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THE ORIGINS OF THE GERMAN CURRENT ACCOUNT SURPLUS: UNBALANCED PRODUCTIVITY GROWTH AND STRUCTURAL CHANGE

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ABSTRACT

The origins of the German current account surplus: Unbalanced productivity growth and structural change

The surge in the German current account surplus in the 2000s is often interpreted as the result of efficiency-enhancing structural reforms, especially in the labor market. However, this interpretation is puzzling because the growth rate of the German economy has been one of the lowest in the Euro area in the 2000s. Using empirical evidence and a simple theoretical two-sector model, the paper argues that the German surplus is closely linked to the increasing gap between productivity growth in manufacturing and services. Such gap is due not only to improvements in the manufacturing sector but also to a significant slowdown of productivity growth in services. Therefore, despite the success in export markets, the German surplus may signal long-run weaknesses associated with constraints on service growth and the inability of productivity growth in manufacturing to create positive spill-over effects on services. Persistence of barriers to liberalization in services may partly explain these phenomena. The paper concludes that higher and more balanced growth could lead to an equilibrium reduction of the current account surplus.

JEL Classification: E21, E22, F31, F41 and O40
Keywords: German current account surplus, structural change and unbalanced productivity change

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1 Introduction

"All that glisters is not gold." (William Shakspeare, The Merchant of Venice)

During the 2000s Germany experienced a surge in its trade and current account surplus. Measured in US dollar value, the German current account surplus matched that of China in 2012, whereas in terms of GDP it was significantly larger than the Chinese surplus. The popular press and academic analyses interpreted such surplus as a sign of the healthy combination of structural reforms and prudent macroeconomic policies implemented by German policy-makers, which determined a significant improvement in the efficiency and competitiveness of the German economy. In this paper we highlight a different channel, which casts some doubts on the simple association between current account surplus and higher overall efficiency of the German economy.

We emphasize the role of unbalanced productivity growth between manufacturing and service sectors as a significant source of current account imbalances. Our conjecture is that the origin of the German surplus partly derives from the low productivity growth in services, possibly due to lack of reforms in the service sector, combined with the rapid growth of productivity in manufacturing sectors. Therefore, the current account surplus results from an unbalanced pattern of reforms and sectoral productivity growth.

Assuming that competition is a main driver of productivity changes, by opening to international trade countries can converge to the world technological frontier for producing tradable goods (Parente and Prescott (2002)). We further assume that innovations in manufacturing may spread over productivity changes and innovations in services. Accordingly, the technological frontier for services is linked to the frontier in manufacturing. The spill-over to services of productivity changes in manufacturing crucially depends on the degree of competition in the service sectors. Low competition in services implies weak spill-over effects and high mark-ups of prices over marginal costs in services. Such spill-over effects, particularly strong in the US (Moretti (2011), have been weak in Germany beacause of persisting barriers to competition in services. Mark-ups in the German service sectors not only are much higher than in the US, but are also among the highest in the Euro area (Costoulopulos and Vermaelen (2008)). Interestingly, the wedge between mark-ups in services and manufacturing in Germany is among the highest of the Euro area, suggesting a sharp asymmetry in market conditions in manufacturing and services. This asymmetry has been emphasized by Rajan, who, referring to Germany (and Japan), argued: "To stay competitive, both countries had to move up the value chain of production and the frontiers of innovation..They certainly managed to do this in the sectors that exported or competed with imports, the so-called tradable sector. But

problems eventually emerged in the domestic nontradable sector..Productivity growth eventually lagged because the market forces that would force the inefficient to shrink or close were suppressed" (Rajan (2010) p. 61).

The fact that unbalanced productivity growth improves the current account can be seen in a simple two-sector inter-temporal model (Obstfeld and Rogoff (1996), Vegh (2012)). In standard intertemporal models the effect on the current account of differential productivity growth in tradable and non-tradable sectors crucially depends on the relative size of the intra-temporal elasticity of substitution (affecting the response of relative consumption of tradable and non-tradable goods to changes in relative prices) and the inter-temporal elasticity of substitution (affecting consumption over time). Rather than focusing on the role of elasticities in consumption, we highlight a new channel that originates from the presence of spill-over effects of productivity changes in one sector on the other and from structural change. We show that following an improvement in productivity in the manufacturing sector, the current account improves if higher productivity growth in manufacturing is not followed by higher productivity growth in services, and, moreover, if it leads to an expansion of employment in manufacturing. This latter effect, which we denote as an anti-deindustrialization or "anti-Baumol" effect, arises when spill-over effects are small and inefficiencies in the service sector are large. In summary, we highlight how the current account balance, for given intra-temporal and inter-temporal elasticities of substitution in consumption, is crucially affected by unbalanced productivity growth in manufacturing vs services and by structural change, measured as the dynamics of sectoral shares in total value added and total employment. [1]

One clear limitation of our analysis is the assumption that services are non-tradable. Although service trade has been growing rapidly at the global level, it is still true that the majority of services are non-tradable. Furthermore, taking into account trade in services is unlikely to significantly change the main thrust of our paper. Indeed, recent studies emphasize that trade in services leads to a pattern of trade imbalances in which countries with more efficient services are characterized by overall current account deficits, while the opposite holds for countries with highly inefficient services, such as Germany (Barattieri (2011)).

Furthermore, we assume a homogeneous manufacturing (tradable) sector. Interesting current account dynamics could arise from reallocation of resources across manufacturing sectors. A natural extension would thus be to consider a manufacturing sector composed by various productions characterized by different factor intensities. Such extension is beyond the scope of the current paper, but it is an important area for future research. This type of model has been recently applied to the analysis of China's current account surplus by Ju et al (2012), who embed the Heckscher-Ohlin model into an inter-temporal trade

[1] Bussière et al (2013) emphasize the role of TFP shocks to tradables for current account surpluses in their analysis of effects of large real exchange rate appreciations.

model. They conclude that a main reason for the Chinese current account surplus is the shift towards labor intensive productions that resulted from trade liberalization. Interestingly, and unexpectedly, such mechanism might have been at work in Germany as well. Marin (2010) has emphasized that the integration of central-Eastern European countries with the EU has lead to a relocation of production phases from Germany to the new EU members. In contrast with the traditional Heckscher-Ohlin model, the "capital abundant" Germany has relocated "capital intensive" (both physical and human capital) activities, in a process that Marin effectively defines as a "reverse maquiladora". [2]

We analyze empirically the relevance of the unbalanced productivity growth looking at bilateral trade balances between Germany and its main trading partners. We extend the analysis of Berger and Nisch (2011) by considering relative productivity growth in services and manufacturing as a main driver of trade balances. We find empirical support to our conjecture that faster productivity growth in manufacturing relative to services leads to improvements in the trade balance. Focusing on bilateral trade helps reducing problems of endogeneity and country heterogeneity that typically arise in multi-country panels.[3]

A close paper to ours is the work by Cova et al. (2009), who use a multi-region DSGE model and simulate the effects of the actual total factor productivity (TFP) dynamics in both tradable and non-tradable sectors on the current account of the US, Eurozone and Japan. Their results attribute the large current account deficit of the US to the surge in TFP in the service sector in the US, relative to the Eurozone and Japan. However, as they aggregate the whole Euro area, their analysis cannot shed light on the surge of the German surplus, which to a large extent corresponds to intra-Euro area imbalances.

The paper is structured as follows. Section 2 summarizes the main stylized facts concerning the dynamics of the German current account in the last three decades. Section 3 summarizes the descriptive evidence on sectoral productivity growth and more generally on structural change in Germany. Section 4 discusses the role of structural factors, namely the different productivity growth in manufacturing and services, as determinants of the dynamics of the current account in a simple two-sector intertemporal model. Section 5 contains the econometric analysis. Section 6 concludes.

