Foreign trade in Modtrim

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Abstract – This working paper gives an overview of the Modtrim team's recent research in the field of Belgian exports and export markets. In the first chapter a new leading indicator is introduced as a supplementary tool to determine a growth profile for Belgium's potential export markets in the first quarters of the forecasting period. In the second chapter, an attempt is made to improve forecasts of Belgium's exports by breaking down the model equation into a goods and a services component. Finally, the third chapter reveals that (a lack of) competitiveness is probably not the only reason for the losses of export market share in Belgium and in some of its main trading partners in the past 25 years.

Executive Summary

This working paper gives an overview of the Modtrim team's recent research in the field of Belgian exports and export markets. In the first chapter a new leading indicator is introduced as a supplementary tool to determine a growth profile for Belgium's potential export markets in the first quarters to be forecasted. Potential export market growth is the most important explanatory variable in the export equation. It is calculated as the weighted average of import growth of Belgium's trading partners. This is done by means of yearly data. The establishment of a quarterly profile is inspired by CPB world trade forecasts (monthly data), but from now on the new leading indicator can be used as a supplementary source of information. The current version of the leading indicator contains two European indicators (Dutch consumer confidence and the OECD leading indicator for Germany) and two US indicators (the OECD leading indicator for the US and the assessment of the economic situation in the US from the IFO World Economic Survey). The fit of the leading indicator with the reference series is quite satisfying.

As the evolution of Belgian exports in recent years has appeared rather difficult to explain, the second chapter presents an attempt to improve forecasts of Belgium's exports by breaking down the current model equation into a goods and a services component. However, an out-of-sample simulation reveals that this approach overestimates export growth of the last few years to the same extent as the current approach. A striking result is that Belgian exports are confronted with a considerable loss of market share, which was partially captured by means of a trend factor. In the third chapter, we take a closer look at this phenomenon and compare it with the situation of Belgium's three main trading partners (France, Germany and the Netherlands) in the past 25 years.

Our results indicate that a lack of competitiveness plays an important role in the loss of export market share, but it cannot explain it entirely. In all four countries competitiveness appears to explain the evolution of export market shares quite well in the eighties and the first half of the nineties. Since 1995, this link has become less clear-cut for Belgium and France. Belgium posted gains in competitiveness in the second half of the nineties while it experienced its strongest losses in market shares. France experienced huge competitiveness gains in the second half of the nineties, yet still lost some market share. Since the beginning of this decade the development of export market shares seems to be more in line again with competitiveness. Nevertheless, structural factors (the export product mix and the role of re-exports) as well as statistical factors are likely to have affected export performances, especially in Belgium.

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1. A leading indicator for Belgium's potential export markets

1.1. Introduction

In the drawing up of the economic budget[1], the growth of Belgium's potential export markets is calculated as the weighted average of import growth of Belgium's trading partners[2] as forecast by the European Commission. However, the release of the economic budget (published in February and September) does not coincide with the release of the EC forecasts (published in November and in May). Due to this time lag, the FPB adapts its potential export markets' assumption in order to incorporate more recent information. This is usually done on the basis of the GDP consensus forecasts of the Economist (which are updated monthly). For the most important trading partners, an import to GDP elasticity is applied in order to adjust their import demand growth to the GDP growth revision (vis-à-vis the EC). All this concerns yearly figures. After that, a quarterly profile of the potential export markets is drawn up, inspired by the monthly world trade data (both observations and short-term forecasts) computed by the Dutch Centraal Planbureau.

The main caveat of this method is the hypothesis that the import to GDP elasticity of each country (calculated as five-year average) remains unchanged in projection. In practice, the import to GDP elasticity fluctuates from year to year. Moreover, the CPB and the EC do not necessarily have the same estimates of world trade growth, leading to difficulties in reconciling the quarterly profile of the CPB and the EC-based (but adapted) yearly figure. Therefore, a leading indicator for Belgium's potential export markets has been developed as a supplementary tool to assess the projection of this reference series.

1.2. Methodology

The approach is similar to the one adopted for the other FPB leading indicators[3]. First, all series are extrapolated by four quarters on the basis of ARIMA models in order to reduce the end point bias of the Hodrick-Prescott filter and to extend the forecast horizon of the composite indicator[4]. Then, the cyclical components of the reference series and the indicators are calculated by removing seasonal and incidental factors and the trend from the series[5]. Subsequently, all series are normalised to obtain comparable amplitudes. The indicators that are Granger causal for the reference series are retained and synchronised with the reference series. After that, all possible composite indicators are calculated (arithmetic mean of a maximum of six indicators) as well as their correlation with the reference series. Finally, a composite indicator has to be selected.

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[1]   The economic budget is made on the basis of the quarterly short-term macroeconomic model Modtrim. See Hertveldt and Lebrun (2003).

[2]   This weighing is based on the weight of the respective countries in Belgium's total exports. See also Annex 1, Figure A.

[3]   See Lebrun (1999).

[4]   The forecasts issued by ARIMA models only have a statistical character and their relevance declines as the forecast horizon is extended.

[5]   As the reference series has a quarterly frequency, all indicators are converted to the common quarterly frequency.

In order to select possibly interesting indicators, we focus on leading indicators for Belgium's seven main trading partners[6], such as consumer confidence, industrial confidence and its components gauging for future activity[7], and economic sentiment. Besides these indicators published by the EC, leading indicators of the OECD, some specific national indicators and some financial variables (price of oil, interest rates, the euro-dollar exchange rate, the evolution of the Standard & Poors stock index) are taken into consideration. Finally, some components of the quarterly World Economic Survey (WES) from the German IFO-institute for the main trading partners and zones have been taken into account.

In the composite indicators appearing to fit best with the reference series on a quarterly base, the following indicators (with their preferential lag, expressed in number of quarters, vis-à-vis the reference series between brackets) were retained very frequently:
- the CBS Dutch consumer confidence [1]
- OECD indicators for the US [3], Germany [1] and, to a lesser extent, Spain [2]
- the global [1] and Asian [2] climate from the WES
- industrial confidence [3], consumer confidence [1] (as well as the subcomponent 'expectations' [2]) and economic sentiment [3] in the US
- the leading indicator for Japan as published by the Cabinet Office [4]
- the Standard & Poors 500 stock market index [1]
- the 'expectations' component of the German IFO index [2]
- the 'current situation' in the US [2] and the 'expectations' in the UK [3] from the WES

It is striking that indicators for the US and Asia appear to have a bigger lead than European ones. This corroborates the common view that these regions are the driving engines of the world economy, rather than Europe. Moreover, the Belgian business cycle is often regarded as being ahead of the euro area cycle[8].

When making the final choice between the often retained indicators, we have opted for a combination of indicators from different sources and from different countries. They also form a mix of qualitative and quantitative data. Preference is given to a set of indicators with different leads[9].

1.3. Findings

The following synthetic leading indicator for Belgian export markets was chosen[10]:

LI_QWXSS = (CONSCONF_NL[-1] + OECD_BD[-1] + OECD_US[-3] + WESSIT_US[-2]) / 4

QWXSS   Potential export markets (FPB; quarterly)

CONSCONF_NL   Dutch consumer confidence (CBS; monthly)

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[6]   Germany, France, the Netherlands, the UK, the US, Italy and Spain.
[7]   The assessment of production in the coming months, the orders and the foreign orders.
[8]   The latter view was confirmed by Vanhaelen et al. (2000) and Dobbelaere et al. (2002).
[9]   Note that the methodology allows for a change in the composition of the leading indicator. The composition of the leading indicator will have to be tested for a while to test its stability.
[10]   The indicator is made on a quarterly basis as this is also the frequency of the reference series. Data available on a monthly basis are aggregated to a quarterly level.

OECD_BD   OECD leading indicator for Germany (OECD; monthly)

OECD_US   OECD leading indicator for the US (OECD; monthly)[11]

WESSIT_US   US economic situation according to the WES survey (IFO; quarterly)

The composition of the synthetic indicator meets the criteria described above: diversity of sources and countries and different quarterly leads, with both US indicators having the highest lead. At first sight the indicators all appear to be qualitative, but this is not the case as the OECD leading indicators are a mix of quantitative and qualitative data.

In Figure 1 the cyclical components of both the reference series and the selected leading indicator are shown. A zero value indicates that the series has reached its trend level, whereas a positive (negative) value means that the series is above (below) its trend level. If the slope is positive (negative), the series grows faster (slower) than its trend. Data were available until 2007Q2, while the projection was made till 2008Q4. Taking into account the different leads of the composing indicators, this implies that from 2007Q4, each data point is mix of observations and ARIMA-extensions. In 2008Q1 only the value for the OECD leading indicator for the US is still an observation (due to its 3 quarter lead).

Figure 1 -   The cyclical components of the Belgian export markets and their leading indicator

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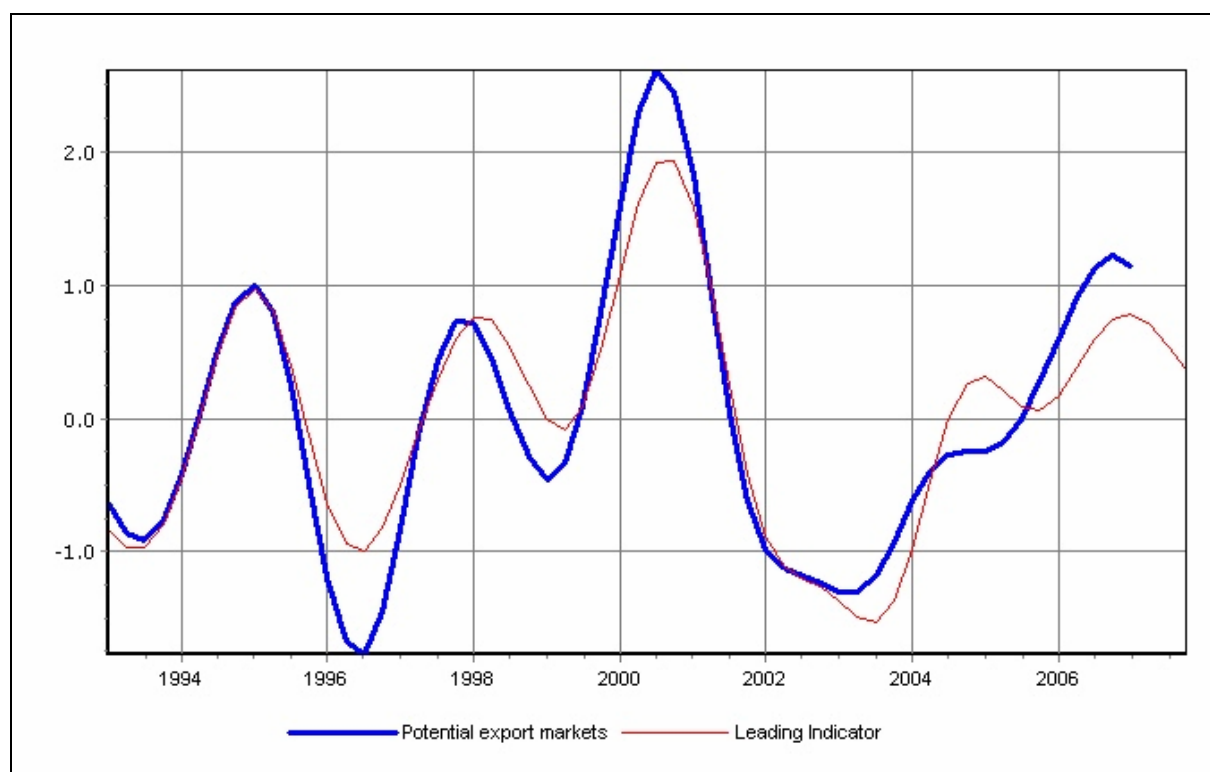
[11]   See Annex 2 for the detailed composition of the OECD leading indicators.

