

**Trade-weighted Exchange Rate  
Indices and Foreign Markets Shares  
by Manufacturing Industries**

**Some Stylised Facts**

**Christa Magerl, Franz R. Hahn**

**Trade-weighted Exchange Rate  
Indices and Foreign Markets Shares  
by Manufacturing Industries  
Some Stylised Facts**

**Christa Magerl, Franz R. Hahn**

WIFO Working Papers, No. 357  
February 2010

# Trade-weighted Exchange Rate Indices and Foreign Markets Shares by Manufacturing Industries – Some Stylised Facts

**Christa Magerl**  
Austrian Institute of  
Economic Research  
Arsenal, Object 20  
1030 Vienna, Austria  
E-mail: [Christa.Magerl@wifo.ac.at](mailto:Christa.Magerl@wifo.ac.at)

**Franz R. Hahn**  
Austrian Institute of  
Economic Research  
Arsenal, Object 20  
1030 Vienna, Austria  
E-mail: [Franz.Hahn@wifo.ac.at](mailto:Franz.Hahn@wifo.ac.at)

## Abstract

In this paper we make an attempt to extend the WIFO-trade-weighted exchange rate index (TWI\_ER) by computing export-weighted exchange rate indices for eight Austrian manufacturing industries covering the period from 1995 to 2005. The TWI\_ER by manufacturing industries improves upon the previous WIFO-TWI by calculating both current single (bilateral) export weights and current double (multilateral) export weights for each year under investigation. We also present stylised facts based on this unique dataset concerning foreign markets share dynamics and the relationship between international competitiveness and improvement in international performance at the industry level.

JEL: F15, F31, F41

Key words: international competitiveness, markets share dynamics, trade-weighted exchange rate index

## 1. Introduction

The rise and fall of the exchange rate against the major trading partners is elemental to the analysis of the overall competitiveness of an economy, particularly of a small open economy. Exchange rate changes play a particularly important role for a country's external competitive edge. Movements in the exchange rate affect market conditions directly via (a) the demand and supply of imports and exports and (b) the prices of tradables denominated in domestic currency.

However, bilateral exchange rate movements do not reveal the whole picture since from a macroeconomic point of view what really matters is the overall impact on an economy of all changes in exchange rates. Trade-weighted exchange rate indices (TWI\_ER) have proven to be useful yardsticks for capturing this total effect, and, in so doing, provide valuable information on the linkage between exchange rates and export sector competitiveness. This is even more so when the design of the trade weights allows for third-country competition. For example, the TWI\_ER for Austria composed by WIFO (Austrian Institute of Economic Research) accounts for third-country effects by factoring in double (multilateral) export weights for manufactured goods and overnight stays (see Hahn et al., 2001). TWI adjusted for producer price changes (or unit labour cost changes), termed PP\_TWI\_ER (or UC\_TWI\_ER), are even more informative as to assessing the international price (and cost) competitiveness of a given country.

Beyond that, TWI\_ER also provides valuable information for monetary policy makers. It is the nominal effective exchange rate index which indicates the average trend in a currency's external value relative to the currencies of its major trade partners. This delivers valuable information for evaluating the current monetary situation in view of the anticipated inflation and price trends.

In this paper we make an attempt to extend the WIFO-TWI\_ER by computing export-weighted exchange rate indices for eight Austrian manufacturing industries covering the period from 1995 to 2005. The TWI\_ER by manufacturing industries improves upon the previous WIFO-TWI by calculating both current single (bilateral) and current double (multilateral) export weights for each year under investigation. In section 2 we briefly outline the design of the WIFO-TWI\_ER. In section 3 the dynamics of the foreign markets shares by industries from 1995 to 2005 is presented. Section 4 presents stylized facts concerning the relationship between the dynamics of TWI\_ER and foreign markets shares for eight Austrian manufacturing industries covering the period from 1995 to 2000. Section 5 concludes.

## 2. Design and Construction of WIFO-TWI\_ER by Manufacturing Industries<sup>1)</sup>

Due to data constraints, the sample of the competitor and destination countries explicitly covered by the WIFO-TWI by manufacturing industries extends to 38 countries. Though the

---

<sup>1)</sup> This section draws heavily on chapter 3 in Hahn et al. (2001).

sample is smaller than that of the WIFO-TWI for the entire manufacturing sector (64 countries), the more sophisticated trade structure of Austria's economy since the beginning of the 1990s, i. e. the greater significance of Overseas and Eastern European trade remains sufficiently well accounted for.

The methodology and weighting procedures follow the dictates of the WIFO exchange rate system used thus far, which conforms with the international and ECB standards (see Mooslechner, 1995 and 1982). Köhler-Töglhofer (1999) offers a current overview of the methodological problems and procedures of the empirical exchange rate index construction.

The main characteristic construction elements of the WIFO-TWI design are maintained in the respective TWI by manufacturing industries: a geometrical weighting, and double (multilateral) export weights. Contrary to the previous computations, however, the WIFO-TWI by manufacturing industries is based on both current single (bilateral) and current double (multilateral) export weights for each year under investigation (that is, from 1995 to 2005).

TWI based on current weights are calculated for the following eight industries: food (food products, beverages and tobacco), paper (pulp, paper, paper products, printing and publishing), chemicals (chemicals and chemical products), plastics (rubber and plastic products), basic metals (basic metals, fabricated metal products), machinery, electricals (electrical and optical equipment), and transport (transport equipment).

The use of an identical vector for competitor and destination countries in the TWI gives us a clear picture of the competitive relationships in the weighting scheme with the aid of double export weights, i. e. those taking into account third-market effects.

#### Box 1

##### *The Economic Logic of Third-Market Effects and How They are Calculated*

The concrete empirical method of capturing third-market effects is based on complete competition matrices of foreign trade in manufactured goods. The foreign trade matrix contains the markets shares of those countries considered to be significant competitors of a given country in export business, which means that it contains, for example, the markets shares on all sales markets of each country exporting manufactured goods. But that portion of the market volume which is produced and sold domestically, thus competing with imports from other countries, is also taken into account.

In calculating the effective exchange rate index based on manufactured goods, we begin with the gross output of the manufacturing sector<sup>2)</sup> of each sales market. The volume of manufactured goods exported by the country in question is then subtracted from this figure, leaving that portion of the domestic production of manufactured goods that is available for the domestic market. Then we add the imports (= the exports of all other countries to this

---

<sup>2)</sup> The Austrian index differs in this respect from the euro index, as the Euro index is calculated based on net output (gross output less intermediate input).

country). The resulting figure is the market volume of the total sales of manufactured goods that is relevant for the calculation.

The markets share of each exporter in this country is considered to be the share of market volume claimed by its exports, and the markets share of the sales market (the main diagonal of the competition matrix) is defined as that share of market volume representing the domestic industrial production which remains in the country. Thus on a given sales market each exporter competes not only with all other exporters, but also with the industrial production of the country in question.

The double (extended) export weight of the currency of each country in the basket of the exchange rate index is the sum of the markets shares of a given country on all markets multiplied by the share of the direct export weight of the respective sales market in total national exports.

### *Algebraic Representation*

If there are  $k$  foreign markets in which country  $j$  (Austria, for instance) competes with  $h$  competitors, then the weight that country  $i$  assumes in  $j$ 's effective exchange rate index is expressed as follows in algebraic terms: Double export weight:

$$w_i^x = \left( \frac{x_j^i}{x_j} \right) \left( \frac{y_i}{y_i + \sum_h x_h^i} \right) + \sum_{k \neq i} \left( \frac{x_j^k}{x_j} \right) \left( \frac{x_i^k}{y_k + \sum_h x_h^k} \right)$$

$y_j$  = domestic sales of country  $j$ 's own output.

$x_j^i$  = exports of country  $j$  to country  $i$

$x_j$  = total exports of country  $j$

The base period selected for the new TWI\_ER by manufacturing industries is 1995.

As indicated above, the real effective TWI\_ER by manufacturing industries is calculated based on producer prices (in short PP\_TWI\_ER). We are also capable of computing real effective TWI\_ER by manufacturing industries in terms of unit labour costs (in short UC\_TWI\_ER).

The data sources used, particularly to calculate the single and double weights and the markets share structure of each competitor and destination country in the supply structure matrix, are fully documented in the appendix. A detailed account of the TWI by manufacturing industries for Austria and for the competitor countries is made available on request.

### **3. Dynamics of Foreign Markets Shares by Manufacturing Industries**

The foreign trade matrix contains valuable information since it reflects the markets shares of those countries that are considered to be significant competitors of a given country in export business. Beyond that, the portion of the market volume which is produced and sold domestically, thus competing with imports from other countries, is also taken into account.

Since TWI by manufacturing industries is based on current weights we calculated the supply matrix for each industry on a yearly basis. This allows for an empirical analysis of the dynamics of markets shares for the period from 1996 to 2005. We leave the in-depth analysis of the evolution of markets shares for a future companion paper and restrict the current work to the presentation of our computations.

In so doing, we start with a brief discussion of the development of the markets shares of the manufacturing industries at the home market from 1995 to 2005. The most striking result is that the domestic manufacturing companies are, in almost all countries, the market leaders in their home markets. This particularly applies to the foods industry, the paper industry, plastics industry, and the basic metals industry. The domestic market shares of these industries exceed the 50 percent margin in almost all years under investigation (see Figure A for the domestic market shares in 2005).

A further interesting finding is that among the manufacturing industries with dominant home market shares the EU-based industries are those that suffered the largest losses between 1995 and 2005. This is supportive of the view that the single market concept of the European Union has significantly contributed to the opening-up of the domestic markets for foreign manufacturing goods. The reduction of the home market dominance of the domestic manufacturing industries has been larger in the new member states than in the old member states of the EU (see Figure B).

The third most startling outcome is that the same applies to the foreign markets shares of the manufacturing industries. Foreign markets shares are related to the portion of the market volume which is sold abroad by competing with exports from other foreign countries only and leaving the home market presence of the respective domestic manufacturing industry out of account.

The computations indicate that those industries that started out with sizeable foreign markets shares in 1995 ended up, in many cases, in holding much smaller markets shares abroad in 2005. A good example in case is the Austrian manufacturing sector that held leading markets shares in Eastern Europe across almost all manufacturing products (except food) in 1995 and suffered markets share losses by a margin of slightly above 1 percentage point on average across all markets by the end of 2005 (see Figure C). Most interestingly, the Austrian manufacturing industries were among those foreign industries that suffered the largest losses in Eastern Europe (see Figure D).

On the other hand, the Austrian manufacturing sector performed positively in Western Europe and Overseas with markets share gains of less than 0.5 percentage points from 1995 to 2005. In Western Europe, the foods industry made the biggest headway gaining a markets share increase of 1.5 percentage points, with the rest of the Austrian manufacturing sector remaining well below the half-percentage point gain (chemicals and plastics industries even suffered slight markets share losses in Western Europe markets). In overseas markets, among the Austrian manufacturing industries under study the transport industries performed best. As compared to foreign competitors, the Austrian transport industry gained the fourth largest

markets share increase in overseas markets, outperformed only by the respective industries of Germany, South Korea and United Kingdom.

### **3.1 Biggest Gainers and Losers**

From 1995 to 2005, the biggest gainers in Western Europe markets, in term of markets shares, were the Eastern European manufacturers, with those of Poland, Czech Republic, and Hungary in the lead. The gains of Eastern European manufacturers were particularly large in machinery and transport markets. The biggest losers in Western European markets were the producers of Japan, France, United Kingdom, and the United States, with significant losses in foods and electrical industries, respectively.

For the period under investigation, the Eastern European manufacturers also succeeded in expanding significantly their markets shares in their home region. This particularly applies to the foods, paper, plastics, and machinery industries. The largest losers in Eastern Europe were the producers of Italy, Austria, the United States and Germany.

The best performers in terms of markets share gains in overseas manufacturing markets, between 1995 and 2005, had been producers of Germany (transports), Belgium and Ireland (chemicals), and Canada (food and plastics). Manufacturers of the United States and Japan belong to the group of the biggest losers in overseas markets.

It is worth stressing that the Austrian manufacturing sector has taken an outstanding development in overseas markets. Due to strong showings of the food, basic metal and transport industry, the markets share gains of the Austrian manufacturers were nowhere bigger than in overseas markets during the period of investigation (Figure D).

## **4. Are TWI\_ER Good Predictors of Markets Share Dynamics?**

Real effective TWI\_ER are considered to be excellent indicators for measuring the impact of exchange rate changes on the magnitude of overall external outflows of goods and services. Exports of goods and services of an economy tend to increase in response to an overall trade-weighted depreciation of the external value of its currency whereas imports of goods and services tend to move into the opposite direction (and vice versa).

Hence, TWI\_ER, adjusted for domestic price or unit labour cost changes, are frequently used as indicators for capturing the international competitiveness of an entire economy and/or respective business sectors.

As outlined above, the WIFO-TWI is composed of an export-structure oriented component and an external market-structure oriented component, respectively (see Box 1). Given this very design the question arises whether the WIFO-TWI are good enough a measure to reflect not only the magnitude of the exports but also the movements of the foreign markets position of the Austrian manufacturing sectors under study. To be specific, by comparing the development of the WIFO-TWI between 1995 and 2005 with the changes of foreign markets



shares of 8 Austrian manufacturing industries in Western Europe, Eastern Europe and Overseas within this given period of time we make an attempt to detect stylized evidence as to how close the relationship of these two variables actually is. Standard theory suggests that real effective exchange rate changes be negatively related to foreign markets share changes. That is to say, a gain in international competitiveness as measured by a decrease of the real effective exchange rate index should be rewarded by an improvement in the foreign market place as measured by an increase of foreign markets shares. We do not conduct an in-depth econometric analysis in order to present evidence whether this hypothesis is supported by our dataset covering eight manufacturing industries and the given demarcation of markets over the period from 1995 to 2005. Instead we present rather stylized evidence in favour or against this proposition by a simple comparison of WIFO-TWI changes and foreign markets share changes by industries.

As a primer, Figure E shows that there may indeed be a negative relationship between changes of the nominal effective exchange rate index (TWI\_ER) and the foreign market position of the Austrian manufacturing industries under study. The question is if this relation holds when taken to the frame in real terms. Table 1 gives a summary of these findings showing that, at the level of the overall manufacturing sector, the hypothesis under investigation is corroborated by the data for the foreign markets in total. This holds for both adjustments of the exchange rate changes: unit labour costs and producer prices. At the industry level, only two third of the Austrian manufacturing industries managed to expand their foreign markets shares in total from 1995 to 2005 in response to an improvement of international competitiveness (i.e. decline of the external trade-weighted value of the currency in real terms). The same holds in the Western European market place, less so, however, in Eastern Europe and Overseas. Foods is the only Austrian industry that, between 1995 and 2005, enhanced both international competitiveness and its position in all four foreign markets under investigation position in all markets under study.

Table 1: *Negative relationship between foreign markets share changes and real effective exchange rate changes*

	Western Europe	Eastern Europe	Overseas	Total
<i>Real effective exchange rate index, adjusted for unit labour costs</i>				
Manufacturing (8 industries)	●		●	●
Food	●	●	●	●
Paper	●			●
Chemicals			●	
Plastics		●	●	
Basic metals				●
Machinery	●			●
Electricals	●	●		
Transports	●		●	●

*Real effective exchange rate index, adjusted for producer prices*

Manufacturing (8 industries)	●			●
Food	●	●	●	●
Paper	●			●
Chemicals			●	
Plastics		●	●	
Basic metals				●
Machinery	●			●
Electricals	●	●		
Transports	●			●

● ... Yes.

## 5. Summary

In this paper we present an extension of the WIFO-trade-weighted exchange rate indicator (TWI\_ER) by computing export-weighted exchange rate indices for eight Austrian manufacturing industries covering the period from 1995 to 2005. The TWI\_ER by manufacturing industries improves upon the previous indicators by calculating both current single (bilateral) and current double (multilateral) export weights for each year under investigation. The computations presented provide valuable information on foreign markets share dynamics and on international competitiveness at the industry level.

One of the striking findings unveiled by this unique dataset is that the domestic manufacturing companies are, in almost all countries, the market leaders in their home markets. This particularly applies to the foods industry, the paper industry, plastics industry, and the basic metals industry. Further, the paper presents stylized facts supporting the view that gains in international price competitiveness are closely related to gains in foreign markets shares at both the aggregate and the industry level. However, the latter relationship is stronger at the aggregate level.