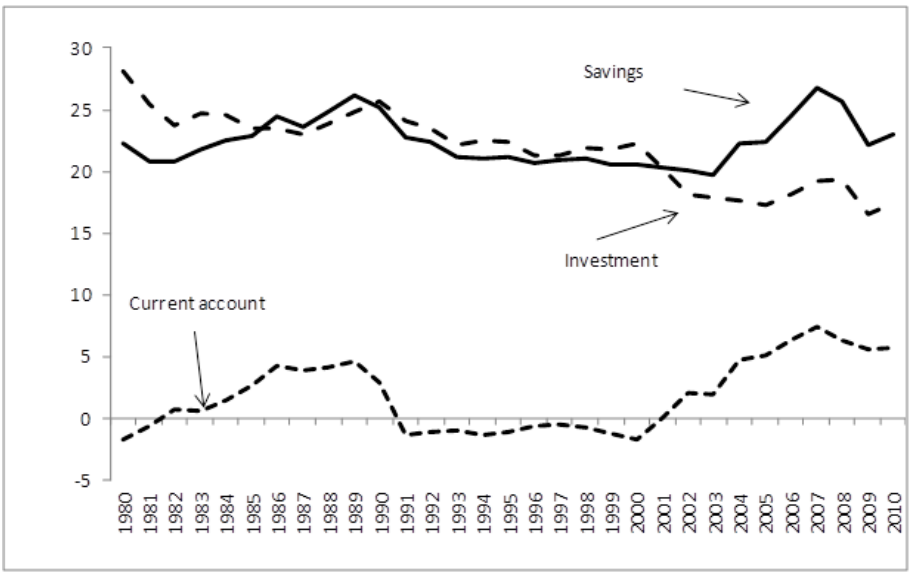
[2] Maquiladora is the term used to characterize the relocation of labor intensive activities from the US to Mexico.

[3] Regarding endogeneity, bilateral trade balances have small effects on aggregate macroeconomic variables, whereas the same cannot be said when one considers overall trade or current account balance.

2 Stylized facts

Chart 1 shows the remarkable surge in the German current account surplus that took place during the 2000s. Focusing on long term trends, it is interesting to note that this surge, and the previous one that occurred in the 1980s, were both associated with a simultaneous increase in savings and a decline in the investment rate. However, in both occasions, swings in savings played the dominant role, with the investment rate displaying a secular decline since 1980, which in fact came to halt at the beginning of the 2000s.

Chart 1. Germany: Current account, savings and investment, percent of GDP

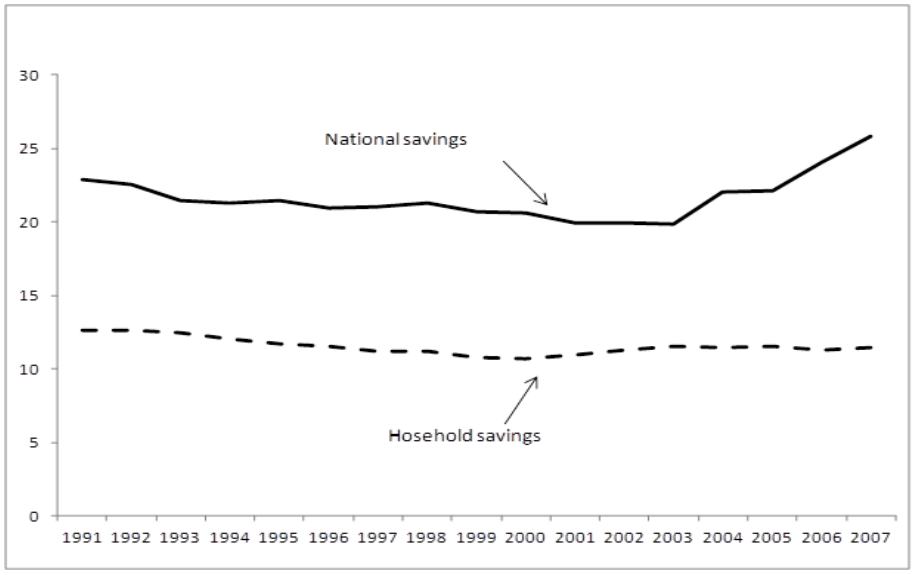


Source: IMF, WEO Database, 2011.

It is worth noting that the increase in private savings has mainly been due to the increase in enterprise savings. The increase in households savings has been much smaller during the 2000s (Chart 2). Furthermore, micro data indicate that households savings remained flat during the 2000s. Therefore, it seems that precautionary savings by households in response to higher uncertainty induced by reforms, especially in the labour market might have played a role but not a dominant one. Furthermore, precautionary savings might also be associated to the supply-side channel we stress in the paper, namely the unbalanced growth of productivity in manufacturing and services, and the increase in the share of manufacturing in total value added, which characterized the 2000s. Assuming that higher volatility of incomes raises precautionary savings in the context of incomplete markets, a larger weight of manufacturing in total VA implies an increase in overall income volatility, as volatility in manufacturing tends to be

significantly larger than in services.

Chart 2. Germany: National and household savings
(per cent of disposable income)



Source: OECD

What types of shocks can be associated with the sharp inversion of tendency in the CA during the 2000s displayed in Chart 1? Three elements are traditionally identified.

i) The post-German unification shock. In the 2000s there is indeed a reversal of the behaviour of the previous decade, associated to the unification. Following unification the initial increase in real wages due to the jump of wages in East Germany and a mainly publicly financed construction boom, damaged competitiveness of the German export sector, which put downward pressure on wages, restoring competitiveness of German exports.

ii) Pension and labour market reform. Reforms increasing flexibility in the labour market, bringing long-term benefit recipients back into the labour market and tightening future conditions for pension transfers might have increased uncertainty and thus induced precautionary savings on the part of German households.

iii) A third factor, less of a shock, but rather an external opportunity, is related to the enlargement of EU to new member states.

The latter factor is associated to the so-called Bazaar economy view (Sinn, 2006). Outward FDI in capital intensive sectors and in production of intermediate goods for such sectors is consistent with both an increase in value added in exporting companies and with a reduction in the capital-labour ratio in the domestic economy, with a corresponding downward pressure on real wages (Marin (2010)). Income distribution in favour of profits likely increased the overall propensity to save. Overall, it appears that labour market reforms benefitted more manufacturing than services, not the least because demand for the domestic sector was constrained by low income growth.

Summing up, there were several factors that boosted manufacturing production and productivity, most importantly the combination of an expansionary external environment and the restoration of competitiveness, supported by labour market reforms. However, such boost was not extended to the service sector, which suffered from the consolidation of public finances in the aftermath of unification, as well as suppressed dynamism, affected by the presence of relevant regulatory entry barriers in services. For instance, Christopoulou and Vermeulen (2010) ephasized that mark-ups in services sectors relative to manufacturing in Germany are among the highest in the euro area, which, in turn, is characterized by high mark-ups for services in comparison with the US. In contrast, mark-ups in German manufacturing have fallen over time between the 1970s and early 2000s.

2.1 Evidence on sectoral dynamics and structural change in Germany

A first striking observation on the dynamics of sectoral productivity growth in Germany arises from a comparison with the US. Chart 3 reports the behavior of TFP in the manufacturing sector and the share of manufacturing in total value added for Germany and the US. The contrast is remarkable. During the 1990s the pattern in Germany is similar to the one in the US, with a declining share of manufacturing in total value added accompanied by increasing TFP in manufacturing. The 2000s mark a sudden shift in this trend, with the share of manufacturing stabilizing, and in fact slightly increasing, during an acceleration of the increase in TFP in the manufacturing sectors.

Chart 3a. Germany: Share of manufacturing in total VA and TFP

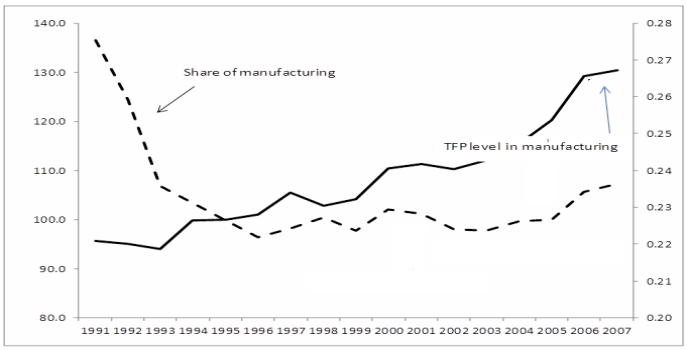
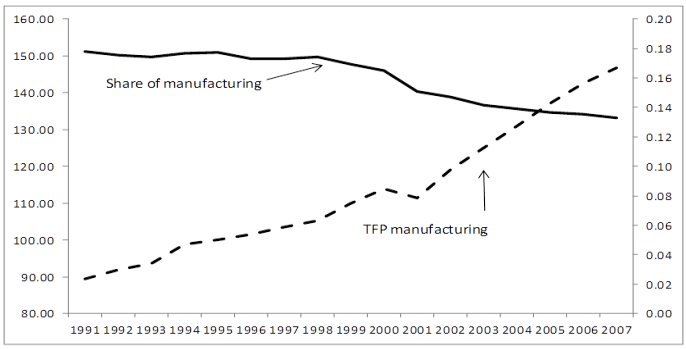


