DEUTSCHE
BUNDESBANK
EUROSYSTEM

How strong is the impact of exports and other demand components on German import demand? Evidence from euro-area and non-euro-area imports

Claudia Stirböck

Discussion Paper
Series 1: Economic Studies
No 39/2006

Deutsche Bundesbank, Wilhelm-Epstein-Strasse 14, 60431 Frankfurt am Main,
Postfach 10 06 02, 60006 Frankfurt am Main

Tel +49 69 9566-1
Telex within Germany 41227, telex from abroad 414431, fax +49 69 5601071

Please address all orders in writing to: Deutsche Bundesbank,
Press and Public Relations Division, at the above address or via fax +49 69 9566-3077

ISBN 3–86558–229–X (Printversion)
ISBN 3–86558–230–3 (Internetversion)

Abstract

This paper presents a single error-correction analysis of German total, euro-area (intra) and non-euro-area (extra) import demand for the 1980-2004 period and the more recent 1993-2004 period. German import demand is mainly driven by domestic demand and foreign demand for German goods; by contrast, the price sensitivity of German imports is low. We note a greater propensity to import with respect to an increase in investment compared to a rise in consumption, yet find that export goods have the highest marginal import content. The influence of export demand on the German economy's import demand is growing, with the marginal propensity to import being higher for extra imports than for intra imports; in addition, the reagibility of the former has intensified perceptibly since the 1990s. The price sensitivity of intra imports is not only higher but, unlike that of extra imports, is also significant and has increased at the current end.

Keywords: Import demand, intra and extra euro-area imports, import content, single equation error-correction.

JEL-Classification: C22, E20, F41.

Non-technical summary

This paper examines German demand for imported goods against the backdrop of current globalisation tendencies and the sharp rise in the international division of labour. The growing importance of imported intermediate goods for domestic production can also be seen from the single-equation error-correction estimations presented to explain German import demand.

More recent literature already includes liberalisation or outsourcing indicators when modelling import demand in order to capture the effects of internationalisation. This study extends previous approaches by reviewing the specific impact of individual demand components on import developments. In this connection, we also analyse whether there have been any perceptible shifts in the significance of the various components over time (especially since the early 1990s). A dedicated supplementary analysis of variations in demand for goods from inside and outside the euro area also goes beyond previous studies.

The results of our estimates of the 1980-2004 and the 1993-2004 period indicate a particular increase in the marginal import content of German export production at the current end. Overall, the marginal propensity to import for domestic demand rose only slightly, however. Here, we find a preponderance of imported intermediate goods in capital formation compared to consumption. In addition, there has recently been something of a rise in the marginal import content in capital goods, whereas that in consumer goods fell slightly.

An analysis of the different elasticities of euro-area (intra) and third-country (extra) imports identifies clear discrepancies in the responsiveness of regional imports to exports. The marginal propensity to import is higher for extra imports than for intra imports; in addition, the former has intensified perceptibly at the current end. This may reflect the growth in imports of more cheaply-produced intermediate goods from non-euro-area partner countries, such as the emerging markets in south-east Asia or neighbouring countries in central and eastern Europe. Moreover, the marginal

propensity to import goods from the euro area following an increase in domestic demand (ie investment and consumption) has risen slightly since the 1990s.

The price responsiveness of German imports is low according to our estimates, but appears to be increasing somewhat at the current end. In general, we see that import demand reacts positively when imported goods become cheaper relative to domestic products. As in many other recent studies, however, the relative prices are not statistically significant as a determinant of import demand, with the exception of imports from the euro area. In comparison to extra imports, intra imports exhibit much higher (and, moreover, significant) price sensitivity; this has intensified considerably at the current end. It would appear that price competition is greater within the euro area and that arbitrage opportunities are increasingly being exploited. As well as the lower price elasticity of energy and commodity imports from third countries, the existence of fixed supply patterns within multinational groups may further reduce the price sensitivity of this sector of German imports.

Nicht technische Zusammenfassung

Das vorliegende Papier untersucht die deutsche Nachfrage nach Importgütern vor dem Hintergrund der aktuellen Globalisierungstendenzen bzw. der stark gestiegenen internationalen Arbeitsteilung. Die wachsende Bedeutung importierter Vorleistungen für die heimische Produktion ist auch anhand der hier präsentierten Eingleichungs-Fehlerkorrektur-Schätzungen zur Erklärung der deutschen Importnachfrage festzustellen.

Die neuere Literatur nimmt bereits Liberalisierung- oder Outsourcing-Indikatoren in die Modellierung der Importnachfrage auf, um die Effekte der Internationalisierung einzufangen. Wir gehen über die bisherigen Ansätze hinaus, indem wir den spezifischen Einfluss der einzelnen Nachfragekomponenten auf die Entwicklung der Einfuhren überprüfen. Hierbei wird auch untersucht, ob eine Verschiebung der Bedeutung der einzelnen Komponenten im Zeitablauf (speziell seit Anfang der neunziger Jahre) festzustellen ist. Die zusätzliche dezidierte Analyse von Unterschieden in der Nachfrage nach Gütern aus dem Euro- und dem Nicht-Euro-Raum stellt ebenfalls eine Erweiterung bisheriger Studien dar.

Entsprechend unserer Ergebnisse der Schätzungen für die Zeiträume 1980-2004 und 1993-2004 hat am aktuellen Rand insbesondere der marginale Importanteil der deutschen Exportproduktion zugenommen. Die marginale Importneigung der inländischen Verwendung erhöhte sich insgesamt hingegen nur geringfügig. Hierbei ist ein größeres Gewicht von importierten Vorleistungen in der Investitionsgüterindustrie im Vergleich zur Konsumgüterindustrie auszumachen. Zusätzlich zeigt sich in jüngerer Zeit eine gewisse Verstärkung des marginalen Importanteils der Investitionen, während der des Konsums leicht gesunken ist.

Die Analyse der Unterschiede der Elastizitäten von Euro-Raum-(Intra-) und Drittländer-(Extra-)Importen stellt deutliche Abweichungen in der regionalen Importreagiblität in Bezug auf die Exporte fest. Die marginale Importneigung ist höher für die Extra-Einfuhren als für die Intra-Einfuhren, zudem hat sich erstere am aktuellen Rand sichtbar intensiviert. Dies könnte die Expansion der Importe kostengünstiger produzierter

Vorleistungen aus Nicht-EWU-Ländern, bspw. den süd-ostasiatischen Schwellenländern oder den mittel- und osteuropäischen Nachbarländern widerspiegeln. Daneben hat sich die marginale Neigung zur Einfuhr von Gütern aus dem Euro-Raum in Folge einer Inlandsnachfragesteigerung (also von Investitionen und Konsum) seit den neunziger Jahren leicht verstärkt.

Die Preissensibilität der deutschen Importe ist nach unseren Schätzungen gering, scheint aber am aktuellen Rand leicht gestiegen zu sein. Zwar ist grundsätzlich eine positive Reaktion der Importnachfrage bei einer relativen Verbilligung der Einfuhrgüter im Vergleich zu den inländischen Produkten festzustellen. Wie in vielen anderen neueren Studien sind die relativen Preise jedoch als Determinante der Importnachfrage, außer für die Einfuhren aus der EWU, statistisch nicht signifikant. Im Vergleich zu den Extra-Importen weisen die Intra-Importe eine deutlich höhere (und darüber hinaus signifikante) Preissensibilität auf, die sich zudem am aktuellen Rand beträchtlich intensiviert hat. Es scheint, dass innerhalb des Euro-Raumes eine stärkere Preis-Konkurrenz herrscht und Arbitrage-Möglichkeiten zunehmend ausgenutzt werden. Zusätzlich zu der geringen Preiselastizität von Energie- und Rohstoffimporten aus den Drittländern mag die Existenz fester Zulieferstrukturen innerhalb multinationaler Konzerne die Preissensibilität dieses Teils der deutschen Importe weiter mindern.

Contents

List of tables

List of figures

How strong is the impact of exports and other demand components on German import demand? Evidence from euro-area and non-euro-area imports*

1 Effects of globalisation on import demand

Globalisation and, in particular, the integration of the European market are causing a steady rise in global trade, which now actually exceeds global output growth. Whereas, according to the IMF *World Economic Outlook* (IMF, 2006), average annual global output growth was almost 4% between 1998 and 2005, the real global trade volume of goods and services increased by more than 6%. These effects of globalisation also influence the evolution and the determinants of import demand.

The German economy is also characterised by sharply rising imports and exports – both in absolute terms and relative to GDP – and, thus, by an openness which has been growing continuously and robustly, especially since the mid-1990s. In real terms, the German economy's openness[1] went up from almost 45% in 1993, just after the Single Market was established, to more than 80% in 2005. The background to this is the increasing international division of labour.[2] The fact that German enterprises are outsourcing some of their production to foreign countries, such as to the 10 new EU member states (see Deutsche Bundesbank, 1999), has boosted imports of intermediary products. Moreover, the exchange rate dependency of a large sector of German imports was reduced by the introduction of the euro. The single currency has facilitated the exploitation of arbitrage benefits and reduced trade transaction costs. It stands to reason

* Correspondence: Claudia Stirböck, Deutsche Bundesbank, Economics Department, Wilhelm-Epstein-Str. 14, 60431 Frankfurt am Main, Germany. E-mail: claudia.stirboeck@bundesbank.de. The opinions expressed in this paper represent those of the author and do not necessarily reflect the official position or policy of the Deutsche Bundesbank. This paper is part of a joint project on "Growth and cyclical asymmetries in France, Germany and Italy" of the Banque de France, the Bundesbank and Banca d'Italia. The author wishes to thank the following people for their valuable comments and suggestions: Joerg Doepke, Ulrich Grosch, Heinz Herrmann, Hans-Eggert Reimers, Michael Scharnagl, Hubert Strauss, Karl-Heinz Toedter and the participants at the conference on "Growth and cyclical asymmetries in France, Germany and Italy", which was organised jointly by the Banque de France, the Bundesbank and Banca d'Italia. All remaining errors are the author's alone.

1 Measured by the total imports and exports of goods and services in relation to GDP: according to the national accounts and chain-linked to previous-year prices.

2 Possible positive and negative impacts resulting from this increasing internationalisation of production on the German economy, ie the trend towards a "bazaar economy", have been widely discussed in the past few years. See, for example, Sachverständigenrat (2004).

that these more recent developments, which strengthened in the 1990s, in particular, have also changed the major determinants of import demand in recent years. Despite the weak domestic economy and consumer demand at precisely that time, the 2003-05 period in Germany, in particular, was characterised by marked import demand – a trend which cannot be captured adequately using the traditional import demand equations.

In this context, this paper seeks both to examine changes in the importance of individual import determinants over time and to identify differences in the responsiveness of imports from euro-area partner countries (intra imports) and from non-euro-area countries (extra imports). The remainder of this paper is organised as follows. The next section summarises some recent relevant empirical studies. Section three discusses the traditional approach and our new estimation approach, while section four presents the results for total German import demand as well as intra and extra euro-area import demand. Section five, finally, concludes and emphasises the most important new results of this analysis.

2 How previous empirical studies explained German imports

Almost all recent empirical analyses estimate import demand as a cointegrating relationship between domestic imports, domestic economic activity and relative prices.[3] To do so, most current studies use single-equation error-correction models, allowing them to map reactions in the long and short run.[4]

The studies show that there is usually a positive dependence between import demand and domestic real income. As incomes increase, there is demand for more products. Since a consumer's utility also rises in line with the number of different products, consumer demand extends not only to domestic, but also to foreign goods.

[3] Since the 1970s, changes in the volume of imports have been explained using demand variables and relative prices and sometimes also by considering domestic and foreign prices as well as exchange rate movements separately. For more detail, see, for example, Sawyer and Sprinkle (1999).

[4] Meurers (2004) goes beyond this simple approach and formulates a structural error-correction model with a simultaneous supply and demand system. In principle, it confirms the results obtained using the simpler methods of analysis, e.g. concerning the low price elasticity of imports; however it receives a coefficient of close to 1 for the responsiveness of import demand to domestic industrial output. Camarero and Tamarit (2004), *inter alia*, resort to a panel cointegration estimation approach to analyse several countries simultaneously.

The latter could therefore be considered "imperfect substitutes" of domestic goods.[5] Real import demand (m) is thus positively dependent on the domestic activity variables (y). In the following, all lower-case abbreviations represent variables transformed by logarithms.

In addition, the demand for imports or the (imperfect) substitution of domestic products by foreign products is influenced by the price competitiveness of the foreign goods on the domestic market. In general, relative prices (expressed in the domestic currency) are used to explain real imports: ie the price of the imported goods (p^m) is expressed in terms of the price of the corresponding domestic products (p^d). The price attractiveness of foreign goods rises if the domestic currency appreciates and if import price increases remain relatively low; by contrast, it falls if the domestic price increase is relatively low.[6]

As a result, the following log-linear aggregate function of import demand is mostly used in the regression analyses as follows:[7]

$$m = \beta_0 + \beta_1 y - \beta_2 (p^m - p^d), \qquad \text{where } \beta_1 > 0, \beta_2 > 0. \tag{1}$$

Since this is a log-linear equation, the coefficients can be interpreted directly as demand elasticities with regard to output and prices.

Table 1 provides a summary of the results obtained by some recent relevant studies on the reaction of import demand in Germany. In these studies, the ***price elasticity*** of German import demand is frequently insignificant and comparatively low. Comparative international studies show that such low responsiveness of imports to price movements is particularly prevalent in France and Germany.[8] These studies mostly use the log-linear relationship of import prices to the price of domestic goods, measured either in terms of producer prices (Clostermann, 1996; Fischer, 1995), the GDP deflator (Senhadji, 1998; Hooper et al, 1998) or consumer prices (Meurers, 2004). In theory, it is

---

5 For the theoretical derivation of the imperfect import substitute model, see, among others, Sawyer and Sprinkle (1999, p 6 et seq) and Goldstein and Khan (1985, p 1044 et seq).

6 Price and cost trends are relatively favourable in Germany compared to other euro-area and non-euro-area countries alike.

7 See, for example, Meurers (2004, p 533) and Deutsche Bundesbank (1997, p 55).

8 See, for example, Hooper et al (1998).

plausible to use the producer price index as an indicator of domestic prices that captures the production costs of tradable goods. Clostermann (1996) carries out the estimations using the ratio of import prices to both the GDP deflator and domestic producer prices and obtains very similar results. To compare price responsiveness in the import and export estimation, Strauss (2003) uses the real external value as a price variable. In contrast to an index of relative prices, using this type of variable assumes complete exchange rate pass-through, as each exchange rate movement causes a symmetrical change in the determinants.[9]

Table 1: More recent studies on the estimation of German import demand

Study	Estimation period	Long-run coefficient ε^D	ε^P
Strauss (2003)[1]	1976-1999	1.6	0.3[a]
Barrell and te Velde (2002)	1970-1995	2.2	[-1.3]
Hooper et al (1998) [1]	1970-1996	1.5	[-0.1]
Senhadji (1998) [1]	1960-1993	2.7	[-0.2]
Clostermann (1996) [2]	1975-1995	1.9	-0.2
Fischer (1995) [2]	1970-1994	1.6	-0.2

ε^D denotes income elasticity of import demand, ε^P price elasticity.

1 Imports comprise imports of goods and services as defined in the national accounts.

2 Imports comprise imported goods as defined in the trade statistics.

a Coefficient relates to the real external value.

Coefficients in square brackets are insignificant.

Source: Meurers (2004), additions by the author.

Strauss (2003), Clostermann (1996) and Fischer (1995) identify significant, albeit weak, price responsiveness in imports.[10] In many studies, however, the price variable is not significant. Overall, the choice of indicator does not appear to have a systematic influence on the significance of the results. With regard to exports, one argument for low price elasticity is the high quality of German products. By contrast, imports of intermediate goods, in particular, which accounted for 30% of imports in 2004, are

9 Strauss (2004, p 183) points to the problem that the real external value can only capture the actual price elasticity of export and import demand in the case of complete pass-through of exchange rate and cost changes. Otherwise, the estimated exchange rate elasticity underestimates the price elasticity of demand.

generally regarded as relatively price-sensitive, as cost is seen as one key motive for outsourcing. Yet, here too, a certain sluggishness to adjust is conceivable, owing to fixed supply patterns and the division of production processes within a multinational organisation. In addition, a further 32% of imports comprises capital goods; here, the quality argument is likely to be at the forefront (see also Fischer, 1995, p 437). The volume of energy imports (a 9% share of import values in 2004) also responds only slightly to price changes, owing to Germany's dependency on high net energy imports with little possibility of domestic substitution.