The graph shows that the amplitude of the indicator is somewhat smaller than the one from the reference series, but the turning points are generally reproduced well by the leading indicator in the period 1993-2003. In 2004 and 2005 the indicator is less in line with the reference series. In the course of 2004 the indicator continues to rise and levels off towards the end of the year, while the reference series levels off earlier. In 2005 a reverse movement can be observed. The reference series is picking up, while the indicator is giving a downward signal. This evolution occurred both in the US and in Europe, with confidence indicators improving much more than the real economy in 2004, while the opposite happened in 2005.

The OECD indicator is generally a good leading indicator for national economic activity. In 2004, however, the link between German GDP and import growth was atypical. In spite of a considerable improvement in German GDP growth (driven by surging exports), import growth remained modest due to a weak domestic demand. Hence, the OECD indicator for Germany gave an overly positive signal regarding the evolution of Belgian export markets.

In 2006, the indicator appears to lag the reference series by one quarter. However, one has to take into account that in national accounts, significant data revisions cannot be excluded for recent quarters or even years.

It is also interesting to look at the growth rates of both the reference series and the leading indicator after the reintegration of the trend (see Figure 2). This gives us a rough idea of the export markets' growth profile for the near future,

Figure 2 - Belgian export markets and their leading indicator
        (growth rates, 4 quarter moving average of yoy)
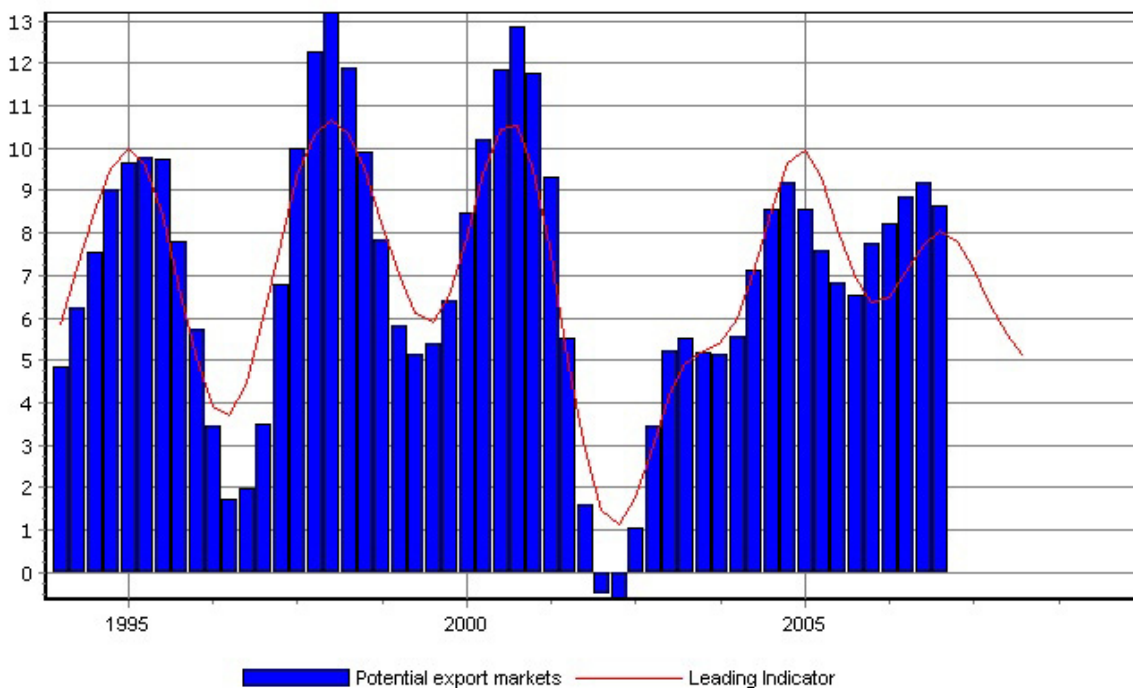
2.   Testing a breakdown of exports into goods and services

2.1. Introduction

In the FPB's quarterly short-term macroeconomic model Modtrim, the determination of export demand for Belgian goods and services is based on equations for total exports (volumes and prices)[12]. However, the evolution of Belgian exports appeared rather difficult to forecast in recent years. In this chapter, we will analyse whether breaking down the modelling of total exports into goods and services improves the forecast accuracy of export demand. Section 2.2 briefly describes the consequences for the model database. The estimation results of the equations and their forecast accuracy are discussed in Section 2.3.

2.2. Data

Traditionally, a country's export volume growth is explained by the evolution of world trade volumes and by the evolution of its competitiveness. In Modtrim, exports are determined by a weighted indicator of world demand (weights reflect the geographical composition of Belgian exports[13]) and by domestic export prices relative to competitors' export prices (both expressed in euro). The data of our trading partners are taken from the European Commission's macroeconomic database (AMECO).

2.3. Specifications and findings

Behavioural equations are estimated by means of a so-called 'error correction model', that consists of a long-term equation (in levels) and an equation in growth rates that captures the short-term dynamics[14]. This short-term equation includes an 'error correction term' that assures a return of the dependent variable to its (simulated) long-term value.

2.3.1. Export volume equations of goods and services

The long-term level of the volume of Belgian exports is determined by a re-weighted indicator of world demand (potential export markets), domestic export prices relative to competitors' export prices (both expressed in euro) that captures the evolution of Belgian competitiveness, and a trend to take systematic market share losses since 1997 into account. This trend is required only for exports of goods as market share losses, not explained by price competitiveness, remain confined to the export of goods (see Annex 1, Figure E).

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[12]   See Hertveldt and Lebrun (2003).
[13]   See Annex 1, Figure A.
[14]   All equations are estimated by means of ordinary least squares. Joint estimation of the goods and services equations by seemingly unrelated regression yielded similar results.

Exports of goods

$$\ln (XOB\_L) = xob\_l0 + xob\_l1*\ln(QWXB) + xob\_l2 * \ln(PXB/PWXB*EX) + xob\_l3*T*(t>1996Q4)$$

- XOB: Belgian exports of goods (volume)
- QWXB: Potential export markets of goods (volume)
- PXB: Deflator of Belgian exports of goods
- PWXB*EX: Competitors' export prices of goods expressed in euro

Estimation period: 1980Q1-2005Q4; R^2 adjusted: 0.99; Durbin-Watson: 0.71; Dickey-Fuller: -4.58

Coefficient values:
- xob_l0: 9.104
- xob_l1: 0.874
- xob_l2: -0.375
- xob_l3: -0.001

The elasticity of exports with respect to potential export markets appears to be somewhat smaller than one, reflecting that the export volume of goods grows slower than potential export markets in the long run. In other words, Belgium experienced losses of export market shares for goods on average over the estimation period. The trend variable indicates that these losses even aggravated during the last ten years. The price competition effect is less important than the volume effect.

Exports of services

$$\ln (XOS\_L) = \quad xos\_l0 + xos\_l1a*\ln (QWXSV)*(t<1989Q1) + xos\_l1b*\ln (QWXSV)*(t>1988Q4) + xos\_l2 * \ln (PXS/PWXSV*EX)$$

- XOS: Belgian exports of services (volume)
- QWXSV: Potential export markets of services (volume)
- PXS: Deflator of Belgian exports of services
- PWXSV*EX   Competitors' export prices of services expressed in euro

Estimation period: 1980Q1-2005Q4; R^2 adjusted: 0.99; Durbin-Watson: 1.23; Dickey-Fuller: -3.93

Coefficient values:
- xos_l0: 7.926
- xos_l1a: 1.112
- xos_l1b: 0.913
- xos_l2: -0.222

Between 1980 and 1988, exports of services increased on average faster than their relevant export markets. Afterwards, the elasticity with respect to world trade of services appears to fall below unity. Price competition exerts a smaller influence on exports of services than on exports of goods.

In the dynamic equation, the short-term elasticity of goods and services exports with respect to relative prices appears to be significant only for the period 1980Q3-1991Q4. If more recent observations

are included, this elasticity becomes very unstable or even insignificant. Nevertheless, exports of goods and services continue to react to changes in relative prices as they converge quickly to their long-term level. While the short-term reaction of goods exports to changes in potential export markets is spread out over two quarters, services exports only react with a lag of one quarter.

Exports of goods

dln(XOB) =   xob1*dln(QWXB) + xob2*dln(QWXB)[-1] + xob3*dln(PXB/PWXB*EX)*(t<1992Q1) +
         xob_e*(ln(XOB)-ln(XOB_L))[-1] + xob4*(t=1981Q4)

Estimation period: 1980Q3-2005Q4; R^2 adjusted: 0.28; Durbin-Watson: 1.85; F-stat: 10.62

Coefficient values, t-statistics between brackets:
- xob1: 0.304 (2.6)
- xob2: 0.320 (2.7)
- xob3: -0.214 (-2.7)
- xob4: -0.081 (-4.4)
- xob_e: -0.294 (-4.6)

Exports of services

dln(XOS) =   xos1*dln(QWXSV)[-1] + xos2*dln(PXS/PWXSV*EX)*(t<1994Q1) +
         xos_e*(ln(XOS)-ln(XOS_L))[-1] + xos3*(t=1983Q2)

Estimation period: 1980Q3-2005Q4; R^2 adjusted: 0.39; Durbin-Watson: 2.07; F-stat: 21.94

Coefficient values, t-statistics between brackets:
- xos1: 0.870 (3.9)
- xos2: -0.239 (-2.3)
- xos3: 0.133 (3.6)
- xos_e: -0.508 (-5.7)

The rather low explanatory power of the dynamic equations has to be attributed to an unexplained short-term volatility of exports, especially during the eighties. Moreover, in each equation a dummy was added to eliminate the influence of outliers on the other coefficients.

2.3.2. Export price equations for goods and services

In the long run, exporting firms are supposed to set prices as a weighted average of international export prices (expressed in euro) and (the long-term value of) domestic value added prices (PQVFZ_L), the coefficient of the latter reflecting their degree of price-makership. Furthermore, the Brent oil price expressed in euro (BRENT*EX) is included as an explanatory variable. In fact, the evolution of energy prices should already be reflected in international prices, but increasing the weight of oil prices significantly improves the explanatory power of the equation and is even necessary to obtain stationary residuals.

Export prices for goods

ln(PXB_L) = pxb_l0 + pxb_l1*ln(PWXB*EX) + pxb_l2*ln(PQVFZ_L) + (1-pxb_l1-pxb_l2)*ln(BRENT*EX)

Estimation period: 1984Q1-2005Q4; R^2 adjusted: 0.89; Durbin-Watson: 0.43; Dickey-Fuller: -3.29

Coefficient values:
- pxb_l0: -1.698
- pxb_l1: 0.349
- pxb_l2: 0.582

Export prices for services

ln(PXS_L) =   pxs_l0 + pxs_l1*ln(PWXSV*EX) + (1-pxs_l1)*ln(PQVFZ_L)
              pxs_l01*(t>1995Q4)+pxs_l02*(t>2002Q2)

Estimation period: 1984Q1-2005Q4; R^2 adjusted: 0.97; Durbin-Watson: 0.57; Dickey-Fuller: -4.34

Coefficient values:
- pxs_l0: -0.337
- pxs_l1: 0.088
- pxs_l01: -0.025
- pxs_l02: 0.039

The estimated elasticities reveal that Belgian exporters of services are predominantly price maker, while this price setting power is found to be less pronounced for the exporters of goods. In the services export price equation, some level shifts had to be introduced to avoid that the simulated long-term value drifts away from the observations. Note that the degree of price makership of the Belgian exporting firms has increased substantially compared to a few years ago[15].