## Sources and Definitions

### Industries by NACE:

Food	DA	15+16	Food products, beverages and tobacco
Paper	DE	21+22	Pulp, paper, paper products, printing and publishing
Chemicals	DG	24	Chemicals and chemical products
Plastics	DH	25	Rubber and plastic products
Basic metals	DJ	27+28	Basic metals and fabricated metal products
Machinery	DK	29	Machinery, nec
Electricals	DL	30 to 33	Electrical and optical equipment
Transports	DM	34+35	Transport equipment
Manufacturing			Sum of 8 industries

### Countries:

Western Europe (EU 17)	Austria (AT), Belgium (BE), Cyprus (CY), Germany (DE), Denmark (DK), Spain (ES), Finland (FI), France (FR), United Kingdom (GB), Greece (GR), Ireland (IE), Italy (IT), Luxembourg (LU), Malta (MT), Netherlands (NL), Portugal (PT), Sweden (SE); Switzerland (CH), Norway (NO), Turkey (TR)
Eastern Europe (EU NMS)	Bulgaria (BG), Czech Republic (CZ), Estonia (EE), Hungary (HU), Lithuania (LT), Latvia (LV), Poland (PL), Romania (RO), Slovenia (SI), Slovak Republic (SK); Croatia (HR), Russian Federation (RU)
Overseas (OVER)	Australia (AU), Canada (CA), Hong Kong (HK), Japan (JP), Korea (KR), New Zealand (NZ), United States (US)

### Sources:

Exports	UN COMTRADE
Gross output	EUKLEMS, national statistical offices
Producer prices	EUKLEMS, national statistical offices
Unit labour costs	EUKLEMS, national statistical offices
Exchange rates	WIFO database (on the basis of Oesterreichische Nationalbank, European Central Bank, International Financial Statistics)

### Definitions:

Foreign markets share:	Exports of industry $i$ of country $j$ to country $k$ as % of exports of industry $i$ of 39 countries to country $k$
Domestic market share:	Share of domestic production in total supply as % (by industry $i$ )
TWI_ER	Nominal effective exchange rate index (by industry $i$ ) for Austria
TWI_UC	Effective unit labour costs index (by industry $i$ ) for Austria
TWI_PP	Effective producer prices index (by industry $i$ ) for Austria
UC_TWI_ER	Real effective exchange rate index, adjusted for unit labour costs (by industry $i$ ) for Austria
PP_TWI_ER	Real effective exchange rate index, adjusted for producer prices (by industry $i$ ) for Austria

### References

- Hahn, F., Köhler-Töglhofer, W., Magerl, Ch., Mooslechner, P., Neuberechnung des Indikators der Wettbewerbsfähigkeit der österreichischen Wirtschaft, OeNB, Berichte und Studien, 2001, (2), S. 270–311.
- Köhler-Töglhofer, W., Berechnung effektiver Wechselkursindizes als Indikatoren der Wettbewerbsfähigkeit, OeNB, Berichte und Studien, 1999, (1), S. 104–128.
- Mooslechner, P., Neuberechnung der WIFO-Wechselkursindizes, WIFO-Monatsberichte, 1982, 55(7), S. 424–433.
- Mooslechner, P., Abnehmende Inflationsdifferenz verstärkt real-effektive Schillingaufwertung, WIFO-Monatsberichte, 1995, 68(9), S. 580–592.

Figure A: Domestic market shares in 2005  
Manufacturing

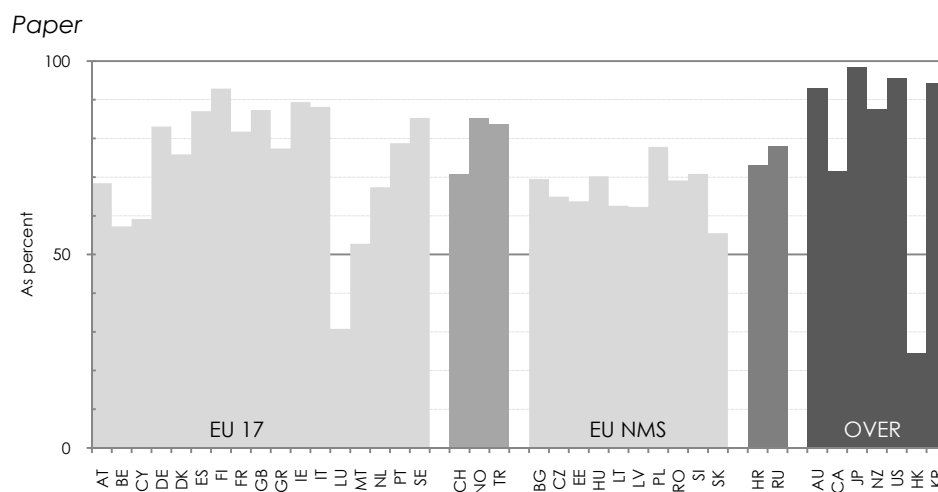
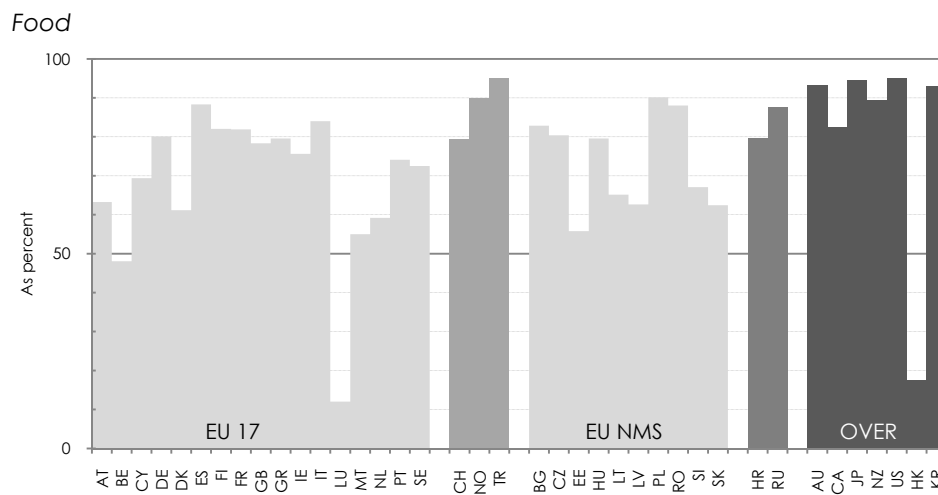
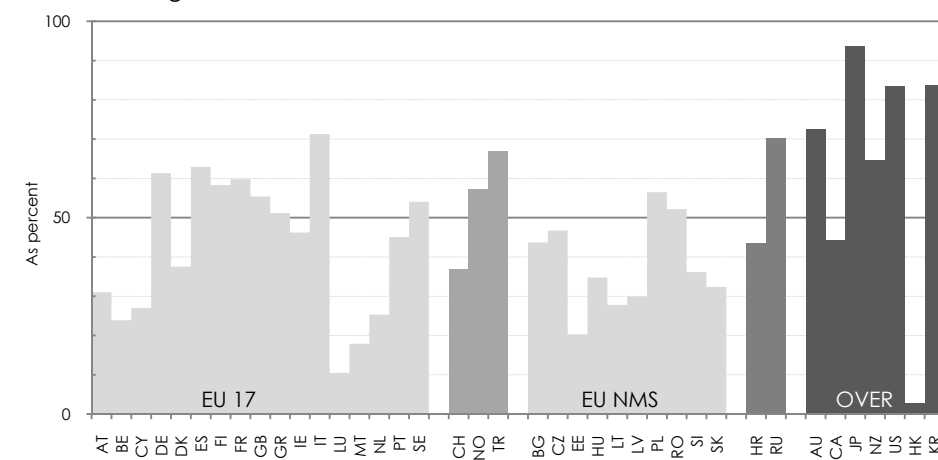
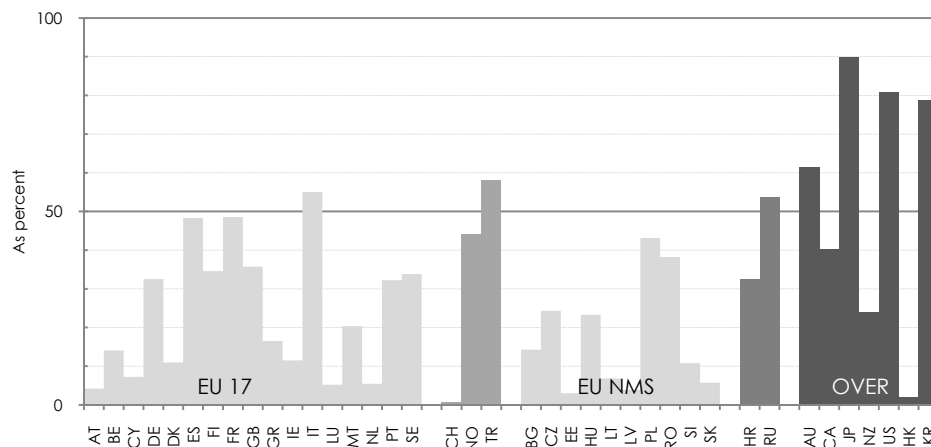
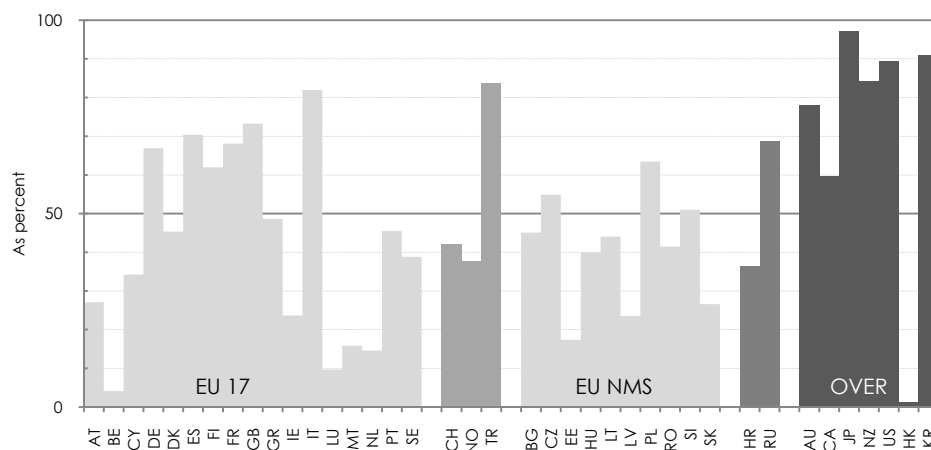


Figure A/continued

Chemicals



Plastics



Basic metals

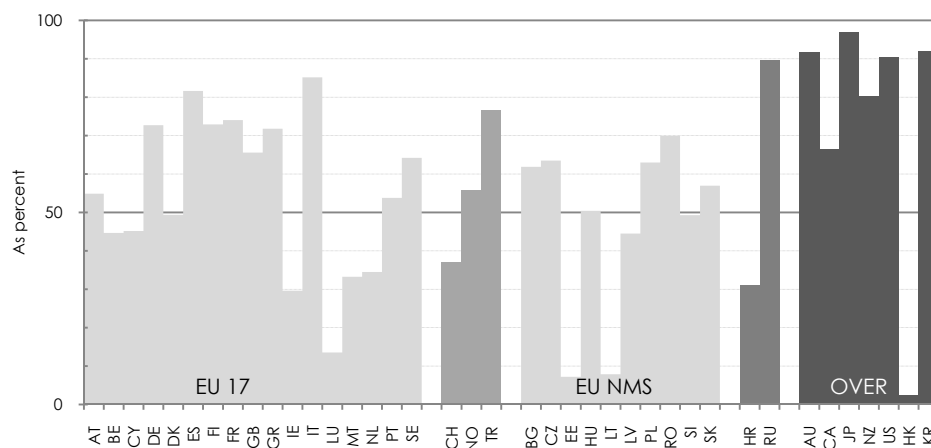
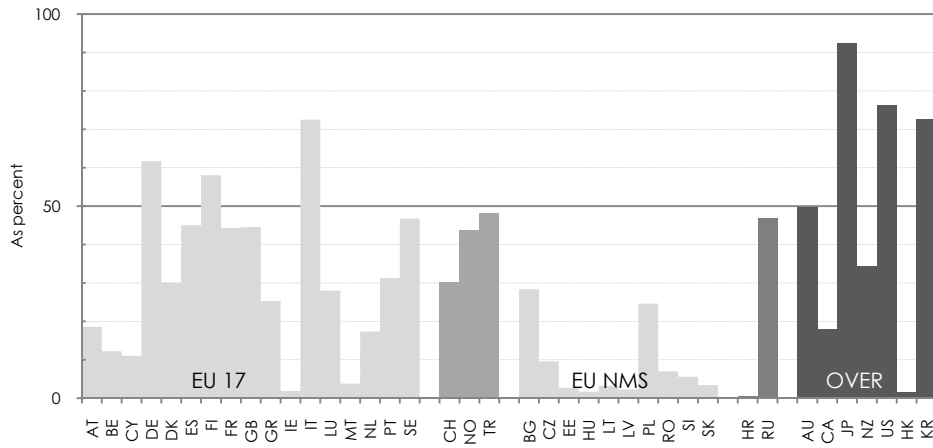
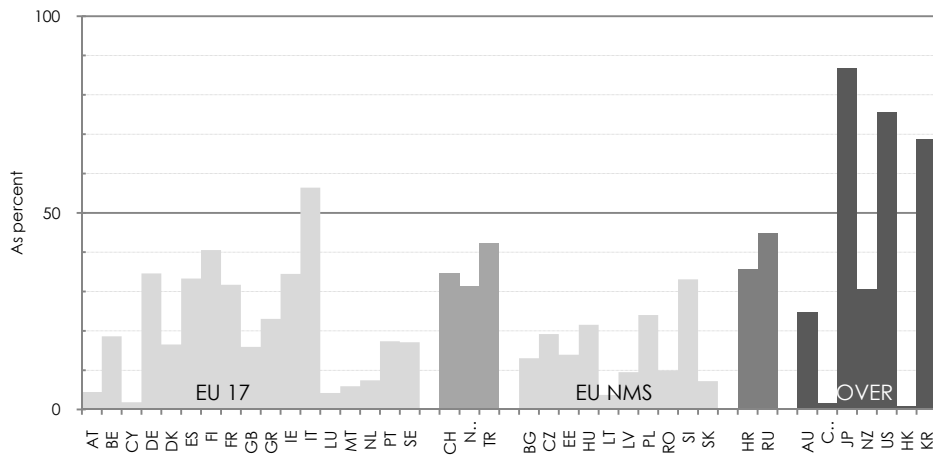