The empirical analyses also consistently indicate significant positive income elasticities for import demand that are perceptibly greater than 1. Most studies use aggregate demand (ie the sum of an economy's domestic demand and exports) as a variable for economic activity.[11] To explain why imports expand, on average, more rapidly than domestic income, Strauss (2000), among others, points to increasing liberalisation of trade in goods, ongoing international division of labour and the growing significance of intra-industry trade. The identified level of import income elasticity, which was perceptibly above 2 in certain estimations, is criticised by some. It is true that aggregate global import growth is currently outpacing that of global GDP. And some authors, such as Barrell and Dées (2005), caution that, were long-run import income elasticity to remain entrenched at such an elevated level, income would be spent entirely on purchases of foreign (intermediate and finished) products. Meanwhile, other authors conjecture that the traditional import demand function fails to capture current developments adequately.

Hence, more recent literature attempts to incorporate ***liberalisation or internationalisation*** variables in the estimation equation that capture the rapidly expanding intensity of global trade or the internationalisation of production, which may be behind the seemingly excessive level of import income elasticity. Such a liberalisation or integration variable should arrive at its maximum before the volume of aggregated world imports has reached that of world output (see Barrell and Dées, 2005). Such approaches have also been used to explain German imports. To do so, Strauss

---

[10] In this instance, the sign of the coefficient should be negative when referring to the relationship between import prices and domestic prices and positive when referring to the real external value.

[11] Clostermann (1996) and Hooper et al (1998) instead model import demand as a function of GDP.

(2003) uses a benchmark for ***the intensity of global trade***. While its influence is significant and increased during the 1990s (as a second restricted estimation shows), it is nevertheless accompanied by an import income elasticity of just over 1.6. A variety of studies have analysed the impact of ***foreign direct investment (FDI) stocks***[12] on imports. Barrell and Dées (2005) analyse the impact of the ratio of FDI stocks to GDP in a cross-country panel analysis. They demonstrate that inflows and outflows of FDI both have significant positive effects on imports. Including the FDI variables, however, does not cause the high level of import income elasticity to drop in comparison with a control estimation without FDI variables. In addition, the results are not consistent or significant with regard to German import demand.[13] Thus, the internationalisation variables that have been tested up to now are not sufficient to explain the phenomena behind the high income elasticity of imports.

A look at the **short-run elasticities** of these studies also reveals the dominant impact of the demand variables in explaining import demand. By contrast, imports either react sluggishly (ie only in the long-run, but not in the short-run), or not at all, to price or exchange rate movements. Altogether, the elimination of imbalances arising in Strauss' import model (2003) takes a long time. In addition, Fischer (1995) observes short-run over-reactions. Overall, however, there is a unanimous consensus in the studies indicating a strong dependency on economic fluctuations in the short-run, since the short-run coefficient of the demand variables is high.

Hooper et al (1998) and Deutsche Bundesbank (1998a) have estimated **regionally disaggregated import demand functions** for Germany. Both analyses demonstrate that price elasticity is slightly lower with regard to import demand from non-EU countries.

---

12 Since import demand functions are usually estimated quarterly, FDI activities must be approximately assigned to the individual quarters. Barrell and Dées (2005) do this using quarterly FDI flow data.

13 Barrell and te Velde (2002) demonstrate that, for Europe, FDI indicators can take the place of internal market proxies, making it possible to reach general conclusions about relocation and outsourcing as factors driving imports. For the period prior to 1986, their estimations of the demand for German imports do, in fact, indicate a positive influence; since 1986 however, they show a negative relationship between German direct investment abroad and German imports. In their findings, Camarero and Tamarit (2004) conclude that FDI does not have a significant impact when it comes to explaining German imports.

Whereas the price sensitivity of both import aggregates is significant in the latter study, this was not the case, however, for Hooper et al (1998).[14]

3 Expanding the traditional estimation approach: focusing on the different demand components

This study will examine Germany's real imports of goods (m_r) from region r (data from the foreign trade statistics, deflated by the respective regional import prices[15]). In addition to the overall perspective, our analysis will focus separately on imports from euro-area countries (intra imports) and from non-euro-area countries (extra imports).

As is common practice in the literature, we shall start, in the most general specification, with one domestic activity variable and one price variable to explain real import demand in Germany. Accordingly, in a first specification, we shall use real aggregate demand (y) as a determinant of German demand for foreign goods as in equation (1). Alongside this, we will test two further approaches which break down aggregate demand into its demand components, the effects of which are to be captured separately. This breaks new ground compared to the traditional demand variables in the import equation, which merely draws on aggregate demand or GDP, as used by Clostermann (1996), Hooper et al (1998) and Strauss (2003), for example. The background for using a disaggregated analysis[16] is, in particular, that import demand in the German economy is driven by a steady rise in intermediate goods that are imported for German manufacturing. This is likely to be visible to varying degrees in the individual components of aggregate demand.

On the one hand, this means including real (autonomous) domestic demand (y^d) in specifiation (2). On the other, we will also analyse foreign demand for German products, which is accompanied by a considerable need for imported intermediate

14 However, Hooper et al (1998) identify significant price dependency of German imports from France, which were also analysed.

15 The price index of imports from euro-area partners includes, from 2000, the current 11 euro-area countries (excluding Germany) and, before 2000, the EU/EC countries in their respective borders. Accordingly, the prices of imports from third countries contain non-euro-area countries from 2000 and, prior to 2000, the non-EU/non-EC countries in their respective borders.

goods, as a separate determinant in this second specification. According to the calculations by the Federal Statistical Office (Statistisches Bundesamt, 2004) based on the input-output analysis, the import content of exports of goods and services was 38.1% in 2000. It was perceptibly higher than the import content of German aggregate demand, which, according to the national accounts, was only 24.8% in the same year. The import content of exports increased in the 1990s, in particular; it stood at just 26.7% in 1991, more than 11 points below the 2000 level. By contrast, the import content in aggregate demand, at 20.7%, was only just over 4 percentage points below the 2000 figure. This, too, confirms that the separate analysis of the period from 1993 onwards is of particular interest, in order to derive significant globalisation effects which may affect the individual determinants in different ways.

Table 2: Breaking down aggregated demand into disaggregated determinants

Specification	(1)	(2)	(3)
Aggregate demand (y)	X		
Domestic demand (y^d)		X	
Consumption (y_C^d)			X
Gross capital formation (y_I^d)			X
Exports (x)		X	X

Finally, in specification (3), we analyse consumption (y_C^d) and gross capital formation (y_I^d) in addition to exports (x). Owing to high demand for metal, iron and steel products in a large proportion of capital goods output, the latter is likely to be more dependent on imported intermediate goods than the production of consumer goods, which may be reflected by a higher corresponding marginal propensity to import.

Moreover, in line with standard practice in the literature, we will – in each specification – analyse the impact of the ratio of the price of foreign goods imported from region r to that of domestic goods ($p_r^m - p^d$), ie the price competitiveness of

[16] A similar procedure has been applied in the very recent analysis by Stephan (2006), which indicates that aggregation problems in the explanatory variables might be responsible for the low price elasticity of imports.

goods imported from region r compared with domestic goods (p^d). If foreign goods become cheaper in relation to domestic goods (in other words, if the relative price indicator drops), then, *ceteris paribus*, a rise in the demand for imports may be expected. The price competitiveness trend (or price attractiveness of imported goods) between 1980 and 2004 shows that imported goods have become cheaper, relatively speaking. In this connection, the relative price of non-euro-area goods fluctuates more as, in addition to inflation differentials, the euro's exchange rate is continuously volatile against the currencies of the non-euro-area – a non-existent phenomenon in EMU.

This analysis is based on economic activity in West Germany up to 1990 followed by Germany as a whole. All economic variables are seasonally adjusted and input into the estimation equation in logarithmic form. [17]

The determinants of German imports are estimated on a quarterly basis for the 1980-2004 period (long period/long sample: "LP"). This should make our results more or less comparable with those from the studies in table 1, most of which start somewhat earlier, but end in the mid to late 1990s. In addition, we also analyse the 1993-2004 period (short period/short sample: "SP"), since we may assume that this period was unaffected by the structural changes which occurred in the early 1990s. Owing to German reunification and the completion of the single market, allowances must be made for structural breaks in the data series in the first quarters of 1991 and 1993.[18] Analysing a long period and a short period separately enables us to determine whether changes in the external framework, particularly over the last 15 years, have had different effects on the pattern of import demand from German producers and consumers in a short sample and over a long estimation period.[19] Strauss (2003), who

---

17 The (seasonally adjusted) special trade or national accounts data (on the basis of fixed prices, base 1995=100) from mid-July 2005 are used for this purpose.

18 Since 1991, foreign trade data and the national accounts have been compiled for the whole of Germany. Since 1993, data on foreign trade with EU countries has been obtained using the Intrastat data collection method, on the basis of corporate surveys. Changes such as this are subject to statistical and methodological effects (see Deutsche Bundesbank, 2005, p 30) which, in both 1993 and 2004 respectively, manifested themselves in an underrecording of foreign trade and thus a downward shift in imports.

19 In theory, observing a long period of 25 years, or 100 quarters, provides more efficient results than simply looking at a short period of 12 years, or 48 quarters, if any structural breaks are adequately modelled and do not distort the coefficients. Hence, we elected to not to carry out an additional small sample analysis of the 1980-1992 period. The disadvantage of this is that we are comparing two

analyses the most recent period (1976-1999) of all the studies summarised in table 1, manages to take account of structural breaks by incorporating a series of dummies. However, not all the stability properties of his estimation are satisfactory, and the *ex post* forecast shows a growing underestimation of imports since 1995. The extended estimation period, until 2004, allows us to carry out separate estimations for the current end.

All variables in levels are non-stationary, while we might assume that their first difference usually is stationary (see presentation in annex A). The optimal lag length for the cointegration test was determined on the basis of the Akaike (AIC) or Hannan-Quinn information criteria in an unrestricted multivariate VAR model.[20] If residuals in the corresponding VEC model are not normally distributed or, in particular, are autocorrelated, additional lags have been incorporated in the specification.

The cointegration tests (see table A3 in the annex) confirm a rank of 1 for most specifications at the 5% level.[21] The only exception is the short sample analysis of specification (1); this, however, may also be due to the small number of observations. As a result, the analysis of import demand consistently uses a single-equation error correction model.

The estimation of the long and short-run impact of the determinants on German imports takes the following form. Taking specification (1) as an example

$$\Delta m_{r,t} = \alpha \cdot (m_{r,t-1} - \beta_0 - \beta_1 y_{t-1} - \beta_2 (p_r^m - p^d)_{t-1} - \beta_3 d_{\tau-1})$$

(long-run relationship)

$$+ \gamma \Delta d_\tau + \sum_{i=1} \lambda_i \Delta m_{r,t-i} + \sum_{j=0} \mu_j \Delta y_{t-j} + \sum_{k=0} \varpi_k \Delta (p_r^m - p^d)_{t-k} + s_t . \quad (1')$$

(short-run impact)

---

overlapping periods, which hampers the analyses of the significance of differences. In addition, since we are confronted with stronger growth in imports – as well as exports – than in capital and consumer goods demand, there is a greater propensity to import, even if the estimates do not contain a matching rise in responsiveness (ie in the respective coefficient).

20 The optimal lag length, t, for the VAR model causes t-1 lags in the error correction model.

21 Owing to the deterministic component, which is included in all three long-run equations as a level dummy for the first quarter of 1993, the p-values recorded are only approximately valid.

where β_0 is a constant, d_τ a dummy variable which takes the value 0 prior to time τ (τ=1991, 1993) and 1 otherwise, Δ denotes the difference of the logarithmic system variables or of the level dummy, and s denotes the residuum from the estimation equation (1).

For a systematic analysis of how import demand adjusts to the long-run equilibrium, it is important in this context to consider possible endogeneity of the determinants (see Strauss, 2003). To verify the required condition of "weak exogeneity" in the explanatory variables by a general approach, global Wald tests have first been conducted on the insignificance of the loading coefficients of all cointegration equations, except that for Δm, in a preliminary VECM estimate. For a number of specifications, these indicate a potential endogeneity problem (see tables A3 and A4). With respect to many specific combinations, however, the Johansen test does not detect a significant stationary linear combination between one of the explanatory variables and the other model variables, which should indicate these explanatory variables' weak exogeneity. Clearly non-weakly exogenous determinants are summarised in tables A3 and A4 in the annex. On balance, however, the analysis and the indicative value of the Johansen test over the long run are affected by the structural break in the early 1990s and, particularly in the short term, by the small number of observations, and the, in some cases, large number of determinants. Hence it is generally important to check the robustness of the long-run coefficients in all specifications. In cases where the Johansen test clearly indicates a significant cointegrating relationship between one explanatory variable and the other model variables, when modelling the short-run relationship, a restriction is imposed whereby values for real imports (or the other explanatory variables) and the variables not identified as "weakly exogenous" should not be input in the estimation equation at the same time or with contemporaneous lags. This applies especially to real exports and relative prices. The price variable is generally not significant as a short-run determinant, so, despite the test results, endogeneity problems are unlikely to bias the results.

4 Estimation results

4.1 Analysis of Germany's total import demand

For both periods, the single-equation error-correction model is estimated on the basis of a simultaneous least-squares estimation of the long-run equilibrium relationship (being estimated in a non-linear form) and the short-run adjustment, consistent with Stock (1987). This one-step estimation approach may be used to minimise the negative effects of small samples which, when estimating the short 1993-2004 period, might distort the long-run regression coefficients.[22] However, when employing this method, particular attention must be paid to the sensitivity of the estimation results in the event of multicollinear regressors (see Gerdesmeier, 1996, p 25).

In line with the optimum identified lag lengths, lagged values for the explanatory variables are input in the general starting equation and the insignificant lags eliminated step-by-step ("general-to-specific approach"). Conducting one global Wald test for all eliminated variables shows that the coefficients of the eliminated lags are not significantly different from 0.

The coefficients prove to be fairly robust. Only specification (3) reacts sensitively to the input or elimination of contemporaneous lags of variables, which is attributable not least to the high number of disaggregated regressors and – as shown above – of regressors that are not clearly "weakly exogenous". The results of specification (3) should therefore be interpreted with caution.[23] However, additional robustness estimations – estimation of the long-run relationship using the Engle-Granger approach (1987)[24] – show a high, sometimes very high, similarity with the long-run coefficients from the Stock approach for all three specifications.[25]

---

[22] Kim (1994) demonstrates that these distortions can be considerable in an estimation with 50 observations.

[23] According to the above procedure, no contemporaneous values were input for the import and export variables – in the long time period – in specification (3), in order to avoid endogeneity problems. In addition, only lags for the potentially endogenous export variable were input in the short-run relationship. In specification (3), this meant that only the 4th lag of exports could be input in place of the contemporaneous exports. On balance, the results from specification (3) are not reliable – this particularly applies to the long-run consumption variable, which was still insignificant in the general starting equation.

[24] The robustness of the long-run relationship's coefficients can be verified using the Engle-Granger (1987) estimator. Following the Engle-Granger approach, the long and short-run relationship are

A significance level of 10% is judged sufficient for including a term in the final equation; generally, however, the short-run terms are significant at the 5% – and most at the 1% – level (see table B1 in the annex). The adjusted determination coefficients are between 0.37 and 0.70 and even between 0.59 and 0.70 in the short sample. The Breusch-Godfrey LM tests confirm that the residuals are free of serial autocorrelation up to the fourth order. The White tests provide evidence of homoscedasticity and the Jarque-Bera tests – except for specification (1) for the short sample – show that the residuals are normally distributed.

