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Post-Brexit FEER

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Abstract.

From the onset of the euro crisis to the Brexit vote, we have assisted to impressive reductions of current account imbalances in peripheral countries of the euro area. These reductions can be the result of either a compression of internal demand or an improvement of external competitiveness. In this paper, we provide new estimates of exchange rate misalignments within the euro area to assess whether peripheral countries have managed to improve their external competitiveness. In order to take into account that business cycles are desynchronized in the euro area, we include the correction of Isard and Faruqee (1998) in the FEER methodology of Jeong et al. (2010a). This approach allows to detect reduction of exchange rate misalignments due to improvement of external competitiveness. Besides, it offers a solution to the problem of over-determination in exchange rate models inspired by the SMIM of Cline (2008). Overall, peripheral countries have managed to reduce their exchange rate misalignments thanks to internal devaluations.

JEL Classification: F31, F32, F44, F45.
Key words: Equilibrium Exchange Rate, Brexit, Internal Devaluation.

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1. Introduction

From the onset of the euro crisis to the Brexit vote, we have assisted to impressive reductions of current account imbalances in peripheral countries of the euro area. As we can see in figure 1, Greece and Portugal have moved from current account deficits above ten percent of GDP in 2009 to virtually no imbalance in 2015. We observe a similar evolution for Italy and Spain, these last countries respectively ran current account deficits of around 2 and 4 percent of GDP in 2009. Six years later, they run current account surpluses of around 2 percent of GDP.

[**Insert figure 1 about here**]

There is no denying that these evolutions have been partially due to compressions of internal demand following the onset of the euro crisis in these countries. Nevertheless, we can argue that these evolutions also reflects improvements in external competitiveness. In order to disentangle these different effects (internal demand or external competitiveness), we investigate the evolution of exchange rate misalignments within the euro area. Indeed, exchange rate misalignments (i.e. the difference between observed rates and equilibrium rates) have know contrasted evolutions during the euro crisis.

Using a two-step analysis, Jeong et al. (2010a) have shown that, in spite of no evidence of exchange rate misalignments for the euro as whole, the euro area was affected by an increasing divergence during the 2000s in terms of exchange rates misalignments for several Member States[1]. This divergence of respective positions in terms of external competitiveness has been one of the main underlying drivers of the euro crisis. Thus, understanding whether peripheral countries have managed to improve their competitiveness or not seems to be especially important.

In order to offset the effect desynchronized business cycles[2] in the euro area on the observed current account balances, we include the correction of Isard and Faruqee (1998) in the approach of Jeong et al. (2010a). Indeed, if a country grow below its relative potential (i.e. relative to those of its trade partners), it will generate current account surpluses or it will reduce its current account deficits. However, when the country will close its relative output gap then the movement will be reversed since the induced imports will increase. In this case, the reduction of the current account deficits has not been due to an improvement of external

[1] Tridico and Fadda (2015) provide empirical evidences robust to structural breaks supporting the divergence of exchange rate misalignments within the euro area.

[2] Campos and Macchiarelli (2016) propose a new methodology to assess the degree of "coreness" of a country for members and non-members of the euro area. They shown that divergence between core and periphery has been reinforced in recent years.

competitiveness but rather to an output gap relatively inferior to those of its trade partners.

After ensuring that these cyclical components of the current account have been corrected, we will be able to assess whether these reductions in the current account deficits reflect reduction of exchange rate misalignments or not within the euro area. Thus, the Fundamental Equilibrium Exchange Rate (FEER) approach[3], pioneered by Williamson (1983, 1994), seems to be naturally fitted to investigate this phenomenon. In recent years, other approaches have been used to explore this question of intra-European exchange rate misalignments like the BEER approach implemented by Coudert et al. (2013). They also detect that misalignments are quite heterogeneous in the euro area. However, the BEER approach assumes that misalignments are stationary (as they are residuals of co-integration relationships in this approach) over the studied period and seems to concern a long run horizon as underlined by López-Villavicencio et al. (2012). As we want to investigate a possible reduction in divergence of misalignments in the medium run, the FEER approach appears to be relevant[4].

Our results confirm that exchange rate misalignments have been reduced in several peripheral countries. These reductions are partially caused by improvements in external competitiveness. Besides, we can observe that the euro is largely undervalued over the last period. This undervaluation of the euro can simply be explained by the fact that overvaluations have been reduced in several peripheral countries but undervaluations have been quite stable in some core countries.

The paper is organized as follow. Section 2 presents the FEER methodology used to estimate exchange rate misalignments. Section 3 focuses on the estimates of exchange rate misalignments for the euro area and for several Member States over the period spanning from 1994 to 2016. Section 4 concludes on the situation of exchange rate misalignments after the Brexit.

2. The FEER-SMIM methodology

In order to estimate exchange rate misalignments for the euro and within the euro area, we use a two-step analysis based on the previous works of Couharde and Mazier (2001); Borowski and Couharde (2003) and Jeong and Mazier (2003). In a first step, we firstly use a multinational trade model for the main currencies

[3]The FEER approach aims at estimating an exchange rate consistent with the internal equilibrium and the external equilibrium in the medium run.

[4]The BEER and the PPP approaches are more relevant to investigate issues and questions that concern a longer temporal horizon as indicated in Driver and Westaway (2005).

(namely the U.S. dollar, the euro, the Chinese yuan, the Japanese yen and the pound sterling) and the Rest of the World. It is well known that this kind of modeling suffers from an over-determination problem. Indeed, as we have more equations (i.e. current account targets) than unknowns (i.e. independent bilateral exchange rates), several solutions are possible. In order to overcome this problem of over-determination, we choose to follow the Symmetric Inversion Matrix Method (SMIM) proposed by Cline (2008) to estimate consistent equilibrium exchange rates. His solution is parsimonious and performs quite well in terms of meeting the ex-post targets[5] as shown by Carton and Hervé (2012).

The OCI (i.e. Own Country Included) solution of Cline (2008) consists in successively solving the model in which each country plays the role of the Rest of World[6]. In our case, we have six different resolutions in which each country plays successively the role of the Rest of the World. This solution consists in averaging the resolution in which the current account target of the country is included. For each country, we average the results of five resolutions in which its current account target is included in the model. This methodology ensures to estimate consistent equilibrium exchange rates at the global level.

In a second step, we use a national trade model in order to estimate exchange rate misalignments within the euro area for several Member States. Jeong and Mazier (2003) shown that the national trade model gives very similar results to those of the multinational model for relatively small countries at the global level.

2.1. The multinational trade model

In the following, we present the multinational model used to describe the trade structure of the leading currencies in the global economy namely the U.S. dollar, the euro, the Japanese yen, the Chinese yuan and the pound sterling. We use standard specifications that describe trade volumes (equations 1 and 2) and trade prices (equations 5 and 6). For the residual country, the trade volumes are obtained through equations that ensure that the world trade is balanced in volume and in value (equations 3 and 4)[7]. We can note that the real effective exchange rate (equation 8) is defined relatively to consumer prices (equation 7). Finally, the current account for the residual country is derived from the current account of the other trade partners to ensure global consistency (equation 9).

[5] As there is more *ex-ante* current account targets than independent bilateral exchange rates, the *ex-post* targets are slightly different than the *ex-ante* targets.

[6] For the n^{th} country, the current account target is not reached.

[7] Since at the global level, the world economy do not run any trade imbalance against itself.

Foreign trade volume equations

Export volume equation

$$X_i = X_{0i} DM_i^{\eta x_i} COMPX^{\varepsilon x_i} \tag{1}$$

$$DM_i = \prod_{j \neq i} M_j^{\alpha_{ij}}$$

$$COMPX_i = \left(\frac{PMX_i}{PX_i} \right)$$

Import volume equation

$$M_i = M_{0i} DI_i^{\eta m_i} \left(\frac{PD_i}{PM_i} \right)^{\varepsilon m_i} \tag{2}$$

Where i, is one of the five main trade partners amongst the six countries or aggregates (namely the U.S., the euro area, Japan, China, the U.K. and the Rest of the World) used in each model resolution. For clarity purposes, we can take the example of the asymmetric approach of Jeong and Mazier (2003). In this last approach, the Rest of the World is the residual country thus i is the one of five main trade partners (namely the U.S., the euro area, Japan, China and the U.K.). In our symmetric approach based on Cline (2008), each country is successively the residual country in the six resolutions of the model.

World trade consistency

Consistency in value

$$\sum_i \frac{PX_i X_i}{E_i} = \sum_i \frac{PM_i M_i}{E_i} \tag{3}$$

Consistency in volume

$$\sum_i X_i = \sum_i M_i \tag{4}$$

Where i, is one of the six countries or aggregates (namely the U.S., the euro area, Japan, China, the U.K. and the Rest of the World) used in each model resolution.

Price equations

Export price equation

$$PX_i = PMX_i^{\alpha x_i} P_i^{1-\alpha x_i} \tag{5}$$
$$PMX_i = \prod_{j \neq i} \left(\frac{E_i PX_j}{E_j} \right)^{\lambda_{ij}}$$

Import price equation

$$PM_i = PMM_i^{\alpha m_i} PD_i^{1-\alpha m_i} \tag{6}$$
$$PMM_i = \prod_{j \neq i} \left(\frac{E_i PX_j}{E_j} \right)^{\mu_{ij}}$$

Consumer price equation

$$PD_i = PM_i^{a_i} P_i^{1-a_i} \tag{7}$$

Real effective exchange rates

$$R_i = \prod_{j \neq i} \left(\frac{\left(\frac{PD_j}{E_j} \right)^{\nu_{ij}}}{\left(\frac{PD_i}{E_i} \right)} \right) \tag{8}$$

Where i, is one of the six countries or aggregates (namely the U.S., the euro area, Japan, China, the U.K. and the Rest of the World) used in each model resolution.

