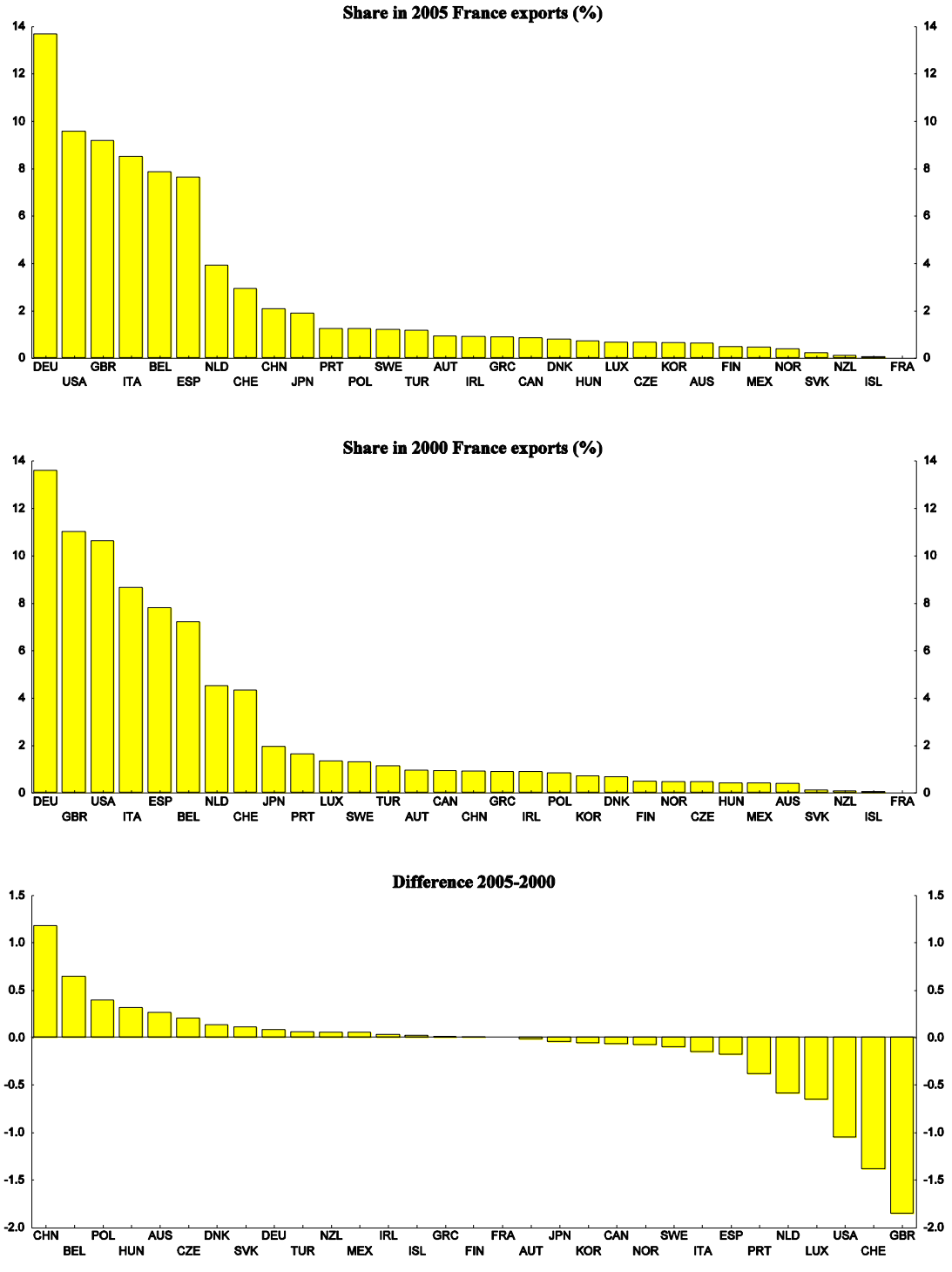


Figure A3.10 France import breakdown by origin

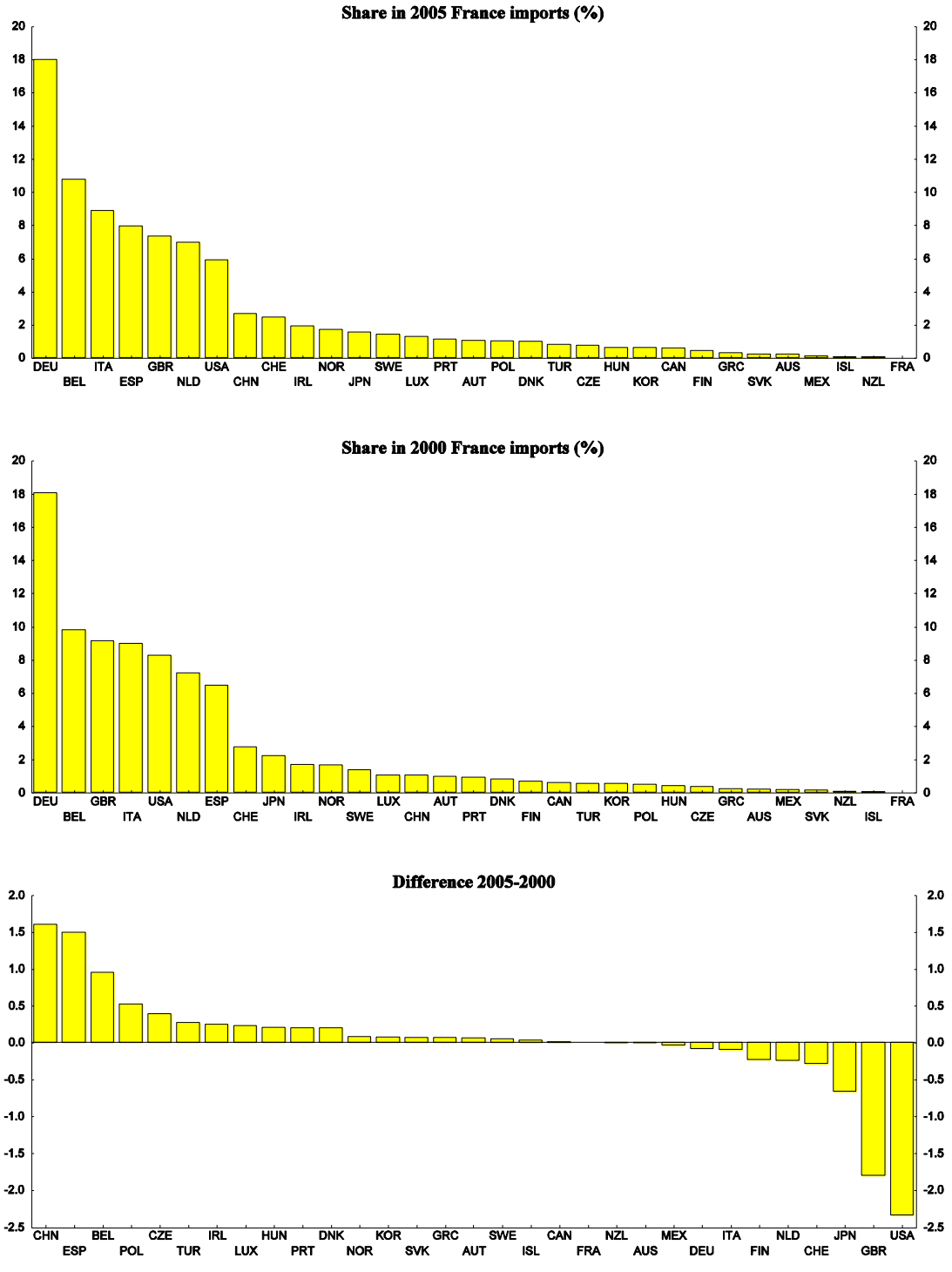


Figure A3.11 Italy export breakdown by destination

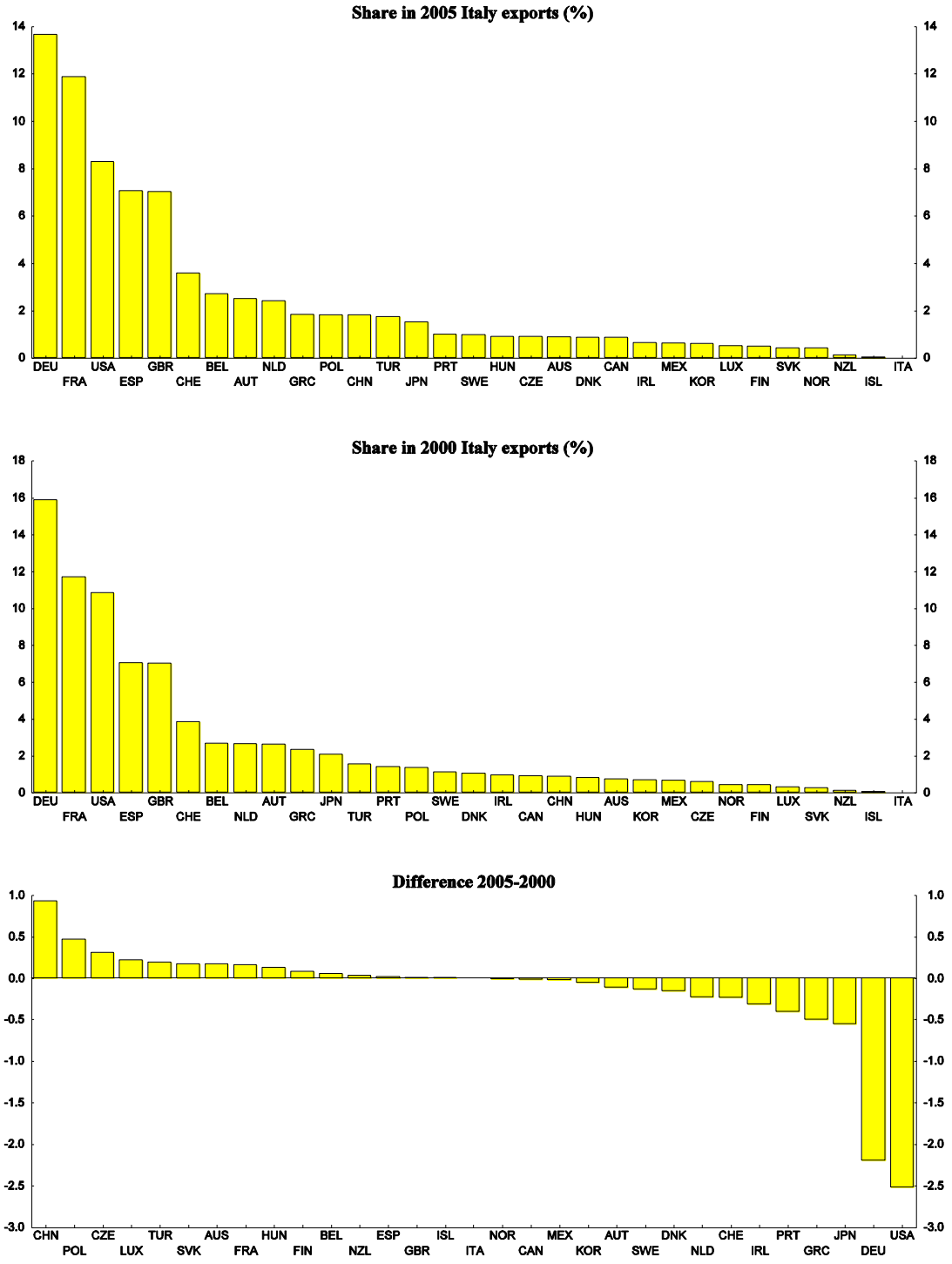


Figure A3.12 Italy import breakdown by origin

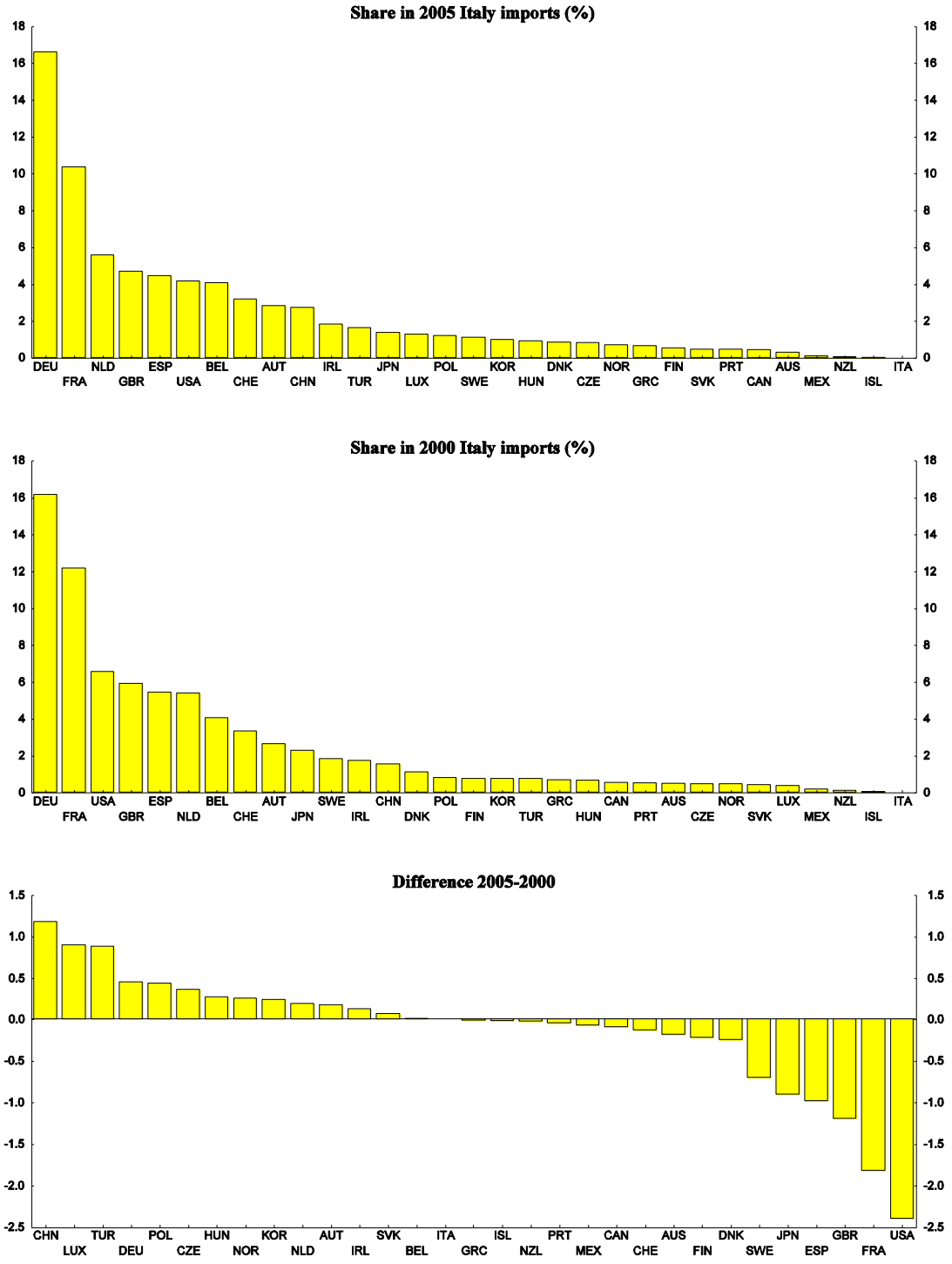


Figure A3.13 United Kingdom export breakdown by destination

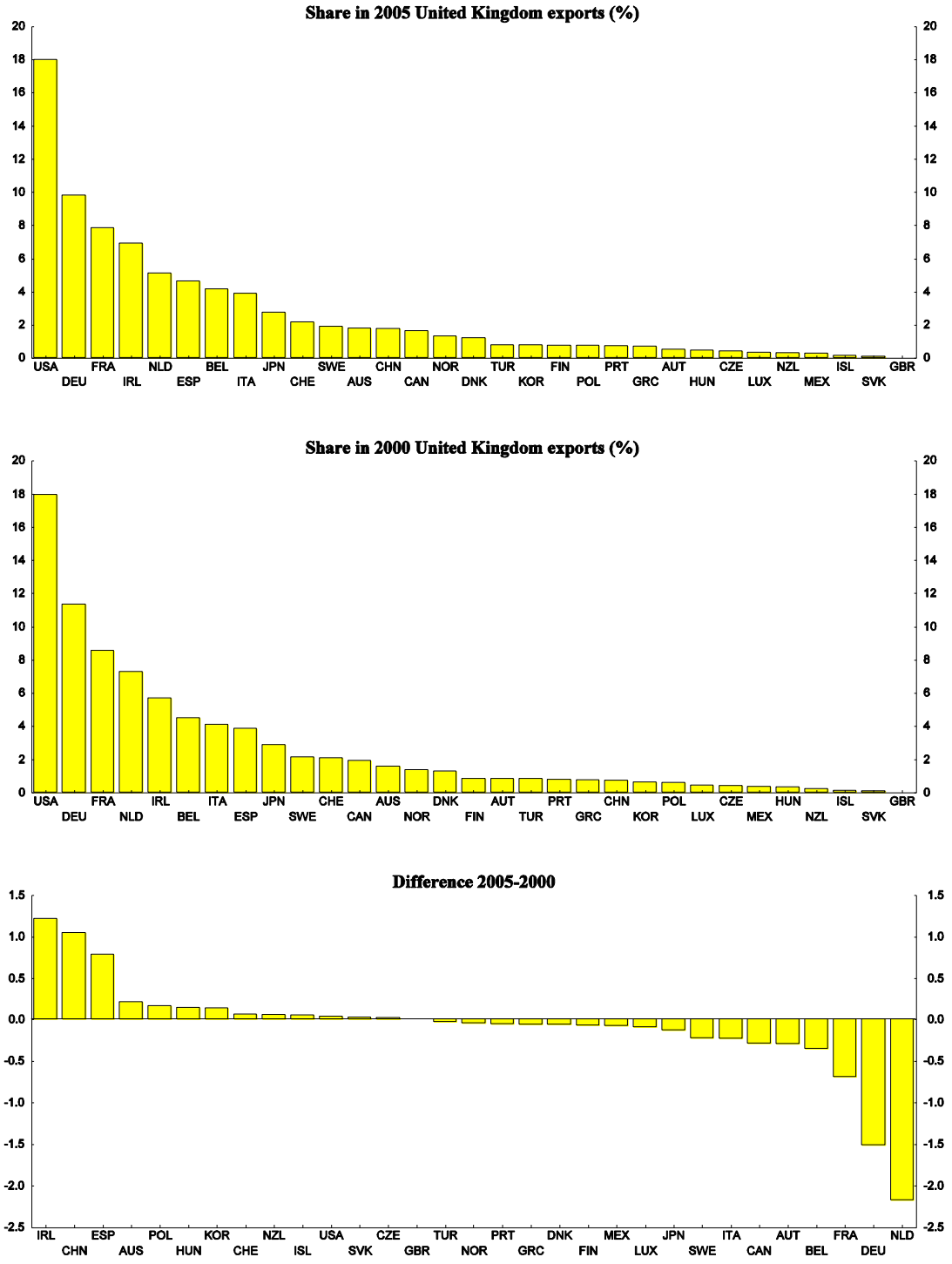


Figure A3.14 United Kingdom import breakdown by origin

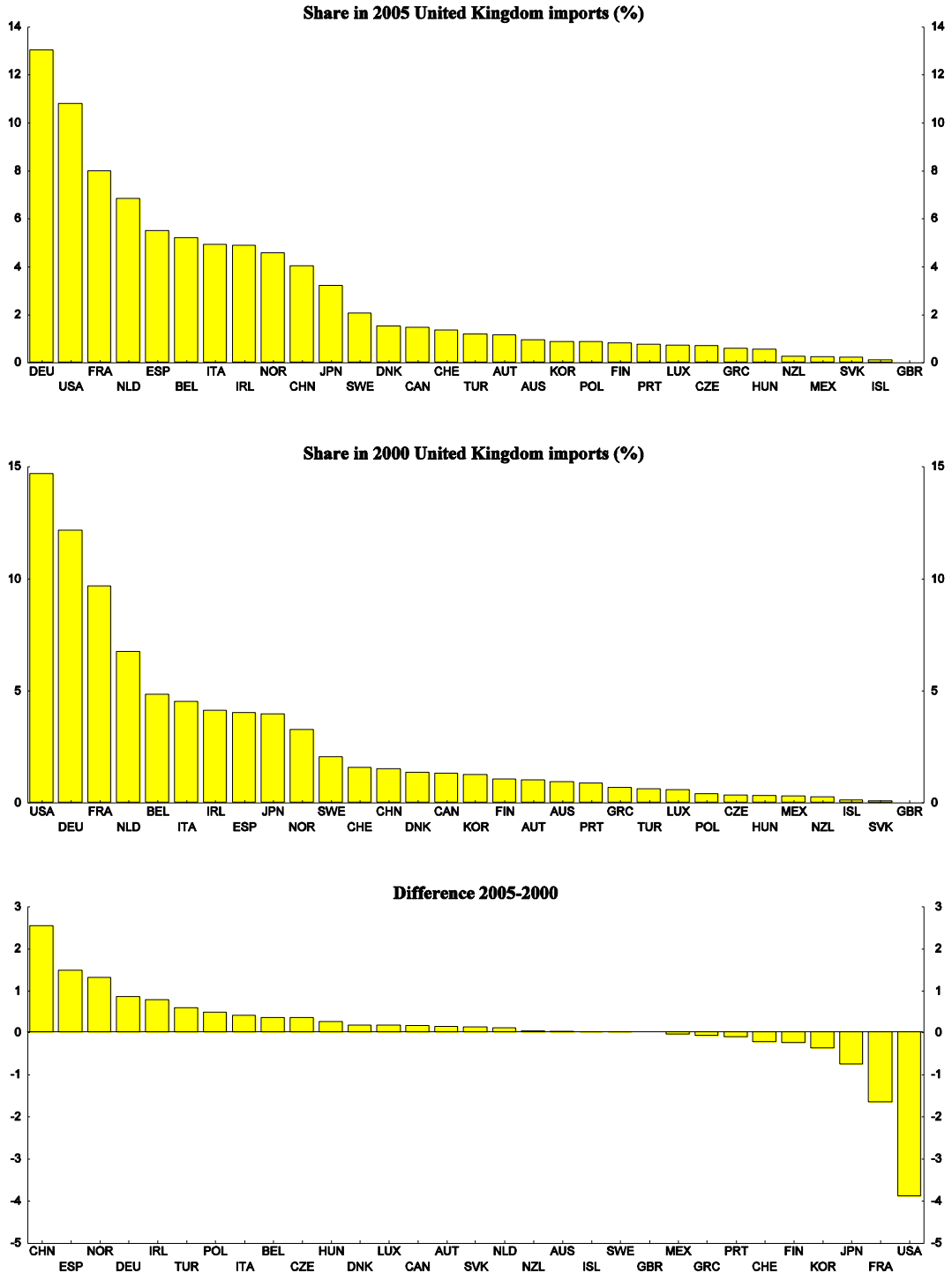


Figure A3.15 Australia export breakdown by destination

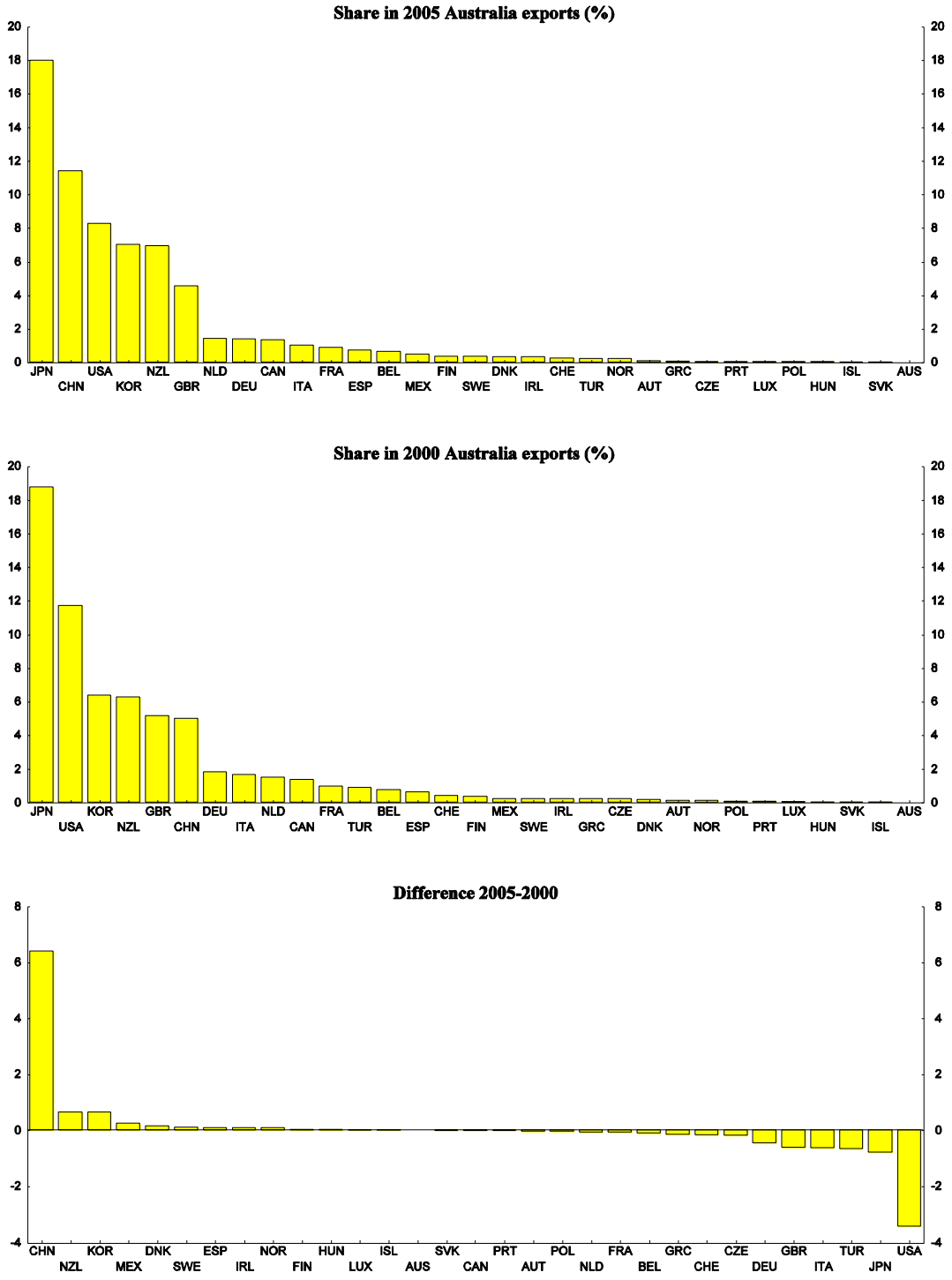