In the short run, an error correction mechanism is applied.

Export prices for goods

dln(PXB) = pxb0 + pxb1*dln(PWXB*EX) +pxb_e*(ln(PXB)-ln(PXB_L))[-1]

Estimation period: 1984Q2-2005Q4; R^2 adjusted: 0.49; Durbin-Watson: 1.85; F-stat: 42.92

Coefficient values, t-statistics between brackets:
- pxb0:   0.003 (2.3)
- pxb1:   0.429 (9.1)
- pxb_e: -0.195 (3.1)

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[15]   See Hertveldt and Lebrun (2003), who obtained a coefficient equal to 0.44 for Belgian total exports.

Export prices for services

dln(PXS) = pxs0 + pxs1*dln(PWXSV*EX) + px_e*(ln(PXS)-ln(PXS_L))[-1]

Estimation period: 1984Q2-2005Q4; R^2 adjusted: 0.08; Durbin-Watson: 2.14; F-stat: 4.84

Coefficient values, t-statistics between brackets:
- pxs0:   0.005 (3.3)
- pxs1:   0.129 (2.7)
- pxs_e: -0.167 (-2.2)

The very low explanatory power of the short-term equation again originates from unexplained volatility in the series. Moreover, the link between services export prices and international prices seems to be very weak.

2.3.3. Forecast accuracy of the equations

The forecast accuracy of the export volume and price equations described above is analysed by means of an out-of-sample test. Long-term and short-term export equations were re-estimated over the period 1980Q1-2003Q4 in order to make forecasts from 2004Q1 to 2005Q4. The results are compared to the outcomes obtained by means of the volume and price equations for total exports[16].

Using a shorter sample to estimate the export equations (results not reported) yielded very similar coefficients, which indicates that the estimation results for the export volume equations presented in Section 2.3.1 are quite robust.

Table 1 -   Out-of-sample simulation results for export volumes
(quarterly growth rates in %)

	04Q1	04Q2	04Q3	04Q4	05Q1	05Q2	05Q3	05Q4	Average
Forecast XO	2.2	1.9	1.7	1.2	0.6	0.4	2.3	1.8	1.5
Forecast XOB+XOS	2.2	1.8	1.8	1.1	0.6	0.2	2.5	1.7	1.5
Observation XO	1.7	1.2	2.2	1.0	0.2	0.5	0.1	1.1	1.0
Forecast error XO	0.4	0.6	-0.5	0.2	0.4	-0.1	2.2	0.7	0.5
Forecast error XOB+XOS	0.5	0.5	-0.5	0.1	0.4	-0.3	2.4	0.6	0.5

Table 1 reveals that the aggregated and the disaggregated approaches overestimate export growth to the same extent in the course of 2004 and 2005 (by 0.5% per quarter on average). The decomposition of exports has not led to a significant improvement in terms of forecast accuracy.

The same exercise was done for the export price equations. Apart from a somewhat weaker error correction coefficient in the dynamic equation for export prices of goods, shortening the estimation sample hardly changed the estimation results. Table 2 shows that, as for the export volumes, both export price approaches lead to the same average forecast error (underestimation of 0.4% per quarter in 2004 and 2005).

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[16] See annex 3 for the aggregate equations of export volumes and prices.

Table 2 -   Out-of-sample simulation results for goods and services export prices' growth rates

	04Q1	04Q2	04Q3	04Q4	05Q1	05Q2	05Q3	05Q4	Average
Forecast PX	-0.2	0.8	0.5	0.1	0.8	1.2	1.3	1.0	0.7
Forecast PXB+PXS	-0.2	0.9	0.6	0.2	0.8	1.2	1.3	1.0	0.7
Observation PX	1.2	2.0	0.9	1.0	0.9	0.4	1.4	0.8	1.1
Forecast error PX	-1.4	-1.2	-0.4	-0.8	-0.1	0.8	-0.1	0.2	-0.4
Forecast error PXB+PXS	-1.4	-1.2	-0.4	-0.8	-0.1	0.8	-0.1	0.2	-0.4

As the forecast accuracy does not improve using separate goods and services equations, the break-down will, for the moment, not be introduced in the Modtrim model. Future improvements in the field of international services trade statistics might warrant to reconsider this problem.

3. An export market share analysis for Belgium and its three main trading partners

3.1. Introduction

As we already mentioned in Chapter 2, Belgian exports are confronted with a considerable loss of market share, which can not be fully explained by export price competitiveness developments. Therefore a trend factor was included in the export equation. In this chapter, we take a closer look at this phenomenon and compare it to the situation in Belgium's three main trading partners, namely Germany, France and the Netherlands (sections 3.2-3.4). In Section 3.5 we look at other possible reasons for these losses of market shares.

3.2. Data

In order to estimate equations explaining the evolution of export volumes, series describing international trade volumes and international prices have been constructed for each of the four countries[17].

For each country, growth of relevant export markets is calculated as a weighted average of import growth rates (source: EC, AMECO database) of its trading partners. The weighting scheme (source: IMF, Direction of Trade Statistics) varies from year to year to take changes in the geographical orientation of exports into account (see Annex 1, Figure A for Belgium).

As export growth is also influenced by the evolution of relative prices, two competitiveness indicators were constructed. The first one relates export prices of the exporting country to a weighted average of the export prices of its competitors (which is calculated in the same way as relevant export markets[18]). The second one is the real effective exchange rate (REER[19]) based on unit labour costs (source: EC, AMECO database) in which unit labour costs of the exporting country are related to a weighted average of its competitors' unit labour costs expressed in a common currency. A rise of these indicators implies a worsening of competitiveness.

It should be noted that we define the evolution of a country's market share as the difference between growth of exports and growth of relevant export markets, the latter reflecting the geographical composition of that country's exports. This means that we exclude with this definition export market share losses due to an unfavourable geographical orientation (an unfavourable orientation implies that relevant export markets grow slower than world trade). In fact, the exports of both Belgium and its main trading partners are mainly directed towards the relatively slow growing European countries and less

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[17] It is also possible to analyse the evolution of export market shares in nominal terms by means of a constant market share analysis, see: Simonis (2000) and Michel (2005).

[18] See chapter 2.

[19] Note the difference with the concept 'wage competitiveness' as used within the 'Law on safeguarding competitiveness', which only takes nominal wage growth per hour (and not productivity growth) into account. Furthermore the REER compares Belgium with 23 trade partners (EU-15, US, Canada, Japan, Switzerland, Norway, Australia, New-Zealand, Mexico and Turkey) instead of the three main trading partners in the concept used in the 'Law on safeguarding competitiveness'.

to the fast growing US and Asian economies, which have a larger weight in world trade than in the relevant export markets measures (see Table 3).

Table 3 - **Shares of different zones in Belgian exports and in world trade**
(2001-2005 averages in %)

	Share in world trade	Share in Belgian exports	Import growth in volume
GE+FR+NL	19.7	49.0	3.2
EU-15	41.7	72.6	3.3
US	19.6	6.5	4.3
Japan	7.0	1.1	3.9
Rest of the world	31.7	19.8	9.9

Source: IMF, EC, FPB

3.3. Specifications

To explain export growth, we estimate for each country a long-term equation (in levels) and an equation to capture the short-term dynamics. This short-term equation includes an 'error correction term' that assures a return of the dependent variable to its (estimated) long-term value.

The long-term equations are specified as follows:

$$\ln(XO\_L) = \alpha_1 + \beta_1 \ln(QWXSS) + \gamma_1 \ln(COMP) + \tau \, TREND$$

where: | XO_L | long-term value of exports at constant prices
| QWXSS | indicator of relevant export markets
| COMP | competitiveness indicator (relative export prices or REER)
| TREND | a trend factor

As we want to focus on the causes of market share losses, β_1 is constrained to unity for each of the four countries in all equations. Consequently, the long-term equations can be considered as equations in which the evolution of export market shares is explained by a trend factor and by the evolution of competitiveness.

The short-term equation for exports reads as follows:

$$d\ln(XO) = \alpha_2 + \beta_2 \, d\ln(QWXSS) + \gamma_2 \, d\ln(COMP) + \varepsilon \left(\ln(XO) - \ln(XO\_L)\right)[-1]$$

In what follows, the long-term equation will be used to assess the importance of the determinants of exports in explaining the observed market share losses over the 1980-2005 period (see section 3.4.1.), while the short-term equation will serve as a tool to check whether the (rather weak) export performance since 2003 can be considered as exceptional (see section 3.4.4.).

3.4. Findings

3.4.1. Long-term equations

Estimation results for the long-term export equations are presented in Table 4[20]. In the case of Belgium, the choice between relative export prices and the REER as an indicator of competitiveness does not lead to significantly different results[21]. For our neighbouring countries, however, the explanatory power of the equations improves markedly when competitiveness is measured by means of the REER. Therefore, the REER is used as competitiveness indicator in all equations.

Except for France, the long-term elasticity of competitiveness is significantly smaller than unity. CPB-studies[22] have pointed out that this elasticity is generally underestimated. In reality, part of the exported volume concerns highly substitutable products with a very high price elasticity. It is however possible that this elasticity is not observed in the available series because of perfect competition that does not allow exporters to set a price that differs from competitors' prices. When making macro-economic estimations, this can cause a downward bias in estimated export price elasticity.

Table 4 - Estimation results for the long-term equations *(sample: 1980-2005)*

	α_1	β_1 [d]	γ_1	τ_1 [a]	τ_1 [b]	τ_1 [c]
Belgium	7.62	1.00	-0.53	-0.08		
Germany	2.45	1.00	-0.34			
France	5.31	1.00	-1.01		-0.01	
Netherlands	2.37	1.00	-0.50		-0.01	0.03

a   Nonlinear trend: equals 0 until 1995, 1 in 1996, $2^{0.58}$ in 1997, $3^{0.58}$ in 1998, etc.

b   Linear trend: equals 1 in 1980, 2 in 1981, 3 in 1982, etc.

c   Nonlinear trend: equals 0 until 1992, 1 in 1993, $2^{0.65}$ in 1994, $3^{0.65}$ in 1995, etc.

d β_1 is constrained to unity in all equations

In the case of Belgium, France and the Netherlands, trends were added to capture systematic market share losses that cannot be explained by the evolution of price competitiveness. In Belgium, these losses only appear in the second half of the nineties and seem to be less important during the first half of this decade. Consequently, a nonlinear trend was introduced in the Belgian export equation. In France and the Netherlands, a linear trend indicates that these countries experience systematic losses of export market share over the whole estimation period[23]. In the Netherlands, an additional, nonlinear trend was introduced because Dutch exports were strongly stimulated by the integration of the EU market[24]. This positive effect appears to counterbalance the systematic market share losses. In Germany, introducing a trend did not improve the explanatory power of the equation[25].

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[20] Note that the estimations in this chapter are on a yearly basis, while estimations in the previous chapter were based on quarterly data.

[21] In Modtrim, export prices are used as the indicator of competitiveness instead of the REER. See Hertveldt and Lebrun (2003).

[22] See Kranendonk and Verbruggen (2006).

[23] This is confirmed by the export equations in the macro-economic models SAFFIER (the Netherlands, CPB) and MÉSANGE (France, Direction de la Prévision).

[24] Note that a similar trend was also tested for the other three countries, but it was not statistically significant.

[25] Note that 'explanatory power' should be rather considered as 'goodness of fit' as the trend variables, in contrast to competitiveness, do not offer a real explanation for the evolution of exports.