Figure A/continued

Machinery



Electricals



Transports

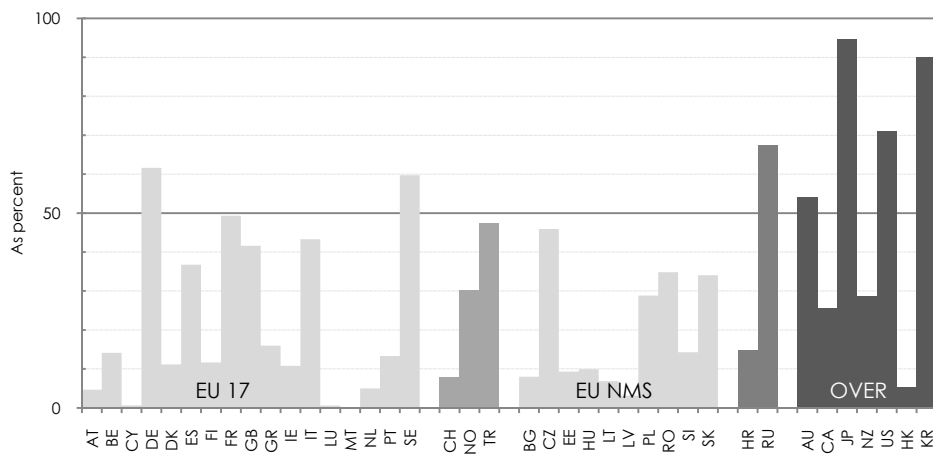
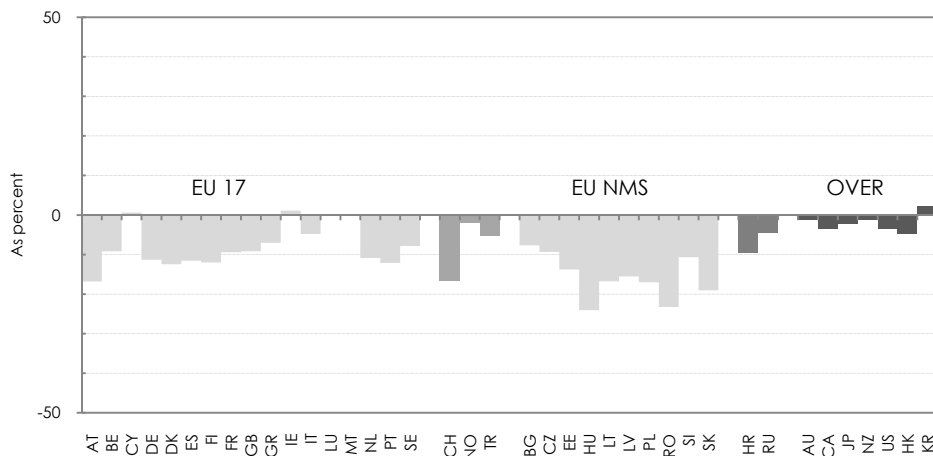
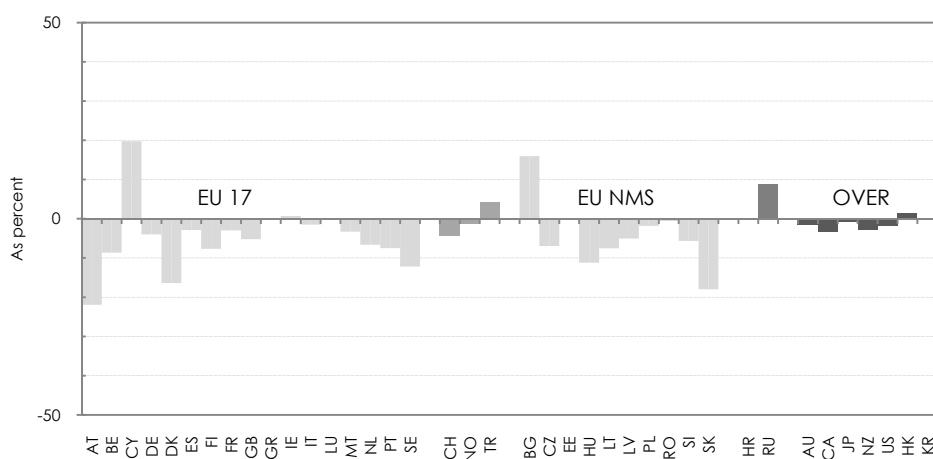


Figure B: Changes in domestic market shares 1995/2005

Manufacturing



Food



Paper

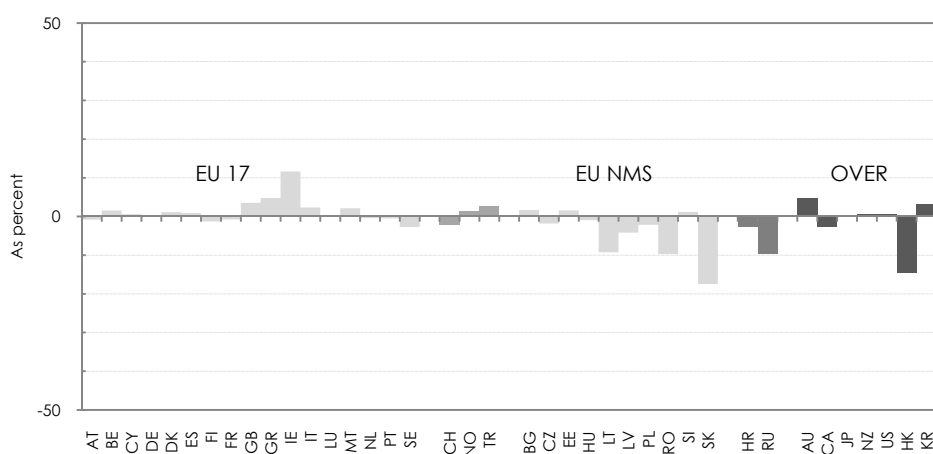
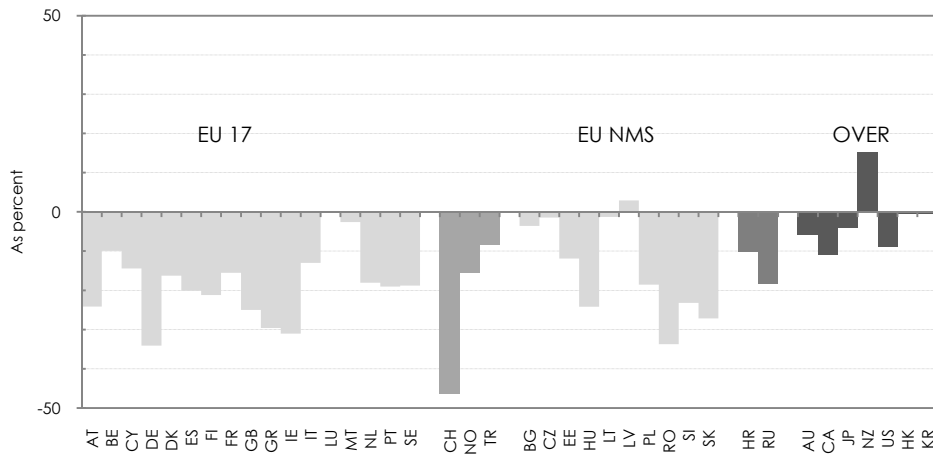


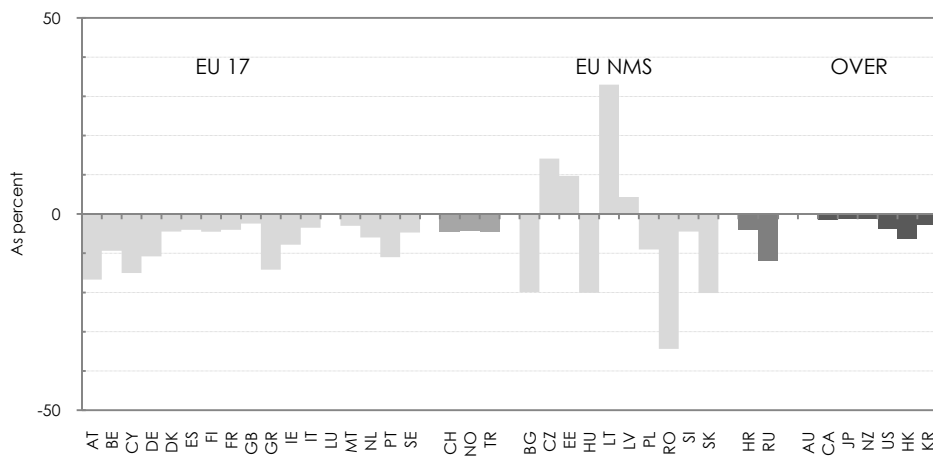


Figure B/continued

Chemicals



Plastics



Basic metals

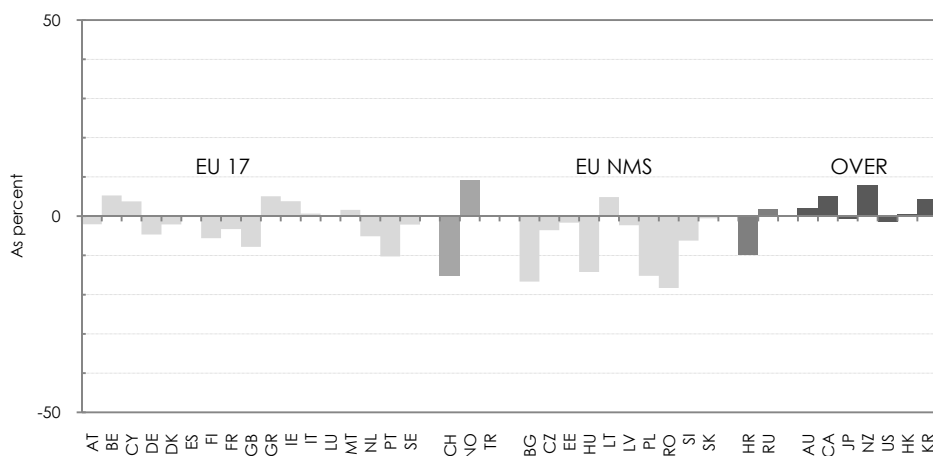
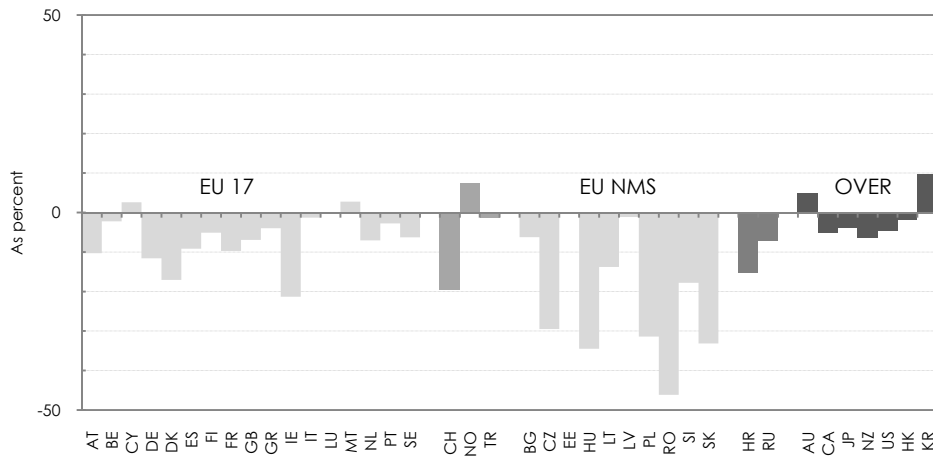
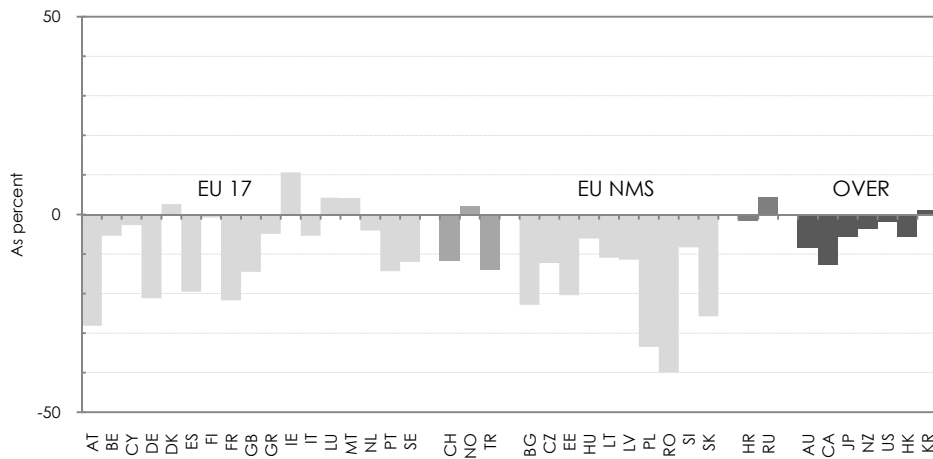


Figure B/continued

Machinery



Electricals



Transports

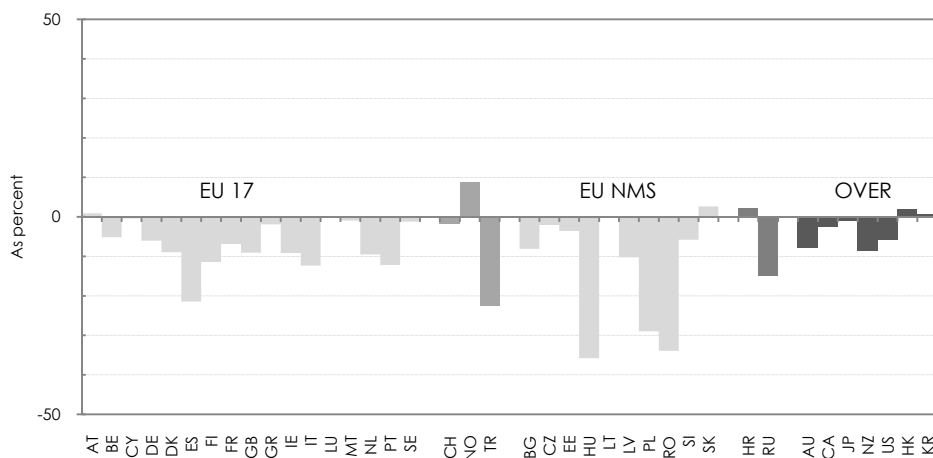


Figure C1: Foreign markets shares in manufacturing (8 industries)