Figure A3.16 Australia import breakdown by origin

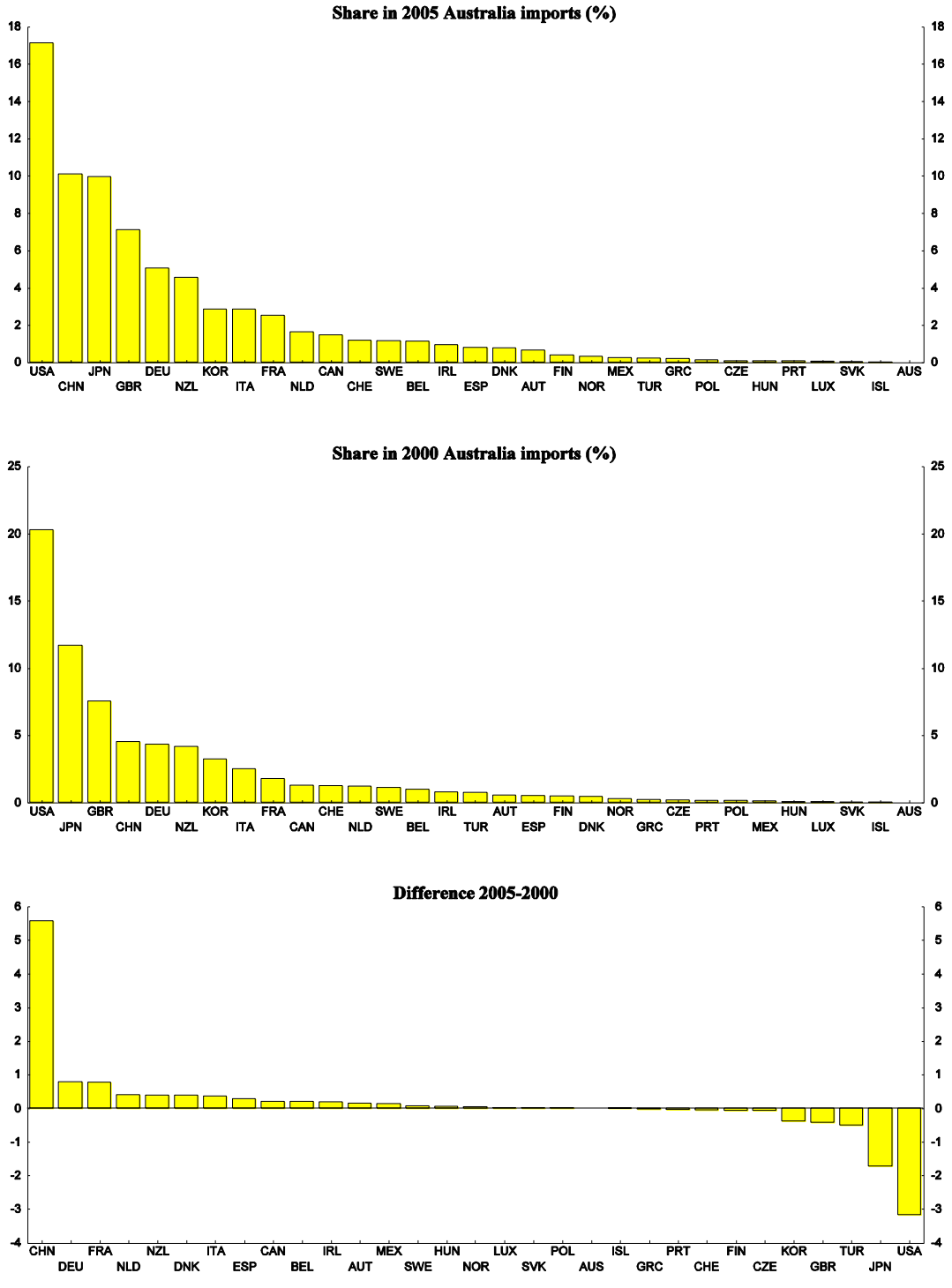


Figure A3.17 Austria export breakdown by destination

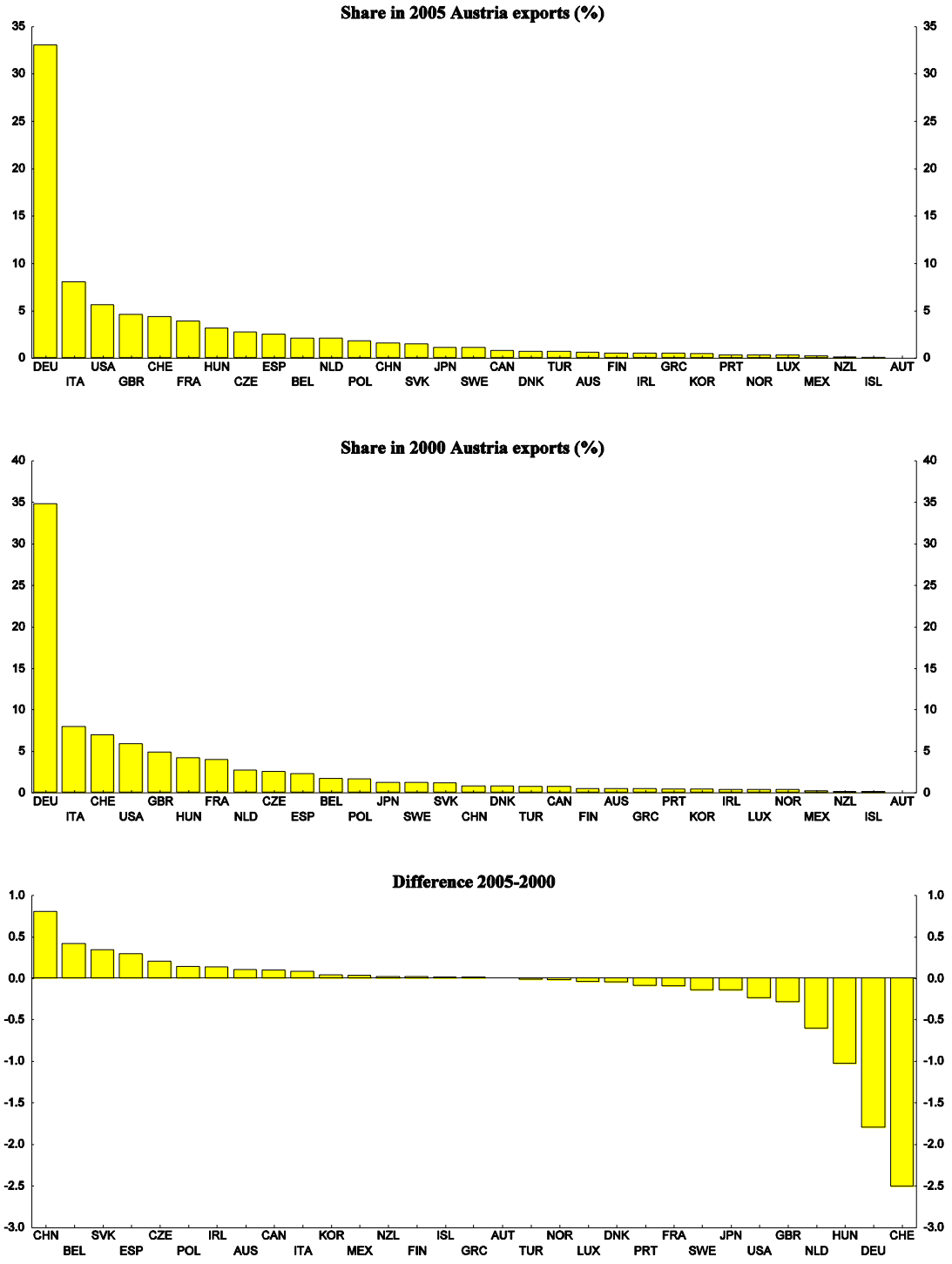


Figure A3.18 Austria import breakdown by origin

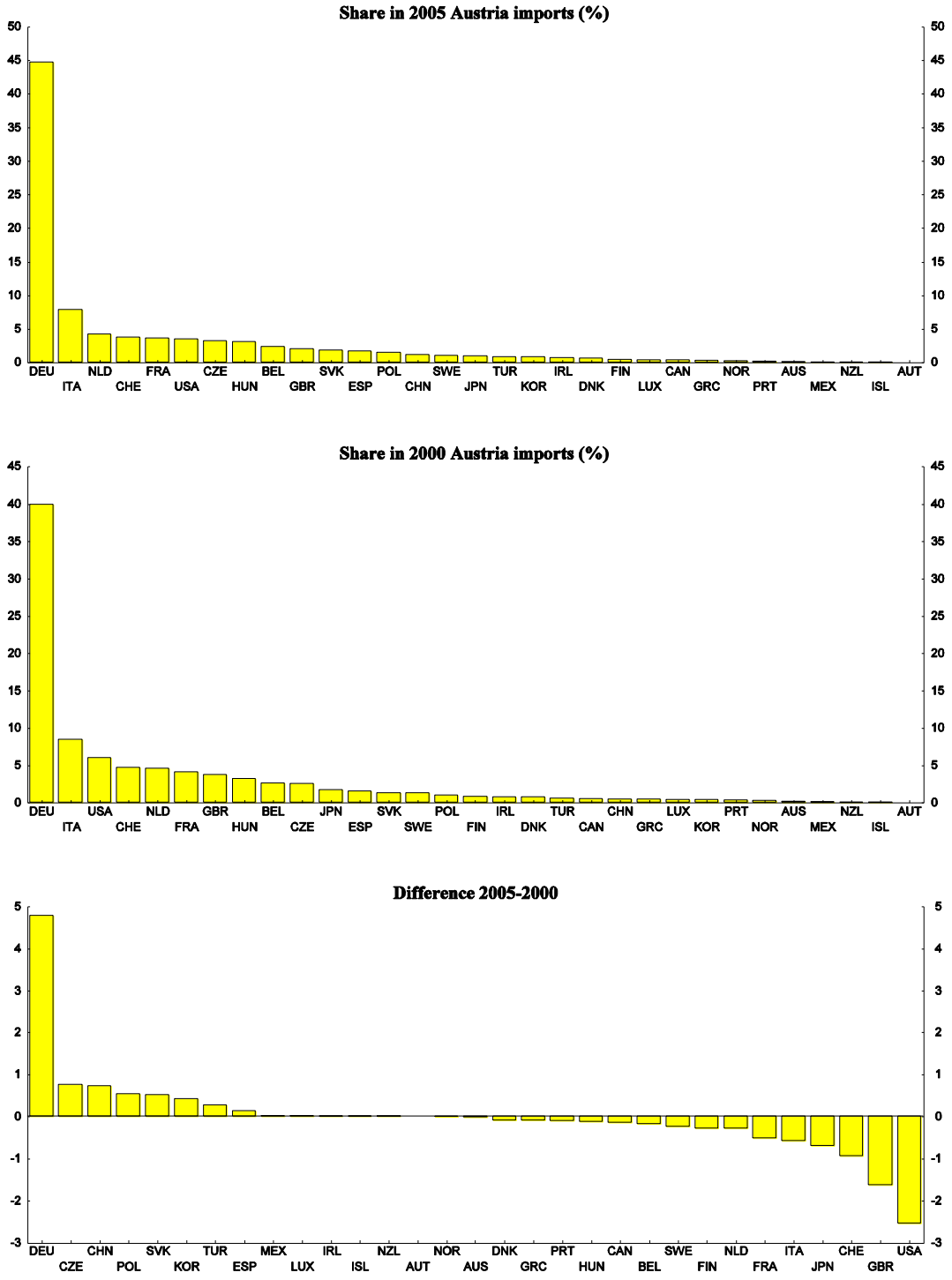


Figure A3.19 Belgium export breakdown by destination

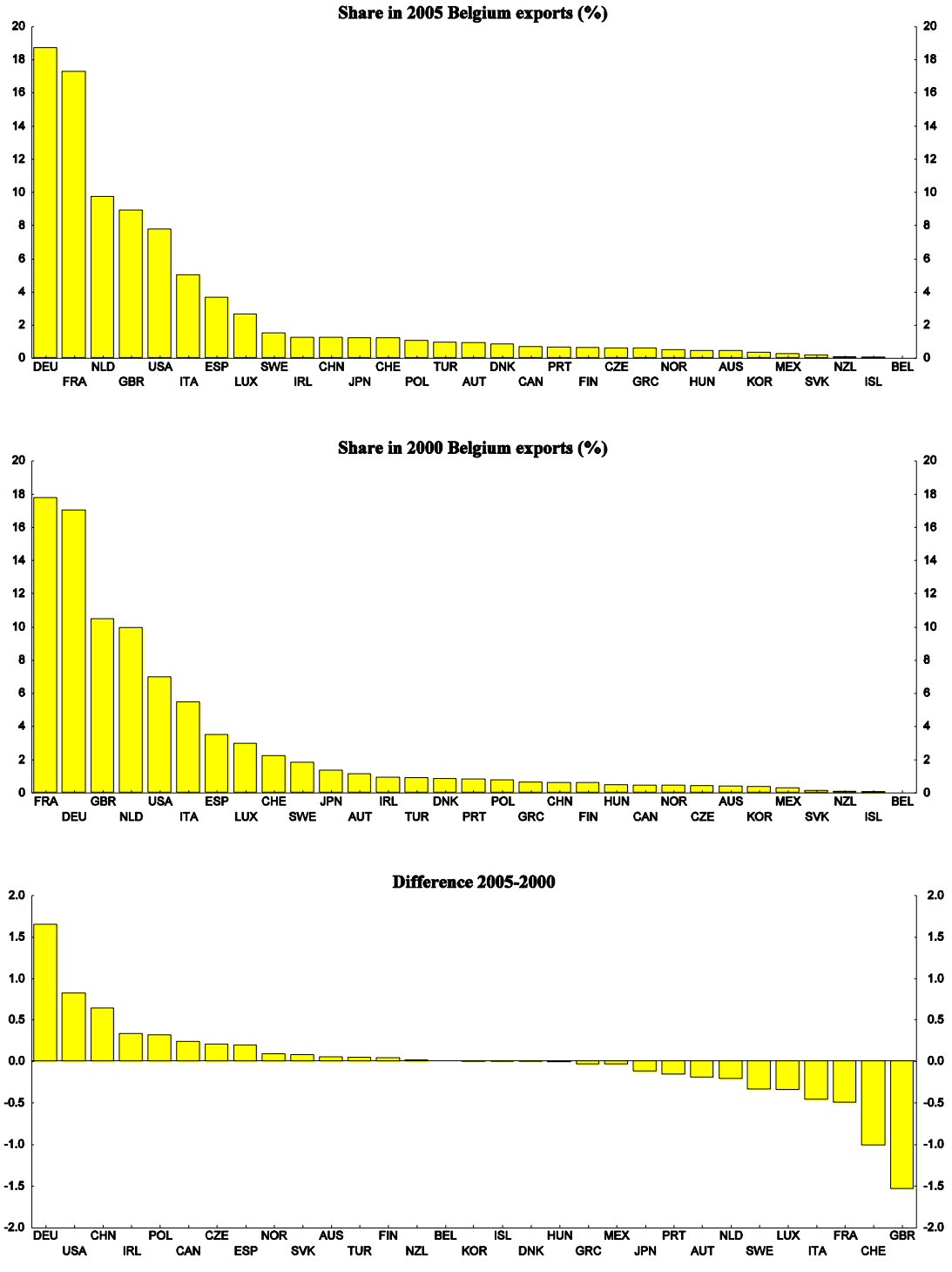


Figure A3.20 Belgium import breakdown by origin

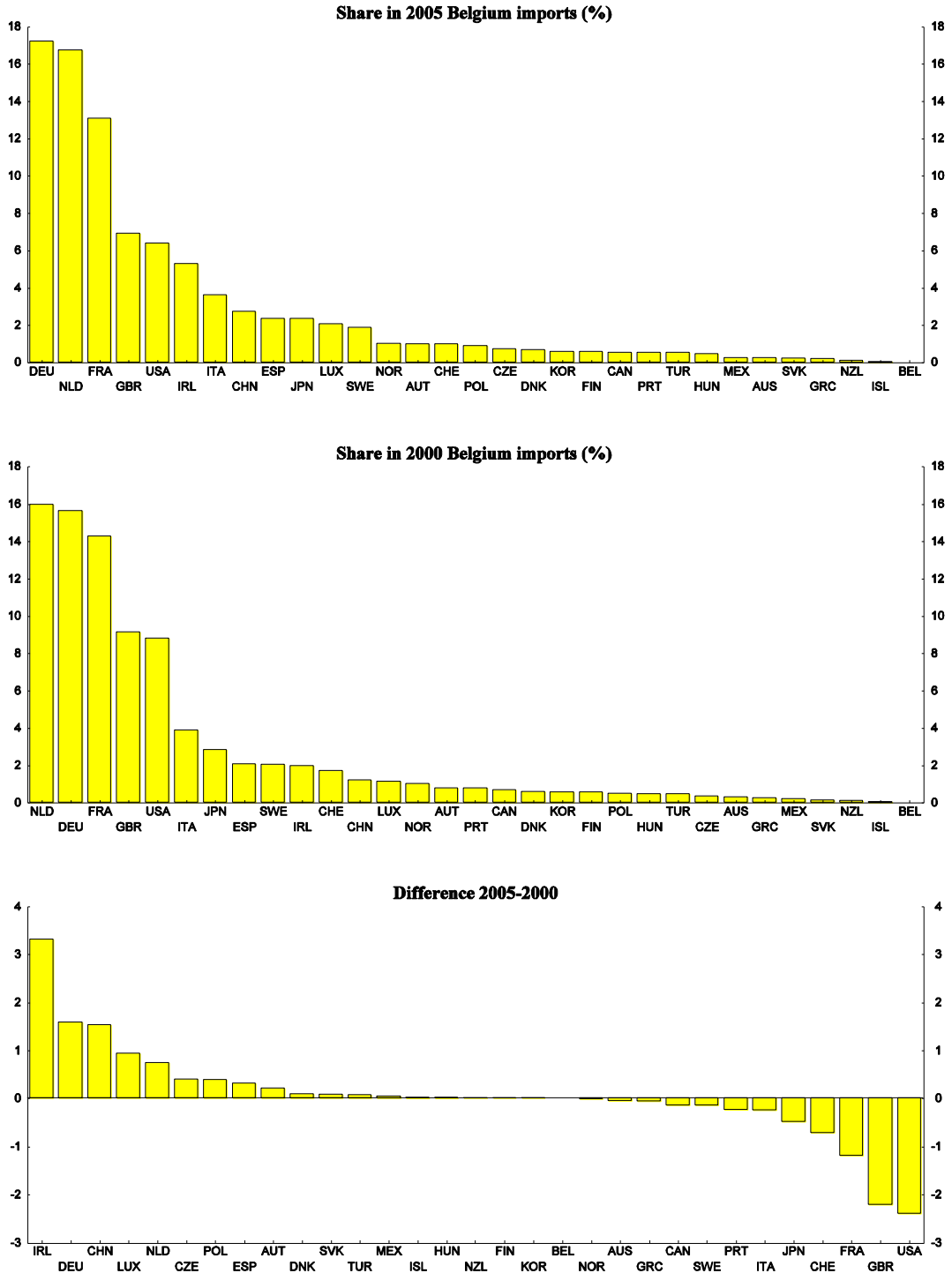


Figure A3.21 Czech Republic export breakdown by destination

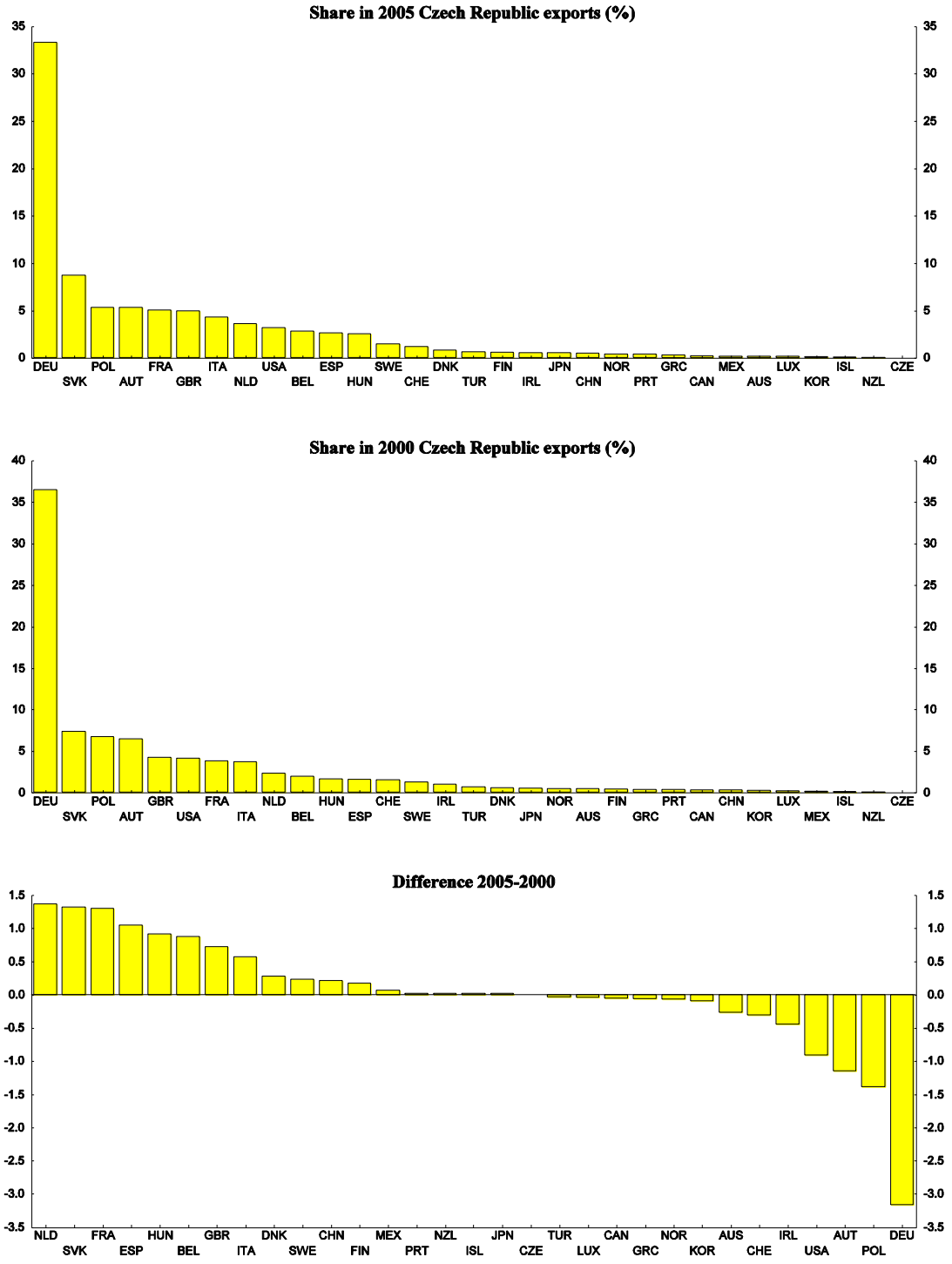


Figure A3.22 Czech Republic import breakdown by origin