Figure 3 shows the contribution of the explanatory variables of the long-term equations to the change in export market shares since 1980 for each country per period of five years. Most countries lost market shares in the second half of the eighties and the first half of the nineties. Germany and the Netherlands were able to link up again with market share gains in the second half of the nineties (albeit in a modest way). It is also clear that Belgium has experienced the strongest losses in market share since 1980 (-28%), with the brunt of the deterioration seen in the second half of the nineties.

In all countries competitiveness seems to explain the evolution of export market shares quite well in the eighties and the first half of the nineties. Improvements/deteriorations of competitiveness throughout this period went hand in hand with increases/declines of export markets shares. After 1995, the relationship between the two variables is blurred, especially for Belgium and France. Belgium posted gains in competitiveness in the second half of the nineties while their market share losses intensified. France experienced huge competitiveness gains in the second half of the nineties, yet still lost some market share.

The residuals are quite limited in the long-term equation of Belgium. For the other three countries, residuals are quite high in the first half of the eighties and the second half of the nineties, implying that other factors might have affected exports during these periods. Moreover, for Germany, data problems due to the reunification can also play a role.

Figure 3 - Evolution of export market shares and contribution of explanatory variables
(expressed in percentage points)
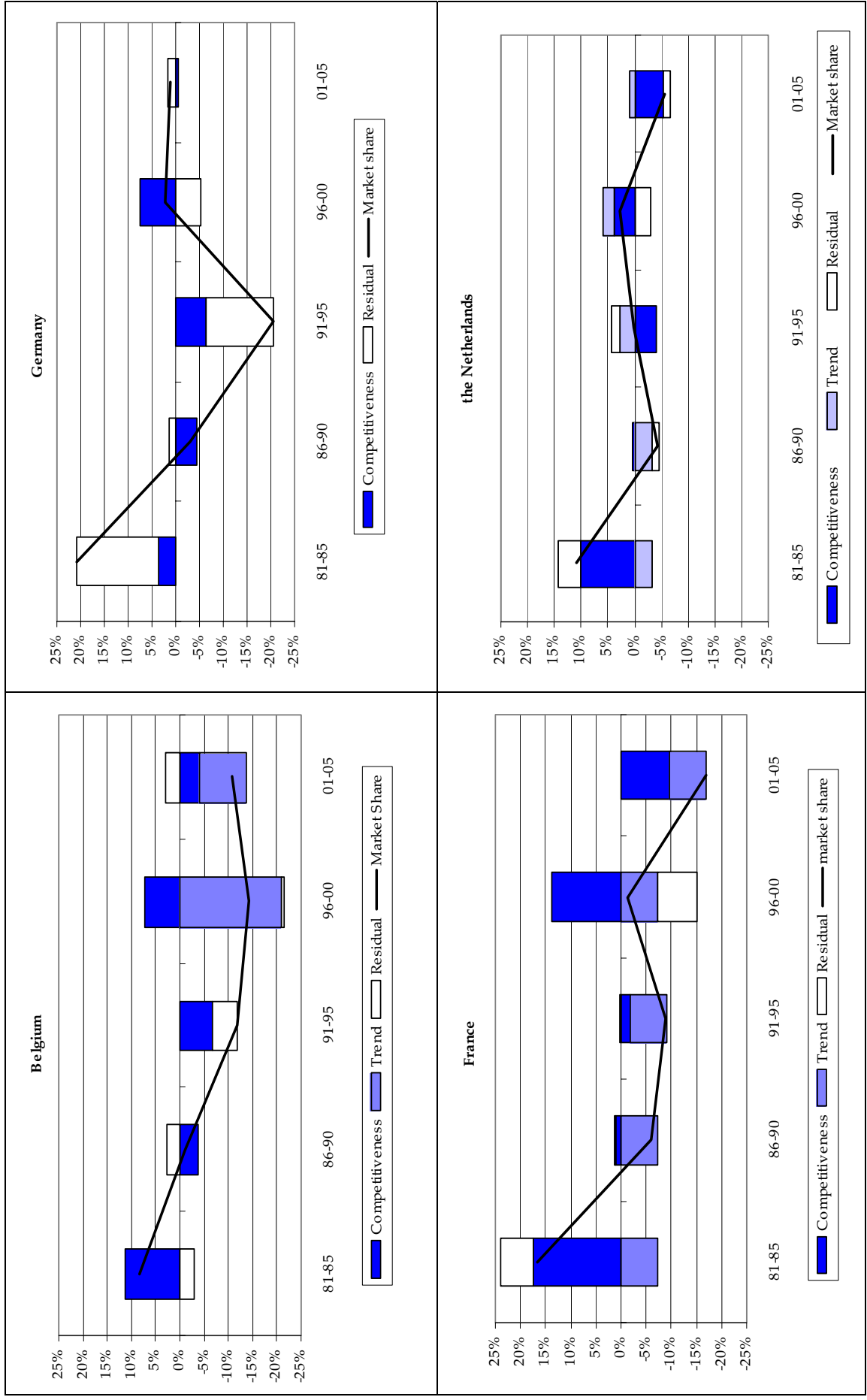
3.4.2. Short-term equations

Table 5 presents the estimation results of the short-term equations for Belgium, Germany, France and the Netherlands. As the constant is never significantly different from zero, it is fixed to zero in all equations.

Table 5 - **Estimation results for the short-term equations (sample: 1982-2005)**
(t-statistics are reported between brackets)

	Belgium	Germany	France	Netherlands
α_2	0.00	0.00	0.00	0.00
β_2	0.71 (14.2)	0.83 (11.9)	0.73 (10.4)	0.82 (11.7)
γ_2	-0.36 (-3.6)	-0.54 (-3.6)	-0.83 (4.8)	-0.40 (4.4)
ε	-0.39 (-2.4)	-0.38 (-3.8)	-0.30 (1.9)	-0.50 (2.8)
Dummy[a]		0.11 (5.5)		
d(trend)[b]				0.04 (4.0)
R^2 adjusted	0.65	0.78	0.66	0.81
Durbin-Watson	1.33	1.58	1.49	1.70

a Equals 1 in 1990 and 1991 to take statistical problems related to the German reunification into account

b First differences of a non-linear trend to take the integration of the EU market into account (cf. supra)

The coefficient for export market growth is significantly smaller than unity in all equations. This means that it takes some time before an acceleration/deceleration in growth of export markets is fully absorbed by exports.

The coefficients of competitiveness are also generally smaller than those in the long-term equation. This is however not the case for Germany, where there seems to be an overreaction to changes in competitiveness in the short run[26]. It was tested whether lags of the competitiveness term added to the explanatory power of the short-term equations. This was the case for all countries, except for the Netherlands. As the coefficients of the lagged and the contemporaneous competitiveness term were never significantly different from each other, a two year moving average of REER growth was introduced in the equations for Belgium, Germany and France.

3.4.3. Stability of the estimated coefficients

To test the robustness of the coefficients, the equations were re-estimated over two subsamples (1980-1992 and 1993-2005). A comparison of these coefficients and the estimation results for the whole sample revealed that the effect of export market developments on exports is quite robust, which is generally not the case for competitiveness.

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[26] This is probably due to data problems. When separate estimations are made for two subperiods, overshooting disappears almost completely.

In Germany, Belgium and the Netherlands the effect of competitiveness on exports becomes insignificant when the estimation sample is restricted to 1993-2005, while the estimated coefficient for the first subsample is very close to that reported in Table 5. For Belgium, this does not come as a surprise. In our quarterly model Modtrim the (estimated) effect of competitiveness on export growth is a lot higher in the eighties than during the last fifteen years. For Germany, our results are confirmed by Stahn (2006, p. 14)[27] who finds that competitiveness is not statistically significant when (intra euro area as well as extra euro area) export equations for Germany are estimated from 1993 onwards. The only exception is France, where estimated coefficients for export markets as well as competitiveness are very robust over the different subsamples.

3.4.4. Forecast accuracy of the export equations

It is appropriate to test the forecast adequacy of a specification by means of an out-of-sample test, rather than looking at the goodness of fit to past data (in-sample test). The performance of the export equations is analysed by re-estimating them over the period 1982-2002 (see Table 6). The results are then used to predict export growth in the out-of-sample period 2003-2005. The forecast errors are obtained by subtracting the forecast results from the observed data values of the test period (see Table 7).

Table 6 - Estimation results for the short-term equations (sample: 1982-2002)
(t-statistics are reported between brackets)

	Belgium	Germany	France	Netherlands
α_2	0.00	0.00	0.00	0.00
β_2	0.71 (11.8)	0.82 (10.3)	0.76 (9.5)	0.80 (8.9)
γ_2	-0.37 (-3.4)	-0.55 (-3.4)	-0.75 (-3.9)	-0.44 (-2.8)
ε	-0.40 (-2.2)	-0.36 (-3.3)	-0.33 (-1.9)	-0.20 (-0.8)
Dummy		0.11 (5.5)		
d(trend)				0.05 (2.5)
R^2 adjusted	0.65	0.78	0.64	0.72
Durbin-Watson	1.29	1.51	1.54	2.07

The estimation results for the 1982-2002 period are in line with the full sample estimation results presented in Table 5, except for France. It appears that shortening the sample by dropping the 2003-2005 period decreases the sensitivity of French exports to changes in competitiveness and increases their elasticity with respect to relevant export markets. As a result, given the real exchange rate appreciation of France in the 2003-2005 period, the forecast appears to overestimate French exports in that period. For Belgium, Germany and the Netherlands, the 2003-2005 forecast is, at least on average, in line with the observed values. The results in Table 7 show however that the equations generally underestimate the amplitude of the export cycle.

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[27] See Stahn (2006).

Table 7 - **Out-of-sample simulation results for exports**
(growth rates)

	Belgium			Germany			France			Netherlands		
	Fcst.	Obs.	Error	Fcst.	Obs.	Error	Fcst.	Obs.	Error	Fcst.	Obs.	Error
2003	2.6	2.9	-0.4	3.2	2.4	0.8	1.3	-1.2	2.4	3.1	1.6	1.5
2004	5.2	5.9	-0.7	7.3	9.6	-2.3	4.1	3.9	0.2	6.8	8.0	-1.2
2005	4.5	2.7	1.7	7.2	6.9	0.3	3.9	3.1	0.8	6.5	5.5	1.0
Average 03-05	*4.1*	*3.9*	*0.2*	*5.9*	*6.3*	*-0.4*	*3.1*	*1.9*	*1.2*	*5.5*	*5.0*	*0.4*

3.5. Which trend factors can play a role?

As the estimation results discussed above showed, not only Belgium suffers from losses of export market share and these losses cannot be attributed entirely to a lack of price competitiveness. In this section, some other factors that might have affected export performance will be put in perspective.

3.5.1. Structural factors

a. An unfavourable export product specialisation

If a country's exporters are relatively weakly specialised in dynamic, fast-growing products (ICT, machines, passenger cars) and relatively strongly in less dynamic products (iron, steel, textiles), that country will have a stronger tendency to lose market share[28].

To try to determine what can be considered as a 'benign' product mix, a ranking was made of the 20 product groupings (out of a total of 266)[29] contributing the most to non-fuel world trade growth in the period 2000-2003 using the UN's Comtrade database (see Table 8). This ranking is based on *contributions* to (non-fuel) world trade growth, which implies that both the export growth rate of each product as well as its overall share in total non-fuel exports are taken into account. In total, these top 20 product groupings represented 43.6% of total world trade growth. Then, the *share* of each of these 20 product groupings in total exports for Belgium and its main trading partners was calculated. Adding up the shares in total exports of these product categories per country provides a rough comparison of the favourability of the product mix per country vis-à-vis the world average. The fact that Belgium's total (37.5%) is considerably lower than the world average seems to confirm that the unfavourable product mix weighed on its market share. The high total for Germany seems consistent with Germany's rising export market share.

