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Quantifying the Economic Effects of the Single Market in a Structural Macromodel

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Jan in 't Veld

Abstract

This paper examines the macro-economic benefits of the Single Market in goods and services by simulating a counterfactual scenario in which tariffs and non-tariff barriers are reintroduced. Model simulations show how the reintroduction of trade barriers in such a counterfactual would lead to significantly lower trade flows between the Member States. Lower trade openness also means reduced market size and less competition. Using empirical evidence on the effect of the Single Market on firms' mark-ups over marginal costs, we add these effects to the direct trade effects to come to a total estimate of the economic benefits of the Single Market of between 8% and 9% higher GDP on average for the EU.

JEL Classification: F13, F14, F15, F17.

Keywords: Trade integration, European Union, Single market, general equilibrium.

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1. INTRODUCTION

The European Single Market Programme was implemented in 1987 and the Single Market was established in 1993. The aim was to make the European Union one territory without any internal borders or other regulatory obstacles to the free movement of goods and services, which would stimulate competition and trade, improve efficiency, raise quality, and cut prices. In an ex-ante analysis at the time, it was estimated that it could raise overall GDP by 4¼-6½ % in the long run (Cecchini et al., 1988). Now twenty-five years later there has been a renewed interest in the macroeconomic benefits the Single Market has brought the Member States. Mayer et al. (2018) and Felbermayr et al. (2018) use gravity trade models to quantify the trade effects of European integration and calculate counterfactual scenarios which represent the costs of a non-Europe going backwards. This paper uses a structural macroeconomic model in a bottom-up approach, building a counterfactual scenario by raising tariffs and non-tariff barriers to intra-EU trade that would arguably apply if trade would revert back to WTO rules. We quantify the macroeconomic benefits of the Single Market in goods and services by the reductions in bilateral trade and GDP in such a counterfactual scenario.

The model used in this exercise is a multi-country version of the QUEST model. QUEST is a structural macroeconomic model, derived from micro-principals of dynamic intertemporal optimisation. It distinguishes between a tradable and non-tradable sector, both importing intermediate goods, and models bilateral trade flows in the traded good. Although it lacks the sectoral details found in typical trade computable general equilibrium (CGE) models, and can therefore not assess the impact on specific sectors, the modelling of trade in intermediate inputs captures linkages through cross-border value chains. This is important, as trade in intermediates amplifies the effects of trade barriers. The model can also assess the wider macroeconomic consequences of trade barriers on the major EU economies, on output and its components. The model version used here includes each of the 28 EU Member States as well as the United States and a block representing the rest of the world. Aggregates are also reported for the EU and the euro area (EA).

For the counterfactual scenario of WTO-rules based intra-EU trade, assumptions have to be made on tariffs and non-tariff barriers (NTBs) that would apply. We calculate country-specific sector-weighted averages of Most-Favored Nation (MFN) tariffs and assume these would hold in this counterfactual scenario. For NTBs we base our assumptions on estimates of the tariff-equivalents of NTBs between the EU and US, derived from TTIP studies (Berden et al, 2013). Our model simulations then show how the reintroduction of tariffs on goods and higher non-tariff barriers on goods and services lead to significantly lower trade flows between the Member States. Intra-EU imports fall by 20-30% in this scenario, while output is 6½-7% lower on average for the EU. Lower trade openness also means reduced market size and less competition. Using empirical evidence on the effect of the Single Market on firms' mark-ups over marginal costs, we add these effects to the direct trade effects to arrive at a total estimate of the macroeconomic benefits of the Single Market of 8-9% on average. This EU average hides a large heterogeneity across Member States, with the largest effects for smaller and more open economies.

Our estimates can be directly compared to those of Mayer et al. (2018) and Felbermayr et al. (2018). Mayer et al. (2018) use a gravity model to estimate the trade creation effects from different stages of European integration, ranging from free trade agreements to the Single Market, and also from membership of the Schengen agreement and the euro. They then apply those to counterfactual exercises where the EU returns to a 'normal', shallowtype regional agreement, or reverts to WTO rules. They find large trade effects and welfare losses for the EU of up to 5½ % in case of a reversion to WTO rules. In a comparable study, Felbermayr et al. (2018) use a sectoral gravity models to estimate the effects of various steps of European product market integration on trade flows for the period 2000-14. They report income per capita effects for their Single Market disintegration scenario that are on average around 4% for the EU as a whole, but also document a strong degree of heterogeneity across EU countries, ranging from 2.2 to 19.7%. While the country ranking in these two

studies show strong similarities to ours, their welfare or income per capita effects appear somewhat lower than our GDP effects, and only part of this difference can be attributed to the competition effects that are included in our results, but not in these two studies. On the other hand, our trade effects, derived from bottom-up estimates of trade barriers, are smaller than the impact on bilateral trade flows found in these gravity studies. It is not clear what can explain the similarity in output effects, while finding smaller trade effects, but it suggests more destabilising effects in our macroeconomic model from e.g. employment responses and investment, leading to a sharper drop in domestic demand. In our scenarios there is a strong decline in investment and the fall in GDP is mainly driven by the decline in the capital stock, as employment effects are cushioned by the decline in wages.

Our assessment of the impact of the Single Market is restricted to trade in goods and services, while the Single Market involves four freedoms – the free movement of goods, services, capital and people. Our focus on goods and services can be justified as this was the emphasis of the Single Market Programme (SMP) in 1992, but it must be stressed that the Single Market is not complete yet and further initiatives have focused on deepening the Single Market. For instance additional legislation has been introduced to strengthen the Single Market in services, transport and the digital Single Market. It should also be noted that this analysis excludes the effects of membership of the customs union (Free-Trade Agreements (FTAs) with third countries), euro membership, and Schengen. The implicit assumption in the counterfactual is no Single Market in goods and services, but e.g. continued membership of the euro, this to identify the macroeconomic benefits of the Single Market alone.¹

There are two other caveats to be mentioned. Firstly, the counterfactual scenarios simulated here are stylised in the sense that new trading conditions are introduced as a sudden shock. This is why we only report long run effects of a reintroduction of trade barriers on the economies of the Member States. Secondly, the focus here is on the 28 Member States of the EU, while 31 countries participate in the Single Market, including Norway, Iceland and Lichtenstein. By not including these three members, the results may underestimate the impact for some close trading partners of these countries.

The paper is structured as follows. The next section gives a brief overview of the model. This is followed by a section discussing the counterfactual shocks on tariffs and NTBs. Section 4 then describes the results of the counterfactual scenarios, and section 5 give a comparison of the results with those in the literature.

2. MODEL DESCRIPTION

The analysis uses the European Commission's QUEST model.² QUEST is a global macroeconomic model developed for macroeconomic policy analysis and research. A member of the class of New-Keynesian Dynamic Stochastic General Equilibrium (DSGE) models, QUEST has rigorous microeconomic foundations derived from utility and profit optimisation and includes frictions in goods, labour and financial markets. With empirically plausible estimation and calibration they are able to fit the main features of the macroeconomic time series. The model distinguishes a tradable and a non-tradable sector, where the latter represents mainly public administration, health and education services. Trade flows are modelled bilaterally. While the model lacks the sectoral details found in

¹ Mayer et al. (2018) and Felbermayr et al. (2018) use gravity equations with dummies for Schengen, euro membership etc to separately identify the effects of other stages of integration.

