The Effects of Public Spending Shocks on Trade Balances in the European Union\(^1\)

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**ABSTRACT**

We investigate the consequences of an increase in government spending for trade balances and budget deficits in the European Union, using a panel VAR approach. While the literature tends to treat the trade balance/GDP ratio as a single variable, we include exports and imports as separate variables. It also allows us to track in more detail the sources of trade balance movements. Further, we use annual rather than quarterly data. This improves the interpretation of the shocks and reduces potential anticipation effects of fiscal policy changes. However, the identification assumptions become stronger, and we extensively check their validity. According to our baseline estimate, a one-percent of GDP increase in government spending produces a 1.2% impact, respectively 1.6% peak rise in GDP. Rising imports and falling exports are responsible for a fall of the trade balance by 0.5% of GDP on impact and a maximum fall of 0.8% of GDP. In addition, the spending increase produces a 0.7% of GDP impact (and peak) budget deficit, thereby pointing to the potential relevance of the twin deficits hypothesis.

**Keywords:** Exports, imports, government spending, trade balance, budget deficit, impulse responses, panel VAR, European Union.

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1. Introduction

Recently a number of papers have started to investigate the consequences of fiscal policy shocks for international trade. In this context, researchers have paid specific attention to the twin deficit hypothesis, which says that an increase in the public deficit worsens the trade balance.

In this paper we follow up on this line of work and extend it into a variety of directions. First, we investigate this hypothesis specifically for the European Union (EU) countries. Secondly, in contrast to most of the literature, which includes the trade balance share of GDP as a single variable in a VAR, we split it into its components (exports, imports and GDP) and include each of these as elements in a VAR. This provides us with information on the sources of trade balance movements. Third, we use annual rather than quarterly observations. There generally is no quarterly calendar for fiscal policy revisions. Hence, by using annual data the interpretation of shocks may be facilitated. Moreover, potential anticipation effects of fiscal policy changes play a smaller role with annual data. The crucial identifying assumption that public spending does not within the observation period react to output movements becomes stronger. However, examining this assumption in a number of ways suggests that it is justified. A final difference with the literature is that we use a panel approach to increase estimation accuracy.

For our baseline estimation, we find that a 1% of GDP public spending impulse produces a 1.2% output rise on impact and a 1.6% peak response of output. Rising imports and falling exports together produce an impact fall of the trade balance of 0.5% of GDP and a peak fall of 0.8% of GDP. The public budget moves into a deficit of 0.7% of GDP on impact. Together, these results provide support for the twin deficits hypothesis. A large number of robustness tests, among other things aimed at scrutinizing identification, leave these results essentially unchanged.

The sequel of this paper is structured as follows. Section 2 provides some theoretical background. Section 3 provides the baseline estimates. Section 4 discusses robustness. Finally, Section 5 concludes the paper. A web-appendix available at [http://www1.fee.uva.nl/toe/content/people/beetsma.shtm](http://www1.fee.uva.nl/toe/content/people/beetsma.shtm) provides details on the data and the results that are not included in the main text.

2. Theory

In the sequel we shall explore the consequences of increases in government purchases for trade balances and fiscal balances in the European Union. Regarding the theoretical predictions about the effects of the spending increase, it is useful to distinguish between the consequences for the domestic economy and how they spill over towards the trade balance. As far as the effects on the
national economy are concerned, both the neoclassical real business cycle framework and the New-Keynesian framework with optimizing agents and sticky prices tend to produce a positive response of economic activity to an increase in government purchases, although the mechanisms are different. The former framework emphasizes the negative wealth effect of the ensuing increase in current and future taxes that results in a rise in labour supply, lower real wages and thus a rise in output (e.g., Baxter and King, 1993). While this wealth effect is also present in the other framework, there output is demand determined in the short run because prices are sticky and the increase in government spending raises GDP. The consequences of the spending increase for the public budget, of course, depend on whether Ricardian equivalence is broken, as is the case when there is a group of non-optimizing agents in the model (e.g., Gali et al., 2007).