Chow tests are used to verify whether there are, in fact, significant changes in the long- or short-run relationship – *inter alia* owing to the change in the statistical methodology for recording foreign trade in the first quarter of 1991 and 1993 (see footnote 17) – and whether these could, if necessary, be modelled adequately by step or impulse dummies. Without the inclusion of dummies, there would be significant structural breaks in all three estimation specifications for the 1980-2004 period. Step dummies, which capture the shifts or alterations in the long-run relationship, do not help to improve the specifications. By contrast, impulse dummies are incorporated in all specifications. 0/1 variables for the first quarter of 1991 also make a major contribution to explaining the evolution of imports, but the inclusion of an 0/1 variable for the first quarter of 1993 is superior and seems to sufficiently capture the effects of the structural break in the early 1990s. For specifications (2) and (3), though not (1), the Chow test shows that the structural break has been modelled adequately. However, additional separate estimations for the time since 1980 (LP) and the current end from 1993 onwards (SP) are suitable for modelling the change at the current end, where our

estimated in two steps, thus reaching a super-consistent estimation of the long-run coefficients that is also robust to autocorrelation and the endogeneity of the explanatory variables. The results of the estimated long-run coefficients are shown in table B2 in the annex. A dynamic OLS estimation incorporating leads and lags consistent with Saikkonen (1991) would have been another possible approach which takes into account endogeneity and serial correlation and leads to efficient long-run coefficients. However, this estimation is only asymptotically efficient if it uses a sufficient number of observations.

[25] The development of the long-run domestic demand coefficient (in specification 2) is the only inconsistency between the two estimation approaches. The Engle-Granger method implies greater intensification of the propensity to purchase from abroad at the current end than was found using the Stock approach.

particular interest lies, and for eliminating any potential distortion of the estimation results.[26]

The loading parameter is significant and negative in all the estimations, which confirms the long-run equilibrium relationship already identified in the cointegration tests. The average speed of adjustment is generally greater in the short sample than the long sample.

4.1.1 Analysis of the disaggregated demand components as import determinants

The estimations of the determinants of German imports from 1980 to 2004 using specification (1) largely return results similar to those obtained by estimations in other current studies. The long-run elasticity of imports in relation to ***aggregate demand*** is high and even exceeds 2 (see table 3), but this is in line with previous estimation results (see table 1). Hence, our estimations also reflect the increasing internationalisation of German production and the fact that foreign goods are expanding the range of consumer goods offered in Germany (see Bundesbank, 1997, p 50).

Calculating the estimated marginal import share in average aggregate demand over the estimation period[27] gives an entirely plausible value of 0.35. This value means that 35% of an additional unit of aggregate demand in Germany would have been met by imports on average over the 1980-2004 period. In the short estimation period beginning in 1993, the long-run income elasticity of imports is somewhat stronger still, which is accompanied by a correspondingly higher marginal import propensity of 0.45. This reflects the high proportion of imports and the increasing long-run significance of imported intermediate goods in German production. This aggregate estimation does not identify which effects are dominant or which explain the rise in import elasticity over time; however, this will be discussed below.

---

[26] Strauss (2003) has already recommended reducing the estimation period to the time after the establishment of the internal market once a sufficient number of observations are available. With 48 observations up to 2004, it is now possible to proceed in this direction.

[27] The rise in the average import value, according to the respective estimated coefficient with a 1% rise in aggregate demand, was measured in relation to the 1% rise in the average value of aggregate demand during the period under review. The marginal import contents of the different demand components are calculated in the same way for the respective components' averages of both time periods analysed.

Table 3: Responsiveness of German demand for imports to changes in demand components

Specification	(1)		(2)		(3)	
	LP	SP	LP	SP	LP	SP
Elasticity of imports with regard to the demand components						
Aggregate demand	2.05	2.37				
Domestic demand			1.59	1.46		
Consumption					0.93	0.64
Gross capital formation					0.52	0.49
Exports			0.55	0.61	0.60	0.72
Marginal import share in the demand components (on an average of the estimation period)						
Aggregate demand	0.35	0.45				
Domestic demand			0.34	0.37		
Consumption					0.25	0.21
Gross capital formation					0.50	0.57
Exports			0.46	0.54	0.51	0.64

The marginal import shares (of an additional unit of demand) were calculated using the average value for the individual demand components in the respective period under review.

All coefficients are significant.

In order to justify the use of disaggregated demand components in the explanation of German import demand, we estimate an additional specification by enhancing the long-run relationship as follows:

$$\Delta m_{r,t} = \alpha \cdot (m_{r,t-1} - \beta_0 - \beta_1 y_{t-1} - \sum_i \beta_{1i}(y_{i,t-1} - y_{t-1})$$

$$- \beta_2 (p_r^m - p^d)_{t-1} - \beta_3 d_{\tau-1}) \ . \qquad (1'')$$

This allows us to identify ***structural effects*** caused by a shift in the weight of the different components. $(y_i - y)$ refers to the time-varying shares of the different components (y^d) and (x) or (y_C^d), (y_I^d), and (x) in total demand (y), since all variables are taken in logarithmic form. For both combinations of disaggregating total demand into its components (used in specification 2 and 3 below), the coefficients of the included time-varying demand component shares are highly significant for the 1993-2004 period and thus demonstrate their autonomous influence.

Table 4: Reagibility of German import demand due to structural changes

Combination of demand component shares referring to specification	(2)		(3)	
	LP	SP	LP	SP
Elasticity of imports				
Aggregate demand	1.75	1.91	1.69	1.81
Share of … in total demand				
domestic demand	[-0.43]	1.78		
investment			[-0.06]	0.39
consumption			[-0.50]	[0.77]
exports	[0.12]	0.78	[0.14]	0.70
% change in imports				
Case a	1.8	1.9	1.7	1.8
Case b	2.7	3.0	2.8	3.2
Case c	1.5	1.7	1.5	1.5
Case d	1.1	1.3	1.3	1.7

Case a: 1% increase in total demand, proportional increase in all components.

Case b: 1% increase in total demand, induced by increase in exports.

Case c: 1% increase in total demand, induced by increase in domestic demand (proportional increase in investment and consumption).

Case d: No change in total demand, increase in exports at the extent of 1% of total demand, decrease in domestic demand to same extent (proportional decrease in investment and consumption).

Coefficients in square brackets are insignificant.

Table 4 presents the estimated coefficients[28] and the resultant import reagibility due to different scenarios of structural changes.[29] Given a proportional change in all demand components (case a), import reagibility is just equal to β_1. β_1 in estimation (1''), however, is now slightly lower (and even below 2) than it is in estimation (1'). If a 1% increase in total demand is induced by export growth only (case 2), imports react (with an elasticity of 3.0 or 3.2 in the 1993-2004 period depending on the combination of disaggregation) about twice as strongly as if demand growth were solely driven by domestic demand (case 3). Though the coefficients β_{1i} in the estimation for the 1980-2004 period are not significant, the results are more or less comparable with a just slightly lower reagibility of imports over the long period than over the short period in all

[28] Detailed results are available upon request.

[29] The percentage change in import demand is calculated according to the formula $dm = \beta_1 dy + \sum_i \beta_{1i} d(y_i - y)$, which directly results from a reformulation of the log-linear aggregate function of import demand given in (1).

scenarios.[30] A structural shift in total demand caused by an increasing importance of exports relative to domestic demand results in a growing reagibility of imports (case 4) even though total demand stagnates. A rising weight of domestic demand in total demand, however, would accordingly cause the reagibility of imports to decline.

The impact of structural shifts is obviously important in the 1993-2004 period, but is not captured in specification (1) used above. We thus might conclude that the inclusion of aggregate demand only is not sufficient and that significant structural effects imply the use of disaggregate demand components as import determinants in the following, at least in the explanation of German import demand in recent years.

Disaggregated specification (2) shows that the income component "***domestic demand***" has a clear long-run influence on the demand for imports. The elasticity is 1.59 in the long and 1.46 in the short estimation period. For domestic demand, this results in a marginal propensity to import for the two periods of 0.34 and 0.37 respectively. Whereas the marginal import share in domestic demand thus still corresponds with that of aggregate demand from specification (1) in the long period, that is no longer the case in the short sample. It appears that, in the recent past, components other than domestic demand were largely responsible for driving up the import content of aggregate demand.[31]

The influence of ***export demand***, which is now explicitly modelled in this specification, is highly significant. The elasticity of imports with regard to foreign demand for German products was 0.55 in the 1980-2004 period and is slightly higher in the 1993-2004 period, at 0.61. The marginal import share in this demand component has risen, on average, from 0.46 to 0.54 since 1993. This result indicates the growing importance of imported intermediate goods for export production over time.

---

30 In addition, estimating equation (2'') either with export shares or domestic demand shares instead of estimating both shares similarly and recalculating import reagibility due to the different scenarios of structural changes gives very similar degrees of reagibility. Thus, estimation results are robust.

31 As already mentioned, the Engle-Granger approach (unlike the Stock approach) points to somewhat greater responsiveness of imports to changes in domestic demand in the shorter period (coupled with the rise in the corresponding propensity to purchase from abroad from 0.37 to 0.45 instead of 0.34 to 0.37). However, this slight increase is not confirmed by the impression imparted by specification (3), either.

The results of specification (3) are – as mentioned earlier – to be interpreted with caution; nevertheless, they appear plausible.[32] The elasticity of imports with regard to ***consumer demand*** is initially higher than that regarding ***demand for capital goods*** (see table 3). However, owing to a higher absolute value for consumption, the marginal propensity to import for this component is markedly lower. Accordingly, the marginal import share with respect to consumer goods appears to amount to 0.25 (0.50 for capital goods) for the period since 1980. This reflects the preponderance of imported intermediate goods in capital goods production compared to consumer goods production. At the current end, the (marginal) import content of investment is apparently rising slightly, whereas that of consumption is falling a little. Using these estimations, then, we are unable to confirm the hypothesis that the range of consumer goods has increased further in recent years owing to an influx of foreign goods.

The elasticity of imports with regard to the ***demand for exports*** is now slightly higher than according to specification (2), which means that marginal import shares are also higher. In this context, it is important to note that they exceed those for the two domestic demand components. In addition, the marginal propensity to import in the period since 1993 is noticeably stronger than in the previous period. In terms of the production of export goods, therefore, imported intermediate goods seem to be most important, and this importance is growing.

The estimation results show that the analysed demand components – aggregate demand (1), domestic demand and exports (2) as well as consumption, gross capital formation and exports (3) – also had a significant influence in the ***short run***. Hence, we can confirm that there is a – sometimes marked – dependency between import demand and economic fluctuations.

In the short sample, the short-run coefficient for domestic demand in specification (2) is actually higher than the long-run coefficient. In line with Fischer (1995), we therefore detect a short-run overreaction in the simulations carried out in the event of a

[32] The recent analysis by Stephan (2006), which studies the cointegrating relationship between imports, gross fixed capital formation, exports and relative prices, finds comparable results for the import elasticity of export demand (0.75) and of investments (0.39) for the 1975-2003 period – while the price elasticity discussed below turns out to be higher than in our analysis.

demand shock (see table C1 and figure C1 in the annex). One possible economic interpretation of these temporary spikes in import demand following an expansion in domestic demand could be connected with a certain lag regarding the expansion of domestic production or the increased build-up of inventories at its outset. The new long-run equilibrium reached after a 10% rise in domestic demand is clearly higher and, for the 1993-2004 estimation period, only somewhat lower than for the 1980-2004 sample. However, the adjustment process can only be described as slow, taking just under two years in the short sample and three years in the long sample, according to the simulations.

While the short-run coefficient for export demand is slightly lower than the long-run coefficient, it is nevertheless fairly high in the estimation of the short sample. Accordingly, adjustment to the new equilibrium following an export shock in the simulation for the period from 1993 onwards is also particularly rapid and extensive (see figure C2). The long-run equilibrium is almost reached after just two quarters.

The analysis of the sums of the simple and squared residuals using the ***CUSUM test*** shows that – with the exception of specification (3), which appears fairly convincing for both periods – the estimation for the more recent period captures economic relationships better. All the specifications exhibit small, but not clearly significant, temporary misspecifications or slight parameter instabilities in the late 1990s. However, the one-step forecast errors that result from the recursive estimates do indicate quite good forecast characteristics for all specifications in the more recent period; the residuals only fall outside the 95% confidence interval for a very small number of quarters.

Even though specification (3) yields plausible results and the AIC value shows that it is superior in the short estimation period, we will use specification (2) for further interpretation, especially interpretation of price elasticity and the analysis of imports by region, as specification (3) is highly sensitive to the inclusion of the various short-run determinants.

4.1.2 Analysis of price dependency

In line with a number of other recent studies, most of our estimations also yield a price variable that is statistically insignificant. However, the analysis shows that import demand generally reacts positively to a fall in the price of imported goods relative to domestic products. In addition, price responsiveness actually increases over time, though (at a statistical significance level of 0.12) it remains insignificant. Yet, owing to the reduced exchange rate volatility or volatility of the relative prices under review in the 1993-2004 period, this does not imply, however, that the relevance of price movements as a determinant of import demand has increased.[33]

Higher import price sensitivity at the current end is also reflected in a stronger reaction to a price shock (modelled here equally strongly for both periods), corresponding to the simulation results presented in the annex (see figure C3). In the analysis of short-run relationships, the price variable is generally insignificant, irrespective of how the import equation is formulated. This indicates slow price reactions which take effect, if at all, only in the long run. We thus confirm the results of most other more recent studies. Nevertheless, the new equilibrium is broadly reached after just a few quarters, not least owing to the weak responsiveness of imports to price changes.

Overall, the estimation results are robust when using different indicators for the relative competitiveness of imported goods (see tables 5 and B3 in the annex). As well as the consistently presented and theoretically plausible[34] relative price between imports and domestic products (specification 2), the relationship between import prices and the domestic GDP deflator (specification 2') as well as the indicator, calculated by the Bundesbank, of the German economy's price competitiveness compared to 19 major trading partners[35] (specification 2'') are also used as alternatives. Looking at the post-1993 period, the price indicator based on the domestic GDP deflator is significant,

---

33 Specifications (1) and (3) also confirm, in principle, the direction of impact of price changes. In specification (3), the price responsiveness of imports in the short period is actually significant, while elasticity corresponds to that of specification (2).

34 In contrast to the indicator of domestic producer prices, the total sales deflator and the GDP deflator also include prices of non-tradables, which should not be included in a measure of international price competitiveness (see Clostermann, 1996, p 25 et seq).

35 This indicator of the price competitiveness of the German economy compared to 19 industrial countries, based on the total sales deflators, is a good indicator of real external value from a German

unlike that based on domestic producer prices, while the coefficients are similar in size. In addition, the former also has lower values for the Akaike and Schwarz information criteria. This indicator now seems to confirm that aggregate imports, in fact, react more strongly to prices at the current end, with, at the same time, higher constancy of relative prices than prior to 1993.

Table 5: Price responsiveness of German import demand (Specification 2)

	Estimation Period	Long-run coefficient ε^D	ε^X	ε^P
Aggregate imports	1980-2004	1.59	0.55	[-0.04]
	1980-2004	1.72	0.53	[0.06][a]
	1980-2004	1.53	0.59	[0.14][b]
	1993-2004	1.46	0.61	[-0.28]
	1993-2004	1.29	0.63	-0.26[a]
	1993-2004	1.34	0.67	[0.20][b]
	1995-2004	1.32	0.63	[-0.24]
Imports excluding energy	1995-2004	1.54	0.65	[-0.27]

ε^D donates elasticity of domestic demand, ε^X elasticity of export demand, ε^P price elasticity.

[a] Relative price indicator based on the domestic GDP deflator.

[b] Indicator of the price competitiveness of the German economy relative to 19 other major trading partners based on deflators of total sales.

Coefficients in square brackets are insignificant.

