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132

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EXTERNAL ASYMMETRIES IN THE EURO AREA AND THE ROLE OF FOREIGN DIRECT INVESTMENT

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ABSTRACT

A few years after the establishment of the European Economic and Monetary Union (EMU), large asymmetries emerged in the trade balances and the current accounts of the member-states. A divide seems to separate two groups in the euro area, one with the northern countries achieving external surpluses and the other including the southern countries with large external deficits. We argue that a crucial factor in shaping productivity, and consequently affecting competitiveness and the external position of the economy, is the size and composition of Foreign Direct Investment (FDI) and find that the northern countries received more total FDI than the southern group. Moreover, the southern countries attracted more investment in real estate rather than the productive sector. Focusing on ten euro area economies over the period 1980-2009, we establish a positive relationship between FDI flows and trade balances in the northern countries, in contrast to a negative one for the southern group. Using industry-level data, we also establish a positive (negative) long-run relationship between FDI in the manufacturing (non-manufacturing) sector and the trade balance for the northern (southern) countries.

JEL Classification: F15, F21
Keywords: Euro area, trade balance, Foreign Direct Investment (FDI)

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1. Introduction

Since the global crisis in 2008, several communiqués issued by the European Commission on the economic situation in the euro area countries adopted an increasingly alarming tone over their external imbalances.[1] There was hardly any comparable worry in the early years, let alone during the preparation of EMU as most of the attention was concentrated on the fiscal and monetary aspects of the integration process. Since the introduction of the common currency ruled out competitive devaluations, little attention was paid to the external disparities, until the global crisis revealed that countries with sizeable current account deficits are more vulnerable to international market pressures and recessions.

In an early study of external imbalances in EMU, Blanchard and Giavazzi (2002) offered the comforting explanation that increased integration of capital markets is likely to result in large current account deficits. In such a context, they disregarded any explosive pattern in the medium run, and argued that countries such as Portugal and Greece need not take measures to reduce their deficits. Only when deficits reached alarming levels, did Blanchard (2007) turn away from his benign-neglect suggestion and stressed that as "…c*urrent account deficits steadily increased… within the Euro, Portugal (*and*) Spain* (have a) *reason to worry, (…*as) *deficits are too large, …(* and) *implications can be bad"***.** Recent studies show that, especially since the intensification of the financial crisis, highly indebted EMU countries with large external deficits are also found to experience the highest sovereign bond yield spreads [e.g. Alexopoulou et al. (2009), Attinasi et al. (2009), Barrios et al. (2009)]. The pairwise correlations for the post-EMU era between government debt, current account and sovereign spreads in Figures 1 and 2, as expected, indicate that the current account (government debt) relative to Germany is negatively (positively) correlated with sovereign spreads.

Figure 1 and 2 here

The complacent view held that the external deficits of the euro area countries have been a demand-driven phenomenon, even though evidence did not supporting this approach. In fact, a study by Arghyrou and Chortareas (2008) suggested that "*other*

[1] See, among others, (EC 2009).

factors beyond income growth may explain the current account positions of Greece, Italy, Portugal and Spain" and find that developments in the real effective exchange rate and consequently in competitiveness is a decisive one.

Using the direction of how external imbalances have evolved after the adoption of the common currency, two groups suggest themselves in the euro area. The first consists of the northern countries of the euro area (henceforth called the "North") where external balances have improved since the creation of the EMU, while the second includes the southern euro area countries (henceforth called the "South") which experienced large external deficits.[2] Even more interesting is the fact that – contrary to the early optimism – this divergence was widening over time, reaching unprecedented levels in recent years.

But what has caused such divergences in external balances? Our paper suggests that different patterns of FDI inflows across the countries in the "North" and the "South" groups have resulted in systematic productivity gaps and diverging external accounts. The establishment of EMU has been of paramount importance for the movement of capital in the euro area and consequently for the shaping of production capabilities in the member states. FDI can bring many changes that should benefit the host country, such as speeding-up the adoption of new technologies, increasing competition, upgrading human capital, giving access to foreign markets etc. FDI inflows to the euro area stemmed either from intra-EMU reallocations or from outside the euro area, although the particular weights are still debated. For example, Petroulas (2008) finds that EMU led mainly to higher intra-euro area FDI flows, and to a lower extent raised FDI inflows from outside. By contrast, Taylor (2008) shows that if FDI inflows to and from Belgium-Luxemburg are removed, it appears that EMU has been a significant stimulus to investment only from non-euro to euro area countries.

When exploring time series data for each country we observe that although all euro area countries have attracted higher FDI inflows since the creation of EMU, there seems to exist sharp differences in the size of inflows attracted by each country/group. In

[2] The categorisation of euro area countries into two groups is adopted only for the purpose of studying the interactions between external balances and FDI flows, and should not be taken to imply a deep-down division on all fronts of economic activities. For example, after EMU Greece experienced a real-estate boom that was weaker than Finland, while France proved to be a lot more resilient than Ireland after the global crisis in 2008.

particular, it seems that the "North" has attracted a lot more FDI in comparison with the "South".

Since the seminal work of Mundell (1957), many papers have aimed at shedding light on the effect of FDI on the host county's activities, though their findings have been far from conclusive.[3] It appears that the nature of the trade-FDI nexus depends on many factors such as the level of aggregation (microeconomic, sectoral, and macroeconomic) and the country and time period under investigation. It is reasonable to expect that the FDI effect will differ significantly between the short run and the long run, depending on the nature of the imported goods in the short run [see e.g. Fontagne (1999)]. Hence, although FDI can attract machinery imports and cause a deterioration in the host country's trade balance in the short run, these imported goods can serve as vehicles of positive externalities and improve the trade balance in the long run. To this effect, Coeurdacier et al. (2009) find a positive effect of the European integration on cross border mergers and acquisitions in the manufacturing sector, while the impact on the services sector is not statistically significant. In addition, as pointed out by Xiao et al. (2008) *"....(t)he "South" has experienced increasing FDI inflows in recent years, but the distribution was not even, and, in particular Greece and Italy have been lagging....Much of the FDI to the "South" has been in the service sector..."*. This caveat is of particular importance since the potential externalities associated with FDI inflows might differ markedly across industries [UNCTAD (2001)]. After all, the empirical discussions that concern spillover effects on productivity and exports are often concentrated in the manufacturing sector [see e.g. Aitken et al. (1997), Aitken and Harrison (1999), Chuang and Hsu (2004), Dimelis and Louri (2002) and Greenway et al. (2004)].

As far as the composition of FDI inflows is concerned, it seems that the "North" has attracted significantly more investments in the productive sector in comparison with the "South", whereas the increased FDI inflows in the "South" have been dominated by investment in real estate activities. To that end, a promising framework to explain the disparities in external balances is to examine whether this heterogeneity in size and composition of FDI inflows has led to different patterns of productivity and trade

[3] For a survey of the literature see Lipsey (2002), Gorg and Greenway (2004) and Filippaios and Kottaridi (2008).

balances in the two groups. In an early study for Ireland, Ruane and Gorg (1999) showed that its economy was completely transformed as a result of the massive flow of foreign affiliates. More specifically, Multinational Enterprises (MNEs) were exporting over 70% of their output and accounted for two thirds of manufacturing net output and half of employment.

The theoretical analysis is based on the framework developed - among many others - by Brock (1988), Engel and Kletzer (1989) Brock and Turnovsky (1994) and Turnovsky (1996) that describes a two-sector dynamic model with traded and non-traded goods. The economy accumulates two types of capital stock, one that is internationally traded and another that is non-traded. In the present context the former represents productive investments such as in manufacturing, while the latter type of capital may be seen as investment in non-traded services, such as real-estate or land for which construction permits have been obtained, as in Wincoop (1990). Both types of capital are employed in both sectors. Inward foreign investment is treated as a rise (outward investment as a reduction) in the stock of internationally-traded capital and can be allocated to both sectors of the economy albeit at different intensities. The economy may be relatively capital-intensive either in the traded or the non-traded sector and this gives rise to the so-called *"Rybsczynski effect",* according to which an increase in a factor of production shifts the composition of output in favour of the sector which is relatively intensive in that factor. In such a context, if a country is FDI-intensive in the productive sector, an inflow will increase traded output and improve the trade balance. On the other hand, if it is attracts FDI mainly in the service sector, this will lead to a relative contraction of the traded sector and the trade balance will deteriorate.

Our empirical analysis aims to test the main predictions of the model. For that purpose we use an error correction model in order to disentangle the short- and long-run effects of aggregate and industry level FDI inflows on the trade balance of goods and services for ten euro area countries over the period 1980-2009. Our main results can be summarized as follows. Firstly, we find a positive long-run relationship between FDI inflows and trade balances for the "North", while a negative one holds for the "South". Secondly, these results seem to be driven by the sub-period 1999-2009, during which we observe a substantial rise in the net inflow of FDI in the euro area. Thirdly, when we use

industry level data we find a positive (negative) long-run relationship between FDI in manufacturing (non-manufacturing) sector and the trade balance for the "North" ("South"). Hence, when FDI inflows are channeled to the productive/tradable (unproductive/non-tradable) sector, this leads to substantial improvement (deterioration) in productivity and competitiveness in the long run.

The rest of the paper is organized as follows. Section 2 discuses the data and presents basis statistics on the evolution of external accounts and FDI inflows within the euro area. Section 3 presents the theoretical analysis and demonstrates the key implications. Section 4 describes the empirical strategy and contains the econometric results. Finally, section 5 offers some concluding remarks.

2. External asymmetries in the euro area and investment patterns

In this section, we present evidence for the development of external balances and investment patterns in the euro area over the last thirty years. More specifically, our sample spans the period 1980 to 2009 and includes 10 euro area countries. The countries of our sample are Austria, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain. We exclude Belgium and Luxemburg from our research first because separate data for each country exist only after 2002 and second, because Belgium and (to a greater extent) Luxemburg have received an extremely large amount of FDI inflows part of which was subsequently channeled to other euro area countries.

The main variables of interest in our analysis are the FDI inflows (*FDI*) and the net trade in goods and services (*Trade balance*), both scaled by GDP and expressed as a percentages. These data are obtained from *International Financial Statistics* - of the *International Monetary Fund* (annual edition online version). A complete list of variables used in our analysis is provided in Appendix A with details on data sources and descriptive statistics. It is worth noting that we abstain from using the current account

balance in order to avoid potential biases in the results. This measure includes net factor income from investments to/from abroad and thus it is directly associated with *FDI*.[4]

Table 1 reports the average *trade balance* for two sub periods before and after the adoption of EMU, namely from 1980 to 1998 and 1999 to 2009 respectively.[5] Two groups of the euro area countries are considered according to whether their balances have been improved or deteriorated after EMU.[6] The group characterized as "North" includes five countries, namely Austria, Finland, Germany, Ireland and Netherlands, and exhibits an average improvement of 4.37% of GDP in the trade balance. On the contrary, the group termed as "South" includes the rest of euro area countries, namely France, Greece, Italy, Portugal and Spain, and shows an average deterioration of 0.95% of GDP in the trade balance.

Table 1 here

It is worth noting at this point that a similar pattern emerges for the current account balances, which improve in the "North" (with the exception of Ireland over the recent years) but deteriorate in the "South" (see Figure 3). Although there is no established benchmark at which point a current account deficit may cause an economy-wide crisis, it is useful to recall that the balance of payments crises in Latin America over the last three decades took place with external deficits ranging between 6% and 8% of the respective country's GDP, a level far below the recent developments in some of the southern euro area countries. Despite the fact that most of the southern economies were historically prone to deficits, none of them experienced such a quick and sharp deterioration in the trade/current account balance in the past. This represented a wholly new type of asymmetry in the euro area.