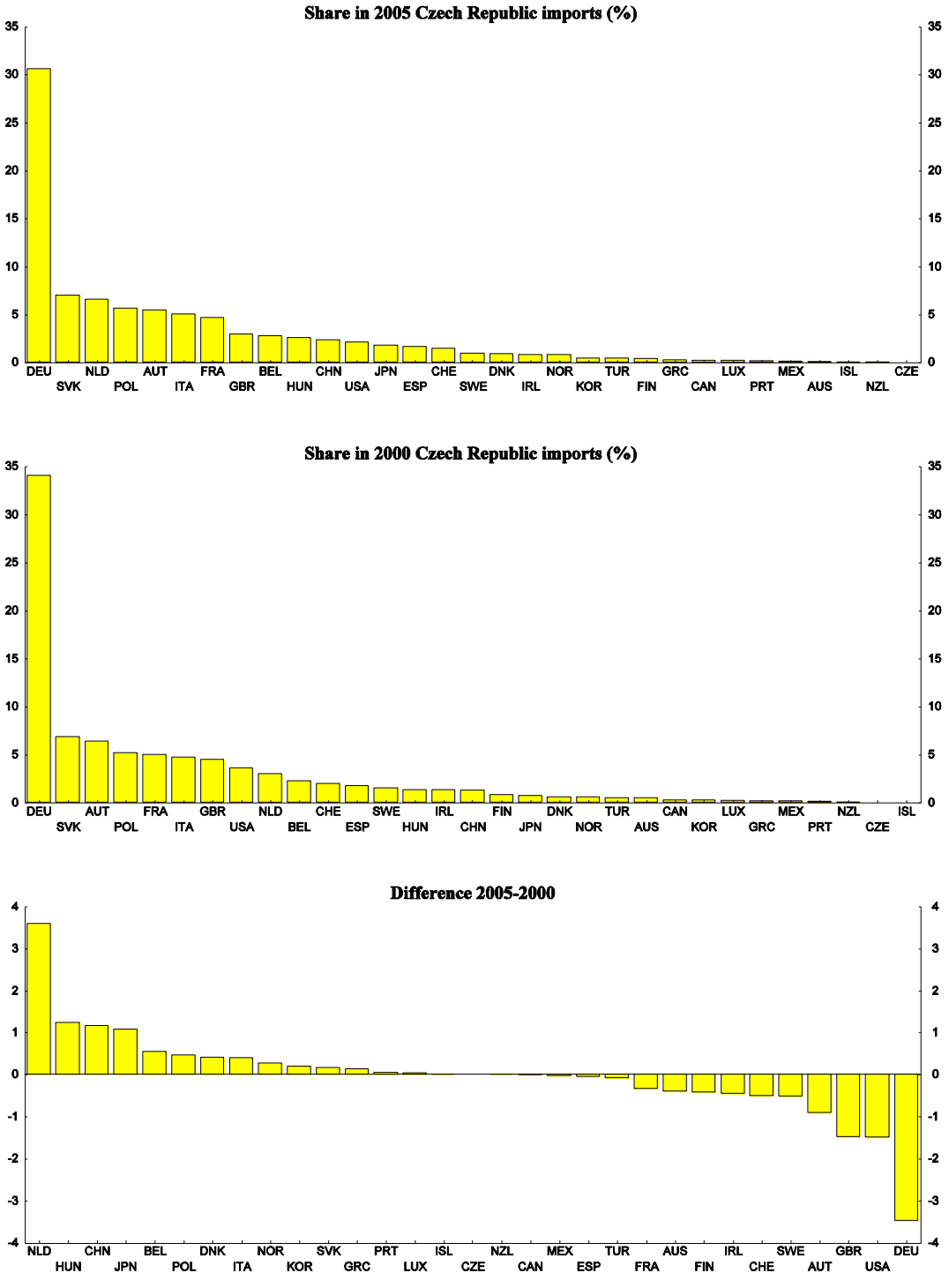


Figure A3.23 Denmark export breakdown by destination

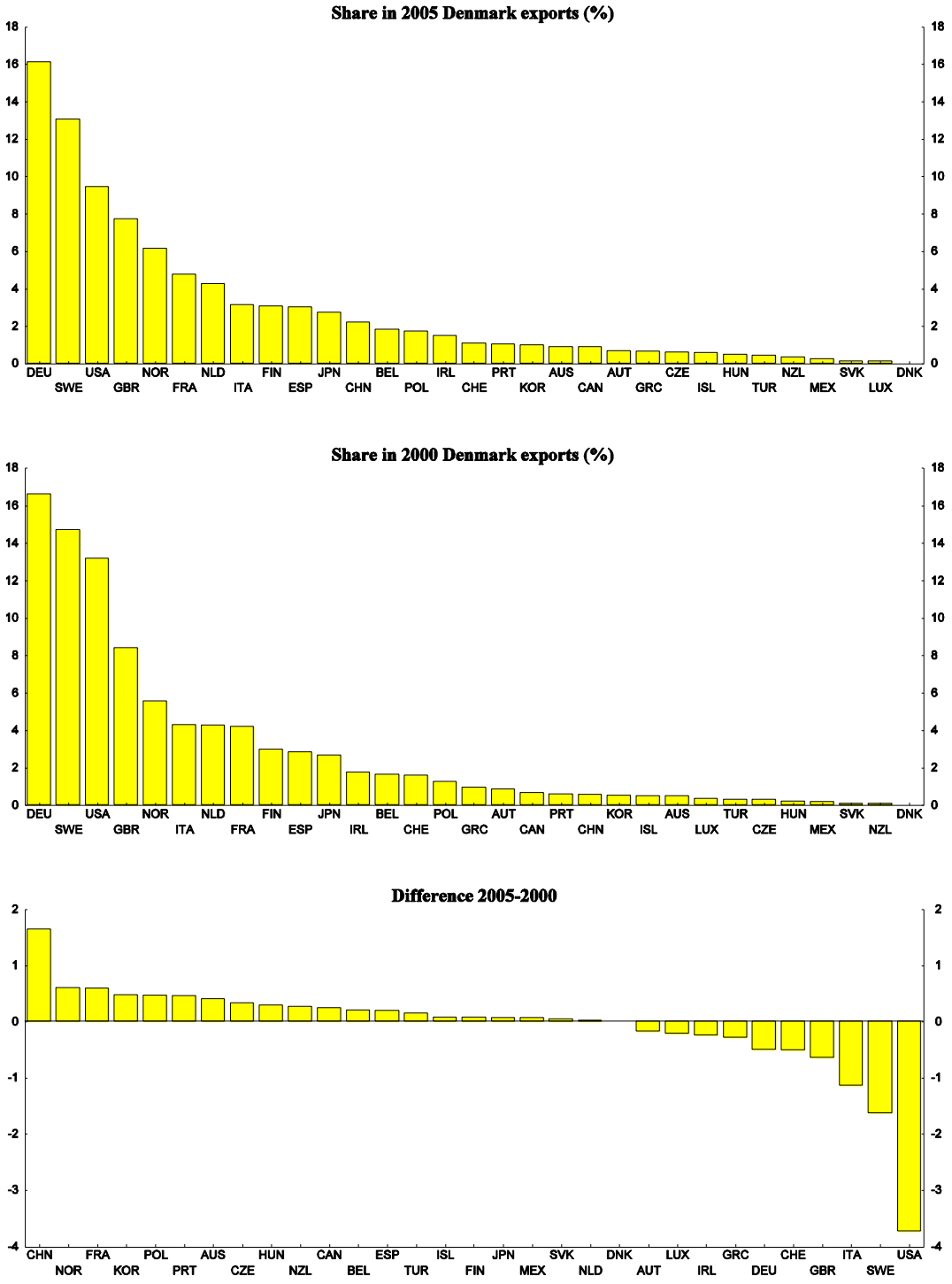


Figure A3.24 Denmark import breakdown by origin

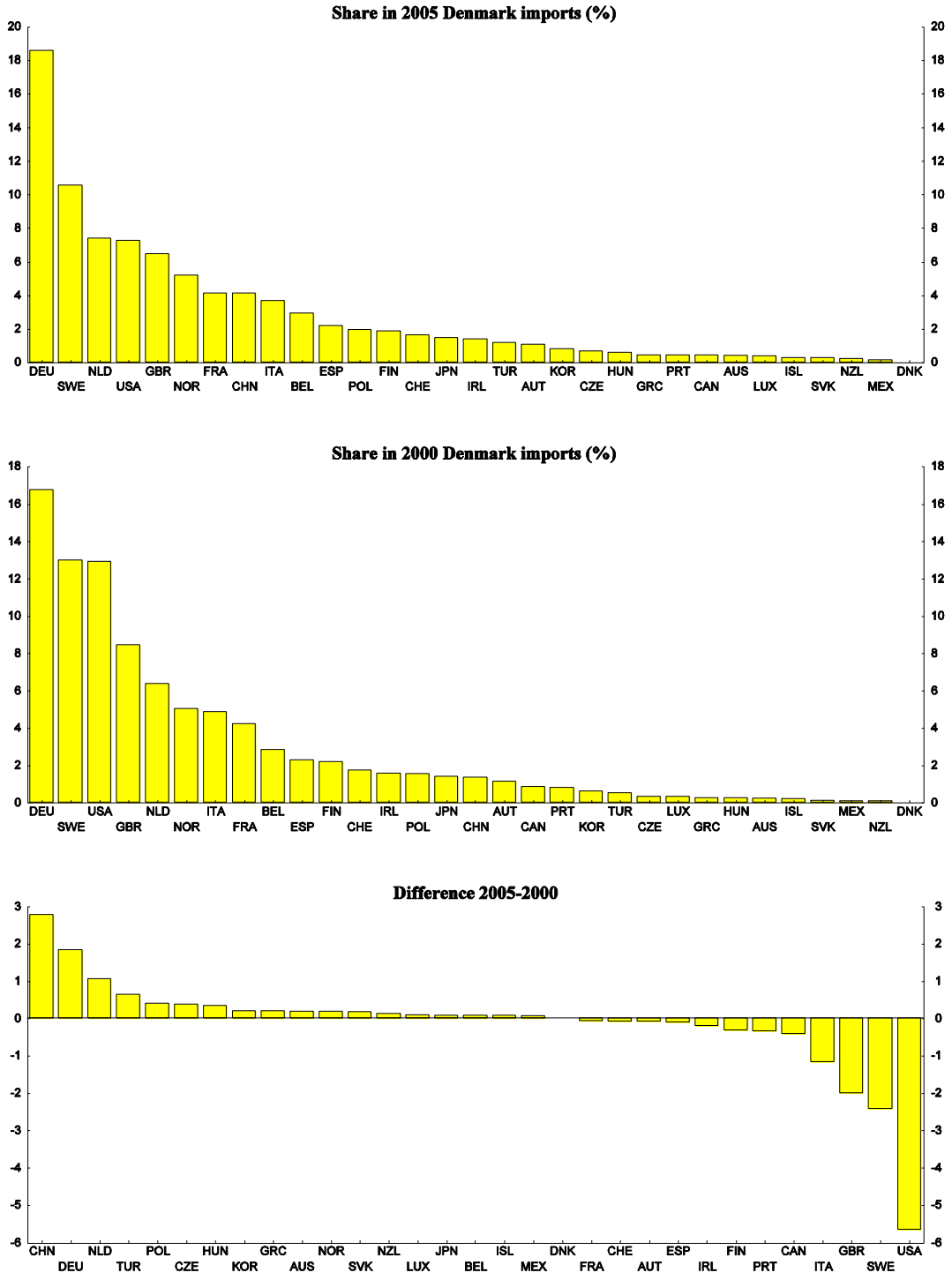


Figure A3.25 Finland export breakdown by destination

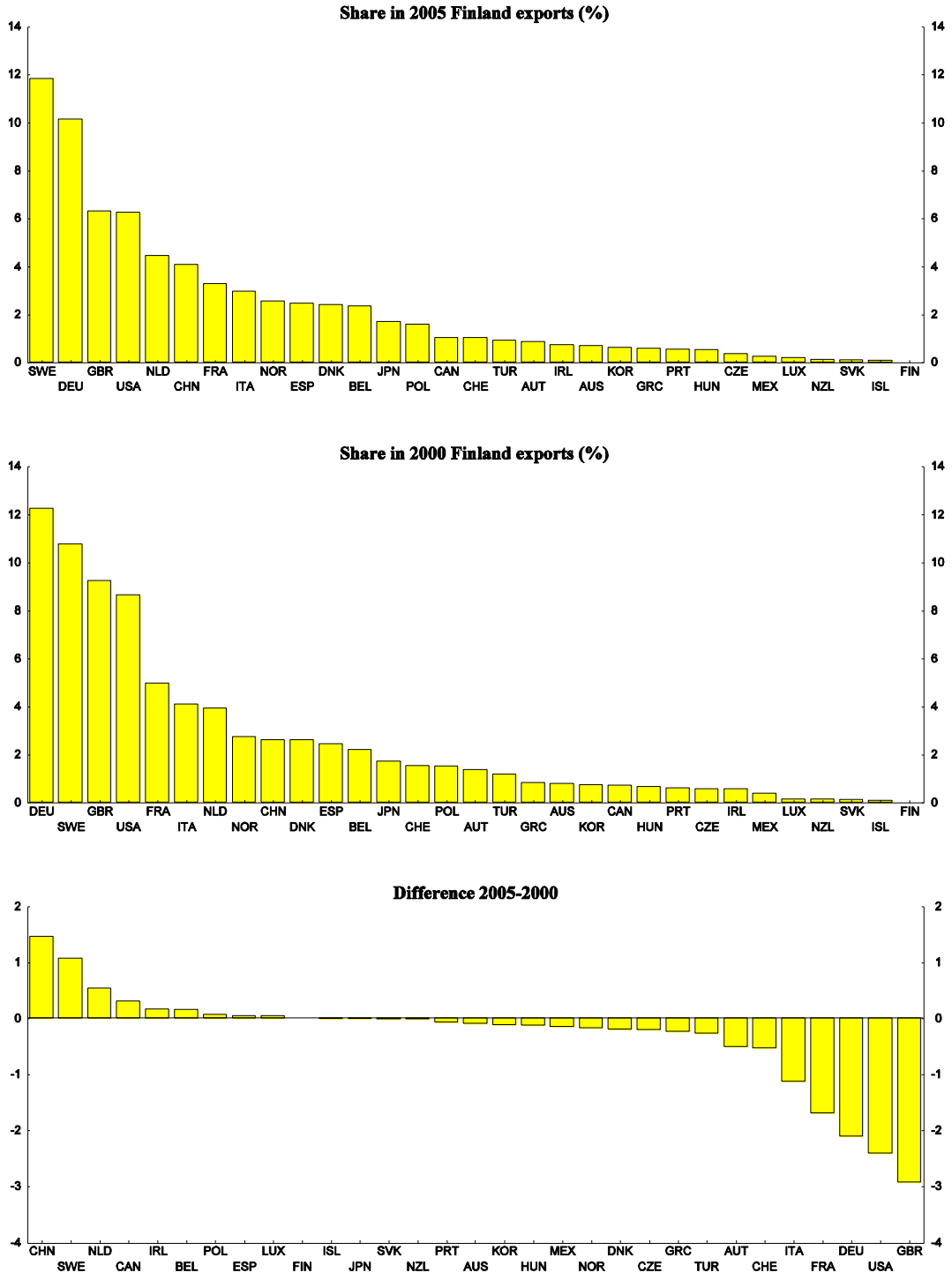


Figure A3.26 Finland import breakdown by origin

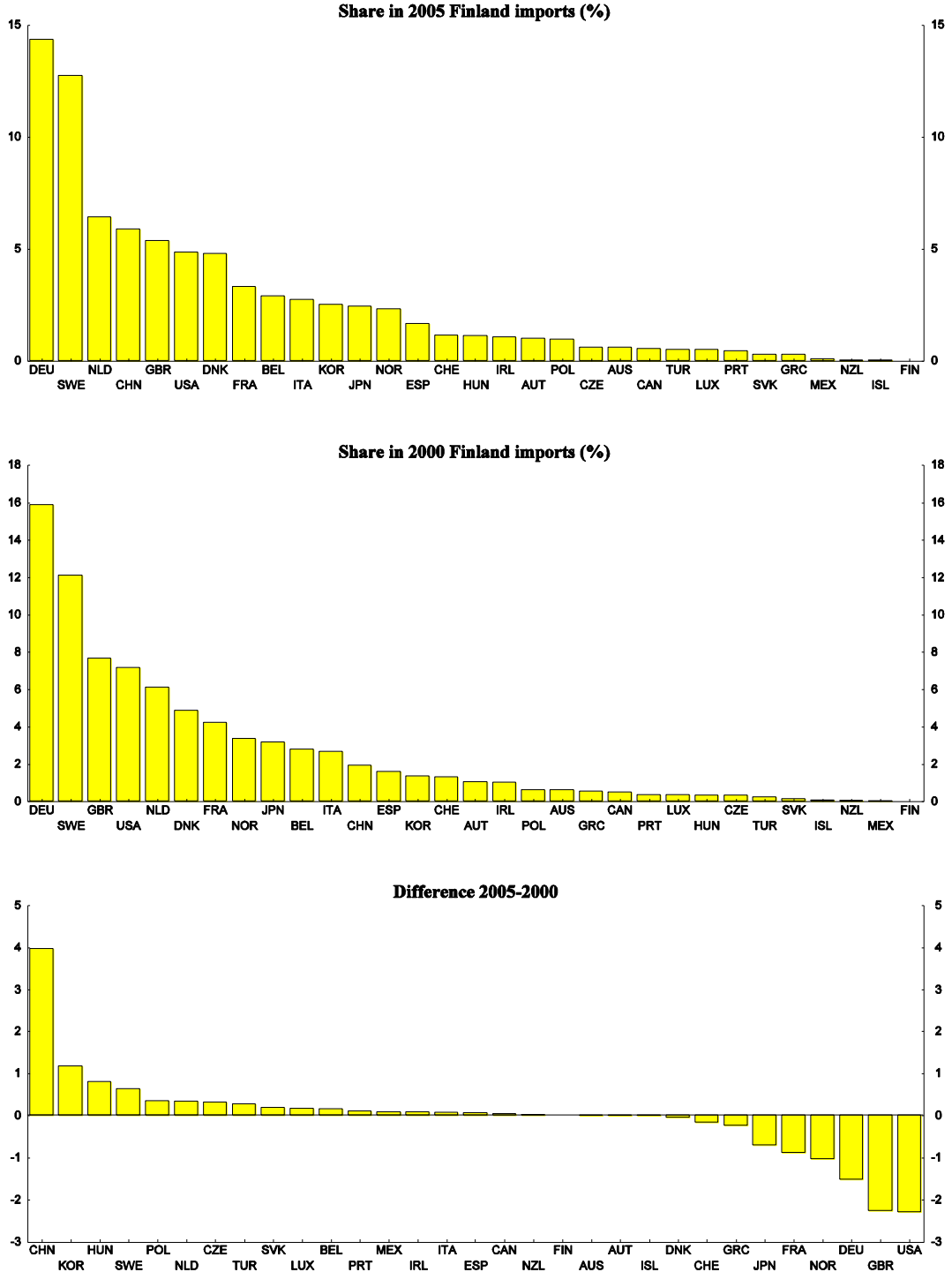


Figure A3.27 Greece export breakdown by destination

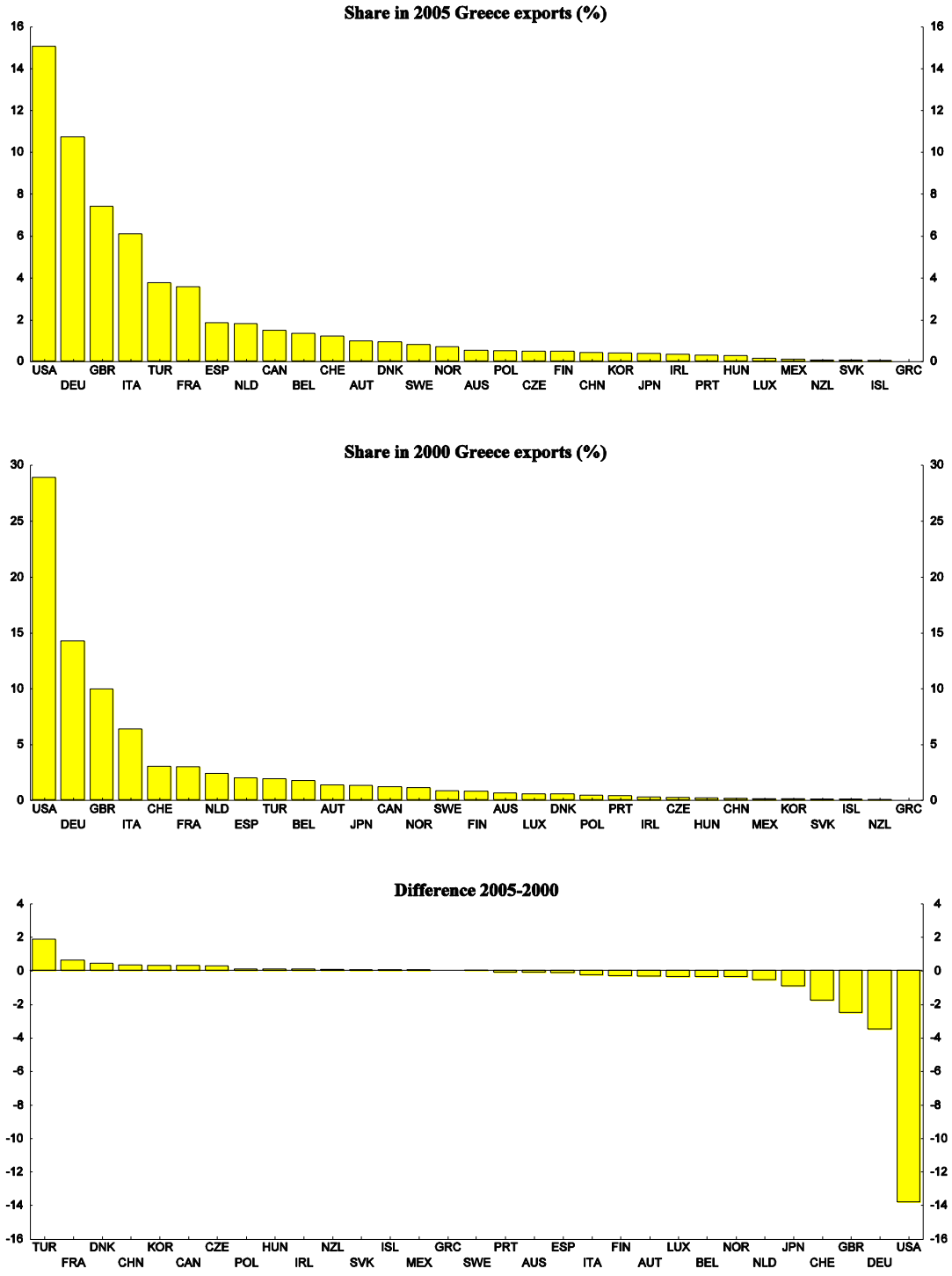


Figure A3.28 Greece import breakdown by origin

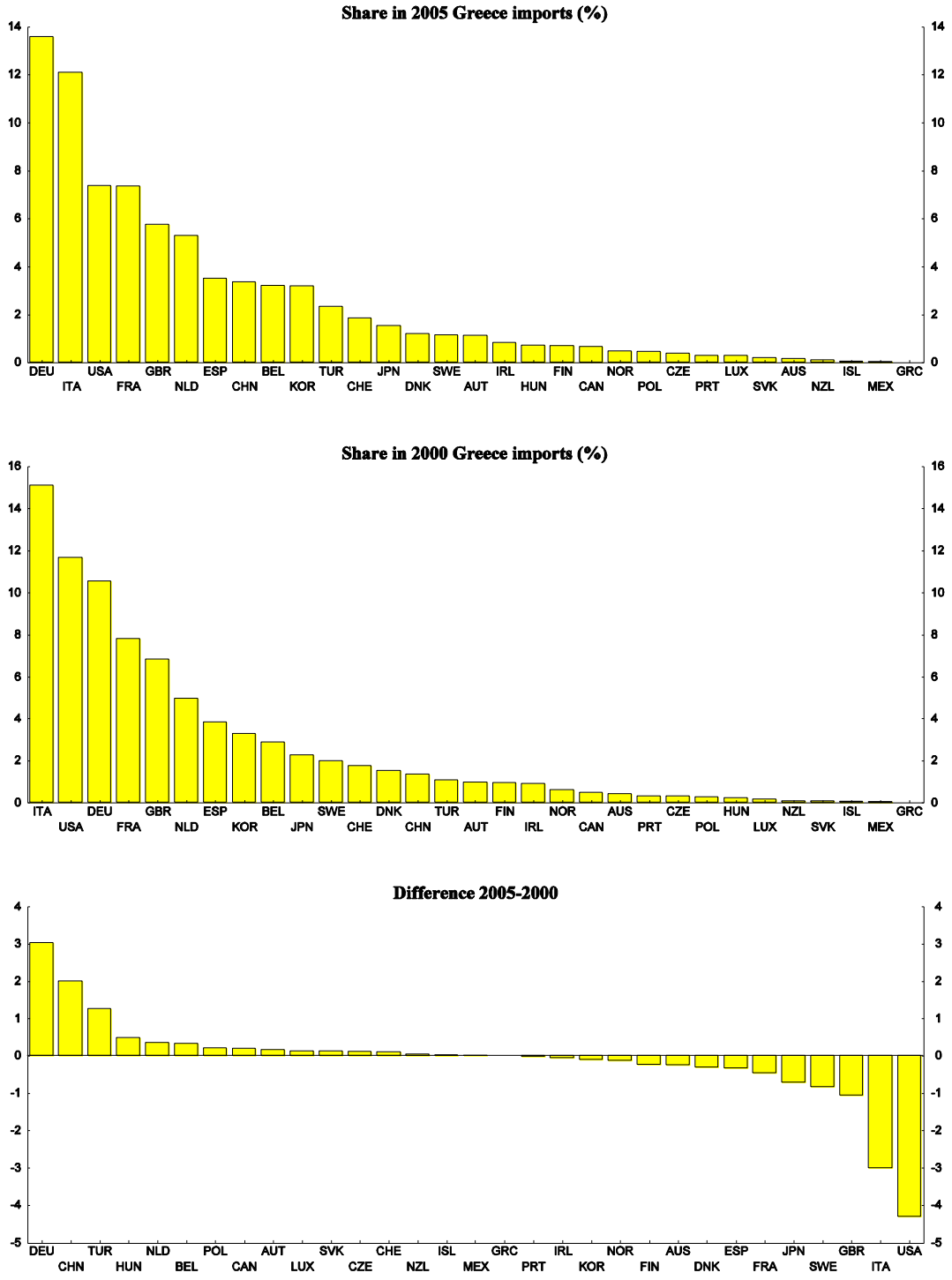