Current account balance

Current account and global consistency

$$B_i = PX_i X_i - PM_i M_i - E_i P_{pet} M_{pet_i} - i_i E_i F_i \tag{9}$$
$$B_{res} = -\sum_{i=1}^{5} B_i$$

Where i, is one of the five main trade partners amongst the six countries or aggregates (namely the U.S., the euro area, Japan, China, the U.K. and the Rest of the World) used in each model resolution.

In order to complete this brief presentation of the multinational model, we define the different variables involved in equations 1 to 9: X, represents the non-oil exports in volume; DI, is the internal demand; $COMPX$, is an indicator of external price-competitiveness; PX and PMX, are, respectively, export prices and competitors' export prices; M, represents the non-oil imports in volume; PM and PMM, are, respectively, import prices and competitors' import prices; PD, is the consumer price index; P, the GDP deflator; E, is the nominal exchange rate vis-à-vis the U.S. dollar; R, represents the real effective exchange rate based on consumer prices; B, is the current account balance in value; i, is the interest rate for external debt; F, the net external debt; $Ppet$, is the oil price and $Mpet$, the net oil imports.

[Insert table 1 about here]

In order to compute directly the exchange rate misalignments, the model is written in logarithmic differential (see appendix A). In the following, variables with a lower case will correspond to logarithmic differences. For example, the exchange rate misalignment in nominal bilateral terms will be equal to $e = \frac{dE}{E} = \frac{E-E^e}{E^e}$ where E^e is the Fundamental Equilibrium Exchange Rate (i.e. the FEER). We can notice that the current account gap will computed as a simple difference thus $b = \frac{B}{PY} - \left(\frac{B}{PY}\right)^e$ where $\left(\frac{B}{PY}\right)^e$ represents the current account target obtained thanks to panel econometric techniques as in Lee et al. (2008). In this context, the FEER of an economy is the level of exchange rate consistent with the simultaneous elimination of the current account gap and of the relative output gap. It allows the realization of the internal equilibrium and of the external equilibrium in a consistent multinational framework.

Overall, each multinational model involves 35 endogenous variables (x, m, px, pm, pd for the the six countries or aggregates and five bilateral nominal exchange rates, e since the U.S. dollar is the numeraire currency) and 35 equations (x, m, b for five countries other the residual one; pd, px, pm for the six countries or aggregates and two equations to ensure world trade consistency).

As we can see in table 1, the residual country has an exchange rate misalignment consistent with the other trade partners but its current account gap is not taken into account in the calculations. The OCI (Own Country Included) solution consists in averaging all the solutions in which its current account gap is included. For each country or aggregate, we average the solution of five models (out of six solutions) in which its current account gap is included, thus ensuring a symmetric treatment.

2.2. The national trade model

In a first step, we use the aforementioned multinational trade model in order to estimate exchange rate misalignments for the euro area as a whole. In a second step, we use a national trade model in order to estimate exchange rate misalignments for several Member States within the euro area. Thanks to this two-step analysis, we can derive an equilibrium exchange rate for the euro *and/or* within the euro area.

In the following equations, we describe the trade volumes (equations 10 and 11) and trade prices (equations 12 and 13) for a relatively small country facing the world economy. The current account balance, for several Member States of the euro area, is described in equation 14. We can note that real effective exchange rates are defined relatively to the GDP deflator (equation 15). Finally, world prices are exogenous in the national trade model (equation 16).

$$X_i = X_{0i} D_i^{*\eta x_i} \left(\frac{E_i P_i^*}{PX_i} \right)^{\varepsilon x_i} = X_{0i} D_i^{*\eta x_i} R_i^{(1-\alpha x_i)\varepsilon x_i} \tag{10}$$

$$M_i = M_{0i} DI_i^{\eta m_i} \left(\frac{P_i}{PM_i} \right)^{\varepsilon m_i} = M_{0i} DI^{\eta m_i} R_i^{-\alpha m_i \varepsilon m_i} \tag{11}$$

$$PX_i = (E_i P_i^*)^{\alpha x_i} P_i^{1-\alpha x_i} = R_i^{\alpha x i} P_i \tag{12}$$

$$PM_i = (E_i P_i^*)^{\alpha m_i} P_i^{1-\alpha m_i} = R_i^{\alpha m i} P_i \tag{13}$$

$$B_i = PX_i X_i - PM_i M_i - E_i P_{pet} M_{pet_i} - i_i E_i F_i \tag{14}$$

$$R_i = \left(\frac{E_i P_i^*}{P_i} \right) \tag{15}$$

$$P_i^* = PX_i^* = \prod_{j \neq i} \left(\frac{PX_j}{E_j} \right)^{\lambda_{ij}} \cong PM_i^* = \prod_{j \neq i} \left(\frac{PX_j}{E_j} \right)^{\mu_{ij}} \tag{16}$$

Where i, is one of the eight Member States of the euro area included in our investigation (namely France, Germany, Italy, Spain, Finland, Ireland, Portugal and Greece) and j, is one the six main trade partners of the multinational model (namely the U.S., the euro area, Japan, China, the U.K. and the Rest of the World)[8].

In order to complete this brief presentation of the national model, we define the different variables involved in equations 10 to 16: X, represents the non-oil exports in volume; D^*, is the (exogenous) world demand in volume; P^* and PX, are, respectively, world prices and export prices; M, represents the non-oil imports in volume; DI, is the internal demand in volume; PM and P, are, respectively, import prices and the GDP deflator; E is the nominal exchange rate vis-à-vis the U.S. dollar; R, represents the real effective exchange rate based on GDP deflator; B, is the current account balance in value; i, is the interest rate for external debt; F, the net external debt; $Ppet$, is the oil price and $Mpet$, the net oil imports.

As for the multinational trade model, we solve this national trade model in logarithmic differential in order to compute directly exchange rate misalignments for several Member States of the euro area (see appendix B). Thus, the exchange rate misalignment specific to several country within the euro area can be described by the following equations. We can note that the exchange rate misalignment can be expressed in real effective terms based on GDP deflator (equation 17), in real effective terms based on consumer prices (equation 18) and in bilateral nominal terms (equation 19).

$$r_i = \left[\frac{((b_i/\mu_i T_i (1 - \sigma petx_i - \sigma x_i)) + \eta m_i di_i - \eta x_i d_i^*)}{((1 - \alpha x_i) \varepsilon x_i + \varepsilon m_i \alpha m_i + \alpha x_i - \alpha m_i)} \right] \tag{17}$$

$$rc_i = (1 - \alpha m_i \mu_i) r_i + \sum_{j \neq i} \nu_{ij} (pd_j - e_j) - \sum_{j \neq i} \lambda_{ij} (px_j - e_j) \tag{18}$$

$$e_i = r_i - \sum_{j \neq i} \lambda_{ij} (px_j - e_j) \tag{19}$$

As underlined by Saadaoui (2015b), the exchange rate misalignment depends on three exogenous variables[9] namely: b_i, the current account gap (i.e. the difference

[8] For the sake of precision, we underline that we use the OCI solution for the multinational trade prices that are included in the national trade model.

[9] For clarity purposes, we can also note that $\sigma petx = EP_{pet} M_{pet}/PXX$ is the ratio of net oil imports in value on non-oil exports in value and that $\sigma x = iEF/PXX$ is the ratio of the foreign debt service on non-oil exports in value.

between the actual current account balance and the so-called underlying capital flows); di_i, the internal demand gap (i.e. the difference between the actual internal demand and the internal demand that would ensure a non-inflationary potential); and d_i^*, the foreign demand gap (i.e. the difference between the actual foreign demand and the foreign demand that would ensure a non-inflationary potential for trading partners).

The trade elasticities used in both the multinational trade model and the national trade model can be found in Jeong et al. (2010b). They are very close from those obtained in the OECD international trade model (Pain et al., 2005). The structure of our trade models is very similar to those used in international institutions like the International Monetary Fund (IMF), the Organization for Economic Co-operation and Development (OECD) or the National Institute of Economic and Social Research (NIESR). Moreover, the specifications used in our trade models ensure that sensitivity to a peculiar parameter is quite limited (Jeong et al., 2010a).

The underlying capital flows have been estimated thanks to panel econometric techniques following the approach of Lee et al. (2008). The approach consists in using medium to long run determinants of the current accounts balances[10] in order to determine an equilibrium/structural current account balance. This equilibrium current account balance is meant to be financed (or to finance the rest of the world in a case of a structural surplus) by the rest of the world through underlying capital flows. Thus, we assume that a non-negligible part of capital flows is not aimed at financing long run growth prospects. Consequently, the exchange rate should correct the difference between the total amount of capital flows and the underlying capital flows.

The exact econometric specifications of the current account regressions are fully exposed in Jeong et al. (2010a)[11]. In appendix C, we present the results in terms of current account projections for the main five trading partners in the multinational trade model (namely the U.S., the euro area, Japan, China and the U.K.) over the period spanning from 1994 to 2016. The current account projections for eight Member States of the euro area (namely France, Germany, Italy, Spain, Finland, Ireland, Portugal and Greece) are presented in the next section.