Figure 3 here

[4] For instance Ireland suffered from current account deficits after 2000 due to rising factor income payments abroad that are associated with large amount of inward FDI inflows that occurred in the preceding years. However, the country continues to enjoy high surpluses on the trade balance.

[5] The substance of the results remains the same if instead of this sample we use data eleven years before and eleven years after the creation of the EMU.

[6] The fact that Portugal's trade balance is improved in the post-EMU era is mainly attributed to the fact that during 1982 and 1983 the trade deficit was above 20 percentage points of GDP. If we exclude these observations, trade balance seems to deteriorate by 1% f GDP after the creation of EMU. In addition, we can add a country to the high competitive economies of the "North" that runs on average trade deficits above 8% of GDP during the whole period.

One factor that seems to have played a key role in shaping productivity, and consequently affecting the external position of the economy, stems from the different patterns of FDI inflows towards the two groups of the euro area. Examining the FDI inflows before and after EMU, they are found to display the following features. First there is the difference in size as can be seen in Table 2: Before EMU both euro area groups were receiving a more or less similar net inflow of FDI. However, in the first years of the new monetary regime, a substantial increase in FDI inflows of about 4% of GDP relative to the period 1980-98 took place in the "North", while the "South" experienced an increase of only 1.18% of GDP. Figure 4 plots this stark contrast between the two groups.

Table 2 and Figure 4 here

Second, in the "North", the productive sector has attracted significantly more investment in comparison with the "South". FDI inflows at the industry level are available from the *OECD's International Direct Investment database*.[7] In order to observe investment patterns at the industry level in the two groups we employ two variables, *FDI Manufacturing* and *FDI Real Estate*, both scaled by GDP and expressed as percentages. The former includes FDI only in the manufacturing sector, while the latter includes FDI in real estate, renting and business activities, FDI in construction activities and FDI in hotel and restaurants. In Figure 5 we see that the "North" has attracted significantly more FDI inflows in the manufacturing sector, while the increased FDI inflows after 1999 for the "South" were dominated by investment in real estate activities.[8]

In addition, as Figure 6 demonstrates, *FDI manufacturing* (*FDI Real estate*) is positively (negatively) correlated with the *trade balance*.[9] Hence, by distinguishing between investment in productive activities and investment in the real estate sector, a different pattern of inward investment and output composition emerges for the two

[7] This database except for FDI at the industry level provides also data for total FDI inflows. We prefer, though, using data for total FDI inflows from the *International Financial Statistic,* since this database provides also quarterly data for total FDI inflows that we will use at a later stage of our research. It is worth noting that our results (available upon request) remain unaffected if we alternatively use data for total FDI inflows from *OECD's International Direct Investment database*.

[8] Because of missing data for variable *FDI Real estate*, we reduce our sample to period 1991-2009, in order to have equal number of observations for both variables.

[9] It is worth noting that we calculate correlations for countries that we have at least 10 observations available, in order to avoid, to the extent possible, small size distortions.

groups. When FDI inflows are directed mainly to the tradable sector this leads to substantial productivity improvements. In contrast, investment going mostly to the real estate sector boosts aggregate demand, raises prices causes the real exchange rate to appreciate and hinders competitiveness. This differentiation has profound consequences for the supply of traded and non-traded output and can be used to explain the diverging pattern in the trade balances and current accounts.

Figures 5 and 6 here

3. Theoretical framework

Following Turnovsky (1996), the economy is inhabited by a single infinitely-lived representative agent who provides labour inelastically and accumulates two types of capital, traded (K) and non-traded (H). The first sector produces internationally traded goods (Y_T), and is subsequently referred to as the '*productive'* sector. The second produces non-traded goods (Y_N), and is referred to as the '*service'* sector. The international price of traded goods is taken as unity and the relative price of non-traded goods is denoted by p .

3.1. The two-sector model

Using continuous-time representation, production functions and capital accumulation dynamics are described as follows. A dot indicates time derivatives and subscripts T and N the traded and non-traded sector of the economy respectively:

Traded sector output: $Y_T = AK_T^{\alpha} H_T^{1-\alpha}$ (1a)

Non-traded output: $Y_N = BK_N^{\beta} H_N^{1-\beta}$ (1b)

Total output: $Y = Y_T + Y_N$ (2a)

Total consumption: $C = C_T + C_N$ (2b)

Net exports: $X = Y_T - C_T - I$ (3a)

Current account: $$\dot{B} = rB + X = rB + Y_T - C_T - I$$

(3b)

Traded capital stock: $$K = K_T + K_N$$

(4a)

$$\dot{K} = -\delta K + I$$

(4b)

Non-traded capital stock: $$H = H_T + H_N$$

(5a)

$$\dot{H} = -\varepsilon H + Y_N - C_N - \psi(I)$$

(5b)

The first two equations (1a, b) are homogeneous Cobb-Douglas production functions for the traded and non-traded sector with constant returns to scale, traded capital intensities $0 < \alpha, \beta < 1$ and exogenous technologies $A, B > 0$, respectively. For simplicity, labour is not included here as a factor of production and there is no role for government although such extensions are straightforward as in Brock (1988). Equations (2a, b) denote the decomposition of output and consumption, (3a) denotes exports of internationally traded goods net of imports and (3b) the accumulation dynamics of bonds *(B)* held abroad by the agent at an exogenous world interest rate (*r*). Equations (4a, b) express the decomposition and dynamics of the traded capital stock, while (5a, b) those for the non-traded capital with δ and ε denoting depreciation rates respectively. FDI is represented by the exogenous variable *(I)*.

The last term in (5b) represents installation costs of traded capital. Turnovsky (1996) treats the costs of installing new capital only in terms of traded goods which has the consequence that investment decisions are not sensitive to the relative price of non-traded goods. However, this is not a plausible assumption if one takes into account that the real-estate boom and the sharp rise in housing prices in several euro area countries over the last decade have adversely affected investment in the productive sectors of their economies.[10] To capture this fact we assume, as in Brock (1988), that installing traded

[10] When, for example, a new factory is installed costs for designating the appropriate land and then obtaining a license to build and operate in it may soar when the size of investment rises, due either to scarcity of industrial land or to the resistance that was frequently organized against production sites fearing that they might undervalue the housing investment in the area.

capital entails costs paid in terms of non-traded goods and is given by the simple convex function:

$$\psi(I) \equiv \sigma I^2 \tag{6}$$

where (σ) is a constant. No installation costs are assumed for non-traded investment. This implies that land for construction is readily available so that extending its stock by issuing new construction permits does not involve additional costs.

Perfect mobility of both types of capital is assumed between traded and non-traded sectors so that rental prices of each factor as expressed by the marginal revenues are equalized across sectors, i.e.

$$R_K \equiv \frac{\partial Y_T}{\partial K_T} = \frac{\partial Y_N}{\partial K_N} \tag{7a}$$

$$R_H \equiv p\frac{\partial Y_T}{\partial H_T} = p\frac{\partial Y_N}{\partial H_N} \tag{7b}$$

3.2 Solving the model

Combining (7a, b) with (1a, b) and (2a), the rental prices of the two types of capital are derived as:

$$R_K = Z_K \; p^{-\frac{1-\alpha}{\alpha-\beta}} \tag{8a}$$

$$R_H = Z_H \; p^{\frac{\alpha}{\alpha-\beta}} \tag{8b}$$

where Z_K and Z_H are abbreviations of model parameters as derived in Appendix B.

Combining the shares of factor incomes with identities (2a) and (4a) we obtain sectoral outputs as a function of total capital stocks and their respective returns, namely:

$$Y_T = \frac{(1-\beta)\cdot R_K}{\alpha-\beta}K - \frac{\beta\cdot R_H}{\alpha-\beta}H \tag{9a}$$

$$Y_N = -\frac{(1-\alpha)\cdot R_K}{(\alpha-\beta)p}K + \frac{\alpha\cdot R_H}{(\alpha-\beta)p}H \tag{9b}$$

Different patterns in the capital intensity of the two sectors, i.e. whether $\alpha > \beta$ or $\alpha < \beta$, give rise to the so-called *"Rybsczynski effect",* according to which an increase in a factor of production shifts the composition of output in favour of the sector which is relatively intensive in that factor [see Rybsczynski (1955)].

Typically we expect that $\alpha > \beta$, but there are situations where this may be otherwise. One reason that might lead to economies exhibiting $\alpha < \beta$ is the presence of congestion in the production of traded goods. In the present context we treat non-traded capital stock (such as, for example, industrial land) as a scarce factor which is congested by the installation of manufacturing capital. Using the formulation of Braun (1993) as described in Barro and Sala-i-Martin (1995), we augment production function (1a) as:

$$Y_T = AK_T^{\omega} H_T^{1-\omega} \cdot (H_T / K_T)^x = AK_T^{\omega - x} H_T^{1-\omega+x} \tag{1c}$$

where x is a "congestion indicator". When obstruction is strong enough so that $x > \omega - \beta$ i.e. $\alpha = \omega - x < \beta$, we have a case where the service sector becomes relatively intensive in internationally-traded capital stock. Looking whether such a pattern exists in the euro area countries, it is interesting to examine the quality of the regulatory environment as a proxy for the facilitation of FDI installation in the traded sector. One such measure is offered by the ranking the Worldwide Governance Indicators over the years 1996 to 2008, as produced by the World Bank. As shown in Figure 7, there seems to be a clear dichotomy between the two groups, with the southern countries having consistently inferior quality regulation relative to the northern members.

Differentiating (9a) and (9b) we get:

$$If \quad \alpha > \beta \quad \Rightarrow \quad \frac{\partial Y_T}{\partial K} > 0 \quad and \quad \frac{\partial Y_N}{\partial K} < 0 \tag{10a}$$

$$If \quad \alpha < \beta \quad \Rightarrow \quad \frac{\partial Y_T}{\partial K} < 0 \quad and \quad \frac{\partial Y_N}{\partial K} > 0 \tag{10b}$$

The representative agent chooses the set $\{C_T, C_N, I\}$ at each time t to maximize the intertemporal utility function:

$$U(t) \equiv \int_0^{\infty} \frac{1}{1-\gamma} [C_T^{\theta}(t+s) \cdot C_N^{1-\theta}(t+s)]^{1-\gamma} \cdot e^{-s\rho} \cdot ds \qquad (11)$$

where ρ is the rate of time preferences, γ is the CRRA coefficient and θ the composition of consumption between traded and non-traded goods. Subject to the constraints given in (3b), (4b) and (5b), the solution provides the optimal consumption and investment decisions as functions of the price of non-traded goods (p) and the price of installed productive capital (Q). Details are given in Appendix B.

To study how investment decisions were affected by the establishment of EMU, the latter is naturally represented as a permanent fall in real interest rates (r). Following a reduction in real interest rates, prices of non-traded goods (p) and the price of installed productive capital (Q) are shown to converge to a new equilibrium on a saddle-path. Details are given in Appendix B. However, the dynamics of adjustment differ according to whether the economy is traded-capital intensive in the productive or the service sector. Distinguishing between the two cases as shown in Figures 8a and 8b we derive a number of stylized facts for the two groups of the euro area.

3.3. Stylized facts

Using the results in Appendix B, the following propositions are established:

Proposition 1: A permanent shock to the world interest rate causes prices to diverge between countries that are relatively FDI-intensive in the productive sector and those which are so in the service sector. This, in turn, causes a productivity gap between the two groups.

Proof: The adjustment path of relative prices after a permanent reduction of real interest rates is given in Figures 8a and 8b for the two types of economies and implies that it falls in the north and rises in the south. Consequently, we expect that inflation rates in the north should have been clearly lower than those in the south. Assuming that wages in both types of countries are adjusted to inflation, this leads to a productivity gap equal to the accumulated inflation differentials as shown in Figure 9a.