² QUEST is the macro-economic model used by DG ECFIN for policy analysis. The first estimated version is described in Ratto et al. (2009), Roeger et al. (2010) describes a tradable and non-tradable sector version used here. For references on the QUEST model, see:

http://ec.europa.eu/economy_finance/research/macroeconomic_models_en.htm

ratio, and (iii) liquidity-constrained households, who do not have access to financial markets, i.e. cannot borrow against future income or save via financial/ real investment, and in each period consume their entire disposable labour and transfer income.

There is a trade union which sets wages taking into account preferences of the individual household groups. Goods and labour markets are subject to nominal and real rigidities. The market for mortgage lending is subject to a collateral constraint. There are no financial constraints for corporate borrowing.

The government is subject to an intertemporal budget constraint. On the expenditure side QUEST distinguishes between government consumption, (productivity enhancing) government investment and transfers (further disaggregated into unemployment benefits and other transfers). On the revenue side, the model distinguishes between taxes from consumption, labour and capital. Tax revenues are linked to their corresponding tax bases via linear tax rates. Tariffs are also a revenue for the government. There is a debt rule which forces the adjustment of taxes and expenditure such that a certain defined debt target is reached.

Households, firms and the government make decisions which are consistent with their respective intertemporal budget constraints. This also makes sure that all stock flow relationships are modelled consistently.

We model bilateral trade between countries. Exporters sell domestically produced tradable goods in world markets. The following describes the allocation of demand between tradable (T) versus non-tradable (NT) output and domestically produced versus imported T goods. In order to facilitate aggregation, private households and the government are assumed to have identical preferences across goods used for private and government consumption and public investment. Let $Z=C+G+IG$ be the demand by private households and the government, and let their preferences for T and NT goods be given by the CES functions:

$$(1) \quad Z_t = \left[(1-s^T)^{1/\sigma_{mt}} (Z_t^{NT})^{(\sigma_{mt}-1)/\sigma_{mt}} + (s^T)^{1/\sigma_{mt}} (Z_t^T)^{(\sigma_{mt}-1)/\sigma_{mt}} \right]^{\sigma_{mt}/(\sigma_{mt}-1)}$$

where Z_t^{NT} is an index of demand across the NT varieties, and Z_t^T is a bundle of domestically produced ($Z_t^{T,D}$) and imported ($Z_t^{T,M}$) T goods:

$$(2) \quad Z_t^T = \left[(1-s_m)^{1/\sigma_x} (Z_t^{T,D})^{(\sigma_x-1)/\sigma_x} + s_m^{1/\sigma_x} (Z_t^{T,M})^{(\sigma_x-1)/\sigma_x} \right]^{\sigma_x/(\sigma_x-1)}$$

The elasticity of substitution between the bundles of NT and T goods is σ_{mt} . The elasticity of substitution between the bundles of domestically produced and imported T goods is σ_x . The steady-state shares of T goods in Z_t and of imports Z_t^T are s^T and s_m , respectively. All investment in physical capital in the T and NT sectors consists of T goods.

The CES aggregate (1) combining T and NT goods gives the following demand functions:

$$(3a) \quad Z_t^T = s^T (P_t^T / P_t^C)^{-\sigma_{mt}} (C_t + G_t + IG_t)$$

$$(3b) \quad Z_t^{NT} = (1-s^T) (P_t^{NT} / P_t^C)^{-\sigma_{mt}} (C_t + G_t + IG_t)$$

The intermediate inputs in sector $J=(T, NT)$ are also composites of T and NT analogously to equations (1) and (2) with T either domestically produced or imported:

$$(4) \quad INT_t^J = \left[(1 - s_{int}^J)^{1/\sigma_{int}} (INT_t^{NT,J})^{(\sigma_{int}-1)/\sigma_{int}} + (s_{int}^J)^{1/\sigma_{int}} (INT_t^{T,J})^{(\sigma_{int}-1)/\sigma_{int}} \right]^{\sigma_{int}/(\sigma_{int}-1)}$$

$$(5) \quad INT_t^{T,J} = \left[(1 - s_m)^{1/\sigma_x} (INT_t^{T,D,J})^{(\sigma_x-1)/\sigma_x} + s_m^{1/\sigma_x} (INT_t^{T,M,J})^{(\sigma_x-1)/\sigma_x} \right]^{\sigma_x/(\sigma_x-1)}$$

This gives demand functions for T and NT intermediates analogously to (3):

$$(6a) \quad INT_t^{T,J} = s_{int}^J \left(P_t^T / P_t^{INT,J} \right)^{-\sigma_{int}} INT_t^J$$

$$(6b) \quad INT_t^{NT,J} = (1 - s_{int}^J) \left(P_t^{NT} / P_t^{INT,J} \right)^{-\sigma_{int}} INT_t^J$$

Aggregate domestic import demand for goods from all regions is given by:

$$(7) \quad M_t^d = \left(\sum_f (s^{d,f})^{\frac{1}{\sigma_1}} (M_t^{d,f})^{\frac{\sigma_1-1}{\sigma_1}} \right)^{\frac{\sigma_1}{\sigma_1-1}},$$

where σ_1 is the elasticity of substitution between imported goods, set in this exercise to 3.

The impact of trade agreements is assessed through their impact on trade costs. This includes both the direct tariffs on imports (MFN tariffs) as well as the tariff equivalent of non-tariff barriers to trade (arising from different regulations, border controls, etc.).

Demand for goods from region f is given by:

$$(8) \quad M_t^{d,f} = s^{d,f} \left(\frac{PM_t^{d,f}}{PM_t^d} \right)^{-\sigma_1} M_t^d$$

where

$$(9) \quad PM_t^{d,f} = (1 + Tariff_t^{d,f} + NTB_t^{d,f}) e_t^{d,f} P_t^f$$

with $s^{d,f}$ the steady state share in imports of the domestic economy's imports stemming from region f , $e_t^{d,f}$ the corresponding bilateral exchange rate, $P_t^{T,f}$ the price of the tradable good in the foreign economy f denoted in f 's currency, $Tariff_t^{d,f}$ is the tariff on imports from region f , and $NTB_t^{d,f}$ the cost equivalent of non-tariff barriers on imports from region f . Tariffs are a revenue for the government which can be recycled through reductions in distortive taxes, unlike NTBs.

Total exports of the domestic economy d are the sum of all countries' imports stemming from region d :

$$(10) \quad X_t^d = \sum_f M_t^{f,d}$$

Aggregate import prices are a CES aggregate over bilateral import prices with trading partners:

$$(11) \quad P_t^{M,d} = \left(\sum_f s^{d,f} \left(P_t^{M,d,f} \right)^{1-\sigma_1} \right)^{\frac{1}{1-\sigma_1}}$$

The trade balance of the domestic economy is net trade in value terms:

$$(12) \quad TB_t^d \equiv \sum_f e_t^{d,f} P_t^{M,f,d} M_t^{f,d} - \sum_f P_t^{M,d,f} M_t^{d,f}$$

3. TRADE BARRIERS

In order to quantify the economic benefits from the Single Market, we need an estimate of the reduction in trade costs that the Single Market has established. We assume a counterfactual in which trade reverts to WTO-rules, and apply Most Favoured Nation (MFN) rates as tariffs on goods. For NTBs we rely on estimates of non-tariff barriers as calculated for trade between the EU and the US. We discuss each of these below.