[10]Such as the structure of net foreign assets, relative demographic ratios/relative population growth and relative productivity rates.

[11]We can note that Saadaoui (2015a) finds very similar results when we extend the current account regressions to the crisis period and that the inclusion of a *de jure* or *de facto* variable of financial openness do not change qualitatively the results.

2.3. The Bayoumi-Faruqee correction

In their previous estimates, Jeong et al. (2010a) do not correct the actual current account balance from a possible business cycle de-synchronization between several Member States of the euro area. Indeed, before the onset of the euro crisis, we could consider that business cycles in the euro area were quite synchronized. So, there was no reason to expect large movements in current account balances caused by different positions in the business cycle during the 2000s.

Since the onset of the euro crisis, this assumption, of relatively well synchronized business cycles, is not valid anymore. Campos and Macchiarelli (2016) propose a new time varying methodology to assess the "coreness" of a country based on the synchronization of demand/supply shocks coming from V.A.R. specifications. They show that we have assisted to an increasing de-synchronization of business cycles between the core and the periphery of the euro area. This de-synchronization of business cycles is partially caused by the compression of internal demand observed in peripheral countries which have implemented internal devaluations.

Indeed, when a country has an output gap relatively weaker than those of its trading partners, it will generate a current account surplus (or it will reduce its current account deficit). However, this improvement is not necessarily due to a better price or non-price competitiveness but rather it is due to a reduction of its induced imports. Eventually, when the country will close its relative output gap, the current account deficit will increase (or the current account surplus will decrease) if the external competitiveness has not been improved.

Symmetrically, when a country has an output gap relatively higher than those of its trading partners, it will generate a current account deficit (or it will reduce its current account surplus). As aforementioned, this deterioration is not necessarily due to a worsening of price or non-price external competitiveness but rather it is due to an increase of its induced imports. Eventually, when the country will close its relative output gap, the current account surplus will increase (or the current account deficit will decrease) if the external competitiveness has not been deteriorated.

In order to take into account the effect of business cycle de-synchronization in the euro area, we implement the correction proposed by Tamim Bayoumi and Hamid Faruqee in Isard and Faruqee (1998). Thanks to this correction, we will be able to determine whether the reduction of current account deficits observed in peripheral countries is mainly due to an improvement of external competitiveness (reflected in a reduction of exchange rate misalignments) or not.

This correction is based on a parsimonious foreign trade model in which trade volume equations are related to real exchange rates. Besides, imports in volume depend on domestic output gap and exports in volume depend on foreign output gap (i.e. an weighted average of trade partners' output gaps). In order to take into account that the impact of exchange rate movements on the current account are not instantaneous, delayed effects of exchange rate variations are spread on three years (60%, the first year; 25%, the second year and 15%, the third year). The real exchange rate does not influence the export price in domestic currency while it affects immediately and completely the import price. We can write the current account balance in percentage of GDP as follow:

$$\begin{aligned} CA/Y = \alpha + [(M/Y)\,\beta_m + (X/Y)\,\beta_x]\,(0.6R + 0.25R_{-1} + 0.15R_{-2}) \\ - (M/Y)\,R - (M/Y)\,\psi_m YGAP + (X/Y)\,\psi_x YGAPF \end{aligned} \quad (20)$$

Where $YGAPF$, is the average output gap of the main partners; R, the logarithm of the real exchange rate (an increase of R indicates a depreciation); β_x, β_m, the long run export and import price elasticities, respectively; ψ_x, ψ_m, long run export and import volume elasticities, respectively.

In case of real appreciation (a decrease of R), imports in volume increases while exports in volume decreases with lagged effects of the exchange rate variations but current account is improved thanks to cheaper imports. Lastly, a rising domestic output gap has a negative impact on current account while foreign output gap has an opposite effect.

The underlying current account (CA/Y_{und}) is the current account corrected from the effects of past and present exchange rate variations and by the effects of the domestic and foreign output gaps:

$$CA/Y_{und} = \alpha + [(M/Y)\,\beta_m + (X/Y)\,\beta_x]\,R - (M/Y)\,R \quad (21)$$

Thanks to equation 20 and equation 21, we can obtain the Bayoumi-Faruqee correction to compute the underlying current account (CA/Y_{und}):

$$\begin{aligned} CA/Y_{und} = CA/Y + [(M/Y)\,\beta_m + (X/Y)\,\beta_x]\,(0,4\Delta R + 0,15\Delta R_{-1}) \\ + (M/Y)\,\psi_m YGAP - (X/Y)\,\psi_x YGAPF \end{aligned} \quad (22)$$

In equation 22, we can easily observe that a country with an output gap relatively weaker than those of its trade partners will have a lower underlying current

account balance since when it will close its relative output gap (i.e. the difference between $YGAP$ and $YGAPF$), its induced imports will increase. Symmetrically, a country with an output gap relatively higher than those of its trade partners will have a higher underlying current account balance.

3. Results

3.1. Misalignments for the euro area

In a global perspective, the most striking feature of our results is that the euro area is now largely undervalued (see table 2). During the 2000s, the most undervalued trade partner was the Chinese economy. There is growing consensus that the Chinese yuan is no longer undervalued since its current account surplus has reduced from 10 percent of GDP in 2007 to less than to 2 percent of GDP in 2014. Indeed, as shown in appendix C, the current account gap is close from zero over the last period for the Chinese yuan.

[**Insert table 2 about here**]

The undervaluation of the euro is not surprising since several peripheral countries of the euro area have reduced their overvaluations thanks to internal devaluations and that some core countries of the euro area have preserved their undervaluations since the onset of the crisis. Over the last period, the current account gap of the euro area becomes largely positive thanks to the movements in the periphery. The current account balance moves from around 0.5 percent of GDP in 2010 to less than 3 percent of GDP in 2014. This value largely overshoots the current account target/underlying capital flows in the medium run.

During the second part of the 2000s, we have observed a clear opposition between an overvalued U.S. dollar and an undervalued Chinese yuan that have fueled many political tensions[12]. After the onset of the euro crisis and the reduction of global imbalances observed after the start of the Great Recession, it seems that the U.S. dollar and the Chinese yuan are no longer misaligned. This result is quite remarkable but since it has not been the result of an international monetary cooperation then this reduction could only be temporary.

In spite of clearcut reductions of exchange rate misalignments in the two biggest economies at the global level, exchange rate misalignments have not been uniformly

[12]Bergsten (2010) illustrates these political tensions due to the fact that undervaluations can be considered as an unfair advantage in terms of price-competitiveness in foreign markets (Blanchard and Milesi-Ferretti, 2012). An undervaluation of the domestic currency amounts to a combination of tariffs on imports *cum* subsidies on exports.

reduced for the other trade partners of the multinational model (see figure 2 and figure 3). The pound sterling is now the most overvalued currency at the global level[13]. These evolutions reflect the growing divergence of the European economies rather than a more traditional opposition on trade issues like it was the case for the U.S. and China during the second part of the 2000s.

[**Insert figure 2 about here**]

[**Insert figure 3 about here**]

3.2. Misalignments within the euro area

3.2.1. Business cycle de-synchronization within the euro area

As underlined by Jeong et al. (2010a), the exchange rate misalignment for the euro area as whole does not necessarily reflect the exchange rate misalignment for each individual Member State. Thus, it appears relevant to estimate an equilibrium exchange rate for each Member State since it remains large individual differences in terms of inflation, trade structure and international specialization.

[**Insert figure 4 about here**]

[**Insert figure 5 about here**]

[**Insert figure 6 about here**]

We can clearly see in figure 4 to 6 that the domestic output gaps are systematically lower than those of their trade partners for Italy, Spain, Portugal and Greece since the start of the euro crisis. This striking feature indicates that when these countries will close their relative output gaps then they will experience a reduction of their current account surpluses or an increase of their current account deficits. In other words, it seems irrelevant to infer *a priori* that external competitiveness have been improved simply because actual current account deficits have been massively reduced during an economic slowdown in which aggregate demand is depressed.

On the other side, while France and Finland seemed to have balanced positions, we can observe, in figure 4 to 6, that the domestic output gap is higher than the

[13]Even if the British pound has known several depreciations since the onset euro crisis, the current account gap remains largely negative partially reflecting the fact that the British economy is highly opened to cross-border movements of capital flows. In 2015, the fair value of the British pound produced by our approach is 1.37 U.S. dollar per pound sterling. The same year, the actual value was 1.53 U.S. dollar per pound sterling.

foreign output gap in Germany and Ireland over the last period. This mean that the underlying current account balance is higher (than the actual current account balance) in these countries since their trade partners will import more when they will reach their potentials. We can notice that Ireland has managed to switch from a negative relative output gap to a positive one since the start of the crisis. This evolution is partially due to the fact that the Irish economy is very open to external trade. Contrary to the Greek or the Portuguese economy, examples of a small semi-closed economies, the Irish economy is particularly prone to reap the benefits of internal devaluations[14].

3.2.2. Reduction of misalignments within the euro area

As we can see in table 3 and 4, the impressive reductions of current account imbalances observed since the onset of the crisis have been accompanied by reductions of exchange rate misalignments in Italy, Spain, Portugal and to a lesser extent in Greece. Overall, these countries have managed to improve their external competitiveness in order to reduce their current account deficits. In figure 7 to 9, we can see that these evolutions are reflected in an appreciation of the Fundamental Equilibrium Exchange Rate (i.e. the FEER).