Figure A3.29 Hungary export breakdown by destination

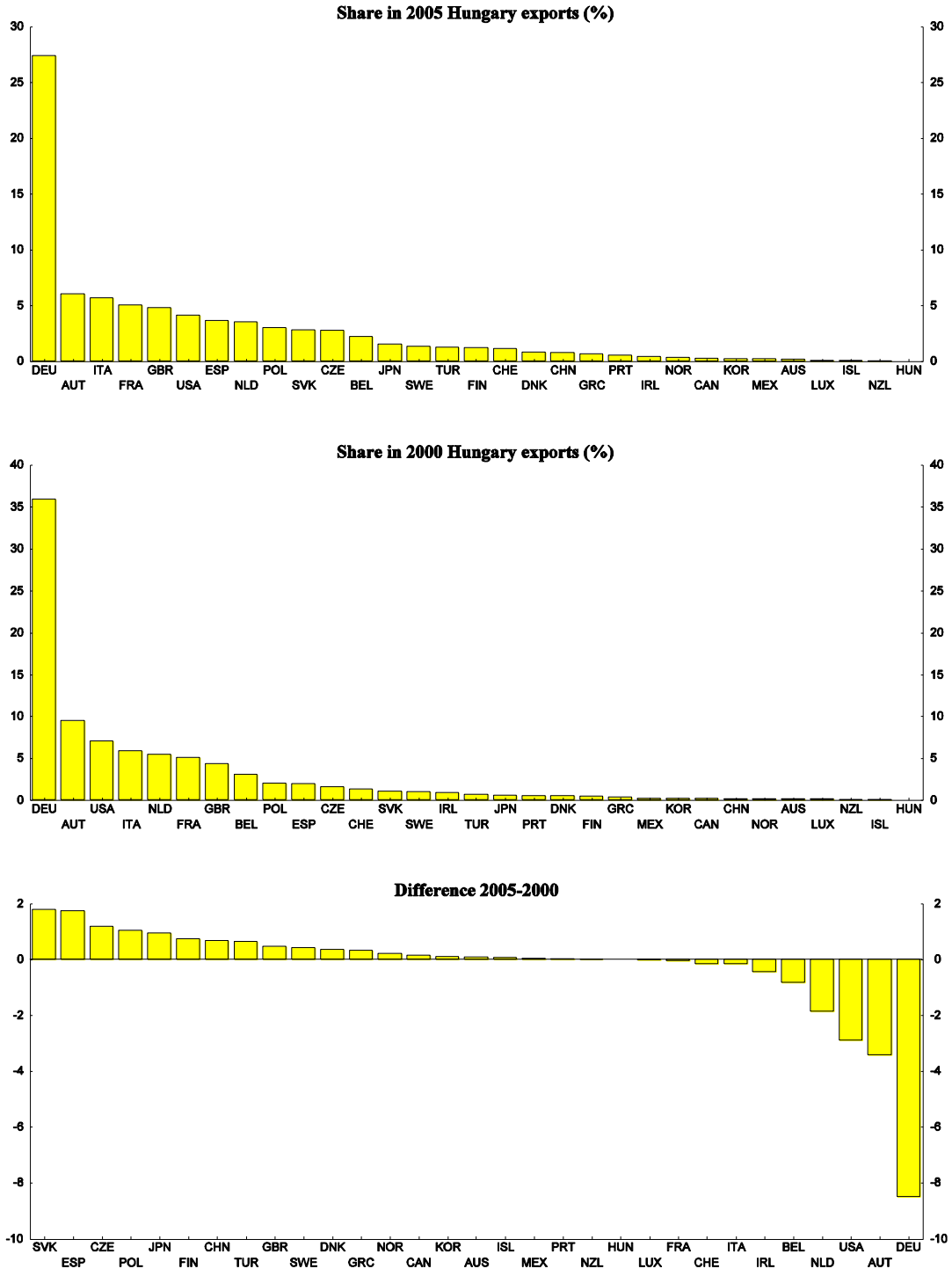


Figure A3.30 Hungary import breakdown by origin

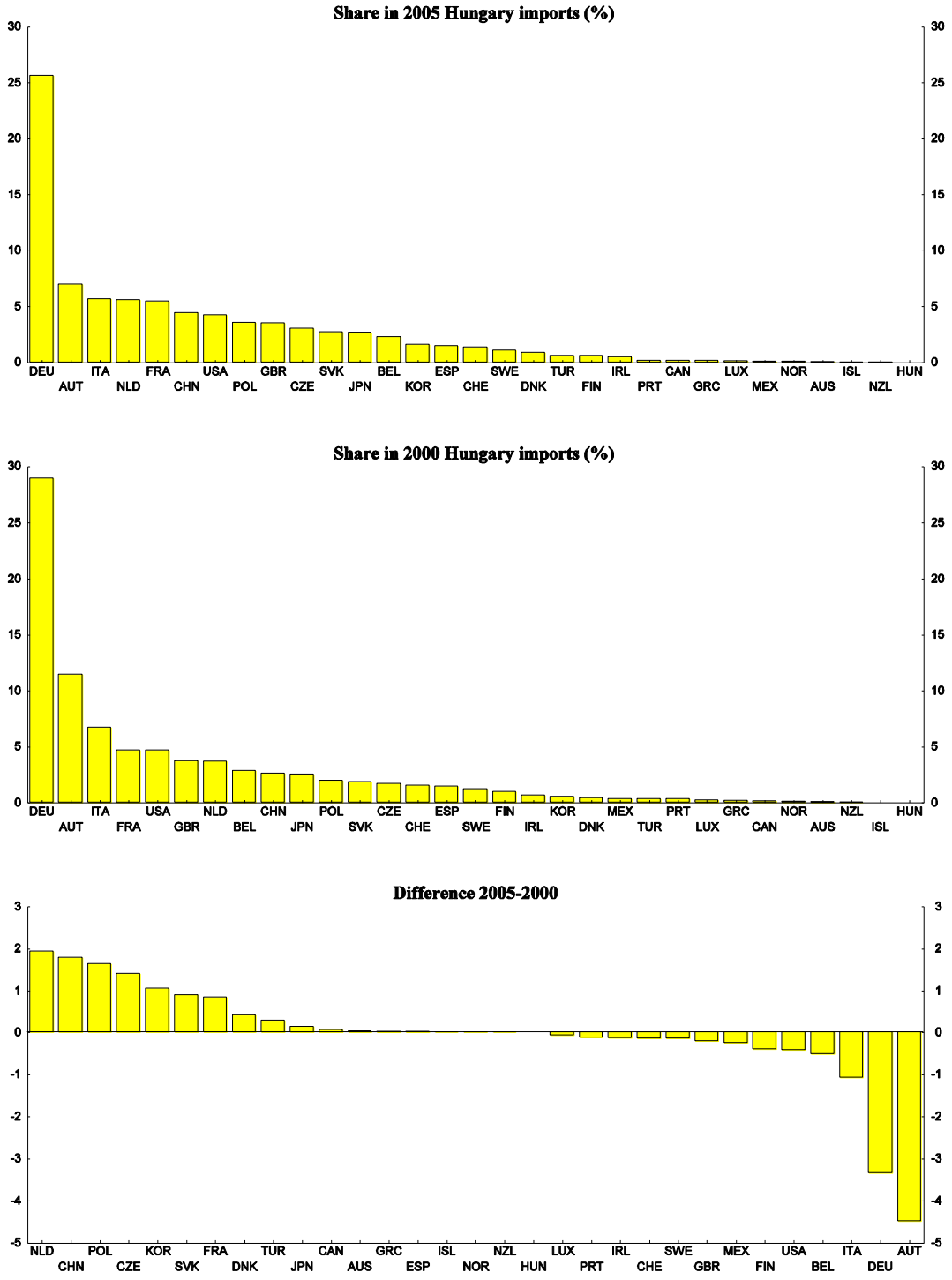


Figure A3.31 Iceland export breakdown by destination

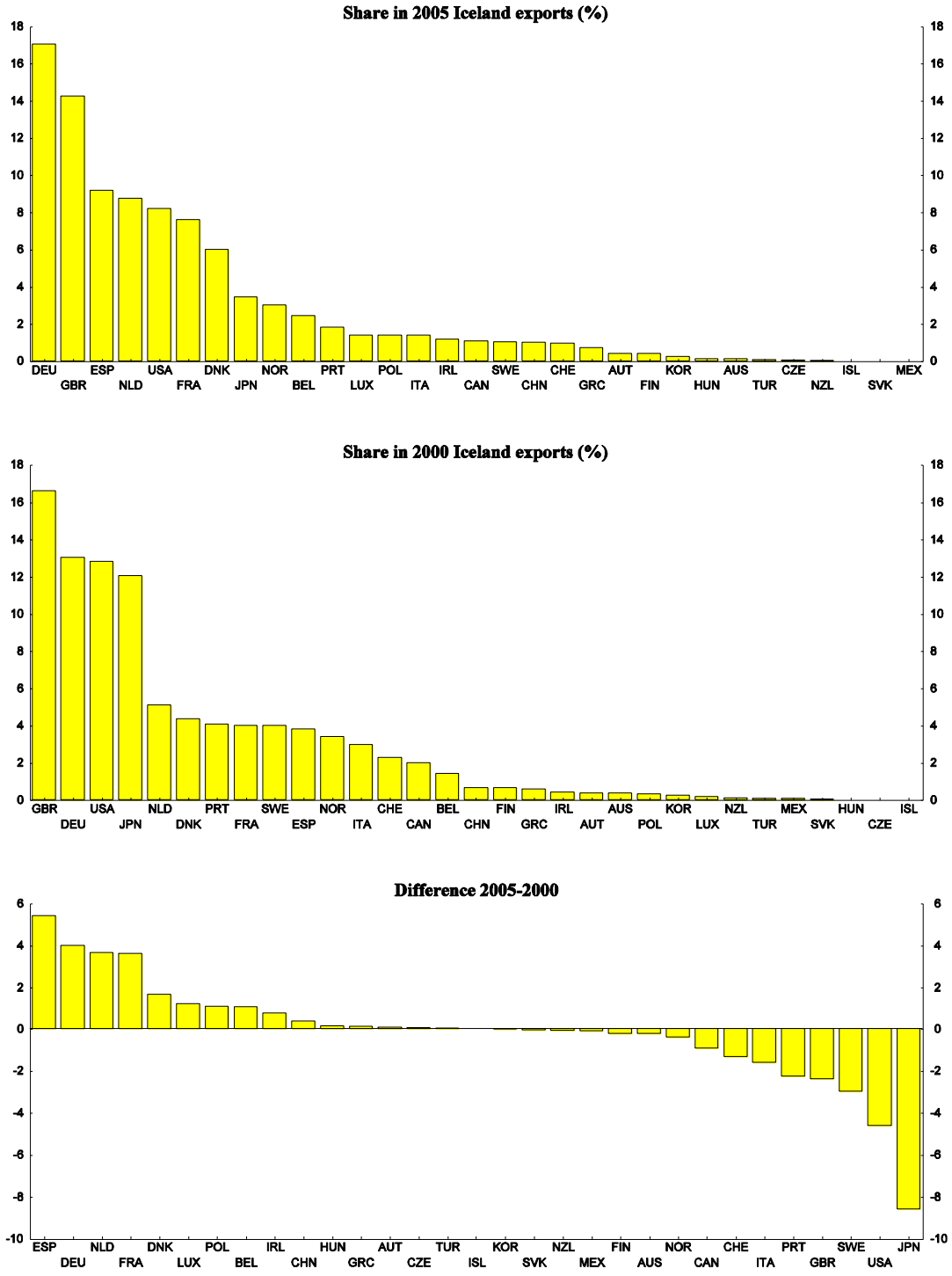


Figure A3.32 Iceland import breakdown by origin

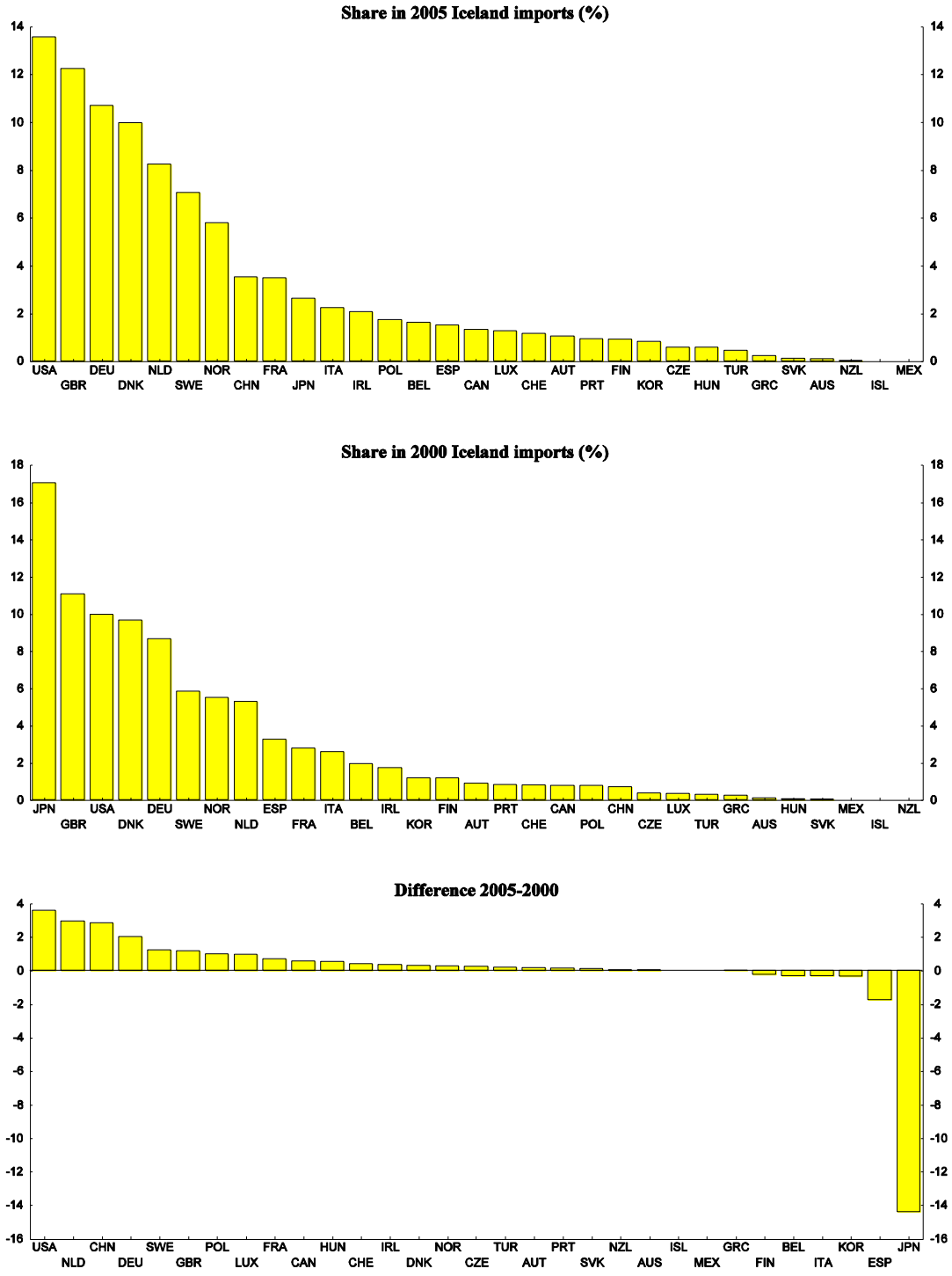
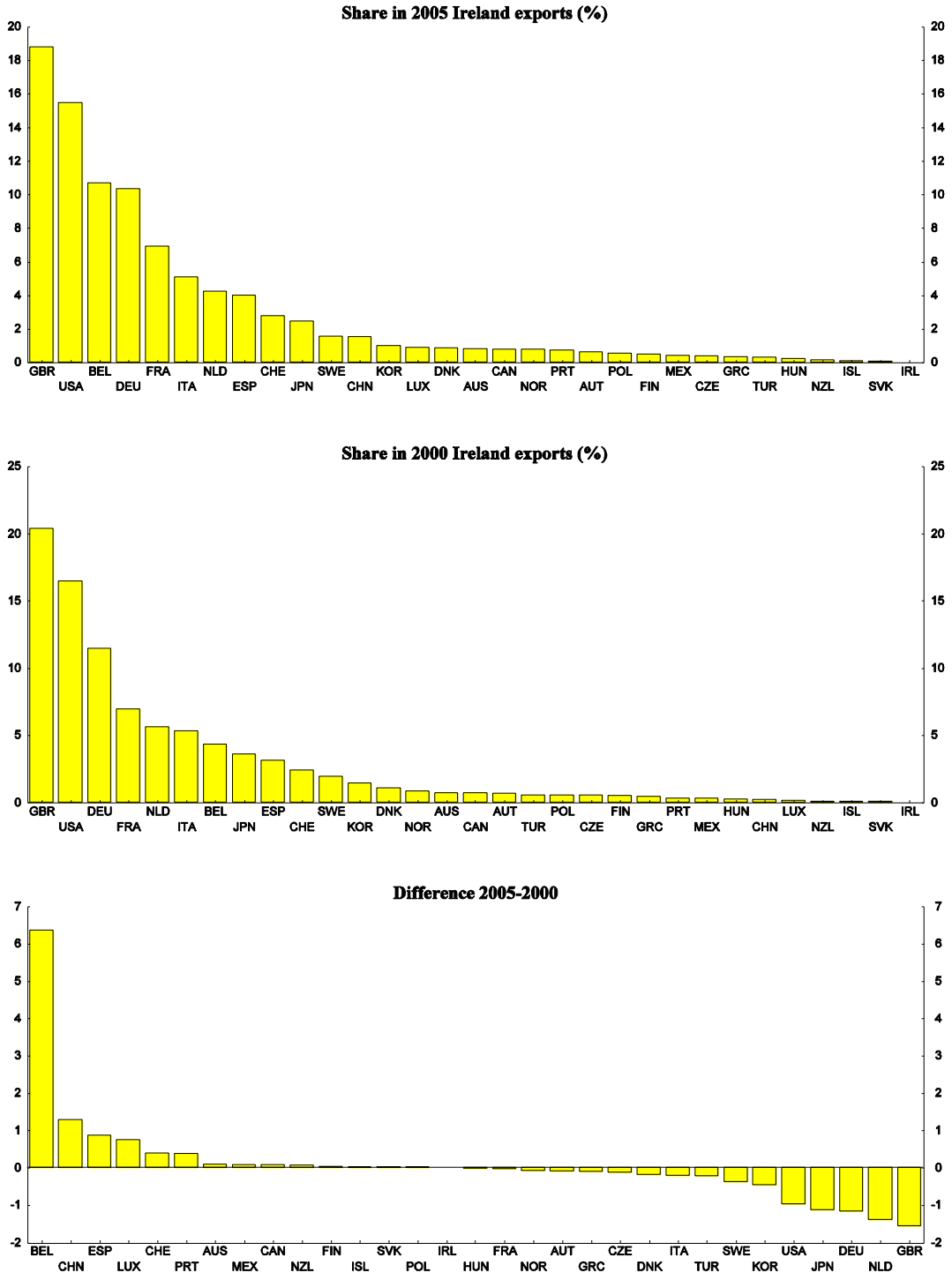


Figure A3.33 Ireland export breakdown by destination



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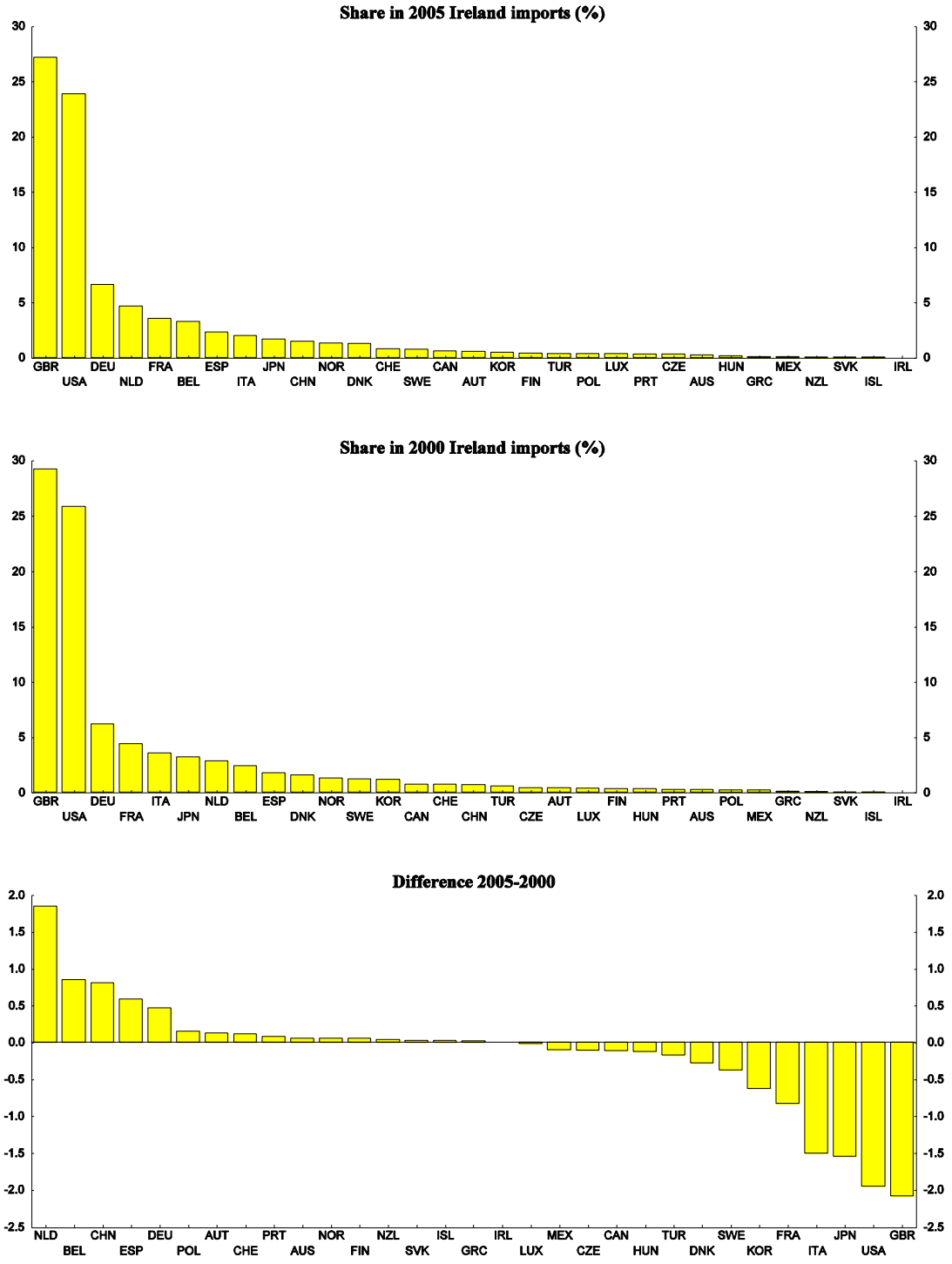
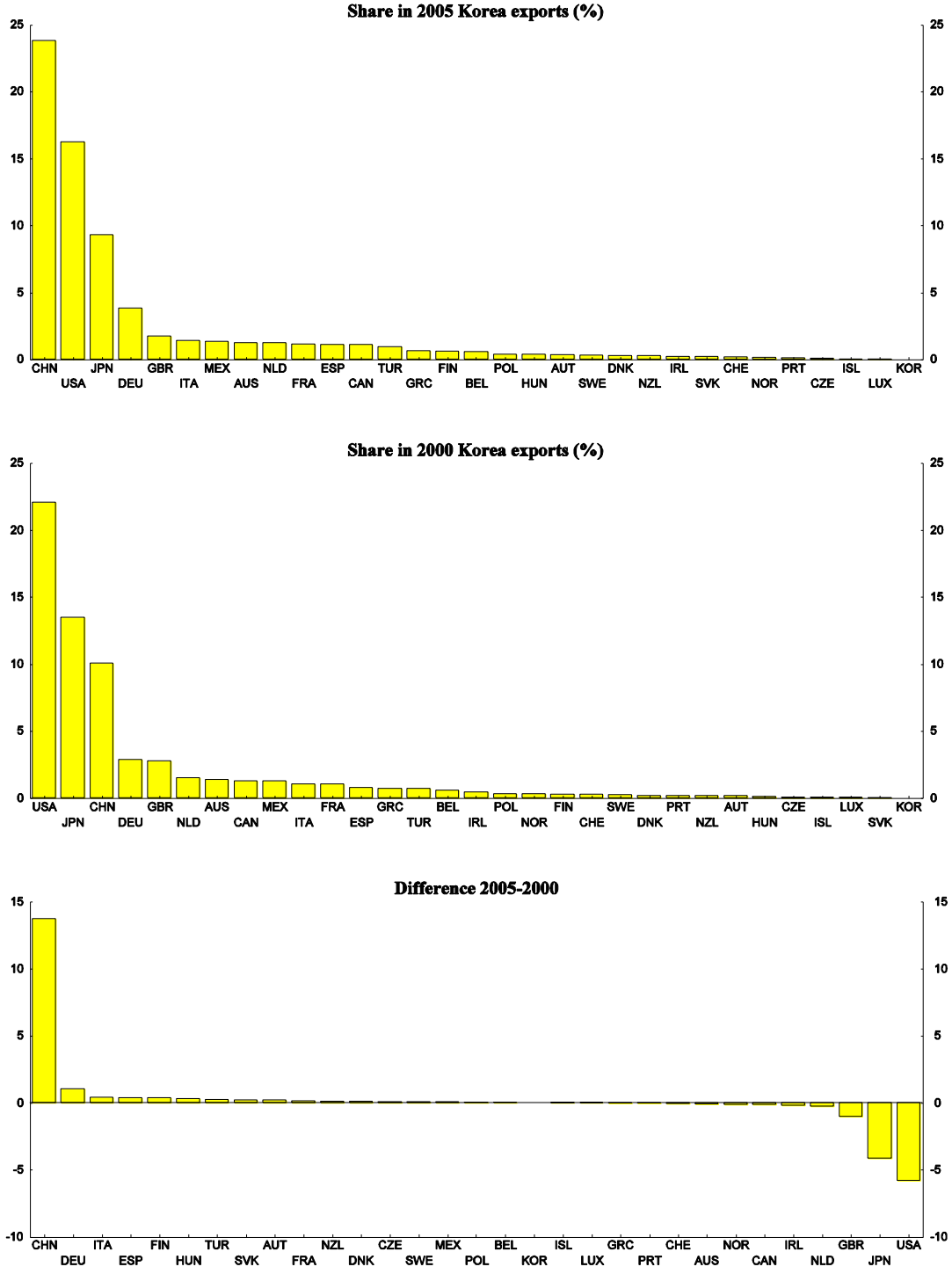