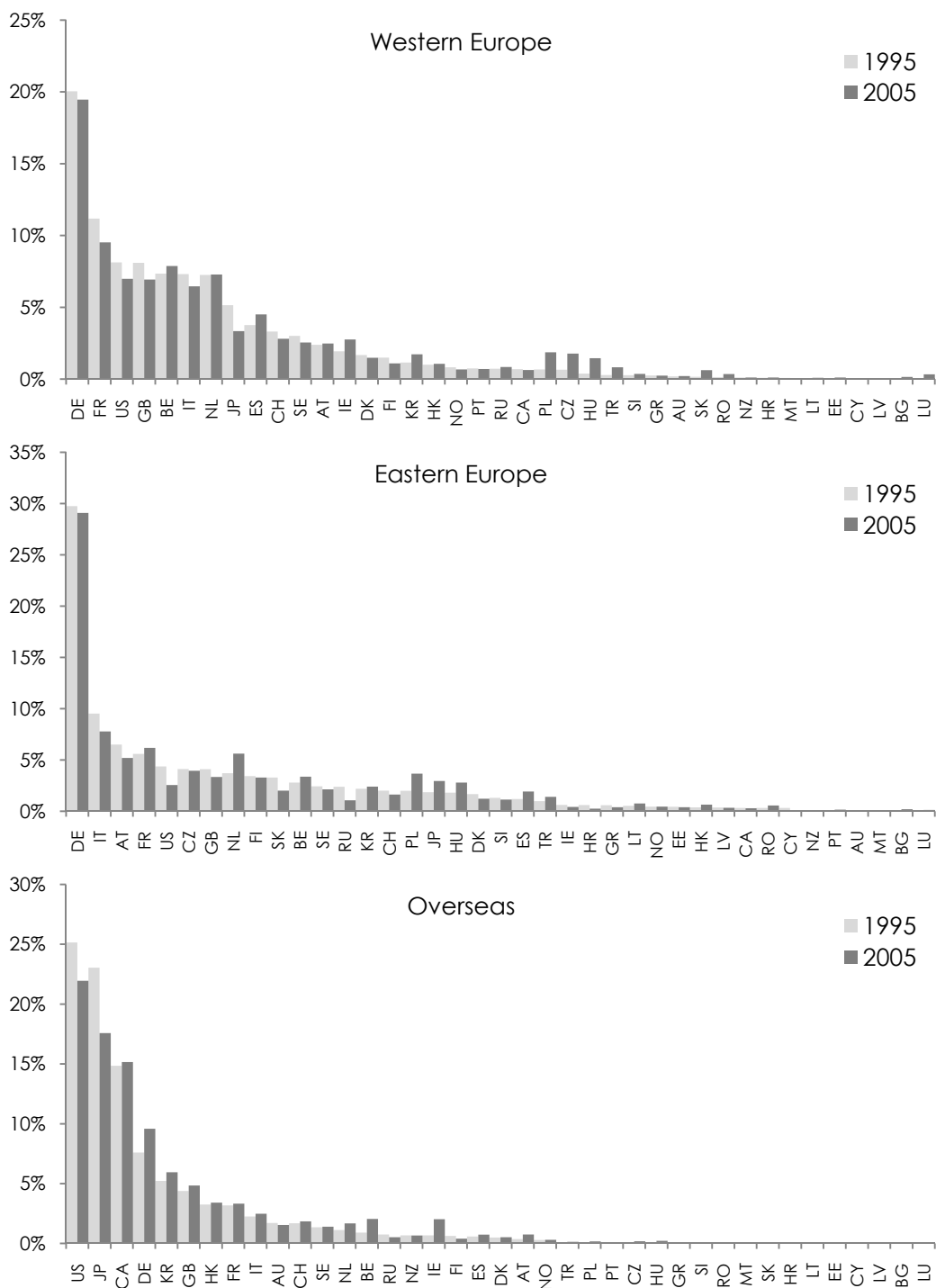


Figure C2: Foreign markets shares in food

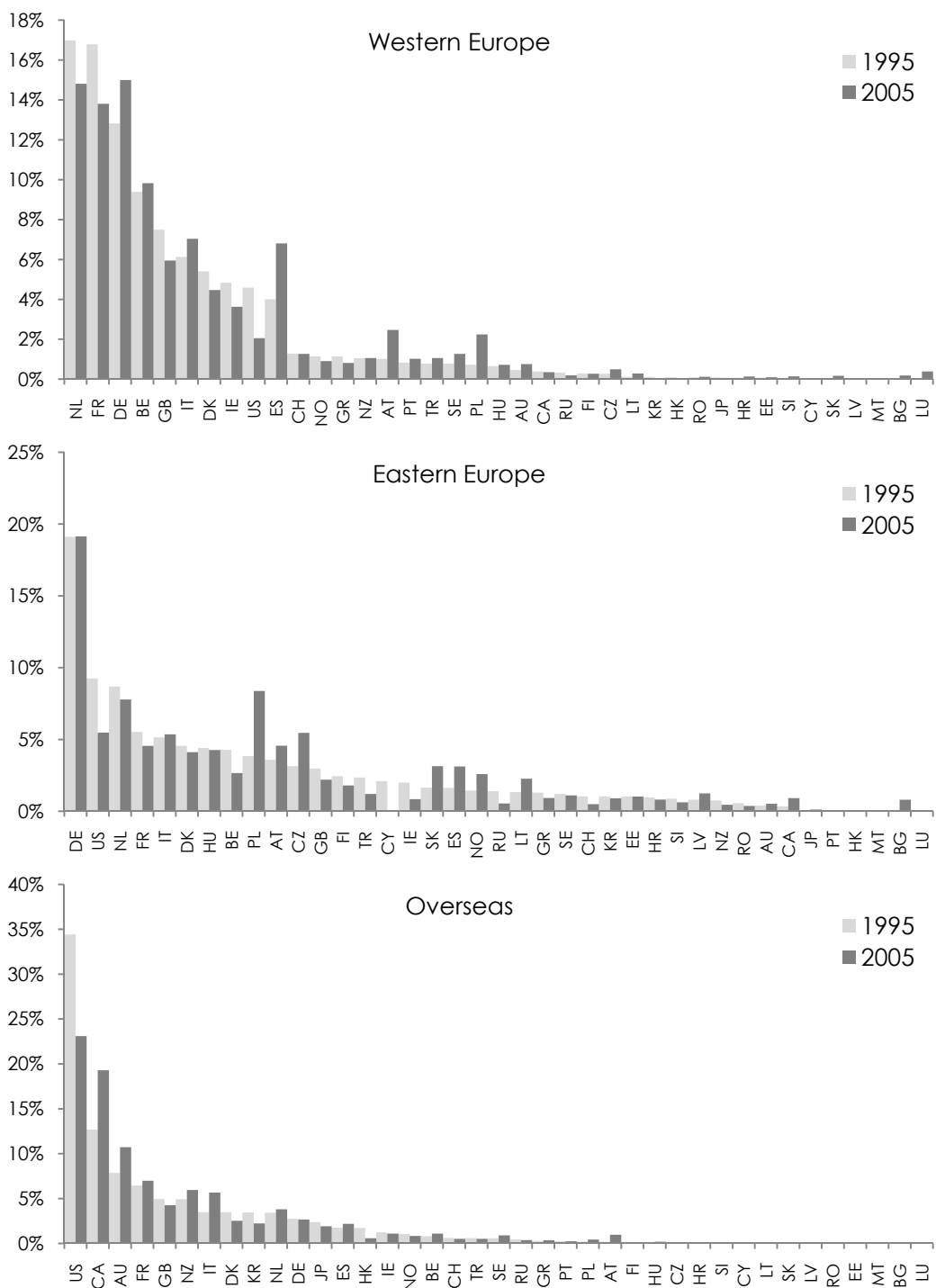


Figure C3: Foreign markets shares in paper

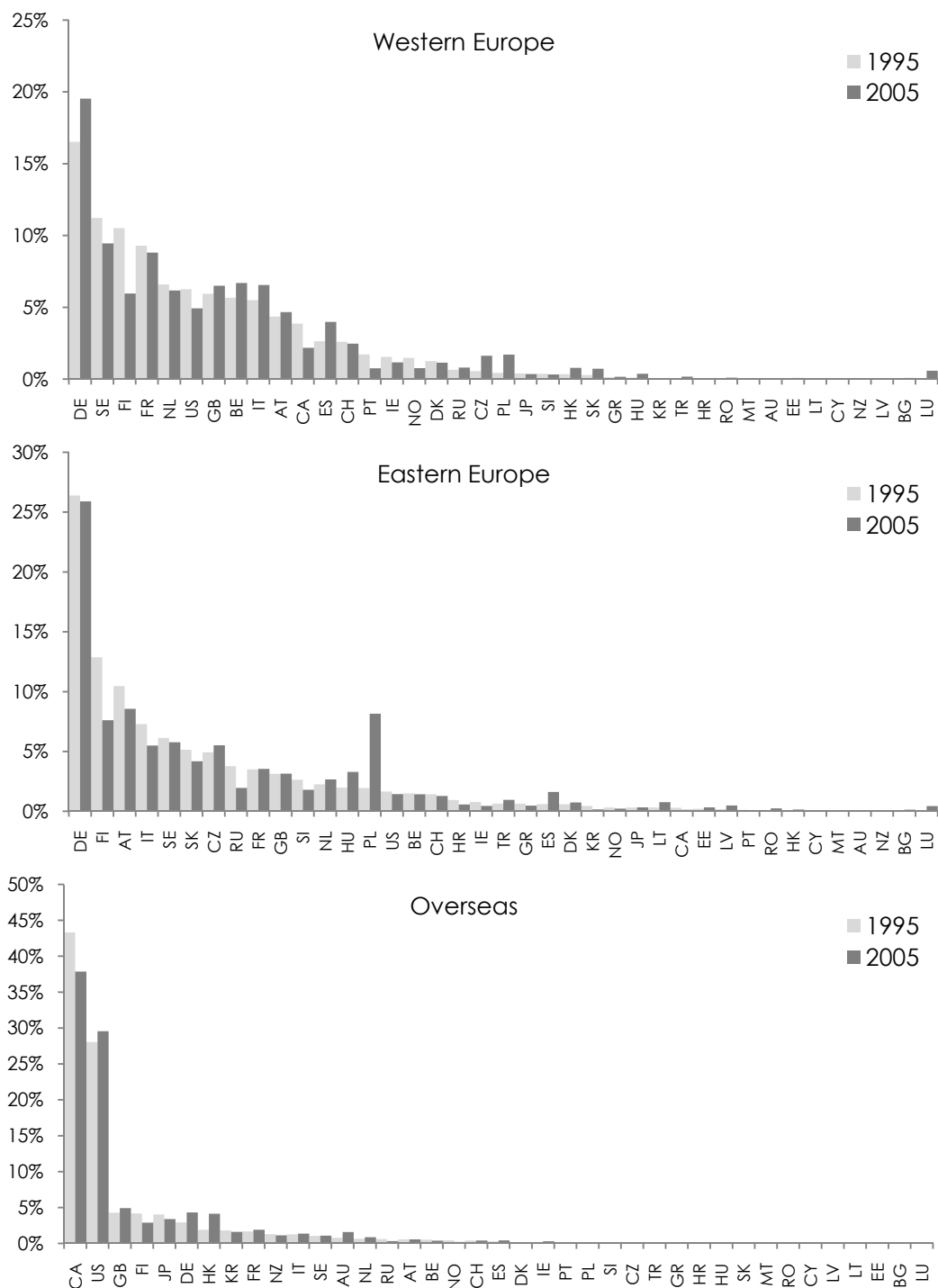


Figure C4: Foreign markets shares in chemicals

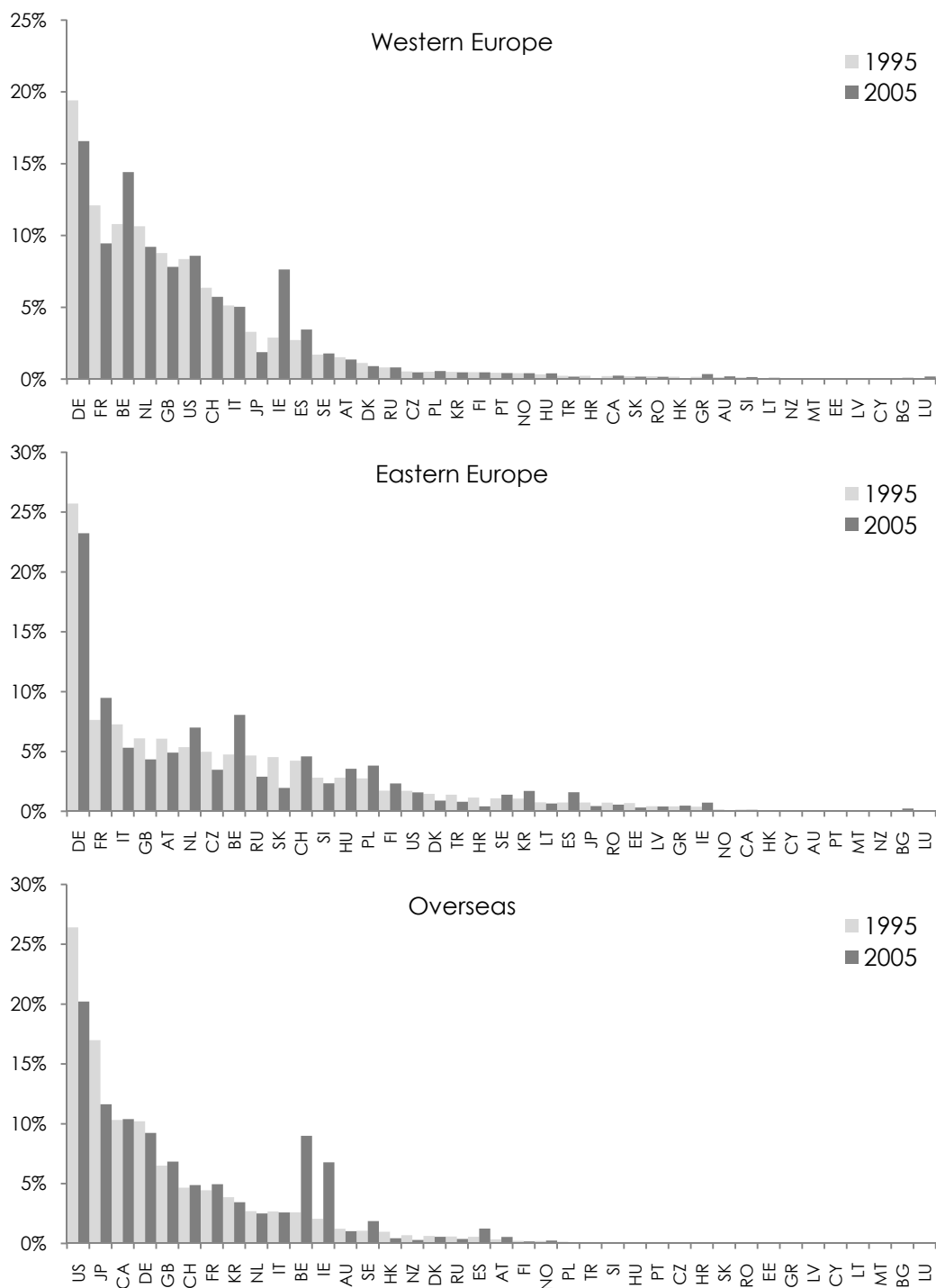


Figure C5: Foreign markets shares in plastics

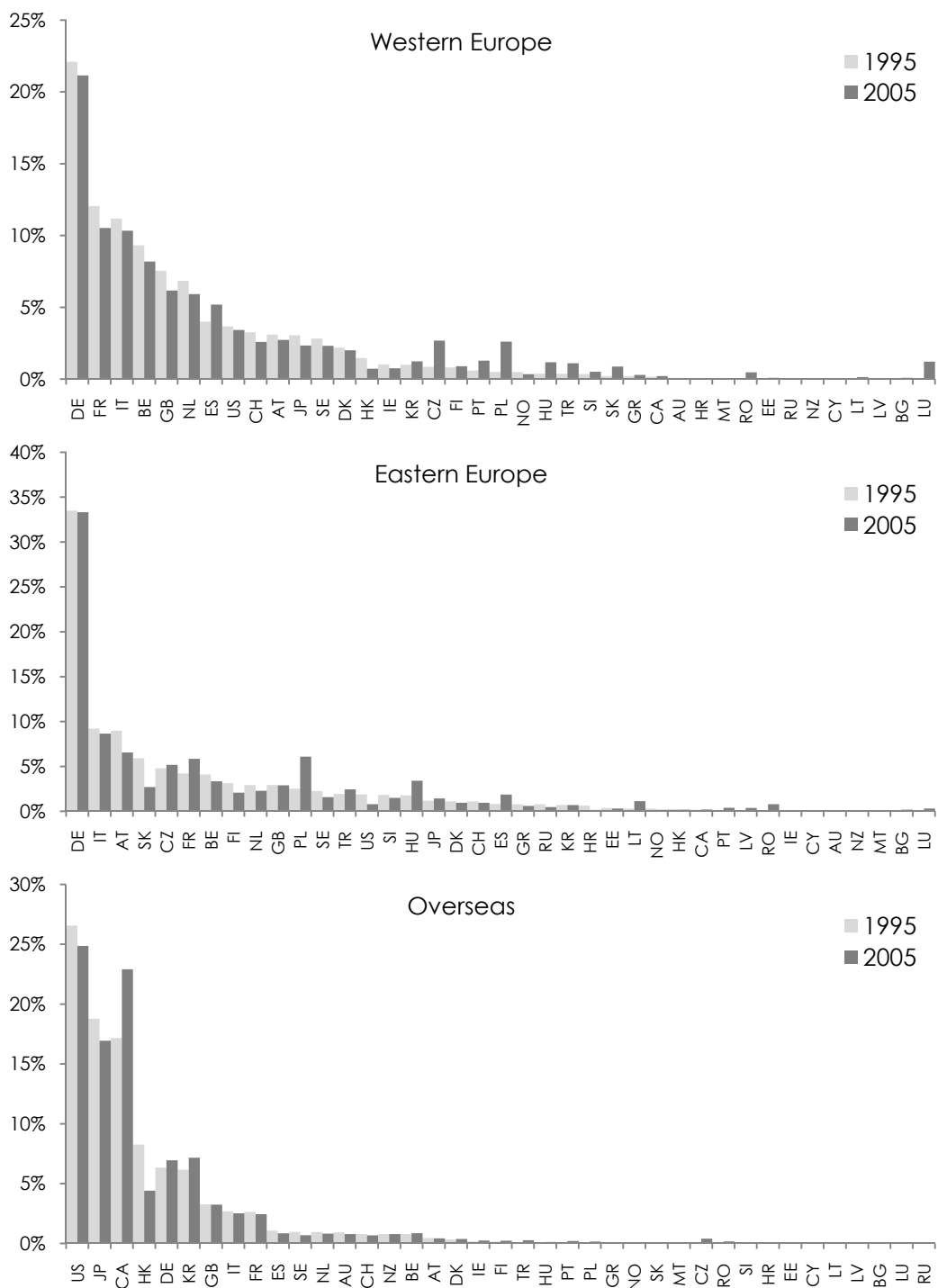


Figure C6: Foreign markets shares in basic metals