Indeed, when the FEER appreciates, the country is able to compete on foreign market with higher prices in the case of a structural improvement of its competitiveness. Conversely, when the FEER depreciates, the country needs lower prices to be competitive on foreign markets in the case of a structural deterioration of its competitiveness. Nevertheless, if we have assisted to cyclical evolutions of competitiveness driven by internal devaluations, we may fear that these favorable evolutions will be offset in the case of a future appreciation of the euro in real effective terms[15].

[**Insert table 3 about here**]

The case of the Irish economy is very interesting since it could illustrate a case of structural improvement of external competitiveness. Indeed, the Irish economy has several features that are particularly useful to reap the benefits of internal devaluations. The Irish economy is very open to external trade so changes in relative prices affect a large part of its GDP. Besides, since its foreign market shares are more oriented towards the U.S., the Irish economy is more isolated to adverse

[14]Saadaoui et al. (2013) provide empirical evidences showing that trade openness is a nonlinear determinant of exchange misalignments. Indeed, the more the country is open to trade, the less the exchange rate misalignment is large in absolute value.

[15]In this respect, Saadaoui (2011) offers an interesting distinction between structural improvement of competitiveness and cyclical improvement of competitiveness.

evolutions in the euro area than other European countries like Greece or Portugal. We can argue that the Irish economy is an example of a very flexible/small open economy in which internal devaluations (i.e. reducing relative prices through compression of relative wages) could possibly generate positive effects in the long run.

[**Insert table 4 about here**]

In spite of an improvement of external competitiveness in Italy, Spain, Portugal and to a lesser extent in Greece, reflected in a reduction of their exchange rate misalignments, it seems quite questionable to explain that the economic structure of these last countries is particularly fitted to reap the benefits of internal devaluations. Indeed, these countries are quite close to external trade (especially the Greek economy and the Portuguese economy). Since their foreign market shares are more oriented towards the European union, these economies are more vulnerable to adverse evolutions in the euro area. Thus the improvement of external competitiveness (obtained thanks to internal devaluations) could only be temporary (cyclical) since these countries will not be able to change their trade structures or their international specializations in the short run.

[**Insert figure 7 about here**]

[**Insert figure 8 about here**]

[**Insert figure 9 about here**]

As aforementioned, the euro is largely undervalued over the last period, this evolution is driven by the reduction of overvaluations in several peripheral countries like Italy, Spain, Portugal and Greece and by stable undervaluations in the main core country namely Germany. The euro is undervalued by around twenty percent for the German economy since the onset the crisis. These evolutions are explained by large underlying current account surpluses (around eight percent in 2015) and by largely positive relative output gaps as shown in figure 4. The other main core economy of the euro area, France, seems to be in a more balanced position than few years ago since its current account gap and its relative output gap are virtually closed.

4. Conclusion

From the onset of the euro crisis to the Brexit vote, we have observed impressive reductions of current account imbalances in some peripheral countries of the euro area. These reductions can be the result of either a compression of internal demand or an improvement of external competitiveness. The aim of this study was to investigate whether exchange rate misalignments have been reduced in these economies. Indeed, a reduction of exchange rate misalignments can partly reflect an improvement of external competitiveness.

In order to answer to this crucial question, we include the correction of Tamim Bayoumi and Hamid Faruqee (Isard and Faruqee, 1998) in the FEER methodology of Jeong et al. (2010a). This correction allows us to control for the desynchronization of business cycles in the euro area underlined by Campos and Macchiarelli (2016). To overcome the over-determination problem, our FEER methodology ensure a symmetric treatment for each trade partner since we follow the SMIM proposed by Cline (2008). Besides, our two-step analysis seems to be particularly fitted to derive exchange rate misalignments for the euro *and/or* within the euro area.

In a global perspective, one of the most striking feature of the results is that the euro is largely undervalued over the last period. This result can be simply explained by the fact that overvaluations have been reduced in several peripheral countries and that undervaluations have been quite stable in some core countries. Quite remarkably, the Chinese yuan and the U.S. dollar do not seem to experience any exchange rate misalignment over the last period. Finally, the pound sterling is largely overvalued in recent years. This last evolution reflects a growing divergence amongst European economies.

In the euro area, the results indicate that exchange rate misalignments have been reduced in Italy, Spain, Portugal and to a lesser extent in Greece. These reductions indicate that these last countries have managed to improve their external competitiveness even after controlling for business cycles de-synchronization. However, these improvement could only be temporary. Indeed, as we can observe for the Irish economy, the country have to be very open to external trade in order to reap the possible benefits of internal devaluation in the long run.

Ultimately, these improvement of external competitiveness obtained *via* internal devaluations can be preserved only if countries manage to improve their non-price competitiveness (i.e. the quality of the exported goods and services), their trade openness, and their international specialization in the long run. It seems quite clear that these evolutions will not be achieved in the short-to-medium run.

Indeed, the growing divergence of economic structures between Member States implies that we need to reject a "one size fits all" approach in designing economic policies aimed at improving external competitiveness within the euro area.

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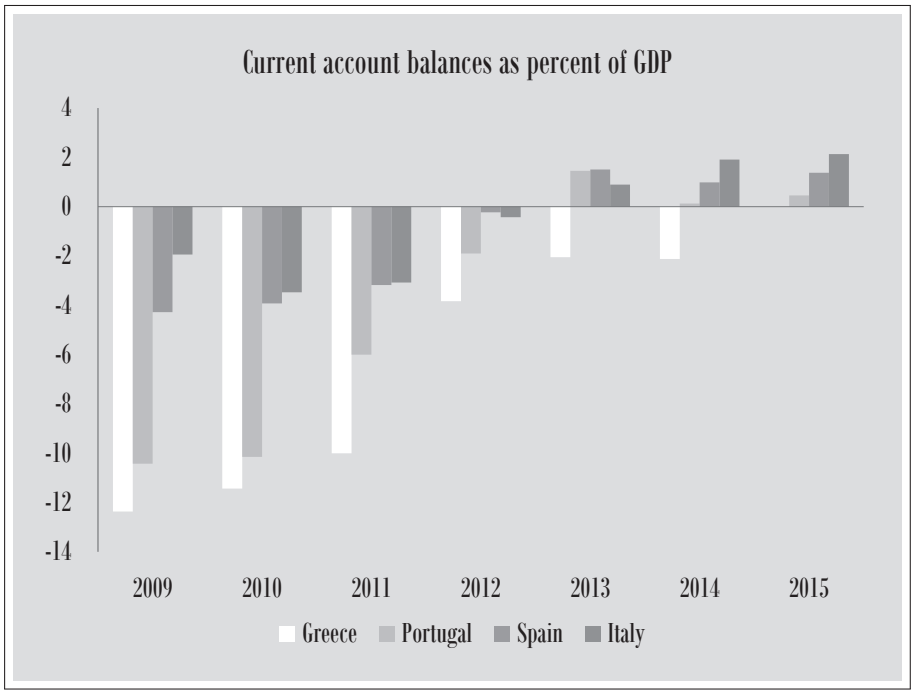
Tables and figures



Source: IMF's World Economic Outlook, April 2016. Forecast for Spain in 2015.

Figure 1: Current account balances as percent of GDP

Endogenous variables	**Equations**
x_i (1 to 5)	x_i (1 to 5)
m_i (1 to 5)	m_i (1 to 5)
x_6	$\sum_i xi = \sum_i m_i$
m_6	$\sum_i px_i x_i - e_i = \sum_i pm_i m_i - e_i$
px_i (1 to 6)	px_i (1 to 6)
pm_i (1 to 6)	pm_i (1 to 6)
pd_i (1 to 6)	pd_i (1 to 6)
e_i (1 to 5)	b_i (1 to 5)
r_i (1 to 5)	r_i (1 to 5)
r_6	r_6
35 + 5 + 1 endogenous variables	**35 + 5 + 1 equations**