One argument for the fact that the estimations explaining German aggregate imports frequently found the price variables to be insignificant points to the high proportion of price inelastic commodity groups in German imports. Meier (1998) deals with this aggregation problem and models German import demand at the sectoral level. For quite a number of sectors such as automobiles, chemical or textile industries, he finds that price elasticity is somewhat strong. Given that, for instance, energy imports (which cannot be substituted domestically and are thus relatively price-inelastic) are also subject to large price fluctuations, applying aggregated estimations might lower price elasticity in particular (see Strauss, 2000, p 30). Hence, we additionally analyse the determinants of non-energy imports. This would be particularly interesting for extra

perspective. It includes the costs of imported goods and services as well as the (unit) costs of the

imports,[36] which are additionally subject to more pronounced relative price changes owing to exchange rate fluctuations, yet this is complicated by a lack of available data. Nor is it possible to carry out an analysis over both time periods, as comparable energy imports have been recorded in the special trade statistics only since 1995.

The estimations indicate that the "real imports excluding energy"[37] aggregate reacts noticeably more strongly to changes in income than aggregate imports including energy (see tables 5 and B4 in the annex). The price responsiveness of non-energy imports is also slightly higher, though it remains insignificant. On balance, however, these estimations confirm that energy imports – originating for the most part from non-euro-area countries – are less dependent on changes in relative prices and, in particular, that they show less of a reaction to the development in income than imports excluding energy. All the same, the reduced price elasticity of energy imports evidently is not sufficient to explain the insignificance of price variables found by the estimation of aggregate imports.[38]

4.2 Analysis of German demand for imports by region

Taking account of the lag lengths that were identified as optimal, the cointegration tests for intra or extra import demand, domestic demand, exports and relative prices all show a cointegration rank of 1 (see table A4 in the annex). The tests are not, however, able to confirm weak exogeneity for all variables. It is again ensured, however, that non-weakly exogenous explanatory variables are only input into the modelled short-run relationship with a time lag, so that endogeneity problems do not bias the estimation specification. Given that relative prices are generally insignificant as short-run determinants (as they also are in the total import demand estimation), they do not adversely affect the specification. However, the short-run influence of domestic demand

---

value added in the whole domestic economy (see Deutsche Bundesbank, 1998b).

36 Energy imports accounted for almost 10 per cent of the value of aggregate imports in 2004. These come mainly from outside the euro area so, in nominal terms, energy imports probably constitute around one-seventh of nominal extra-imports at the current end.

37 Nominal imports excluding energy were deflated accordingly using the price index for imports excluding energy.

38 However, the further analysis of price reagibility of sectoral imports is a promising starting point for future research, especially combined with the investigation of intra and extra imports.

in the long estimation period and the influence of export demand on intra imports in the short sample must be modelled with caution.[39]

Once again, though, the long-run coefficients can be described as fairly robust. The results using the Stock method (table B5 in the annex) are, again, very close to those yielded by the Engle-Granger method (table B6), although the similarity is somewhat smaller than in the case of the aggregate estimations, where the coefficients are, in some cases, almost identical in size. In particular, the development of the coefficients over time is correspondingly uniform for both methods.

The Chow tests indicate a significant structural break in the early 1990s for both regionally-disaggregated estimations of the 1980-2004 period. When estimating intra imports, this break can be captured using a step dummy in the cointegrating relationship and an impulse dummy in the short-run relationship. For the first quarter of 1993, the coefficient of the step dummy is significantly negative, in line with statistical under-recording. When estimating extra imports, the Chow test is also highly significant for the first quarter of 1993, yet the significance tests do not confirm the inclusion of either the step dummy or the impulse dummy. This suggests that the determinants of extra-import demand undergo more fundamental changes over time than the determinants of intra-import demand.

Table 6 outlines the regionally disaggregated analysis of German imports. The detailed results in table B5 in the annex show that intra and extra imports are affected by economic fluctuations since, in principle, both observed demand components – exports and domestic demand – are also significant in the short run.

[39] Irrespective of the modelling of the short-run relationship, the long-run coefficients are generally extremely robust. The restriction mentioned above means that in explaining intra-imports in the short period, domestic demand, although highly significant, is not included in the estimation specification for the benefit of the non-weakly exogenous export variable. The decision to include "competing" short-run determinants is taken based on the AIC. Notwithstanding this general approach, contemporaneous domestic demand was included in the intra-import equation in the long sample, which substantially improved the white noise characteristics of the residuals. The long-run coefficients are, therefore, confirmed for all specifications of the robustness estimations. The consequence of this method, however, is that, for both intra-import regressions, the global Wald test for all variables eliminated from the general starting equation no longer confirms that the coefficients of the eliminated lags do not differ significantly from 0.

Table 6: Responsiveness of German intra and extra import demand

Specification (2)	Intra		Extra		Aggregation	
	LP	SP	LP	SP	LP	SP
Elasticity of imports in terms of the demand components						
Domestic demand	1.55	1.81	1.84	1.46		
Exports	0.34	0.38	0.62	0.71		
Marginal import share in the demand components (on an average of the estimation period)						
Domestic demand	0.14	0.19	0.22	0.22	0.37	0.41
Exports	0.13	0.14	0.30	0.37	0.43	0.51
Price elasticity of imports	-0.65	-1.29	[0.08]	[-0.23]		

The marginal import shares (of an additional unit of demand) were calculated using the average value for the individual demand components in the respective period under review. The aggregation of marginal import shares was conducted by totalling the individual components.

Coefficients in square brackets are insignificant.

The elasticity of imports as regards ***domestic demand*** is clearly higher than 1 for intra and extra imports alike. The average marginal import shares calculated are stronger for extra imports than for intra imports. However, in the post-1993 period they almost correspond to the (nominal) market share of both regions in German imports, or merely indicate responsiveness of euro-area imports to imports from third countries, which is slightly higher than the market share would suggest.[40] Elasticity of imports from non-euro-area countries fell in the analysis of the short sample; however, the marginal import content was comparable for both periods owing to the relatively strong increase in absolute imports at the current end. By contrast, the marginal propensity to import euro-area goods following a rise in domestic demand appears to have increased since 1993. It is apparent that intermediate imports for capital or consumer goods from neighbouring countries have risen of late. The aggregate propensity to import (goods of both economic areas) for domestic demand since 1993 is, however, still slightly above

A test estimation for intra-imports in the short sample permitting all short-run determinants does not, however, obtain forecast characteristics that are any better than those from the specification modelled here.

[40] From 1993 to 2004, 43.2% of imports originated from euro-area partner countries, while 56.8% came from third countries. Accordingly, the coefficients estimated for that period reflect the fact that, on average, just under 47% of imports induced by domestic demand are intra-imports and just over 53% are extra-imports.

that for the entire period and roughly corresponds to the estimation based on total imports.[41]

The simulations illustrate (see table C2 and figure C4 in the annex) that the increase in new equilibrium of the SP estimation following a 10% demand shock for intra and extra imports is similar in degree to the new equilibrium of the LP estimation. The speed of adjustment in the 1993-2004 period for both regional disaggregates – at four (extra imports) to six (intra imports) quarters – corresponds to that of total imports. However the pattern of adjustment is extremely heterogeneous. In the SP estimation, extra imports are initially subject to a pronounced ***short-run*** overreaction, comparable with that for aggregate imports. Hence, it appears extra imports react to fluctuations in domestic demand more strongly than intra imports.[42]

In contrast to its elasticity with regard to domestic demand, the responsiveness of imports to an increase in ***exports*** increases over time for imports of both areas. In line with the higher coefficient value, the marginal propensity to import also rises at the current end, regardless of the origin of the imports. Looking at export demand, it is interesting to note that the marginal import shares from the intra area are markedly lower than those from the extra area.[43] Thus, an increase in foreign demand for German products boosts imports from third countries more than imports from euro-area partner countries. A particularly likely explanation for this is the growth in imports of cheaply-produced intermediate goods from the extra area, which includes central and eastern European neighbours as well as Asian countries.

---

41 In this context, a combined estimate of intra and extra imports that is restricted to the overall aggregate would be the superior technique. However, we must then choose between a top-down (one disaggregate is the result of the estimation of the overall aggregate and the other disaggregate) and a bottom-up approach (the sum of both estimations of disaggregates yields the overall aggregate). Using the latter approach would require the disaggregates' estimations to be of a higher quality than the aggregate estimation.
However, the simple aggregation of the marginal import shares (given in Table 7, last column) already shows that the regionally disaggregated estimations roughly match the aggregate estimation.

42 To an extent, this is distorted by the parsimonious modelling which, in turn, means that the demand variables are not included as short-run determinants in the formulation of intra import demand since 1993. However, the identical modelling of the short-run demand functions for German imports from both economic areas for the purposes of comparison confirms the findings.

43 Thus, the coefficients estimated for that period indicate that, on average, just over 27% of marginal imports induced by additional export demand are intra imports and just under 73% are extra imports. In contrast to marginal imports induced by domestic demand, however, these shares do not broadly correspond to the proportions traded. Hence, it is reasonable to assume that extra-imports react more strongly to foreign demand shocks.

The simulation of how imports react to a 10% increase in foreign demand (see figure C5 in the annex) also shows that, in a long-run equilibrium, the increase in extra imports is twice as sharp as that of intra imports. The rate of adjustment to their new long-run equilibrium is similarly rapid for both disaggregates. In the ***short run***, however, intra imports are affected by an over-reaction. Initially, in the first quarter after a foreign demand shock, there is a sharp rise in imports from within the euro area, contrary to the reaction following a domestic demand shock.[44] This may be caused by a short-run spike in imports of finished or semi-finished goods from neighbouring countries.

The ***price variable*** is only significant for explaining intra imports and is perceptibly larger for intra trade than for extra trade. This is consistent with the results obtained by Hooper et al (1998) and Deutsche Bundesbank (1998a) in a comparison of German demand for EU and non-EU imported goods. High (price) competition within the euro area and systematic exploitation of arbitrage opportunities offered by monetary union may be behind the comparatively high price sensitivity of imports from euro-area partner countries. The price independence of extra imports may be due, in part, to the lower price elasticity of energy and commodity imports. In addition, the fixed supply patterns in multinational groups[45] and price-insensitive imports of high-quality intermediate goods may contribute to reduced price responsiveness. It should be noted, however, that the absolute influence of price changes outside the euro area is *per se* greater because the volatility of price determinants is higher, not least owing to more pronounced exchange rate fluctuations.

The price responsiveness of intra imports increases considerably at the current end. Figure C6 clearly shows the comparatively sharp (long-run) reaction of intra imports to a reduction in the price of imported goods in the short sample. By contrast,

---

44 This result is, however, partly influenced by the omission of the first difference of the export variable (which was not significant in the general starting equation) as a short-run determinant in the specification of extra-imports. Nevertheless, the sharper short-run reaction of intra-imports compared to extra-imports is confirmed by trialling an identical model for both import demand disaggregates.

45 In 2004, about 2/3 of consolidated German FDI stocks were invested outside the euro area. Though we might assume that the predominant motives for German FDI are the opening-up of new markets and the improvement of distribution abroad, vertical investment (ie splitting up the production process) is central as well, and seem to be gaining in importance (see Bundesbank, 2006). With respect to the non-euro area activity of German firms, especially in South-East Asia and the new EU member countries, we may assume that vertical FDI, and thus intra-firm imports, are much stronger than within EMU.

the analysis of German exports by Stahn (2006) for the comparable periods illustrates that, changes in price competitiveness since 1993 have had a perceptibly weaker effect on intra exports than those over the long estimation period.[46] As different price variables are used, however, it is not possible to compare the absolute price elasticities of imports and exports. The corresponding estimations, though, show that German importers have increasingly exploited existing or emerging price differences in recent years, at least within the euro area, causing import demand to exhibit significant and somewhat greater price responsiveness than was previously the case. By contrast, German exporters are pricing to market to a larger extent by accepting adjustments to their profit margins and only gradually altering their export prices even in response to exchange rate movements, in order to positively influence demand for German goods.[47]

Once again, the price variable is consistently insignificant as a ***short-run*** determinant of imports, which is a sign of the hesitant reaction of import demand to price changes. The simulations outlined in the annex (see figure C6) reflect this initial sluggishness to adjust to price changes. Yet, even after a price shock, the new equilibrium is reached within two years at the most.

The simple and squared residuals of the estimations (figure B2) in the ***CUSUM tests*** indicate high parameter stability for the extra estimation. The one-step forecast errors obtained on the basis of recursive estimations are low in both periods and actually decrease at the current end. The intra-estimation for the period 1993-2004 is alone in appearing to be characterised by temporarily elevated estimation errors in the late 1990s and the start of the 2000s. Accordingly, we see that the simple residual sum breaks out and the squared residual sum exceeds the 95% confidence interval. However, this appears not to be a systematic misspecification in the import equation, but merely a case of poor model adaptation in a particular period (based on an estimation with a very limited number of observations during this period). On the basis of the recursive estimation, then, it is possible to identify a mere five extreme one-step forecast errors for sample points where the hypothesis of parameter consistency would be rejected at

[46] An increase in the importance of exports of price-insensitive goods, especially capital goods, might be the reason behind this.

[47] See Deutsche Bundesbank (1997) and Stahn (2006).

the 5% level. These occur in the 1990s and beginning of the 2000s, but do not lie in the most recent quarters. The specification thus again seems to map the economic relationships closely at the current end and therefore provide usable forecast characteristics.

5 Summary and conclusions

The import share in German production has increased progressively in recent years. The growing importance of imported intermediate goods in German production is also evident in the estimations to explain German import demand that are presented in this paper.

Analyses of the various components of German aggregate demand show that there has been a particular increase in the marginal import share in German export production. Overall, the marginal propensity to import for domestic demand rose only slightly, however. Here, we find a preponderance of imported intermediate goods in capital formation compared to consumption. In addition, there is a rise in the marginal import content in capital goods at the current end, whereas that in consumer goods fell slightly. In line with the significant structural effects we are able to identify, a result of the change over time in the propensity to import for most components of German aggregate demand, the predictive quality of the import demand estimation based on the more recent period (1993-2004) is somewhat better than that for the 1980-2004 period.

When analysing the different elasticities of euro-area and third-country imports, clear discrepancies are apparent in the marginal propensity to import in the event of a rise in exports. The marginal propensity to import is greater – and has perceptibly increased at the current end – for extra imports. This may reflect the growth in imports of more cheaply-produced intermediate goods from non-euro-area partner countries, such as the emerging markets in south-east Asia or neighbouring countries in central and eastern Europe. In addition, the marginal propensity to import from the euro area on the back of a rise in domestic demand (ie investment or consumption) has increased slightly since 1993.

The price responsiveness of German imports is marginally higher at the current end. In general, we see that import demand reacts positively when imported goods

cheapen relative to domestic products. As in many recent studies, however, the price variables are not significant, except for intra-import demand. In comparison to extra imports, intra imports exhibit much higher (and significant) price sensitivity; moreover, this has increased considerably at the current end, which to some extent is also due to the somewhat reduced volatility especially of intra, but also extra import prices observable since the beginning of the 1990s. However, it would appear that there is greater price competition within the euro area and that arbitrage opportunities are being exploited more and more. As well as the lower price elasticity of energy and commodity imports from third countries, the existence of fixed supply patterns within multinational groups may exacerbate the low price sensitivity of third-country imports. However, the analysis of import demand at an aggregated and not sectoral level might to some extent also mask the price elasticity of imports.

On balance, we find that German import demand is driven largely by domestic and foreign demand (with the influence of the latter increasing) and less by changes in relative prices.

6 Bibliography

Barrell, R and S Dées 2005, World Trade and Global Integration in Production Processes: A Re-Assessment of Import Demand Equations, *European Central Bank Working Paper Series* No 503 / July 2005.

Barrell, R and D te Velde 2002, European Integration and Manufactures Import Demand: An Empirical Investigation of Ten European Countries, *German Economic Review*, vol 3(3), 263-293.

Camarero, M und C Tamarit 2004, Estimating the Export and Import Demand for Manufactured Goods: The Role of FDI, *Review of World Economics* (Weltwirtschaftliches Archiv), vol 140(3), 347-375.

Clostermann, J 1996, The Impact of the Exchange Rate on Germany's Balance of Trade, *Economic Research Centre of the Deutsche Bundesbank Discussion Paper* No 7/96.

Deutsche Bundesbank 1997, Exchange rate and foreign trade, *Monthly Report,* January, 41-59.

Deutsche Bundesbank 1998a, Effects of exchange rates on German foreign trade. Prospects under the conditions of European monetary union, *Monthly Report,* January, 49-58.

