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A multi-speed Europe: is it viable? A stock-flow consistent approach

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Based on the hypothesis that states that the underlying cause of the crisis in the euro area is a combination of exchange-rate misalignments with uncoordinated wage policies, we explore different exchange-rate arrangements that may help to reduce imbalances between surplus and deficit countries. These alternative configurations of the eurozone, which imply abandoning the common currency to a greater or a lesser extent, are tested with a theoretical four-country stock-flow consistent model. We find that although the different alternatives of a multi-speed Europe vary in their stability and macroeconomic effects, in all cases they produce better results compared to the one that has been observed since the introduction of the euro.

Keywords: *eurozone crisis, exchange-rate misalignments, multiple euros*

JEL codes: *E12, E61, E65, F37*

1 INTRODUCTION

After a period of a seemingly successful implementation of the euro (1999–2007), the eurozone has been immersed in a crisis of almost equal length (2008–2014). One of the immediate impacts of the crisis, as in most countries in the world, was the increase of budget deficits. This is no surprise, as the automatic stabilizers in conjunction with expansionary fiscal spending in 2009 mitigated the effects of the global financial crisis on production and employment. However, the dominant paradigm in economics interpreted the crisis as a process directly linked to profligate behaviour by the deficit countries. The problem with this explanation of the crisis is that it neglects the role played by financial liberalization in the periphery of the eurozone (Spain, Portugal, Greece, Ireland, etc.) combined with the export-led growth strategy pursued by the core (mainly Germany). In this regard, as Lapavitsas (2012) explains, the introduction of the euro and the parities at which each of the member countries joined the eurozone, as well as the differential wage policies implemented by the member states, have been playing a major role in the determination of macroeconomic imbalances within the eurozone which would eventually arise under the form of current account and budget deficits in the periphery and surpluses in the core.

According to this second vision, the order of causation has been inverted, meaning that it was the weak external performance (which resulted from the unfavourable conditions at which southern countries joined the eurozone) that produced the imbalances that ended up emerging as large budget deficits. Thus, if these imbalances are to be reduced, instead of tackling the symptoms, the real source of the crisis must be solved. In this regard, many alternatives have been proposed since the beginning of the crisis. On one hand, the European authorities have strengthened the mechanisms designed to enforce the compliance of member

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countries with the Maastricht criteria (for instance, the so-called 'sixpack'). Simultaneously, new treaties like the 'fiscal compact', aimed at increasing fiscal tightness, were signed. On the other hand, other alternatives like a wider role of the ECB, the convergence towards a banking union and a higher degree of fiscal integration have been discussed but not yet implemented. In our view, these proposals, apart from being unlikely from a political point of view, would not solve the real problem – that is, the structural differences that make it impossible for southern countries to compete against Germany at the same nominal exchange-rate parity – and adjusting the real exchange rate through the so-called internal devaluations may imply an unacceptable social cost. Hence, the reintroduction of an adjustment of nominal exchange rates within the eurozone may imply an immediate positive competitiveness shock that may help some of the troubled countries to deal with the crisis and, in the medium run, stay in the eurozone in a sustainable way.

This is what may be called a multi-speed Europe; that is, a eurozone with two euros: a southern euro and a northern euro, each with a value that gets countries closer to reaching both the internal and external equilibrium. The aim of this article is to examine some of the different ways in which this reform could be implemented. To do so, we make use of a four-country stock-flow consistency model specifically designed to represent the institutional structure of the euro area. Based on this description of reality, in Section 2 we explain in detail how each of these proposals would work and how the model can be modified to simulate each scenario. In Section 3 we run some simulation experiments aimed at assessing the macroeconomic viability of these potential solutions. Finally, in Section 4, we present our main conclusions.

2 A MULTI-SPEED EUROPE: ALTERNATIVE CLOSURES

In this section we present different ways in which the current institutional setting of the eurozone could be reformed in order to yield more sustainable macroeconomic dynamics. We believe that the best methodological tool to assess each of these alternatives is a stock-flow consistent model, as they are based on a watertight description of transactions (every flow must go from somewhere to somewhere else, every financial asset is a liability for another agent in the economy, etc.) that prevents the analysis from overlooking processes that, when accumulated over time, may end up producing episodes of instability. Hence, unlike many studies that are static (in the sense that they neglect the fact that economic processes evolve through time), stock-flow consistent models allow us to trace the evolution of variables over time. This feature is crucial, as what may seem sustainable in the short run (for instance, a current-account deficit financed by short-term capital inflows) might actually not be sustainable in the long run: in the end, the capacity to accumulate current-account deficits over time depends on the willingness of international financial markets to keep on financing the economy in question.