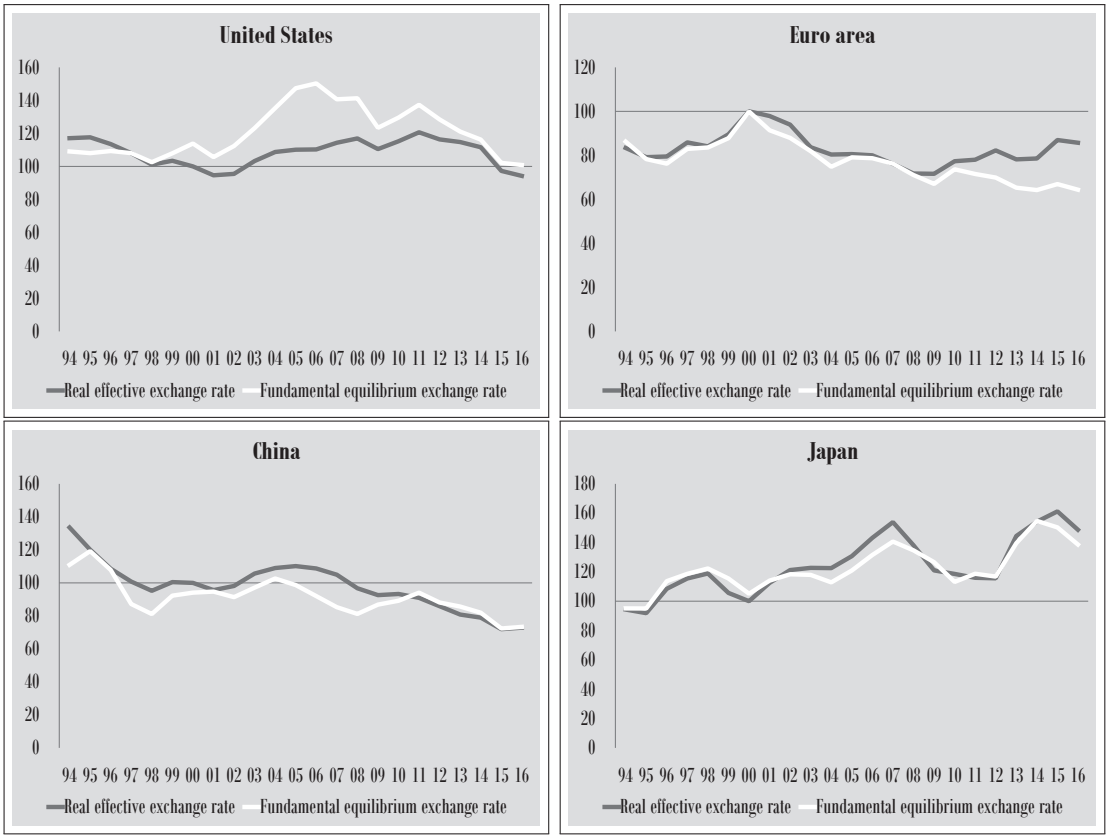
Notes: lower case variables indicate variables transformed in logarithmic differences except for the current account balance. In the FEER-SMIM approach, each country or aggregate is treated successfully as a residual country. The real effective exchange rates are calculated *ex post* using bilateral exchange rates and consumer prices. In the approach of Jeong and Mazier (2003), for the residual country (i.e. the sixth country), the exchange rate misalignment is consistent with those of its trade partners but not with its current account target.

Table 1: Structure of the multinational model

	Nominal Bilateral					Real Effective					
	e_{row}	e_{ch}	e_{eu}	e_{jp}	e_{uk}	r_{row}	r_{ch}	r_{eu}	r_{jp}	r_{uk}	r_{us}
2004	17.8	20.6	20.8	20.9	10.3	4.9	6.0	7.2	8.2	-5.5	-21.9
2005	25.0	30.3	20.7	25.0	16.8	9.4	11.0	1.9	7.8	-1.7	-29.1
2006	24.6	36.7	20.5	26.5	15.6	8.7	16.7	1.6	8.5	-2.9	-31.0
2007	10.2	29.3	8.1	17.2	7.0	3.8	20.7	-0.2	9.0	-0.4	-20.7
2008	14.4	31.5	12.4	15.6	5.8	3.5	17.6	0.9	2.5	-6.0	-18.9
2009	13.7	21.6	17.6	9.4	1.4	0.6	6.4	6.6	-4.6	-13.0	-11.1
2010	14.2	21.0	16.9	19.3	4.8	0.5	4.5	4.9	4.7	-9.6	-11.7
2011	18.8	14.4	23.1	13.2	6.4	3.1	-3.4	8.6	-2.3	-11.9	-12.9
2012	11.9	10.5	25.8	10.3	-0.6	-1.7	-2.6	16.3	-1.0	-17.2	-9.9
2013	8.9	6.9	26.0	14.2	-2.5	-4.7	-5.9	18.0	3.4	-18.6	-5.4
2014	6.0	6.5	25.8	8.3	-6.2	-6.1	-3.7	20.1	-0.4	-21.0	-4.0
2015	-4.3	-1.1	23.9	5.7	-10.9	-9.0	-0.6	26.1	7.0	-19.4	-4.9
2016	-4.6	-1.8	26.1	4.9	-11.5	-9.2	-0.6	28.6	7.0	-20.8	-6.8

Notes: In the multinational trade model, e indicates exchange rate misalignments in nominal bilateral terms vis-à-vis the U.S. dollar and r designates exchange rate misalignments in real effective terms based on consumer prices. Forecasts for 2016 based on current account projections of the IMF's World Economic Outlook (April 2016).

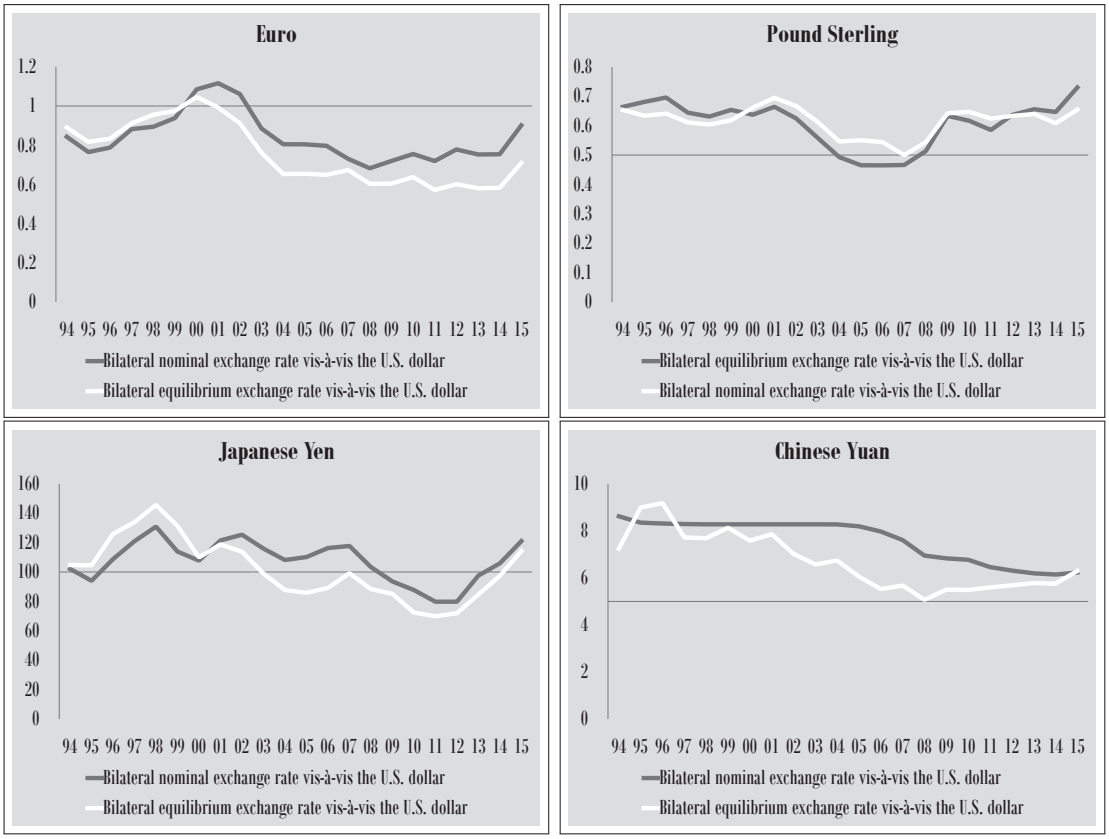
Table 2: Exchange rate misalignments in the multinational trade model



Note: an increase (decrease) of the real effective exchange rate corresponds to a depreciation (appreciation).

Source: author's calculations for the FEER and BIS for real effective exchange rates, basis 100 in 2000.

Figure 2: Actual and equilibrium real effective exchange rates



Note: an increase (decrease) of the bilateral nominal exchange rate corresponds to a depreciation (appreciation).

Source: author's calculations for the bilateral FEER and OECD for bilateral nominal exchange rates.

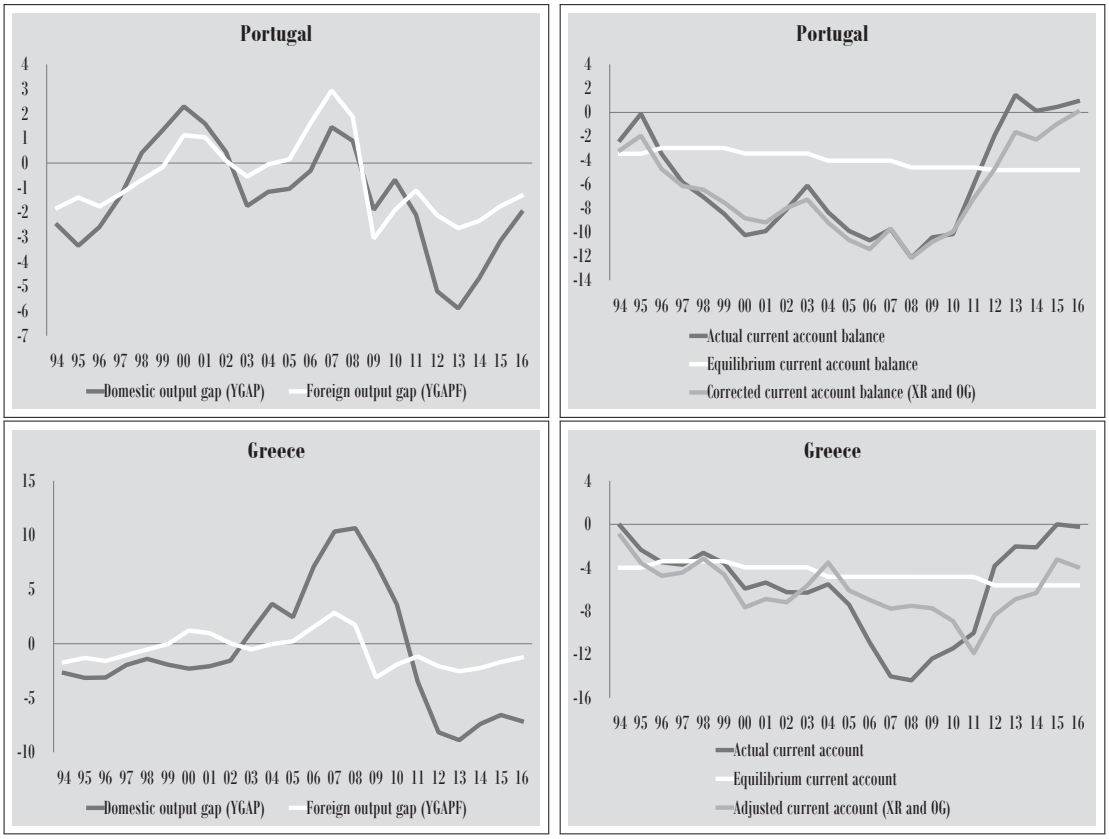
Figure 3: Actual and equilibrium bilateral nominal exchange rates