Deutsche Bundesbank 1998b, The indicator quality of different definitions of the real external value of the Deutsche Mark, *Monthly Report,* November, 39-52.

Deutsche Bundesbank 1999, Germany's relative position in the central and east European countries in transition, *Monthly Report,* October, 15-27.

Deutsche Bundesbank 2005, German balance of payments in 2004, *Monthly Report,* March, 25-41.

Deutsche Bundesbank 2006, Die deutschen Direktinvestitionsbeziehungen mit dem Ausland: neuere Entwickungstendenzen und makroökonomische Auswirkungen, Monthly Report September, 45-61.

Enders, W 2004, Applied Econometric Time Series, Danvers.

Engle, R F und C W J Granger 1987, Co-Integration and Error Correction: Representation, Estimation and Testing, *Econometrica*, vol 55, 251-276.

Fischer, M 1995, Was bestimmt die westdeutschen Importe?, *Die Weltwirtschaft*, vol 4, 431-443.

Gerdesmeier, D 1996, Die Rolle des Vermögens in der Geldnachfrage, *Economic Research Centre of the Deutsche Bundesbank Discussion Paper* No 5/96.

Goldstein, M und M S Khan 1985, Income and Price Effects in Foreign Trade, in R W Jones und P B Kenen (eds), *Handbook of International Economics*, vol 2, Amsterdam, 1041-1105.

Hooper, P , K Johnson und J Marquez 1998, Trade Elasticities for G-7 Countries, Board of Governors of the Federal Reserve System, *International Finance Discussion Papers* No 609, April.

IMF 2006, World Economic Outlook – Globalization and Inflation, April 2006, Washington.

Kim, J-R 1994, *Analyse kointegrierter Modelle*, Frankfurt.

MacKinnon, J G 1996, Numerical Distribution Functions for Unit Root and Cointegration Tests, *Journal of Applied Econometrics*, vol 11, 601-618.

MacKinnon, J G , A A Haug and L Michelis 1999, Numerical Distribution Functions of Likelihood Ratio Tests For Cointegration, *Journal of Applied Econometrics*, vol 14, 563-577.

Meier, C-P 1998, Reale Wechselkurse und internationale Wettbewerbsfähigkeit – Eine empirische Analyse der Wirkungen von Wechselkursschwankungen auf die Bundesrepublik Deutschland, Untersuchungen zur Wirtschaftspolitik, vol 111.

Meurers, M 2004, Estimating supply and demand functions in international trade: A multivariate cointegration analysis for Germany, *Journal of Economics and Statistics* (Jahrbücher für Nationalökonomie und Statistik), vol 224(5), 530-556.

Perron, P 1990, Testing for a Unit Root in a Time Series with a Changing Mean, *Journal of Business & Economic Statistics*, vol 8(2), 153-162.

Sachverständigenrat 2004, External successes - internal challenges, *Annual Report* 2004/05, Wiesbaden.

Saikkonen, P 1991: Asymptotically Efficient Estimation in Cointegrated Regressions, *Econometric Theory*, vol 7, 1-21.

Sawyer, W C und R L Sprinkle 1999, *The Demand for Exports and Imports in the World Economy*, Brookfield / USA.

Senhadji, A 1998, Time-Series Estimation of Structural Import Demand Equations: A Cross-Country Analysis, *IMF Staff Papers*, vol 45(2), 236-345.

Stahn, K 2006, Has the impact of key determinants of German exports changed? Results from estimations of Germany's intra euro-area and extra euro-area exports, *Economic Research Centre of the Deutsche Bundesbank Discussion Paper*, 07/2006.

Statistisches Bundesamt 2004, Importanteil der deutschen Exporte bei 40%, press release of 17 August 2004.

Stephan, S 2006, *Modellierung von Mengen und Preisen im deutschen Außenhandel*, http://www.diss.fu-berlin.de/2006/99/index.html.

Stock, J H 1987, Asymptotic Properties of Least Square Estimators of Cointegrating Vectors, *Econometrica*, vol 55, 1035-1056.

Strauss, H 2000, Eingleichungsmodelle zur Prognose des deutschen Außenhandels, *Kieler Arbeitspapier* No 987.

Strauss, H 2003, Globalisierung und die Prognose des deutschen Außenhandels, *Journal of Economics and Statistics* (Jahrbücher für Nationalökonomie und Statistik), vol 223(2), 176-203.

Strauss, H 2004, *Demand and Supply of Aggregate Exports of Goods and Services. Multivariate Cointegration Analyses for the United States, Canada and Germany*, Kiel Studies No 329, Kiel Institute for the World Economy, Berlin et al.

Annex A: Stationarity and cointegration tests

Tabelle A1: Stationarity tests (ADF and PP)

Test	ADF 1980-2004	1993-2004	PP 1980-2004	1993-2004
m	T,2 -3.56**	T,0 -2.13	T,5 -3.14	T,3 -2.49
m_{intra}	T,0 -2.22	T,0 -2.73	T,5 -2.38	T,3 -3.05
m_{extra}	T,0 -3.62**	T,0 -2.00	T,6 -3.60**	T,3 -2.16
y	T,0 -1.79	T,2 -2.39	T,7 -2.29	T,3 -1.72
y^d	T,0 -0.93	T,3 -2.10	T,7 -1.36	T,4 -1.26
y^d_I	T,0 -2.19	T,0 -2.11	T,5 -2.25	T,4 -2.17
y^d_C	T,5 -1.69	T,0 -1.47	T,8 -1.01	T,2 -1.52
x	T,0 -1.85	T,1 -2.75	T,5 -1.91	T,3 -2.60
$(p^m - p^d)$	N,1 -1.30	C,1 -2.23	T,5 -1.16	T,4 -1.88
$(p^m_{\text{intra}} - p^d)$	N,1 -1.67	C,1 -2.70	T,4 -1.57	T,4 -2.11
$(p^m_{extra} - p^d)$	N,1 -1.21	N,4 -0.35	T,5 -1.09	T,4 -0.74

** indicates rejection of the null hypotheses of non-stationarity according to the respective test at the 5% level of significance. T / C / N refer to the test specification including constant and trend / one constant without trend / no constant and no trend. With respect to the ADF test, the number of included lags is given as well; with respect to the PP test, the Bartlett kernel-based Newey-West bandwidth chosen by e-views. The respective critical values for the 5% level of significance are: -3.46 / -2.89 / -1.94 for the 1980-2004 period and -3.51 / -2.92 / -1.95 for the 1993-2004 period according to MacKinnon (1996).

At first, and for reasons of completeness, we conducted conventional Augmented Dickey-Fuller (ADF) tests and Phillips-Perron (PP) tests (by use of e-views version 5.1). Besides serial autocorrelation, the latter additionally account for potential heteroscedasticity of the residuals. The results of both tests are very similar (see Table A1) and point to the existence of a unit root for the variables in levels for both time periods in most cases.[48] Only with respect to total imports and imports from the extra euro area can non-stationarity not be assumed at the 5% level of significance in the long time period on the basis of the ADF test. However, this result – at least for total imports – is not confirmed by the superior PP test. Analysing the first difference of each

[48] The identification of the deterministic structure of the time series is based on Enders (2004: 213). In general, we assume that exports and imports as well as the demand components follow a deterministic trend due to the more or less continuous economic growth over time (see Strauss, 2004, p 54). Test results are markedly robust against changes in the deterministic structure.

variable, we find that these are, irrespective of whether we use the PP or ADF test and independent of the time period, stationary – with the exception of d(ivr) which only rejects the null hypothesis at 8.7% level of significance. However, as we expect at least one structural break in the time series at the beginning of the 1990s due to a change in the statistical methodology for recording foreign trade, we have to assume that the conventional unit root tests are distorted – which might result in mistaking a structural break for non-stationarity.

Table A2: Stationarity tests (Perron, 1990)

	1980-2004 Level		1980-2004 d(Variable)	
m	0	-2.93	1	-4.81 **
m_{intra}	1	-1.65	0	-11.3 **
m_{extra}	0	-3.48	1	-3.02
y	0	-1.91	3	-2.65
y^d	0	-0.73	1	-6.87 **
y^d_I	5	-0.95	3	-3.26
y^d_C	5	-2.35	4	-3.03
x	6	-0.74	5	-5.31 **
$(p^m - p^d)$	1	-2.21	0	-5.81 **
$(p^m_{\text{int}ra} - p^d)$	1	-1.90	0	-5.39 **
$(p^m_{extra} - p^d)$	1	-2.13	0	-6.16 **

Note: ** indicates that the null hypothesis of non-stationarity was rejected at the 5% significance level. The corresponding critical value is -3.76 according to Perron (1990). The (according to the Ljung-Box test) optimal number of lags included is given in the first column.

The Perron procedure (1990) provides reliable results for the unit root test with regard to a structural break. The crash model is estimated, which models a level shift. On the basis of the Chow test, the most important structural break is diagnosed as having occurred in the first quarter of 1993. According to the test (see table A1 in the annex), the variables in levels are clearly non-stationary. An analysis of the first differences shows that 7 of the 11 variables are clearly integrated of order 1. It is not possible to reject the hypothesis of non-stationarity for the other four variables at the 5% level in the first instance. However, it is possible that these variables are marked by an additional structural break or that, owing to a shift in the constants, the break is not

adequately modelled, making the test result unreliable. From an economic perspective, integration of order 2 is not likely; hence, all variables in the subsequent analyses are treated as I(1) variables.

Table A3: Cointegration test for specifications of aggregate imports

Specification	**(1)**		**(2)**		**(3)**	
	LP	**SP**	**LP**	**SP**	**LP**	**SP**
Lag	4	1	1	2	4	1
Trace test						
H0: r=0	31.4	17.8	46.8	62.5	79.0	91.5
	(0.03)	(0.58)	(0.06)	(0.00)	(0.00)	(0.00)
H0: r=1	7.0	5.57	18.3	24.6	44.6	41.9
	(0.58)	(0.75)	(0.54)	(0.18)	(0.10)	(0.16)
Maximum eigenvalue test						
H0: r=0	24.4	12.2	28.4	37.9	34.4	49.7
	(0.02)	(0.53)	(0.04)	(0.00)	(0.04)	(0.00)
H0: r=1	6.1	5.55	15.9	18.1	23.0	19.7
	(0.60)	(0.67)	(0.23)	(0.12)	(0.17)	(0.37)
General test for weak exogeneity						
Chi²	9.2	0.04	9.9	16.2	18.3	17.0
(p-value)	(0.01)	(0.98)	(0.02)	(0.00)	(0.00)	(0.00)
Problem variable	PWF			PWF		
according to Johansen test					REX	

Note: MacKinnon/Haug/Michelis (1999) p-values stated separately in parentheses for the trace and maximum eigenvalue test. The VECM includes a constant in the cointegration space.

Table A4: Cointegration test for a specification of intra and extra imports

Specification (2)	**Intra**		**Extra**	
	LP	**SP**	**LP**	**SP**
Lag	4	1	1	2
Trace test				
H0: r=0	48.1	53.0	50.8	51.2
	(0.05)	(0.02)	(0.03)	(0.02)
H0: r=1	16.0	27.5	20.1	18.9
	(0.71)	(0.09)	(0.42)	(0.50)
Maximum eigenvalue test				
H0: r=0	32.1	25.5	30.7	32.3
	(0.01)	(0.09)	(0.02)	(0.01)
H0: r=1	13.8	21.7	16.7	11.9
	(0.38)	(0.04)	(0.19)	(0.55)
General test for weak exogeneity				
Chi²	23.5	10.9	7.6	14.6
	(0.00)	(0.01)	(0.05)	(0.00)
Problem variable				PWF
according to the Johansen test		IVR	REX	

Note: see table A3.

Annex B: Regression results

Table B1: German import determinants

Specification	(1) LP	(1) SP		(2) LP	(2) SP		(3) LP	(3) SP
Loading coeff.	**-0.29**	**-0.39**	Loading coeff.	**-0.25**	**-0.54**	Loading coeff.	**-0.29**	**-0.71**
	-4.89	-3.49		-4.04	-4.20		-3.96	-5.27
Long-run relationship								
y	**2.05**	**2.37**	y^d	**1.59**	**1.46**	y^d_I	**0.52**	**0.49**
	38.73	30.85		6.92	4.38		3.77	8.00
						y^d_C	**0.93**	**0.64**
							2.41	2.13
			x	**0.55**	**0.61**	x	**0.60**	**0.72**
				8.88	12.21		5.76	12.02
$(p^m - p^d)$	**0.20**	**-0.30**	$(p^m - p^d)$	**-0.04**	**-0.28**	$(p^m - p^d)$	**-0.11**	**-0.35**
	2.03	-1.24		-0.23	-1.59		-0.55	-2.85
Constant	**8.41**	**10.50**	***Constant***	**7.62**	**7.19**	***Constant***	**6.00**	**4.80**
	25.36	20.98		6.64	3.95		4.19	3.18
Short-run relationship								
d(Dum1_93)	**-0.05**		***d(Dum1_93)***	**-0.05**		***d(Dum1_93)***	**-0.08**	
	-3.37			-2.93			-3.70	
d(m(-4))	**0.20**							
	3.15							
d(y)	**1.61**	**2.32**	***d(y^d)***	**1.02**	**1.58**	***d(y^d_I)***	**0.20**	**0.44**
	9.61	7.09		5.62	5.80		3.35	6.11
d(y(-1))		**0.62**	***d(y^d (-2))***		**0.52**	***d(y^d_I(-3))***	**0.13**	
		1.86			1.87		2.22	
d(y(-2))	**0.40**					***d(y^d_C)***		**0.58**
	2.50							1.78
			d(x)	**0.38**	**0.53**	***d(x)***		**0.54**
				6.10	4.84			5.33
						d(x (-4))	**0.14**	
							1.89	
R^2 adj.	0.62	0.59		0.53	0.66		0.37	0.70
SSR	0.02	0.01		0.03	0.01		0.03	0.01
AIC	-5.45	-5.40		-5.24	-5.55		-4.92	-5.67
Breusch-Godfrey Serial Correlation LM test								
LM(4)	2.32	0.26		5.43	0.84		7.71	4.14
p-value	0.68	0.99		0.25	0.93		0.10	0.39
ARCH LM(4)	3.60	0.97		7.35	3.37		6.45	1.83
p-value	0.46	0.91		0.12	0.50		0.17	0.77
White heteroscedasticity test								
	39.03	19.39		30.30	34.37		71.49	29.46
p-value	0.29	0.15		0.45	0.10		0.27	0.44

(continued on the next page)

Table B1 continued

JB normality test							
	0.11	10.77		0.84	0.44	1.08	3.44
p-value	0.95	0.00		0.66	0.80	0.58	0.18
Chow breakpoint test							
91.1	3.24			0.62		0.62	
p-value	0.00			0.76		0.79	
93.1	3.47			1.02		0.76	
p-value	0.00			0.43		0.67	

Coefficients are given in **boldface**, t-values in normal type.