Evidence: Average inflation rates of the consumer price index are displayed in Figure 9b for the two groups of the euro area after the establishment of EMU. In the beginning, inflation rates are at similar levels for both groups, but subsequently they

diverge sharply. Average inflation in the southern group exceeded that in the North by an average of one percentage unit during the period 2002-2007.

Proposition 2*:* In the face of a permanent reduction in the interest rate, asset prices of installed capital stock rise in both types of economies.

Proof: As shown in Figure 8a, adjustment to the new equilibrium in the first type of the economy takes place without overshooting. After the initial jump, asset prices are rising further and converge gradually to the new steady-state. Figure 8b is drawn for the economy with $\alpha < \beta$ and shows that the asset price jumps immediately to the new equilibrium without further rise. The initial reaction is likely to be stronger in this case.

Evidence: Asset prices are approximated by using quarterly stock market indices of the euro area countries normalized at the same base in the first month of 1997, two years before the start of EMU. A simple average is taken to denote the evolution of asset prices in each euro area group and Figure 10 displays the average asset prices in the two groups in the aftermath of EMU. The initial response of the southern average index after the EMU shock is stronger than that of the northern group, as predicted by the above analysis.

Proposition 3: FDI flows are expected to be higher in an economy where the productive sector is relatively intensive in FDI capital.

Proof: Dividing the optimal investment rules as in (A6) for "North" and "South" respectively, and using superscripts for the two groups we obtain:

$$\frac{FDI \quad north}{FDI \quad south} = \left(\frac{\sigma^S}{\sigma^N} \right) \cdot \left(\frac{p^S}{p^N} \right) \cdot \left(\frac{Q^N - 1}{Q^S - 1} \right) \tag{12}$$

Evidence: All fractions in the r.h.s. tend to be above unity; the first because the installation of FDI is more costly in the South due to less efficient regulation (see Figure 7), and the second term by virtue of Proposition 1. The last term as explained above is below unity, but not enough to overturn the other two effects (see Figure 10). All these reasons combined, result to a higher FDI inflows in the northern group of the euro area as shown in Figure 4.

Proposition 4: After a fall in real interest rates, the proportion of productive investment to total FDI shrinks in economies with $\alpha < \beta$. The outcome in economies with $\alpha > \beta$ depends on the change of relative prices, but in general it is expected to be lower than in the former case.

Proof: See Appendix B.

Evidence: Figure 5 shows the average shares of investment in manufacturing and in real estate for the two groups before and after the EMU, so that the relative compositions can be calculated. Before EMU, the proportion of manufacturing to the sum of the two types of FDI was 70% and 58% for the north and south respectively, giving a ratio of 1.20 between the two groups. After EMU the proportions were 40% and 22% respectively, making the ratio of north to south to rise to 1.82.

Proposition 5: If the traded (non-traded) sector is relatively intensive in traded capital, then FDI inflows are positively (negatively) correlated with trade balances.

Proof: If foreign investment is treated as a rise in the stock of traded capital, then by recalling (9a) the following implications for the two cases are immediately derived:

(i) If the economy is relatively capital-intensive in the production of traded output, FDI will be directed in greater proportions to the traded sector. In this case, traded output expands relatively more than the output of the non-traded sector, thus improving the trade balance.

(ii) If the economy is relatively capital-intensive in the non-traded sector, then most of the internationally traded FDI will be attracted by the service sector and production will shift towards non-traded goods. As a result, the trade balance deteriorates as shown in Figure 11. Figure 3 provides a clear evidence of the divergence between the two euro area groups.

4. Econometric analysis

4.1. Empirical strategy

The empirical approaches applied to estimate the external account determinants have differed substantially across studies [see e.g. Arghyrou and Chortareas (2008), Chinn and Prasad (2003), Schmitz and Von Hagen (2009)] and particular caution seems warranted in specifying an appropriate model. All specification tests discussed in this section are carried out for two different panels containing (i) the northern European countries and (ii) the southern European countries.

We begin our empirical analysis with an examination of the unit root properties of the baseline series involved in our analysis. It is well known that structural breaks can be mistaken for non-stationarity [(see Perron (1989)]. Hence, we use the Carrion-i-Silvestre et al. (2005) panel unit root test, which extends the panel unit-root test of Hadri (2000) to allow for heterogenous structural breaks by applying the Bai and Perron (1998) procedure. Tables 3 and 4 display the location of the breaks and the unit root tests for the two different panels. Based on these results we can conclude that we can reject the null of stationarity for both variables with or without the presence of structural breaks.

Table 3 and 4 here

Once the existence of a panel unit root has been established, the second stage involves testing for the existence of a long-run relationship between the variables under study. Due to the short and narrow dimension of our panel, no Johansen-related system-based test is performed since it is likely to be the most distorted. Instead, we use the alternatives of applying Kao's (1999) and Pedroni's (1999) residual-based tests that assume a single cointegrating vector. Based on Gutierrez (2003), Kao's panel tests have higher power than Pedroni's tests when a small-T number of observations are included in a homogeneous panel. Based on Kao's (1999) statistics, reported in Table 5, the null hypothesis is always rejected and therefore we have indications that variables *trade balance* and *FDI* are cointegrated.

Table 5 here

In order to estimate the long-run relationship, the selected approach is the Pooled Mean Group (PMG) estimator proposed by Pesaran et al. (1999a). This method allows for the short-and long-run effects of FDI inflows on the net trade balance of the euro area countries to be disentangled. Our method can be summarized as a panel error correction model, where short-and long-run effects are estimated jointly from a general autoregressive distributed-lag (ARDL) model and where short-run coefficients, the speed of adjustment and error variances are allowed to vary across countries, but the long-run coefficients are constrained to be the same.

Initially we restrict our estimations to include only the key variables of interest, i.e. *trade balance* and *FDI* inflows. A fairly general dynamic specification is represented by an auto-regressive distributed lag model of order p_i and q_i, ARDL(p_i,q_i):

$$TRADE_{it} = \sum_{j=1}^{p_i} \lambda_{ij} TRADE_{it.j} + \sum_{j=0}^{q_i} \delta_{ij} FDI_{it.j} + \mu_t + \varepsilon_{it} \tag{13}$$

By re-parameterising and stacking time series observations together, the Pooled Mean Group (PMG) model specification can be rewritten in the following error correction form:

$$\Delta TRADE_{it} = \phi_i (TRADE_{it-1} + \frac{\beta_i}{\phi_t} FDI_{it}) + \sum_{j=1}^{p_{i-1}} \lambda_{ij}^* \Delta TRADE_{it.j} + \sum_{j=0}^{q_i} \delta_{ij}^* \Delta FDI_{it.j} + \mu_i + \varepsilon_{it} \tag{14}$$

where:

$$\phi_i = -(1 - \sum_{j=1}^{p_i} \lambda_{ij}),\ \beta_t = \sum_{j=0}^{q_i} \delta_{ij}\ , \lambda_{ij}^* = -\sum_{k=j+1}^{p_i} \lambda_{ik}\ ,\ \delta_{ij}^* = -\sum_{k=j+1}^{p} \delta_{ik}$$

For a long-run relationship to exist we expect ϕ_i to be significantly different from zero. Additionally, when the ARDL (p_i,q_i) is stable, ϕ_i is expected to be negative and less than 1 in absolute value. In this case, the long-run relationship is defined by:

$$TRADE = -\frac{\beta_i}{\phi_t} FDI_{it} + \eta_{it} \tag{15}$$

where η_{it} is a stationary process. In the steady state, *trade balance* and *FDI* are tied together with a long-run coefficient of $\theta_i = -\beta_i / \phi_i$. Moreover, the parameter δ_{ij}^* is the short-run coefficient relating FDI inflows to the trade balance. We determine the optimal lag structure using the Akaike selection criterion, starting with a maximum lag length of two.

Instead of using the PMG estimator, we could use the alternatives, the Dynamic Fixed Effects (*DFE*) or Mean Group (*MG*) estimators as proposed by Pesaran et al. (1999a). The former imposes homogeneity of all slope coefficients allowing only the intercepts to vary across countries, while the latter allows not only the intercept to differ across individuals but also the slope coefficients and the error variances. One advantage of the Pooled Mean Group (*PMG*) estimator over the Dynamic Fixed Effects (*DFE*) estimator is that it allows for the short-run dynamics to differ across countries.

Moreover, the PMG estimator has the advantage over the MG estimator that it performs well even when the number of cross sections is small. Hsiao et al. (1998) have shown that if at least one dimension of the panel is small, the MG estimator, although consistent, is not a good estimator. Additionally, in small samples, the MG estimator, unlike the PMG estimator, being an unweighted average is very sensitive to the inclusion of outliers. As mentioned in the previous section, we have observations in our sample, especially during the post-EMU era, in which FDI inflows take extreme values.

Finally, as shown by Pesaran et al. (1999b), an additional advantage of the ARDL model is that it yields consistent estimates of the long-run parameters, irrespective of whether the underlying regressors are stationary, nonstationary or mutually cointegrated. In other words, this procedure allows inferences to be made in the absence of any a priori information about the order of integration of the series under investigation. This property of the ARDL model can be extremely useful in our case for two reasons. First, given the low power of the panel unit root tests, it is difficult to draw safe inference for the statistical properties of our data. Second, in the next section we will use alternative specifications in order to check the sensitivity of our results.

4.2. Results

As a preliminary step in Table 6 we provide some evidence for the importance of external accounts for the determination of sovereign spreads in the euro area during the post-EMU era.[11] More specifically, in accordance with the existing literature, we observe that current account deficits relative to Germany are positively related to sovereign spreads in the long run [see e.g. Alexopoulou et al. (2009), Attinasi et al. (2009) and Barrios et al. (2009)].[12] Hence, the higher the current account deficit, the more the economy is perceived as vulnerable to reversals in international flows of funding. In addition, as expected, results indicate that government debt (budget balance) is positively (negatively) related to sovereign spreads.

Table 6 here

Moving a step further, the results of estimating equation (14) for the northern European countries and the southern European countries are presented in Tables 7 and 8, respectively, using annual data for the period 1980-2009. Lags throughout the analysis are chosen on the basis of AIC with a maximum of 2 lags and are allowed to vary across countries.[13] Moreover, the error correction term is negative and statistically significant in all estimations for both panels, indicating the presence of a long-run relationship. As far as the short-run effects are concerned, we observe in column (1) that *FDI* is negatively and significantly related to the *trade balance* for the case of the "North", while it is insignificant for the case of the "South". This short-run effect can be justified if it is based on the fact that foreign affiliates require imported inputs and products from the home country [see e.g. Head and Ries (2001)]. These imported goods can be intermediate and capital goods that serve as vehicles of positive externalities and improve the host country's trade balance in the long run though (see Fontagne (1999)). Still UNCTAD (1998) argues that many of these imports can be consumer goods that fail to carry such benefits.

[11] In these estimations we include Belgium in our sample, while when Belgium is dropped from regressions results remain unaffected.
[12] Qualitative results remain unaffected when we use in the right hand side of the estimated equation the trade balance instead of the current account balance. In addition, we get similar results if we split the euro area countries into the northern and the southern group.
[13] It is worth noting that results remain unaffected when we impose a uniform one-lag structure for all countries and variables entering the model.

Tables 7 and 8 here

Regarding the long-run coefficient, results indicate that *FDI* is positively (negatively) related to the *trade balance* in the "North" ("South"). This result is associated with the composition of inward FDI inflows, which differs significantly between the two groups. More specifically, the "North" has attracted a lot more FDI inflows into the productive sector in comparison with the "South", where FDI inflows were dominated by investment in real estate activities. Hence, in the "North", although in the short run the FDI effects on the trade balance seem to be detrimental, in the long run the effect is reversed. The accumulated capital that is associated with the FDI inflows improves competitiveness and the productivity of the host country in the long run and consequently the trade balance. On the other hand, in the "South", where FDI inflows are concentrated mostly in activities other than the productive sector, in the long run the associated externalities are vague and intangible and the trade balance deteriorates.