Our starting point is Godley/Lavoie (2007a), who show how the traditional structure of a stock-flow consistent model can be extended to build a multi-country model. Some earlier studies on open economy stock-flow models are Godley (1999) and Godley/Lavoie (2005). Lately, there has been a growing literature in this field. For instance, Lavoie/Zhao (2010) build a three-country model with fixed and flexible exchange-rate regimes in order to study the effects of reserve diversification. Godley/Lavoie (2007b) use a three-country framework with two exchange rates aimed at modelling the macroeconomic dynamics between two members of the euro area and the United States. Duwicquet/Mazier (2010) use a two-country model to examine the effects of financial integration within a monetary union. Finally, Mazier/Tiou-Tagba Aliti (2010; 2012) build a three-country

model to assess the contribution of potential exchange-rate realignment to the narrowing of global imbalances. In the remainder of this section, we will explain how the framework proposed by Godley/Lavoie (2007a) can be modified to model each of the alternatives for the reform of the institutional setting of the euro area.[1]

The institutional agents of our model, the economic processes (transactions) that they are part of and the financial assets and liabilities that constitute their balance sheets can be found in the social accounting matrix and the flow of funds (see Appendix). The whole structure of the model, except for the behavioural equations, can be deduced from these matrices. As we are not coming up with any innovation regarding the behaviour of institutional agents and the general structure of the model,[2] we focus our analysis on the alternative closures that describe each of the proposals for the reform of the euro area into a multi-speed system.

Godley/Lavoie (2007a) present two closures for an open economy model: one for the case where the exchange rate is flexible and the other for the case of fixed exchange rates.[3] In the first case, the bond market of one of the countries (say, the UK) is cleared through exchange-rate movements, which may be upwards or downwards depending on the gap between supply and demand. The purchases and sales of domestic bonds by the central bank ensure that its balance sheet identity holds at every point in time. The other country's (say, the US) bond market is balanced through purchases and sales by the monetary authority. So we are left with the explanation of how the balance-sheet identity of the monetary authority of the US is satisfied. As happens in every stock-flow consistent model, there is an equation that does not need to be written, as it can be derived from the remaining equations of the model. In this closure, this is the case of the balance-sheet identity of the central bank of the US.

In the second case – that is, when the exchange rate is fixed – this variable can no longer ensure that the bond market of the UK is in equilibrium. Thus, it is the central bank that must intervene to make supply equal demand. Moreover, since the exchange rate is fixed, the monetary authority must intervene in the foreign-exchange market in order to ensure equilibrium between supply and demand at the targeted exchange rate. These interventions bring about changes in the stock of foreign reserves held by the monetary authority. As regards the bond market of the other county, it is cleared through interventions of the central bank. Once the equations for the aforementioned processes have been written, we are left with the equation that guarantees that the balance-sheet identity of the central bank of the US is being held. As happened in the flexible exchange-rate closure, this is the redundant equation of the model. This same closure is used by Mazier/Tiou-Tagba Aliti (2012) who, instead of defining one exchange rate, work with three (one for each country).

2.1 A baseline closure of the euro area

Our model takes the structure provided by Godley/Lavoie (2007b) and extends it to the case of four country blocks: the US, Germany (representing the surplus countries of the euro area),

1. The complete description of our model can be found at: http://www.univ-paris13.fr/CEPN/IMG/pdf/wp2014_03.pdf.
2. The main difference from the previous models is that the portfolio decision regarding how many bonds to buy from each government is attributed to the commercial banks of each country rather than to households, which seems closer to reality. However, this has no impact on the results of the simulation, mainly because in our model commercial banks are rather passive. This may not have been the case if we had dealt with the dynamics associated with financialization.
3. Actually, they present four closures as the fixed exchange-rate closure can be combined with endogenous foreign reserves, endogenous interest rate and endogenous government expenditures. In this paper we take the fixed exchange-rate closure with endogenous foreign reserves.