Figure A3.35 Korea export breakdown by destination



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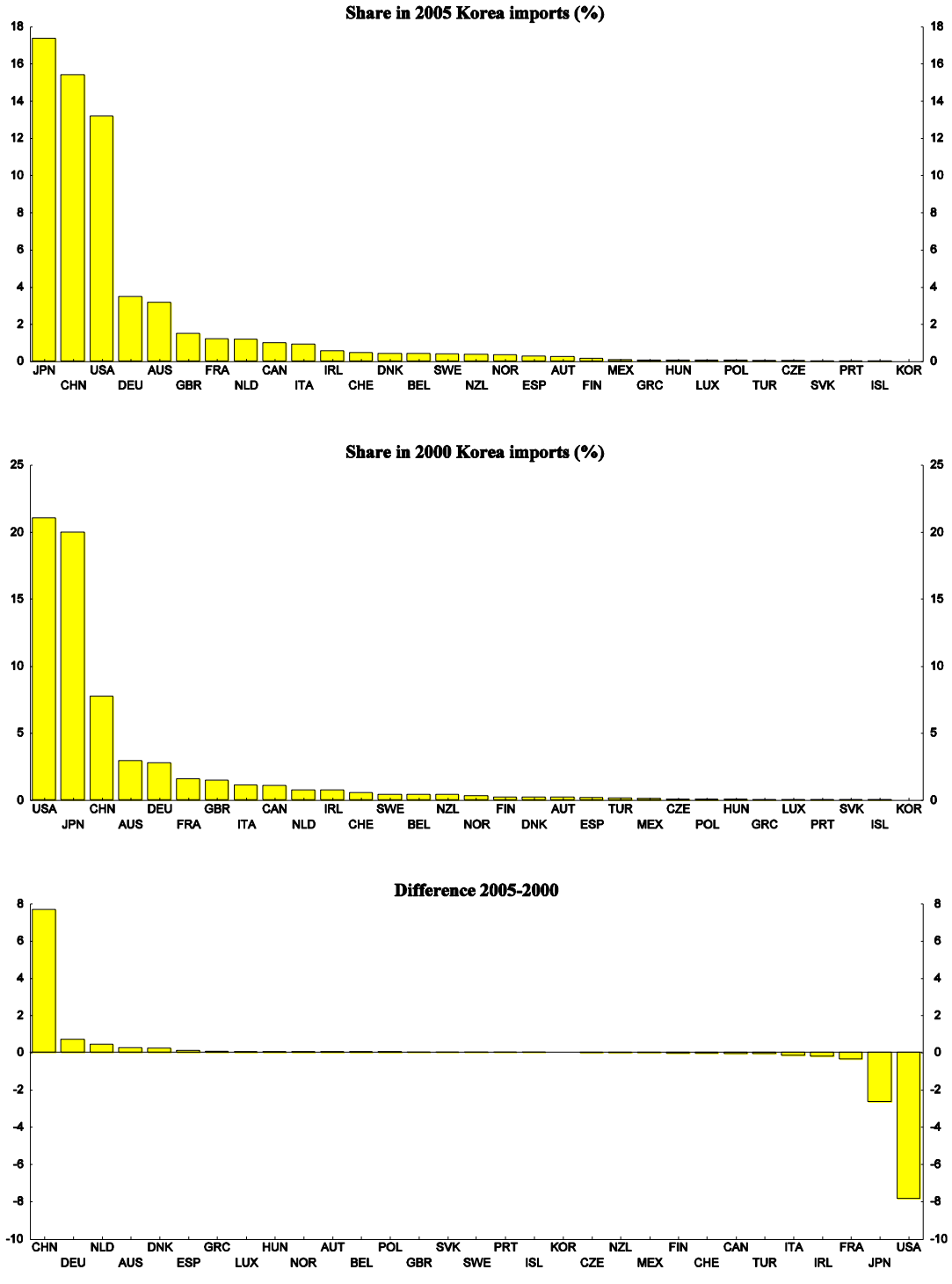


Figure A3.37 Luxembourg export breakdown by destination

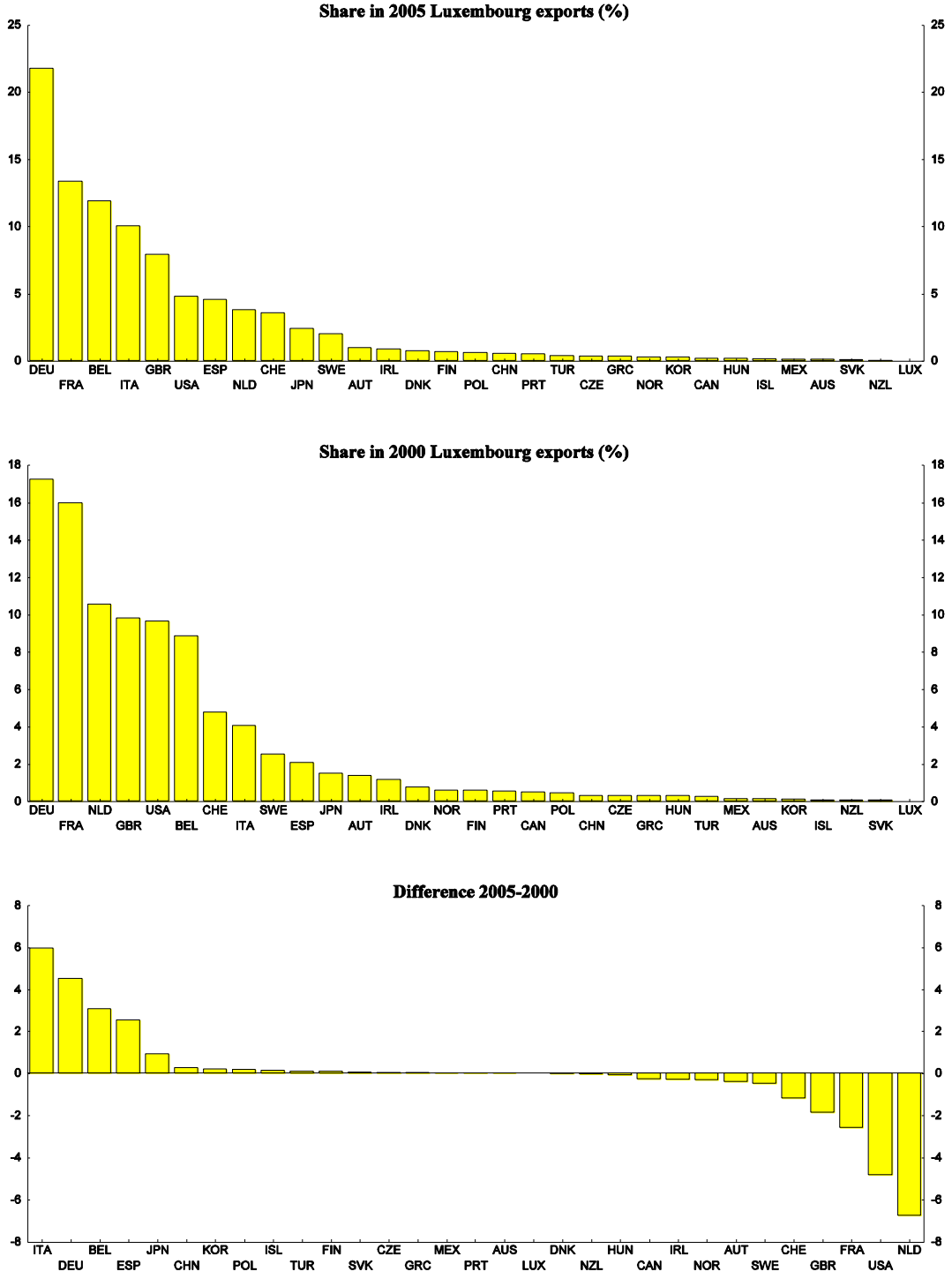


Figure A3.38 Luxembourg import breakdown by origin

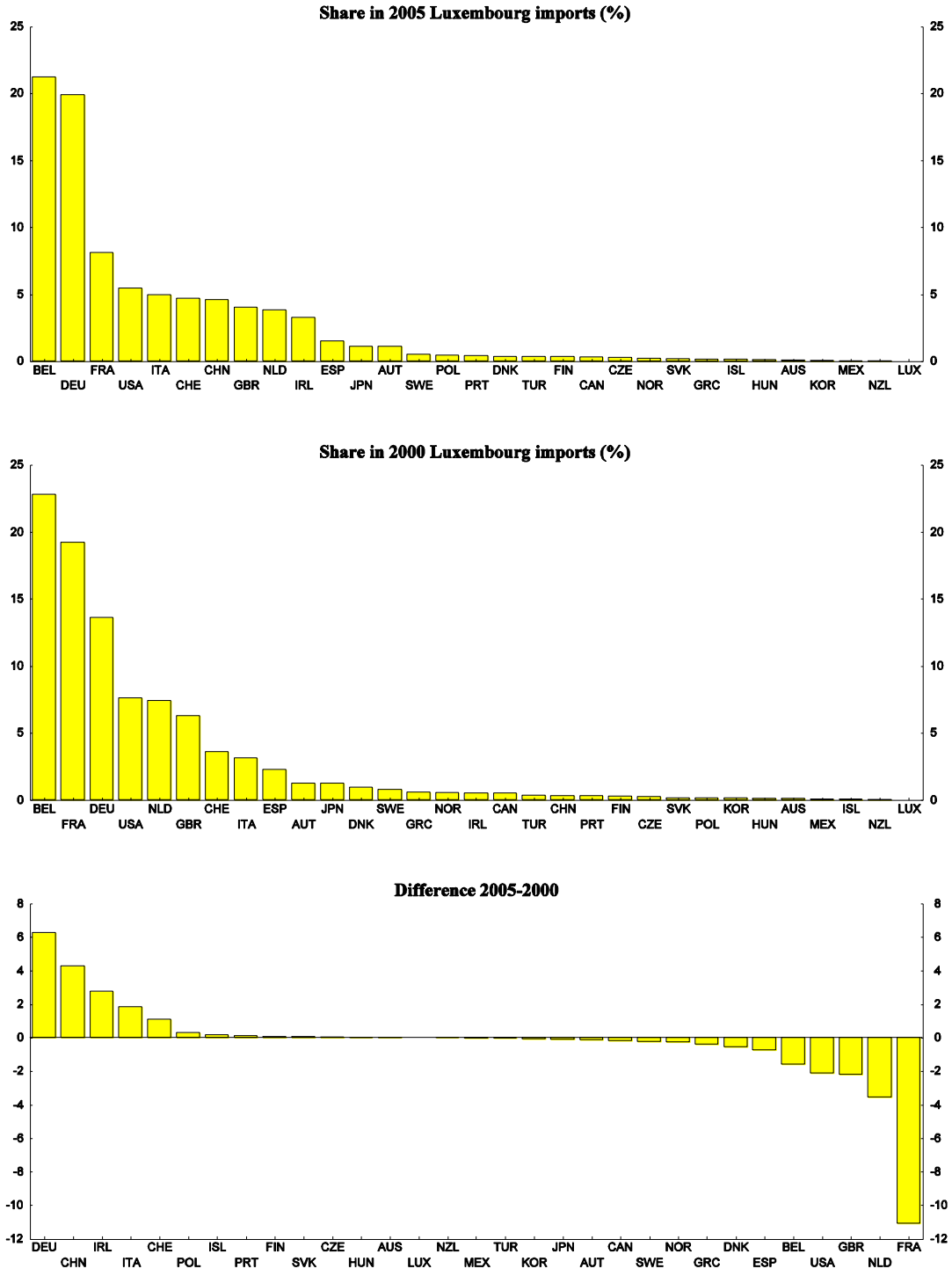
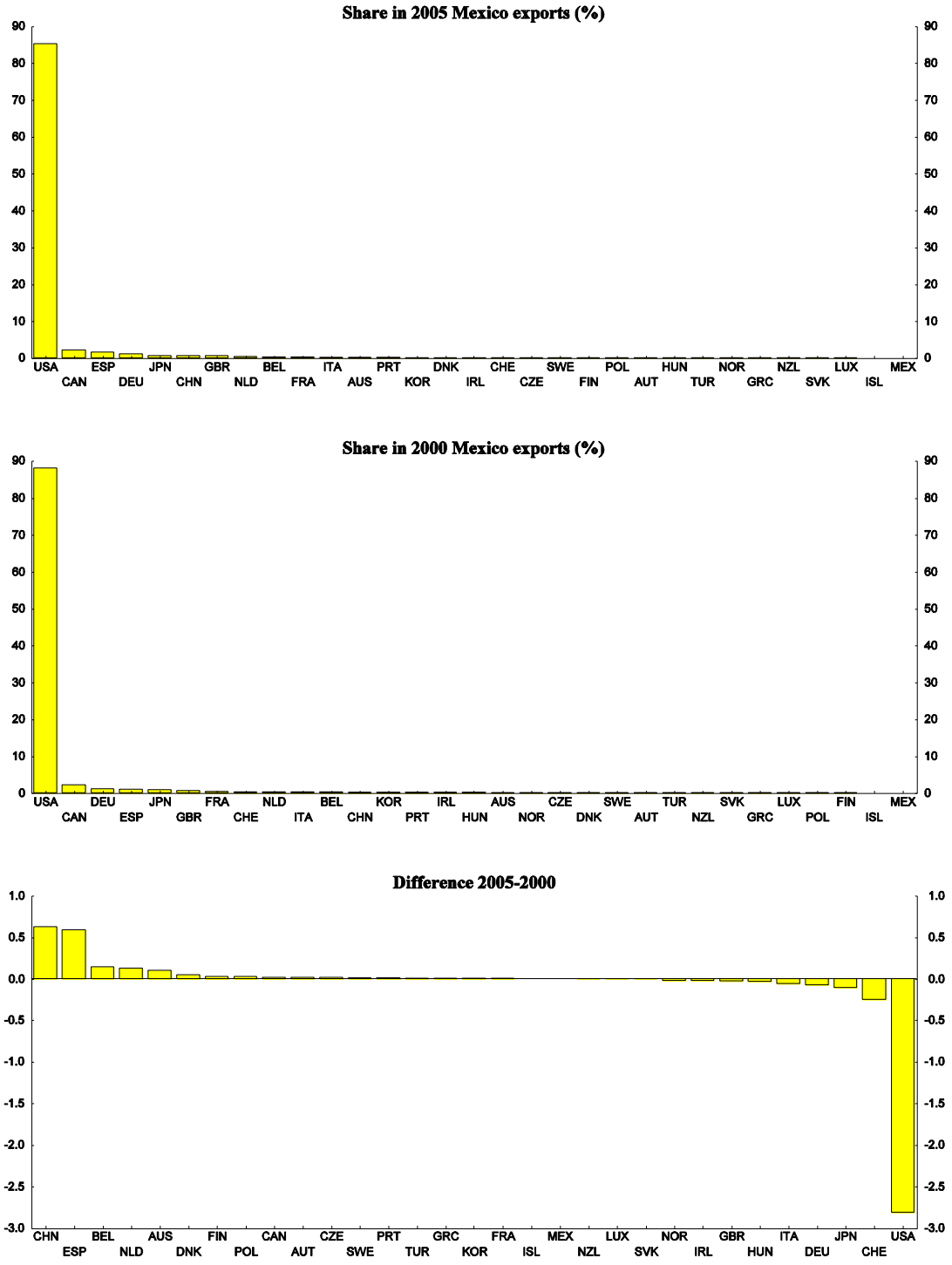


Figure A3.39 Mexico export breakdown by destination



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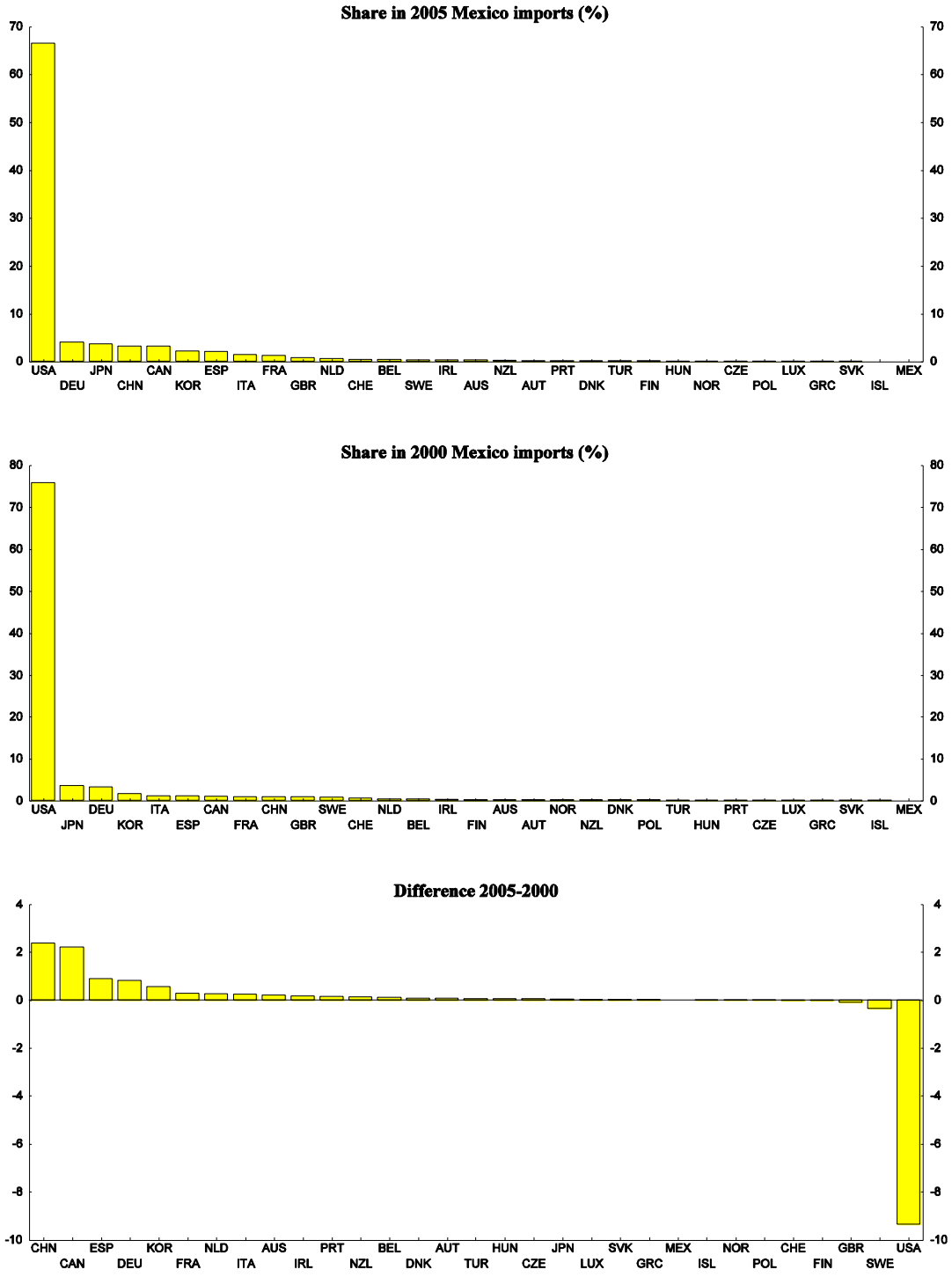
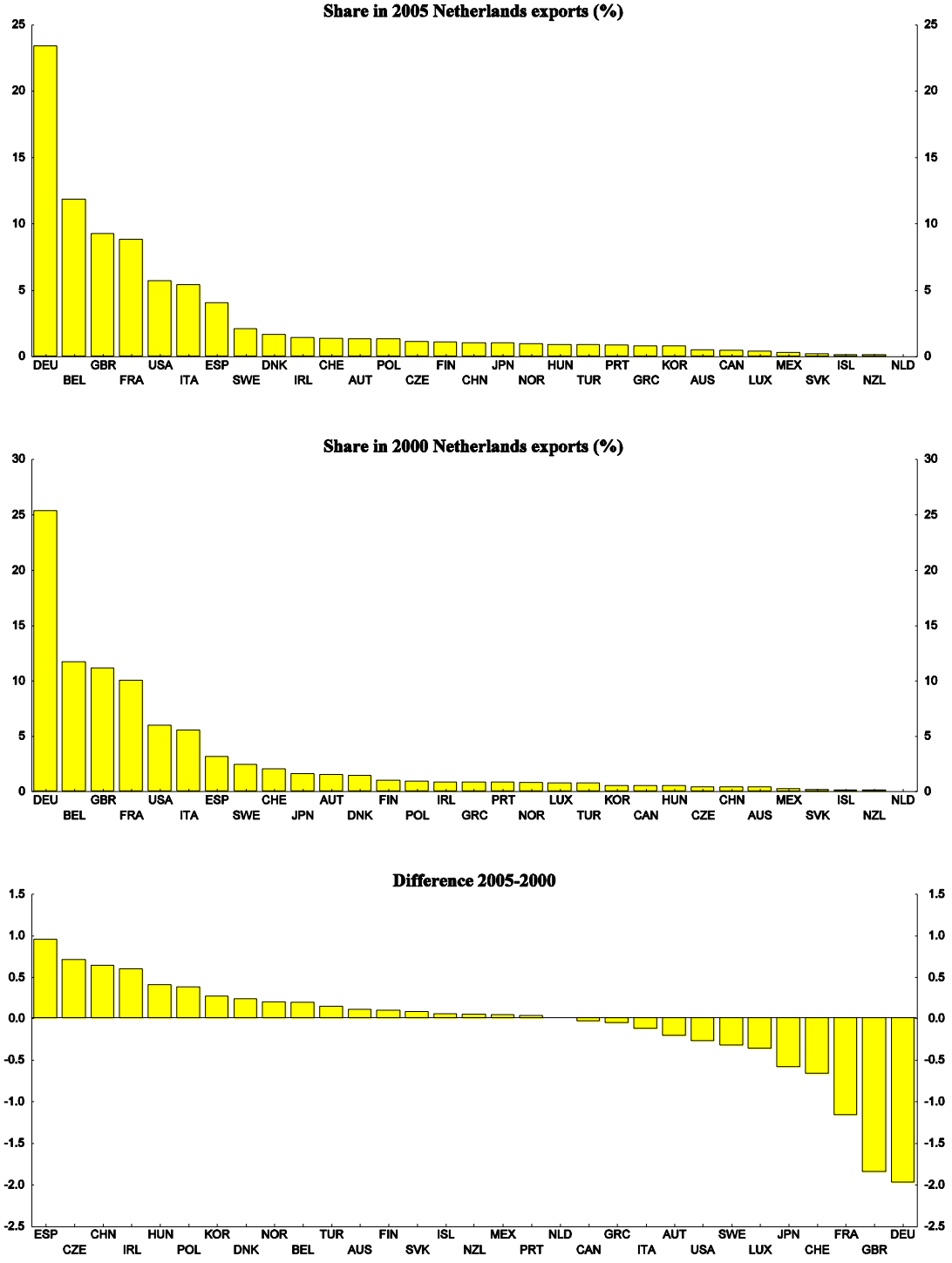