In order to assess the consistency of our results we report in Tables 7.1 and 8.1 some standard tests on the functional form of the country-specific estimates. More specifically, we perform the Breusch (1978) test for serial correlation, the Ramsey (1969) reset test for functional-form misspecification, the Jarque-Bera (1980) test for the normality of the errors and the White (1980) test for heteroskedasticity. From the results derived only Austria from the "North" and Italy from the "South" display some problematic statistics. It should be noted that when we drop these countries from our estimations, the results remain unaffected, indicating that the models are correctly specified.[14]

Tables 7.1 and 8.1 here

As a second step we attempt to estimate the *FDI* effect on *trade balance* at the industry level. Two points are worth making before discussing the results. First, data availability did not allow us to estimate the effect of *FDI real estate* on *trade balance.* Alternatively, we manage to split FDI inflows in the *manufacturing* and *non-manufacturing* sector. FDI in the *non-manufacturing* sector contains all FDI inflows other than the FDI inflows in the *manufacturing* sector. Second, we understand that *FDI non-*

[14] Results are available upon request.

manufacturing, especially for the "North", contains productive investment (e.g. electricity, gas and water or transports, storage and communication) but it is the best we can do based on data availability. Hence, in the second column of Tables 7 and 8 we estimate the effect of *FDI manufacturing* and *FDI non-manufacturing* on *trade balance*, for the "North" and the "South" respectively.

Initially, we observe that the short-run coefficients are insignificant in both tables. By contrast, we find the long-run coefficient of variable *FDI manufacturing* to be positively and significantly (insignificantly) related to *trade balance* for the "North" ("South"). This is the expected result for the "North", since when an economy accumulates capital in the productive/traded sector the associated positive externalities can improve the trade balance in the long run. On the contrary, for the "South" the result is most probably attributed to two factors. First, because the "South" has attracted a small amount of FDI inflows in the manufacturing sector in both the pre-EMU and post-EMU eras. Hence, the associated externalities in the long-run are intangible. Second, because both export-oriented high-tech manufacturing goods and labour intensive textiles are included in manufacturing FDI, but they are expected to affect a country's productivity in a different way. So, these results suggest that one should take a closer look on the composition of FDI manufacturing inflows. Unfortunately, data availability does not allow us to compare the composition in the manufacturing sector for the "North" and the "South" and draw safe inferences.

Regarding, the long-run effect of *FDI non-manufacturing* on *trade balance*, the results depicted show a positive (negative) effect for the "North" ("South"). The result for the "North" is less expected, but it is related to the fact that the "North" has attracted a great amount of productive investments in the non-manufacturing sector, especially after the creation of EMU. As far as the "South" is concerned, *FDI non-manufacturing* has the expected negative effect on *trade balance*, since the non-manufacturing sector in the "South" is dominated by investment in real estate activities. These results are in line with our findings for the trade effect of total FDI inflows in the two groups. In particular, for the "North" ("South") we get a positive (negative) long-run effect for *FDI* since it has attracted more FDI in the productive (real estate) sector. Of course these are some preliminary evidence of the effect of industry level FDI inflows on the trade balance at

the macro level. If we were unconstrained by data availability, we could have checked for structural breaks in both variables, *FDI manufacturing* and *FDI non-manufacturing,* in the pre-EMU and post-EMU eras, since the composition of both variables is of paramount importance. For the same reason, we cannot add control variables in the specification of column (2), as we will do for our basic specification in equation (14).

Hence, in the third column of Tables 7 and 8 we want to ensure that our findings are not product of a particular specification. For this reason, we add to our estimated equation the real GDP growth rate (*GROWTH*) and the real effective exchange rate index (*REER*). We add *GROWTH*, since according to Blanchard and Giavazzi (2002), increased economic integration is likely to lead to a decrease in saving and an increase in investment and so to a deterioration of external balance. This effect can be very strong especially in the case of the poorer southern European countries that are catching up with the union's average income. Moreover, an increase in the growth rate of output, which is associated with enhanced imports in consumer goods, can similarly cause the trade balance to deteriorate [see e.g. Abel and Bernanke (2001), Gandolfo (2004)].[15]

Regarding the *REER* variable, we expect relative prices and heterogeneity of competitiveness between the two groups to be an important determinant of the diverging external accounts [see e.g. Arghyrou and Chortareas (2008), Lee and Chinn (2006)]. It is worth noting that we expect *REER* to be closely related to productivity shocks caused by the FDI inflows, but relative prices are not solely determined by this factor. In fact, we believe that variables *FDI* and *REER* act complementarily in our estimated equation. Regarding the results, in Tables 7 and 8 we get the expected signs for our new control variables. More specifically, an increase in the *REER* (*GROWTH*) variable causes the external balance to deteriorate. Finally, results for the *FDI* variable remain unaffected in both specifications.

As a next step, in column (4) of Tables 7 and 8 we proceed by applying quarterly data instead of annual data in the specification of column (3), but once again results for *FDI* remain unaffected. The reason for using quarterly data is that we want to check for a break in the *trade balance-FDI* nexus in the pre-EMU and the post-EMU eras and have

[15] An increase in *REER* index for each country indicates deterioration of competitiveness and vice versa.

an adequate number of observations for both sample periods. Hence, the final step in our empirical analysis is to split our sample in two to sub-periods, 1980-1998 and 1999-2009. Indeed in column 5 of Tables 7 and 8, which refer to the pre-EMU era, we get a positive long-run relationship between *trade balance* and *FDI* for both groups. This result is meaningful if we bear in mind that that the FDI characteristics were more or less the same in the pre-EMU era. These characteristics, though, changed significantly after the creation of EMU. As can be seen, in the sixth column of Table 7 (8) we derive a positive (negative) long-run *trade balance-FDI* relationship for the "North" ("South"). Hence, we have strong evidence that the diffusion of investment in the unproductive/non-traded sector during the post-EMU era in the "South" caused the external balance to deteriorate significantly.

5. Conclusions

Despite the threat that huge external deficits might pose for the sustainability of the common currency, they did not attract extensive policy attention from the start of EMU. In recent years, during which external deficits reached alarming levels, a public debate on the potential threats to the economies of southern Europe and their viability within the euro area has started to take place.

This paper suggests that differences in FDI inflows among the member states of the euro area have resulted in productivity gaps and have therefore constituted a crucial determinant of external accounts. Hence, although almost all member states have attracted massive FDI inflows, especially since the creation of EMU, there seems to exist a sharp differentiation between the "North" and the "South" regarding their size and composition. More specifically, the "North" has attracted a lot more FDI inflows into the traded sector in comparison with the "South", where FDI inflows have been dominated by investment in real estate activities. Our results reveal that these different patterns have resulted in a positive relationship between FDI inflows and trade balances in the "North", while the opposite holds for the "South". Additionally, these results seem to be driven by the sub-period 1999-2009 during which we observe a substantial net inflow of FDI into the euro area. Finally, when we use industry level data we find a positive (negative) long-

run relationship between FDI in the manufacturing (non-manufacturing) sector and the trade balance for the "North" ("South").

In conclusion, member states should not solely be interested in attracting FDI inflows, but they should also care about their "quality". Disparities in external accounts and productivity gaps seem to be closely related with the composition of FDI inflows attracted by the two groups of the euro area.

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Appendix A. Data sources and descriptive statistics

Variable	Description	Obs.	Mean	Std. dev.	Min	Max	Source
Current account	Current account balance relative to Germany as a share of GDP (%)	396	-5.213	7.335	-28.580	15.001	International Financial Statistics (*IFS*)
spreads	Differential in yield on long-term government bonds vis-à-vis the German bund.	440	27.671	36.587	-10.333	265	OECD statistics
Government debt	Government debt relative to Germany as a share of GDP (%)	400	3.321	26.974	-42.8	55.4	Eurostat
Fiscal balance	Budget surplus/deficit relative to Germany as a share of GDP (%)	412	0.045	5.409	-21.26	12.64	Eurostat
Trade balance	Net trade in goods and services as a share of GDP (%)	299	0.307	6.066	-27.224	16.711	*IFS*
FDI	Foreign direct investment inflows as a share of GDP (%)	299	2.141	3.883	-15.028	26.954	*IFS*
FDI manufacturing	Foreign direct investment inflows in the manufacturing sector as a share of GDP (%)	220	0.511	1.123	-6.555	9.418	OECD Statistics
FDI non-manufacturing	Foreign direct investment inflows in the non-manufacturing sector as a share of GDP (%)	220	1.479	2.559	-13.834	14.066	OECD Statistics
FDI real estate	Foreign direct investment inflows in real estate, renting and business activities, in construction activities and in hotel and restaurants as a share of GDP (%)	141	0.827	1.448	-1.496	11.242	OECD Statistics
GROWTH	Real growth rate of output (%)	300	2.428	2.633	-8.019	13.22	*IFS*
REER	Real effective exchange rates index	300	97.329	10.431	71.515	132.134	*IFS*

Appendix B: Solving the two-sector model

Factor shares in the two sectors are given by the familiar expressions:

$$R_K K_T = \alpha Y_T \qquad \text{and} \qquad R_H H_T = (1-\alpha) Y_T \tag{A1a}$$

$$R_K K_N = \beta Y_N \qquad \text{and} \qquad R_H H_N = (1-\beta) Y_N \tag{A1b}$$

Combining the above expressions, the rates of returns are obtained as follows:

$$R_K = Z_K \cdot p^{-\frac{1-\alpha}{\alpha-\beta}}, \qquad Z_K = \left[\frac{1-\alpha}{1-\beta}\cdot\frac{\alpha^{\alpha}}{\beta^{\beta}}\right]^{\frac{(1-\alpha)(1-\beta)}{\alpha-\beta}} \cdot \mathrm{A}^{\frac{(1-\beta)}{\alpha-\beta}} \cdot \mathrm{B}^{-\frac{(1-\alpha)}{\alpha-\beta}} \tag{A2a}$$

$$R_H = Z_H \cdot p^{\frac{\alpha}{\alpha-\beta}}, \qquad Z_H = \left[\frac{\beta}{\alpha}\right]^{\frac{\alpha\beta}{\alpha-\beta}} \cdot \frac{(1-\beta)^{\frac{\alpha(1-\beta)}{\alpha-\beta}}}{(1-\alpha)^{\frac{\beta(1-\alpha)}{\alpha-\beta}}} \cdot \mathrm{A}^{-\frac{\beta}{\alpha-\beta}} \cdot \mathrm{B}^{\frac{\alpha}{\alpha-\beta}} \tag{A2b}$$

The discounted Hamiltonian is given by:

$$\begin{aligned} \Gamma \equiv\ & \frac{1}{1-\gamma}[C_T^{\theta} \cdot C_N^{1-\theta}]^{1-\gamma} + \lambda \cdot [rB + Y_T - C_T - I] \\ & + (Q\lambda) \cdot [-\delta K + I] + (p\lambda) \cdot [-\varepsilon H + Y_N - C_N - \sigma I^2] \end{aligned} \tag{A3}$$

In the above expression, λ is the shadow price of external assets, Q is the asset price of installed traded capital and p the relative price of non-traded goods both expressed in terms of foreign asset prices. The first order conditions with respect to $\{C_T, C_N\}$ yield:

$$\theta \cdot C_T^{\theta(1-\gamma)-1} C_N^{(1-\theta)(1-\gamma)} = \lambda \tag{A4a}$$

$$(1-\theta) C_T^{\theta(1-\gamma)} C_N^{(1-\theta)(1-\gamma)-1} = \lambda p \tag{A4b}$$