Note: the foreign output gap is a trade weighted average of foreign output gaps. Source: author's estimates for the equilibrium current account balance and IMF for the output gap.

Figure 4: Relative output gaps and current account gaps

Note: the foreign output gap is a trade weighted average of foreign output gaps. Source: author's estimates for the equilibrium current account balance and IMF for the output gap.

Figure 5: Relative output gaps and current account gaps (continued)



Note: the foreign output gap is a trade weighted average of foreign output gaps. Source: author's estimates for the equilibrium current account balance and IMF for the output gap.

Figure 6: Relative output gaps and current account gaps (continued)

	Real Effective							
	rc_{fra}	rc_{ger}	rc_{ita}	rc_{spa}	rc_{fin}	rc_{irl}	rc_{prt}	rc_{grc}
2004	-0.1	5.6	-5.4	-15.4	19.6	-3.8	-40.1	5.0
2005	-4.6	5.3	-4.1	-20.3	7.8	-4.8	-46.1	-7.6
2006	-4.8	9.1	-3.8	-24.6	9.7	-2.0	-47.9	-6.3
2007	-6.0	13.1	-0.7	-26.4	15.5	-0.9	-34.5	-5.2
2008	-13.3	13.0	-4.5	-33.3	11.7	-4.7	-46.3	-3.7
2009	-8.3	13.9	-2.9	-10.2	0.2	-0.7	-34.4	-8.5
2010	-6.9	16.8	-4.2	-14.6	2.5	-0.9	-28.1	-21.1
2011	-10.1	16.8	-5.8	-22.9	-5.9	-2.5	-19.6	-53.1
2012	-12.6	19.3	-2.5	-14.1	-8.9	-7.9	-12.2	-30.9
2013	-5.0	18.7	1.5	-3.6	-7.2	1.4	6.8	-20.3
2014	-10.1	19.4	3.8	-2.7	-7.4	5.9	4.4	-15.4
2015	-8.2	18.7	2.4	6.1	-6.7	12.8	8.6	1.9
2016	-5.2	15.8	2.0	14.3	-8.6	11.7	14.1	-5.2

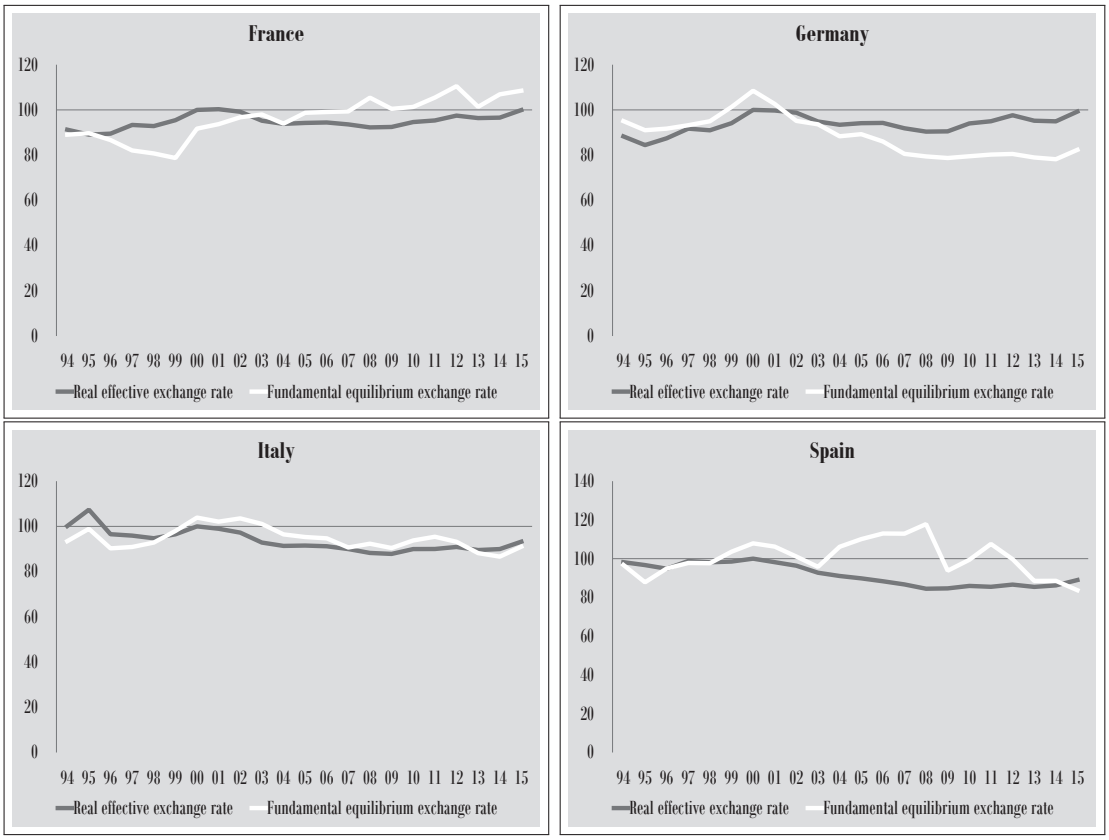
Notes: In the national trade model, rc designates exchange rate misalignments in real effective terms based on consumer prices. Forecasts for 2016 based on current account projections of the IMF's World Economic Outlook (April 2016).

Table 3: Real effective exchange rate misalignments within the euro area

	Nominal Bilateral							
	e_{fra}	e_{ger}	e_{ita}	e_{spa}	e_{fin}	e_{irl}	e_{prt}	e_{grc}
2004	17.8	23.8	11.5	-0.2	40.8	9.9	-33.5	24.6
2005	15.1	26.7	16.0	-4.0	31.0	11.9	-41.1	12.2
2006	14.8	31.6	16.5	-10.0	33.9	15.4	-45.2	13.8
2007	1.9	25.0	8.2	-24.4	28.5	7.0	-36.9	3.0
2008	-3.7	27.9	7.2	-30.0	26.8	3.9	-47.4	8.5
2009	4.0	30.2	10.8	1.3	13.8	8.6	-29.3	4.8
2010	6.0	33.9	9.5	-4.2	17.0	9.3	-21.4	-10.2
2011	6.5	37.9	12.0	-9.9	10.8	10.6	-4.9	-43.8
2012	2.5	39.0	14.3	0.5	4.3	1.8	4.7	-18.7
2013	10.5	37.2	17.9	12.9	4.9	11.9	28.2	-7.2
2014	3.2	36.6	19.2	12.8	2.9	15.5	24.2	-2.8
2015	1.3	30.8	12.5	20.2	-2.3	20.2	26.4	12.8
2016	5.9	28.2	12.8	31.9	-4.2	19.4	35.0	5.4

Notes: In the national trade model, e indicates exchange rate misalignments in nominal bilateral terms vis-à-vis the U.S. dollar. Forecasts for 2016 based on current account projections of the IMF's World Economic Outlook (April 2016).