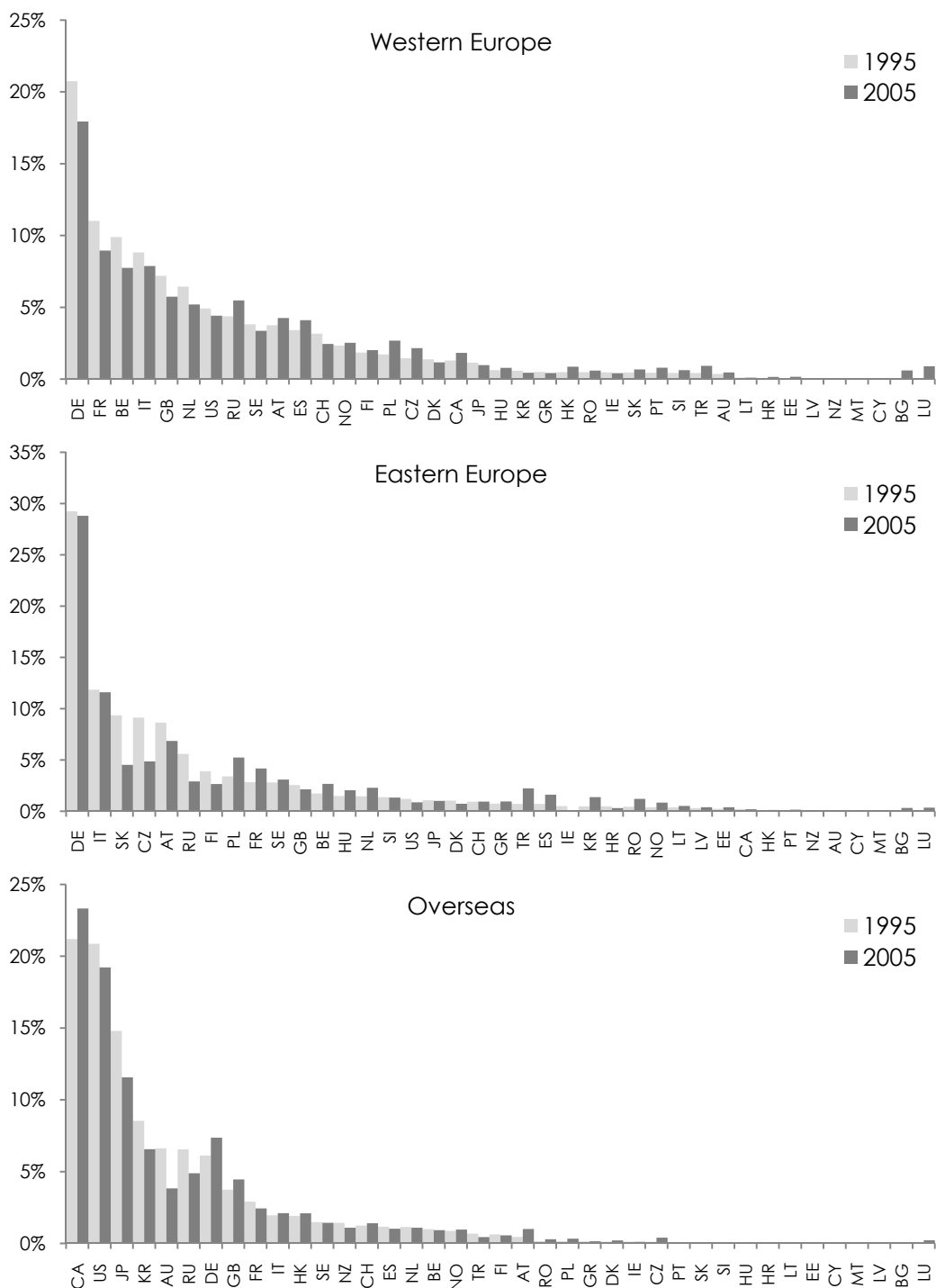




Figure C7: Foreign markets shares in machinery

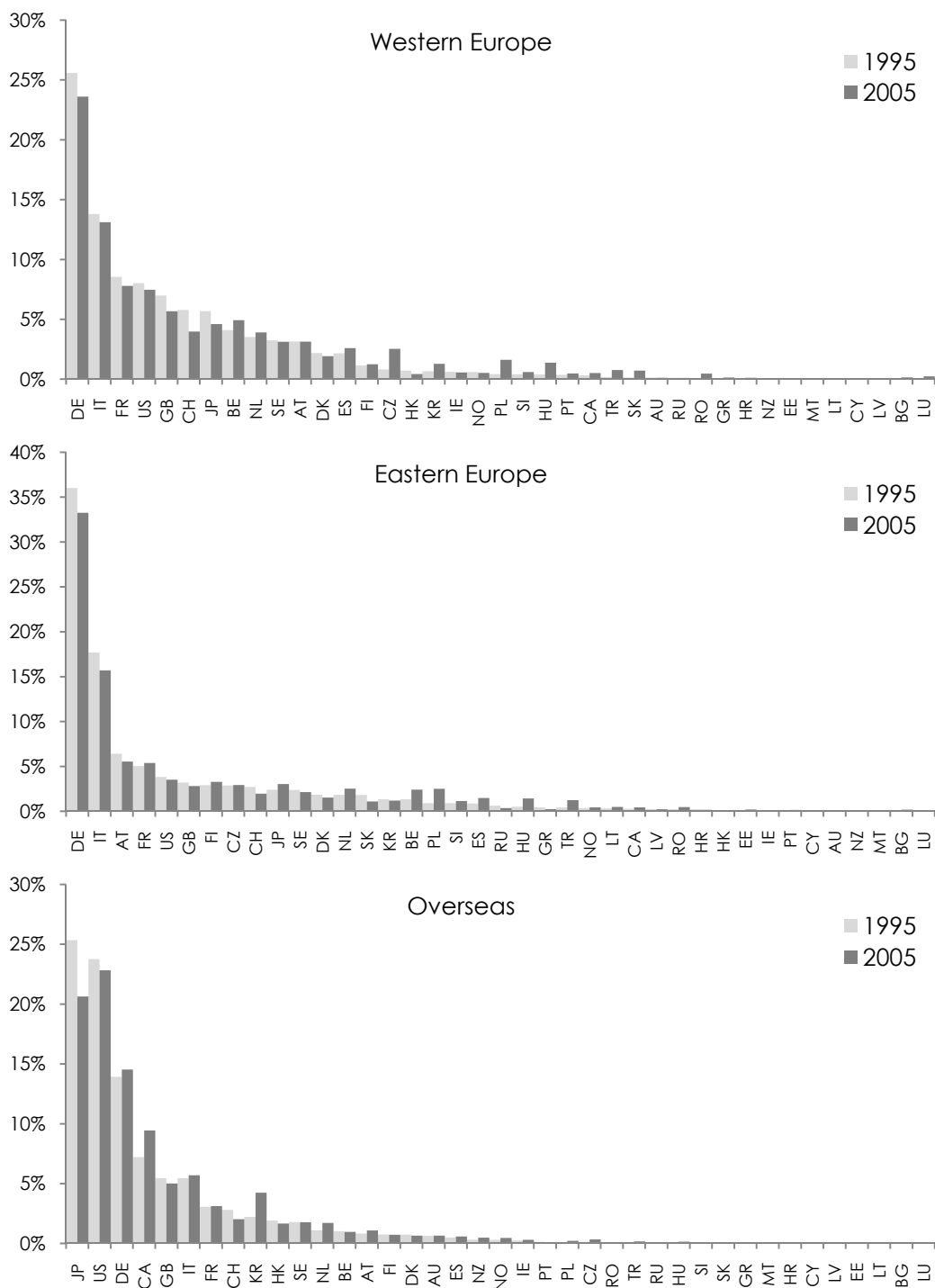


Figure C8: Foreign markets shares in electricals

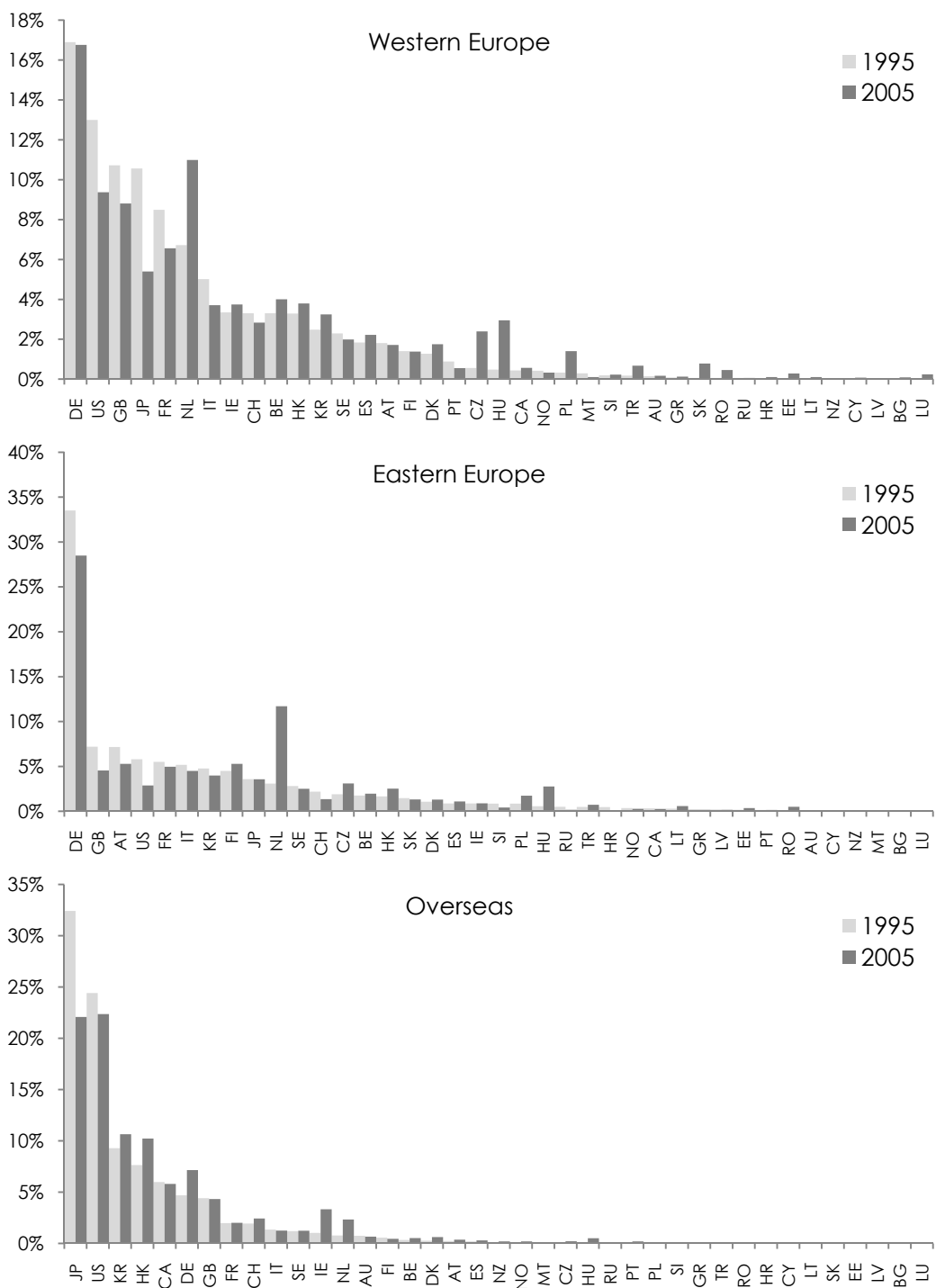


Figure C9: Foreign markets shares in transports

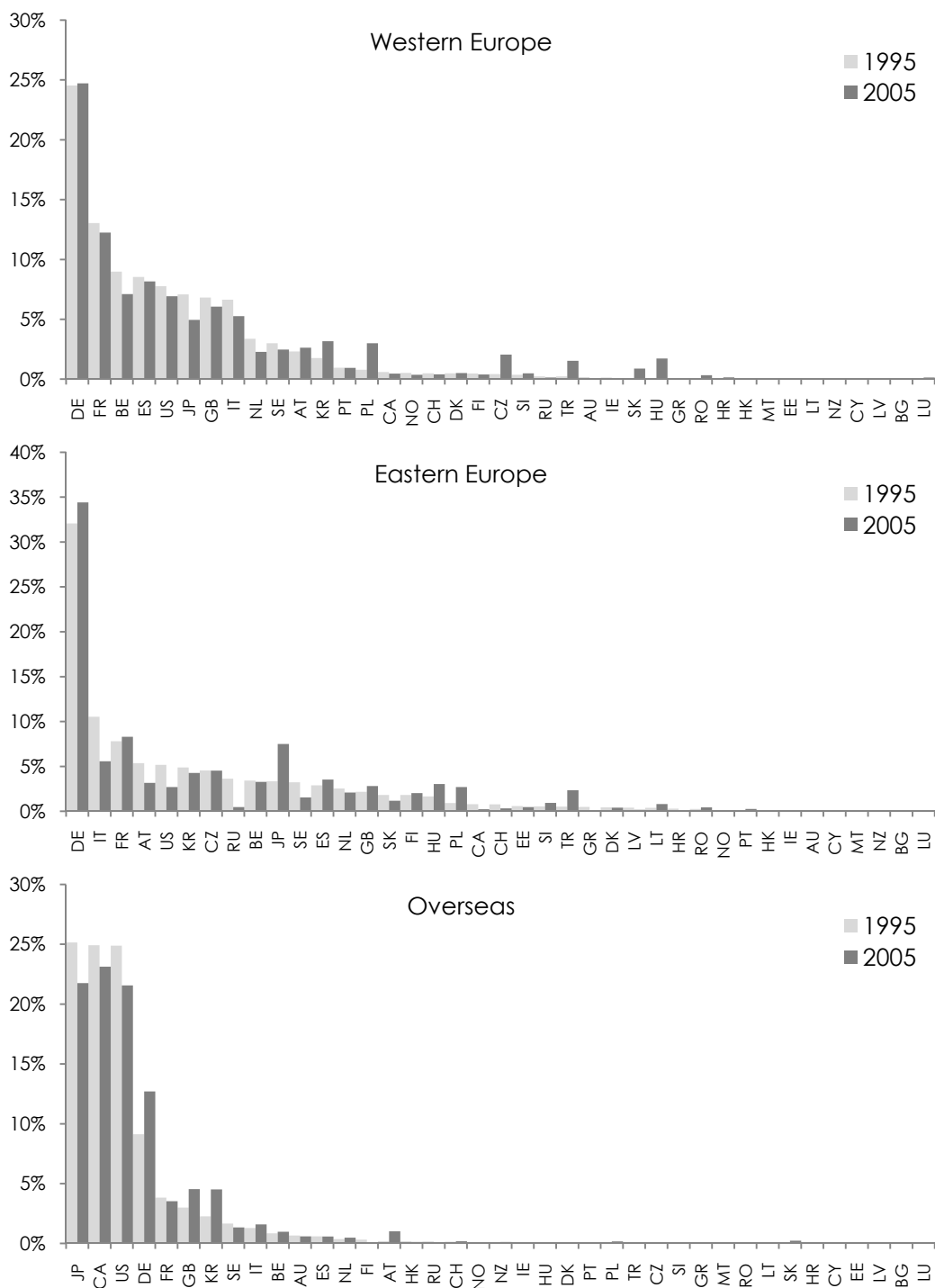


Figure D1: Changes in foreign markets shares 1995/2005 in manufacturing (8 industries)