Figure A3.41 Netherlands export breakdown by destination



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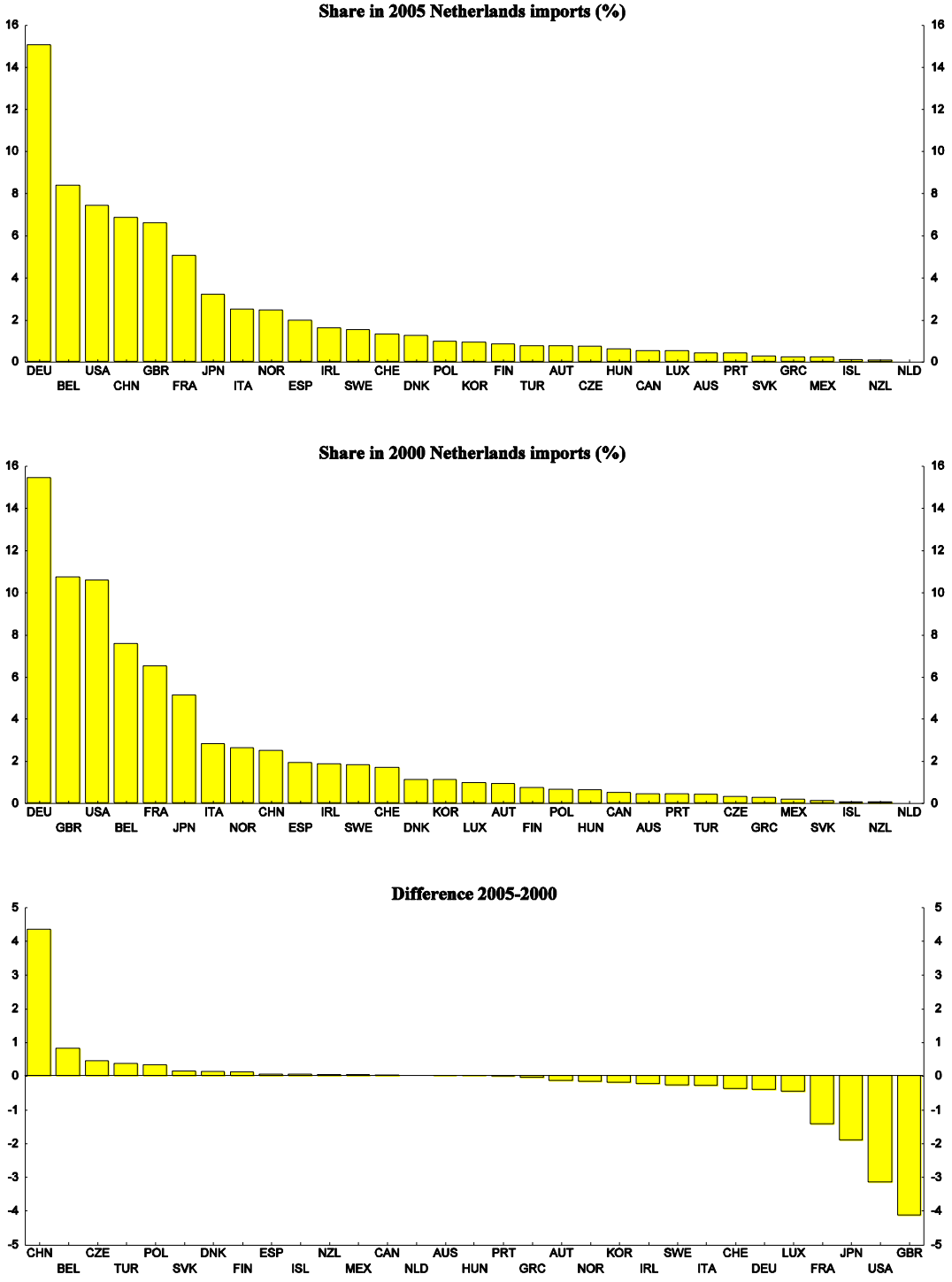
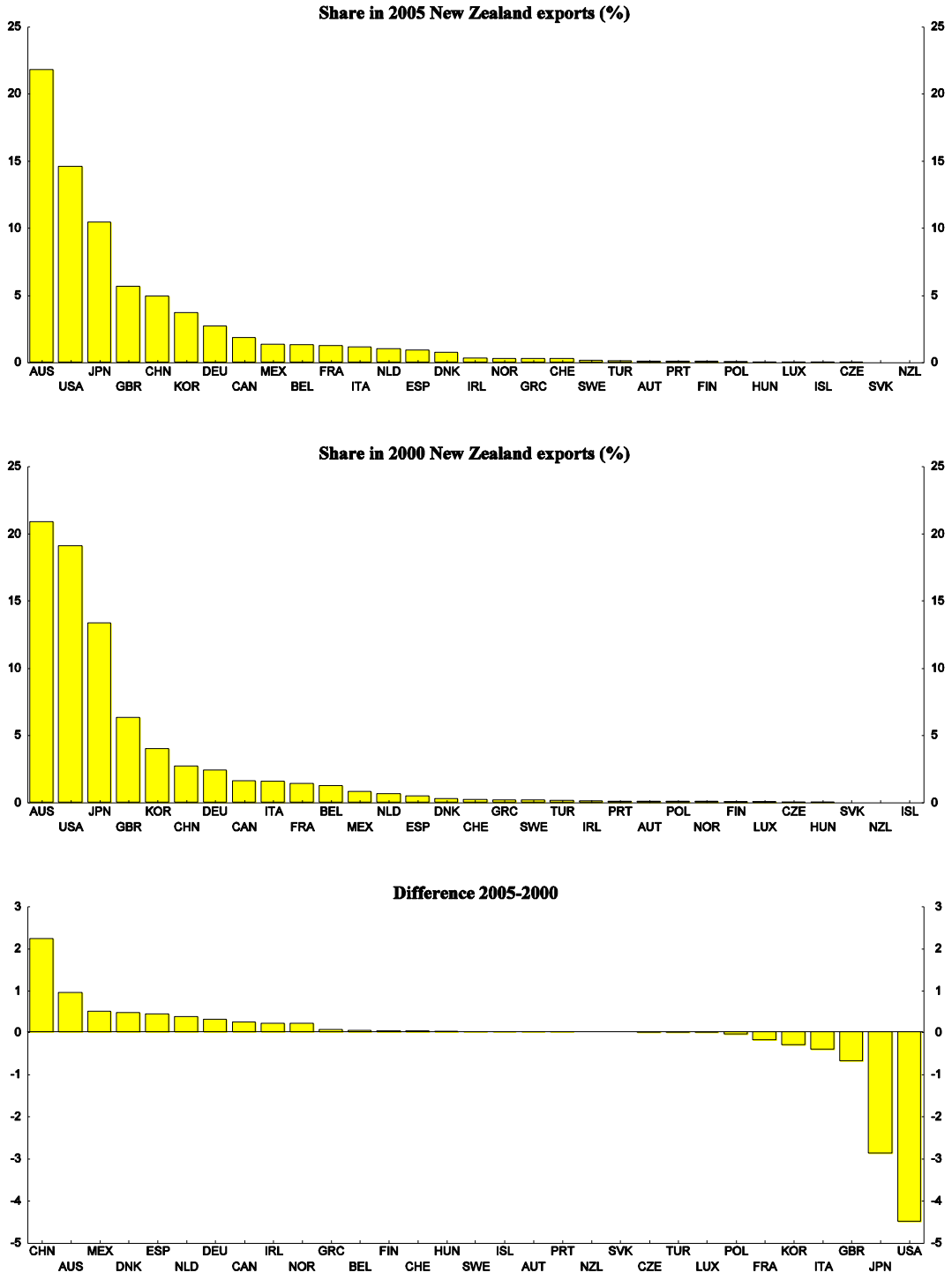


Figure A3.43 New Zealand export breakdown by destination



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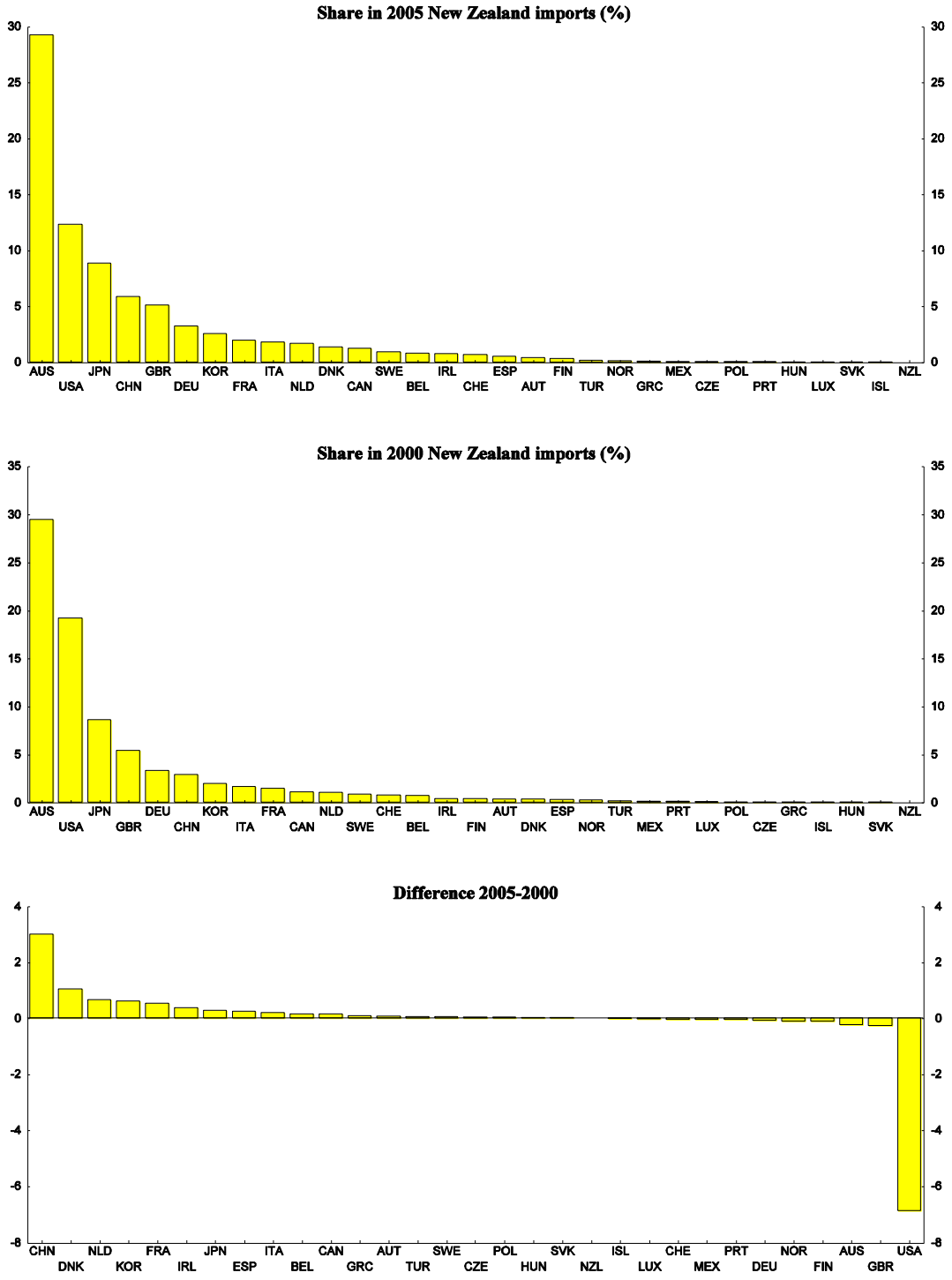
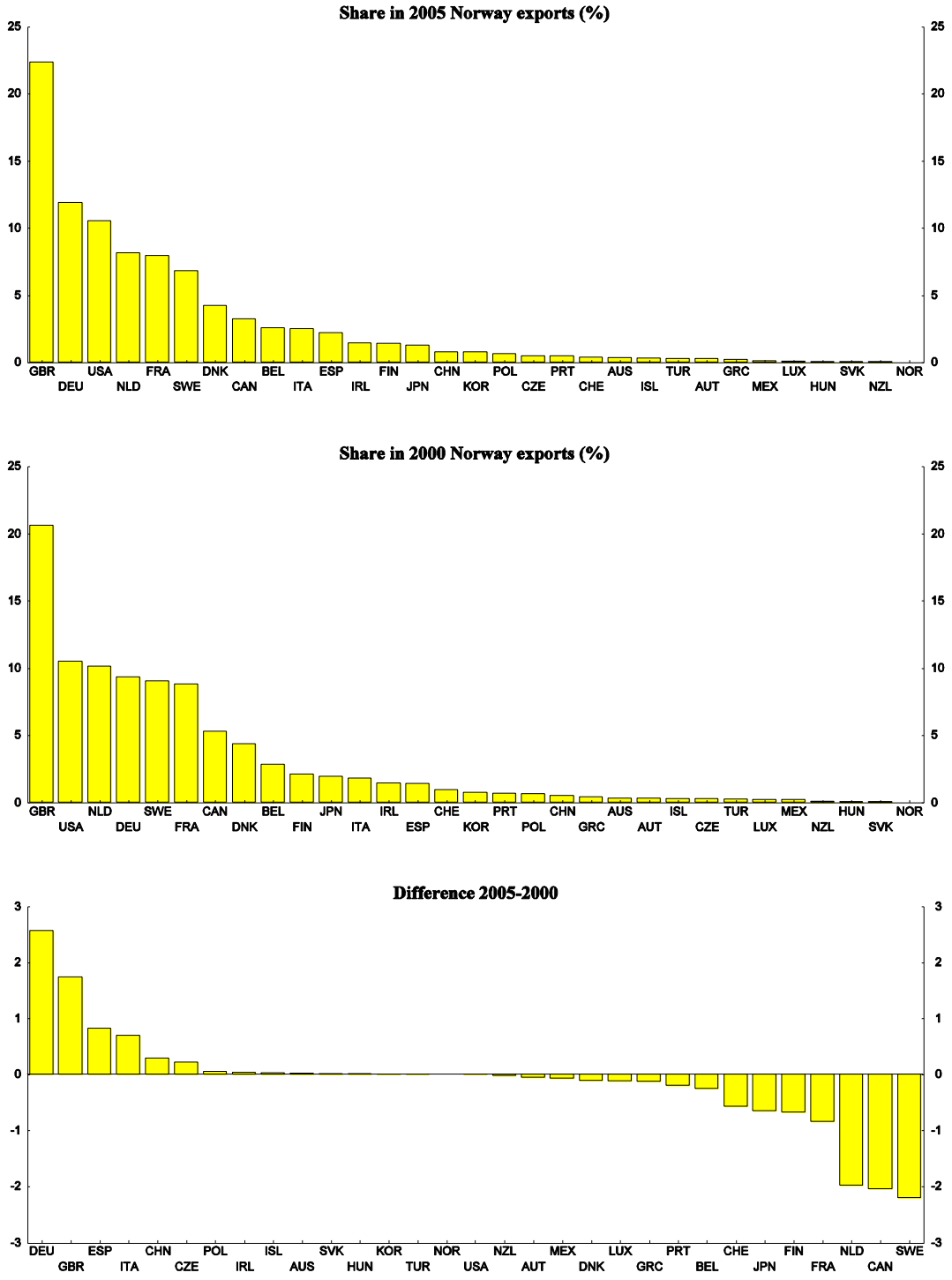


Figure A3.45 Norway export breakdown by destination



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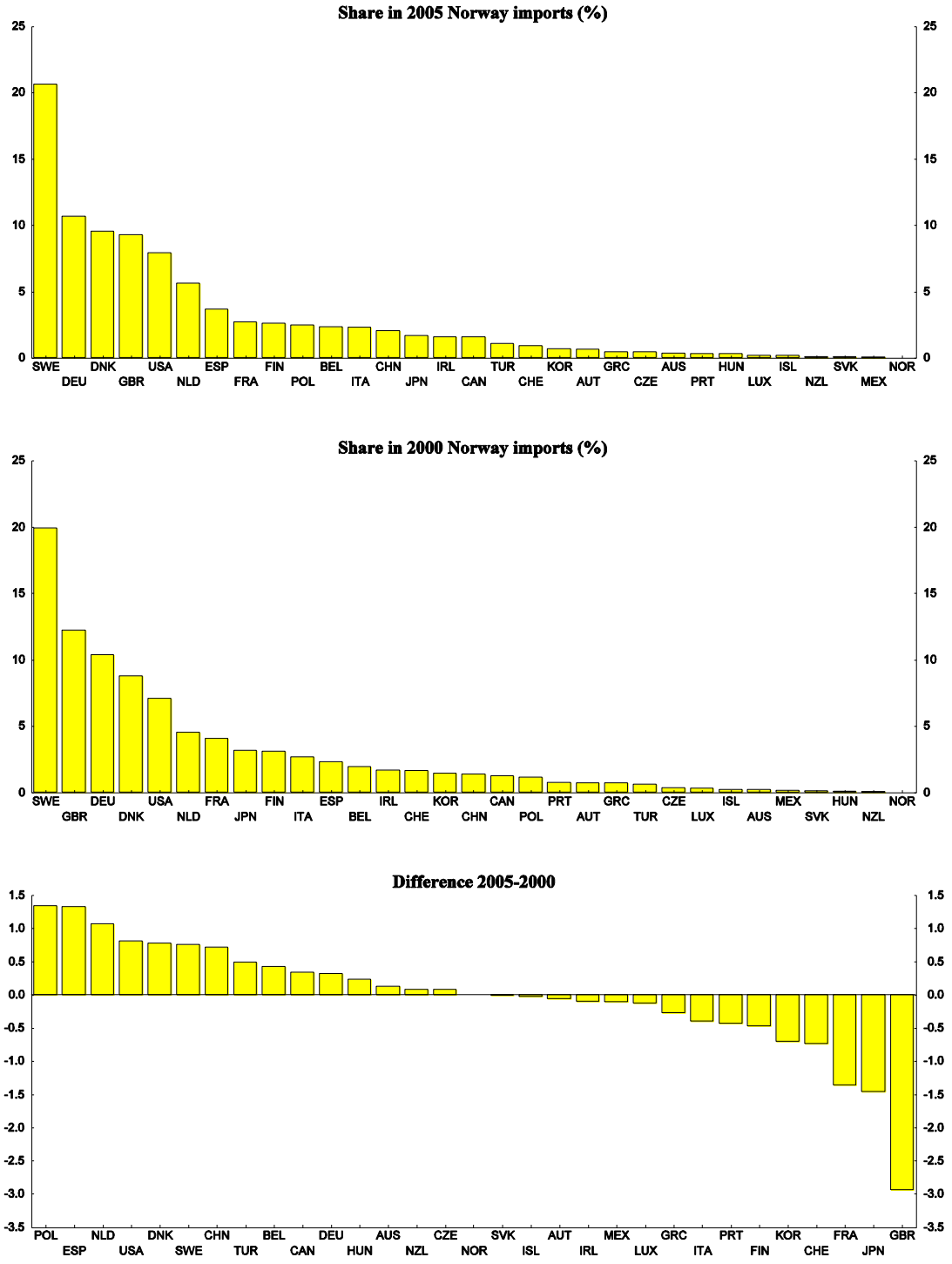