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[28] See e.g. Melyn (2004), Simonis (2000) and Michel (2005).

[29] See also Havik and Mc Morrow (2006).

Table 8 - **Top 20 of contributors in the SITC-3 product classification to non-fuel world trade growth**
*(average shares in % of total non-fuel exports, 2000-2003)*

Product Group (SITC-code)	World	BE	GE	NL	FR
1. Medicinal and pharmaceutical products (541)	2.6	7.9	2.9	3.4	4.5
2. Polymerization, etc, products (583)	1.5	4.0	2.2	2.6	1.5
3. Paper and paperboard (641)	1.3	1.2	1.6	1.4	1.4
4. Internal combust piston engines (713)	1.2	0.5	1.7	0.4	1.3
5. Engines and motors nes (714)	0.9	0.3	1.0	0.6	1.5
6. Non-electrical machinery parts, accessories (749)	1.2	0.8	2.0	0.6	1.3
7. Automatic data processing equip (752)	3.3	1.5	1.7	9.1	1.7
8. Office, adp machinery parts, accessories (759)	2.7	0.6	0.9	4.5	0.8
9. Telecom equipment, parts, accessories (764)	3.7	1.4	2.5	2.6	3.0
10. Switchgear etc, parts nes (772)	1.6	0.5	2.0	0.9	1.7
11. Transistors, valves, etc (776)	4.7	0.6	2.0	2.6	2.2
12. Electrical machinery nes (778)	1.7	1.3	1.7	1.0	1.3
13. Passenger motor vehicles, excl bus (781)	5.7	10.0	12.1	2.0	7.8
14. Lorries, spec motor vehicles nes (782)	1.0	1.3	1.3	0.8	1.1
15. Motor vehicles parts, accessories nes (784)	2.6	2.0	3.2	0.9	4.1
16. Aircraft, etc (792)	2.0	0.3	2.7	0.4	5.7
17. Furniture and parts thereof (821)	1.1	0.9	0.9	0.5	0.8
18. Measuring, controlling instruments (874)	1.3	0.4	1.9	1.3	1.2
19. Articles of plastic nes (893)	1.0	1.1	1.2	0.9	1.1
20. Special transactions (931)	2.5	0.8	5.2	0.2	0.0
Aggregate share of top 20 in non-fuel total	**43.6**	**37.5**	**50.8**	**36.7**	**44.1**

Source: UN Comtrade

The table is, however, only part of the picture of the product mix at a given moment. To be able to take the product mix into account as an explanatory variable in the export equations, a longer series on a yearly basis had to be constructed. Furthermore, as the list of the 20 most dynamic product groupings changes from year to year, the indicator had to take all 266 categories into account. So for each year a ranking of all the product groupings based on their contribution to non-fuel world trade growth was made, then the same ranking was imposed to the data for individual countries. Using this ranking, a comparison of the cumulative share of the product categories in total exports allows calculating a coefficient that indicates (per year) whether the product mix of exports for the country at stake is more or less benign than the product mix of world trade. If this coefficient exceeds one, the product mix is expected to lead to gains of market share, while a coefficient below one could provide an explanation for market share losses. To be able to compare these coefficients to the evolution of export market shares, they have to be converted into an index that declines (rises) when the coefficient is below (above) unity.

Figure 4 shows that there appears to be a link between the product mix of Belgian exports and the evolution of its export market shares. Only in the beginning of the eighties and between 2000 and 2004, both series clearly move in opposite directions. For the former period, this should not come as a surprise as Belgian exports were then boosted by the devaluation of the Belgian Franc. In 2001 and 2002, the product mix indicator suffers from an upward bias due to peculiarities in the pharmaceutical industry. From 2003, however, this bias disappears but both indices continue to develop in opposite directions.

Figure 4 -   Evolution of export market shares (MKTSH) and the export product mix (PRMIX) for Belgium (indices, 1980=100)
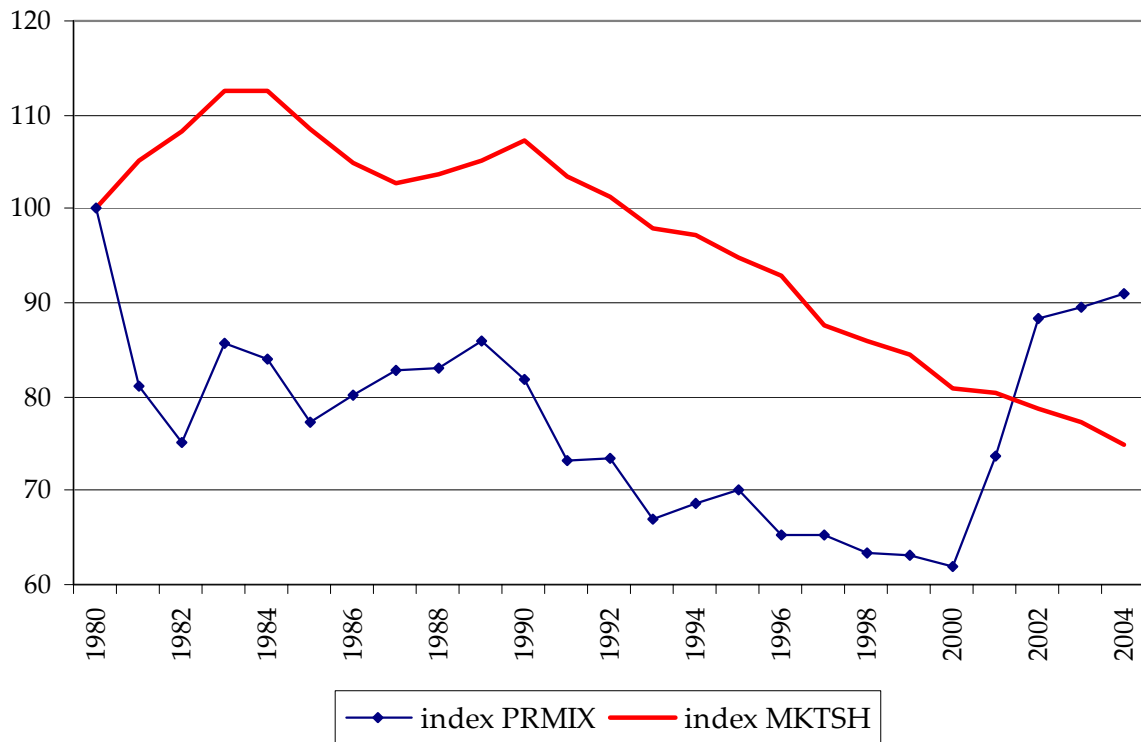
Source: UN Comtrade, FPB

Finally, the product mix indicator is introduced in the long-term export equation for Belgium. The estimation results revealed that this indicator slightly improves the explanatory power of the equation. It is however not able to reduce the role of the trend in the equation significantly, which implies that an unfavourable product mix is only part of the explanation behind the Belgian losses of export market shares and that some other factors may also affect the Belgian export performance[30].

Some caveats should be born in mind regarding the product mix measure presented in this section. Firstly, the UN Comtrade's database is only available in current prices, while our export equations try to explain real export growth. The prices of computers for example have a tendency to decline strongly over time, leading to an overestimation (current prices compared to quantities) of its weight in the product mix in the years before the base year of the national accounts and an underestimation in the years after the base year. However, this problem should have become less important as Belgian national accounts recently shifted to chain weighted volume measures. Secondly, data for Belgium are only available from 1998 on, where trade data before 1997 include Luxemburg, which slightly distorts the indicator for Belgium.

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[30] The product mix variable was also introduced in the short-run equation, but was not statistically significant.

b. Re-exports

Another factor is the rising importance of re-exports. Re-exports are goods that are imported and leave the country again practically in the same state as previously imported. This means that re-exports generate almost no value added in the Belgian economy. The importance of re-exports has increased strongly over the last 20 years. The first boost originated from the preparation (from 1988 onwards) and the effective implementation of the common single market (from 1993 on). Temporarily a setback emerged in 2001-2002 with the bursting of the ICT-bubble (ICT has a high weight in re-exports), but the subsequent recovery of the ICT sector, China's entry into the WTO (in 2001) and the extension of the EU by 10 East European countries (in 2004) made it surge again in the last few years.

The distinction between re-exports and domestically produced exports is important as their composition is strongly different. According to the Dutch Centraal Planbureau[31], the composition of re-exports is quite different from domestically produced exports. In Belgium, the former is more focused on machines, computers, electronics and minerals, while the latter consists rather of agricultural products & foodstuffs, chemicals and base materials. As world demand for typical re-export goods tends to be stronger than demand for domestically produced goods, re-exports and its potential export markets tend to grow faster than exports and potential export markets of domestically produced goods. Furthermore, while domestic (wage) costs play an important role in the price of domestically produced goods (more than 60%), they are almost negligible with respect to re-exported goods (around 10%), where factors as the existence of large ports, good infrastructural facilities, the closeness of other (large) economies, the existence of distribution centres,… are more important. This implies that the real effective exchange rate is not a good explanatory variable for re-exports. This could also explain why competitiveness seems to become less important from the nineties onwards as an explanatory variable in the export equations (cfr. section 3.4.1). Ideally, re-exports should be modeled separately. As only very few countries split up exports into domestically produced exports and re-exports, it would be very difficult to construct appropriate explanatory variables. Yet rough estimates by the CPB indicate the huge importance of re-exports in total exports (about 30% in 2000 for Belgium).

The effect of re-exports on the evolution of Belgian export market shares is however not clear-cut. If re-exports are more important for Belgium than for its trading partners, re-exports would tend to limit market share losses. Conversely, if they are less important for Belgium than for its trading partners, re-exports could be part of the explanation behind Belgium's market share losses.

3.5.2. Statistical factors

It is also possible that part of the export market share losses is rather a statistical than a real problem. Export performances are generally measured in volume terms (corrected for price evolutions), but an analysis in value terms is also possible[32]. For Belgium, the loss of export market shares in real terms over the last 25 years amounted to almost 30%, compared to a loss of only 8% in value terms. Over the last five years Belgium even gained some export market share when using the value approach.

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[31] See Mellens et al. (2007).
[32] See e.g. Simonis (2000) and Michel (2005).