MFN rates vary per sector and are highest for 'textiles' and 'transport equipment', and lowest for 'paper and pulp' and 'mining' (see Table 3.1). In aggregate, these tariffs amount to approximately 3½% for goods. For individual countries tariffs are weighted by sector import shares. Trade in goods amount to approximately 70% of all trade in goods and services, and in the model the tariff shock is adjusted accordingly.

Table 3.1. **MFN tariffs**

	<i>MFN Tariff</i>
<i>Goods</i>	
Transport Equipment	8.09
Chemicals and Chemical Products	2.71
Electrical and Optical Equipment	1.97
Food, Beverages and Tobacco	7.26
Coke, Rened Petroleum and Nuclear Fuel	2.69
Basic Metals and Fabricated Metal	2.05
Machinery, Nec	2.05
Mining and Quarrying	0.00
Textiles and Textile Products; Leather, Leather and Footwear	9.58
Rubber and Plastics	5.35
Manufacturing, Nec; Recycling	1.71
Pulp, Paper, Paper , Printing and Publishing	0.04
Agriculture, Hunting, Forestry and Fishing	5.90
Other Non-Metallic Mineral	3.78
Wood and Products of Wood and Cork	2.35
<i>EU sector weighted average MFN tariff</i>	3.5

Source: Berden et al. (2013), Dhingra et al. (2017), own calculations based on WIOD (2014)

Non-tariff barriers (NTBs), such as differences between regulatory regimes or product standards, represent a greater impediment to trade than tariffs. Following the elimination of tariffs on good and services, much of the work on strengthening the Single Market has been related to reducing remaining NTBs, particularly for trade in services. For our counterfactual we base our shocks on available estimates of NTBs that apply to trade between the EU and the US, as published in studies assessing the potentail impact of TTIP (Berden et al. (2009, 2013)). By using these estimates we assume that trade between EU Member States without a Single Market would be subject to similar conditions as now apply between the EU and the US.

The authors calculate detailed tariff equivalents of NTBs, using econometric techniques and business surveys. These are estimated to be highest for 'food, beverages and tobacco', and lowest for 'construction' and other services (Table 3.2 below). Not all NTBs are 'actionable' or 'reducible' by trade agreements or other policy actions (e.g 110/240 voltage differences between the US and the EU, or translation costs for manuals, cannot be eliminated by a trade agreement). A 'reducible' share is therefore also estimated by sector and taken into account when calculating the change in the tariff-equivalent of NTBs that would apply with or without a trade agreement. Conversely, when simulating a reversal of the Single Market, we also take the reducible share of NTBs and use this to calculate individual country NTBs (weighted by import sector shares). On average the tariff equivalent cost of NTBs amount to 10.3 percentage points (GDP weighted EU average).

Table 3.2. **Non-tariff barriers (NTBs) used in counterfactual**

<i>Sector</i>	<i>NTB cost EU/USA (tariff equivalent)</i>	<i>Reducible share of NTB</i>
Transport Equipment	22.1	0.53
Chemicals and Chemical Products	23.9	0.63
Post and Telecommunications	11.7	0.70
Electrical and Optical Equipment	6.5	0.41
Financial Intermediation	11.3	0.49
Food, Beverages and Tobacco	56.8	0.53
Construction	4.6	0.38
Renting of Machinery & Equip. and Other Business Activities	14.9	0.51
Services Nec (*)	4.4	0.37
Basic Metals and Fabricated Metal	11.9	0.62
Textiles and Textile Products; Leather, Leather and Footwear	19.2	0.50
Wood and Products of Wood and Cork	11.3	0.60
<i>Reducible sector weighted average</i>	10.3	

Source: Berden et al. (2013), Dhingra et al. (2017), WIOD (2014)

In the model, the costs of NTBs come on top of the MFN tariff and add to the overall increase in trade costs. Tariffs and NTBs are applied to trade in final goods and to trade in intermediate inputs. NTBs are more distortive than MFN tariffs, and unlike tariffs, which are a revenue for the government and which can be recycled by reducing other distortionary taxes, NTBs are a 'waste' in economic terms.

4. A COUNTERFACTUAL SCENARIO

4.1. EFFECTS OF TRADE BARRIERS

Adding the MFN tariffs and NTBs as additional costs to the bilateral trade between EU Member States, we can simulate a counterfactual scenario with the model. The results are reported in Table 4.1. The increase in trade costs of around 13% on average reduces intra-EU trade, replacing it by internal domestic trade and diverts some trade to non-EU countries (increase in extra-EU trade). Intra-EU imports decline by about 20-30% in the long run, while total imports fall by about 20% on average. The fall in imports is larger than that in exports as there is a large decline in domestic demand in the EU.

The increase in tariffs and NTBs not only affects trade flows, but also has a direct impact on the domestic economy and thereby on GDP. As imported intermediate inputs become more expensive, it raises the cost of output. It also deters investment because of the increase in investment prices, and reduces capital accumulation. Higher consumer prices put upward pressure on wages and lead to a further increase in wage costs for firms and reduces employment. Government spending, both government consumption and (productive) government investment, is kept constant in real terms in this scenario, to avoid additional fiscal contraction effects (see discussion below). Government finances deteriorate as prices rise for imported government spending, and as lower domestic demand reduces tax revenues and raises social expenditure. This more than offsets the extra revenue coming in from tariffs and the increase in the government deficit forces an increase in taxes. Higher taxes have a further negative impact on consumption.

Overall GDP is about 6% lower in Germany and Spain, 5% lower in France and 4½% lower in Italy. The effects are larger in some smaller and more open Member States, with a more than 13% decline in the Netherlands and over 15% in Belgium. On average, GDP is 6.8% lower in the euro area and 6.6% lower in the EU28. Greece and the UK are relatively less integrated with the rest of the EU, but even there GDP is more than 4% lower in the long run. There are small positive effects in the US and the rest of the world due to some trade diversion effects.

Lower GDP in the counterfactual is mostly a productivity effect, which is largely the result of lower investment. Employment falls by 1% on average in the EU, much less than the more than 6% decline in GDP, while the capital stock falls by 10%. Note that the decline in productivity is mostly the direct result of the model hypothesis that links wages to productivity, which in this case leads to a decline in wage growth that stabilises employment, up to the decline due to the terms of trade effect described above.