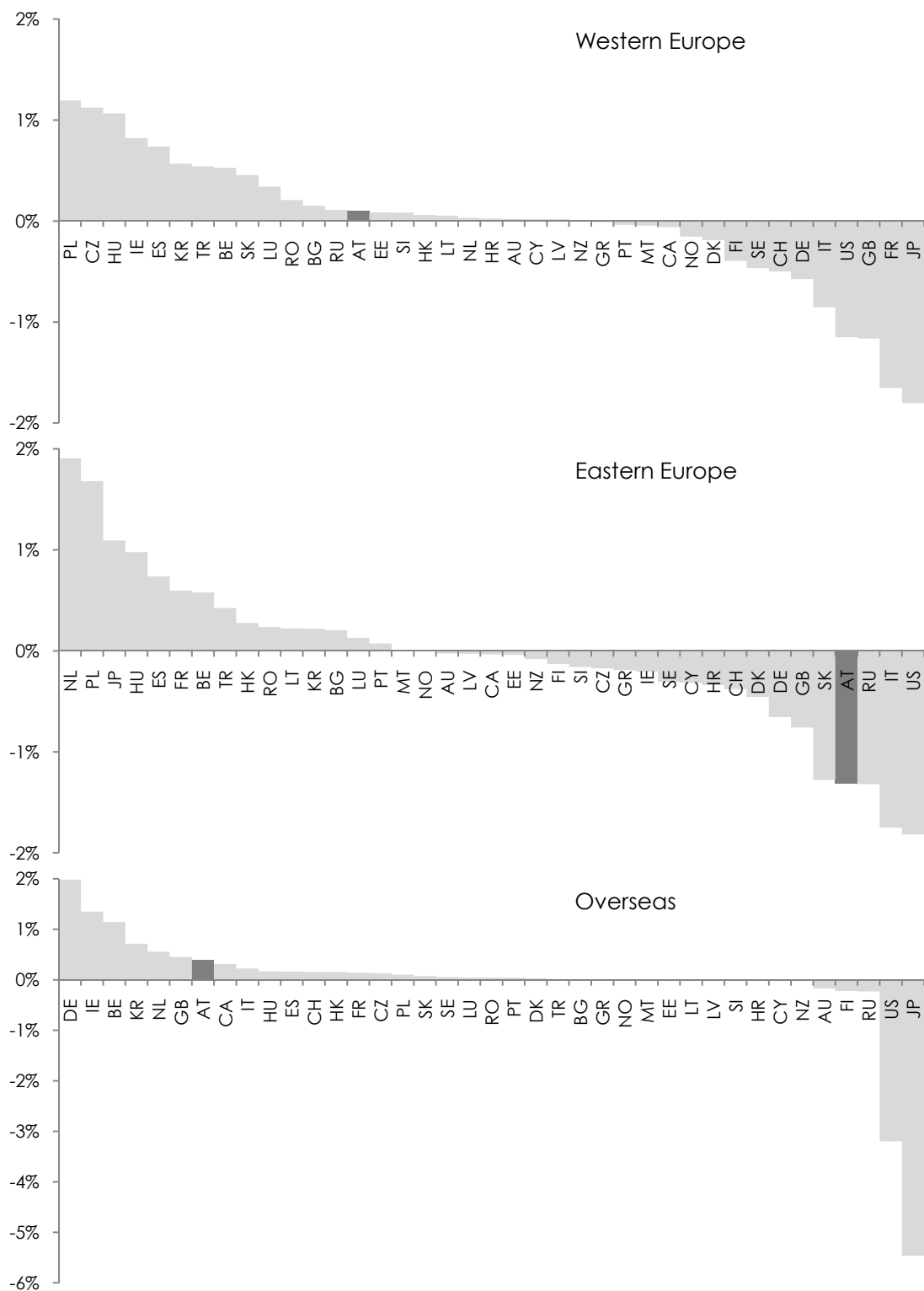


Figure D2: Changes in foreign markets shares 1995/2005 in food

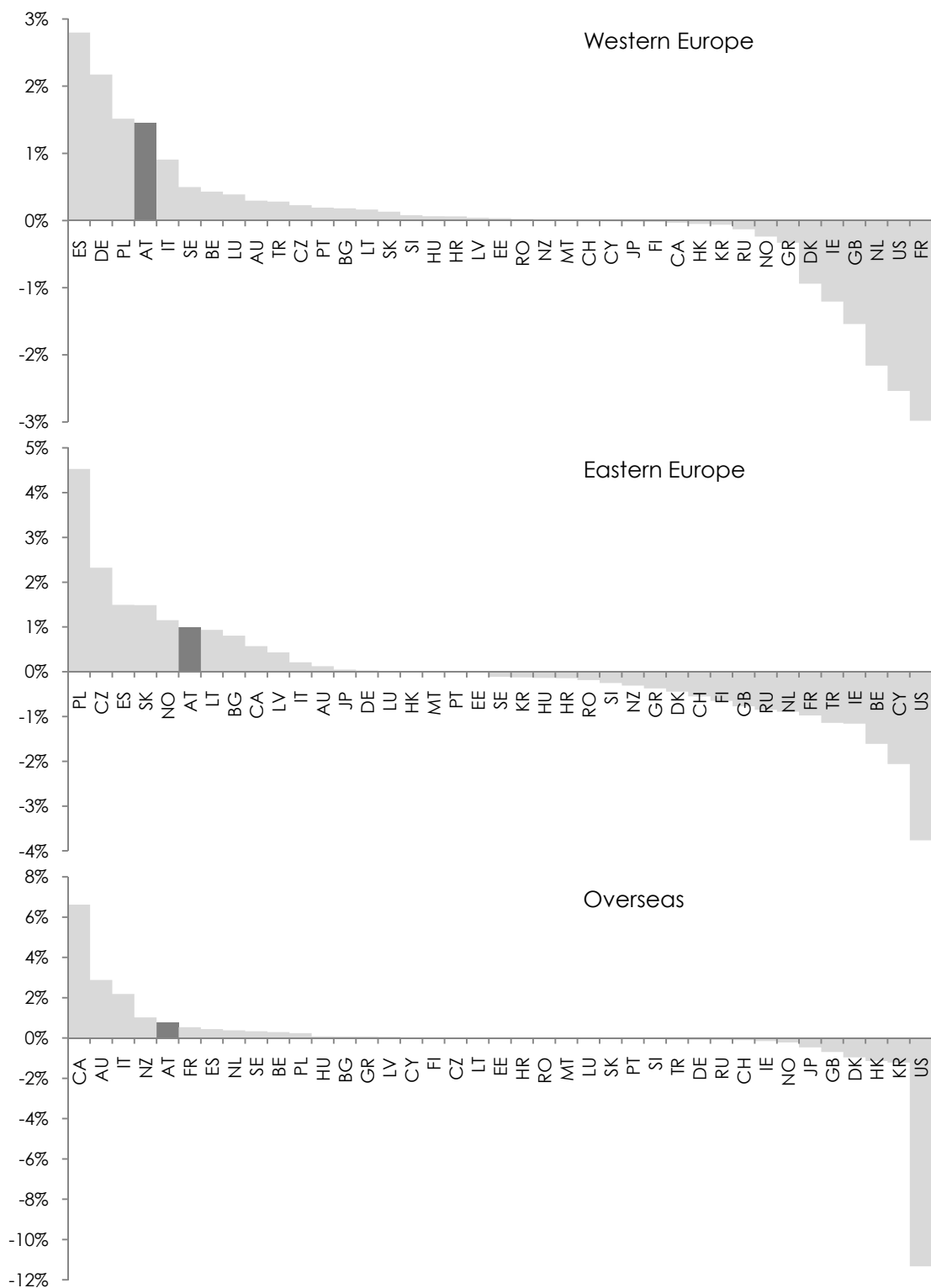


Figure D3: Changes in foreign markets shares 1995/2005 in paper

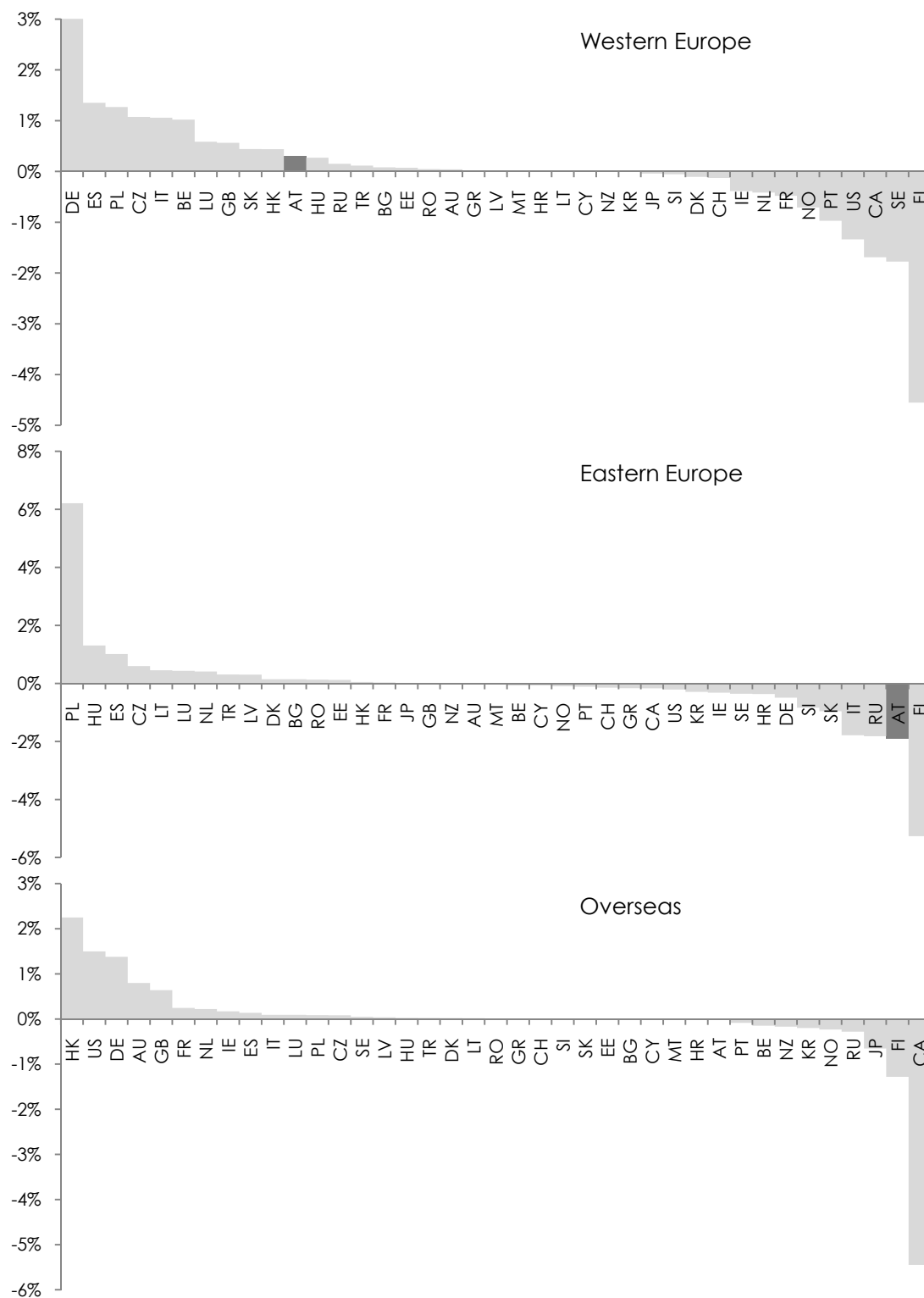


Figure D4: Changes in foreign markets shares 1995/2005 in chemicals

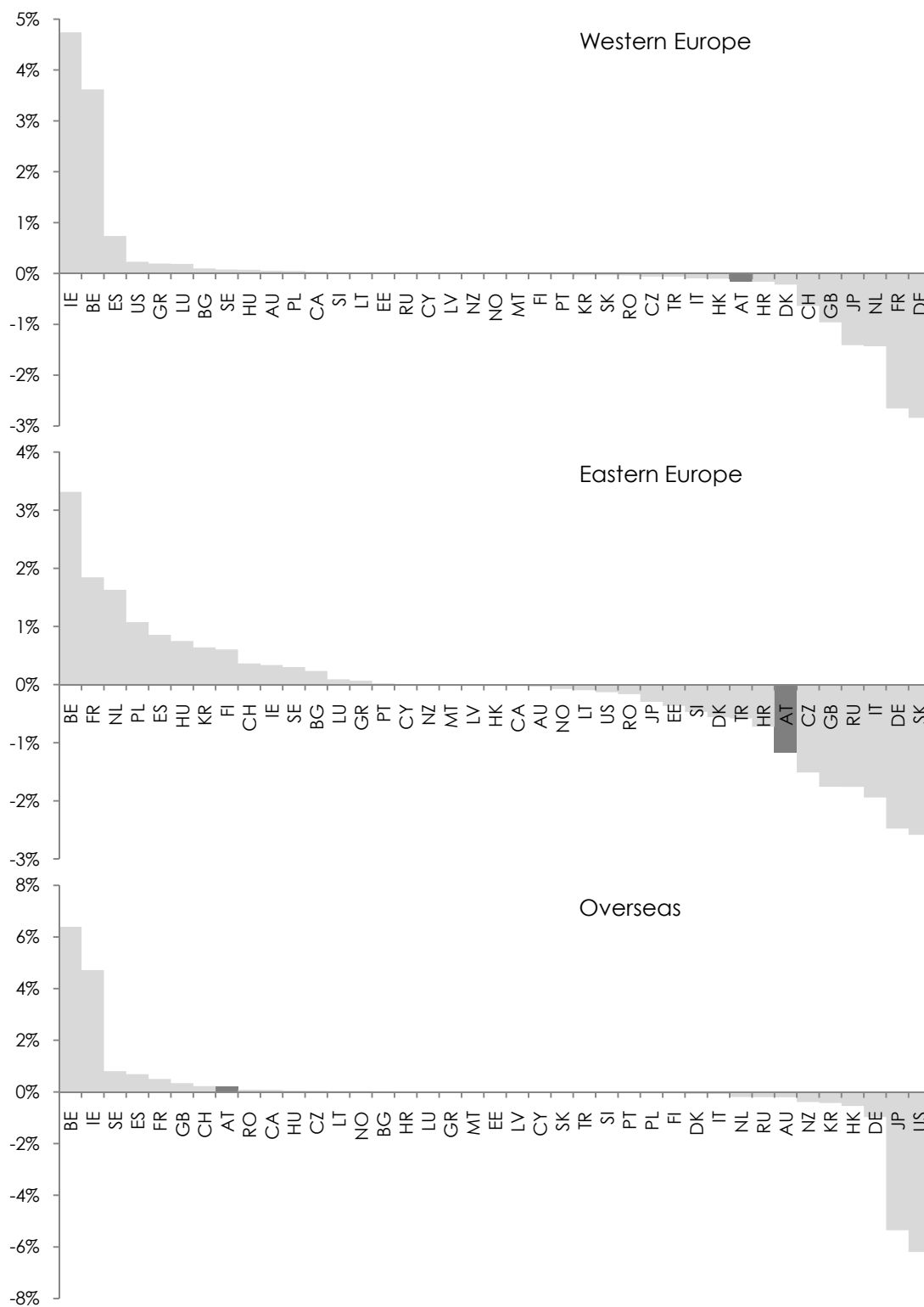


Figure D5: Changes in foreign markets shares 1995/2005 in plastics

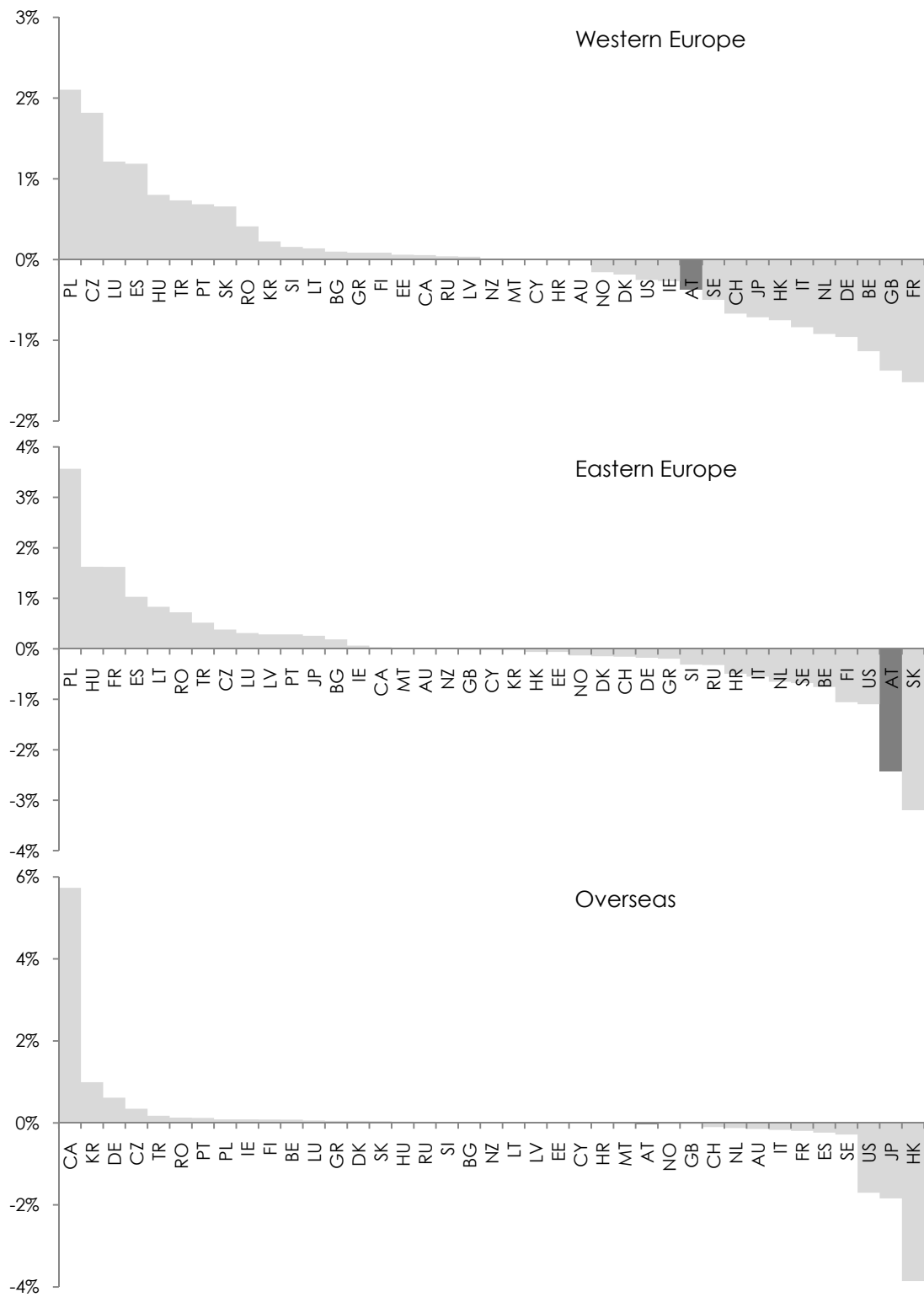




Figure D6: Changes in foreign markets shares 1995/2005 in basic metals