As regards to the consequences of the spending shock for the trade balance, the textbook Keynesian model predicts a worsening of the trade balance both under fixed exchange rates and under flexible exchange rates when trade balance is made a function of income. Monacelli and Perotti (2006) discuss and extend a small-open economy model with sticky prices, monopolistic competition and complete asset markets. An increase in public spending produces an ambiguous effect on the trade balance, depending on whether falling private consumption or the expenditure switching effect of the appreciation of the real exchange rate dominate.

3. The baseline empirical model

In our empirical investigation, we focus only on government spending shocks rather than tax shocks, because the effects of government spending shocks have been investigated more elaborately both in theory and in empirical work. Further, for a variety of reasons we use trade balance data rather than current account data: the latter tend to be of poorer quality (owing to its net factor payments component) and its time series tend to be shorter. Moreover, a split into its components is not directly possible.

In line with much of the literature (e.g., Corsetti and Mueller, 2006, and Monacelli and Perotti, 2006) for easy comparison, we start with a typical vector auto-regression (VAR) specification based on the vector of endogenous variables \([g, nt, y, tby, reer]\), where \(g\) is government spending (i.e., government consumption plus government investment),\(^2\) \(nt\) is cyclically-adjusted net taxes (with country-specific cyclical adjustment – see Van den Noord, 2000, and OECD, 2005), \(y\) is output (all in natural logarithms), \(tby\) is

\(^2\) Government spending thus explicitly excludes transfers and subsidies, elements that possibly move automatically with the business cycle.
the trade balance in percent of GDP, and \( \text{reer} \) is the log of the real effective exchange rate (an increase in \( \text{reer} \) means a real domestic depreciation).\(^3\) Our identifying scheme is based on a Cholesky decomposition with the indicated ordering. Hence, each variable in the vector \([g, nt, y, tby, \text{reer}]\)' is allowed to react contemporaneously to all variables above it, but does not within the period react to any of the variables ordered below it. We estimate the model on a sample of 14 EU countries over the period 1970-2004. Our data sources are the Economic Outlook and the Main Economic Indicators of the OECD Statistical Compendium (for more detail, see the Web Appendix).

We use annual data instead of quarterly data, as is common in much of the literature. The main advantage of using annual data is that the economic interpretation of fiscal shocks identified with quarterly data may be more problematic, as (substantial) fiscal revisions do not usually take place at that high frequency. Moreover, potential anticipation effects of fiscal policy changes play a smaller role, as forcefully argued by Ramey (2006). Other advantages are that one does not need to be concerned with potential seasonal effects in the data and there is less need to be concerned with the details of the institutional setting.

Of course, the main drawback is that our identifying assumptions become stronger. In particular, the Cholesky scheme given above excludes a response of \( g \) to \( y \) and \( nt \) within the budget year. This assumption is motivated by the fact that spending plans are usually determined before the new fiscal year starts. In Section 3, we put the assumption that \( g \) does not contemporaneously react to \( y \) to scrutiny.\(^4\)

Another potential drawback of using annual data is that we have fewer observations, although in many instances quarterly fiscal data are the result of interpolation. To increase the precision of estimates, we estimate the VAR model in panel format, including all countries in the sample. We include fixed country and time effects (to account for all possible variables that are common to all years and countries, respectively) and country-specific time trends to partly correct for potentially omitted trending variables. Nevertheless, we still have to impose some homogeneity restrictions. However, the selected country sample should be conducive in this respect as the EU-14 countries share many similarities. Extensive testing in Beetsma et al. (2006) suggests that our homogeneity assumptions are not unreasonable. We also explore a variant below in which we split the country sample into relatively closed and relatively open countries.

Figure 1 shows the impulse responses for a one-percent of GDP increase in government spending. The central estimates are accompanied by 90%

\(^3\) We include two lags of each variable in the VAR. However, the results are insensitive to the precise lag length.