Table 4.1. Long run macroeconomic impact of trade barriers

	GDP	Consumption	Investment	Gov. Cons.	Gov. Invest.	Exports	Imports	Imports Intra-EU	Capital	Employment
BE	-15.4	-29.5	-28.1	0.0	0.0	-19.3	-26.8	-29.2	-23.1	-3.0
DE	-5.8	-12.3	-12.2	0.0	0.0	-10.5	-18.8	-21.3	-9.4	-0.9
EE	-12.6	-24.4	-23.3	0.0	0.0	-16.2	-22.6	-25.1	-18.8	-2.1
IE	-10.5	-21.5	-20.0	0.0	0.0	-14.0	-20.1	-22.2	-16.4	-1.8
EL	-4.4	-8.7	-10.2	0.0	0.0	-7.8	-15.2	-21.8	-7.6	-0.6
ES	-6.2	-11.7	-12.3	0.0	0.0	-10.7	-19.0	-23.9	-9.3	-0.9
FR	-5.0	-9.7	-10.9	0.0	0.0	-9.8	-17.9	-21.0	-8.2	-0.7
IT	-4.5	-9.0	-9.6	0.0	0.0	-9.4	-17.7	-22.2	-7.3	-0.7
CY	-7.8	-14.7	-16.6	0.0	0.0	-11.6	-19.7	-25.8	-13.0	-1.1
LV	-11.1	-21.5	-20.0	0.0	0.0	-14.8	-22.5	-28.6	-15.9	-1.5
LT	-9.6	-20.5	-19.5	0.0	0.0	-12.2	-19.1	-25.2	-15.7	-1.6
LU	-18.3	-33.6	-32.7	0.0	0.0	-20.9	-25.6	-25.9	-27.3	-3.4
MT	-12.1	-22.3	-24.1	0.0	0.0	-13.4	-19.1	-20.0	-20.1	-1.7
NL	-13.6	-27.8	-24.4	0.0	0.0	-16.7	-25.6	-30.3	-20.3	-2.2
AT	-9.5	-18.9	-18.8	0.0	0.0	-14.1	-22.7	-24.0	-14.8	-1.3
PT	-8.1	-15.4	-16.8	0.0	0.0	-13.1	-22.3	-25.8	-13.1	-1.2
SI	-12.8	-26.0	-23.6	0.0	0.0	-17.1	-26.1	-28.0	-19.1	-2.0
SK	-16.2	-30.3	-28.9	0.0	0.0	-20.7	-27.5	-28.6	-23.7	-3.4
FI	-5.6	-11.0	-11.6	0.0	0.0	-9.5	-16.1	-18.4	-8.8	-0.8
EA19	-6.8	-13.6	-13.7	0.0	0.0	-12.5	-20.5		-10.7	-1.0
BG	-10.2	-20.6	-18.4	0.0	0.0	-13.7	-20.6	-23.6	-14.8	-1.7
CZ	-14.9	-29.1	-25.5	0.0	0.0	-20.2	-28.7	-29.1	-20.5	-3.0
DK	-7.2	-14.5	-14.6	0.0	0.0	-11.1	-18.6	-22.2	-11.5	-1.0
HR	-7.1	-14.8	-14.2	0.0	0.0	-11.4	-20.7	-23.0	-11.0	-0.9
HU	-13.7	-26.9	-25.3	0.0	0.0	-18.1	-25.2	-25.6	-20.7	-2.8
PL	-8.0	-16.4	-15.6	0.0	0.0	-13.3	-22.2	-24.2	-12.3	-1.3
RO	-6.8	-14.9	-12.9	0.0	0.0	-11.9	-21.3	-23.1	-10.0	-0.9
SE	-5.7	-11.9	-11.8	0.0	0.0	-10.0	-17.8	-20.1	-9.0	-0.7
UK	-4.3	-8.5	-8.7	0.0	0.0	-7.8	-14.3	-19.6	-6.6	-0.4
EU28	-6.6	-13.2	-13.1	0.0	0.0	-12.1	-19.9		-10.2	-1.0
US	0.2	0.4	0.4	0.0	0.0	0.3	0.8		0.4	0.1
RoW	0.7	2.8	1.3	0.0	0.0	-6.3	5.1		1.3	0.3

The scenario described here assumes real government consumption and investment remain fixed. If fiscal expenditure was instead kept constant as a share of GDP, real spending would decline in line with GDP and have additional negative output effects. A sensitivity analysis shows this in Table A.1 in the annex. When (nominal) government consumption and investment fall in line with (nominal) GDP, there is a smaller deterioration in the government budget position. As a result the tax increase needed to stabilise the debt-to-GDP ratio is smaller, which leads to a less negative impact on private consumption and a smaller negative employment effect. But as government investment is productivity enhancing, the overall GDP effect is more negative in this scenario, which now includes the additional effects of a reduction in productive government spending, with a total decline in EU28 GDP of more than 7%.

A second sensitivity analysis shown in Table A.2 in the annex shows the sensitivity with respect to the trade elasticity. There is some uncertainty about the value of this elasticity of substitution between imported goods (σ_1), with trade models typically using a larger elasticity. For example the preferred value reported in Head and Mayer (2014) is around -5. The macro studies on which macromodels base their trade elasticities find generally much lower values, as these also capture a (lower) sensitivity to exchange rate changes. In the simulations used here, we have set the trade elasticity already higher than the standard setting, at -3. When we raise the elasticity in the model to -5, the trade effects become significantly larger, with lower imports and exports, and intra-EU imports falling by between 25-35%. The magnitude of the real GDP effects is slightly lower, by up a tenth, when substitution is higher.

4.2. EFFECTS OF LOWER COMPETITION

The scenario described above, based on higher trade barriers in the EU, shows a significant negative effect on productivity. But it does not capture the impact the Single Market has had on competition. Greater trade openness has increased competition and lowered prices, and the re-establishment of trade barriers is likely to reduce competitive pressures. This would allow firms to raise the mark-ups of their prices over their marginal costs, and have a negative impact on output.

One study that examines the impact of the Single Market on mark-ups is Badinger (2007). This paper uses a panel approach, covering 10 EU Member States over the period 1981–99, to test whether the EU's Single Market Programme has led to a reduction in firms' mark-ups over marginal costs. Mark-up reductions are found for aggregate manufacturing, but mark-ups have gone up in most service industries since the early 1990s, which confirms in his view the weak state of the Single Market for services and suggests that anti-competitive defence strategies have emerged in EU service industries. The relative reduction in mark-ups reported in this paper in manufacturing is 26%.

We apply this in our model to the mark-up in the manufacturing share of the tradable goods sector. In our view the observed increase in mark-ups in service industries is more difficult to link directly to the Single Market, and there is some evidence that there too mark-ups have come down in more recent years. In the second counterfactual simulation we assume only a change in mark-ups in manufacturing and no change in the services sector.

Table 4.2 reports the results for this scenario. An increase in mark-ups in manufacturing leads to a reduction in GDP of about 2% on average. It lowers profits and has a negative impact on demand for capital and reduces investment. It also lowers consumption. Note that there is also a further reduction in trade, with intra-EU trade flows falling by about 5%.