Table B2: Robustness estimates: long-run coefficients: total imports

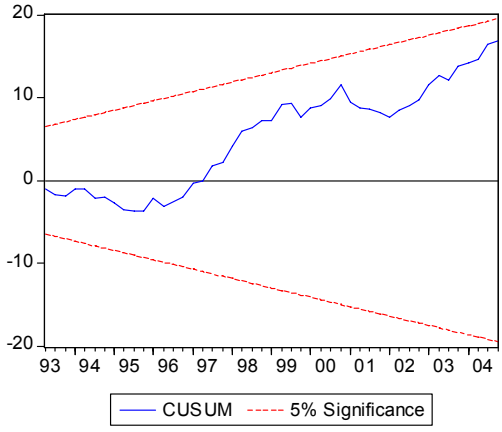
Specifi-cation	(1) LP	SP		(2) LP	SP		(3) LP	SP
				Long-run relationship				
y	**2.05**	**2.35**	y^d	**1.74**	**1.81**	y^d_I	**1.13**	**0.78**
	78.00	61.59		20.68	10.44		7.79	4.07
						y^d_C	**0.46**	**0.49**
							8.89	12.25
			x	**0.51**	**0.55**	x	**0.56**	**0.68**
				21.95	22.13		14.45	18.05
$(p^m - p^d)$	**0.21**	**-0.22**	$(p^m - p^d)$	**0.13**	**-0.36**	$(p^m - p^d)$	**0.07**	**-0.39**
	4.40	-1.90		1.89	-3.59		0.95	-4.53
Constant	**-8.37**	**-10.31**	***Constant***	**-8.41**	**-9.06**	***Constant***	**-6.81**	**-5.45**
	-51.06	-41.70		-19.89	-9.48		-12.62	-5.61

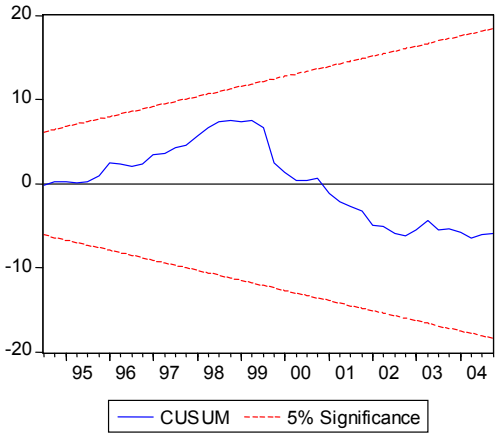
Coefficients are given in **boldface**, t-values in normal type. Only the long-run coefficients estimated using the Engle-Granger estimation are shown.

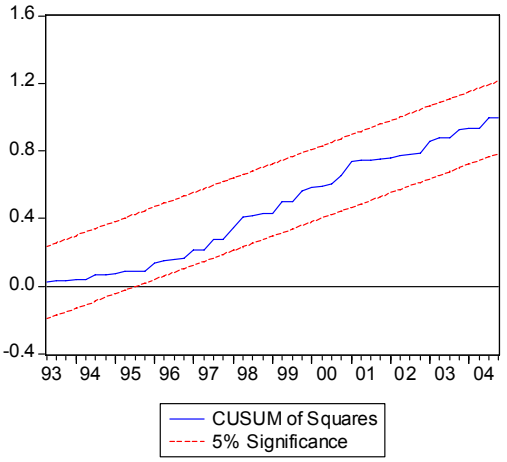
Figure B1: CUSUM and CUSUM of squares tests: total imports

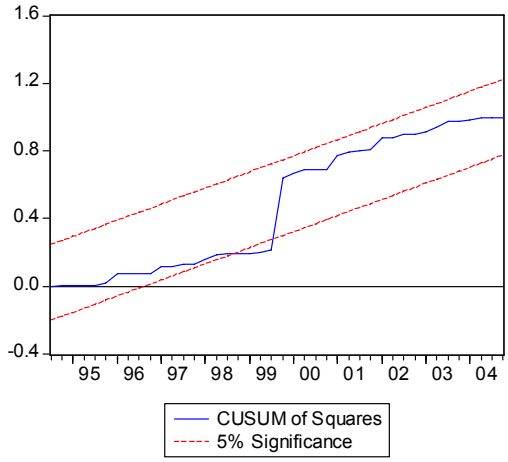
1980 – 2004	1993 - 2004

Specification (1)

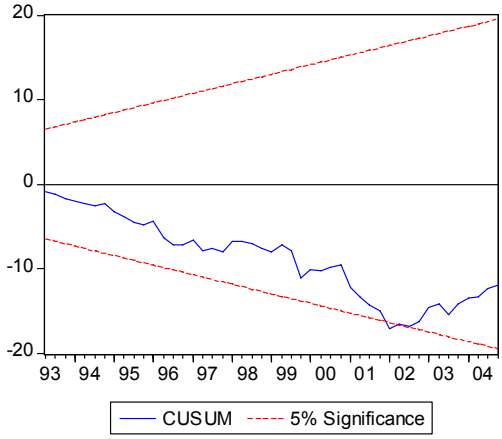


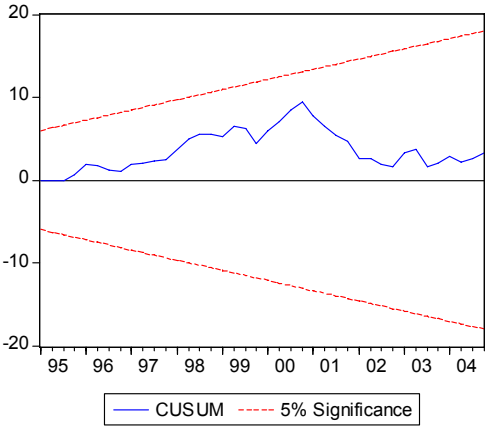


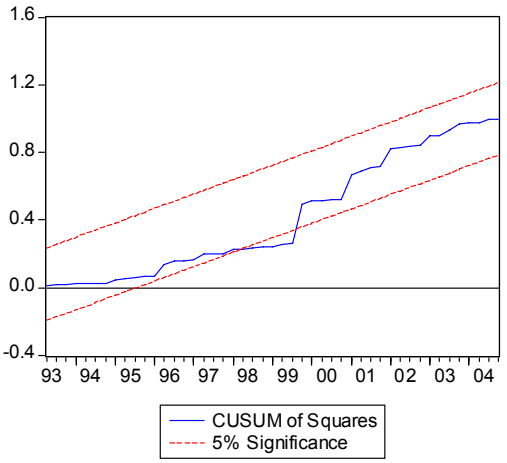


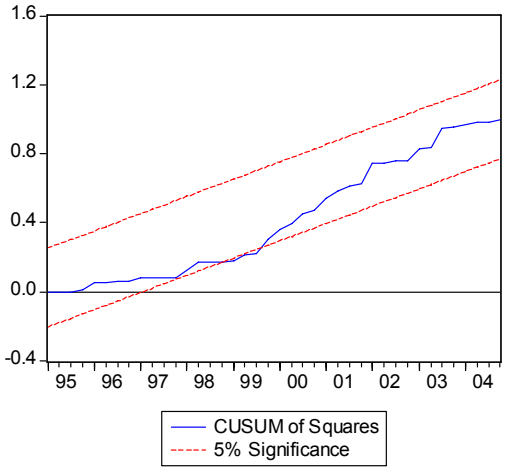


Specification (2)

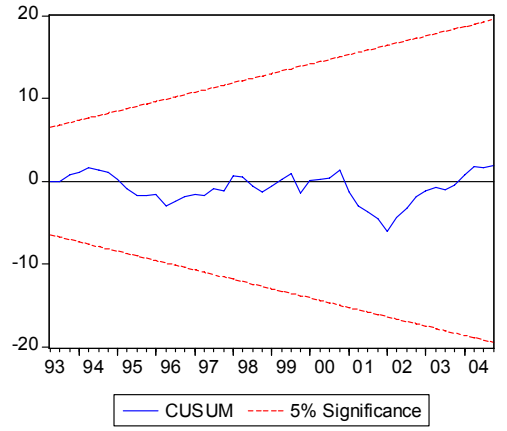


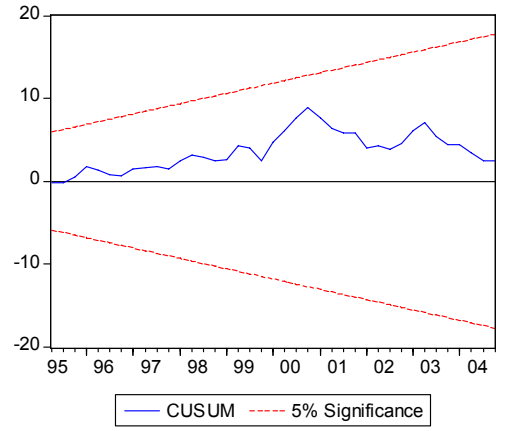


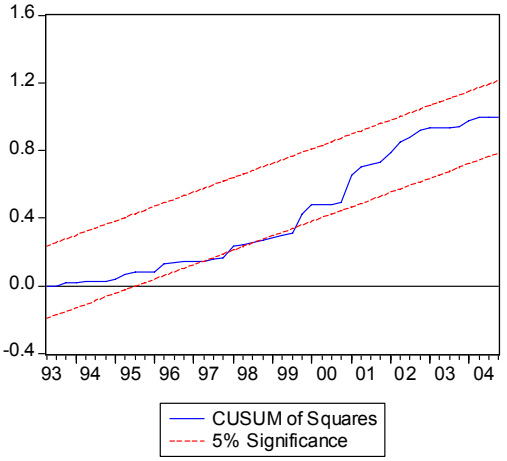


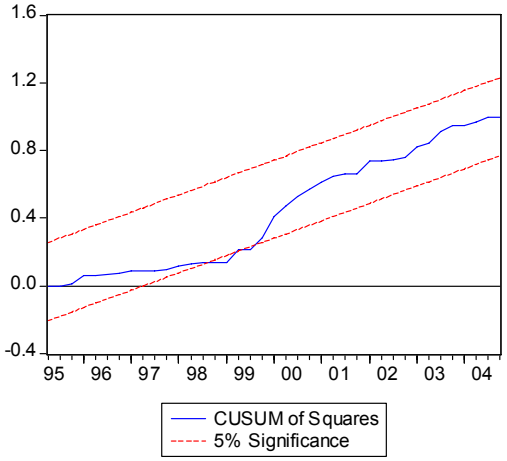


Specification (3)









Cumulated sums of simple and squared residuals with 95% confidence intervals.

Table B3: German import determinants: varying price indicator

Specification	(2)		(2)'		(2)''	
	LP	SP	LP	SP	LP	SP
Loading coefficient	-0.25	-0.54	-0.26	-0.55	-0.25	-0.50
	-4.04	-4.20	-4.17	-4.32	-4.26	-4.16
	Long-run relationship					
y^d	1.59	1.46	1.72	1.29	1.53	1.34
	6.92	4.38	6.35	4.47	8.27	4.00
x	0.55	0.61	0.53	0.63	0.59	0.67
	8.88	12.21	8.89	13.46	6.97	12.01
$(p^m - p^d)$	-0.04	-0.28	0.06	-0.26	0.14	0.20
	-0.23	-1.59	0.36	-1.82	0.71	1.41
Constant	7.62	7.19	8.33	6.26	8.11	7.67
	6.64	3.95	5.85	3.99	13.04	3.48
	Short-run relationship					
d(Dum1_93)	-0.05		-0.05		-0.05	
	-2.93		-2.90		-2.92	
$d(y^d)$	1.02	1.58	0.38	1.45	0.38	1.57
	5.62	5.80	6.10	5.22	6.17	5.76
$d(y^d(-2))$		0.52		0.50		0.50
		1.87		1.82		1.81
$d(x)$	0.38	0.53	1.06	0.50	1.02	0.55
	6.10	4.84	5.82	4.54	5.93	5.11
R^2 adj.	0.53	0.66	0.53	0.66	0.53	0.66
SSR	0.03	0.01	0.03	0.01	0.03	0.01
AIC	-5.24	-5.55	-5.24	-5.56	-5.24	-5.54
Breusch-Godfrey Serial Correlation LM test						
LM(4)	5.43	0.84	5.44	1.52	6.41	1.81
p-value	0.25	0.93	0.24	0.82	0.17	0.77
ARCH LM (4)	7.35	3.37	6.68	2.54	7.92	4.81
p-value	0.12	0.50	0.15	0.64	0.09	0.31
White heteroscedasticity test						
	30.30	34.37	33.00	33.08	33.44	26.30
p-value	0.45	0.10	0.32	0.13	0.22	0.16
JB normality test						
	0.84	0.44	0.91	1.03	1.16	0.28
p-value	0.66	0.80	0.64	0.60	0.56	0.87

See table B1.

Table B4: German import determinants: total and non-energy imports

	1993-2004	1995-2004	1995-2004
Loading coefficient	**-0.54**	**-0.51**	**-0.52**
	-4.20	-3.24	-3.11
	Long-run relationship		
y^d	**1.46**	**1.32**	**1.54**
	4.38	2.99	3.39
x	**0.61**	**0.63**	**0.65**
	12.21	10.39	10.51
$(p^m - p^d)$	**-0.28**	**-0.24**	**-0.27**
	-1.59	-1.15	-1.29
Constant	**7.19**	**6.41**	**7.96**
	3.95	2.62	3.16
	Short-run relationship		
$d(y^d)$	**1.58**	**1.48**	**1.55**
	5.80	4.27	4.24
$d(y^d(-2))$	**0.52**	**0.69**	**0.68**
	1.87	1.85	1.69
$d(x)$	**0.53**	**0.47**	**0.56**
	4.84	3.46	3.89
R² adj.	0.66	0.48	0.52
SSR	0.01	0.01	0.01
AIC	-5.55	-5.37	-5.28
Breusch-Godfrey Serial Correlation LM test			
LM(4)	0.84	2.01	2.05
p-value	0.93	0.73	0.73
ARCH LM (4)	3.37	3.61	6.37
p-value	0.50	0.46	0.17
White heteroscedasticity test (no cross-runs)			
	18.81	14.92	9.27
p-value	0.09	0.25	0.68
JB normality test			
	0.44	0.54	0.77
p-value	0.80	0.76	0.68

See table B1.

Table B5: Determinants of intra and extra imports

	Intra		Extra	
	LP	SP	LP	SP
Loading coefficient	**-0.36**	**-0.51**	**-0.23**	**-0.46**
	-3.89	-3.82	-4.68	-3.28
	Long-run relationship			
y^d	**1.55**	**1.81**	**1.84**	**1.46**
	6.00	3.31	6.04	3.05
x	**0.34**	**0.38**	**0.62**	**0.71**
	5.69	4.53	6.93	10.25
$(p_r^m - p^d)$	**-0.65**	**-1.29**	**0.08**	**-0.23**
	-2.42	-2.57	0.44	-1.20
Dum1_93	**-0.09**			
	-3.37			
Constant	**7.25**	**9.15**	**10.04**	**8.23**
	5.29	3.05	6.80	3.10
	Short-run relationship			
d(Dum1_93)	**-0.14**			
	-5.12			
$d(y^d)$	**1.01**		**0.82**	**1.63**
	3.41		3.67	4.44
$d(y^d(-2))$				**0.63**
				1.71
$d(x)$		**0.64**	**0.27**	
		2.99	3.54	
$d(x(-1))$		**0.35**		
		2.00		
$d(x(-2))$	**0.32**			
	3.33			
$d(x(-4))$	**0.28**			
	2.96			
R² adj.	0.47	0.49	0.34	0.40
SSR	0.06	0.03	0.04	0.01
Breusch-Godfrey Serial Correlation LM test				
LM(4)	0.80	4.66	3.62	0.61
p-value	0.94	0.32	0.46	0.96
ARCH LM (4)	1.97	4.72	1.71	5.38
p-value	0.74	0.32	0.79	0.25
White heteroscedasticity test				
	38.09	24.96	18.03	27.17
p-value	0.85	0.20	0.65	0.17
JB normality test				
	0.84	0.34	1.46	2.22
p-value	0.66	0.84	0.48	0.33
Chow breakpoint F-test				
93.1	0.74		17.47	
p-value	0.68		0.01	

See table B1.

Table B6: Robustness estimates: long-run coefficients: intra and extra imports

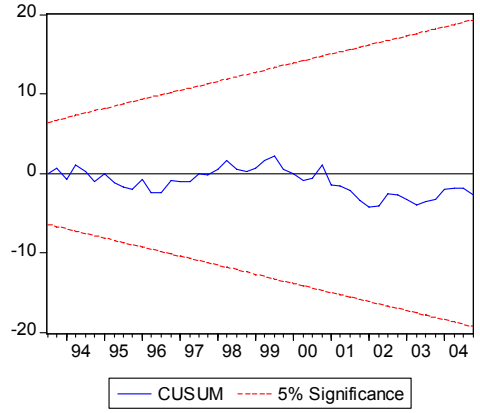
	(1) Engle		(2) Engle	
	LP	**SP**	**LP**	**SP**
y^d	**1.73**	**2.13**	**2.04**	**1.72**
	17.53	7.74	16.12	7.67
x	**0.37**	**0.33**	**0.54**	**0.67**
	15.11	8.21	14.65	21.35
$(p^m - p^d)$	**-0.31**	**-0.82**	**0.27**	**-0.34**
	-3.39	-3.08	3.48	-3.65
Dum1_93	**-0.10**			
	-8.64			
c	**-8.46**	**-10.81**	**-10.94**	**-9.62**
	-16.49	-7.11	-17.79	-7.73

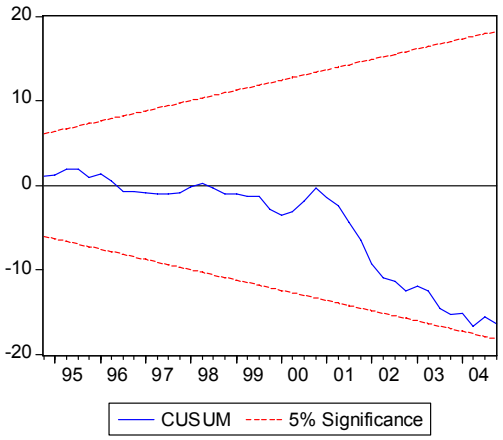
See table B2.