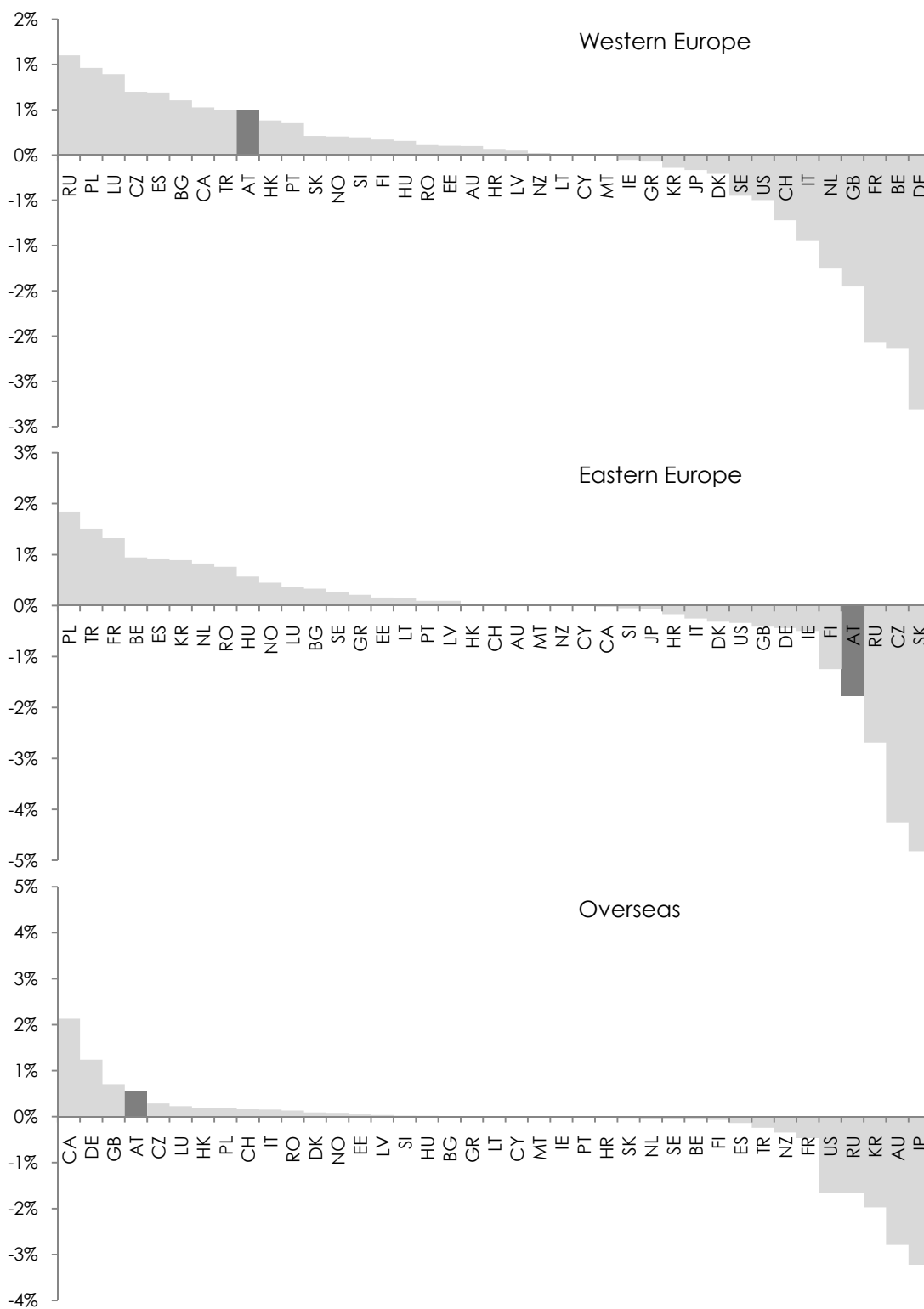


Figure D7: Changes in foreign markets shares 1995/2005 in machinery

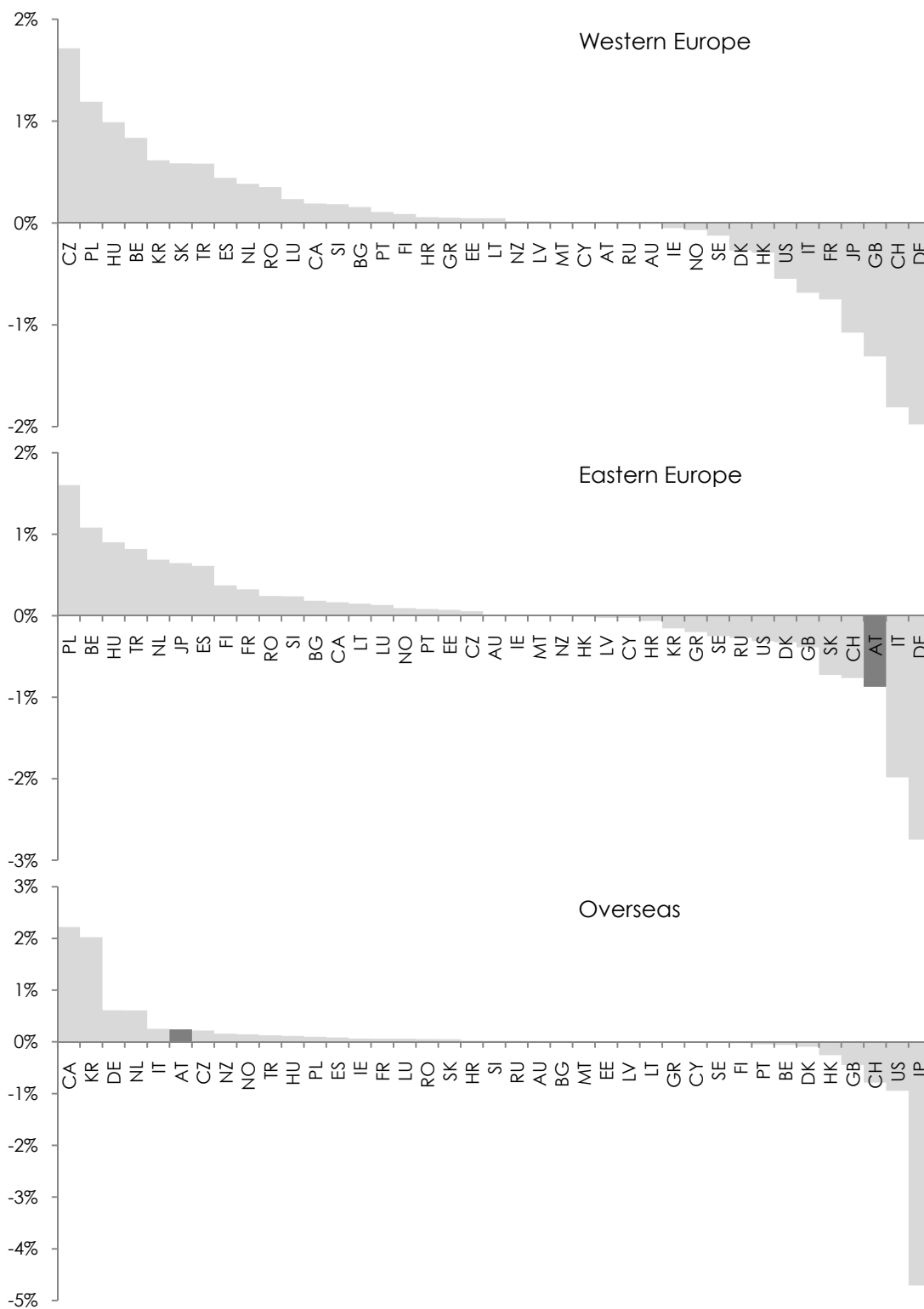


Figure D8: Changes in foreign markets shares 1995/2005 in electricals

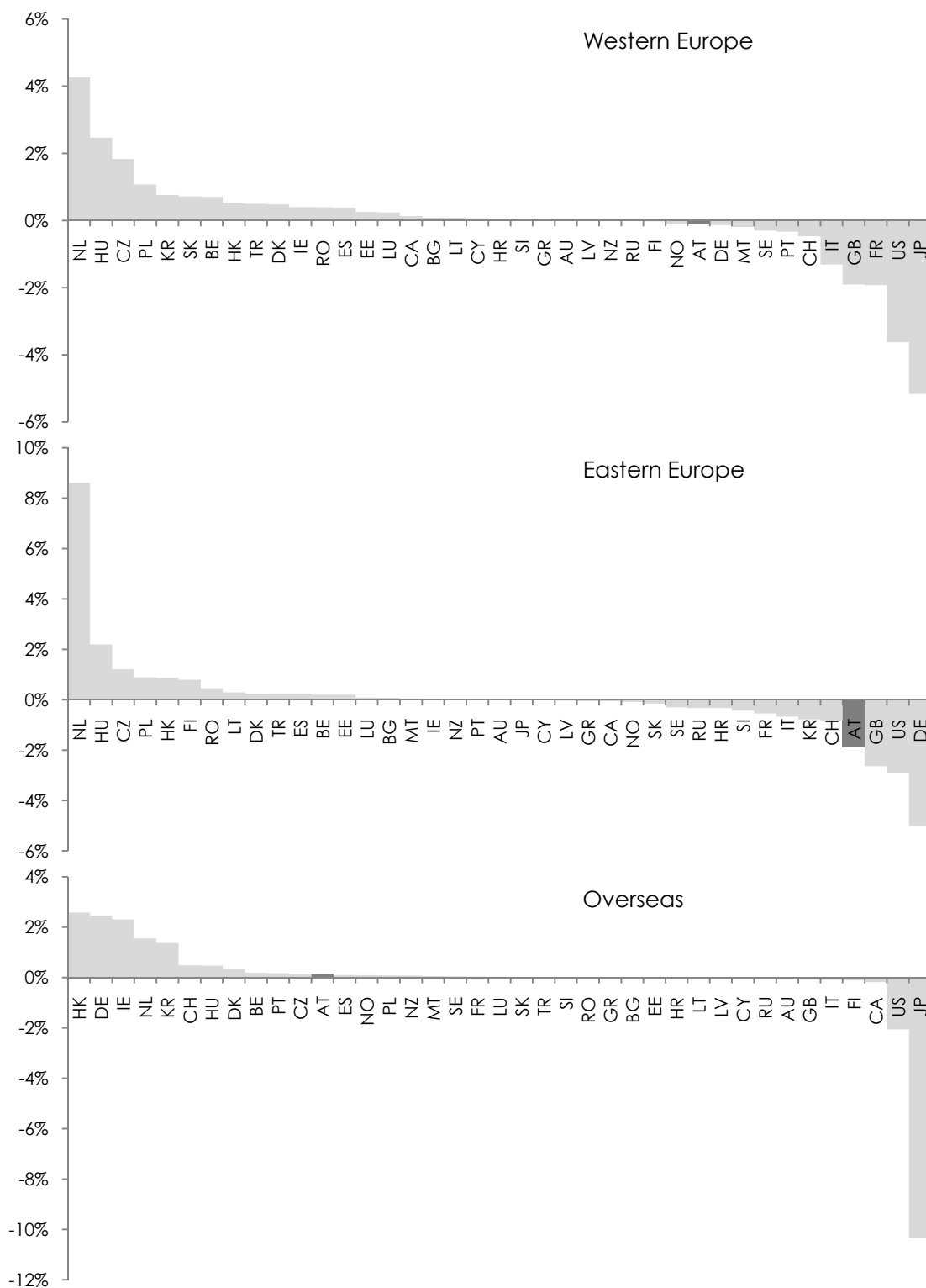


Figure D9: Changes in foreign markets shares 1995/2005 in transports

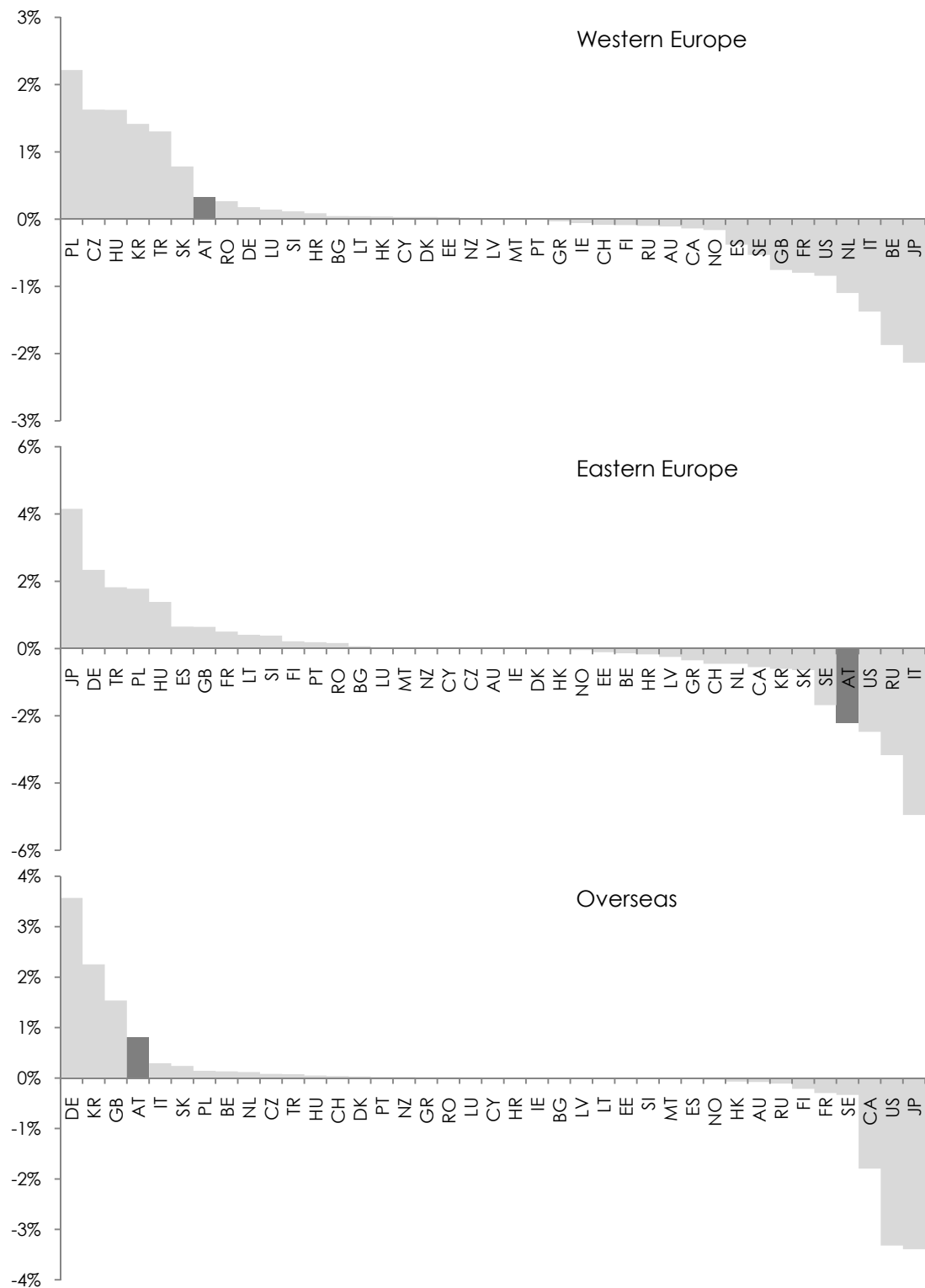


Figure E: Austria: Markets share changes versus TWI changes

Percentage points

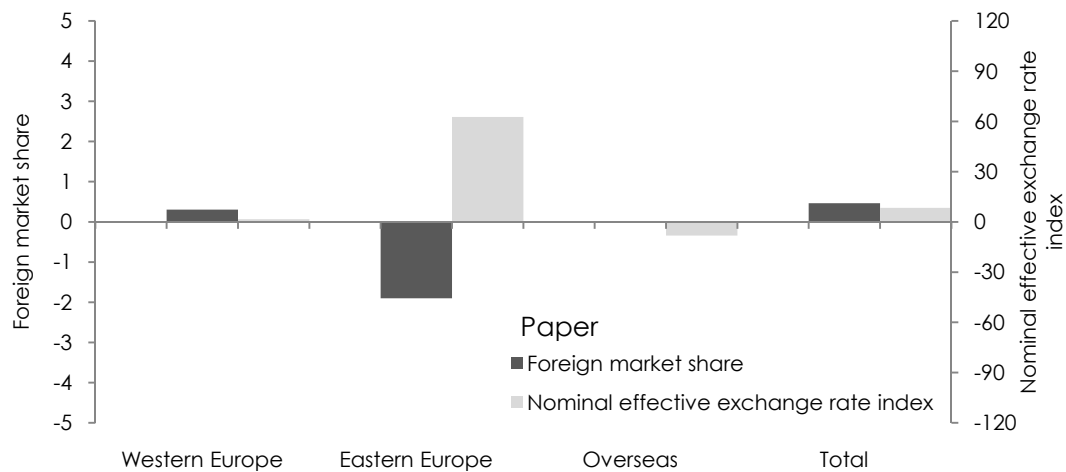
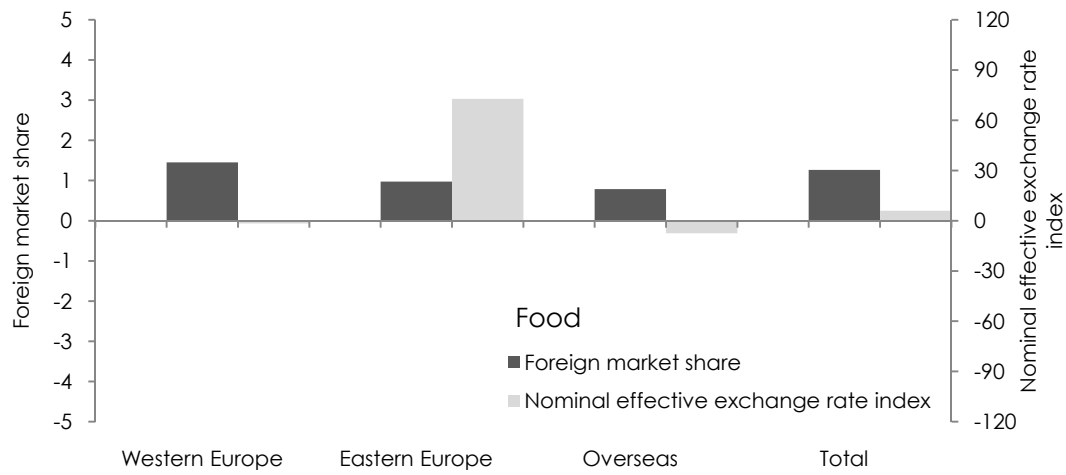