Table 4.2. Long run macroeconomic impact of less competition

	GDP	Consumption	Investment	Gov. Cons.	Gov. Invest.	Exports	Imports	Imports Intra-EU	Capital	Employment
BE	-2.5	-2.2	-5.3	0.0	0.0	-4.2	-3.7	-5.0	-3.7	0.0
DE	-2.1	-2.1	-4.6	0.0	0.0	-3.4	-3.0	-4.5	-3.3	0.0
EE	-2.3	-2.0	-4.9	0.0	0.0	-3.9	-3.4	-4.6	-3.4	0.0
IE	-2.2	-1.6	-4.6	0.0	0.0	-3.6	-3.0	-4.7	-3.3	0.0
EL	-1.6	-1.3	-3.9	0.0	0.0	-3.0	-2.3	-4.5	-2.6	0.0
ES	-2.3	-2.2	-4.8	0.0	0.0	-3.8	-3.0	-4.9	-3.3	0.0
FR	-2.1	-2.0	-4.8	0.0	0.0	-3.7	-3.0	-4.5	-3.3	0.0
IT	-2.3	-2.2	-5.1	0.0	0.0	-3.8	-3.0	-4.8	-3.6	0.0
CY	-1.7	-1.5	-4.1	0.0	0.0	-3.3	-2.7	-4.6	-2.7	0.0
LV	-2.2	-1.9	-4.6	0.0	0.0	-3.7	-3.0	-4.7	-3.1	0.0
LT	-1.7	-1.2	-3.8	0.0	0.0	-3.0	-2.5	-4.3	-2.6	0.0
LU	-2.2	-1.8	-4.8	0.0	0.0	-4.0	-3.7	-5.0	-3.3	0.0
MT	-1.3	-0.7	-3.2	0.0	0.0	-3.1	-2.5	-4.9	-2.0	0.1
NL	-2.1	-1.9	-4.4	0.0	0.0	-3.4	-3.0	-5.3	-3.1	0.0
AT	-2.3	-2.4	-5.0	0.0	0.0	-3.8	-3.6	-4.4	-3.4	0.0
PT	-2.2	-2.2	-5.0	0.0	0.0	-3.9	-3.5	-4.8	-3.4	0.0
SI	-2.4	-2.6	-5.1	0.0	0.0	-3.8	-3.7	-4.8	-3.6	-0.1
SK	-2.9	-2.7	-6.0	0.0	0.0	-4.8	-4.3	-5.2	-4.3	-0.1
FI	-2.2	-1.9	-4.7	0.0	0.0	-3.7	-2.9	-4.4	-3.3	0.0
EA19	-2.2	-2.1	-4.8	0.0	0.0	-3.7	-3.1		-3.3	0.0
BG	-2.4	-2.1	-4.9	0.0	0.0	-3.8	-3.1	-4.8	-3.5	-0.1
CZ	-3.3	-3.5	-6.5	0.0	0.0	-4.9	-4.5	-5.4	-4.7	-0.2
DK	-2.0	-1.8	-4.4	0.0	0.0	-3.4	-2.8	-4.4	-3.1	0.0
HR	-2.0	-2.1	-4.3	0.0	0.0	-3.2	-3.0	-4.3	-3.0	0.0
HU	-2.7	-2.4	-5.7	0.0	0.0	-4.4	-3.9	-5.1	-4.0	0.0
PL	-2.6	-2.6	-5.4	0.0	0.0	-4.1	-3.6	-4.8	-3.9	-0.1
RO	-2.5	-2.7	-5.0	0.0	0.0	-3.6	-3.4	-4.4	-3.6	-0.1
SE	-2.0	-2.0	-4.4	0.0	0.0	-3.3	-2.9	-4.2	-3.0	0.0
UK	-1.8	-1.6	-3.9	0.0	0.0	-2.9	-2.3	-4.3	-2.6	0.0
EU28	-2.1	-2.0	-4.6	0.0	0.0	-3.6	-3.1		-3.2	0.0
US	-0.1	-0.2	-0.1	0.0	0.0	-0.1	-0.4		0.0	0.0
RoW	-0.1	-0.2	-0.1	0.0	0.0	-0.1	-0.8		-0.1	0.0

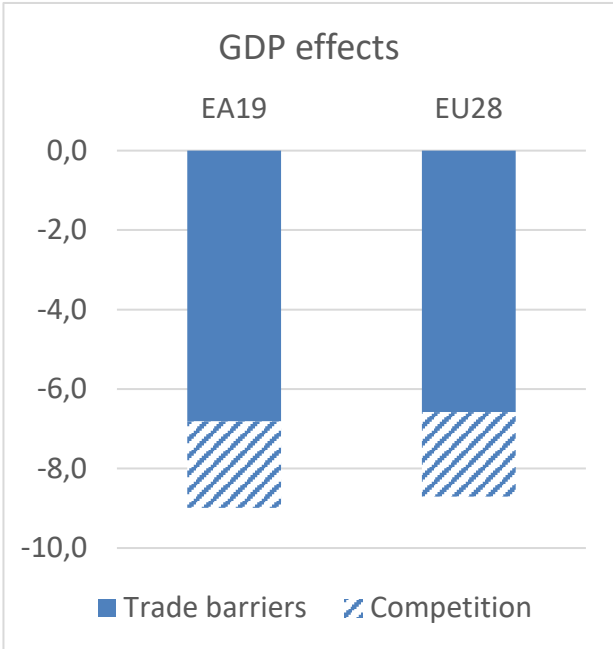
4.3. TOTAL EFFECTS OF THE SINGLE MARKET

In order to come to a total estimate of the effects of the Single Market we combine the two counterfactual scenarios described above and simulate the combined impact of higher trade barriers and higher mark-ups. Graph 4.1 shows the total impact on GDP for the euro area and EU aggregates, Table 4.3 shows macroeconomic effects for individual countries. Overall the impact is roughly linear and the sum of the two scenarios described above.

The increase in trade costs and lower competition raises prices and reduces economic activity. Lower demand for labour reduces real wages, while lower investment leads to lower capital accumulation. This reduces output. Intra-EU trade flows fall by between 25% and 35%, as a direct result of higher trade barriers and indirectly due to less competition. Overall trade openness is also strongly reduced, with exports falling by 15% and imports by 22%, more due to the additional impact of lower domestic demand.

Lower demand leads to lower tax revenues, and this more than offsets the extra revenue from tariffs. The increase in the government deficit forces an increase in taxes in order to stabilise government debt, and this has an additional negative impact on consumption.⁵ There is a strong heterogeneity across countries. Overall GDP is about 8% lower in Germany and Spain, 7% lower in France and Italy. The effects are larger in some smaller and more open Member States, with an almost 16% decline in the Netherlands, 18% in Belgium, and 20% for Luxembourg. Greece, on the other hand, is relatively less affected, with GDP almost 6% lower. The Central and Eastern European Member States that joined in 2004 are ranked high on the list of countries most affected in this counterfactual disintegration scenario. On average, GDP is 9% lower in the the euro area and 8.7% lower in the EU28. There are small positive effects in the US and the rest of the world due to some trade diversion effects. Again, lower GDP in the Member States is mostly a productivity effect, coming from lower capital accumulation.

Graph 4.1. Trade and competitiveness effects on long run GDP



⁵ Note that government consumption and (productive) government investment are kept fixed in real terms in this scenario, to avoid additional fiscal contraction effects.