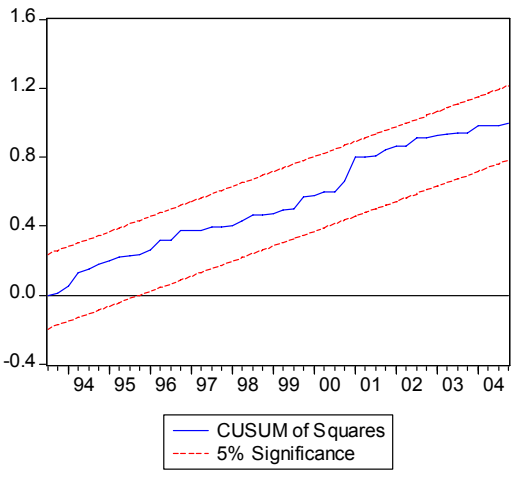
Figure B2: CUSUM and CUSUM of squares tests: intra and extra imports

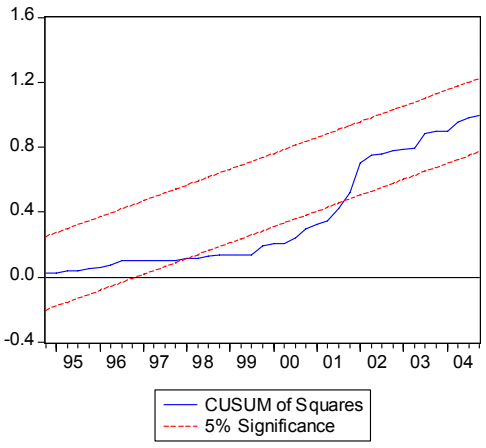
1980 – 2004	**1993 - 2004**

Intra imports

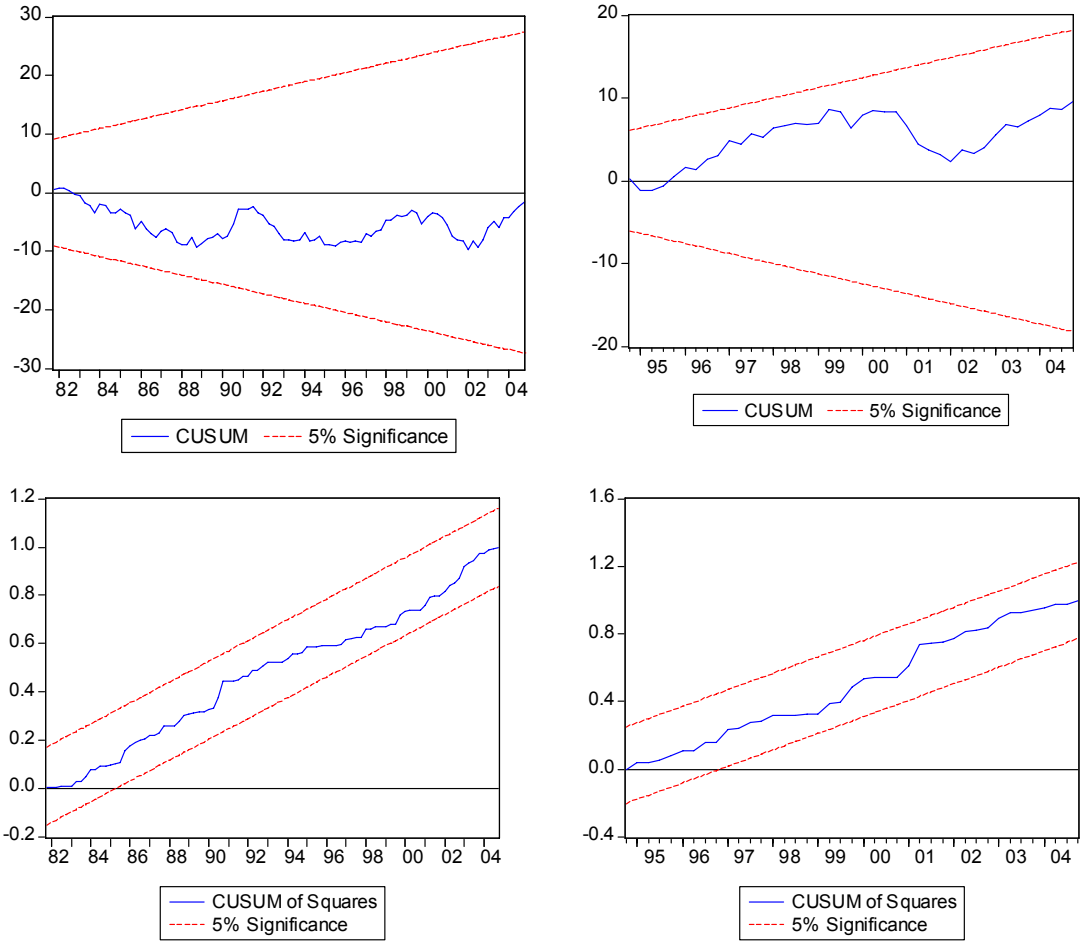








Extra imports



Cumulated sums of simple and squared residuals with 95% confidence intervals.

Annex C: Simulations

Table C1: Reaction over time after a change in the determinants: total imports

Reaction at / after	t = 0	1 quarter	1 year	2 years	3 years	long-run
10% increase in domestic demand						
long sample	**10.3**	**11.7**	**14.4**	**15.7**	**16.1**	**16.3**
short sample	16.2	15.5	16.2	14.9	14.9	**14.9**
10% increase in export demand						
long sample	**3.7**	**4.1**	**4.8**	**5.2**	**5.3**	**5.3**
short sample	5.1	5.6	6.0	6.0	6.0	6.0
10% deterioration in price competitiveness						
long sample	**0.0**	**0.1**	**0.3**	**0.4**	**0.4**	**0.4**
short sample	0.0	1.6	2.8	3.0	3.0	**3.0**

Figure C1: Reaction to a 10% rise in domestic demand: total imports (Specification 2)

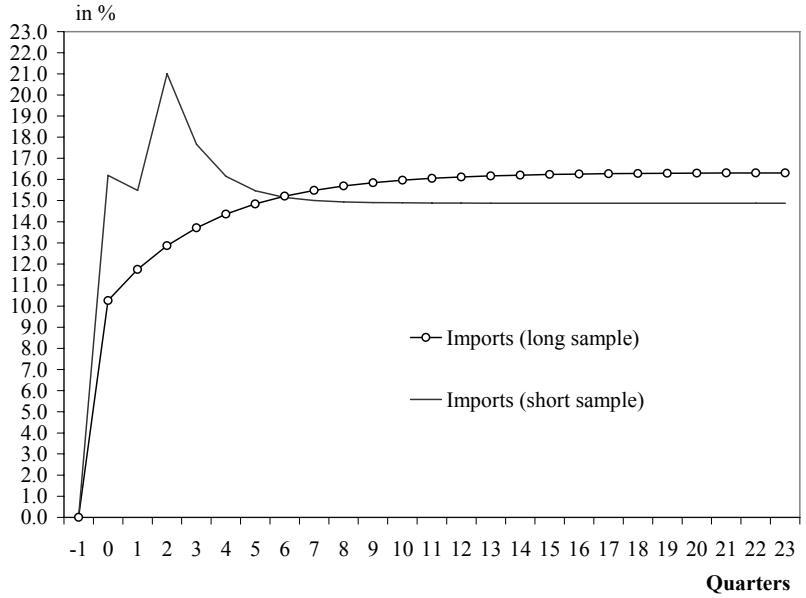


Figure C2: Reaction to a 10% rise in foreign demand: total imports (Specification 2)

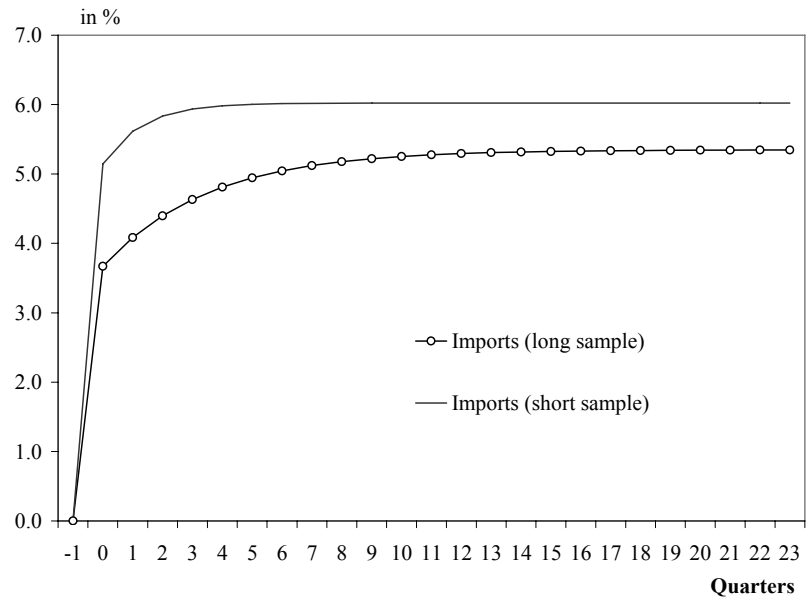


Figure C3: Reaction to a 10% fall in the price of imported goods: total imports (Specification 2)

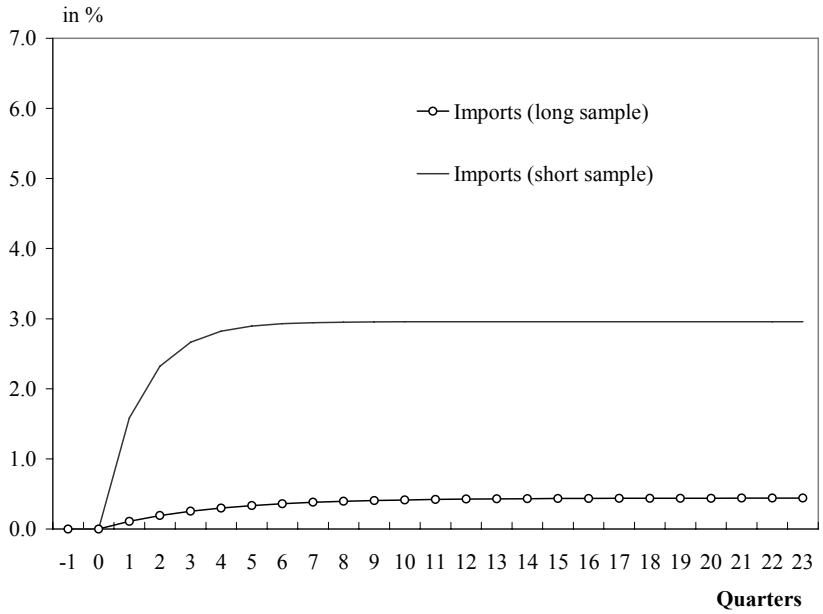


Table C2: Reaction over time after a change in the determinants: intra and extra imports

Reaction at / after	t = 0	1 quarter	1 year	2 years	3 years	long-run
10% increase in domestic demand						
Intra imports:						
long sample	**10.1**	**12.2**	**15.0**	**15.8**	**15.9**	**15.9**
short sample	0.0	9.3	17.7	18.8	18.8	**18.8**
Extra imports:						
long sample	**8.1**	**10.6**	**15.2**	**17.8**	**18.7**	**19.1**
short sample	16.8	15.9	17.1	15.1	15.0	**15.0**
10% increase in export demand						
Intra imports:						
long sample	**0.0**	**1.2**	**6.8**	**3.9**	**3.4**	**3.3**
short sample	6.3	8.5	4.2	3.7	3.7	**3.7**
Extra imports:						
long sample	**2.6**	**3.4**	**4.8**	**5.6**	**5.9**	**6.0**
short sample	0.0	3.2	6.4	7.0	7.0	**7.0**
10% deterioration in competitiveness						
Intra imports:						
long sample	**0.0**	**2.5**	**5.9**	**6.9**	**7.1**	**7.1**
short sample	0.0	7.2	13.7	14.5	14.5	**14.5**
Extra imports:						
long sample	**0.0**	**-0.2**	**-0.6**	**-0.8**	**-0.8**	**-0.9**
short sample	0.0	1.1	2.2	2.4	2.4	**2.4**

Figure C4: Reaction to a 10% rise in domestic demand: intra and extra imports

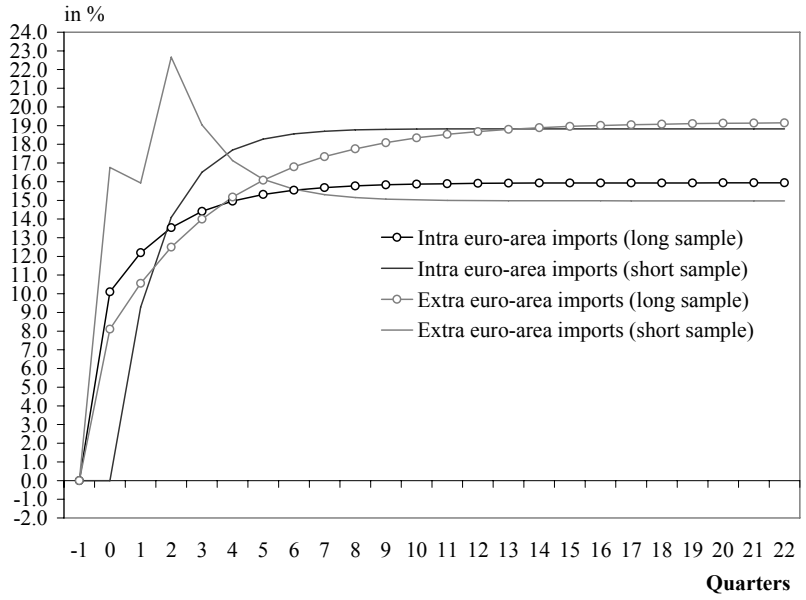


Figure C5: Reaction to a 10% rise in foreign demand: intra and extra imports

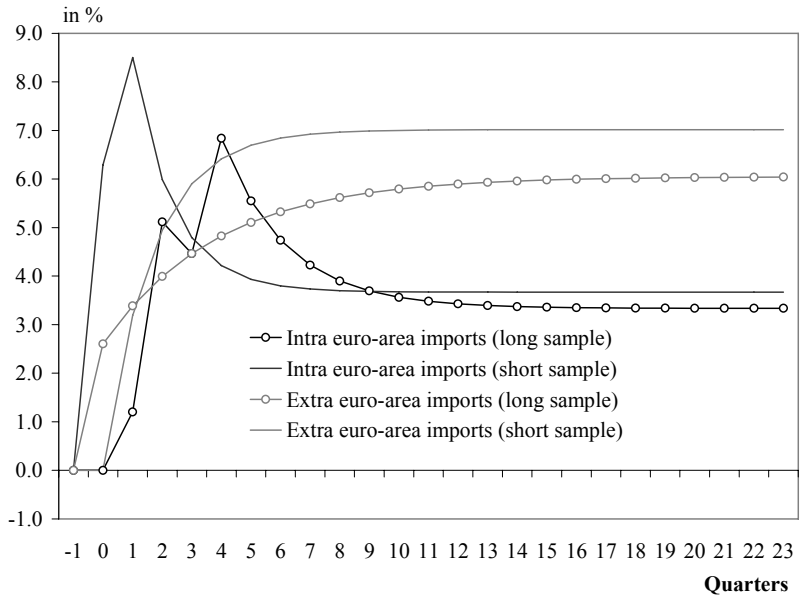
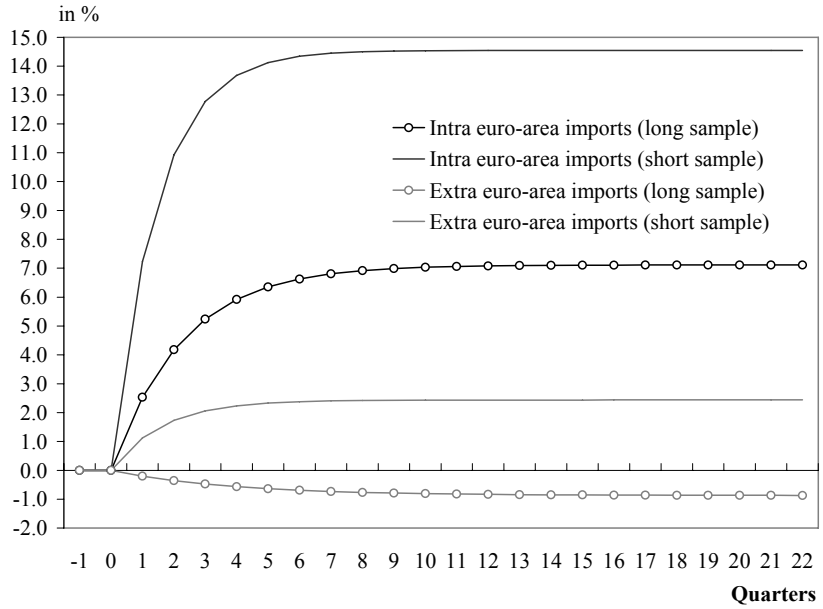