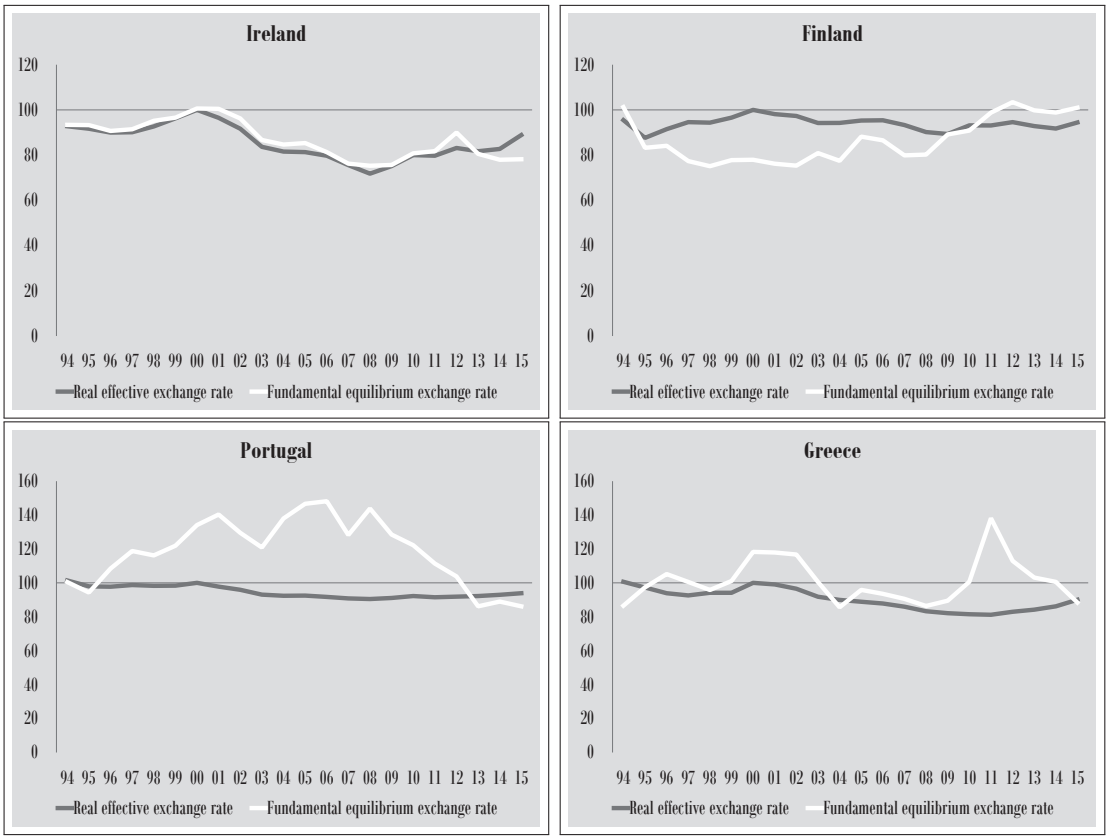
Table 4: Bilateral nominal exchange rate misalignments within the euro area



Note: an increase (decrease) of the real effective exchange rate corresponds to a depreciation (appreciation).

Source: author's calculations for the FEER and BIS for real effective exchange rates, basis 100 in 2000.

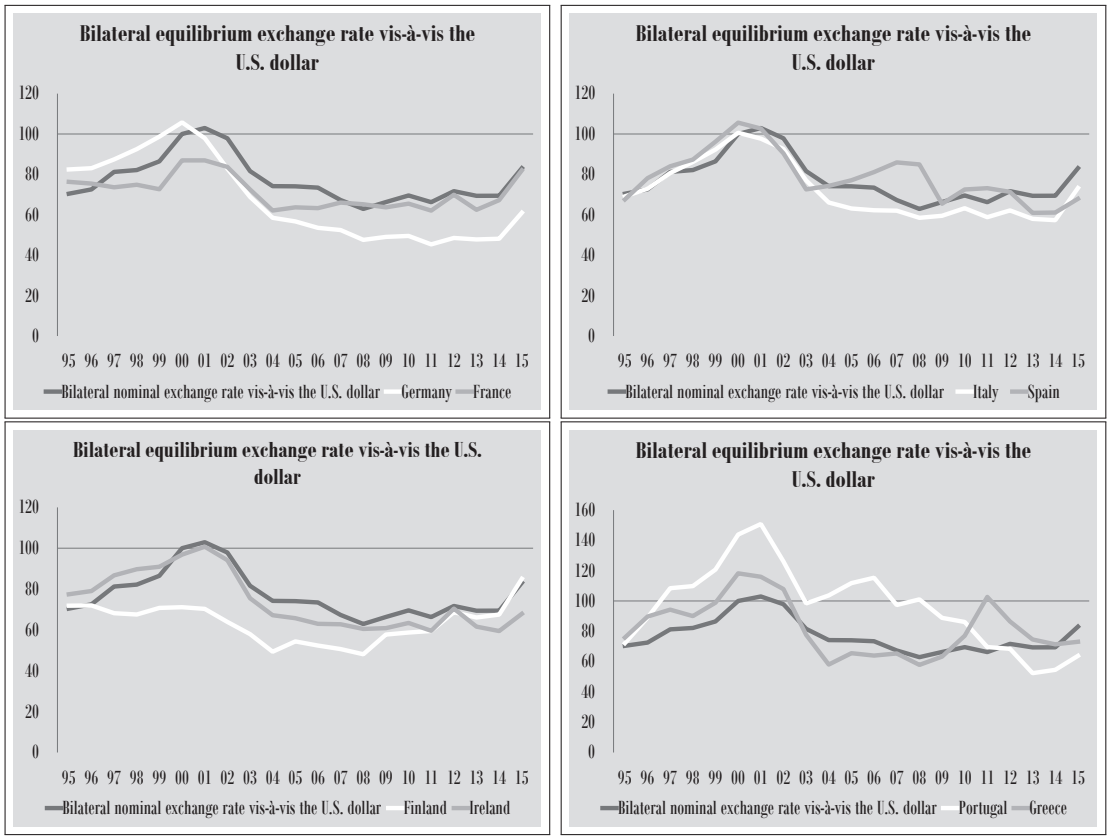
Figure 7: Actual and equilibrium real effective exchange rates within the euro area



Note: an increase (decrease) of the real effective exchange rate corresponds to a depreciation (appreciation).

Source: author's calculations for the FEER and BIS for real effective exchange rates, basis 100 in 2000.

Figure 8: Actual and equilibrium real effective exchange rates within the euro area (continued)



Note: an increase (decrease) of the bilateral nominal exchange rate corresponds to a depreciation (appreciation).
Source: author's calculations for the bilateral FEER and OECD for bilateral exchange rates, basis 100 in 2000.

Figure 9: Actual and equilibrium bilateral nominal exchange rates within the euro area

A. The multinational trade model in logarithmic differential

In order to compute directly the exchange rate misalignment, the equations of the multinational model are written in logarithmic differential. Thus, variables in lower case will correspond to logarithmic differences ($x = \frac{dX}{X} = \frac{X - X^e}{X^e}$)[16]:

$$x_i = \eta x_i \sum_{j \neq i} \alpha_{ij} m_j + \varepsilon x_i \left(pmx_i - px_i \right) \tag{A.1}$$
$$pmx_i = \sum_{j \neq i} \lambda_{ij} \left(px_j - e_j \right) + e_i$$

$$m_i = \eta m_i di_i + \varepsilon m_i \left(pd_i - pm_i \right) \tag{A.2}$$
$$pmm_i = \sum_{j \neq i} \mu_{ij} \left(px_j - e_j \right) + e_i$$

$$\sum_i vx_i \left(x_i + px_i - e_i \right) = \sum_i vm_i \left(m_i + pm_i - e_i \right) \tag{A.3}$$
$$\sum_i wx_i x_i = \sum_i wm_i m_i$$

$$px_i = \alpha x_i pmx_i + \left(1 - \alpha x_i \right) p_i \tag{A.4}$$

$$pm_i = \alpha m_i pmm_i + \left(1 - \alpha m_i \right) pd_i \tag{A.5}$$

$$pd_i = a_i pm_i + \left(1 - a_i \right) p_i \tag{A.6}$$

$$b_i = \mu_i T_i \left(1 - \sigma_{petx_i} - \sigma_{x_i} \right) \left(px_i + x_i - pm_i - m_i \right) \tag{A.7}$$

Where wx, wm, vx and vm, represent the share of each countries in the world exports in volume, the world imports in volume, the world exports in value and

[16] For the sake of clarity, we define the following trade weights: $\lambda_{ij} = \frac{X_{i \to j}}{X_i}$; $\mu_{ij} = \frac{M_{i \leftarrow j}}{M_i}$; $\alpha_{ij} = \frac{X_{i \to j}}{M_j}$; $\nu_{ij} = \left(\frac{X_{i \to j} + M_{i \leftarrow j}}{X_i + M_i} \right)$.

the world imports in value, respectively; $T = PXX/PMM$, is the coverage ratio; $\mu = PMM/PY$, is the openness ratio; i, is the interest rate for external debt; F, the net external debt; $\sigma petx = EP_{pet}M_{pet}/PXX$, is the ratio of net oil imports in value on non-oil exports in value and $\sigma x = iEF/PXX$, is the ratio of the foreign debt service on non-oil exports in value.