**Figure 5 - Evolution of market share of Belgium in volumes and values (1980=100)**
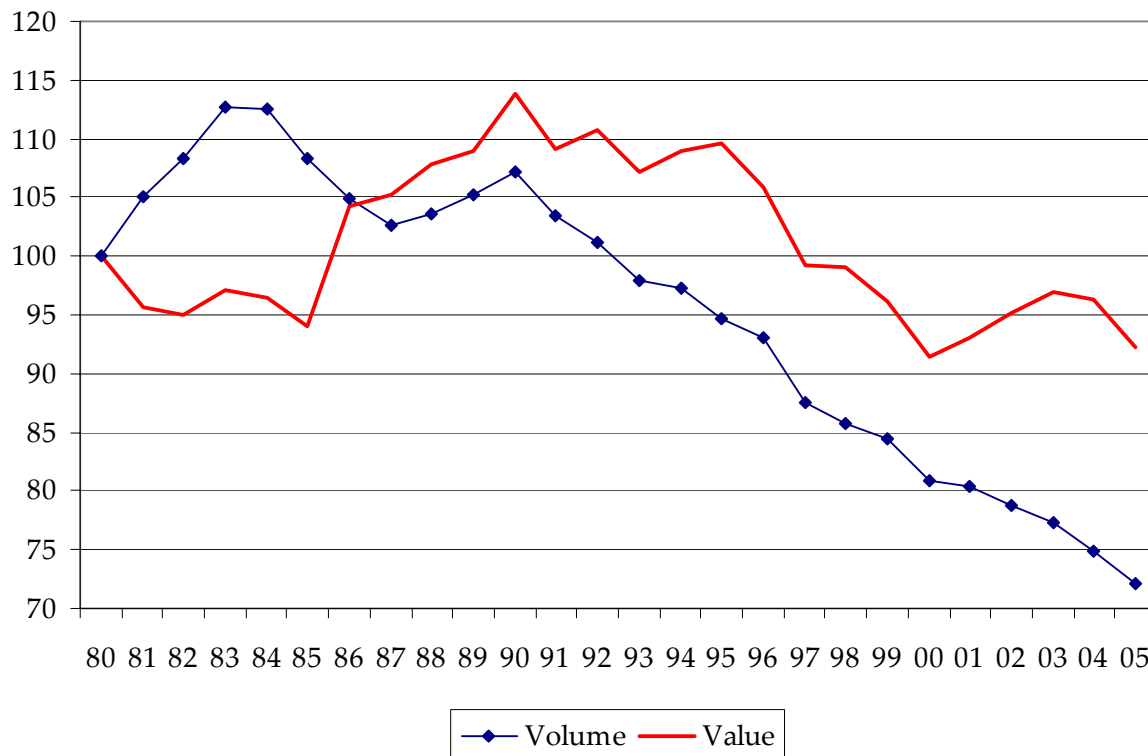
For Belgium's three main trading partners, the divergence between the evolution of market shares in volumes and values is also remarkable, but generally less marked than in Belgium (see Table 9). The export performance of Germany, France and the Netherlands over the last 25 years is even less favourable in value terms than in volume terms. In the period 2000-2005, all countries gain market share in the value approach, while losing or gaining substantially less than in the volume approach.

The divergence between the value and the volume approach is reflected by the evolution of the export deflators. Figure 6 shows that export prices in Belgium rose much faster than in our neighbouring countries, especially between 1995 and 2005.

Table 9 - Evolution of market shares in %
(cumulative changes)

		80-05	80-90	90-00	00-05
Belgium	volume	-27.9	7.2	-24.5	-10.9
	value	-7.7	13.8	-19.6	0.9
Germany	volume	7.0	17.8	-10.0	1.0
	value	-4.2	29.6	-32.0	8.7
France	volume	-18.3	9.5	-10.3	-16.8
	value	-33.2	2.6	-24.7	-13.5
Netherlands	volume	3.4	6.5	3.1	-5.8
	value	-8.3	-4.6	-3.9	0.0

Figure 6 -   Export deflators of Belgium, Germany, France and the Netherlands (1995=1)
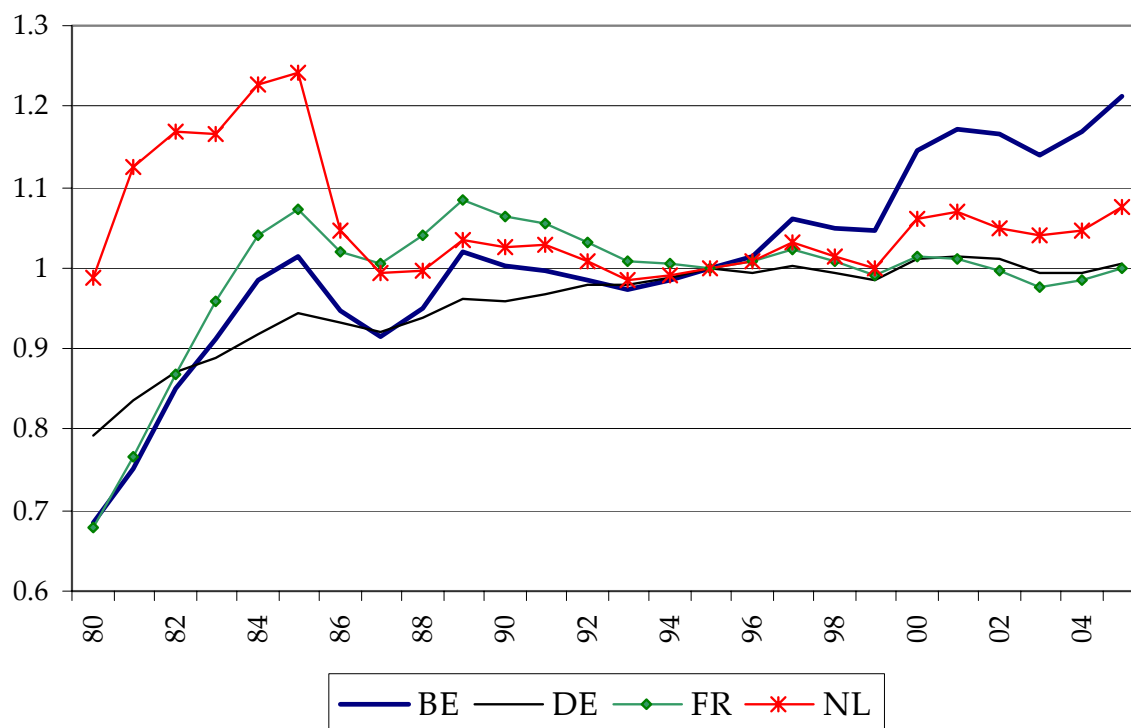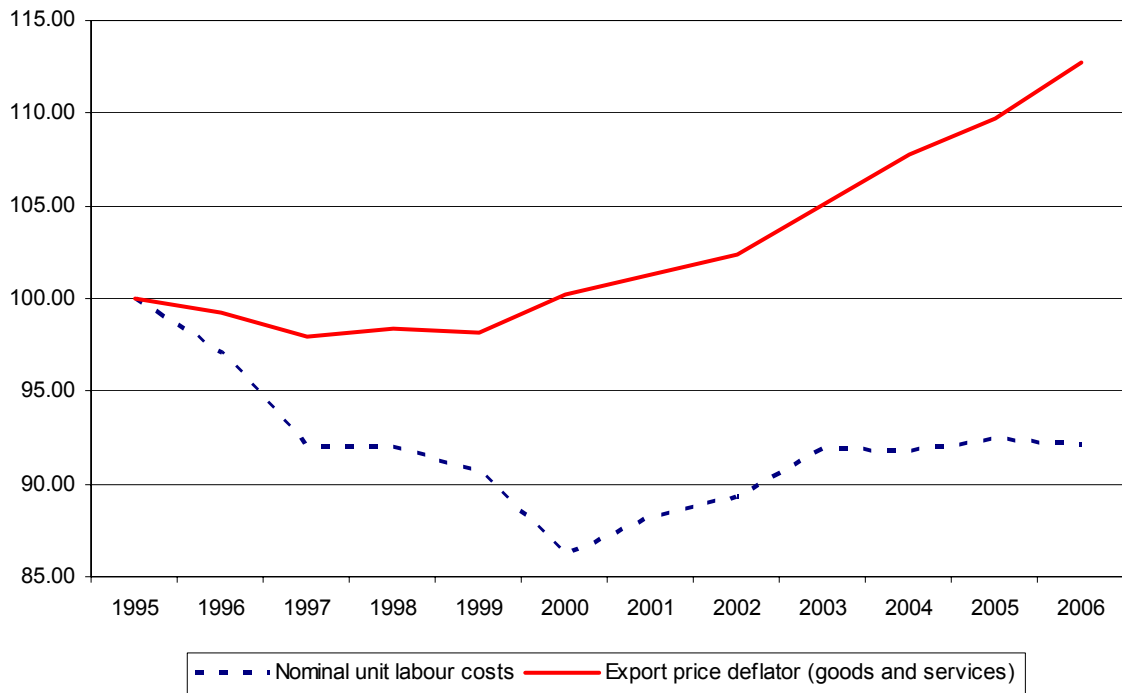

Source: Ameco EC

There are two possible reasons for this relative rise in Belgian export prices:

- Relatively high domestic costs (such as labour costs) are being passed on to export prices. The increase in relative export prices hence implies a deterioration of the cost competitiveness of the Belgian economy.

- It is a sign that Belgian exports are being directed more (than in other countries) to high value-added products and to more dynamic product markets, where competition is much more based on product content than on prices. In this case the decline in volumes is merely a statistical problem since one does not take quality improvements into account when calculating volumes.

Figure 7 shows that the evolution of relative unit labour costs and of relative export prices for Belgium are very different from one another. While the former was in 2006 more than 5% below its level of 1995, the latter was more than 10% higher. Hence, the first explanation seems difficult to hold. The second reason appears to be more likely. There is evidence that Belgian exports are scaling up, although there is no proof that it is doing so faster than its neighbouring countries. Moreover, the National Bank of Belgium does not exclude statistical problems in the decomposition of exports in volumes and prices. This leads to the conclusion that at least part of the observed Belgian market share losses in real terms could be due to an overestimation of export price inflation[33].

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[33] Nationale Bank van België, Verslag 2006, Deel 1: Economische en financiële ontwikkeling, p. 62. bibliografische verwijzing + toevoegen aan bibliografie

Figure 7 - **Evolution of relative unit labour costs in common currency and relative export prices (1995=1)**
(Belgium relative to rest of group of 36 countries)

Source: Ameco, EC

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Annex 1. Additional figures

Figure A -   Weights of trading partners in Belgian exports
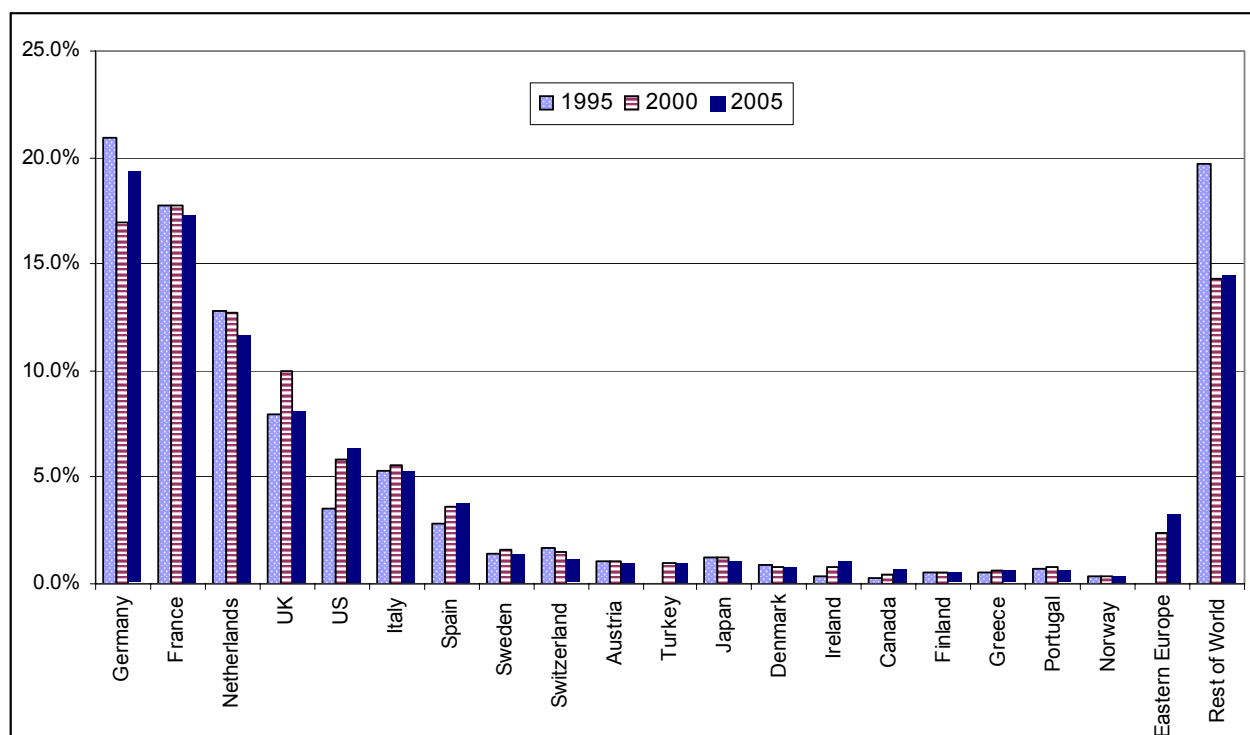
Source: IMF

Note: Due to statistical limitations Eastern Europe and Turkey are only explicitly taken into account from 1996 on, explaining the drop in the weight of the rest of the world between 1995 and 2000.