Spain (representing the deficit countries of the euro area) and the rest of the world. The following expressions are used for the exchange rates that are presented in the following closures: 1$ = $E1$ GE, which is the German euro/dollar exchange rate (if $E1$ goes up, the German euro depreciates), 1$ = $E2$ SP, which is the Spanish euro/dollar exchange rate. From these definitions we can derive the Spanish euro/German euro exchange rate (1GE = $E3$ SP): $E3 = E2/E1$.

However, under the current setting there are no specific exchange rates for Spain and Germany – they are engaged in a super-fixed exchange-rate arrangement: the euro. Thus, $E1 = E2$ and $E3 = 1$. Since the European Central Bank (ECB) allows the euro to float freely, the closure of the model will follow the one proposed by Godley/Lavoie (2007a). This means that the euro/dollar exchange rate will adjust for any imbalances between the supply and demand for bonds denominated in euros (equations (1)–(2)). The balance sheet of each national central bank is equilibrated through central bank purchases/sales of domestic bonds (equations (3)–(4)), which are supplied on demand (equations (5)–(6)). Having defined all the rows and columns of the matrices of the two members of the euro, we assume that the rest of the world fixes its currency to the dollar. Hence the domestic bond market is equilibrated through interventions of the domestic central bank. The equilibrium in the balance sheet of the central bank of the rest of the world is ensured by the purchases/sales of foreign reserves (which are necessary to keep the exchange rate fixed). Finally, the central bank of the US purchases/sells domestic bonds to ensure the equilibrium in the domestic bond market. The balance-sheet identity of the central bank of the US is the redundant equation.

$$E1_t = E2_t = \frac{Bs_t^{GE} + Bs_t^{SP} - Bd, b_{SP_t}^{GE} - Bd, b_{RW_t}^{GE} - Bd, b_{GE_t}^{SP} - Bd, b_{RW_t}^{SP} - Bd, b_{GE_t}^{GE} - Bd, b_{SP_t}^{SP} - Bd, cb_{SP_t}^{SP} - Bd, cb_{GE_t}^{GE} - Bd_{ECB_t}^{GE} - Bd_{ECB_t}^{SP}}{Bd_{US_t}^{GE} + Bd_{US_t}^{SP}} \tag{1–2}$$

$$\Delta\, Bd, cb_{SP_t}^{SP} = \Delta\, R_t^{SP} + \Delta\, H_t^{SP} - \Delta\, A_t^{SP} \tag{3}$$

$$\Delta\, Bd, cb_{GE_t}^{GE} = \Delta\, R_t^{GE} + \Delta\, H_t^{GE} - \Delta\, A_t^{GE} \tag{4}$$

$$Bs, cb_{SP_t}^{SP} = Bd, cb_{SP_t}^{SP} \tag{5}$$

$$Bs, cb_{GE_t}^{GE} = Bd, cb_{GE_t}^{GE} \tag{6}$$

As, in the current setting, there are no interventions of the ECB in the secondary markets (thus far, the Outright Monetary Transactions programme has not been used), we assume that its balance sheet is constant over time. In the next subsections, we show how this simple structure can be modified to model how the different exchange-rate arrangements that have been put forward could work.

2.2 A eurozone with three euros

As suggested by Lapavitsas (2012) and shown by Duwicquet et al (2012), there are reasons to think that the introduction of the euro worked as a source of real exchange-rate misalignments within the euro area. If we consider this a reasonable argument, then it makes sense to examine what would happen if these misalignments were reduced. This would not require that each country regained its monetary and exchange-rate policy, but that the eurozone split into two blocks, each of them gathering countries that are more or less similar. For instance, it seems more reasonable that Portugal shares a common exchange rate with Greece than with Germany or Finland. Thus, what we propose in

this subsection is a scenario where there are two regional euros, each of them associated with a certain sub-region within the eurozone (we keep the classification where Spain represents the deficit countries while Germany represents the surplus countries). Moreover, there would also be a global euro aimed at supporting the role of the current euro in financial markets as an international store of value.