Dividing by parts and using (4b) we obtain the shares of consumption as:

$$C_T = \theta \cdot C \tag{A5a}$$

$$C_N = (1-\theta) \cdot \frac{C}{p} \tag{A5b}$$

Consumption rule

Given the shares of consumption in (12), the consumer price index is equal to $\theta + (1-\theta)p$ and the economy-wide inflation rate is given by:

$$\pi = (1-\theta)\frac{\dot{p}}{p} \tag{A6}$$

Differentiating (A5a,b) and using (A6), the growth rates of traded and non-traded consumption are obtained as:

$$g_{CT} = g_C \tag{A7b}$$

$$g_{CN} = g_C - \frac{\pi}{1-\theta} \tag{A7c}$$

Differentiating (A4a,b) and using (A7), the growth rate of total consumption is finally determined as a function of world rates, preferences and the inflation rate by the expression:

$$g_C \equiv \frac{\dot{C}}{C} = \frac{1}{\gamma} \cdot [r - \rho - (1-\gamma)\pi] \tag{A8}$$

Investment rule

Differentiating (A3) w.r.t. $\{ I \}$, we obtain the expression

$$Q = 1 + p\frac{\partial \psi}{\partial I} = 1 + p \cdot \psi'(I)$$

Recalling (6), optimal new investment in traded capital stock is given by:

$$I = \frac{1}{2\sigma p}(Q-1) \tag{A9}$$

Dynamics of adjustment

The equations for the three state variables in (9) are given as follows:

$$\dot{\lambda} - \rho\lambda = -\frac{\partial \Gamma}{\partial B} \quad \Rightarrow \quad \frac{\dot{\lambda}}{\lambda} = \rho - r \tag{A10}$$

$$(\dot{Q\lambda}) - (Q\lambda)\rho = -\frac{\partial \Gamma}{\partial K} \quad \Rightarrow \quad \dot{Q} = (r+\delta) \cdot Q - Z_K \cdot p^{-\frac{1-\alpha}{\alpha-\beta}} \tag{A11a}$$

$$(\dot{p\lambda}) - (p\lambda)\rho = -\frac{\partial \Gamma}{\partial H} \quad \Rightarrow \quad \dot{p} = (r+\varepsilon) \cdot p - Z_H \cdot p^{\frac{\alpha}{\alpha-\beta}} \tag{A11b}$$

Equations (A11a and b) can be used to determine the dynamics of adjustment to equilibrium for the steady-state values of asset prices and the relative price of non-traded goods. We distinguish the following two cases:

(i) Productive sector relatively intensive in FDI $(\alpha > \beta)$: The equilibrium loci for the prices of traded and non-traded capital *(Q*, p*)* are depicted in Figure 7a. Since p* is independent of Q*, its locus is a vertical line, while the asset price locus is a downward slopping curve. The unique equilibrium is given by E_0 and the dynamics of adjustment imply a saddle-path S_0S_0. If there is a permanent fall in the world real interest rate *(r)* , the first locus remains the same, while the asset price locus moves upwards. Adjustment takes place by the asset price jumping onto the new saddle-path S_1S_1, leading to a new equilibrium E_1 with a higher asset price $(Q_1 > Q_0)$. The price of the non-traded goods is reaching gradually a lower equilibrium $(p_1 < p_0)$. Calculation of equilibrium values from (A11a, b) is straightforward.

(ii) Service sector relatively intensive in FDI $(\alpha < \beta)$***:*** The equilibrium loci for the prices of traded and non-traded capital *(Q*,p*)* are now depicted in Figure 7b. The p^* locus is again a vertical line, but now the asset price locus is an upward slopping curve as implied by (A11a) and moves leftwards with a rise in interest rates. The equilibrium is unique and given by E_0, but the system is not saddle-path stable anymore as it is clearly shown by the dynamics of adjustment. Thus, when there is a permanent rise in interest rate *I,* both the asset price and the non-traded price have to jump on the new equilibrium E_2 and take higher values:

$(Q_2 > Q_0, \quad p_2 > p_0)$.

<u>Proof of Proposition 4:</u>

Setting the shares as $\tau = K_T / K, \quad \eta = H_T / H$ **,** production functions (1a) and (1b) are rewritten as

$$Y_T = A(\tau K)^{\alpha} (\eta H)^{1-\alpha} \tag{A12a}$$

$$Y_N = B[(1-\tau)K]^{\beta} [(1-\eta)H]^{1-\beta} \tag{A12b}$$

From (7a) and (7b) we obtain two expressions for the ratio H/K, and equating them we get

$$\frac{1/\tau - 1}{1/\eta - 1} = \frac{1/\alpha - 1}{1/\beta - 1} \tag{A13}$$

From (A1a,b) and (A2a,b) we obtain

$$\frac{\tau}{\eta} = \frac{H}{K} \cdot \left[\frac{Z_H}{(1-\alpha)A} \right]^{1/a} \cdot p^{\frac{1}{\alpha-\beta}} \tag{A14}$$

Combining (A13) and (A14) the fraction of FDI allocated in the traded sector is given as a function of K and p by the expression:

$$\tau = \frac{1-\beta}{\alpha-\beta} - \frac{\xi}{\alpha-\beta} \cdot \frac{H}{K} \cdot p^{\frac{1}{\alpha-\beta}} \tag{A15}$$

where $$\xi \triangleq \frac{\beta(1-\alpha)}{\alpha} \left[\frac{(1-\alpha)A}{Z_H} \right]^{1/a}$$

Differentiating w.r.t. *K* and *p* we obtain that the total shift in fraction (τ) is:

$$d\tau = \frac{\partial \tau}{\partial p} dp + \frac{\partial \tau}{\partial K} dK \tag{A16}$$

with partial differentials given as

$$\frac{\partial \tau}{\partial p} = -\frac{\xi}{(\alpha-\beta)^2} \cdot \frac{H}{K} \cdot p^{\frac{1-\alpha+\beta}{\alpha-\beta}} \; < \; 0 \tag{A17a}$$

$$\frac{\partial \tau}{\partial K} = \frac{\xi}{\alpha-\beta} \cdot \frac{H}{K^2} \cdot p^{\frac{1}{\alpha-\beta}} \tag{A17b}$$

The sign of the latter is not clear and two cases are distinguished:

(i) For $\alpha > \beta$, we have $\partial\tau / \partial K > 0$. Thus if *dp<0*, we combine (A17a, b) and (A16) to get $d\tau > 0$. If *dp>0*, the direction of total change in (τ) is uncertain.

(ii) For $\alpha < \beta$, we have $\partial\tau / \partial K < 0$. With *dp>0*, it clearly follows that $d\tau < 0$.

Appendix C: Tables

Table 1. Trade balances in the euro area as % of GDP

COUNTRY	1980-1998	1999-2009	CHANGE
Austria	-0.115	3.119	3.234
Finland	2.380	6.976	4.596
Germany	1.895	4.191	2.296
Ireland	3.751	12.966	9.215
Netherlands	4.069	6.601	2.532
North (average)	**2.396**	**6.771**	**4.375**
France	0.919	0.097	-0.822
Greece	-6.688	-8.258	-1.57
Italy	0.927	0.412	-0.515
Portugal	-9.725	-8.756	0.969
Spain	-0.869	-3.683	-2.814
South (average)	**-3.087**	**-4.037**	**-0.950**

Source: IFS

Table 2. FDI inflows in the euro area as % of GDP

COUNTRY	1980-1998	1999-2009	CHANGE
Austria	0.644	5.644	5.000
Finland	0.976	3.125	2.149
Germany	0.255	2.459	2.204
Ireland	2.062	7.82	5.758
Netherlands	2.407	7.176	4.769
North (average)	**1.268**	**5.244**	**3.976**
France	0.969	2.994	2.025
Greece	1.074	0.844	-0.230
Italy	0.307	1.228	0.921
Portugal	1.609	2.766	1.157
Spain	1.615	3.634	2.019
South (average)	**1.115**	**2.293**	**1.178**

Source: IFS

Table 3. Estimated breaks

	Trade balance		FDI	
COUNTRY	**No.**	**Breakpoint**	**No.**	**Breakpoint**
Austria	2	1983,1997	1	2004
Finland	2	1992,2002	1	1997
Germany	2	1989,2001	2	1996,2000
Ireland	2	1984, 2004	2	1997, 2003
Netherlands	2	1985,1998	2	1997,2001
France	2	1986,1996	2	1998,2004
Greece	1	2005	1	2005
Italy	2	1986,1992	2	1999, 2005
Portugal	1	1986	0	-
Spain	2	1983,1992	2	1999, 2005

Notes: The breakpoints were estimated using the Bai and Perron (2003) procedure, while the number of breaks to use for each country was estimated using the Liu Wu and Zidek (LWZ) information criterion with a maximum of two breaks.

Table 4. Panel unit root test on TRADE (H_0 : no unit root)

	Trade balance		FDI	
	North	**South**	**North**	**South**
	Test (p-value)	**Test (p-value)**	**Test (p-value)**	**Test (p-value)**
Breaks (Homogenous)	12.212 (0.000)	8.290 (0.000)	3.867 (0.000)	1.323 (0.093)
Breaks (Heterogeneous)	14.038 (0.000)	13.368 (0.000)	30.761 (0.000)	2.431 (0.008)

Notes: The long-run variance is estimated using the Bartlett spectral kernel with automatic spectral window bandwidth selection. The bootstrap distribution is based on 2,000 replications.

Table 5. Results of Kao's residual cointegration test (H_0 : no cointegration)

	North	**South**
	Test (p-value)	**Test (p-value)**
	-2.552 (0.005)	-4.461 (0.000)

Notes: Automatic selection of lags based on Akaike information criterion with a max of 2 lags.

Table 6. PMG estimations of spreads determinants

	(1)	(2)
Long run coefficients		
Current account	-2.160***	-1.720**
	(-3.328)	(-2.888)
Government Debt	1.345***	1.216***
	(3.749)	(3.734)
Fiscal balance	-	-1.571**
		(-2.821)
Short run coefficients		
Speed of adjustment	-0.198***	-0.223***
	(-10.354)	(-8.029)
Change in Current	-0.136	0.308
account	(-1.056)	(0.693)
Change in Government	1.510**	1.459**
Debt	(2.731)	(2.693)
Change in Fiscal balance	-	0.256*
		(1.933)
Intercept	3.906*	5.567**
	(1.832)	(2.406)
No. of obs.	378	378
Log likelihood	-1314.557	-1289.381

Notes: t-statistics are presented in brackets. *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level. Automatic selection of lags based on Akaike information criterion with a max of 2 lags.