Table 4.3. Simulated long run effects of counterfactual non-Single Market

	GDP	Consumption	Investment	Gov. Cons.	Gov. Invest.	Exports	Imports	Imports Intra-EU	Capital	Employment
BE	-18.0	-31.6	-32.0	0.0	0.0	-23.0	-29.8	-33.1	-25.9	-3.4
DE	-7.9	-14.3	-16.3	0.0	0.0	-13.6	-21.2	-25.1	-12.4	-1.0
EE	-14.9	-26.2	-27.1	0.0	0.0	-19.6	-25.3	-28.7	-21.5	-2.3
IE	-12.6	-22.9	-23.7	0.0	0.0	-17.2	-22.5	-26.1	-19.0	-1.9
EL	-5.9	-9.9	-13.6	0.0	0.0	-10.5	-17.0	-25.6	-9.9	-0.6
ES	-8.4	-13.7	-16.5	0.0	0.0	-14.2	-21.3	-27.9	-12.3	-1.0
FR	-7.1	-11.6	-15.2	0.0	0.0	-13.2	-20.3	-24.7	-11.2	-0.7
IT	-6.8	-11.1	-14.3	0.0	0.0	-12.9	-20.1	-26.2	-10.6	-0.7
CY	-9.5	-16.0	-20.0	0.0	0.0	-14.6	-21.8	-29.5	-15.3	-1.1
LV	-13.3	-23.2	-23.6	0.0	0.0	-18.0	-24.8	-32.3	-18.4	-1.7
LT	-11.2	-21.5	-22.4	0.0	0.0	-14.8	-21.0	-28.7	-17.8	-1.6
LU	-20.5	-35.2	-36.0	0.0	0.0	-24.4	-28.5	-29.9	-29.6	-3.8
MT	-13.3	-22.8	-26.4	0.0	0.0	-16.0	-21.1	-24.2	-21.5	-1.7
NL	-15.7	-29.5	-27.8	0.0	0.0	-19.8	-27.9	-34.4	-22.8	-2.3
AT	-11.8	-21.2	-22.9	0.0	0.0	-17.5	-25.6	-27.7	-17.8	-1.5
PT	-10.3	-17.5	-21.1	0.0	0.0	-16.6	-25.0	-29.6	-16.1	-1.3
SI	-15.3	-28.5	-27.7	0.0	0.0	-20.6	-28.9	-31.8	-22.1	-2.4
SK	-19.3	-33.0	-33.4	0.0	0.0	-24.9	-30.9	-32.8	-27.0	-4.0
FI	-7.7	-12.7	-15.8	0.0	0.0	-12.8	-18.4	-22.1	-11.7	-0.8
EA19	-9.0	-15.6	-17.9	0.0	0.0	-15.8	-23.0		-13.6	-1.1
BG	-12.6	-22.5	-22.4	0.0	0.0	-17.1	-23.0	-27.5	-17.7	-1.9
CZ	-18.5	-32.7	-30.7	0.0	0.0	-24.7	-32.3	-33.6	-24.4	-3.8
DK	-9.1	-16.1	-18.3	0.0	0.0	-14.2	-20.8	-25.8	-14.1	-1.1
HR	-9.1	-16.9	-18.0	0.0	0.0	-14.4	-23.1	-26.6	-13.7	-1.0
HU	-16.5	-29.2	-29.7	0.0	0.0	-22.0	-28.2	-29.8	-23.9	-3.2
PL	-10.6	-18.9	-20.4	0.0	0.0	-16.9	-25.1	-28.1	-15.7	-1.5
RO	-9.2	-17.5	-17.3	0.0	0.0	-15.1	-24.0	-26.8	-13.3	-1.2
SE	-7.7	-13.8	-15.7	0.0	0.0	-12.9	-20.2	-23.7	-11.8	-0.8
UK	-6.0	-9.9	-12.2	0.0	0.0	-10.5	-16.2	-23.3	-9.0	-0.4
EU28	-8.7	-15.1	-17.2	0.0	0.0	-15.3	-22.3		-13.0	-1.1
US	0.2	0.2	0.3	0.0	0.0	0.3	0.3		0.3	0.0
RoW	0.6	2.5	1.1	0.0	0.0	-6.2	4.0		1.2	0.2

5. COMPARISON TO OTHER STUDIES

Our analysis can be compared to two other recently published studies that try to quantify the macroeconomic benefits of EU membership. Mayer *et al* (2018) quantify the “Cost of Non-Europe” using modern versions of the gravity model to estimate the trade creation implied by the EU, and apply those to counterfactual exercises where the EU returns to a “normal”, shallow type regional agreement, or reverts to WTO rules. They then calculate the trade-related welfare gains from membership of the EU, and losses of a Non-Europe. They abstract from dynamic gains from trade and do not separately include effects from competition, so their results can only be compared to our first scenario, as reported in Table 4.1. Although their methodology differs from ours, and the model used is also different, their calculated welfare effects are in a similar range, and the ranking of countries shows a remarkable resemblance to ours. For the EU as a whole, they report a 4.4% loss for a regional trade agreement and 5.5% for an MFN counterfactual, compared to the 6.6% GDP loss reported in Table 4.1. They examine more alternative specifications including unilateral exits and alternative estimation methods and elasticity assumptions.

In one aspect their results differ from ours and that is the estimated impact on trade. In their preferred simulation, based on the OLS estimator, the Single Market is found to have increased trade between EU members by 109% on average for goods and 58% for tradable services. However, based on the PPML estimator, which corrects for potential bias related to heteroscedasticity arising through log-linearisation and is better able to deal with zeros, the trade effects are reduced, although still very significantly positive. This estimator puts more weight on pairs of countries with large levels of trade and yields a total effect of EU trade integration of 55% for goods and 33% for services, which implies for a counterfactual of a reversal an average trade reduction of around 30-33%. One factor in which the models differ is the higher trade elasticity used in trade model. Mayer *et al.* use an elasticity of 5.03, taken from the preferred value reported in Head and Mayer (2014). The macro studies on which macromodels base their trade elasticities find generally much lower values, as these also capture a (lower) sensitivity to exchange rate changes. In the simulations used here, we have set the trade elasticity already higher than the standard setting, at 3. But the sensitivity analysis reported in Annex Table A2 shows that the effects under a higher trade elasticity of 5 gives higher trade effects (intra-EU imports fall by between 26-35%). It is difficult to reconcile the larger trade effects based on the OLS estimator with observed intra-EU and extra-EU trade data, as there is no strong evidence of much faster intra-EU15 trade growth. To the contrary, EU15 intra-EU15 imports increased by 40% between 1990 and 2000, while their extra-EU28 imports increased by 60% over the same period. It is possible that this gap could be explained by lower import prices of non-EU imports, which may have more than offset the effects from stronger trade integration within the EU, but it is also conceivable that the large OLS based trade effects reported in Mayer *et al.* are mostly driven by the Central and Eastern European Member States that joined in 2004.

Another study to which our estimates can be compared is Felbermayr *et al.* (2018). They carry out simulation experiments that are meant to shed light on the economic benefits arising from various steps of European integration (Single Market, but also Schengen and euro membership). The difference with the Mayer *et al.* paper is that their analysis is based on a larger disaggregated dataset of 50 goods and services sectors, but over a shorter sample 2000-14. They find income per capita effects from the Single Market dominate quantitatively, with statistically significant losses of between 2.2% up to 20% of the 2014 baseline, with a strong degree of heterogeneity across EU Member States. Their estimates suggest that membership in the Single Market has boosted goods trade by about 36%. In services trade, the trade creation effects is as high as 82%. Thus, while their estimated impact on goods trade is closer to our aggregate estimate, their estimated impact on trade in services is much higher,

despite the fact that their estimated trade elasticity is -3.7. Welfare effects are similar to our results though, with a similar ranking between Member States.