\(^4\) In fact, changing the ordering of \( g \) and \( nt \) has no effect on the results.
confidence bands (both here and in the sequel). This shock produces a significant increase in GDP that dies out only slowly and only loses significance after six years. Somewhat surprisingly, (cyclically adjusted) net taxes fall upon impact. Here, we can only speculate about source of this finding. Rather than being caused by some economic mechanism, it could also, for example, be the result of an overestimation of the elasticities of taxes with respect to output or the way the data are processed. The trade balance/GDP ratio also deteriorates, which could be the result of a reduction in national saving associated with the reduction in government saving alone (a decrease in the numerator). The real effective exchange rate does not move on impact, but appreciates slowly and becomes temporarily significant. The stable real exchange rate might at least partly be explained by the fact that prices are sticky and the EU countries have most of the time tried to limit nominal exchange rate movements. Figure 1 also shows the constructed response of the primary budget (as a share of GDP). As the figure shows, a government spending increase produces a twin deficit on impact. However, the government budget balance returns to zero faster than the trade balance.

It may be useful at this point to compare our findings to those in the literature. We can compare the domestic effects with those obtained by Perotti (2005) who estimates “closed-economy” VAR models in \([g, nt, y]\) and other variables for five large economies, employing an identification scheme similar to ours. He finds that for the period before 1980 the short-run response of output to a public spending increase tends to be positive, while it falls substantially on average for the years after 1980. The main differences with our approach are that he uses quarterly, instead of annual, observations and that his country sample has only limited overlap with our country sample. Monacelli and Perotti (2006) estimate individual-country VAR models similar to ours for Australia, USA, Canada and UK. The impulse responses show that in most cases GDP increases immediately or with a lag, the trade balance deteriorates during the first couple of years and the real exchange rate depreciates. Again, their analysis differs from ours in that they use quarterly data and that their country sample has a minimal overlap with our sample.

We drop \(t\) from the VAR system and replace it with its components, (the log of) exports, \(x\), and (the log of) imports, \(m\). This helps us in tracing the

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5 It is constructed as the percentage-point change in \(\left( G_t - NT^{\text{NA}}_t \right) / Y_t \), which in turn is computed as \(G / Y \left[ \hat{G}_t - \hat{Y}_t \right] - \left( NT^{\text{NA}} / Y \right) \left( \hat{N}T + \xi \hat{Y}_t - \hat{Y}_t \right)\) (see Beetsma et al., 2006). Here, \(G\), \(NT^{\text{NA}}\) and \(Y\) are government purchases, unadjusted net taxes and GDP in levels, while a hat denotes the percent (or log) deviation from the initial value (the impulse response). Finally, \(\xi\) is the elasticity of net taxes with respect to real output. The approximation is evaluated at the overall sample mean shares of \(G\) and \(NT^{\text{NA}}\) over \(Y\).

6 Replacing the trade balance ratio with the current account ratio in our model yields similar responses, albeit the response of output to the spending shock is weakened (see Figure A1).
sources of movements in the trade balance. The new ordering is \([g, nt, x, y, m, \text{reer}]\) and this is the baseline model for the rest of the paper. Out of the impulse responses of its components, we can calculate the percentage point increase in \(tby\) as:

\[
\begin{align*}
(X / Y) (\hat{X}_t - \hat{Y}_t) - (M / Y) (\hat{M}_t - \hat{Y}_t) &= \\
(X / Y) \hat{X}_t - (M / Y) \hat{M}_t + [(M / Y) - (X / Y)] \hat{Y}_t,
\end{align*}
\]

which we evaluate at the overall sample mean share of \(X\) and \(M\) over \(Y\).

Figure 2 shows the impulse responses including the ones constructed for the primary budget and trade balances. The responses for the variables that we retained from the previous regression are basically unchanged. In particular, GDP increases significantly (see also Table 1, panel A) and then dies out slowly. On impact, GDP increases by 1.2%, while it reaches a peak response after one year of 1.6%, which suggests a Keynesian (i.e., larger than unity) multiplier effect of the spending increase. Exports react by becoming significantly negative. If the economy runs into capacity constraints, the increase in domestic demand may crowd out exports. The observed pattern would also be consistent with an increase in government spending that falls mainly on government wage consumption and that drives up economy-wide wages (see Lane and Perotti, 1998). Hence, traded sector output falls and exports decrease. Moreover, the requirement that the market for non-traded output clears at the national level likely causes a real exchange rate appreciation (as is the case here). Imports increase substantially, which is consistent with the increase in income. Both effects on exports and imports reduce the (constructed) trade balance, which falls by 0.5% of GDP on impact and peaks at -0.8% of GDP after two years. Hence, even though the increase in GDP pushes the trade balance as a share of GDP towards zero, it still deteriorates significantly. This may not be surprising, because as long as the ratios \(X/Y\) and \(M/Y\) are of comparable magnitude, the effect of the increase in GDP will be marginal. Finally, we observe that the public budget deteriorates significantly with a deficit of 0.7% on impact and that decays only slowly.