Table 7. PMG estimations of Trade determinants for northern European countries

	(1)	(2)	(3)	(4)	(5)	(6)
	annual data	annual data	annual data	quarterly data	quarterly data (1980-1998)	quarterly data (1999-2009)
Long run coefficients						
FDI	0.400***	-	0.485***	0.089**	0.326**	0.061***
	(4.666)		(6.578)	(2.411)	(2.374)	(4.548)
FDI manufacturing	-	2.099**	-		-	-
		(2.282)				
FDI non-manufacturing	-	1.124**	-		-	-
		(2.490)				
REER	-	-	-0.159***	-0.094*	-0.109**	-0.083
			(-3.386)	(1.882)	(-2.411)	(-1.237)
GROWTH	-	-	-0.250**	-0.149	0.133	-0.171*
			(-2.017)	(-1.442)	(0.982)	(-1.761)
Short run coefficients						
Speed of adjustment	-0.255**	-0.116**	-0.254**	-0.271***	-0.348***	-0.378**
	(-3.523)	(-2.426)	(-2.969)	(-3.749)	(-3.045)	(-2.250)
Change in FDI	-0.076*	-	-0.097**	0.007	0.000	0.006
	(-1.730)		(-2.318)	(1.000)	(0.000)	(1.000)
Change in FDI manufacturing	-	-0.027	-		-	-
		(1.000)				
Change in FDI non-manufacturing		-0.067			-	-
		(1.000)				
Change in REER	-	-	0.012	0.044	0.046	0.027
			(0.387)	(1.000)	(1.045)	(1.000)
Change in GROWTH	-	-	0.089	0.059	0.000	0.094
			(1.508)	(1.629)	(0.000)	(1.502)
Intercept	0.929**	0.518**	5.125**	4.406**	4.306***	5.501**
	(2.235)	(2.037)	(3.608)	(2.572)	(3.254)	(2.569)
No. of obs.	145	90	145	523	300	215
Log likelihood	-211.058	-121.549	-177.089	-997.993	-547.833	-387.385

Notes: see Table 6

Table 7.1. Individual countries specification tests. Equation 1

	R^2	Correl.	FF	NO	HE
Austria	0.40	3.24	4.05	14.13	11.69
Finland	0.14	0.15	0.00	0.63	0.53
Germany	0.37	0.71	0.01	1.17	0.20
Ireland	0.61	0.51	0.02	0.97	0.55
Netherlands	0.08	2.65	0.06	5.51	6.56

Notes: Correl. stands for first order correlation, FF for functional form test, whereas NO and HE stand for the normality and hetroskedasticity tests, respectively

Table 8. PMG estimations of trade determinants for southern european countries

	(1)	(2)	(3)	(4)	(5)	(6)
	annual data	annual data	annual data	quarterly data	quarterly data (1980-1998)	quarterly data (1999-2009)
Long run coefficients						
FDI	-0.643**	-	-1.014***	-0.509***	1.553**	-0.346***
	(-2.593)		(-3.569)	(-3.754)	(4.339)	(4.454)
FDI manufacturing	-	0.290	-	-	-	-
		(0.379)				
FDI non-manufacturing	-	-0.608***	-	-	-	-
		(-4.769)				
REER	-	-	-0.096***	-0.149***	-0.176***	-0.160***
			(-3.879)	(-4.873)	(-4.503)	(-5.898)
GROWTH	-	-	-0.419**	-0.118	-0.302**	-0.063
			(-3.656)	(-1.213)	(-2.050)	(-1.239)
Short run coefficients						
Speed of adjustment	-0.366***	-0.507**	-0.424***	-0.516*	-0.305***	-0.882**
	(-3.953)	(-2.492)	(-2.774)	(-1.929)	(-5.059)	(-3.618)
Change in FDI	0.000	-	0.142	0.009	-0.273	0.043
	(0.000)		(1.000)	(1.000)	(-1.000)	(1.599)
Change in FDI manufacturing	-	-0.092	-	-	-	-
		(0.992)				
Change in FDI non-manufacturing		-0.131	-	-	-	-
		(-1.000)				
Change in REER	-	-	0.018	-0.059	-0.077	0.039
			(0.700)	(-1.340)	(1.000)	(1.000)
Change in GROWTH	-	-	0.051	0.072	0.166	0.146
			(0.795)	(1.000)	(1.604)	(1.215)
Intercept	-1.393	-2.872	2.403***	5.236**	4.451***	10.019**
	(-1.433)	(-1.645)	(5.920)	(2.703)	(3.590)	(3.518)
No. of obs.	144	109	142	503	296	203
Log likelihood	-189.029	-126.644	-155.928	-927.816	-538.379	-308.308

Notes: see Table 6

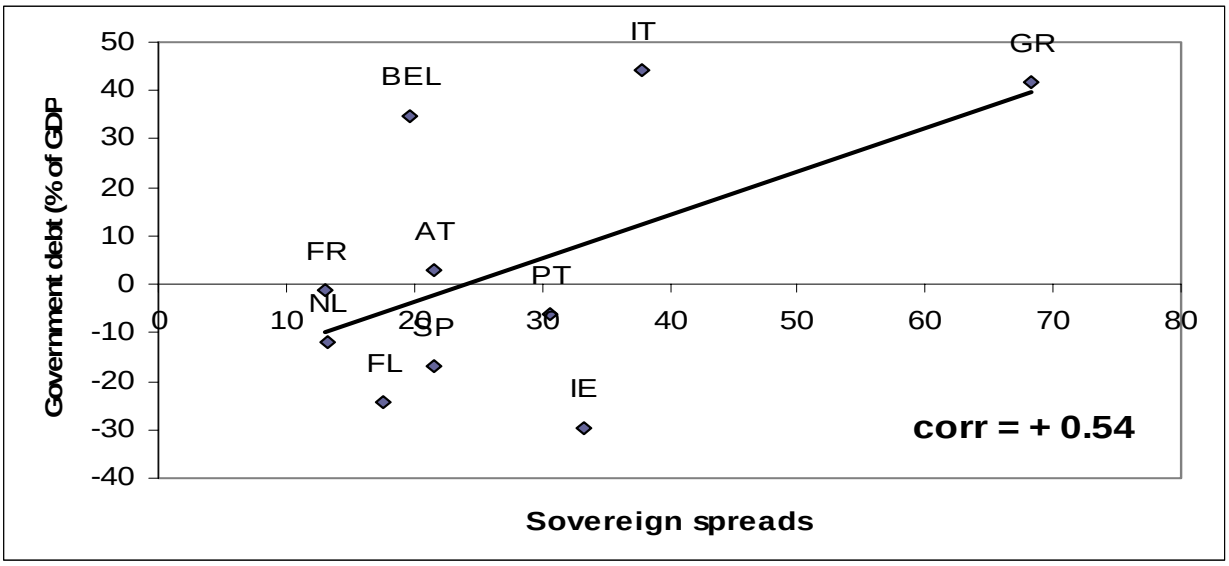
Table 8.1. Individual countries specification tests. equation 1

	R^2	Correl.	FF	NO	HE
France	0.09	1.32	0.01	0.25	0.57
Greece	0.35	1.40	0.01	0.09	0.02
Italy	0.19	0.44	0.97	14.14	0.10
Portugal	0.73	0.42	3.84	2.00	0.19
Spain	0.51	0.07	3.49	1.26	0.32

Notes: see Table 7.1.

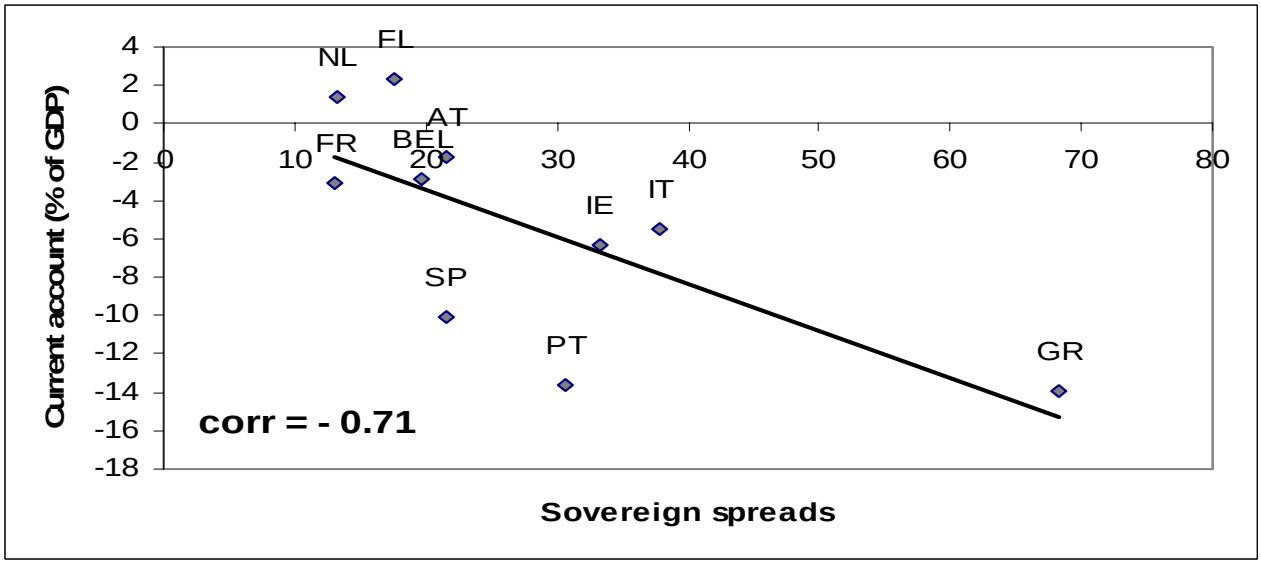
Appendix D: Figures

Figure 1. Correlation between public debt and sovereign spreads for the post-EMU era



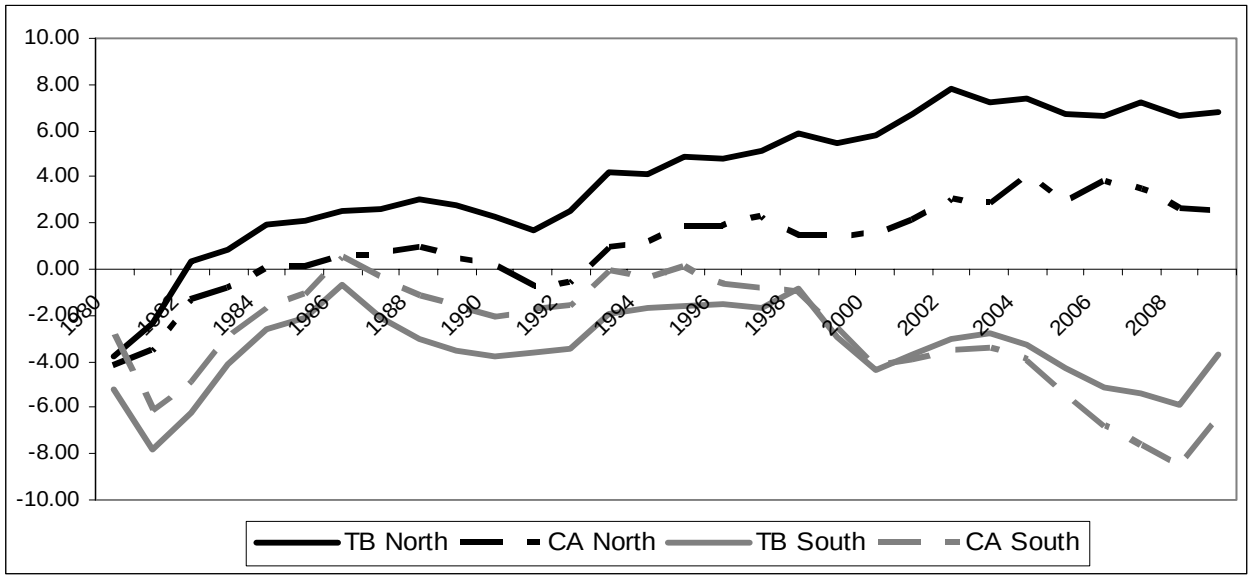
Source: IFS and AMECO

Figure 2. Correlation between current account balance and sovereign spreads for the post-EMU era