Figure C6: Reaction to a 10% fall in the price of imported goods: intra and extra imports



The following Discussion Papers have been published since 2005:

Series 1: Economic Studies

1	2005	Financial constraints and capacity adjustment in the United Kingdom – Evidence from a large panel of survey data	Ulf von Kalckreuth Emma Murphy
2	2005	Common stationary and non-stationary factors in the euro area analyzed in a large-scale factor model	Sandra Eickmeier
3	2005	Financial intermediaries, markets, and growth	F. Fecht, K. Huang, A. Martin
4	2005	The New Keynesian Phillips Curve in Europe: does it fit or does it fail?	Peter Tillmann
5	2005	Taxes and the financial structure of German inward FDI	Fred Ramb A. J. Weichenrieder
6	2005	International diversification at home and abroad	Fang Cai Francis E. Warnock
7	2005	Multinational enterprises, international trade, and productivity growth: Firm-level evidence from the United States	Wolfgang Keller Steven R. Yeaple
8	2005	Location choice and employment decisions: a comparison of German and Swedish multinationals	S. O. Becker, K. Ekholm, R. Jäckle, M.-A. Muendler
9	2005	Business cycles and FDI: evidence from German sectoral data	Claudia M. Buch Alexander Lipponer
10	2005	Multinational firms, exclusivity, and the degree of backward linkages	Ping Lin Kamal Saggi

11	2005	Firm-level evidence on international stock market comovement	Robin Brooks Marco Del Negro
12	2005	The determinants of intra-firm trade: in search for export-import magnification effects	Peter Egger Michael Pfaffermayr
13	2005	Foreign direct investment, spillovers and absorptive capacity: evidence from quantile regressions	Sourafel Girma Holger Görg
14	2005	Learning on the quick and cheap: gains from trade through imported expertise	James R. Markusen Thomas F. Rutherford
15	2005	Discriminatory auctions with seller discretion: evidence from German treasury auctions	Jörg Rocholl
16	2005	Consumption, wealth and business cycles: why is Germany different?	B. Hamburg, M. Hoffmann, J. Keller
17	2005	Tax incentives and the location of FDI: evidence from a panel of German multinationals	Thiess Buettner Martin Ruf
18	2005	Monetary Disequilibria and the Euro/Dollar Exchange Rate	Dieter Nautz Karsten Ruth
19	2005	Berechnung trendbereinigter Indikatoren für Deutschland mit Hilfe von Filterverfahren	Stefan Stamfort
20	2005	How synchronized are central and east European economies with the euro area? Evidence from a structural factor model	Sandra Eickmeier Jörg Breitung
21	2005	Asymptotic distribution of linear unbiased estimators in the presence of heavy-tailed stochastic regressors and residuals	J.-R. Kurz-Kim S.T. Rachev G. Samorodnitsky

22	2005	The Role of Contracting Schemes for the Welfare Costs of Nominal Rigidities over the Business Cycle	Matthias Paustian
23	2005	The cross-sectional dynamics of German business cycles: a bird's eye view	J. Döpke, M. Funke S. Holly, S. Weber
24	2005	Forecasting German GDP using alternative factor models based on large datasets	Christian Schumacher
25	2005	Time-dependent or state-dependent price setting? – micro-evidence from German metal-working industries –	Harald Stahl
26	2005	Money demand and macroeconomic uncertainty	Claus Greiber Wolfgang Lemke
27	2005	In search of distress risk	J. Y. Campbell, J. Hilscher, J. Szilagyi
28	2005	Recursive robust estimation and control without commitment	Lars Peter Hansen Thomas J. Sargent
29	2005	Asset pricing implications of Pareto optimality with private information	N. R. Kocherlakota Luigi Pistaferri
30	2005	Ultra high frequency volatility estimation with dependent microstructure noise	Y. Aït-Sahalia, P. A. Mykland, L. Zhang
31	2005	Umstellung der deutschen VGR auf Vorjahres-preisbasis – Konzept und Konsequenzen für die aktuelle Wirtschaftsanalyse sowie die ökono-metrische Modellierung	Karl-Heinz Tödter

32	2005	Determinants of current account developments in the central and east European EU member states – consequences for the enlargement of the euro erea	Sabine Herrmann Axel Jochem
33	2005	An estimated DSGE model for the German economy within the euro area	Ernest Pytlarczyk
34	2005	Rational inattention: a research agenda	Christopher A. Sims
35	2005	Monetary policy with model uncertainty: distribution forecast targeting	Lars E.O. Svensson Noah Williams
36	2005	Comparing the value revelance of R&D report-ing in Germany: standard and selection effects	Fred Ramb Markus Reitzig
37	2005	European inflation expectations dynamics	J. Döpke, J. Dovern U. Fritsche, J. Slacalek
38	2005	Dynamic factor models	Sandra Eickmeier Jörg Breitung
39	2005	Short-run and long-run comovement of GDP and some expenditure aggregates in Germany, France and Italy	Thomas A. Knetsch
40	2005	A“wreckers theory” of financial distress	Ulf von Kalckreuth
41	2005	Trade balances of the central and east European EU member states and the role of foreign direct investment	Sabine Herrmann Axel Jochem
42	2005	Unit roots and cointegration in panels	Jörg Breitung M. Hashem Pesaran
43	2005	Price setting in German manufacturing: new evidence from new survey data	Harald Stahl

1	2006	The dynamic relationship between the Euro overnight rate, the ECB's policy rate and the term spread	Dieter Nautz Christian J. Offermanns
2	2006	Sticky prices in the euro area: a summary of new micro evidence	Álvarez, Dhyne, Hoeberichts Kwapil, Le Bihan, Lünnemann Martins, Sabbatini, Stahl Vermeulen, Vilmunen
3	2006	Going multinational: What are the effects on home market performance?	Robert Jäckle
4	2006	Exports versus FDI in German manufacturing: firm performance and participation in inter-national markets	Jens Matthias Arnold Katrin Hussinger
5	2006	A disaggregated framework for the analysis of structural developments in public finances	Kremer, Braz, Brosens Langenus, Momigliano Spolander
6	2006	Bond pricing when the short term interest rate follows a threshold process	Wolfgang Lemke Theofanis Archontakis
7	2006	Has the impact of key determinants of German exports changed? Results from estimations of Germany's intra euro-area and extra euro-area exports	Kerstin Stahn
8	2006	The coordination channel of foreign exchange intervention: a nonlinear microstructural analysis	Stefan Reitz Mark P. Taylor
9	2006	Capital, labour and productivity: What role do they play in the potential GDP weakness of France, Germany and Italy?	Antonio Bassanetti Jörg Döpke, Roberto Torrini Roberta Zizza
10	2006	Real-time macroeconomic data and ex ante predictability of stock returns	J. Döpke, D. Hartmann C. Pierdzioch

11	2006	The role of real wage rigidity and labor market frictions for unemployment and inflation dynamics	Kai Christoffel Tobias Linzert
12	2006	Forecasting the price of crude oil via convenience yield predictions	Thomas A. Knetsch
13	2006	Foreign direct investment in the enlarged EU: do taxes matter and to what extent?	Guntram B. Wolff
14	2006	Inflation and relative price variability in the euro area: evidence from a panel threshold model	Dieter Nautz Juliane Scharff
15	2006	Internalization and internationalization under competing real options	Jan Hendrik Fisch
16	2006	Consumer price adjustment under the microscope: Germany in a period of low inflation	Johannes Hoffmann Jeong-Ryeol Kurz-Kim
17	2006	Identifying the role of labor markets for monetary policy in an estimated DSGE model	Kai Christoffel Keith Küster Tobias Linzert
18	2006	Do monetary indicators (still) predict euro area inflation?	Boris Hofmann
19	2006	Fool the markets? Creative accounting, fiscal transparency and sovereign risk premia	Kerstin Bernoth Guntram B. Wolff
20	2006	How would formula apportionment in the EU affect the distribution and the size of the corporate tax base? An analysis based on German multinationals	Clemens Fuest Thomas Hemmelgarn Fred Ramb

21	2006	Monetary and fiscal policy interactions in a New Keynesian model with capital accumulation and non-Ricardian consumers	Campbell Leith Leopold von Thadden
22	2006	Real-time forecasting and political stock market anomalies: evidence for the U.S.	Martin Bohl, Jörg Döpke Christian Pierdzioch
23	2006	A reappraisal of the evidence on PPP: a systematic investigation into MA roots in panel unit root tests and their implications	Christoph Fischer Daniel Porath
24	2006	Margins of multinational labor substitution	Sascha O. Becker Marc-Andreas Mündler
25	2006	Forecasting with panel data	Badi H. Baltagi
26	2006	Do actions speak louder than words? Household expectations of inflation based on micro consumption data	Atsushi Inoue Lutz Kilian Fatma Burcu Kiraz
27	2006	Learning, structural instability and present value calculations	H. Pesaran, D. Pettenuzzo A. Timmermann
28	2006	Empirical Bayesian density forecasting in Iowa and shrinkage for the Monte Carlo era	Kurt F. Lewis Charles H. Whiteman
29	2006	The within-distribution business cycle dynamics of German firms	Jörg Döpke Sebastian Weber
30	2006	Dependence on external finance: an inherent industry characteristic?	George M. von Furstenberg Ulf von Kalckreuth
31	2006	Comovements and heterogeneity in the euro area analyzed in a non-stationary dynamic factor model	Sandra Eickmeier

32	2006	Forecasting using a large number of predictors: is Bayesian regression a valid alternative to principal components?	Christine De Mol Domenico Giannone Lucrezia Reichlin
33	2006	Real-time forecasting of GDP based on a large factor model with monthly and quarterly data	Christian Schumacher Jörg Breitung
34	2006	Macroeconomic fluctuations and bank lending: evidence for Germany and the euro area	S. Eickmeier B. Hofmann, A. Worms
35	2006	Fiscal institutions, fiscal policy and sovereign risk premia	Mark Hallerberg Guntram B. Wolff
36	2006	Political risk and export promotion: evidence from Germany	C. Moser T. Nestmann, M. Wedow
37	2006	Has the export pricing behaviour of German enterprises changed? Empirical evidence from German sectoral export prices	Kerstin Stahn
38	2006	How to treat benchmark revisions? The case of German production and orders statistics	Thomas A. Knetsch Hans-Eggert Reimers
39	2006	How strong is the impact of exports and other demand components on German import demand? Evidence from euro-area and non-euro-area imports	Claudia Stirböck

Series 2: Banking and Financial Studies

1	2005	Measurement matters – Input price proxies and bank efficiency in Germany	Michael Koetter
2	2005	The supervisor's portfolio: the market price risk of German banks from 2001 to 2003 – Analysis and models for risk aggregation	Christoph Memmel Carsten Wehn
3	2005	Do banks diversify loan portfolios? A tentative answer based on individual bank loan portfolios	Andreas Kamp Andreas Pfingsten Daniel Porath
4	2005	Banks, markets, and efficiency	F. Fecht, A. Martin
5	2005	The forecast ability of risk-neutral densities of foreign exchange	Ben Craig Joachim Keller
6	2005	Cyclical implications of minimum capital requirements	Frank Heid
7	2005	Banks' regulatory capital buffer and the business cycle: evidence for German savings and cooperative banks	Stéphanie Stolz Michael Wedow
8	2005	German bank lending to industrial and non-industrial countries: driven by fundamentals or different treatment?	Thorsten Nestmann
9	2005	Accounting for distress in bank mergers	M. Koetter, J. Bos, F. Heid C. Kool, J. Kolari, D. Porath
10	2005	The eurosystem money market auctions: a banking perspective	Nikolaus Bartzsch Ben Craig, Falko Fecht
11	2005	Financial integration and systemic risk	Falko Fecht Hans Peter Grüner

12	2005	Evaluating the German bank merger wave	Michael Koetter
13	2005	Incorporating prediction and estimation risk in point-in-time credit portfolio models	A. Hamerle, M. Knapp, T. Liebig, N. Wildenauer
14	2005	Time series properties of a rating system based on financial ratios	U. Krüger, M. Stötzel, S. Trück
15	2005	Inefficient or just different? Effects of heterogeneity on bank efficiency scores	J. Bos, F. Heid, M. Koetter, J. Kolatri, C. Kool
01	2006	Forecasting stock market volatility with macroeconomic variables in real time	J. Döpke, D. Hartmann C. Pierdzioch
02	2006	Finance and growth in a bank-based economy: is it quantity or quality that matters?	Michael Koetter Michael Wedow
03	2006	Measuring business sector concentration by an infection model	Klaus Düllmann
04	2006	Heterogeneity in lending and sectoral growth: evidence from German bank-level data	Claudia M. Buch Andrea Schertler Natalja von Westernhagen
05	2006	Does diversification improve the performance of German banks? Evidence from individual bank loan portfolios	Evelyn Hayden Daniel Porath Natalja von Westernhagen
06	2006	Banks' regulatory buffers, liquidity networks and monetary policy transmission	Christian Merkl Stéphanie Stolz
07	2006	Empirical risk analysis of pension insurance – the case of Germany	W. Gerke, F. Mager T. Reinschmidt C. Schmieder

08	2006	The stability of efficiency rankings when risk-preferences and objectives are different	Michael Koetter
09	2006	Sector concentration in loan portfolios and economic capital	Klaus Düllmann Nancy Masschelein
10	2006	The cost efficiency of German banks: a comparison of SFA and DEA	E. Fiorentino A. Karmann, M. Koetter

Visiting researcher at the Deutsche Bundesbank

The Deutsche Bundesbank in Frankfurt is looking for a visiting researcher. Among others under certain conditions visiting researchers have access to a wide range of data in the Bundesbank. They include micro data on firms and banks not available in the public. Visitors should prepare a research project during their stay at the Bundesbank. Candidates must hold a Ph D and be engaged in the field of either macroeconomics and monetary economics, financial markets or international economics. Proposed research projects should be from these fields. The visiting term will be from 3 to 6 months. Salary is commensurate with experience.

Applicants are requested to send a CV, copies of recent papers, letters of reference and a proposal for a research project to:

Deutsche Bundesbank
Personalabteilung
Wilhelm-Epstein-Str. 14

D - 60431 Frankfurt
GERMANY