\[\text{In an attempt to track the sources of the real exchange rate movement, we have also replaced \text{reer} in the VAR by the nominal effected exchange rate (ordered last) and the log of the price level (ordered first, as the price level is expected to be sticky). A shock to the system would move the real exchange rate by moving the domestic price level and/or the nominal exchange rate. The price increase gets close to significance, while the nominal effective exchange rate does not change, suggesting that the effect of the fiscal shock on domestic inflation is driving the real exchange rate (see Figure A2).}\]
4. Robustness tests

4.1. Identifying restrictions

In this section we explore the robustness of our results. One of the main assumptions behind our approach is that government spending within the year does not react to unexpected output shocks. To explore the sensitivity of our results to this assumption, we relax this assumption by restricting the within-period response of government spending to output, $\alpha_{gy}$, to different values than under the baseline, which imposes $\alpha_{gy}=0$. Given that government spending in principle does not automatically react to the business cycle, a positive (negative) value of $\alpha_{gy}$ indicates a pro-cyclical (counter-cyclical) discretionary response to unexpected output shocks. Panels B of Table 1 report the responses (and their significance) of output, imports, exports, the trade balance and the budget surplus on impact and at a number of lags, when we vary the contemporaneous response of government spending to output over a rather wide range from –0.25 to 0.25 (see Figures A3 and A4). The responses of these variables are qualitatively similar to those under the baseline in panel A (and Figure 2), although there are some quantitative differences. When varying the response of government spending to output from negative to positive, the effects on output and, hence, on imports and the trade balance as a share of GDP become weaker. Even so, the peak estimate of the spending to output multiplier still exceeds unity under the pro-cyclical response.

We also explore an indirect way of assessing our identifying assumption that government spending does not react to output within the period. First, we subtract government spending from output to obtain what we refer to as “private output”. In our baseline regression we replace output with private output. Hence, for this regression government spending precedes private output in the Choleski decomposition. Private output reacts significantly to a government spending shock with a maximum response of 0.69 after one year. (see Figure A5) We also estimate a variant in which we place private output just government spending, keeping the ordering in the VAR otherwise as before. (see Figure A6) The estimated responses of government spending are very close to each other for the two orderings while the confidence bands on

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8 This latter number roughly equals the average estimate of the degree of spending pro-cyclicality found by Lane (2003) for the OECD countries (computing this average estimate as the weighted average of his average estimates for the pro-cyclicality of public consumption and public investment). However, there is very little agreement on whether OECD fiscal policies have been pro-, counter-, or a-cyclical, which is the reason why we vary the within-year response of government spending to output over a rather wide range from negative to positive.

9 We could not reasonably do this regression with total output ordered before government spending, because the latter almost surely affects the former within the period, as the national income identity would suggest.
the government spending responses almost overlap, suggesting that our identifying assumption is justified.

Our baseline assumption that spending does not contemporaneously react to output is in line with Beetsma et al. (2006), where we estimate a panel VAR model in \([g, y]\) for seven EU countries for which we have non-interpolated quarterly government spending data, assuming that, due to implementation lags, \(g\) does not react to \(y\) within the quarter. From the quarterly-data estimates we construct an estimate of \(\alpha_{gy}\) at yearly data frequency and find that it is not significantly different from zero.\(^{10}\)

Next, we re-estimated the model switching the ordering of \(nt\) and \(g\), but leaving the specification unaltered otherwise. The results are roughly unchanged (panel C, Table 1). (see Figure A7) We also made the current real exchange rate exogenous by ordering it first in the panel VAR system, but leaving the ordering the same otherwise. We thus allow for a within-year reaction of government spending to this variable. The results, and in particular the effects on the trade balance share of GDP, are basically unchanged (see Figure A8). Another variant includes the real effective exchange rate (up to two lags) as an exogenous variable. Again, our results are essentially unchanged (see Figure A9). These findings suggest that the main source of movement of the trade balance is an increase in output following the increase in government purchases.