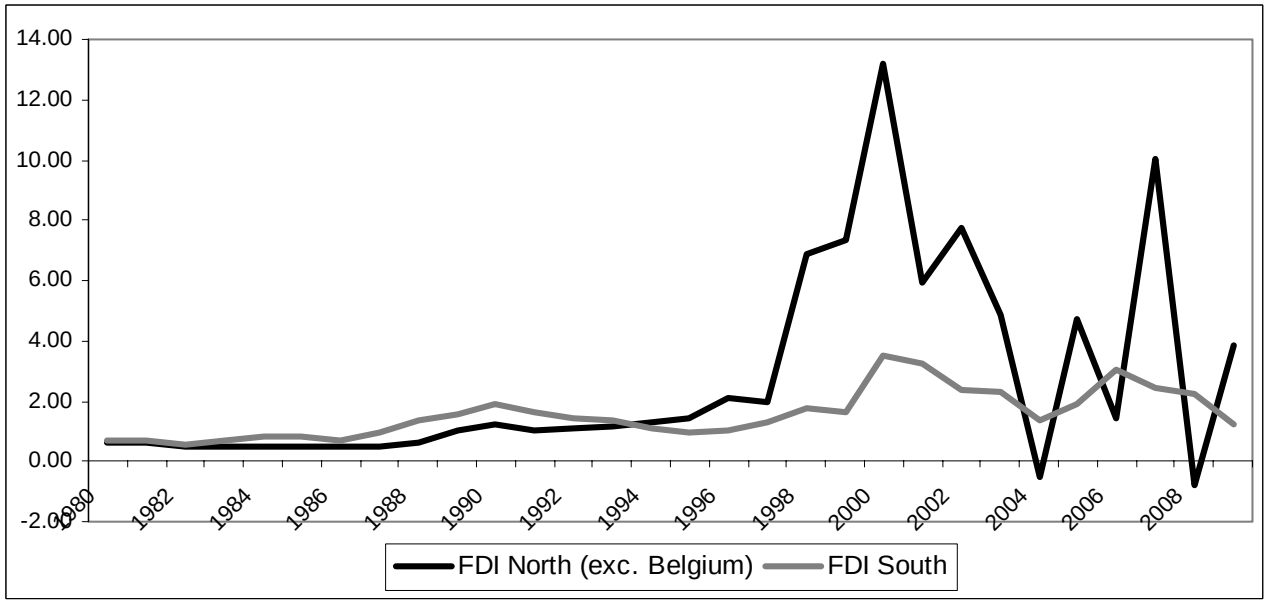
Source: IFS and AMECO

Figure 3. Trade balances (TB) and current accounts (CA) (% of GDP)



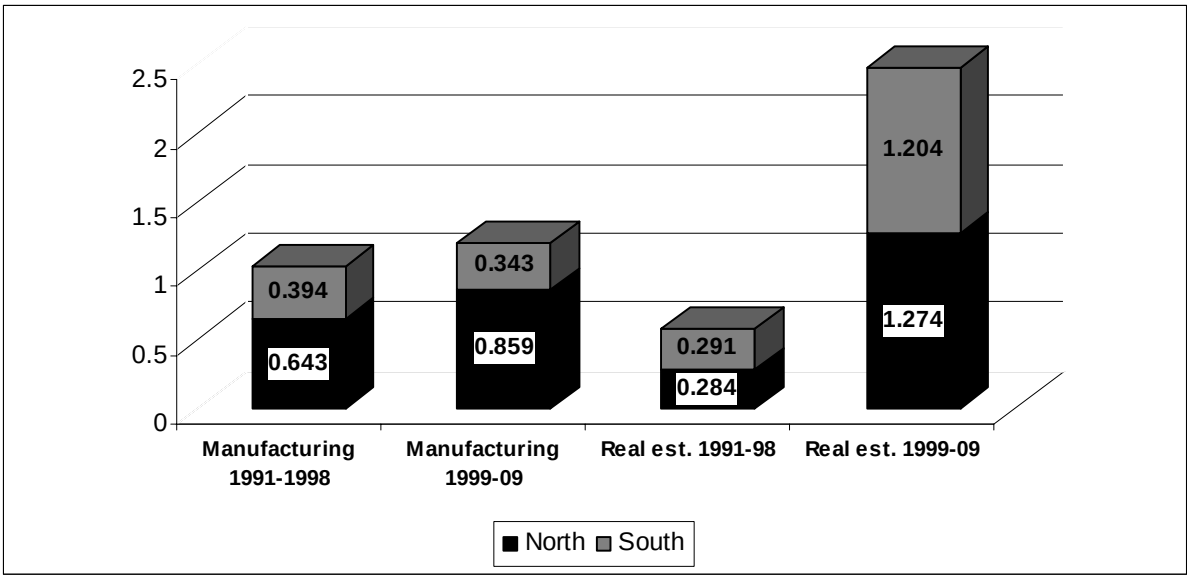
Source: IFS

Figure 4. FDI inflows (% of GDP)



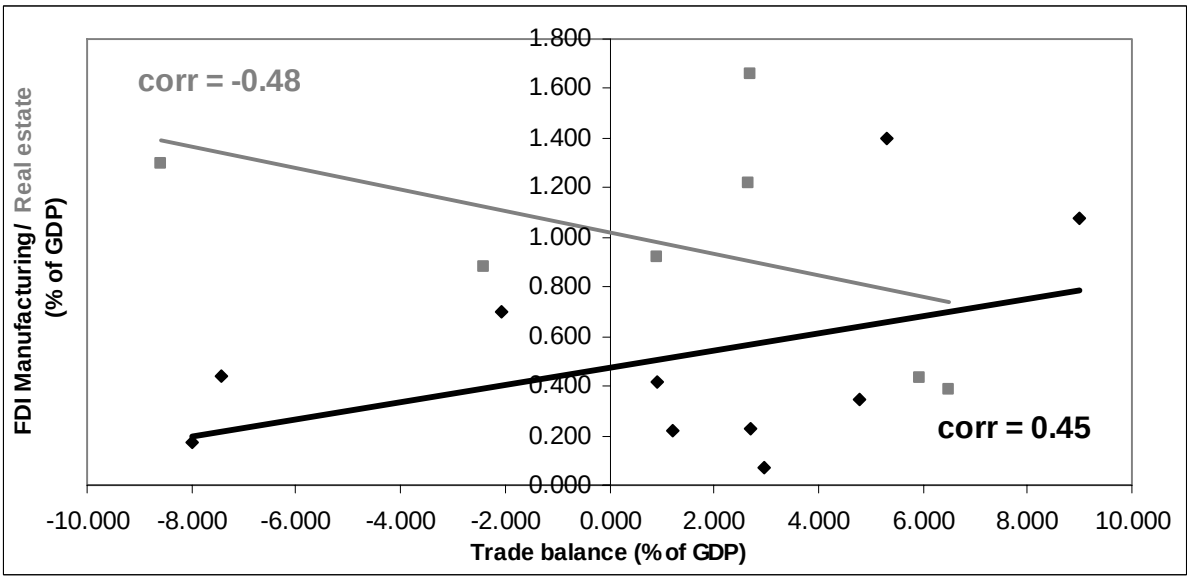
Source: IFS

Figure 5. Composition of FDI inflows in the euro area (% of GDP)



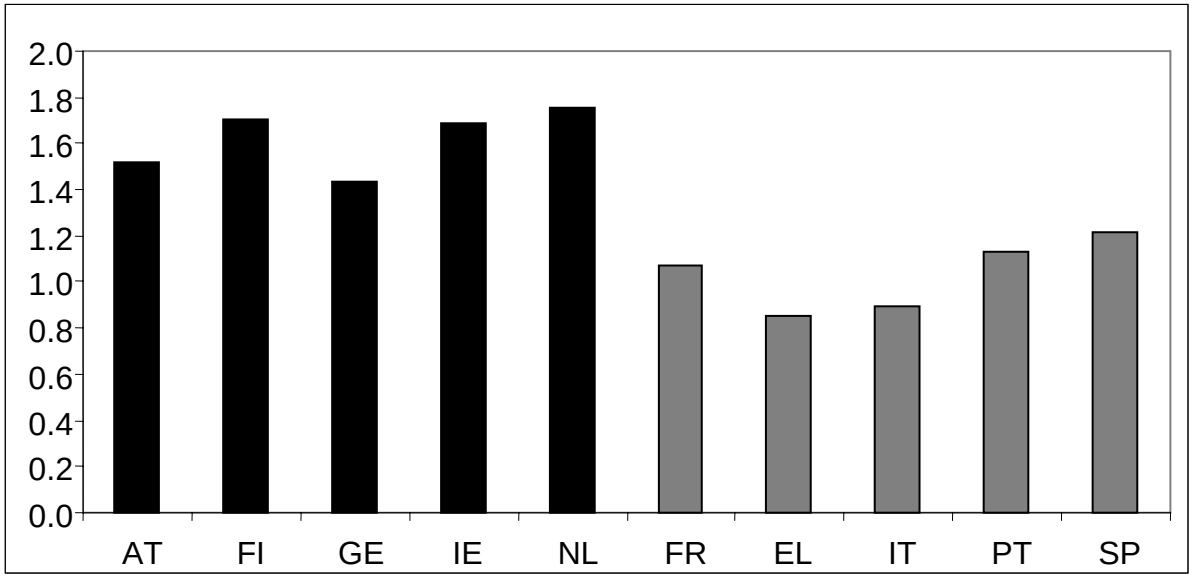
Source: OECD

Figure 6. Correlation between FDI inflows and trade balances



Source: OECD and IFS

Figure 7. Regulatory quality



Notes: This indicator is measured in units ranging from 0 to 2, with higher values corresponding to better governance outcomes. We use data from 1996 to 2008.
Source: World Bank

Figure 8a: Adjustment of asset prices after a permanent fall in interest rates (Case I: FDI intensive in the Traded sector)

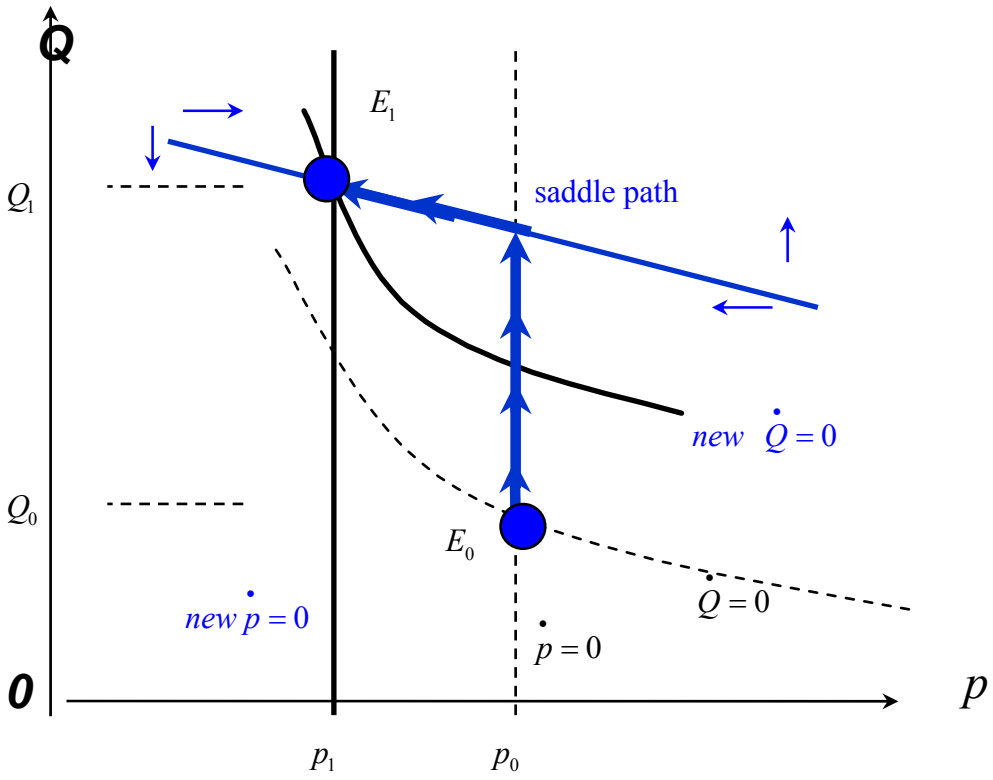


Figure 8b: Adjustment of asset prices after a permanent fall in interest rates (Case II: FDI intensive in the Non-traded sector)