Both these trade models show larger trade effects than our structural macroeconomic model, but very similar, and if anything somewhat lower output effects. We can only speculate about possible explanations for this. The general equilibrium effects in our macroeconomic model, with an explicit modelling of the government sector and with distortive taxation, may generate more destabilising effects from e.g. employment responses and investment, leading to a sharper drop in domestic demand. Higher labour taxes needed to stabilise the government debt-to-GDP ratio have a distortive effect on employment, which would not be the case if we assumed lump sum taxation or inelastic labour supply. Our results also depend on how government expenditure is modelled. If it is kept constant as share of GDP (as shown in the sensitivity analysis in table A.1 in the annex) the required tax increase is smaller and the employment effect is also much reduced compared to Table 4.1. But in that case there is a sharp reduction in (productivity enhancing) government investment, which reduces potential output by more. Other differences may be related to the production structure in these trade models, which include labour and intermediate inputs, but it is not clear how the impact on capital is captured. In our scenarios there is a strong decline in investment and the fall in GDP is mainly driven by the decline in the capital stock, as employment effects are cushioned by the decline in wages. The presence of (constant) fixed costs in our model also magnifies the negative impact on profits as these costs weigh higher when output declines.

6. CONCLUDING REMARKS

Almost three decades after the establishment of the Single Market it is worth having a fresh look at the macroeconomic benefits this has brought the Member States of the EU. The Single Market, though incomplete, has boosted trade flows within the EU through the elimination of trade tariffs and reduction in non-tariff barriers, and so raised output and domestic demand. The opening-up of domestic economies has also increased competition, reduced mark-ups and lowered prices. The combined impact of these two channels is found to have raised EU GDP by 8-9% on average in the long run.

This simulated impact is somewhat larger than the ex-ante estimates reported in the Cecchini report, but of a comparable magnitude to estimates found in Mayer et al. (2018) and Felbermayr et al. (2018), considering that these studies only look at the effect of higher trade barriers and do not include effects from mark-ups. The competition channel has added an additional 2% to the GDP effects from lower trade barriers.

Besides the scale and competition effects, there is a third channel through which trade can impact on productivity and that is linked to innovation. Higher trade openness increases market access and can induce more innovation, and stimulate cross-border spillovers from innovation. There is however no consensus on this. In work related to increased import competition from China, Autor et al. (2016) find that the impact of the change in import exposure on the change in patents produced is strongly negative, with the accompanying reduction in innovation possibly negatively affecting economic growth in the longer run. The implication of this could be that lower import competition may actually raise innovation, although this is contradicted by the results from Bloom et al. (2016) who find a positive impact of Chinese competition on innovation activities for a panel of European firms.

The macroeconomic benefits of the Single Market exceed the trade and competition effects highlighted here. The focus has been on free movement in goods and services, while we are silent about the gains from free movement of capital and persons. There is also a general recognition that the Single Market

is incomplete and the European Commission has published its assessment on how the Single Market can be deepened (European Commission, 2018). This includes dealing with persistent challenges in products and services markets, but also further progress towards a digital Single Market, capital markets union and banking union. This paper has only given a snapshot of the macroeconomic benefits of the Single Market in goods and services, and this is only one part of the overall benefits of the European Union.

REFERENCES

- Autor, D., Dorn, D., Hanson, G., Pisano, G. and Shu, P. (2016), "Foreign Competition and Domestic Innovation: Evidence from US Patents ", NBER Working Papers 22879.
- Badinger, H. (2007). "Has the EU's Single Market Programme Fostered Competition? Testing for a decrease in mark-up ratios in EU Industries". *Oxford Bulletin of Economics and Statistics*, 69, 4 (2007), p.497-519.
- Berden, K.G., J. Francois, S. Tamminen, M. Thelle and P. Wymenga (2009), "Non-Tariff Measures in EU-US Trade and Investment – An Economic Analysis", Ecorys report prepared for the European Commission, Reference OJ 2007/S180-219493.
- Berden K., Francois, J. (2015). "Quantifying Non-tariff Measures for TTIP". CEPS Special Report no 116, July 2015.
- Bloom, N., Draca, M. and Reenen, J. (2016), "Trade Induced Technical Change? The Impact of Chinese Imports on Innovation, IT and Productivity ". *Review of Economic Studies*, 83(1), pp. 87-117.
- Cecchini, P., Catina, M. and Jacquemin, A. (1988). The Benefits of a Single Market.
- Dhingra, S., H. Huang, G. Ottaviano, J.P. Pessoa, T. Sampson and J. Van Reenen (2017) 'Trade after Brexit', *Economic Policy*, p.651-705.
- European Commission (2018), "The Single Market in a changing world", COM(2018) 772. Downloadable from: <https://ec.europa.eu/docsroom/documents/32662>
- Felbermayr, G., Groschl, J., Heiland, I. (2018). Undoing Europe in a New Quantitative Trade Model, ifo Working papers 250-2018, January 2018.
- Head, K. and Mayer, T. (2014), "Gravity Equations: Workhorse, Toolkit, and Cookbook", in Gopinath, G., Helpman, E. and Rogoff, K. (eds.), *Handbook of international economics*, Elsevier, Vol. 4, pp. 131-196.
- Mayer, T., Vicard, V., Zignago, S. (2018). The Cost on Non-Europe, Revisited. Mimeo, September 2018.
- Ratto M, W. Roeger and J. in 't Veld (2009) . "QUEST III: An Estimated Open-Economy DSGE Model of the Euro Area with Fiscal and Monetary Policy". *Economic Modelling*, 26 (2009), pp. 222-233.
- Roeger W., in 't Veld J. (2010), "Fiscal stimulus and exit strategies in the EU: a model-based analysis", *European Economy Economic Papers* no. 426.
- Timmer, M. P., Dietzenbacher, E., Los, B., Stehrer, R. and de Vries, G. J. (2015), "An Illustrated User Guide to the World Input–Output Database: the Case of Global Automotive Production", *Review of International Economics*, 23: 575–605.
- Timmer, M. P., Los, B., Stehrer, R. and de Vries, G. J. (2016), "An Anatomy of the Global Trade Slowdown based on the WIOD 2016 Release", GGDC research memorandum number 162, University of Groningen.

ANNEX SENSITIVITY ANALYSIS

Table A.1. Long run macroeconomic impact of trade barriers, government spending endogenous