4.2. International trade in goods only

The imports and exports figures used up to now include both trade in goods and services. However, figures on services trade would generally be considered less reliable than figures on trade in goods. Moreover, the attention of the policy debate on trade is often based on figures for goods trade. Here, we re-estimate our baseline model replacing the “total” imports and exports figures with those for goods only. The bulk of trade is in goods. Exports and imports of goods are on average (over time and countries) in our sample roughly 28% of GDP, while exports and imports of services are roughly 5% on average. Because we have bilateral data on goods trade (from the IMF Direction of Trade Statistics), focusing on goods only allows for more flexibility in that we are now able to vary the sample of countries with which our EU countries trade.

Figure 3 shows the impulse responses for our 14 EU country panel VAR based on trade in goods of each country with all other countries in the world, so the only change compared to the baseline is that we exclude services. The results are rather similar to those for the baseline regression. Now, however, exports no longer decrease significantly – see also panel D1 of Table 1. Panel

\(^{10}\) We describe the aggregation from quarterly to annual parameter estimates in the web-appendix to Beetsma et al. (2006).
D2 of Table 1 reports impulse responses for the case in which goods trade is only with the other countries in the EU. Interestingly, in spite of the output responses being virtually identical in the two cases, the estimated imports response is much stronger when goods trade is only with the EU countries, indicating that the sensitivity to income of imports from other EU countries is higher than that of imports from countries outside the EU.11

4.3. Sample split: open and closed economies

As Corsetti and Mueller (2006) argue, the effect of a government spending increase on the trade balance may depend on the degree of trade openness of a country. To explore the relevance of their hypothesis for our sample, and also as a check for an obvious potential source of heterogeneity, we split our sample into groups of “open” and “closed” economies and re-estimate the baseline model for each of the two groups. Open (closed) economies are those for which the ratio of exports plus imports over GDP has on average been in the upper (lower) half of the sample over the period 1970-2004. The open economies are Austria, Belgium, Denmark, Ireland, Portugal, The Netherlands and Sweden. Table 1, panels E1 and E2, reports the responses (and their significance) of our variables of interest for the groups of closed and open economies, respectively (see also Figures A10 and A11). The group of closed economies exhibits a stronger output response to the spending shock (on impact 1.43 versus 0.83), which is consistent with hypothesis that for this group less of the fiscal stimulus leaks abroad. In fact, for the open economies, the spending multiplier never exceeds unity. A comparison of the responses of imports and exports is complicated by the difference in the output response. Dividing the impact effects on imports by that on output, we obtain “normalized” responses. Somewhat surprisingly, the normalized import response of the closed economies exceeds that of the open economies (0.72 versus 0.49). The normalized export responses, however, are (in absolute value) much smaller for the closed than for the open economies (-0.41 versus -0.99). Indeed, the deterioration of the trade balance both on impact and for the ensuing three years is larger for the open than for the closed economies. The budget deficit is smaller for the closed economies on impact and vanishes within a year, while for the open economies it rises even further after one year and it takes a couple of years to vanish.

4.4. Further robustness testing

11 Even so, the responses of the trade balance ratios are rather similar. However, notice that these are expressed in terms of percentage points of GDP and that exports and imports form a larger share of GDP when they are aggregated over all trading partners rather than other EU countries only – see expression (1).
We explore the robustness of our baseline results further for a variant of our model without country-specific time trends and one with a linear-quadratic country-specific time trends. The results largely remain the same. Only the real exchange rate switches from insignificance in the absence of trends to a significant fall after a year under linear-quadratic trends. (see Figures A12 and A13, respectively).

We also explore the robustness of our findings for changes in the sample period. To retain a sufficiently long sample in the time dimension, we have only limited flexibility in this regard. In one variant, we leave out the EMU period, implying the sample period 1970-1998 (see Figure A14) The other variant leaves out the seventies and, hence, the turbulent period of the major oil shocks. The sample then covers the period 1980-2004 (see Figure A15). Both variants leave the results qualitatively unchanged, although the size of the output and imports responses are larger (smaller) than the baseline under the 1970-1998 (1980-2004) sample – see panels F1 and F2 of Table 1.