For clarity purposes, we detail the derivation of the current account gap, b, presented in equation A.7:

$$b_i = \left(\frac{B_i}{P_i Y_i}\right) - \left(\frac{B_i^e}{P_i^e Y_i^e}\right) = d\left(\frac{B_i}{P_i Y_i}\right) = \mu_i d\left(\frac{B_i}{PM_i M_i}\right) \tag{A.8}$$

$$\begin{aligned} b_i = {} & \mu_i d\left[\left(\frac{PX_i X_i}{PM_i M_i}\right)\right] \\ & - \mu_i d\left[1 - \left(\frac{EP_{pet}M_{peti}}{PX_i X_i}\right)\left(\frac{PX_i X_i}{PM_i M_i}\right) - \left(\frac{i_i E_i F_i}{PX_i X_i}\right)\left(\frac{PX_i X_i}{PM_i M_i}\right)\right] \end{aligned} \tag{A.9}$$

$$b_i = \mu_i d T_i \left(1 - \sigma_{petxi} - \sigma_{xi}\right) \tag{A.10}$$

B. The national trade model in logarithmic differential

As in the multinational trade model, the equations of the national model are written in logarithmic differential in order to compute directly the exchange rate misalignment. Again, variables in lower case will correspond to logarithmic differences ($x = \frac{dX}{X} = \frac{X - X^e}{X^e}$):

$$x_i = \eta x_i d_i^* + (1 - \alpha x_i)\, \varepsilon x_i r_i \tag{B.1}$$

$$m_i = \eta m_i di_i - (\alpha m_i \varepsilon m_i)\, r_i \tag{B.2}$$

$$px_i = \alpha x_i r_i + p_i \tag{B.3}$$

$$pm_i = \alpha m_i r_i + p_i \tag{B.4}$$

$$b_i = \mu_i T_i \,(1 - \sigma_{petx_i} - \sigma_{x_i})\,(px_i + x_i - pm_i - m_i) \tag{B.5}$$

As aforementioned in equation 17, we can derive an exchange rate misalignment specific to each Member States. Here, the misalignment can be expressed in real effective terms based on GDP deflator:

$$\frac{dT_i}{T_i} = px_i + x_i - pm_i - m_i \tag{B.6}$$

$$\frac{dT_i}{T_i} = (\eta x_i d_i^* - \eta m_i di_i) + [(1 - \alpha x_i \varepsilon x_i) + \varepsilon m_i \alpha m_i + \alpha x_i - \alpha m_i]\, r_i \tag{B.7}$$

From equations A.10 and B.5, we know that the current account gap can be expressed as follow:

$$b_i = \mu_i dT_i \,(1 - \sigma_{petx_i} - \sigma_{x_i}) \tag{B.8}$$

$$\frac{dT_i}{T_i} = \frac{b_i}{\mu_i T_i \left(1 - \sigma_{petx_i} - \sigma_{x_i}\right)} \tag{B.9}$$

As in equation 17, we find the expression of the exchange rate misalignment specific to each Member States expressed in real effective terms based on GDP deflator:

$$r_i = \left[\frac{\left(\left(b_i/\mu_i T_i \left(1 - \sigma_{petx_i} - \sigma_{x_i}\right)\right) + \eta m_i di_i - \eta x_i d_i^*\right)}{\left(\left(1 - \alpha x_i\right)\varepsilon x_i + \varepsilon m_i \alpha m_i + \alpha x_i - \alpha m_i\right)} \right] \tag{B.10}$$

Thanks to the equation 15, we can derive the expression for the exchange rate misalignment in bilateral nominal terms vis-à-vis the U.S. dollar:

$$r_i = e_i + px_i^* - p_i \tag{B.11}$$

As in the multinational model and for the sake of simplicity, we assume that internal prices are in equilibrium thus $p_i = \frac{(P_i - P_i^e)}{P_i^e} = 0$. As in equation 19, the exchange rate misalignment in bilateral nominal terms vis-à-vis the U.S. dollar is expressed as follow:

$$e_i = r_i - \sum_{j \neq i} \lambda_{ij} \left(px_j - e_j\right) \tag{B.12}$$

Thanks to the OCI solution of the multinational model, we can derive the exchange rate misalignment in real effective terms based on consumer prices, PD:

$$RC_i = \frac{E_i PD_i^*}{PD_i} \tag{B.13}$$

$$rc_i = e_i + pd_i^* - pd_i \tag{B.14}$$

$$pd_i^* = \sum_{j \neq i} \nu_{ij} \left(pd_j - e_j\right) \tag{B.15}$$

$$pd_i = \mu_i pm_i + \left(1 - \mu_i\right) p_i \tag{B.16}$$

$$pm_i = \alpha m_i \left(e_i + pm_i^*\right) + \left(1 - \alpha m_i\right) p_i \tag{B.17}$$

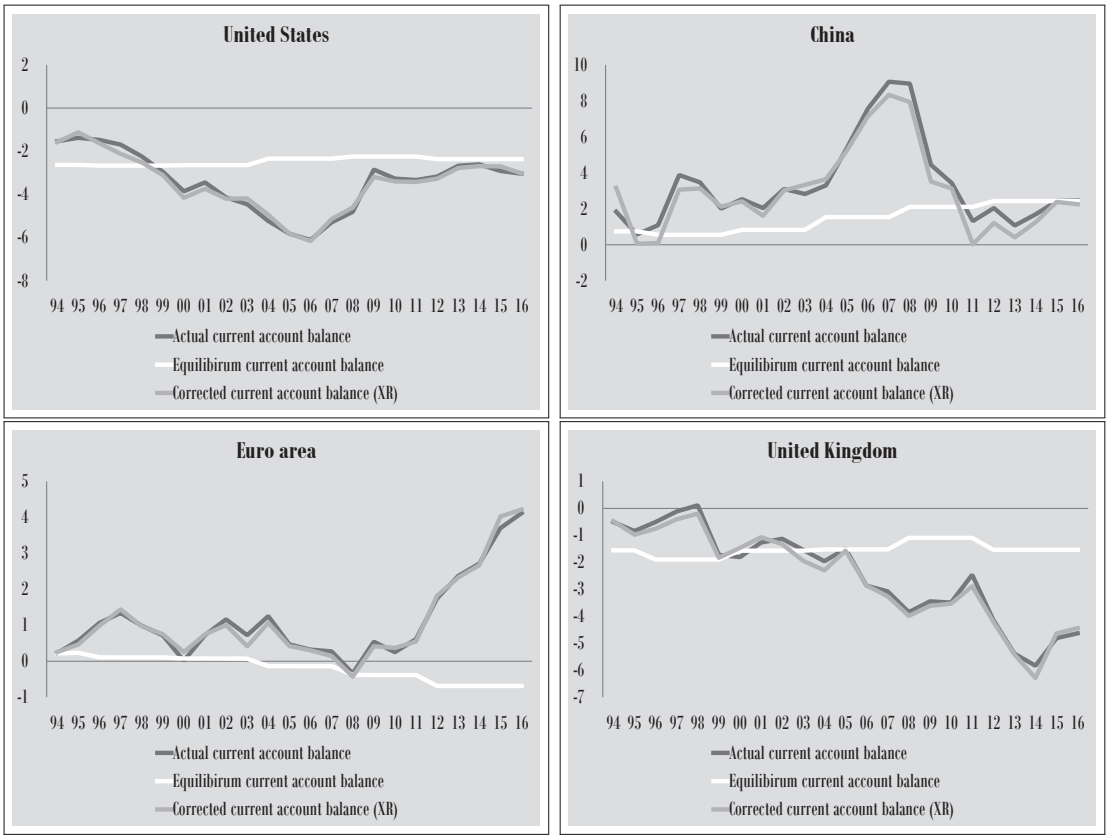
$$pd_i = \alpha m_i \mu_i \left(e_i + pm_i^*\right) \tag{B.18}$$

$$rc_i = \left(1 - \alpha m_i \mu_i\right) r_i + pd_i^* - px_i^* \tag{B.19}$$

As in equation 18, we can derive the exchange rate misalignment expressed in real effective terms based on consumer prices. We note that the variables pd_j, e_j and px_j are retrieved from the OCI resolution of the multinational model:

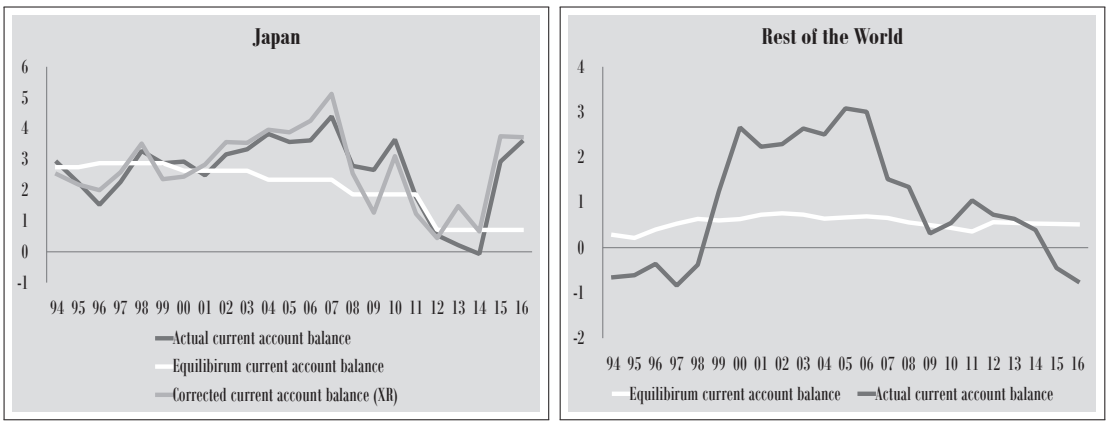
$$rc_i = \left(1 - \alpha m_i \mu_i\right) r_i + \sum_{j \neq i} \nu_{ij} \left(pd_j - e_j\right) - \sum_{j \neq i} \lambda_{ij} \left(px_j - e_j\right) \tag{B.20}$$

C. Current account gaps in the multinational trade model



Note: The global discrepancy is corrected proportionately the share in the world trade ensuring that the current account balances offset each other at the global level. Source: author's estimates for the equilibrium current account balance and IMF's World Economic Outlook (April 2016) for the current account balance.

Figure C.1: Current account gaps



Note: The global discrepancy is corrected proportionately the share in the world trade ensuring that the current account balances offset each other at the global level. Source: author's estimates for the equilibrium current account balance and IMF's World Economic Outlook (April 2016) for the current account balance.

Figure C.2: Current account gaps (continued)