	GDP	Consumption	Investment	Gov. Cons.	Gov. Invest.	Exports	Imports	Imports Intra-EU	Capital	Employment
BE	-15.9	-22.2	-28.4	-22.6	-22.6	-19.7	-27.1	-29.5	-23.2	-0.3
DE	-6.5	-9.6	-12.6	-10.0	-10.0	-11.0	-19.1	-21.9	-9.6	-0.1
EE	-13.2	-18.4	-23.6	-19.3	-19.3	-16.8	-22.9	-25.5	-18.9	-0.1
IE	-11.2	-16.2	-20.2	-17.0	-17.0	-14.6	-20.4	-22.8	-16.5	-0.2
EL	-4.8	-6.8	-10.5	-7.0	-7.0	-8.2	-15.4	-22.4	-7.8	-0.1
ES	-6.6	-9.0	-12.5	-9.3	-9.3	-11.1	-19.2	-24.4	-9.4	0.0
FR	-5.5	-7.6	-11.3	-8.0	-8.0	-10.3	-18.1	-21.5	-8.4	-0.1
IT	-4.9	-7.1	-9.9	-7.3	-7.3	-9.8	-17.9	-22.8	-7.4	-0.1
CY	-8.5	-11.4	-17.0	-11.9	-11.9	-12.2	-20.0	-26.3	-13.2	-0.2
LV	-11.9	-16.5	-20.3	-16.8	-16.8	-15.4	-22.8	-29.2	-15.9	0.0
LT	-10.4	-15.7	-19.7	-16.0	-16.0	-12.8	-19.4	-25.8	-15.8	-0.2
LU	-18.7	-24.8	-32.8	-26.4	-26.4	-21.3	-25.8	-26.1	-27.4	0.1
MT	-12.8	-17.0	-24.1	-17.5	-17.5	-14.0	-19.4	-20.7	-20.1	-0.2
NL	-14.5	-21.4	-24.7	-21.2	-21.2	-17.5	-25.9	-30.9	-20.4	-0.1
AT	-10.4	-14.7	-19.3	-15.2	-15.2	-14.8	-23.2	-24.6	-15.0	-0.1
PT	-8.8	-12.0	-17.3	-12.4	-12.4	-13.7	-22.6	-26.3	-13.3	-0.2
SI	-13.7	-20.0	-24.1	-20.4	-20.4	-17.9	-26.5	-28.5	-19.3	-0.1
SK	-16.4	-22.5	-29.2	-23.4	-23.4	-21.0	-27.6	-28.8	-23.8	-0.3
FI	-6.1	-8.5	-11.9	-8.9	-8.9	-9.9	-16.4	-19.0	-8.9	-0.1
EA19	-7.4	-10.6	-14.1	-10.9	-10.9	-13.0	-20.8		-10.8	-0.1
BG	-10.9	-15.7	-18.6	-15.9	-15.9	-14.3	-20.8	-24.1	-15.0	-0.1
CZ	-15.3	-21.8	-25.9	-22.3	-22.3	-20.6	-29.0	-29.4	-20.8	-0.1
DK	-7.9	-11.2	-14.9	-11.7	-11.7	-11.7	-18.9	-22.8	-11.6	-0.1
HR	-7.9	-11.7	-14.6	-11.9	-11.9	-12.1	-21.1	-23.6	-11.2	-0.1
HU	-14.3	-20.3	-25.7	-20.9	-20.9	-18.7	-25.5	-26.0	-21.0	-0.4
PL	-8.7	-12.7	-16.1	-13.1	-13.1	-13.8	-22.5	-24.7	-12.5	-0.2
RO	-7.5	-11.6	-13.4	-11.9	-11.9	-12.5	-21.7	-23.6	-10.2	0.0
SE	-6.4	-9.3	-12.2	-9.7	-9.7	-10.5	-18.1	-20.6	-9.2	-0.1
UK	-4.8	-6.7	-9.0	-7.0	-7.0	-8.2	-14.6	-20.2	-6.7	0.0
EU28	-7.1	-10.2	-13.5	-10.6	-10.6	-12.6	-20.2		-10.3	-0.1
US	0.2	0.3	0.4	0.3	0.3	0.4	0.8		0.3	0.0
RoW	0.8	2.4	1.3	1.1	1.1	-6.0	4.9		1.2	0.2

Note: As table 4.1, but with government consumption and investment linked to GDP in nominal terms.

Table A.2. Long run macroeconomic impact of trade barriers, higher trade elasticity ($\sigma = 5$)

	GDP	Consumption	Investment	Gov. Cons.	Gov. Invest.	Exports	Imports	Imports Intra-EU	Capital	Employment
BE	-16.0	-30.8	-28.9	0.0	0.0	-23.1	-30.9	-35.2	-23.8	-3.2
DE	-5.3	-11.5	-11.2	0.0	0.0	-15.5	-23.1	-27.8	-8.7	-0.8
EE	-13.5	-26.4	-24.8	0.0	0.0	-20.2	-27.0	-31.4	-20.1	-2.3
IE	-11.0	-22.8	-20.9	0.0	0.0	-17.6	-24.0	-27.9	-17.2	-1.9
EL	-4.1	-8.3	-9.6	0.0	0.0	-12.1	-19.2	-30.7	-7.2	-0.6
ES	-5.8	-11.0	-11.5	0.0	0.0	-16.0	-23.7	-32.5	-8.7	-0.8
FR	-4.6	-9.1	-10.1	0.0	0.0	-15.1	-22.5	-28.2	-7.6	-0.6
IT	-4.0	-8.2	-8.7	0.0	0.0	-14.8	-22.4	-30.4	-6.6	-0.6
CY	-7.6	-14.5	-16.2	0.0	0.0	-16.0	-23.9	-34.5	-12.7	-1.0
LV	-11.1	-21.8	-20.0	0.0	0.0	-19.0	-26.8	-37.0	-15.9	-1.6
LT	-10.3	-22.1	-20.6	0.0	0.0	-15.4	-22.8	-33.4	-16.8	-1.8
LU	-22.1	-40.4	-37.8	0.0	0.0	-24.2	-29.7	-30.6	-31.8	-4.8
MT	-14.0	-26.0	-27.5	0.0	0.0	-15.4	-22.0	-24.7	-23.0	-2.1
NL	-13.4	-27.7	-24.1	0.0	0.0	-20.1	-28.8	-37.2	-20.0	-2.1
AT	-9.2	-18.5	-18.2	0.0	0.0	-18.9	-27.3	-30.0	-14.4	-1.3
PT	-7.6	-14.8	-16.0	0.0	0.0	-18.7	-27.4	-33.9	-12.5	-1.1
SI	-12.5	-25.8	-23.3	0.0	0.0	-21.4	-30.2	-34.1	-18.8	-2.0
SK	-17.0	-32.2	-30.1	0.0	0.0	-24.9	-32.0	-34.3	-24.8	-3.8
FI	-5.4	-10.7	-11.2	0.0	0.0	-13.8	-20.2	-24.7	-8.5	-0.8
EA19	-6.5	-13.1	-13.1	0.0	0.0	-17.1	-24.8		-10.2	-1.0
BG	-10.6	-21.5	-19.0	0.0	0.0	-18.1	-25.2	-30.8	-15.3	-1.8
CZ	-14.4	-28.4	-24.8	0.0	0.0	-24.9	-33.1	-34.5	-19.9	-2.9
DK	-7.0	-14.3	-14.2	0.0	0.0	-15.6	-23.0	-29.5	-11.2	-1.0
HR	-6.6	-13.9	-13.1	0.0	0.0	-16.5	-25.1	-29.6	-10.2	-0.8
HU	-14.1	-27.9	-26.0	0.0	0.0	-22.3	-29.5	-30.9	-21.2	-3.0
PL	-7.4	-15.4	-14.6	0.0	0.0	-18.7	-27.0	-31.0	-11.5	-1.2
RO	-6.2	-13.8	-11.9	0.0	0.0	-17.6	-26.3	-29.9	-9.2	-0.9
SE	-5.4	-11.3	-11.1	0.0	0.0	-14.7	-22.2	-26.5	-8.5	-0.7
UK	-4.0	-8.0	-8.2	0.0	0.0	-11.9	-18.2	-27.3	-6.2	-0.4
EU28	-6.2	-12.7	-12.5	0.0	0.0	-16.7	-24.2		-9.7	-0.9
US	0.3	0.4	0.5	0.0	0.0	0.5	0.9		0.5	0.1
RoW	0.7	2.6	1.2	0.0	0.0	-5.7	4.7		1.2	0.2

Note: As Table 4.1, but with higher trade elasticity ($\sigma = 5$)

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