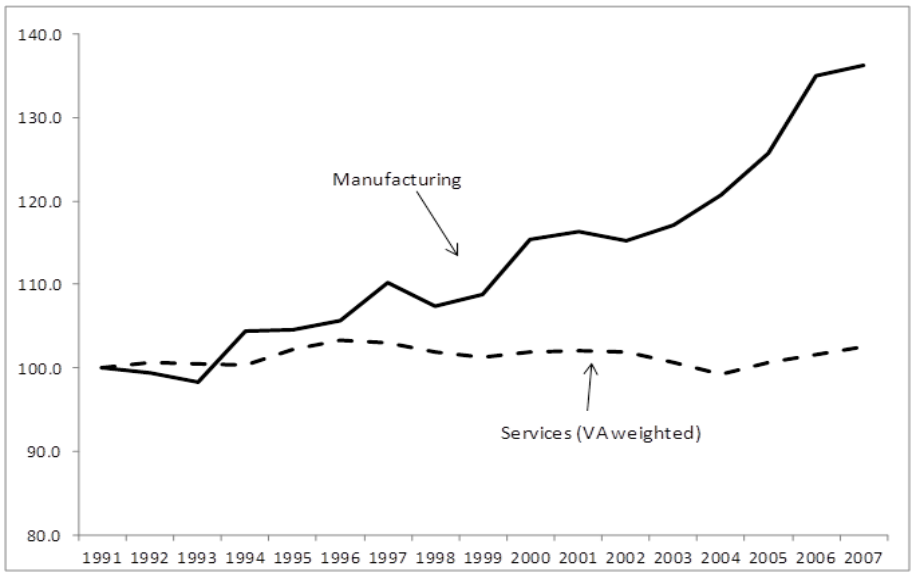
Chart 3b. United States: Share of manufacturing in total VA and TFP



Source: EUKlems.

We now turn to the behaviour of productivity in manufacturing versus the service sectors. Chart 4 shows that starting at the end of the 1990s TFP growth has been stagnant in the service sector whereas it has accelerated in the manufacturing sector.

Chart 4. Germany: TFP in manufacturing and service

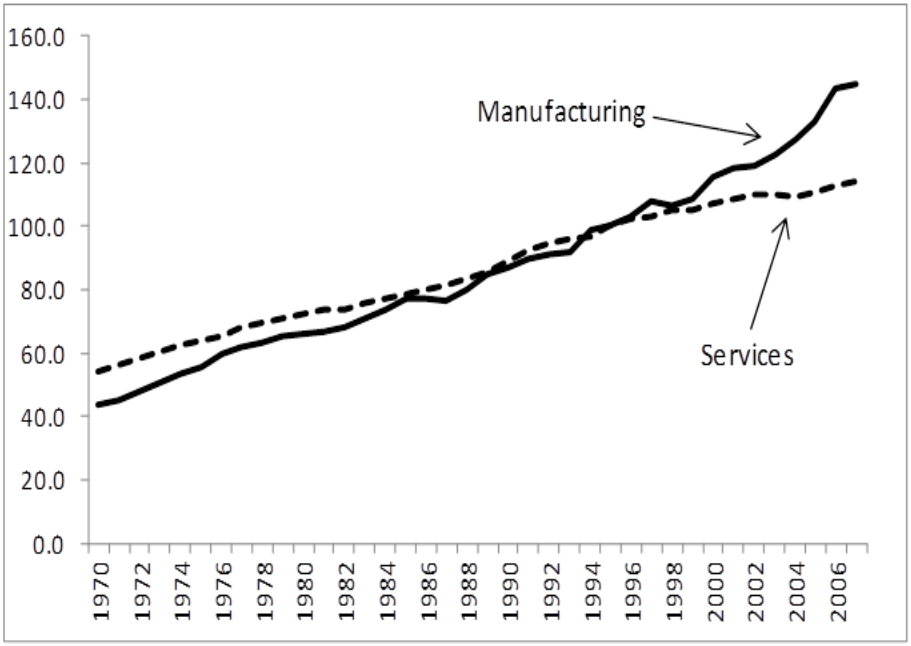


Source: EUKlems.

Unfortunately, TFP estimates are available only since 1990. To analyze longer term trends we thus look at the behavior of sectoral labor productivity (real value added per hours worked) and its relationship with structural change for the period 1970-2007.

Chart 5 clearly illustrates how during the 2000s labor productivity in manufacturing jumps above its long-run trend, whereas, the growth of productivity in services flattens. Consequently, a large gap opens up between labor productivity in manufacturing relative to services.

Chart 5. Germany: TFP in manufacturing and service

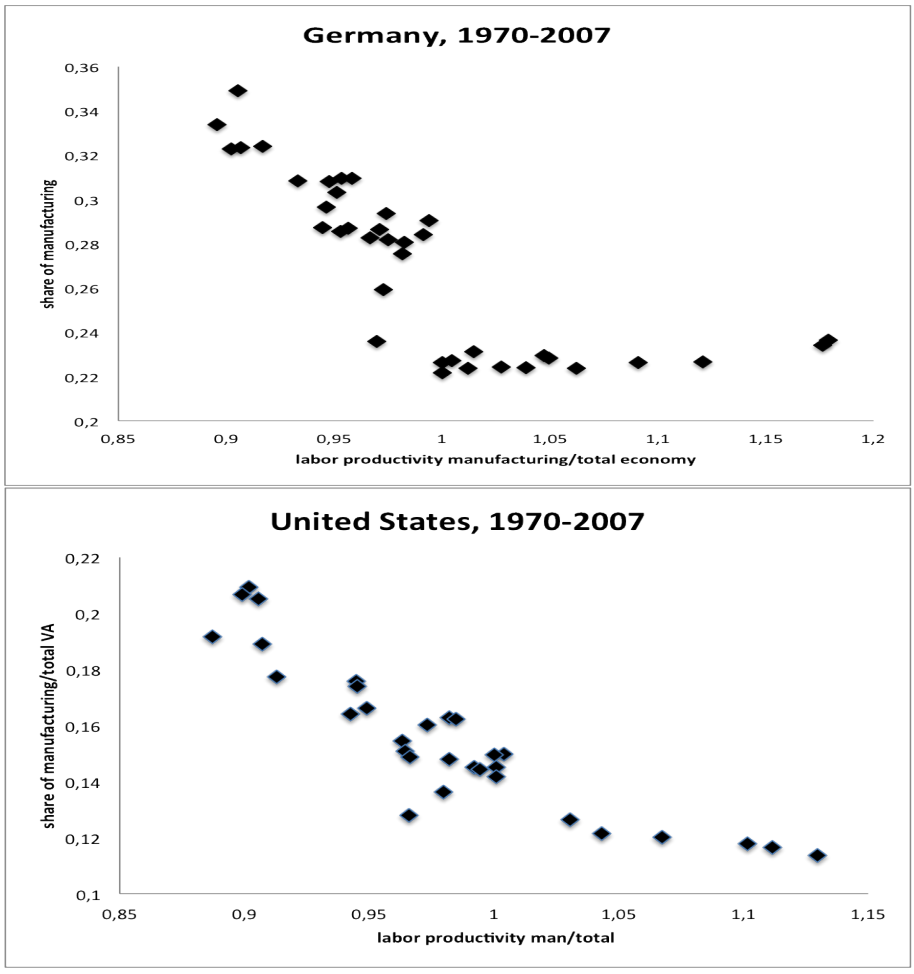


Source: EUKlems.

Comparing again Germany and the US, Chart 6 displays the evolution of labor productivity in manufacturing relative to the whole economy and the share of manufacturing in total value added (in nominal terms).

The stylized facts discussed above suggest that the surge in the German current account surplus in the 2000s might be linked to a pattern of productivity growth biased towards manufacturing production and to the halt of the long-term decline of the share of manufacturing VA in total GDP. In the next section we present a simple model that may capture those facts.

Chart 6. Sectoral labour productivity and structural change, a longer view



Source: EUKlems.