Figure A3.47 Poland export breakdown by destination

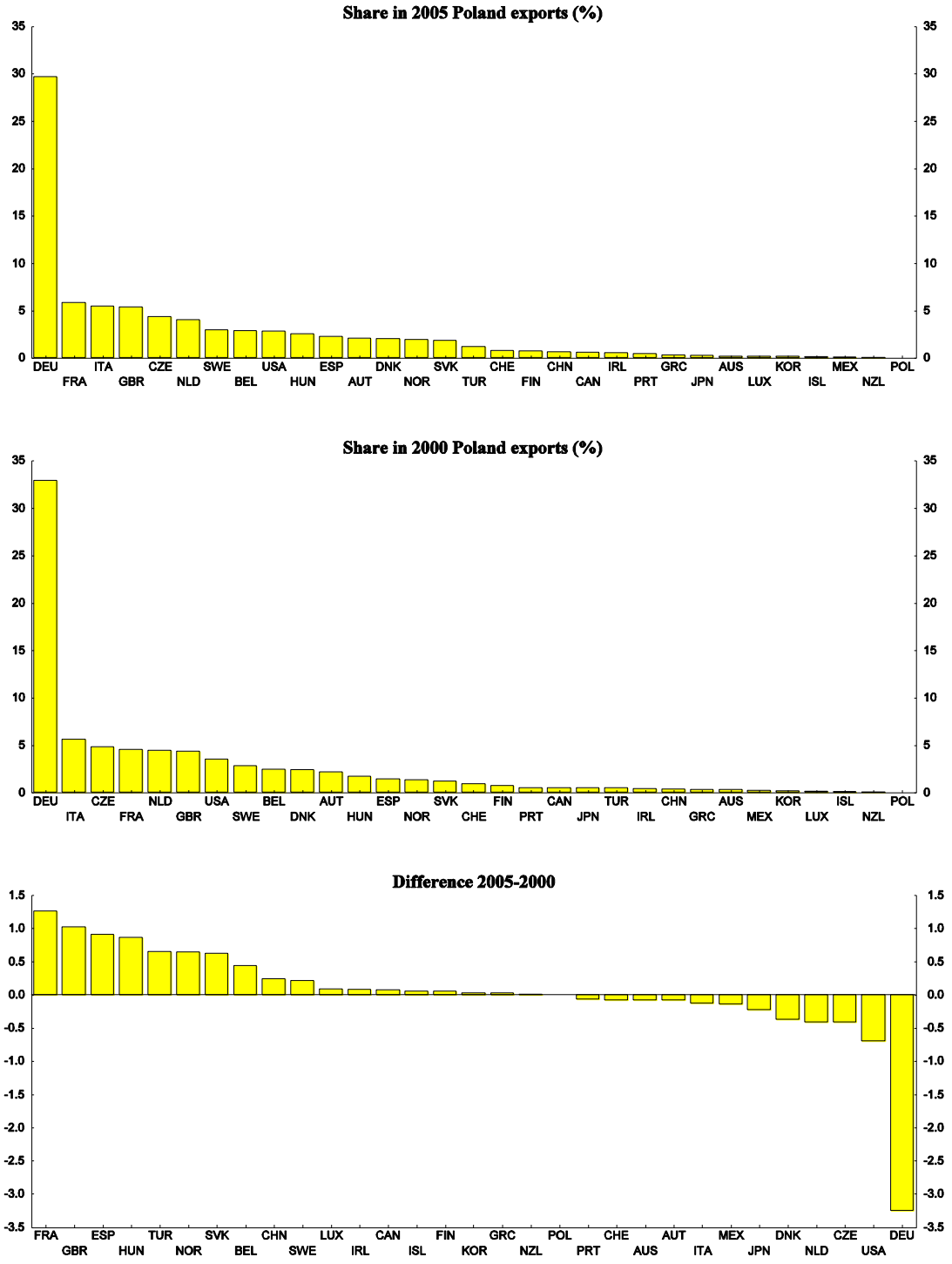


Figure A3.48 Poland import breakdown by origin

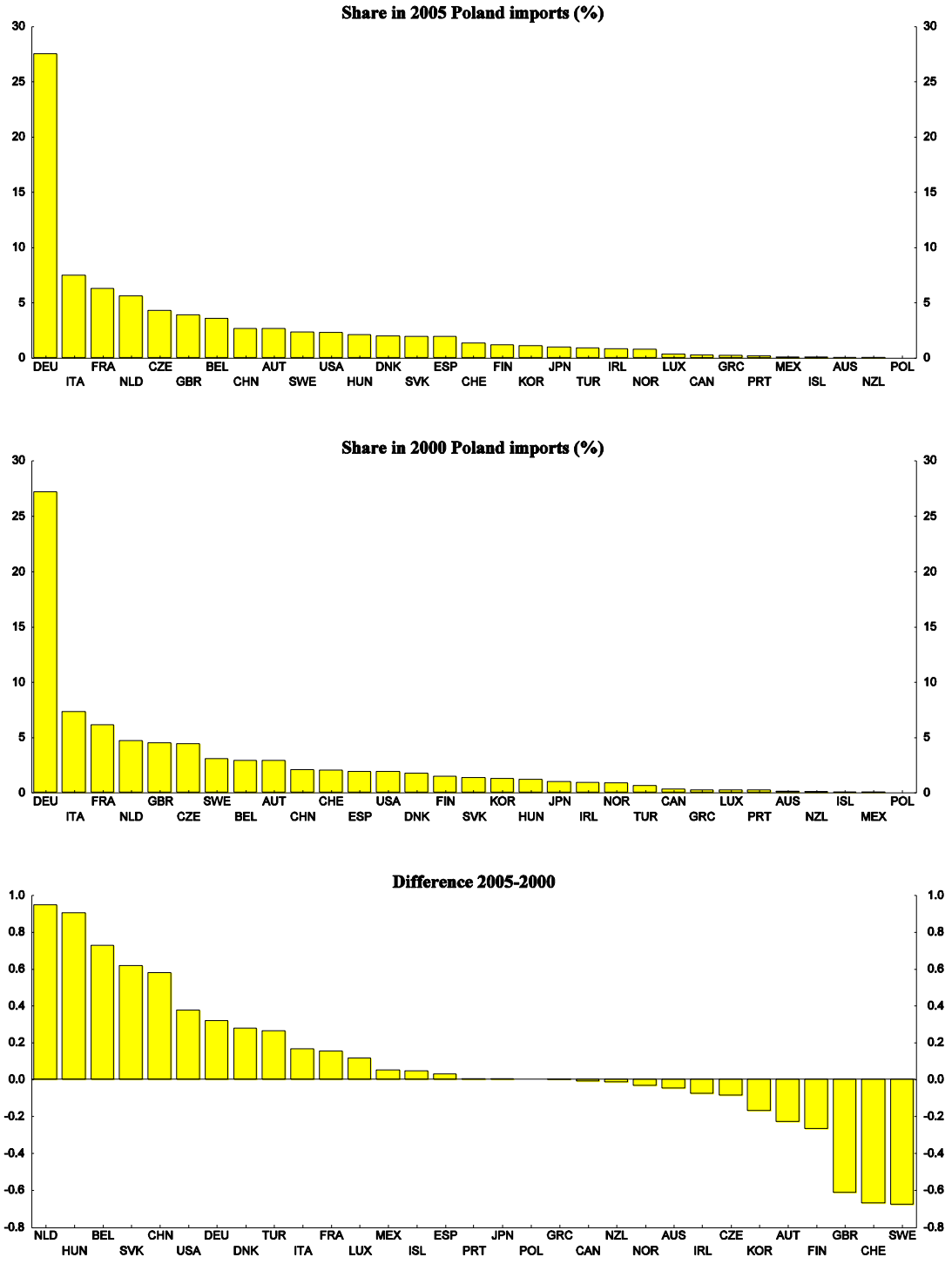


Figure A3.49 Portugal export breakdown by destination

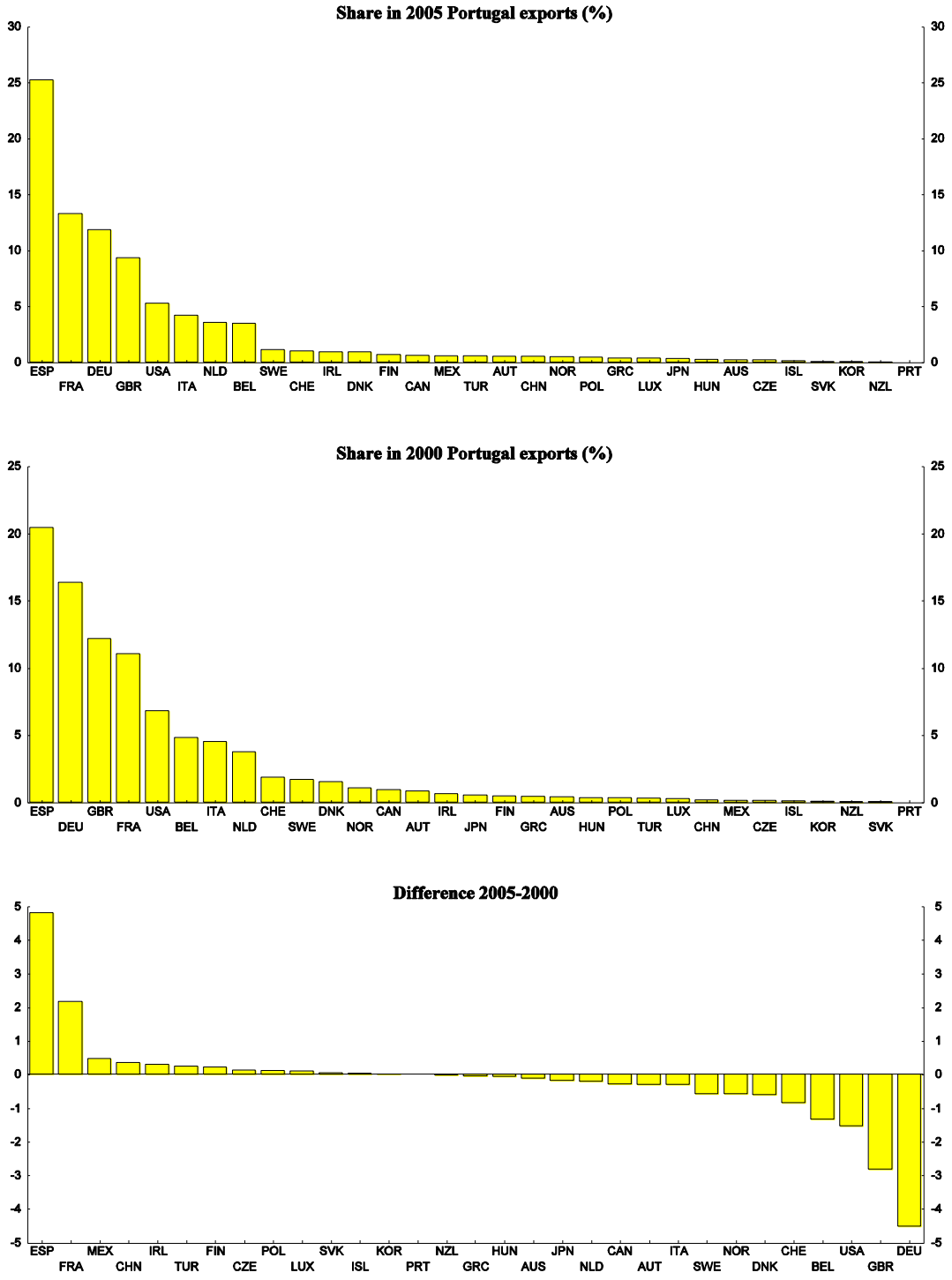


Figure A3.50 Portugal import breakdown by origin

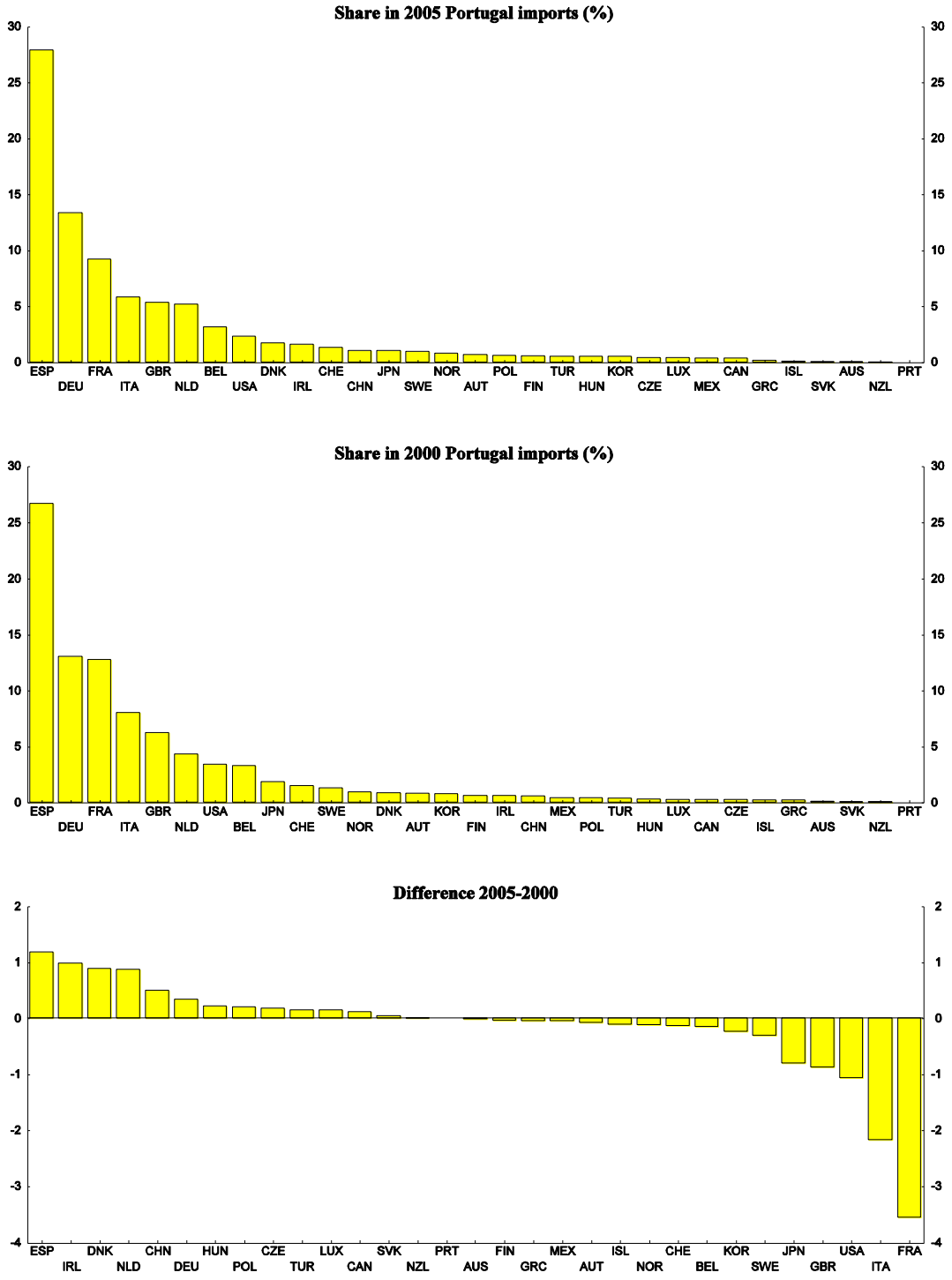
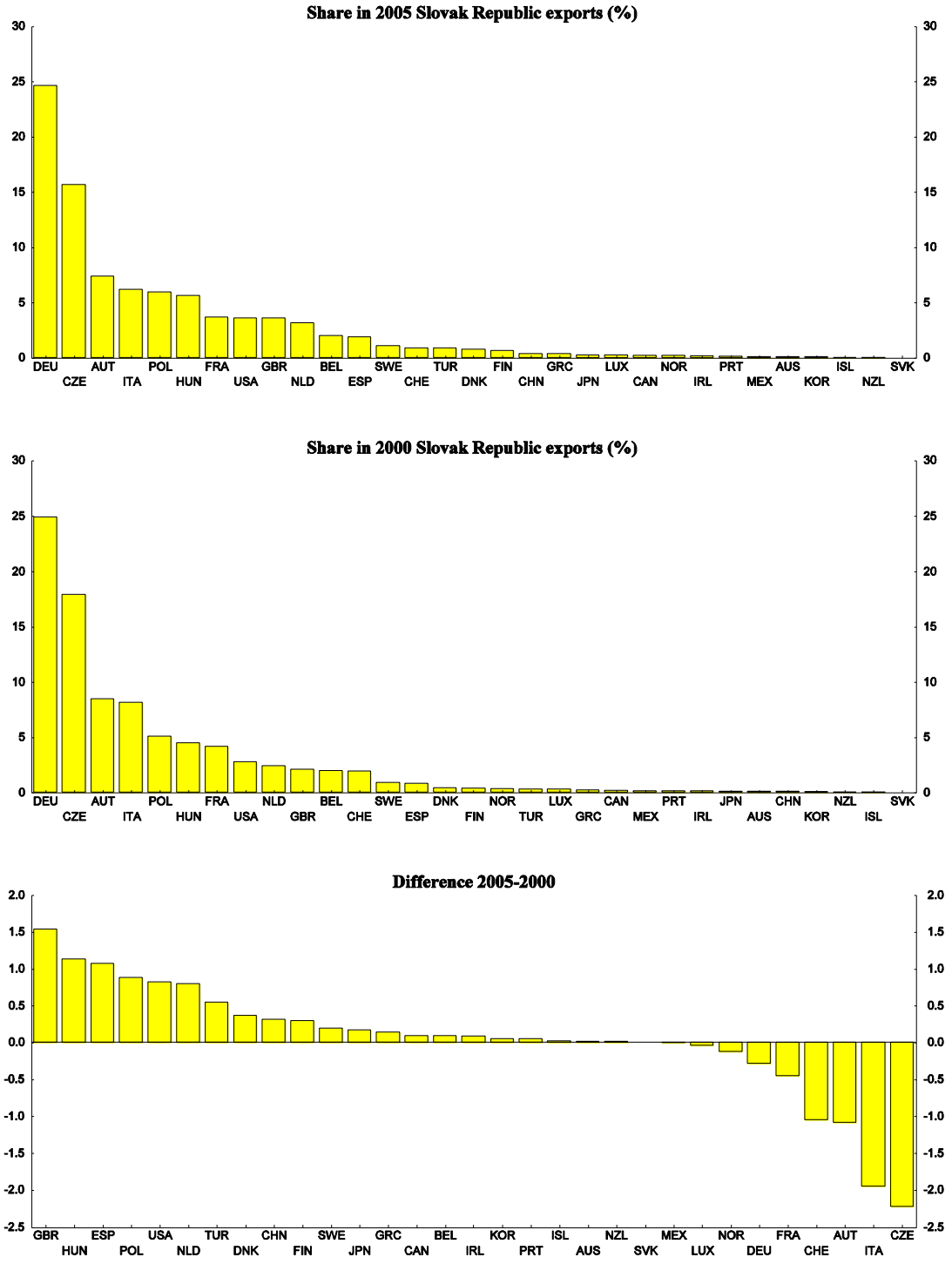


Figure A3.51 Slovak Republic export breakdown by destination



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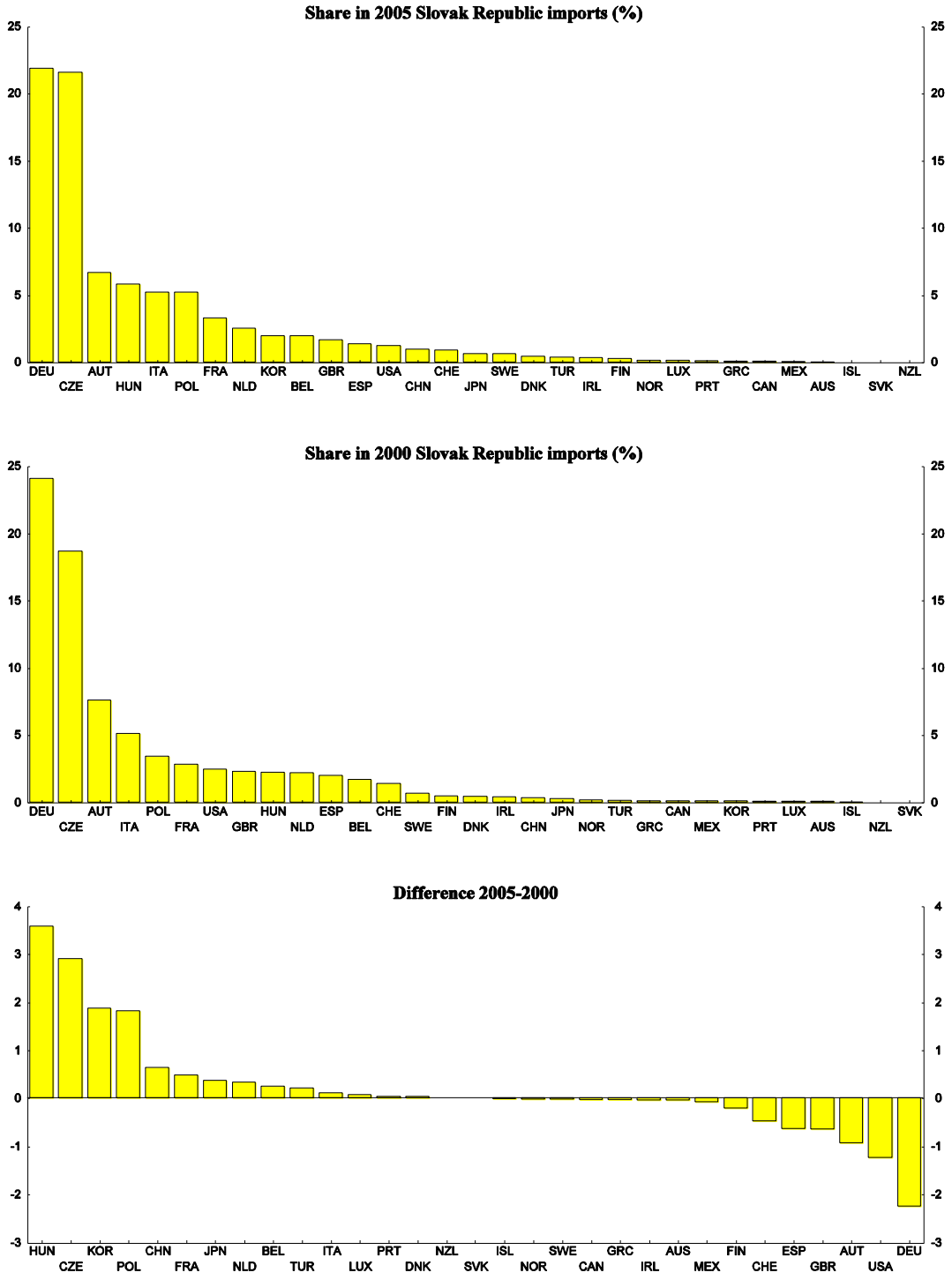
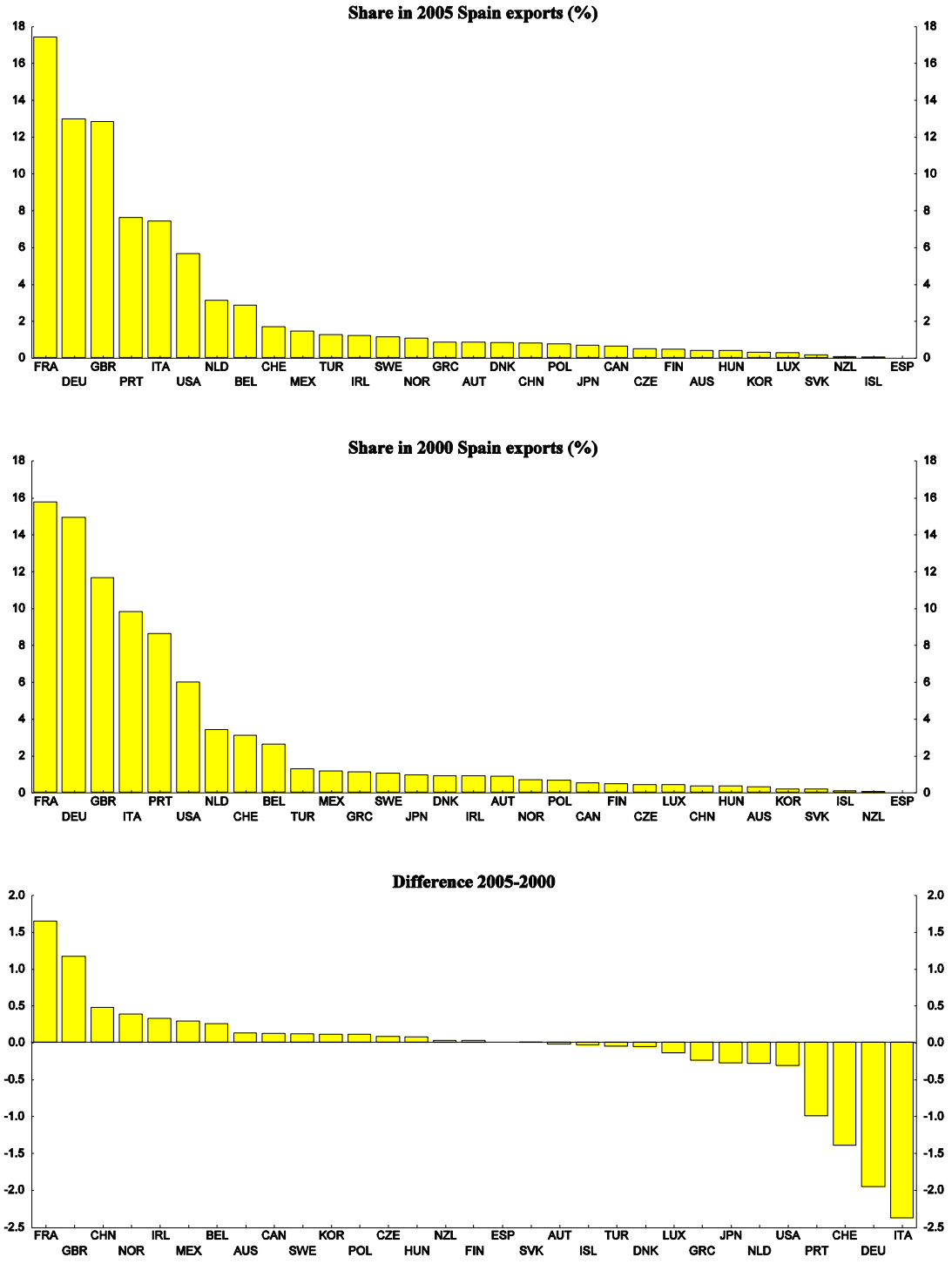


Figure A3.53 Spain export breakdown by destination



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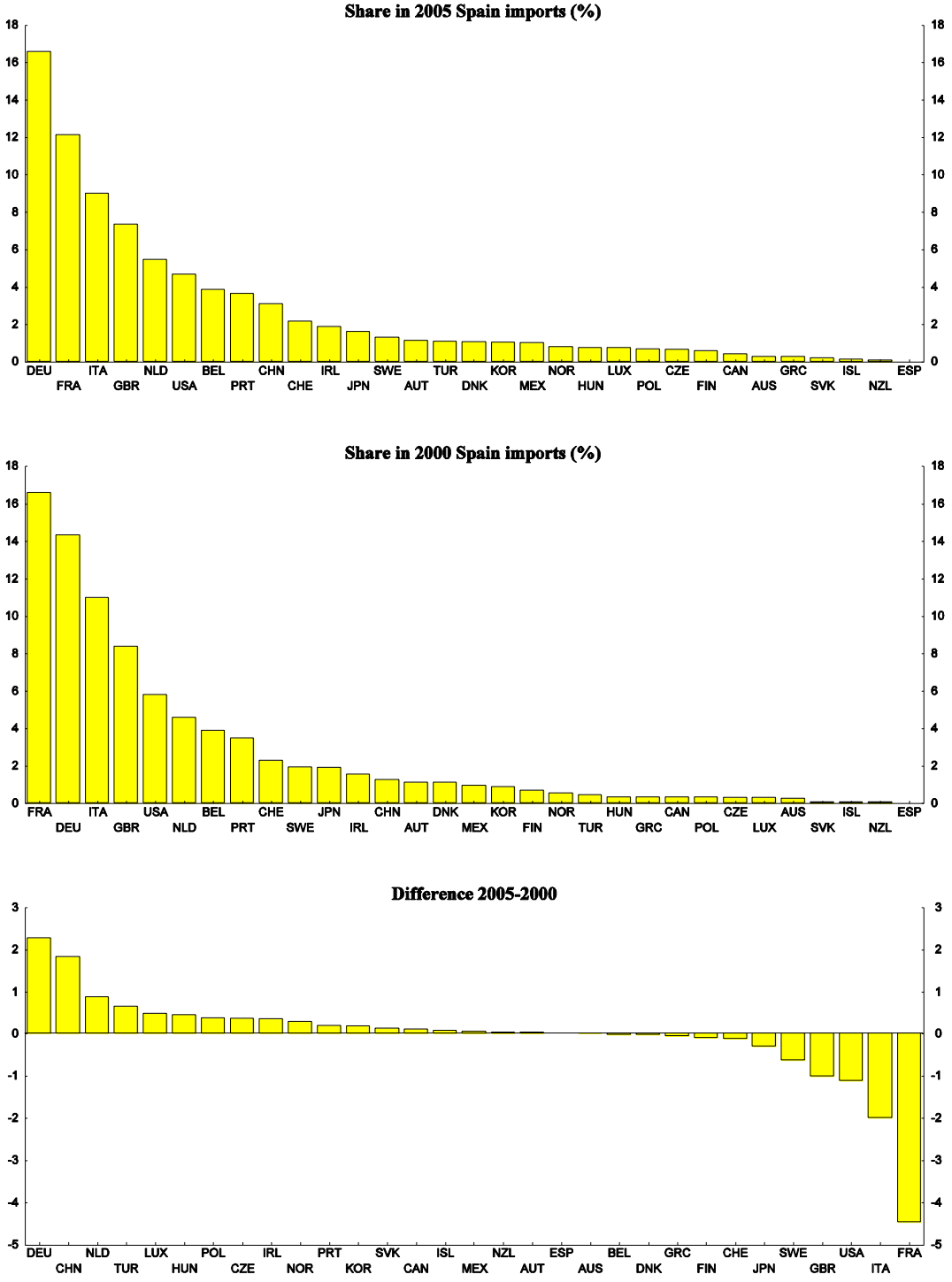