Figure B - Evolution of potential export market volumes: goods (B), services (SV) and total (SS)
(annual growth rates)
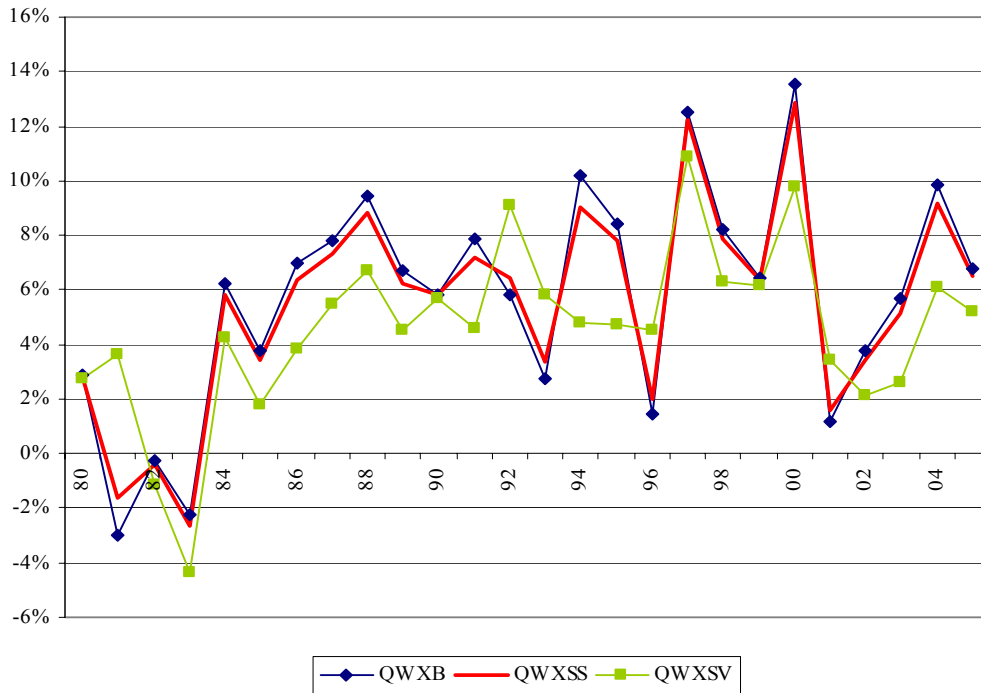
Figure C - Evolution of international export prices in euro: goods (B), services (SV) and total (SS)
(annual growth rates)
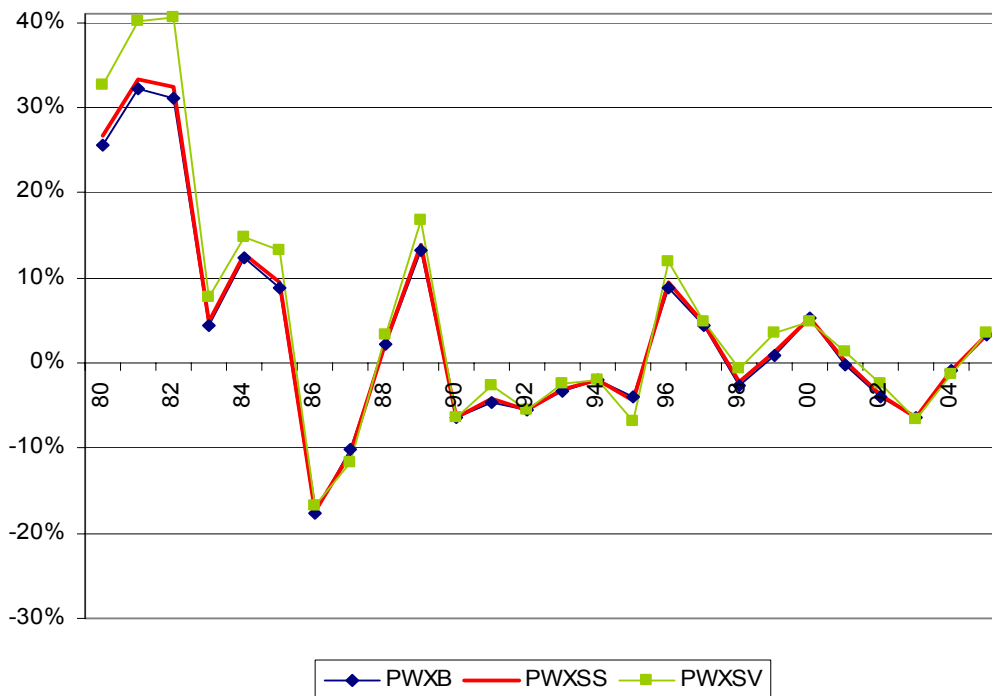
Figure D -   Share of services in foreign trade
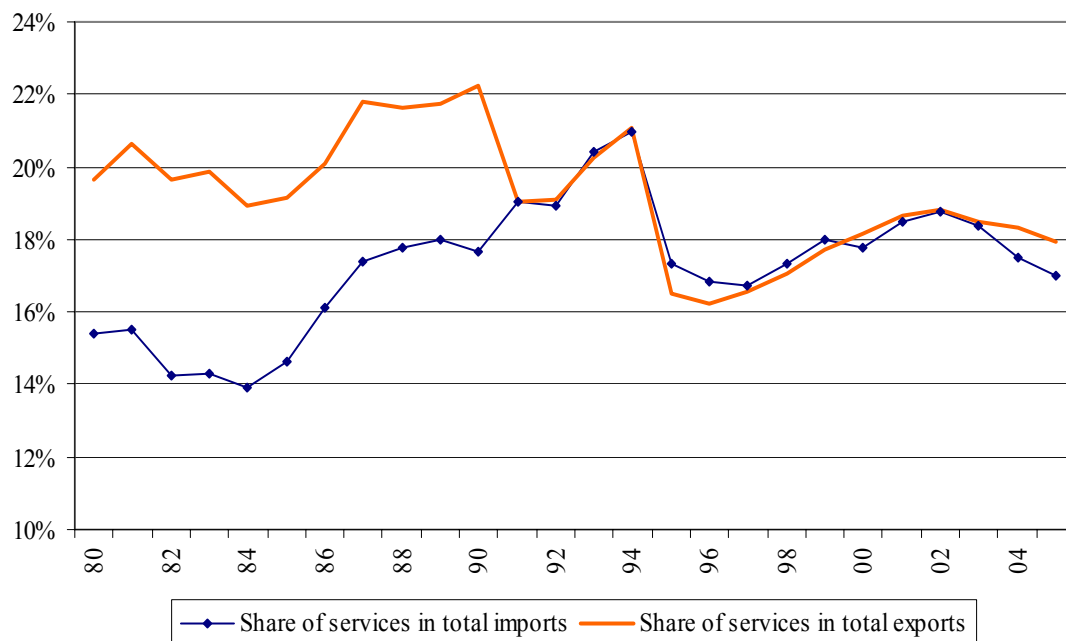
Figure E -   Evolution of Belgian export market share: goods, services and total (1980=100)
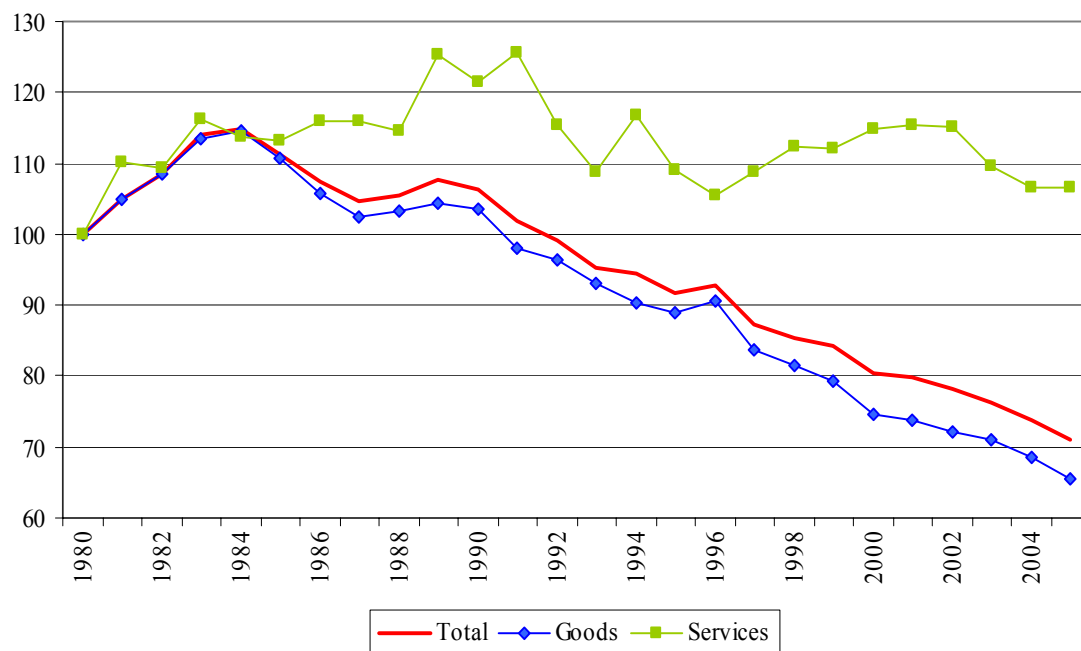
Figure F -   Quarterly evolution of Belgian exports: total (XO), goods (XOB) and services (XOS)
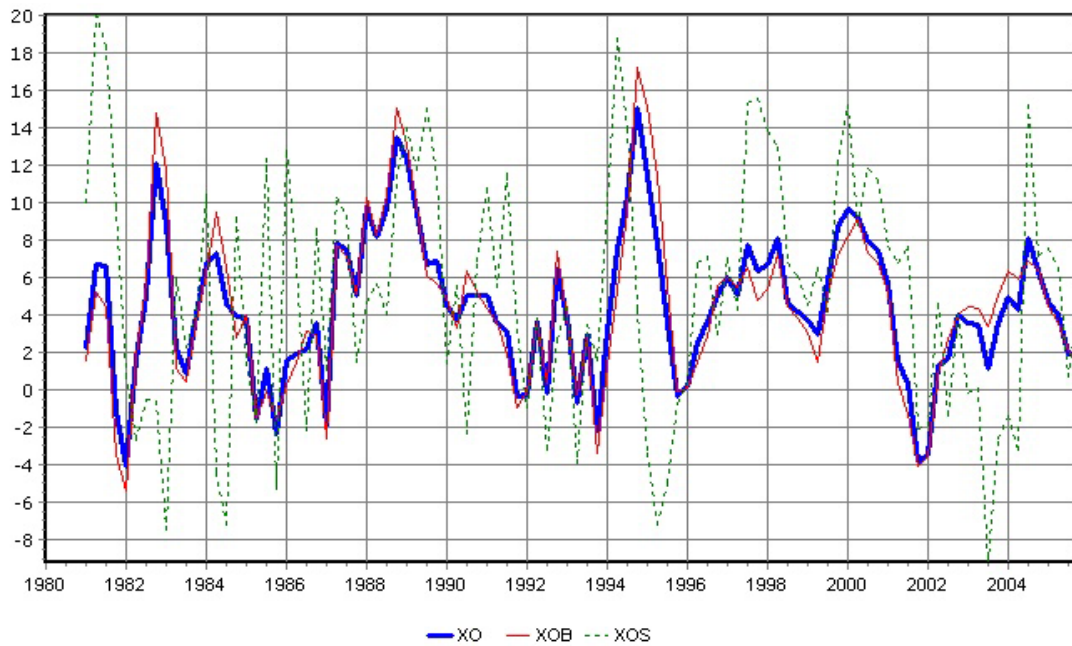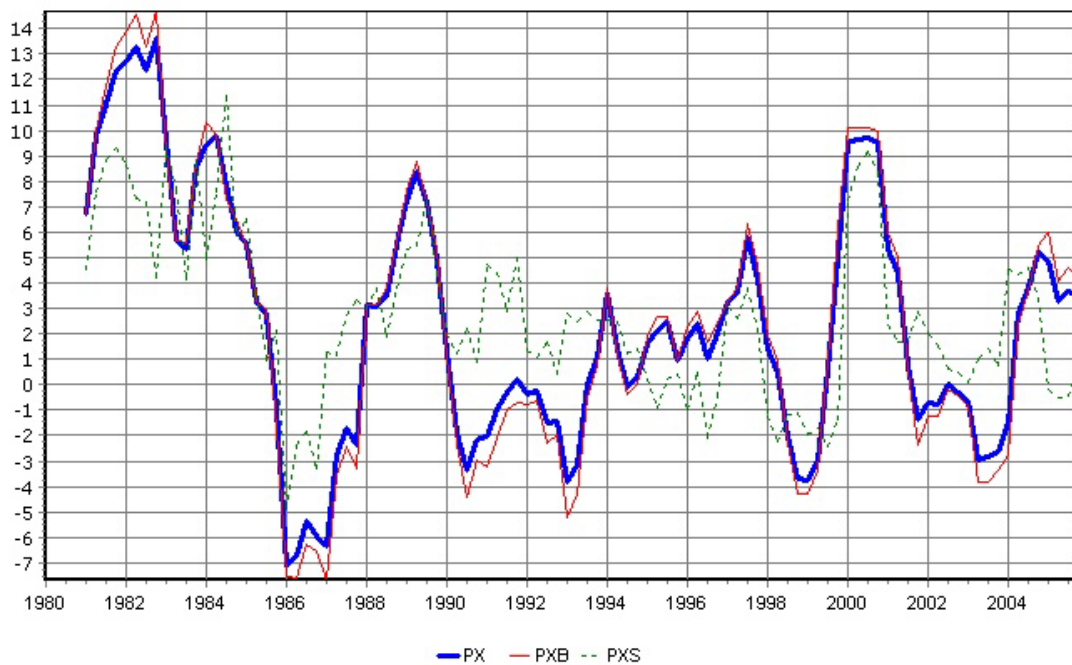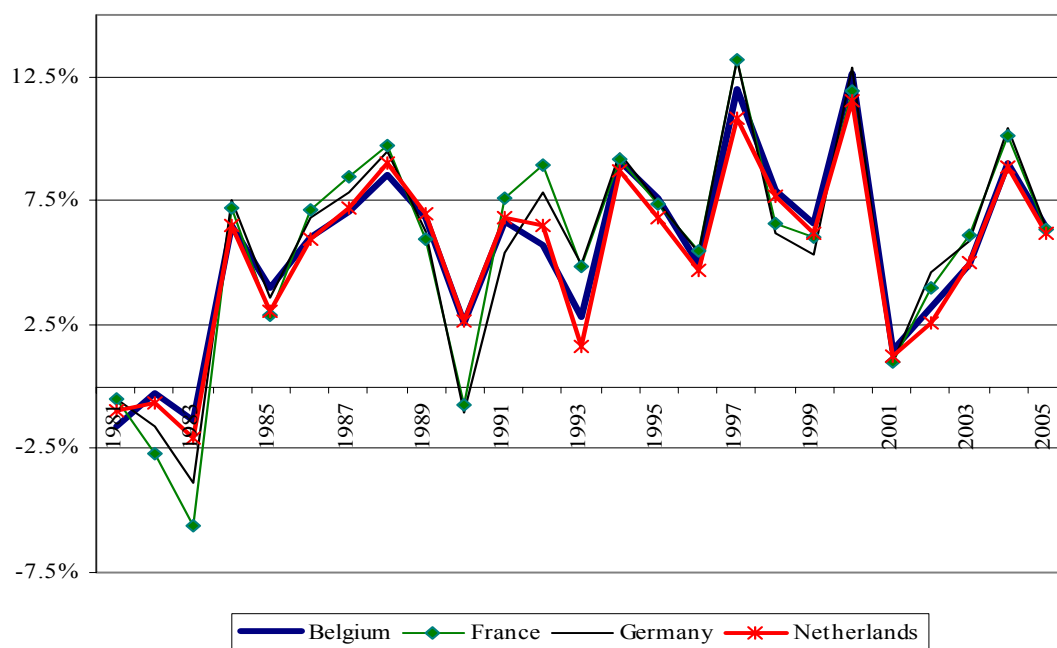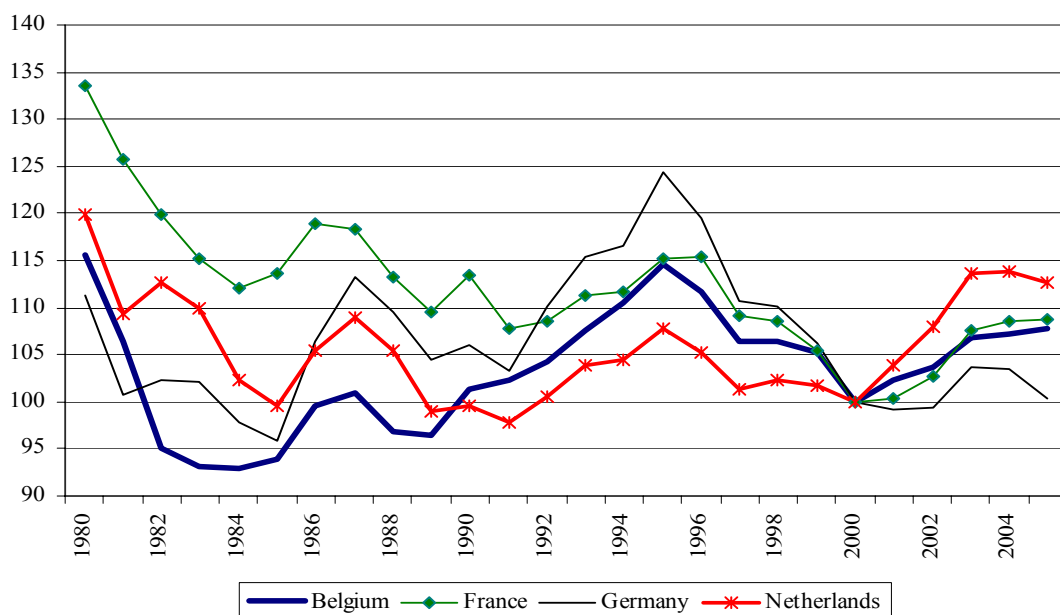   *(yoy growth rates)*