3 A simple model of unbalanced productivity growth, structural change and current account balance

We first analyze in a general equilibrium framework the long-run reallocation of resources across tradable (manufacturing) and non-tradable (services) sectors, resulting from asymmetric TFP growth in the two sectors. The main objective is to show how unbalanced productivity growth, biased towards manufacuring, and lack of competition in services, induce a reallocation of resources from services to manufacturing. In contrast to the partial equilibrium effects originally studied by Baumol (1967), faster productivity growth in manufacturing may lead to a movement of labor from services to manufacturing. Moreover, such effect is stronger the higher is the inefficiency in the service sector. In a general equilibrium framework, demand factors play a role and structural change, namely the evolution of sectoral shares in total output and total employment, is affected by relative demand for the two sectos, which in turn depends on relative prices.

We depart from standard two-sector tradable/non-tradable models by assuming that TFP growth works through a diffusion process going from manufacturing to services. The idea is that there is a world technology frontier that can be adopted in specific countries and the rate of adoption crucially depends on the degree of competition among firms. In an open economy, we assume that there exists perfect competition in tradable sectors, and thus in those sectors TFP grows in line with the world frontier. By contrast, there is no perfect competition in the non-tradable sectors. The lower the degree of competition in non-tradable sectors, the smaller is the diffusion of TFP growth from tradable to non-tradable sectors. Furthermore, lack of competition is associated to mark-ups of prices over marginal costs and we assume that the mark-up of actual over competitive prices is an increasing function of the productivity gap between non-tradable and tradable sectors. In order to highlight the main channels of structural change and inefficiencies in services, we concentrate on a simple two-period intertemporal model of optimal consumption.

3.1 Unbalanced growth in an inter-temporal model of the current account

We analyze the equilibrium in an inter-temporal model. We simplify the production process assuming that capital is sector specific and is fixed. Normalizing the stock of capital in the two sectors to be equal to 1, we can write the production functions in the two sectors as follows

$$Y_m = A_m L^{\mu_{lm}}, \tag{1}$$

for manufacturing, and

$$Y_s = A_s L^{\mu_{ls}}, \tag{2}$$

for services. Labor is supplied inelastically, and total labor supply is constant (and normalized to 1):

$$L = 1 = L_{st} + L_{mt}, \tag{3}$$

for every t. The pattern of technological change reflects the presence of an exogenous process of innovation, which has asymmetric effects on productivity in the two sectors.

3.2 The Pattern of Technological Change

The arrival of innovations affects first the manufacturing sector, which in period 1 is exposed to the technology shock $\hat{A}$. Potential diffusion of technology to services takes place in period 2, and it is summarized by the parameter measuring the spill-over effects $\beta \epsilon [0,1]$. Furthermore, the peristence of the shock in the manufacturing sector is defined by the parameter $\rho \epsilon [0,1]$:

$$\begin{bmatrix} \hat{A}_{m,1} \\ \hat{A}_{s,1} \end{bmatrix} = \begin{bmatrix} 1 & 0 \end{bmatrix} \hat{A}, \tag{4}$$

in period 1, and

$$\begin{bmatrix} \hat{A}_{m,2} \\ \hat{A}_{s,2} \end{bmatrix} = \begin{bmatrix} \rho & \beta \end{bmatrix} \hat{A}, \tag{5}$$

in period 2.[4] We turn next to the determination of wages and prices.

3.3 Wages and Prices

We assume labor is perfectly mobile across sectors but perfectly immobile across countries. Therefore, wages are equalized across sectors and fluctuate in response to country specific shocks. We further assume that manufacturing is the numeraire and that the price of manufacturing is given in international markets (and it is normalized to 1). Consequently, the relative price of services in terms of manufacturing (the "real exchange rate") is $p = \frac{P_s}{P_m}$. Free mobility of labor across sectors and perfect competition in the two sectors would imply the equality between the value of the marginal products of labor in the two sectors. However, while we assume that perfect competition prevails in the tradable sector (manufacturing), the service sector, being protected from international competition, is characterized by rents associated to a mark-up of prices over marginal costs (wages). Therefore, the zero profit condition holds for manufacturing:

$$A_m L_m^{\mu_{lm}} = w L_m.$$

[4]Note that even when the shock is fully persistent, which occurs when $\rho = 1$, there are effects on the current account because of reallocation of resources across sectors.

Log differentiating the above condition we obtain that employment in manufacturing is an increasing function of TFP changes and a decreasing function of real wages:

$$\hat{A}_m + (\mu_{lm} - 1)\hat{L}_m = \hat{w}. \tag{6}$$

In services lack of competition allows the presence of rents that are not appropriated by workers:

$$A_s L_s^{\mu_{ls}} > wL_s.$$

We assume that the rents associated to prices above their competitive levels are an increasing function of the productivity gap between manufacturing and services: $\Lambda(\frac{A_m}{A_s})$. Given that manufacturing is characterized by perfect competition, the productivity gap between services and manufacturing is a proxy for the lack of competition in services and the consequent inefficiency of the sector. Assuming the following functional form

$$\Lambda(\frac{A_m}{A_s}) = (\frac{A_m}{A_s})^{\lambda}, \tag{7}$$

log-differentiation of the condition on profit maximization leads to:

$$.\hat{p} + \hat{A}_s + (\mu_{ls} - 1)\hat{L}_s = \hat{w} + \lambda(\hat{A}_m - \hat{A}_s), \tag{8}$$

Since wages are equalized across sectors, we can plug the change in real wages from eq(6) into eq(8), to obtain the following conditions for both period 1 and period 2:

$$\hat{p}_1 = (\mu_{lm} - 1)\hat{L}_{m,1} - (\mu_{ls} - 1)\hat{L}_{s,1} + (1 + \lambda)\hat{A} \tag{9}$$

$$\hat{p}_2 = (\mu_{lm} - 1)\hat{L}_{m,2} - (\mu_{ls} - 1)\hat{L}_{s,2} + (\rho - \beta)(1 + \lambda)\hat{A} \tag{10}$$

3.4 Consumption

The economy lasts for two periods and the optimal inter-temporal decision by consumers solves the following problem:

$$\max_{C_1, C_2} u(C_1) + \delta u(C_2)$$

subject to the inter-temporal budget constraint

$$Y_1 + \frac{Y_2}{1+r} \quad = \quad P_1 C_1 + P_2 \frac{C_2}{1+r}$$

where P_1, P_2 denote the current and the future consumer price indices and $\delta < 1$ denotes the subjective time discount factor. The period utility function is of the constant elasticity of substitution (CES) type, with elasticity of substitution σ:

$$u(C) = \frac{C^{1-\sigma} - 1}{1 - \sigma} \tag{11}$$

and aggregate consumption is also of the CES type, with intra-temporal elasticity of substitution θ:[5]

$$C = (\gamma^{\frac{1}{\theta}} c_m^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} c_s^{\frac{\theta-1}{\theta}})^{\frac{\theta}{1-\theta}} \tag{12}$$

The optimal inter-temporal decision by consumers yields the familiar Euler equation for the dynamics of consumption:

$$C_2 = (1+r)^{\sigma} \delta^{\sigma} (\frac{P_1}{P_2})^{\sigma} C_1 \tag{13}$$

From the intratemporal first order condition on the distribution of total consumption between manufacturing and services, we derive, for each period, the following condition:

$$c_m = \gamma (\frac{1}{P})^{-\theta} C \tag{14}$$

Plugging the above condition in the Euler equation, we obtain the dynamics of manufacturing consumption:

$$C_{m,2} = (1+r)^{\sigma} \delta^{\sigma} (\frac{P_1}{P_2})^{\sigma-\theta} C_{m,1} \tag{15}$$

Since all services are consumed domestically, from the inter-temporal budget constraint it follows that the present value of income from manufacturing is equal to the present value of manufacturing consumption. Using eq (14), it follows that consumption of manufacturing in the first period is

$$C_{m,1} = \frac{Y_{m,1} + \frac{Y_{m,2}}{1+r}}{1 + (1+r)^{\sigma-1} \delta^{\sigma} (\frac{P_1}{P_2})^{\sigma-\theta}} \tag{16}$$

Defining the present value of manufacturing income as

$$Z = Y_{m,1} + \frac{Y_{m,2}}{1+r},$$

[5] We follow the same assumptions as in Obstfeld and Rogoff (1996) and Vegh (2012).