Another important variation on our baseline specification would be to include the nominal interest rate. We augment the baseline model by positioning the short-term interest rate below government spending. The impulse responses of the baseline variables are unaffected (see Table 1, panel G1) (see Figure A16) although there is a slight widening of the error bands. The short-term interest rate itself does not seem to respond significantly to spending shocks. Replacing the short-term with the long-term interest rate (see Figure A17) we observe that the latter increases significantly after 3 years, while the other responses remain qualitatively the same (see Table 1, panel G2).

Adding the first two lags of the government debt – GDP ratio as exogenous variables to the regression, as suggested by Favero and Giavazzi (2007), has no consequences either, although the real exchange rate after two years shows a rather strong appreciation (see Figure A18). Our finding that the results are otherwise unchanged is potentially due to the country-specific trends correcting for the movements in the debt-GDP ratios.

5. Concluding remarks

In this paper, we have explored the effects of government spending shocks for trade balances and budget deficits in the European Union. To this end we employed an annual panel VAR with exports and imports as separate variables, and constructed the responses of trade balances and budget balances from their composing variables. This allowed us to track in detail the movements in the trade balance as a share of GDP.
Our baseline estimates suggest the presence of a Keynesian multiplier of government spending. A one-percent of GDP increase in government spending produces a 1.2% impact increase in GDP and a 1.6% peak increase. The trade balance deteriorates because imports rise and exports fall. Our estimates suggest an impact fall of the trade balance by 0.5% of GDP and a peak fall by 0.8% of GDP. Moreover, the government spending increase produces a 0.7% of GDP impact (and peak) budget deficit, thereby pointing to the potential relevance of the twin deficits hypothesis. We employ a large number of robustness tests, a number of them aimed at checking our identifying assumptions. However, they leave our results essentially unchanged. A split of our sample in closed and open economies, shows that the government spending increase has a larger effect on output of the former group (as one would expect), but that the trade balance of the latter group exhibits a stronger deterioration (which runs mainly via the exports channel).

References


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<th>Table 1: Responses to a spending increase (1% of GDP)</th>
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**Case B2: Contemporaneous response of $g$ to $y$ set at 0.25**

| Case | C: nt ordered first |
| **Exports** | -0.71* | -1.05* | -0.62 | -0.19 | -0.74* | -0.93* | -0.78 | -0.57 |
| **Output** | 0.80* | 1.13* | 0.81* | 0.39 | 1.10* | 1.44* | 0.96* | 0.38 |
| **Imports** | 0.64 | 1.07* | 1.21* | 0.87* | 0.97* | 1.64* | 0.90 | 0.07 |
| **Surplus/GDP** | -0.80* | -0.57* | -0.28* | -0.21* | -0.56* | -0.84* | -0.55* | -0.21 |
| **Trade balance/GDP** | -0.44* | -0.70* | -0.60* | -0.35* |

**Case D1: Only goods trade (with all countries)**

| **Exports** | 0.22 | -0.56 | -0.58 | -0.47 | -0.16 | -0.61 | -0.47 | -0.25 |
| **Output** | 1.20* | 1.57* | 1.21* | 0.68* | 1.19* | 1.56* | 1.24* | 0.74* |
| **Imports** | 1.40* | 1.96* | 1.51* | 0.64 | 2.32* | 3.02* | 2.77* | 1.78* |
| **Surplus/GDP** | -0.72* | -0.46* | -0.18 | -0.19* | -0.73* | -0.45* | -0.14 | -0.12 |
| **Trade balance/GDP** | -0.32* | -0.69* | -0.57* | -0.30* | -0.46* | -0.67* | -0.60* | -0.37* |