Figure G -   Quarterly evolution of Belgian export prices: total (PX), goods (PXB) and services (PXS)
     (yoy growth rates)

Figure H - Potential export markets
(annual growth rates)

Figure I -   Real effective exchange rates based on relative unit labour costs (2000=100)

Annex 2. Composition of OECD leading indicators

OECD_BD: The OECD leading indicator for Germany contains:

- IFO Business Climate Indicator

- Order inflow/demand : tendency (manufacturing) (% balance)

- Export order books : level (manufacturing) (% balance)

- Total new orders (manufacturing)

- Finished goods stocks : level (manufacturing) (% balance)

- Spread of interest rates (% per annum)

OECD_US: The OECD leading indicator for the US contains:

- Dwellings started (number)

- Net new orders for durable goods (in mio USD)

- USA Share prices : NYSE composite (2000=100)

- Consumer sentiment indicator (Normal = 100)

- Weekly hours of work : manufacturing (hours)

- Purchasing manager index (% balance)

- Spread of interest rates (% per annum)

Note that the composition of the OECD indicators is being revised from time to time. These are available at the OECD's website (www.oecd.org).

Annex 3. Aggregated export equations and estimation results

Export volumes of goods and services

Long-term equation:

ln (XO_L) = xo_l0 + xo_l1*ln(QWXSS) + xob_l2 * ln(PX/PWXSS*EX) + xob_l3*T*(t>1996Q4)

- XO: Belgian exports of goods and services (volume)
- QWXSS: Potential export markets of goods and services (volume)
- PX: Deflator of Belgian exports of goods and services
- PWXSS*EX: Competitors' export prices of goods and services expressed in euro

Estimation period: 1980Q1-2005Q4; R^2 adjusted: 0.99; Durbin-Watson: 0.76; Dickey-Fuller: -4.45

Coefficient values:
- xo_l0: 9.381
- xo_l1: 0.908
- xo_l2: -0.350
- xo_l3: -0.001

Short-term equation:

dln(XO) =   xo1*dln(QWXSS) + xo1bis*dln(QWXSS)[-1] + xob2*dln(PX/PWXSS*EX)*(t<1992Q1) +
            xob_e*(ln(XO)-ln(XO_L))[-1]

aantal decimalen gelijkgeschakeld met hoofdstuk 2

Estimation period: 1980Q3-2005Q4; R^2 adjusted: 0.15; Durbin-Watson: 1.79; F-stat: 6.77

Coefficient values, t-statistics between brackets:
- xo1: 0.287 (2.2)
- xo1bis: 0.353 (2.7)
- xo2: -0.200 (-2.5)
- xo_e: -0.269 (-3.7)

Export prices of goods and services

Long-term equation:

ln(PX_L) = px_l0 + px_l1*ln(PWXSS*EX) + px_l2*ln(PQVFZ_L) + (1-px_l1-px_l2)*ln(BRENT*EX)

Estimation period: 1990Q1-2005Q4; R^2 adjusted: 0.92; Durbin-Watson: 0.45; Dickey-Fuller: -3.58

Coefficient values:
- px_l0: -1.493
- px_l1: 0.305
- px_l2: 0.634

Short-term equation:

dln(PX) = px0 + px1*dln(PWXSS*EX) + px2*dln(PWXSS*EX) +px_e*(ln(PX)-ln(PX_L))[-1]

Estimation period: 1990Q2-2005Q4; R^2 adjusted: 0.62; Durbin-Watson: 1.60; F-stat: 26.20

Coefficient values, t-statistics between brackets:
- px0:   0.003 (3.3)
- px1:   0.4180 (2.3)
- px2:   0.323 (6.2)
- px_e: -0.206 (-4.1)

Annex 4. Abbreviations

- CBS: Centraal Bureau voor Statistiek (the Netherlands)

- CPB: Centraal Planbureau (the Netherlands)

- CO: Cabinet Office (Japan)

- EC: European Commission

- IFO: Information und Forschung (Germany)

- S&P: Standard & Poors

- WES: World Economic Survey (by the German IFO institute)