we can compute the change (determined by shocks to TFP) of first period manufacturing consumption with respect to its initial equilibrium:

$$\hat{c}_{m,1} = \hat{Z} + \eta_r(\sigma - \theta)(\hat{P}_2 - \hat{P}_1) \tag{17}$$

$$\eta_r = \frac{(1+r)^{(\sigma-1)}\delta^\sigma}{1 + (1+r)^{(\sigma-1)}\delta^\sigma} \tag{18}$$

Note that the aggregate consumer price index is

$$P = [\gamma + (1-\gamma)p^{1-\theta}]^{\frac{1}{1-\theta}} \tag{19}$$

Assuming that at the initial equilibrium p=1, then

$$\hat{P} = (1-\gamma)\hat{p} \tag{20}$$

We can thus rewrite (16) as follows,

$$\hat{c}_{m,1} = \hat{Z} + \eta_r(\sigma - \theta)(1-\gamma)(\hat{p}_2 - \hat{p}_1) \tag{21}$$

From the intratemporal first order condition, we know that

$$\hat{c}_m = \hat{c}_s + \theta\hat{p} \tag{22}$$

and therefore we can derive the rate of change of first period consumption of services

$$\hat{c}_{s,1} = \hat{Z} + \eta_r(\sigma - \theta)(1-\gamma)(\hat{p}_2 - \hat{p}_1) - \theta\hat{p}_1 \tag{23}$$

Using the Euler equation for manufacturing consumption, we have that

$$\hat{c}_{m,2} = (\sigma - \theta)(1-\gamma)(\hat{p}_1 - \hat{p}_2) + \hat{c}_{m,1} \tag{24}$$

from which we can obtain the dynamics (in terms of percentage deviations from initial equilibrium) of the consumption of services:

$$\hat{c}_{s,2} + \theta\hat{p}_2 = (\sigma - \theta)(1 - \gamma)(\hat{p}_1 - \hat{p}_2) + \hat{c}_{s,1} + \theta\hat{p}_1$$

Given that for the service sector demand and supply are equal in each period, we can replace consumption with output in the above equation, to obtain

$$(\sigma - \theta)(1 - \gamma)(\hat{p}_1 - \hat{p}_2) + \theta(\hat{p}_1 - \hat{p}_2) = \hat{y}_{s,2} - \hat{y}_{s,1}$$

Using the production function for services, we can then repalce output changes with changes in employment and TFP in services:

$$(\sigma(1 - \gamma) + \theta\gamma)(\hat{p}_1 - \hat{p}_2) = \mu_{ls}(\hat{L}_{s,2} - \hat{L}_{s,1}) + (\hat{A}_{s,2-}\hat{A}_{s,1}) \tag{25}$$

The current account in period 1 is simply given by the difference between output and consumption of manufacturing. We have identified in eq (16) manufacturing consumption in period 1. We thus need to compute manufacturing output in period 1. Note that given that total employment is constant, we have that the rate of change in employment in manufacturing is equal to the negative of the rate of change of employment in services multipled by the ratio of initial employment in services with respect to manufacturing. Using the production function, from employment changes we can then derive output changes. We have assumed that TFP in services does not change in period 1. Therefore, from the service production function for period 1 we have

$$\mu_{ls}\hat{L}_{s,1} = \hat{c}_{s,1} \tag{26}$$

Therefore, from eq (23) we have

$$\mu_{ls}\hat{L}_{s,1} = \hat{Z} + \eta_r(\sigma - \theta)(1 - \gamma)(\hat{p}_2 - \hat{p}_1) - \theta\hat{p}_1 \tag{27}$$

or

$$\mu_{ls}\hat{L}_{s1} = \frac{1+r}{2+r}\hat{y}_{m,1} + \frac{1}{2+r}\hat{y}_{m,2} - \eta_r(\sigma-\theta)(1-\gamma)(\hat{p}_1 - \hat{p}_2) - \theta\hat{p}_1 \qquad (28)$$

We further assume that $(1+r)\delta = 1$, which implies that at constant prices consumption is costant over time, and thus

$\eta_r = \frac{1}{2+r} \simeq \frac{1}{2+r} \simeq \frac{1}{2}$

Eq (28) can thus be rewritten as

$$\mu_{ls}\hat{L}_{s1} = \frac{1}{2}[\hat{y}_{m,1} + \hat{y}_{m,,2} - (\sigma-\theta)(1-\gamma)(\hat{p}_1 - \hat{p}_2)] - \theta\hat{p}_1 \qquad (29)$$

The above equation illustrates how structural change, namely the reallocation of labor across sectors, is affected in general equilibrium by the change in the present value of manufacturing income and by changes in relative prices. We have now all the information needed to compute the response of the current account and structural change to the pattern of productivity changes described in equations (4) and (5).

3.5 Structural Change and Current Account Balance

From equations (23), (26) and (29), we can compute the general equilibrium response of prices over time (expressed in deviations from initial equilibrium):

$$\hat{p}_2 - \hat{p}_1 = \hat{A}[\pi_1 + \pi_2(1+\lambda) + \pi_3\rho + \pi_4\beta + \pi_5(1+\lambda)(\rho - 1 - \beta)] \qquad (30)$$

The values of π's and η's are given in the appendix.

The closed form solution for $\hat{p}_2 - \hat{p}_1$ allows us to compute the effect of TFP changes on structural change and the current account for different combinations of the key parameter values describing the pattern of technological change, namely β and ρ. Moreover, we will analyze the role of the inefficiency in the service sector, measured by λ, on the different configurations of current account response and structural change. Structural change is summarized by the response of employment in services following a TFP shock:

$$\hat{L}_{s,1} = \frac{1}{\eta_5}[(\eta_r - \theta(1+\lambda) + \rho)\hat{A} + \eta_r c2(\hat{p}_2 - \hat{p}_1) + \eta_r \frac{\mu_{lm}}{\mu_{ls}}\frac{L_s}{L_m}\beta\hat{A}] \qquad (31)$$

while the current account response in period 1 is given by the following expression

$$CA_1 = \eta_r[(1-\rho)\hat{A} - c2(\hat{p}_2 - \hat{p}_1) - \beta\eta_r \frac{\mu_{lm}}{\mu_{ls}} \frac{L_s}{L_m} \hat{A}] \tag{32}$$

with the parameter c2 described in appendix. The response of the current account in period 2 is of course exactly the opposite to the one observed in period 1. We consider period 1 as the most relevant for the analysis, as the second period reflects the necessary future adjustment that eventually has to take place. Of course, with rational expectations, economic agents perfectly anticipate the pattern of technological spill-over that can take place in period 2. In spite of the extremely simplified structure of the model, the possible outcomes are very rich. To highlight the contribution of the paper, which focuses on the unbalanced TFP growth and inefficiency of services, in the numerical solution of the model we use parameter values from existing literature, except for our main parameters β, ρ and λ, which describe the main channels of our analysis.

Table 1 contains the parameter values we used to describe the response of the current account and structural change.

Table 1: Parameter values

γ	.25
μ_{ls}	.66
μ_{lm}	.6
$\frac{L_s}{L_m}$	4
σ	.4
θ	.3
λ	0 - 0.3

Figure 1 illustrates the relevance of the relative values of the two main elasticities for consumption behavior, namely σ and θ for both the current account balance and the change in employment in services. Note that when the effect is positive (negative) for the current account, the effect is negative (positive) for service employment. Thus, from Figure 1 we can see, for each pair of σ and θ, whether the current account will improve or deteriorate following a TFP shock, and simultaneously we can infer the change in employment in services, which will be opposite to the one for the current account. It can be seen that for any given θ a larger σ produces an improvement in the current account and a shift of labor away from services (the anti-Baumol effect). Indeed, when $\sigma > \theta$, consumption of manufacturing moves in line with consumption of services. As higher produc-

tivity in manufacturing tends to pull away workers from services, output and consumtpion of services decline. Consequently, consumption of manufacturing declines as well, which, together with the increased output in manufacturing resulting from TFP growth, leads to an improvement of the current account. However, what is more imprtant for us is that the current account/structural change configurations crucially depend on the pattern of technological spill-over and the inefficiency of the service sector.