The exchange rate of the global euro vis-à-vis the US dollar would be determined as usual; that is, as a result of the interaction between supply and demand for euro-denominated bonds (equation (7)). We call the global euro/dollar exchange-rate $E9$, in order to keep $E1$ and $E2$ as the exchange rates between Germany and Spain vis-à-vis the US. Unlike the current setting of the euro area, where Spain and Germany only issue bonds denominated in euros, in this case we assume that the issuances to foreign creditors are denominated in global euros (for instance, $Bs, b_{GE_t}^{SP,€}$ is the supply of Spanish bonds in global euros to German banks) whereas domestic banks purchase domestic bonds denominated in national currency ($Bs, b_{SP_t}^{SP,SP}$). Moreover, we keep the assumption that the ECB holds a certain pre-existing stock of German and Spanish bonds, which are denominated in global euros.

$$E9_t = \frac{Bs_t^{GE,€} + Bs_t^{SP,€} - Bd, b_{SP_t}^{GE,€} - Bd, b_{RW_t}^{GE,€} - Bd, b_{GE_t}^{SP,€} - Bd, b_{RW_t}^{SP,€} - Bd_{ECB_t}^{GE,€} - Bd_{ECB_t}^{SP,€}}{Bd_{US_t}^{GE,€} + Bd_{US_t}^{SP,€}} \tag{7}$$

As the government debt could be denominated in national euros, in this institutional framework each sub-region would regain its monetary sovereignty. As mentioned before, the only institutional agent that can purchase domestic bonds in local currency is the home banks. But it should be borne in mind that those countries that do not issue reserve currencies (like the national euros would be) might encounter limits to get external financing by issuing bonds denominated in domestic currency. In those cases, the gap between the financing needs (B_t^{SP}, for instance) and the total demand for bonds denominated in domestic currency ($Bd, b_{SP}{}^{SP}$) is filled with issuances of bonds denominated in a reserve currency. In this case, should there be any gap, it would be filled with issues of bonds denominated in global euros ($Bs_t{}^{SP,€}$). These supplies are the ones that enter equation (7). Since the total supply of bonds in each country is expressed in domestic currency (either Spanish or German euros), it is required to transform this stock of debt into global euros. To do so, we divide by the bilateral exchange rate of Spanish and German euros to global euros ($E7$ and $E8$, respectively, which are defined in equations (10)–(11)).

$$Bs_t^{GE,€} = \frac{Bs_t^{GE} - Bs, b_{GE_t}^{GE}}{E7_t} \tag{8}$$

$$Bs_t^{SP,€} = \frac{Bs_t^{SP} - Bs, b_{SP_t}^{SP}}{E8_t} \tag{9}$$

The multi-speed feature of this model implies that Germany and Spain can have adjustable exchange rates according to their external performance vis-à-vis their regional trading partner. Thus, we define the Spanish euro/global euro and German euro/global euro exchange rate based on the intra-European current account (CA).[4] We have chosen this variable as the criterion determining the intra-European exchange rate since it reflects the overall performance of the Spanish (German) external sector vis-à-vis the German

4. As an example, we write Spain's current account as: $CA_{SP_t}^{GE} = X_{SP_t}^{GE} - IM_{SP_t}^{GE} + r_{t-1}^{GE}.Bs, b_{SP_{t-1}}^{GE,€}.E7_t - r_{t-1}^{SP}.Bs, b_{US_{t-1}}^{SP,€}.E7_t$.

(Spanish) counterpart. The criterion consists of keeping exchange rates fixed as long as the intra-European current account is in surplus or, if in deficit, only for a certain period of time (we base this criterion on the fact that in principle a country cannot accumulate persistent balance-of-payments deficits indefinitely[5]). If a bad external performance yields a balance-of-payments deficit for five consecutive periods, then the national currency is adjusted. Once these intra-European exchange rates have been defined, it is also possible to derive the exchange rates vis-à-vis the dollar (equations (12)–(13)) as well as the bilateral exchange rate between Spain and Germany (equation (14)).