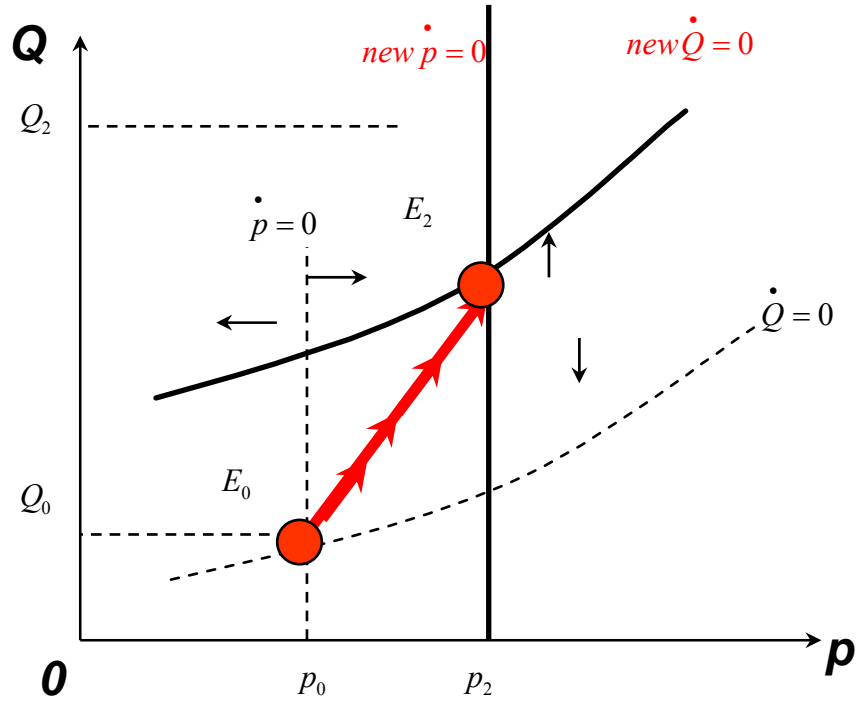


Figure 9a. **Price level adjustment after a permanent fall in interest rates Solid (dotted) line indicates Traded (Non-traded) sector Intensive in FDI**

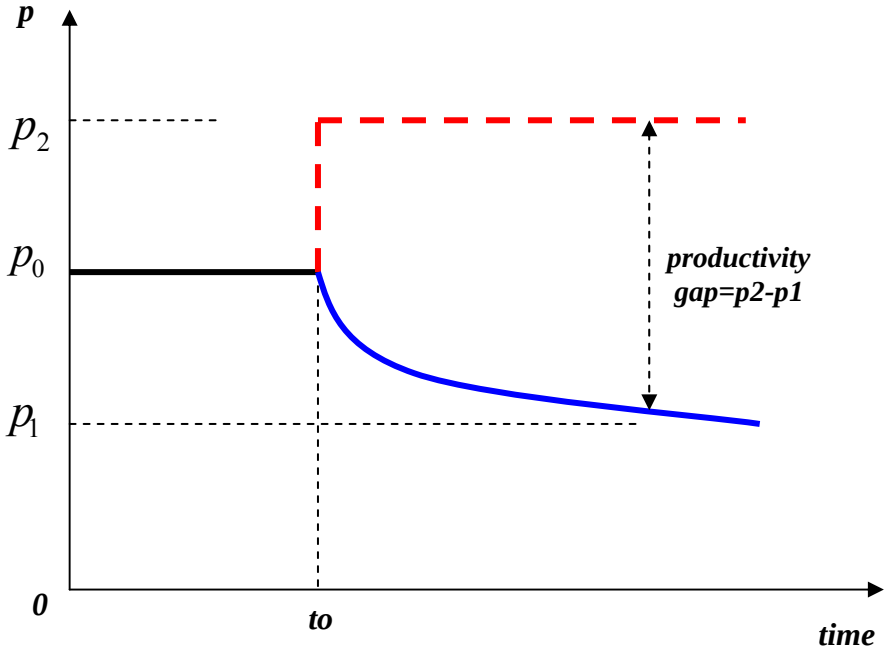
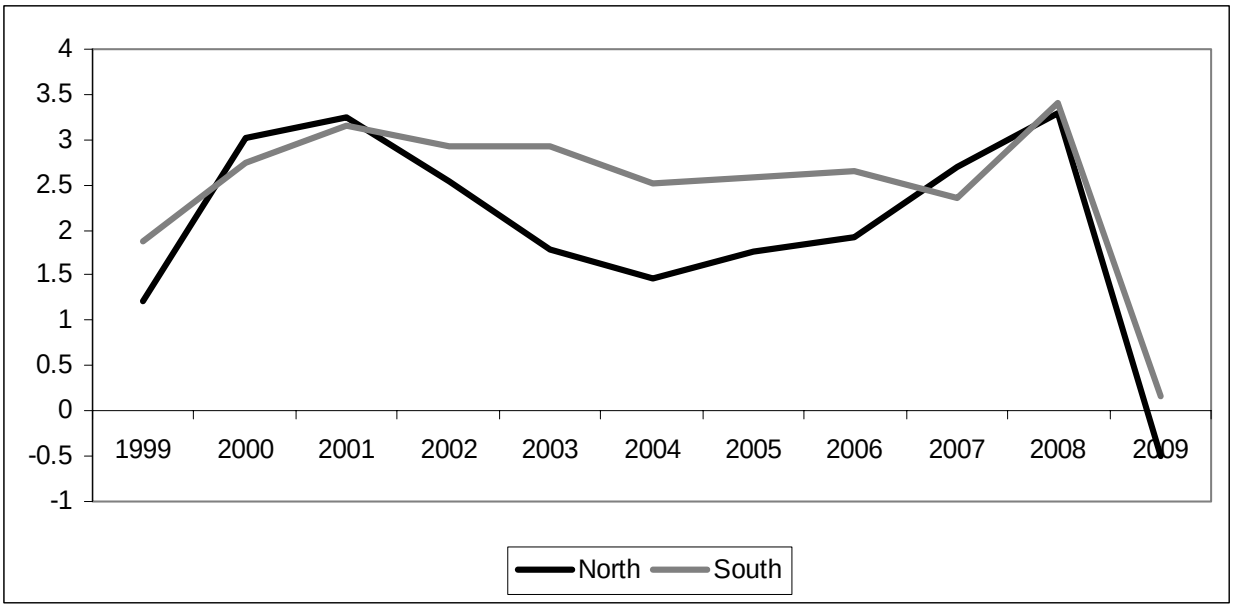
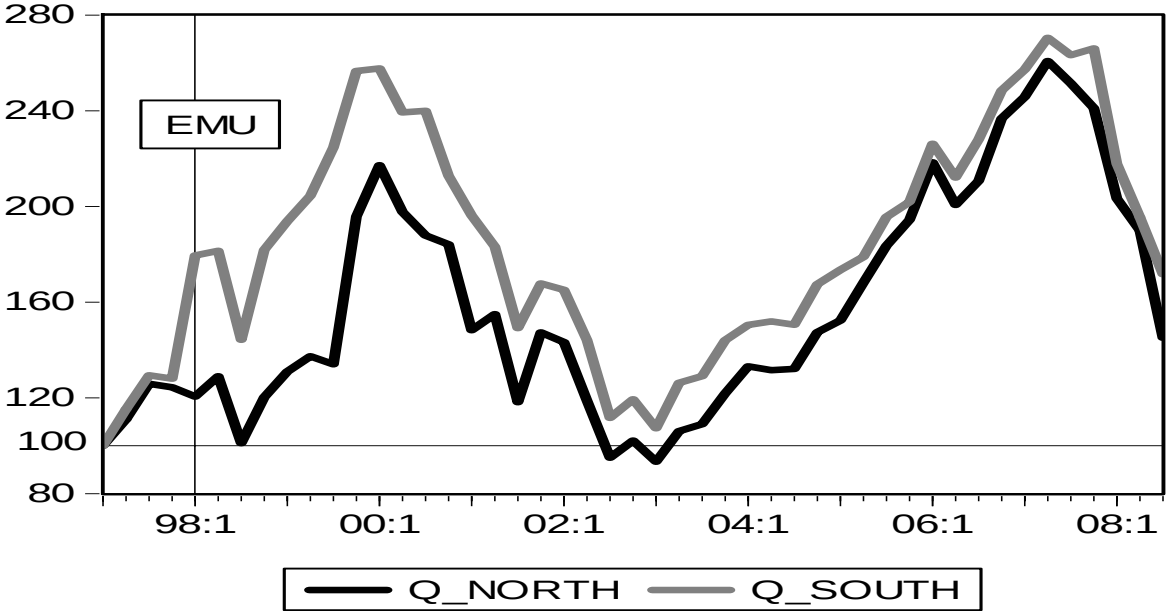


Figure 9b: Post-EMU Inflation Rates, in average higher in the SOUTH



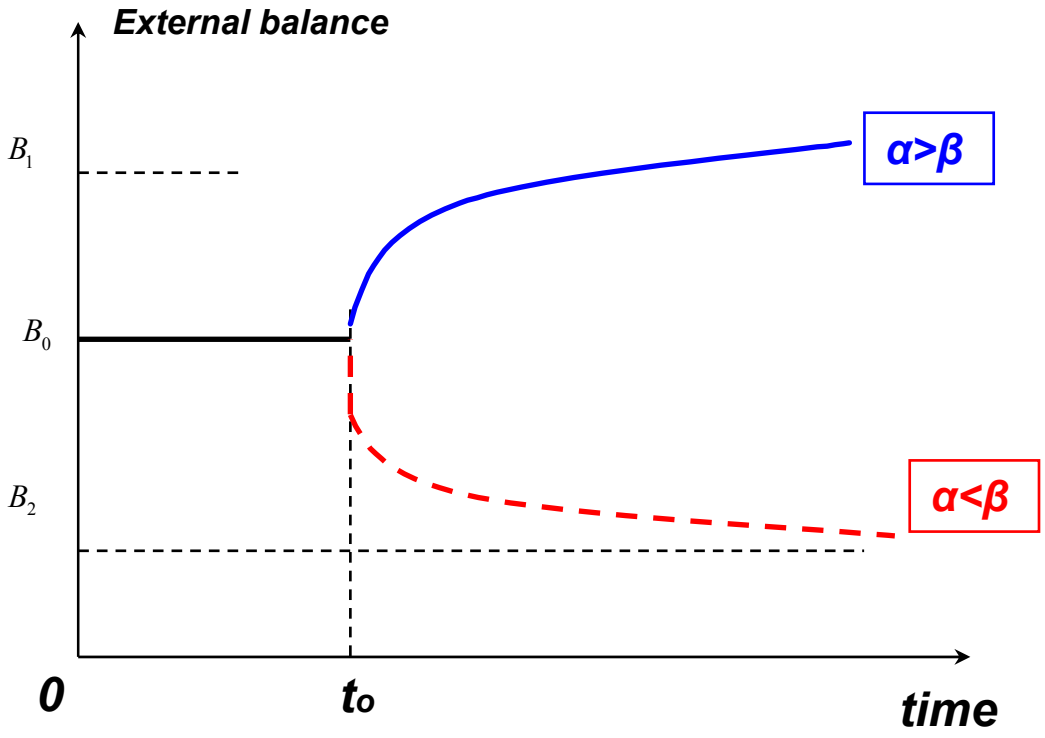
Source: IFS

Figure 10. After EMU, asset prices higher both in the North and the South.



Source: Eurostock, quarterly data. Indexed 1997:01=100.

Figure 11. External balance adjustment after a permanent fall in interest rates. Solid (dotted) line indicates that Traded (Non-traded) sector is intensive in FDI



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