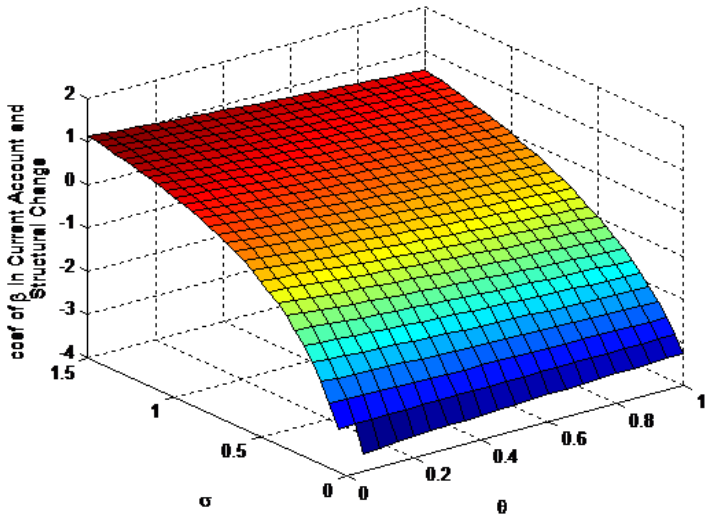


Figure 1: $0 < \sigma < 1.5, 0 < \theta < 1$

This is shown in Figure 2, which describes the various responses of the current account and structural change for different patterns of technological change (different values of β and ρ), assuming no inefficiency in the service sector ($\lambda = 0$). Figure 3 displays the effect on the equilibria of introducing positive mark-ups in the service sector.
Figure 2 depicts three different regions: one with current account surplus and labor reallocation from services to manufacturing; the other with current account surplus but reallocation of labor towards services, and three, current acccount deficits and reallocation of labor towards manufacturing. For illustration purposes, we are tempted to call the first region as the "German case" and the 3rd region as the "US case". Interestingly, for $\beta = 0$, the current account response will always be a surplus. As β increases the current account deficit becomes a possible outcome. Higher persistence tends to induce the "Baumol effect", as consumption smoothing is consistent with high overall consumption in period 1, which also implies that consumption of services increases in period 1, leading to a reallocation of labor towards services.

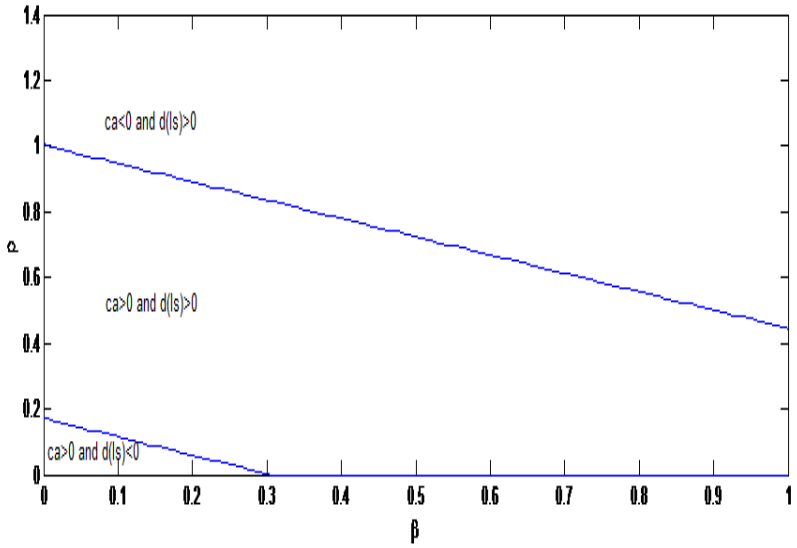


Figure 2: $0 < \rho < 1.5, 0 < \beta < 1$

Figure 3 provides interesting results, as it shows the effect of introducing inefficiency in the service sector, with $\lambda = 0.3$. The red lines are the new lines delimiting the three areas, while the blue lines are those from the simulation with $\lambda = 0$. Interestingly, and consistent with our priors, the region of current account deficits shrinks significantly. Furthermore, the regions with labor reallocation towards the service sector shrink as well, as the first region expands. In summary, both a low value of the spill-over parameter β, which results in a strongly unbalanced TFP growth, and high inefficiency in the service sector ($\lambda > 0$) tend to strengthen the current account. In the next section we verify econometrically whether these theoretical results find empirical support in the experience of Germany in the decades of 1990s and 2000s.

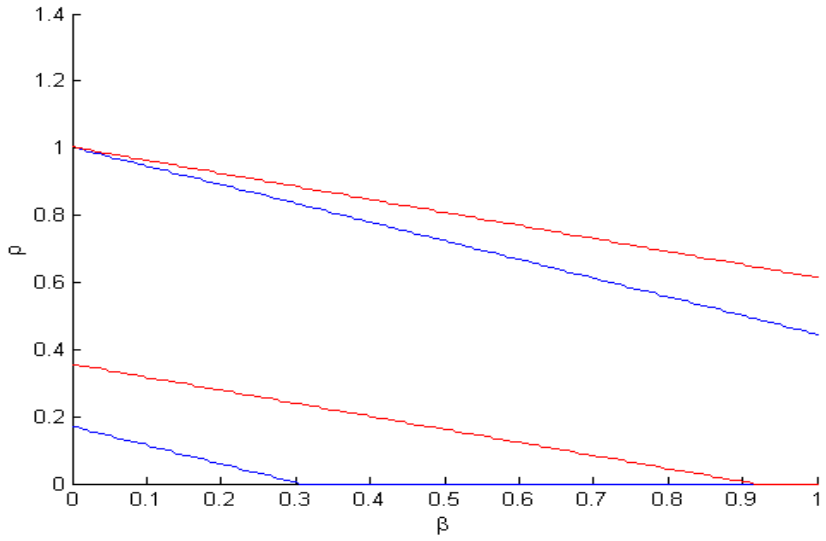


Figure 3: Red:$\lambda = .3$,Blue:$\lambda = 0$

4 Econometric analysis on bilateral trade balances

Standard models of current account determinants that include only aggregate output growth are not capable of explaining the large increase in the German CA surplus during the 2000s: these models imply a large unexplained component, especially for the 2000s (see Cheung et al., 2010). To contribute to the solution of this unexplained component, we implement an empirical model of the current account that adds to traditional variables used in econometric analyses of current account balances the relative productivity growth of manufacturing vs services. We isolate the effect of the relative productivity for a given overall growth rate of the economy, in order to seprate the impact of the unbalanced nature of sectoral productivity growth from the impact on inter-temporal decisions by households of the overall growth rate of incomes. We use as benchmark the recent epirical analysis carried out by Kerdrain et al. (2010), in which determinants of the current account balance are divided in demographic, macroeconomic and reform variables. In particular, following Bertola and Lo Prete (2010), we focus on labor market reforms, as higher flexibility of labor markets, by increasing uncertainty on incomes, may have a significant effect on precautionary savings and thus on the current account. This channel might have been particularly relevant for Germany, which implemented a far-reaching labor market reform at the beginning of the 2000s. Rather than focusing on a panel analysis of possibly highly heterogeneous countries, we focus on the

bilateral trade balance between Germany and OECD countries. The current account balance (and the trade balance) is by definition a "relative" variable, as the surplus of one country is the deficit of another. Therefore, the analysis of bilateral positions may help to estimate more precisely the impact of country determinants on the trade balances. Such analysis of bilateral trade balances has been recently carried out by Berger and Nitsch (2010) for the experience of the Euro area.

4.1 Data and variables

The dataset for the analysis draws on the data used in Kerdrain et al (2010), to which we add relative TFP, or relative labor productivity, in manufacturing versus services. The original dataset covers the period 1970-2007 and includes all OECD countries, although the length of the interval varies depending on countries. However, data on sectoral TFP cover a shorter sample, ranging for most countries from 1990 to 2007. For this reason, when analyzing 5-year non-overlapping priods to abstract from business cycle fluctuations we replace TFP with labor productivity, for which data are available for the entire sample. The dependent variable is the bilateral trade balance, normalized by the total bilateral trade (exports plus imports), of Germany with respect to the other OECD countries. Inclusion of relative TFP represents the main innovation of our study. We use the Klems database for the estimates of TFP, which is obtained from a growth accounting framework, adjusting for the quality of both labour and capital (capital is differentiated between ICT and non-ICT). The reform variable is the employment protection index (EPL), compiled by the OECD. From the standpoint of our analysis of the impact of unbalanced productivity growth on the trade balance, we consider the other determinants of the current account as control variables. These control variables capture (i) structural factors affecting savings behavior, such as demographic variables like the dependency ratio of old and young people; (ii) macroeconomic determinants such as the rate of growth of GDP per capita, the budget balance as a ratio of GDP, the real interest rate and the terms of trade.