Figure A3.55 Sweden export breakdown by destination

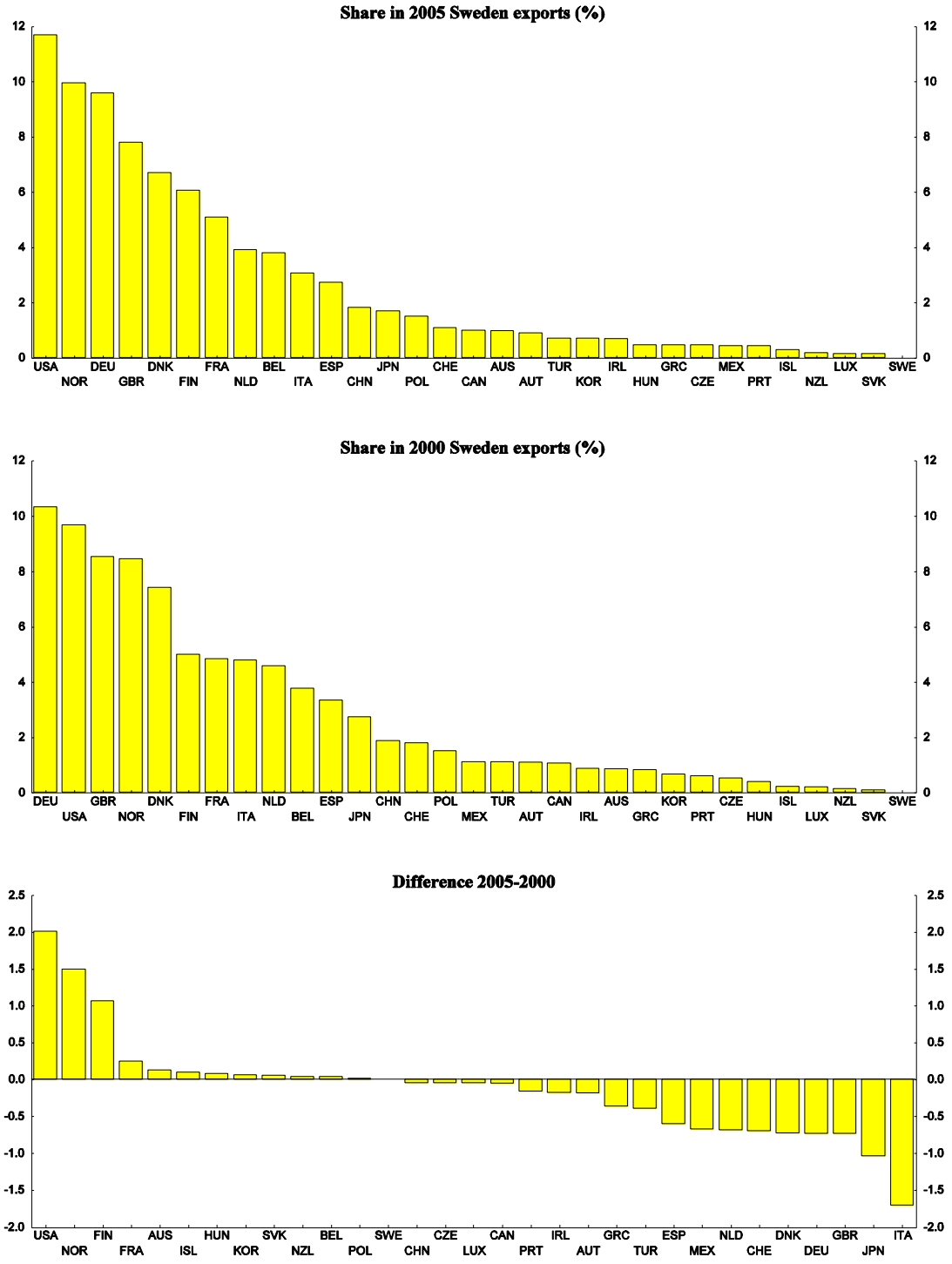


Figure A3.56 Sweden import breakdown by origin

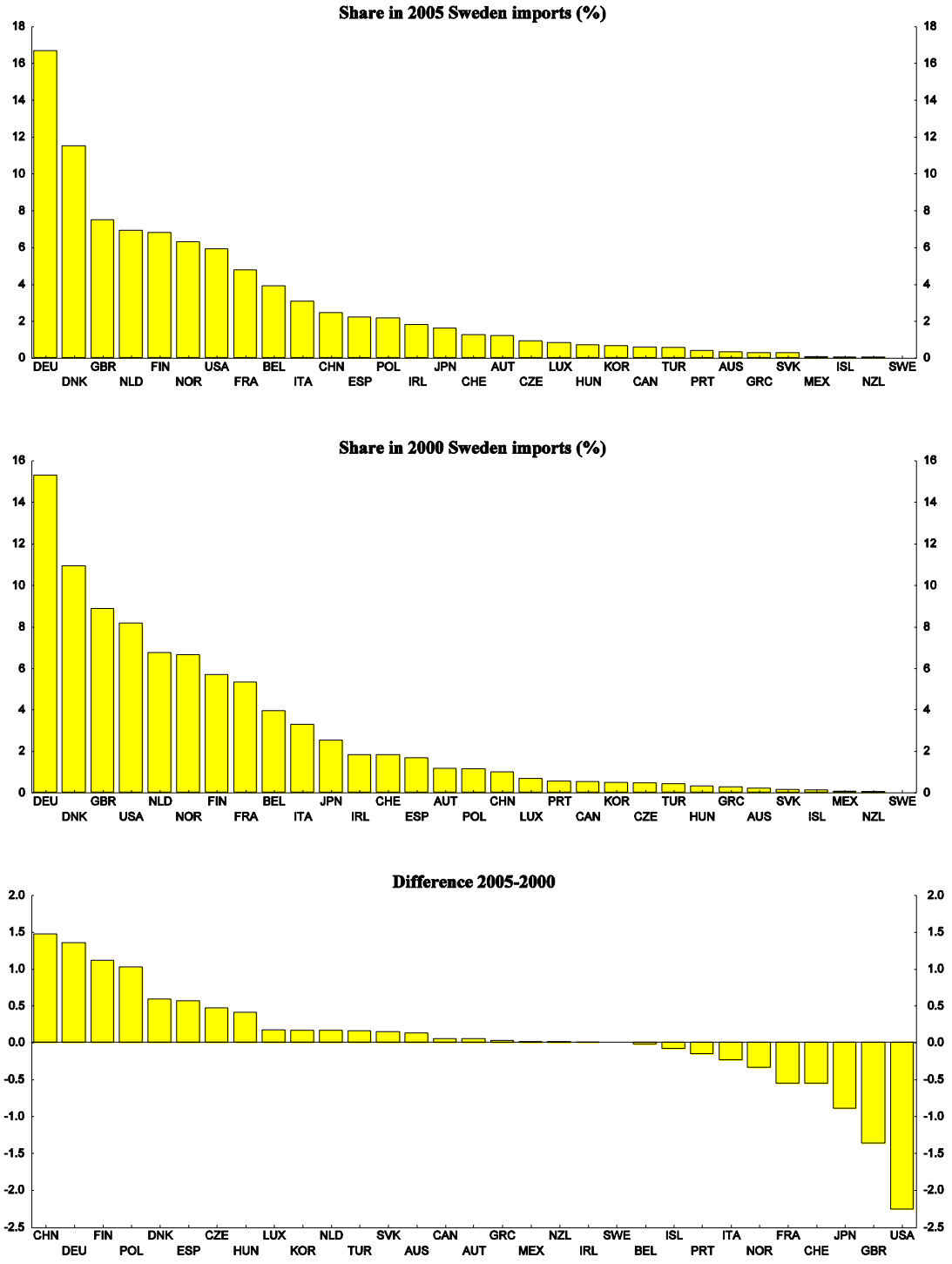


Figure A3.57 Switzerland export breakdown by destination

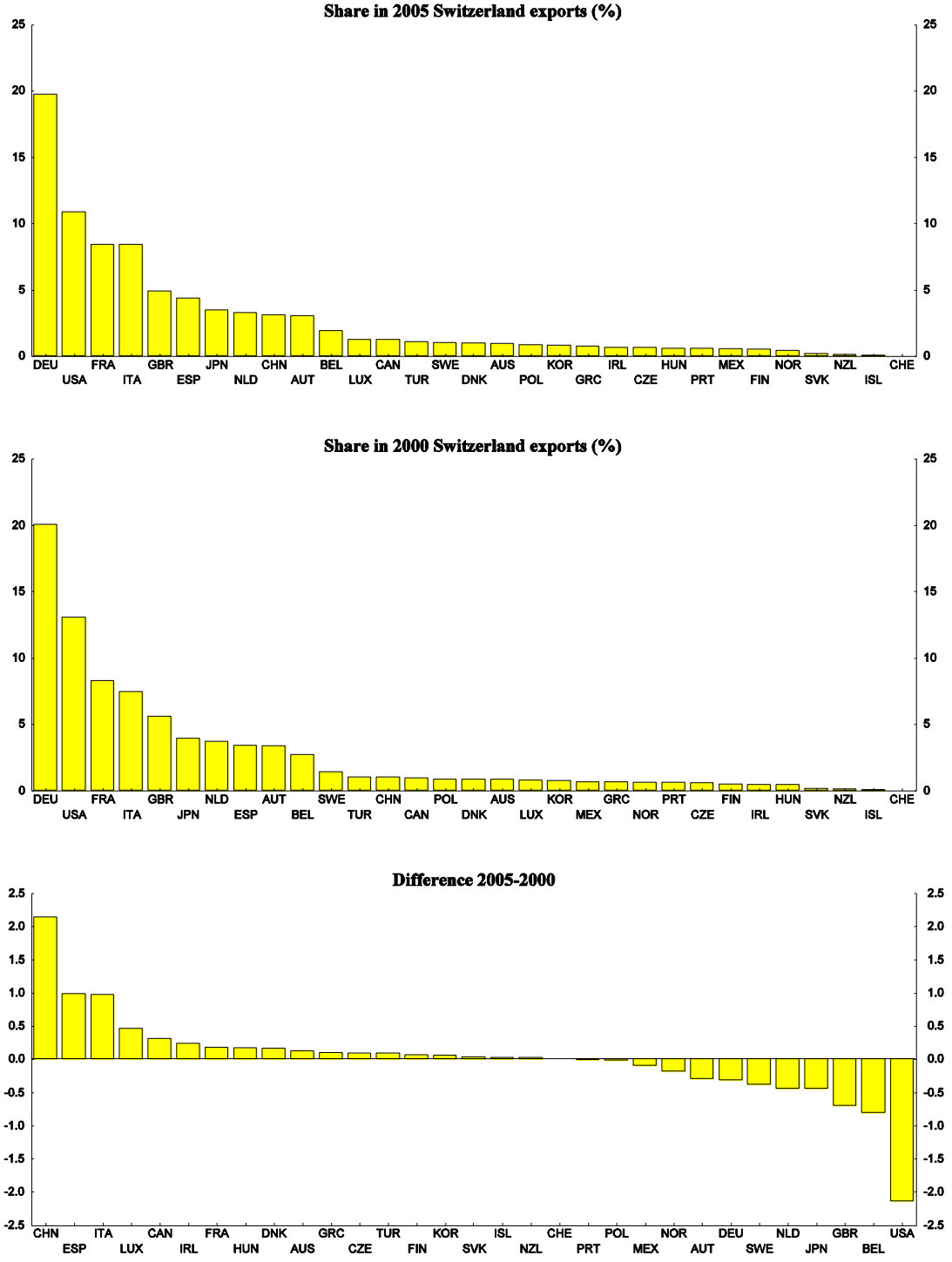


Figure A3.58 Switzerland import breakdown by origin

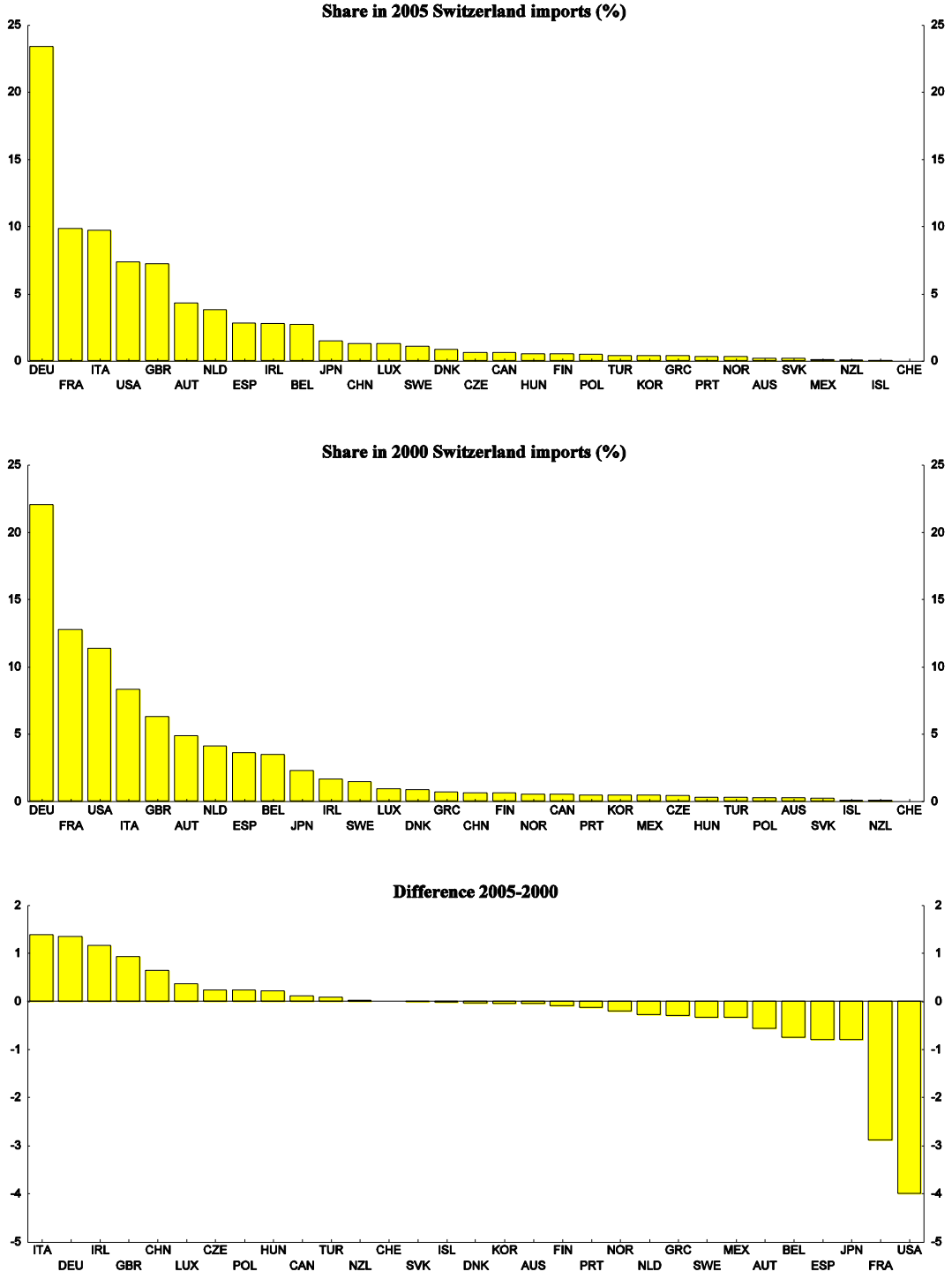


Figure A3.59 Turkey export breakdown by destination

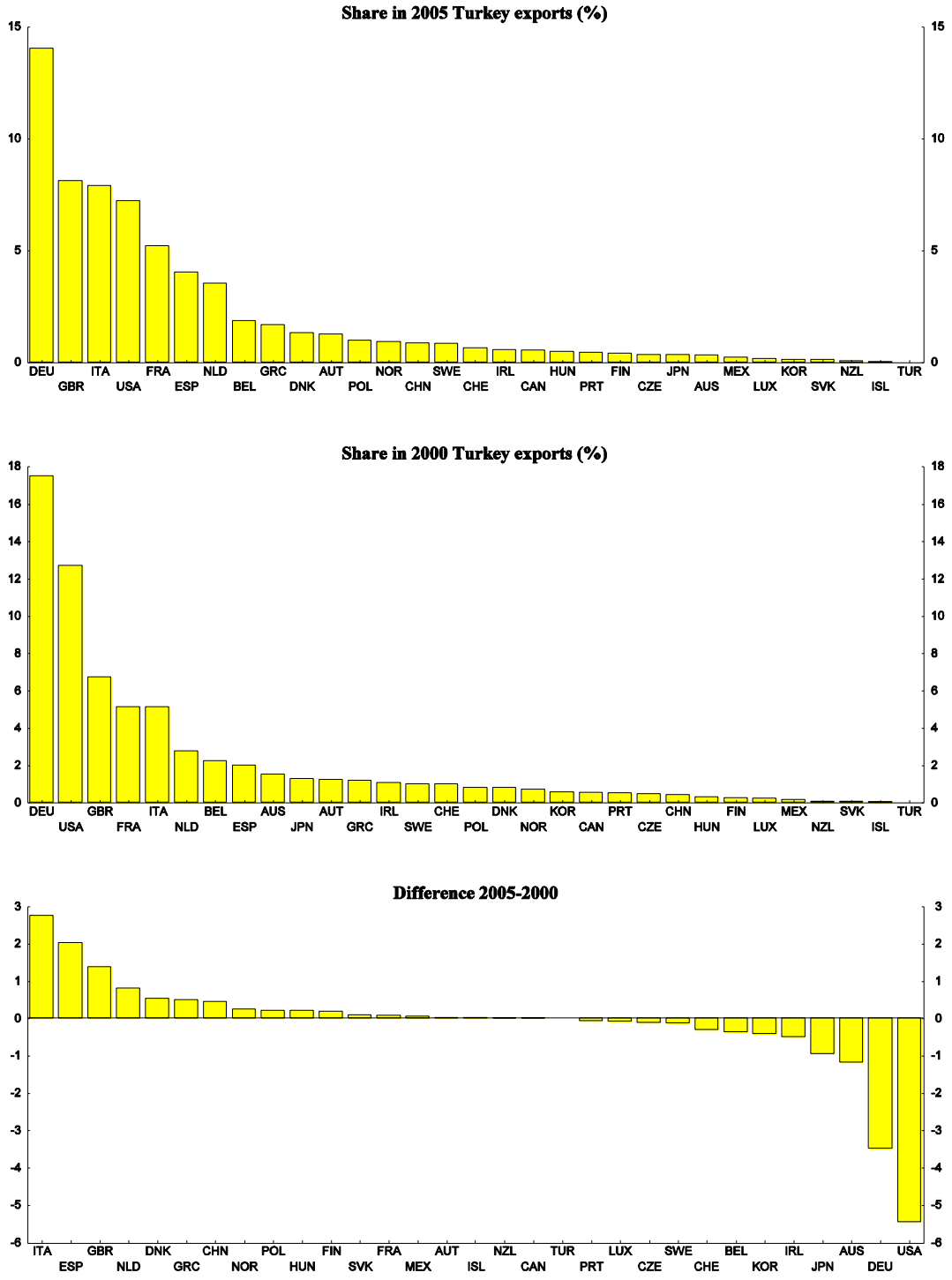


Figure A3.60 Turkey import breakdown by origin

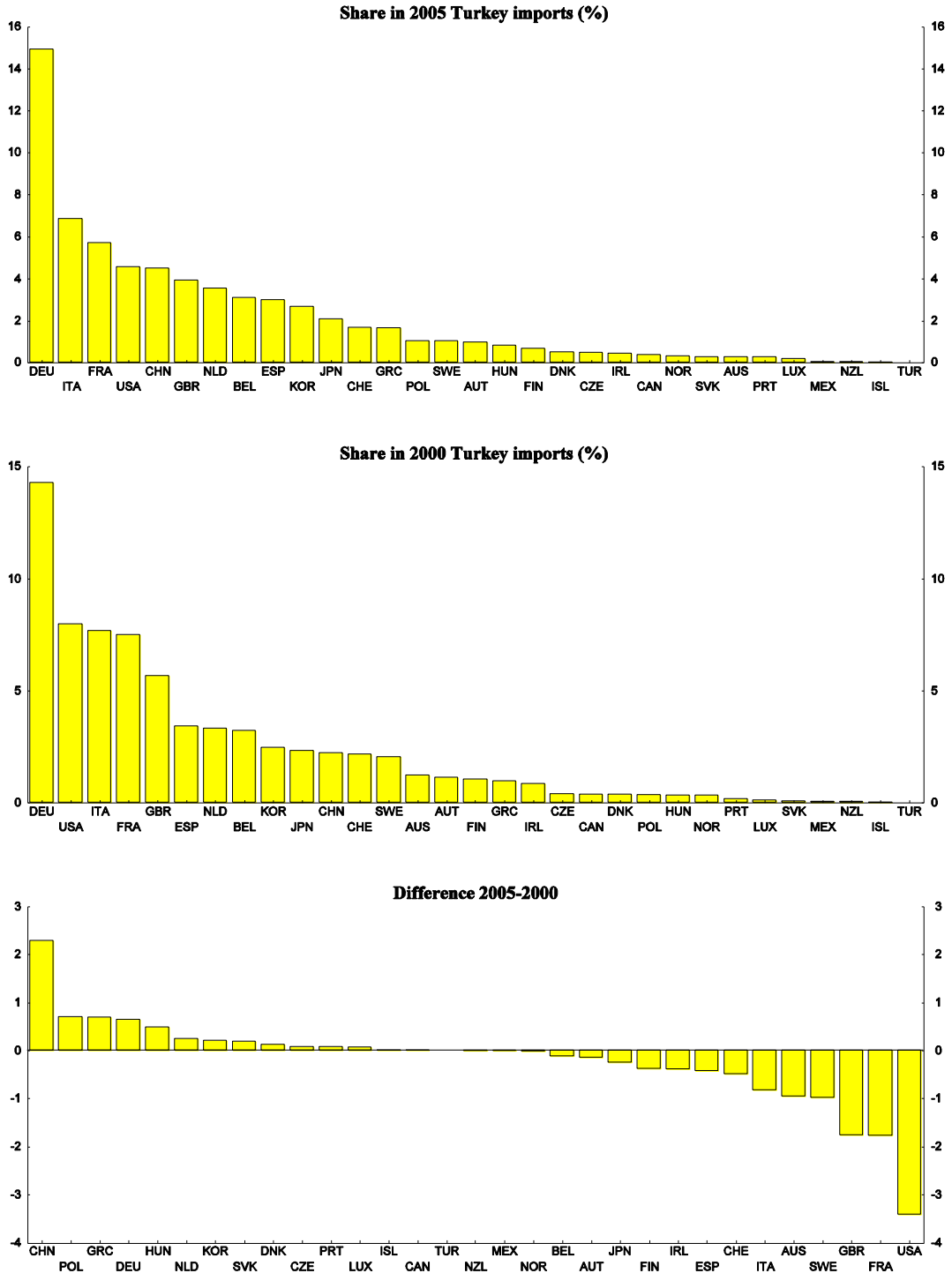


Figure A3.61 China export breakdown by destination

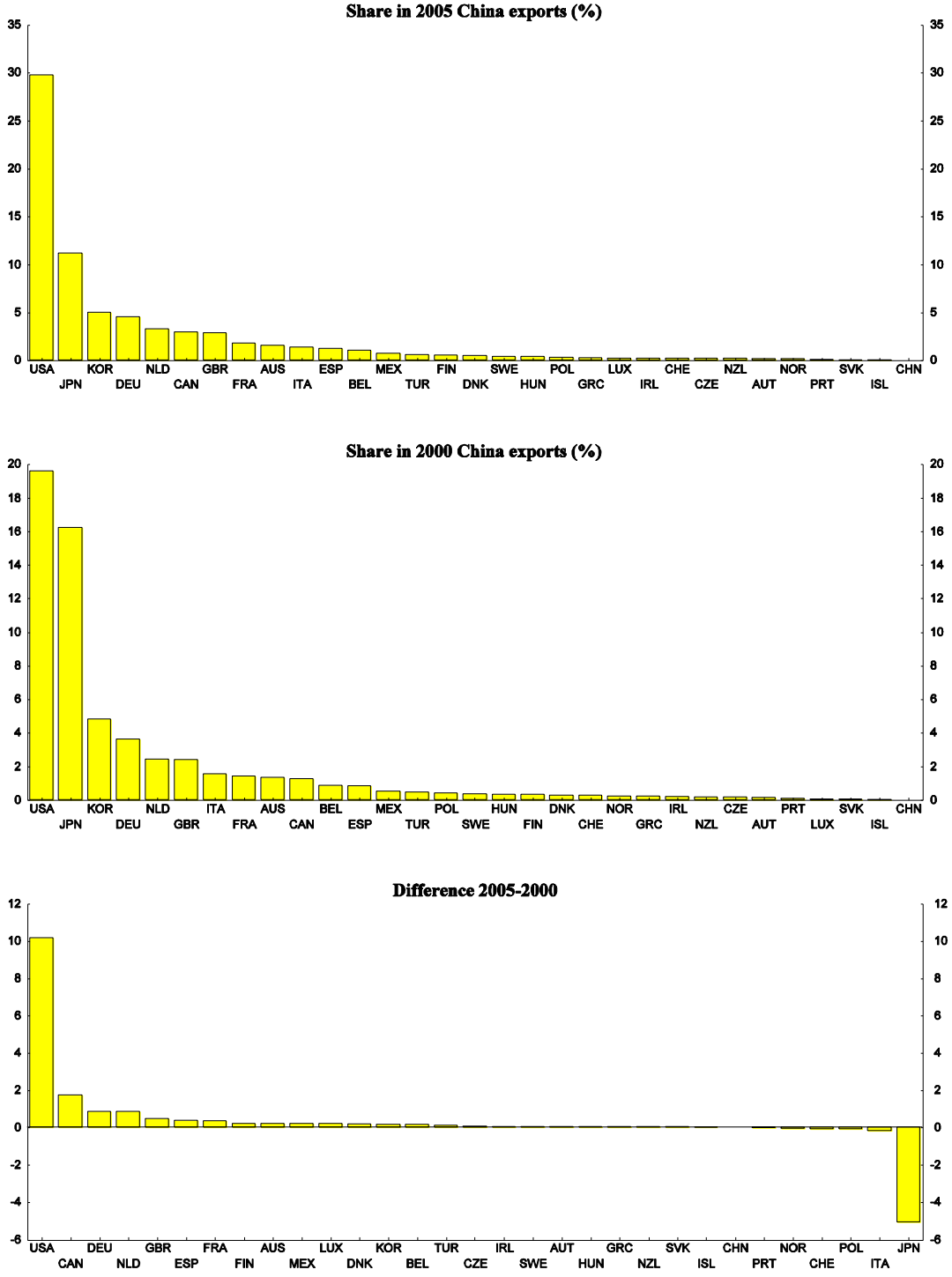
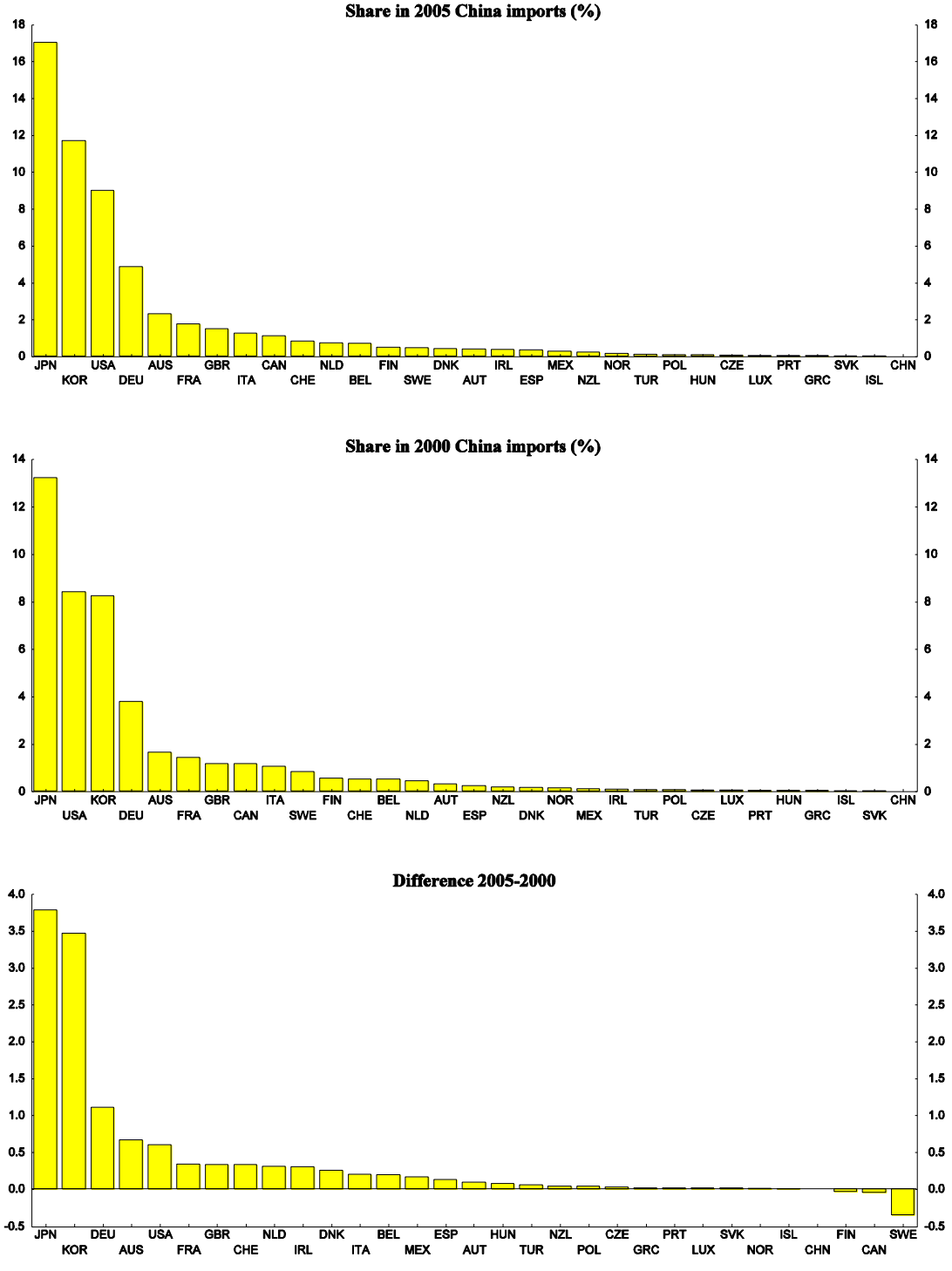


Figure A3.62 China import breakdown by origin



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