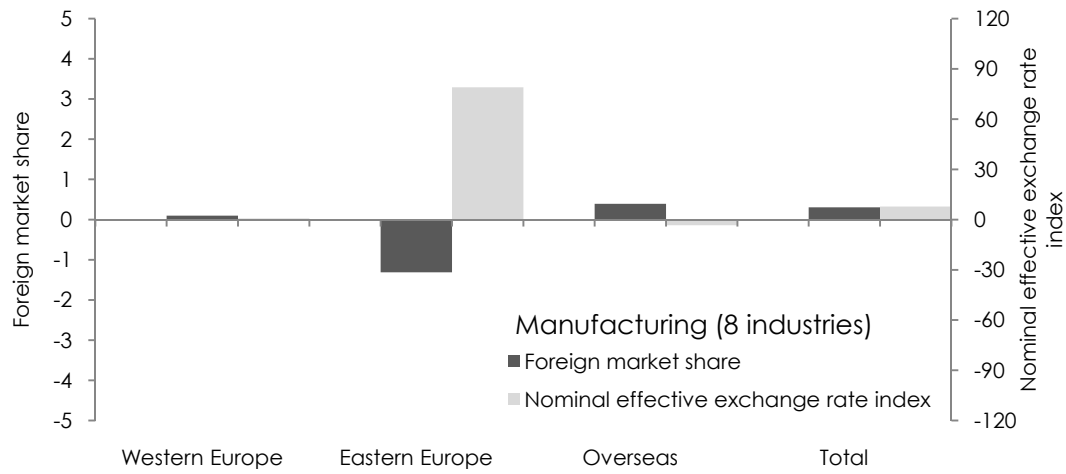


Figure E/continued

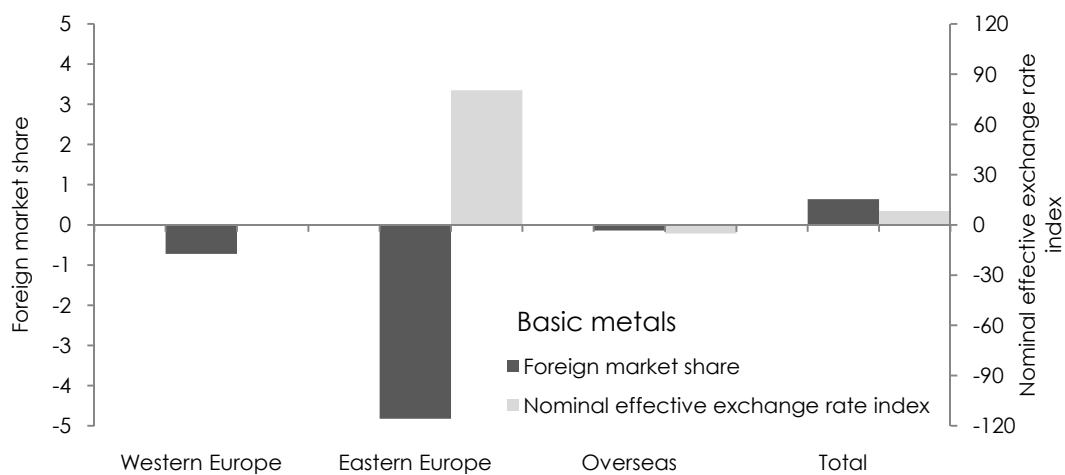
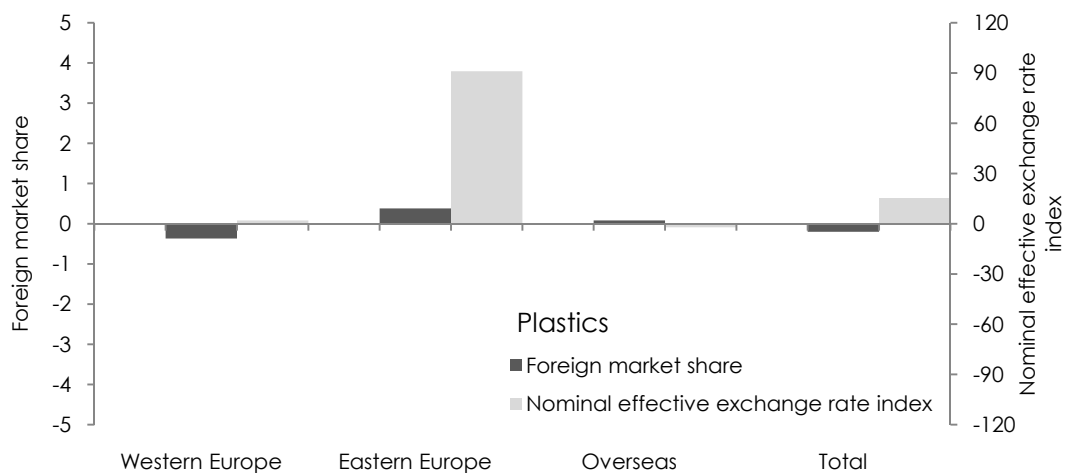
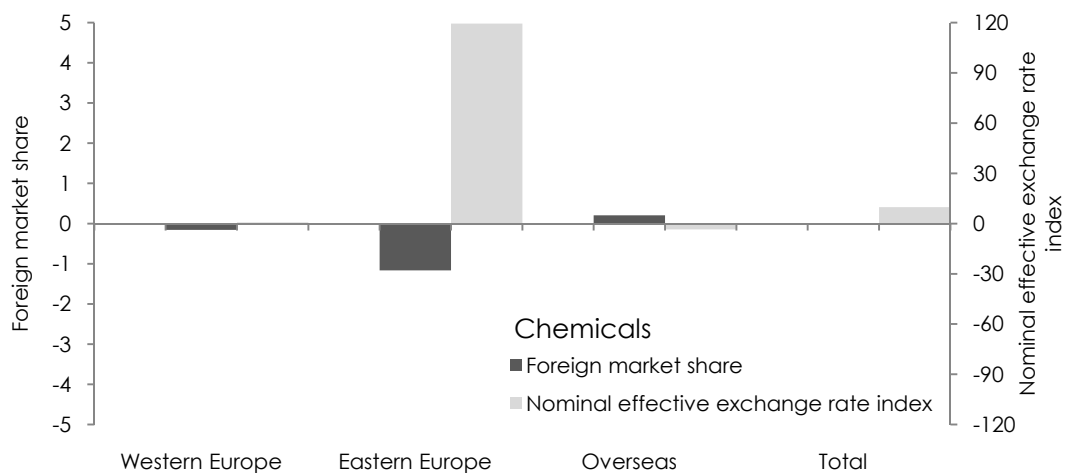


Figure E/continued

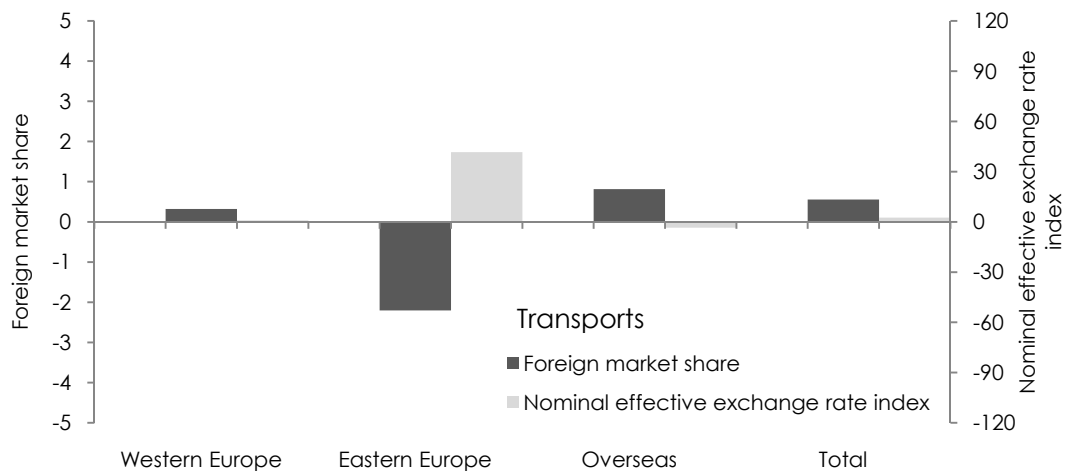
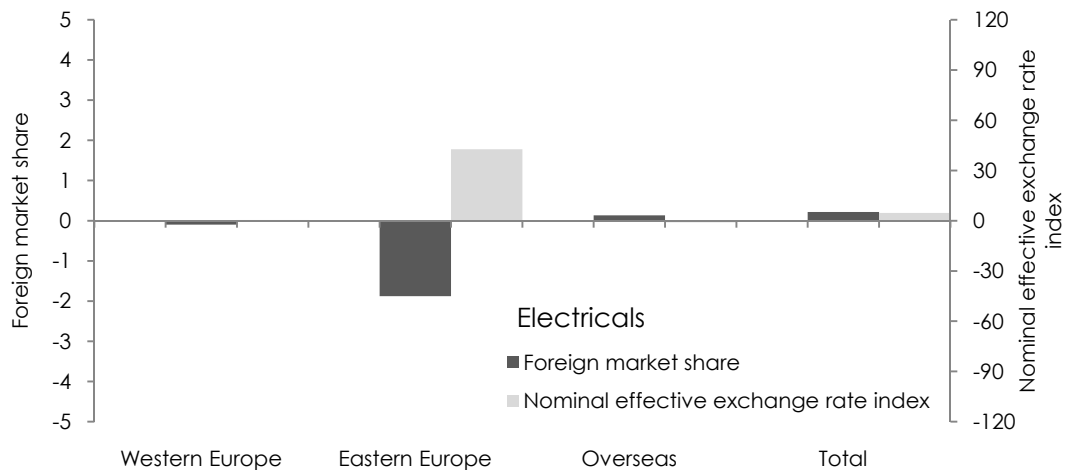
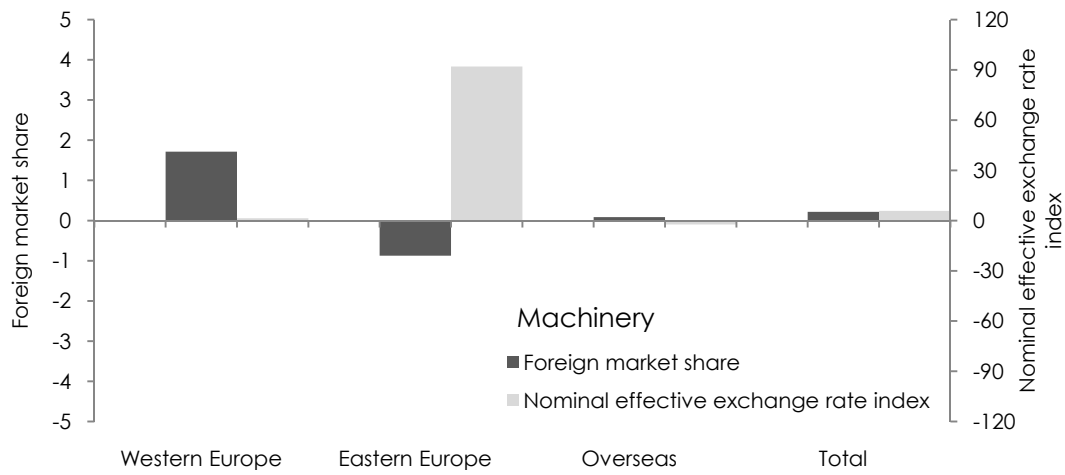


Figure F: TWI changes versus foreign markets share changes by industries 1995/2005

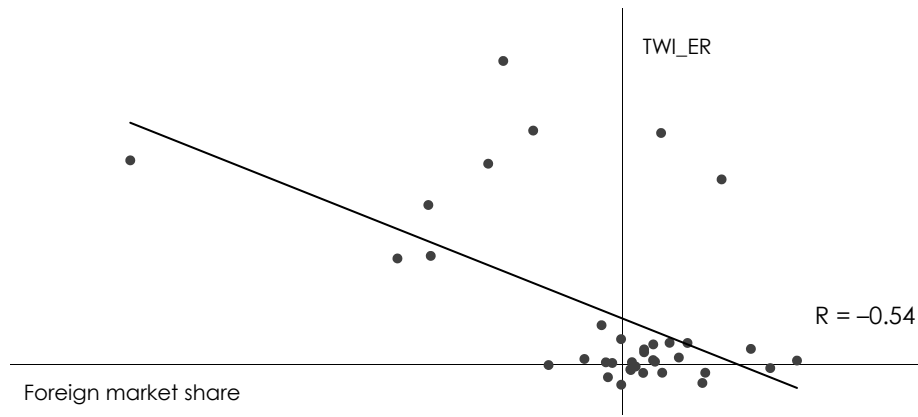




Figure G: TWI changes versus foreign markets share changes by industries 1995/2005