4.2 The econometric specification and results

The emphasys on the effects of unbalanced productivity growth and structural change on the current account implies a focus on medium term effects rather than short-term dynamics. Accordingly, we search for a long-run relationship. To smooth out short-term dynamics we construct a 5-year non-overlapping sample. For the yearly sample, as in Clovis et al (2010), we find evidence of cointegration between bilateral trade balances and the vector of determinants and thus we estimate as well an error correction model. Furthermore, we present estimates for both levels and first differences. Our prior is that relative productivity exerts a medium-run effect rather than a short-run effect, as its general equilibrium effects involve as well a reallocation of labour across sectors. In our bilateral analysis, the position of Germany is determined by the relative value of

the determinants of the current account balance (trade balance). The bilateral indicators take into account changes in the partner countries and thus add an interesting perspective to the dynamics of the trade balance. Results for the 5-year non-overlapping sample are summarized in Table 2.

(Insert Table 2 here)

Results in Table 2 indicate that relative productivity has a strongly significant effect on the current account, effect that is robust to different specifications, in levels and in differences, with and without time fixed effects. Furthermore, the result on labor market flexibility is in line with the findings in Bertola and Lo Prete (2011), and suggests that increased flexibility in labor markets, by raising uncertainty for the workers, induces higher precautionary savings. In Bertola and Lo Prete (2011) such effect is linked to underdevelopment of financial markets. As labor market reform reduces the protection for workers, precautionary savings increase when workers cannot insure themselves through the financial market. Interestingly, our results suggest that this effect is relevant in the case of Germany, indicating possibly the inability of the German financial market to provide insurance for households facing higher incomle risks. The dominant role played in Germany by traditional banks, with an emphasys on tight relationships between banks and firms, seems consistent with these results, which indicate that improvements in the financial sector may also contribute to the rebalancing of the current account surplus.

Table 1: Productivity and bilateral trade balance, 5-year intervals

a. In levels

Dependent variable: Bilateral trade balance		
Productivity and reform variable		
Relative TFP	0.332***	0.2777***
EPL	-0.068***	-0.034***
Control variables: Demography		
Dependency ratio old	0.002	-0.007
Dependency ratio young	-0.005	0.000
Control variables:Macroeconomic		
Change in GDP per capita	1.290*	-0.527
Budget balance/GDP	-0.003	0.000
Change in terms of trade	0.007	-0.119*
Real interest rate	0.360	-1.629***
Country effects	yes	yes
Period effects	no	yes
Number of obs.	93	93
R2	0.91	0.93

b. First differences

Dependent variable: Bilateral trade balance		
Productivity and reform variable		
Relative TFP	0.342***	0.335***
EPL	-0.090***	-0.025
Control variables: Demography		
Dependency ratio old	0.010	0.009
Dependency ratio young	-0.016	-0.009
Control variables:Macroeconomic		
Change in GDP per capita	0.629**	-0.208
Budget balance/GDP	-0.010***	0.000
Change in terms of trade	-0.217	-0.200
Real interest rate	-0.284	-1.554**
Country effects	yes	yes
Period effects	no	yes
Number of obs.	71	71
R2	0.47	0.56

Our results are also consistent with Berger and Nitsch (2010), who found a significant effect of structural reforms on the current account. However, our interpretation, based on the significant impact of relative TFP between manufacturing and services, is different. Rather than a sign of increased competitiveness, the current account surplus in Germany reflects inefficiencies in the service sector, including the financial sector.

To verify the robustness of the above results we analyze as well a panel with yearly observations. In this case, we use data on TFP, as we have a sufficiently large number of observations over the period 1990-2007. Table 3 reports results for the same specification used for the 5-year observations, whereas Table 3 reports results from an error corection specification, which can provide information on the speed of adjustment. Results from the yearly panel broadly confirm the findings of the 5-year panel. In particular, the effect of relative productivity is still highly significant and of a similar order of magnitude of the one found in Table 2. Moreover, the effect of labor market regulation is also significant and similar in size. The effects of the control variables are less robust. It is worth noting that the budget balance is not significant in most specifications.

Table 2: Productivity and bilateral trade balance, yearly observations

a. In levels

Dependent variable: Bilateral trade balance		
Productivity and reform variable		
Relative TFP	0.244***	0.214***
EPL	-0.037***	-0.038***
Control variables: Demography		
Dependency ratio old	0.006	-0.016***
Dependency ratio young	-0.010**	-0.007
Control variables:Macroeconomic		
Change in GDP per capita	0.020	-0.599***
Budget balance/GDP	-0.001	0.001
Change in terms of trade	0.147	-0.153
Real interest rate	1.428***	1.293***
Country effects	yes	yes
Period effects	no	yes
Number of obs.	268	268
R2	0.90	0.92

b. First differences

Dependent variable: Bilateral trade balance		
Productivity and reform variable		
Relative TFP	0.167*	0.147*
EPL	-0.024	-0.029
Control variables: Demography		
Dependency ratio old	0.016	0.021
Dependency ratio young	-0.037	-0.053***
Control variables:Macroeconomic		
Change in GDP per capita	-0.176	-0.653***
Budget balance/GDP	-0.000	-0.000
Change in terms of trade	0.173	-0.122
Real interest rate	0.545	1.362***
Country effects	yes	yes
Period effects	no	yes
Number of obs.	250	250
R2	0.11	0.20

In the yearly panel there is an issue of persistence of the current account. Cointegration tests reveal the presence of cointegration if we exclude EPL, a variable with little time variation. Table 4 contains the results of the ECM model. The long run estimation is of course the same as the one in Table 3 for the levels. The short run estimation indicates no significant effect of relative productivity or the aggregate output growth on the dynamic adjustment. This

Table 3: Productivity and bilateral trade balance, yearly panel: ECM model

Long run model. Dependent variable: Bilateral trade balance	
Productivity and reform variable	
Relative TFP	0.213***
EPL	-0.038**
Control variables: Demography	
Dependency ratio old	-0.016***
Dependency ratio young	-0.007**
Control variables:Macroeconomic	
Change in GDP per capita	-0.599***
Budget balance/GDP	-0.001
Change in terms of trade	-0.153
Real interest rate	1.293***
Country effects	yes
Period effects	yes
Number of obs.	268
R2	0.92
Short run model. Dependent variable: (D(1)) Bilateral trade balance	
Error correction (-1)	-0.394***
Productivity and reform variable	
D(1) Relative TFP	0.100
D(1) EPL	-0.030*
Control variables: Demography	
D(1) Dependency ratio old	0.006
D(1) Dependency ratio young	-0.035***
Control variables:Macroeconomic	
D(1) Change in GDP per capita	-0.110
D(1) Budget balance/GDP	-0.000
D(1) Change in terms of trade	0.735***
D(1) Real interest rate	1.293***
Country effects	yes
Period effects	no
Number of obs.	250
R2	0.26

result seems consistent with the view that the relative productivity variable plays a crucial role in the medium run. The magnitude of the error correction coefficients implies that the speed of adjustment is rather fast and therefore medium term factors dominate the behavior of the bilateral trade.

(Insert Table 4 here)

5 Concluding remarks

In this paper we focused on a largely unexplored channel for explaining the recent surge of the current account surplus in Germany, namely the acceleration in productivity in manufacturing sectors combined with stagnant productivity in the service sector. The effects of this unbalanced productivity growth work as well through structural change, defined as the evolution of the shares in value added and employment of sectors like manufacturing and services. In the US, accelerating productivity in manufacturing sectors has been generally accompanied by a decline of the weight of manufacturing in total value added. In contrast, in Germany the acceleration in productivity growth in manufacturing sectors went hand in hand with a stable share of manufacturing in total value added. We argue that this phenomenon reflects two interrelated aspects, not necessarily positive, of the German economy. First, the type of technological progress in manufacturing is based on improving the efficiency of existing products, consolidating the traditional specialization of the German economy (Cheptea et al (2010)). Such efficiency gains do not generate multiplier effects on the service sectors, in contrast with what has been observed in the US (Moretti (2010)). The second aspect is the lack of dynamism in the service sector and the lack of creation of high quality jobs in services.

In summary, as these aspects relate to the surge in the current account surplus, such surplus may reflect some weaknesses of the German model rather than only its strength. These types of weaknesses seem related to the limits, emphasized by Rajan (2010), of the export-led growth model when applied to rich countries.