**Case D2: Only goods trade (with EU countries only)**

| **Exports** | -0.58 | -1.02 | -0.51 | -0.33 | -0.83* | -0.86 | -0.97 | -0.95 |
| **Output** | 1.43* | 1.75* | 1.15* | 0.53 | 0.83* | 0.94* | 0.55* | 0.01 |
| **Imports** | 1.03* | 1.00 | 1.52* | 1.10* | 0.41 | 1.28* | 0.42 | -0.66 |
| **Surplus/GDP** | -0.58* | -0.00 | -0.04 | -0.11 | -0.85* | -1.12* | -0.61* | -0.30 |
| **Trade balance/GDP** | -0.38* | -0.48* | -0.49* | -0.34* | -0.55* | -0.95* | -0.62* | -0.13 |

**Case E1: “Closed” economies**

| **Exports** | -0.58 | -1.02 | -0.51 | -0.33 | -0.83* | -0.86 | -0.97 | -0.95 |
| **Output** | 1.43* | 1.75* | 1.15* | 0.53 | 0.83* | 0.94* | 0.55* | 0.01 |
| **Imports** | 1.03* | 1.00 | 1.52* | 1.10* | 0.41 | 1.28* | 0.42 | -0.66 |
| **Surplus/GDP** | -0.58* | -0.00 | -0.04 | -0.11 | -0.85* | -1.12* | -0.61* | -0.30 |
| **Trade balance/GDP** | -0.38* | -0.48* | -0.49* | -0.34* | -0.55* | -0.95* | -0.62* | -0.13 |

**Case E2: “Open” economies**

| **Exports** | -0.61 | -1.05* | -0.49 | -0.05 | -0.89* | -1.02* | -0.56 | -0.14 |
| **Output** | 1.48* | 1.80* | 1.08* | 0.44 | 1.00* | 1.31* | 0.99* | 0.48 |
| **Imports** | 1.39* | 2.10* | 1.74* | 1.02* | 1.10* | 1.59* | 1.58* | 0.90* |
| **Surplus/GDP** | -0.60* | -0.28* | -0.14 | -0.19* | -0.86* | -0.51* | -0.26 | -0.26* |
| **Trade balance/GDP** | -0.63* | -1.02* | -0.72* | -0.35 | -0.73* | -0.96* | -0.79* | -0.38* |

**Case F1: Sample period 1970-1998**

| **Exports** | -0.30 | -0.74 | -0.47 | -0.08 | -0.35 | -0.79* | -0.59 | -0.19 |
| **Output** | 1.22* | 1.57* | 1.15* | 0.56* | 1.19* | 1.54* | 1.15* | 0.56* |
| **Imports** | 1.21* | 1.66* | 1.39* | 0.79* | 0.97* | 1.48* | 1.41* | 0.83* |
| **Interest rate** | -0.07 | -0.20 | 0.14 | 0.16 | -0.02 | -0.06 | 0.23* | 0.31* |
| **Surplus/GDP** | -0.70* | -0.43* | -0.22* | -0.21* | -0.73* | -0.48* | -0.24* | -0.22* |
| **Trade balance/GDP** | -0.50* | -0.79* | -0.61* | -0.29* | -0.43* | -0.75* | -0.66* | -0.34* |

* Denotes significance at the 10% level.
Figure 1: Standard model with trade balance as share of output

Note: dotted lines mark 90% confidence interval

Figure 2: Baseline: split of trade balance in its components
Figure 3: International trade in goods only
APPENDIX

Figure A1: Current account instead of trade balance

Figure A2: Nominal effective exchange rate and price level in VAR
Figure A3: Imposing counter-cyclical response of $g$ to $y$ ($\alpha_{gy}=-0.25$)

Figure A4: Imposing pro-cyclical response of $g$ to $y$ ($\alpha_{gy}=0.25$)
Figure A5: Replacing output with private output

Figure A6: Private output before government spending
Figure A7: Cyclically adjusted net taxes ordered first
Figure A8: Real effective exchange rate ordered first

Figure A9: Real effective exchange rate included as exogenous variable
Figure A10: Baseline for Closed EU countries
Figure A11: Baseline for Open EU countries

Figure A12: Baseline specification without trend
Figure A13: Baseline specification with linear-quadratic trend

Figure A14: Sample period 1970 - 1998
Figure A15: Sample period 1980 - 2004

Figure A16: Short term interest rate in VAR
Figure A17: Long term interest rate in VAR

Figure A18: Baseline specification with first and second lag of debt/GDP ratio included