An interesting area for future research is to study in more depth the main factors that characterize such export-led model, looking at fundamental areas such as the education system and the financial sector. Indeed, it is likely that the education system based on vocational schools plays a fundamental role in creating incentives for efficiency gains in existing products and sectors and in creating barriers for absorbing radical innovation and new products, which possibly require a more general education (Krueger and Khumar (2004)). Similarly, a financial sector centered on banks and dominated by collateralized loans constrains the ability of households to insure from income volatility and thus increases precautionary savings. Furthermore, such type of financial sector contributes to constrain radical innovation and the development of innovative activities in skill-intensive services, which are likely to have low collateral, at least at the start olf their activities. The differences in both areas, education and financial sector, between Germany and the United States are striking. These observations indicate that a useful research and policy agenda is to focus on the role of the education system and the financial sector for the process of innovation, its typology and the spillover effects across sectors. This research can also shed light on the implications of such patterns of innovation and productivity growth for job creation, spillover effects in job creation across manufacturing

and service sectors and structural change. In this paper we have provided some evidence that these issues may be relevant for understanding the puzzling behavior of the German current account. Such understanding may also be useful to frame the policy debate on the interpretation of the large German current account surplus.

References

[1] Blanchard, O. (2007) "Current account deficits in rich countries", *NBER Working Paper* 12925.

[2] Berger, H. and V. Nitsch (2010), "The Euro's effect on trade imbalances", *IMF Working Paper*, WP/10/226.

[3] Bussière, M., C. Lopez and C. Tille (2013), "Currency crises in reverse: Do large real exchange rate appreciations matter for growth?", *MPRA Paper*, n. 44053.

[4] Chakraborty, S. and R. Dekle (2008) "Can international productivity differences explain US current account deficits?", *NBER WP.*

[5] Cheptea, A., L. Fontagn and S. Zignago (2010), "European export performance", *CEPII WP*, 2010 12.

[6] Cheung, Furceri and Rusticelli (2010), "Structural and cyclical factors behind current account balances", *OECD Economics Department Working Papers,* No. 775.

[7] Christopoulou, R. and Ph. Vermeulen (2010), Markups in the Euro area and the US over the period 19812004: a comparison of 50 sectors, *Empiricial Economics*, online, www.springerlink.com/content/mw1458t396628132/fulltext.pdf.

[8] Cova, P., M. Pisani, N. Batini and A. Rebucci (2009), Global imbalances: The role of non-tradable total factor productivity in advanced economies", *IMF Working Paper,* WP/09/63.

[9] Dekle, R. , J. Eaton and S. Kortum (2008), "Global rebalancing with gravity: Measuring the burden of adjustment", *NBER Working Paper* 13846.

[10] Fournier, J. and I. Koske (2010), "A Simple Model of the Relationship Between Productivity, Saving and the Current Account", *OECD Economics Department Working Papers,* No. 816.

[11] Ju, J., K. Shi and S.J. Wei (2012), "Trade Reforms and Current Account Imbalances. When Does the General Equilibrium Effect Overturn the Partial Equilibrium Intuition" mimeograph.

[12] Kerdrain, C., I. Koske and I. Wanner (2010), "The Impact of Structural Policies on Saving, Investment and Current Accounts," *OECD Economics Department Working Papers* 815.

[13] Koske, I. and A. Woergoetter (2010), "Germany's Growth Potential, Structural Reforms and Global Imbalances", *OECD Economics Department Working Papers*, No. 780.

[14] Krueger, D. and K.B. Khumar, (2004), "Skill-specific rather than general education: A reason for US-Europe growth differences?", *Journal of Economic Growth*, 9, :167-207.

[15] Marin, D. (2010), "The Opening Up of Eastern Europe at 20. Jobs, Skills and 'Reverse Maquiladoras' in Austria and Germany", *Munich Discussion Papers*, n. 2010-14.

[16] Moretti, E. (2010), "Local multipliers", *American Economic Review*, May.

[17] Obstfeld, M. and K. Rogoff (1996), *Foundations of international macroeconomics*, MIT Press.

[18] Obstfeld, M. and K. Rogoff (2004), Adjustment of US current account...*Foundations of international macroeconomics*.

[19] Ostry, J. and C. Reinhart (1992), "Private savings and terms of trade shocks: Evidence from developing countries", *IMF Staff Papers* 39 (3): 495-517.

[20] Parente, S. and E.C. Prescott (2002), *Barriers to Riches*, MIT Press.

[21] Rajan, R. (2010), *Fault lines. How hidden fractures still threaten the world economy*. Princeton University Press.

[22] Sinn, H.W. (2006), "The pathological export boom and the bazaar effect: How to solve the German puzzle" *CESIFO Working Paper* no.1708.

[23] Vegh, C. (2012), *Open economy macroeconomics in developing countries*, MIT Press.

Table 4: Productivity and bilateral trade balance, 5-year intervals

a. In levels

Dependent variable: Bilateral trade balance		
Productivity and reform variable		
Relative TFP	0.332***	0.2777***
EPL	-0.068***	-0.034***
Control variables: Demography		
Dependency ratio old	0.002	-0.007
Dependency ratio young	-0.005	0.000
Control variables:Macroeconomic		
Change in GDP per capita	1.290*	-0.527
Budget balance/GDP	-0.003	0.000
Change in terms of trade	0.007	-0.119*
Real interest rate	0.360	-1.629***
Country effects	yes	yes
Period effects	no	yes
Number of obs.	93	93
R2	0.91	0.93

b. First differences

Dependent variable: Bilateral trade balance		
Productivity and reform variable		
Relative TFP	0.342***	0.335***
EPL	-0.090***	-0.025
Control variables: Demography		
Dependency ratio old	0.010	0.009
Dependency ratio young	-0.016	-0.009
Control variables:Macroeconomic		
Change in GDP per capita	0.629**	-0.208
Budget balance/GDP	-0.010***	0.000
Change in terms of trade	-0.217	-0.200
Real interest rate	-0.284	-1.554**
Country effects	yes	yes
Period effects	no	yes
Number of obs.	71	71
R2	0.47	0.56

Table 5: Productivity and bilateral trade balance, yearly observations

a. In levels

Dependent variable: Bilateral trade balance		
Productivity and reform variable		
Relative TFP	0.244***	0.214***
EPL	-0.037***	-0.038***
Control variables: Demography		
Dependency ratio old	0.006	-0.016***
Dependency ratio young	-0.010**	-0.007
Control variables:Macroeconomic		
Change in GDP per capita	0.020	-0.599***
Budget balance/GDP	-0.001	0.001
Change in terms of trade	0.147	-0.153
Real interest rate	1.428***	1.293***
Country effects	yes	yes
Period effects	no	yes
Number of obs.	268	268
R2	0.90	0.92

b. First differences

Dependent variable: Bilateral trade balance		
Productivity and reform variable		
Relative TFP	0.167*	0.147*
EPL	-0.024	-0.029
Control variables: Demography		
Dependency ratio old	0.016	0.021
Dependency ratio young	-0.037	-0.053***
Control variables:Macroeconomic		
Change in GDP per capita	-0.176	-0.653***
Budget balance/GDP	-0.000	-0.000
Change in terms of trade	0.173	-0.122
Real interest rate	0.545	1.362***
Country effects	yes	yes
Period effects	no	yes
Number of obs.	250	250
R2	0.11	0.20

Table 6: Productivity and bilateral trade balance, yearly panel: ECM model

Long run model. Dependent variable: Bilateral trade balance	
Productivity and reform variable	
Relative TFP	0.213***
EPL	-0.038**
Control variables: Demography	
Dependency ratio old	-0.016***
Dependency ratio young	-0.007**
Control variables:Macroeconomic	
Change in GDP per capita	-0.599***
Budget balance/GDP	-0.001
Change in terms of trade	-0.153
Real interest rate	1.293***
Country effects	yes
Period effects	yes
Number of obs.	268
R2	0.92
Short run model. Dependent variable: (D(1)) Bilateral trade balance	
Error correction (-1)	-0.394***
Productivity and reform variable	
D(1) Relative TFP	0.100
D(1) EPL	-0.030*
Control variables: Demography	
D(1) Dependency ratio old	0.006
D(1) Dependency ratio young	-0.035***
Control variables:Macroeconomic	
D(1) Change in GDP per capita	-0.110
D(1) Budget balance/GDP	-0.000
D(1) Change in terms of trade	0.735***
D(1) Real interest rate	1.293***
Country effects	yes
Period effects	no
Number of obs.	250
R2	0.26