$$E7_t = \begin{cases} E7_{t-1} & if \ \dfrac{CA^{GE}_{SP_{t-i}}}{Y^{SP}_{t-i}} \geq 0 \quad \forall i = 1,2,3,4,5 \\ E7_{t-1}.(1+\pi) & if \ \dfrac{CA^{GE}_{SP_{t-i}}}{Y^{SP}_{t-i}} < 0 \quad \forall i = 1,2,3,4,5 \end{cases} \tag{10}$$

$$E8_t = \begin{cases} E8_{t-1} & if \ \dfrac{CA^{SP}_{GE_{t-i}}}{Y^{GE}_{t-i}} \geq 0 \quad \forall i = 1,2,3,4,5 \\ E8_{t-1}.(1+\pi) & if \ \dfrac{CA^{SP}_{GE_{t-i}}}{Y^{GE}_{t-i}} < 0 \quad \forall i = 1,2,3,4,5 \end{cases} \tag{11}$$

$$E1_t = E8_t.E9_t \tag{12}$$

$$E2_t = E7_t.E9_t \tag{13}$$

$$E3_t = E2_t/E1_t \tag{14}$$

As Spain and Germany are now engaged in a fixed (but adjustable) exchange-rate arrangement where bilateral nominal exchange rates indeed exist (unlike the current situation, in which there are no nominal exchange rates within the eurozone), national central banks must intervene in the foreign-exchange markets in order to ensure that the parity holds over time. These interventions are carried out via purchases/sales of foreign reserves. We make the assumption that both countries accumulate these reserves under the form of dollar-denominated bonds issued by the US. As it is normal in stock-flow consistent models with fixed exchange rates, the central bank intervention that keeps the exchange rate constant is such that its balance-sheet identity holds at every point in time (equations (15)–(16)). Then, the process of reserve accumulation needs to take into account the possible valuation effects that result from exchange-rate movements (equations (17)–(18)).

$$\Delta Bs, cb^{US}_{SP_t} = \frac{\Delta R^{SP}_t + \Delta H^{SP}_t - \Delta A^{SP}_t - \Delta Bs, cb^{SP}_{SP_t}}{E2_t} \tag{15}$$

$$\Delta Bs, cb^{US}_{GE_t} = \frac{\Delta R^{GE}_t + \Delta H^{GE}_t - \Delta A^{GE}_t - \Delta Bs, cb^{GE}_{GE_t}}{E1_t} \tag{16}$$

5. In practice, it has been observed that deficit countries in the euro area have accumulated persistent negative stocks of TARGET2 balances. From our point of view, the crisis itself and the austerity policies that have been implemented in deficit countries thereafter are a sign that the Eurosystem is not willing to finance deficits on a permanent basis.

$$\Delta Bd, cb^{US}_{SP_t} = Bs, cb^{US}_{SP_{t-1}}.\Delta E2_t + \Delta Bs, cb^{US}_{SP_t}.E2_t \tag{17}$$

$$\Delta Bd, cb^{US}_{GE_t} = Bs, cb^{US}_{GE_{t-1}}.\Delta E1_t + \Delta Bs, cb^{US}_{GE_t}.E1_t \tag{18}$$

These equations ensure that the model is consistent. As regards the ECB, no changes are introduced with respect to the model described in the previous section because, as described above, we are not allowing for the interventions that it could eventually make. In the next section we will run some simulation experiments in order to assess the economic viability of this proposal.

2.3 A return to the European Monetary System (EMS)

In a similar line to the one proposed in the previous scenario, the ideas embedded in the EMS could be taken up in order to give the euro area a higher degree of stability. The proposal would consist of a split-up of the eurozone into two sub-regions (as we did in the previous case) but instead of keeping a global euro that would be used as an international currency, there would be a European Currency Unit (ECU) that would only play the role of being a unit of account. As it did in the past, it would be the reference to which the national currencies are pegged. Hence, the ECU could be written as follows (equation (19)), where β represents the share of Germany in total output of the euro area:

$$\frac{1}{E9_t} = \beta.\frac{1}{E1_t} + (1-\beta).\frac{1}{E2_t}. \tag{19}$$

The way the ECU is constructed implies that it is a basket currency constituted partly by the German currency and partly by the Spanish currency. It is expressed in ECUs with respect to units of US dollars; that is, 1$ = *E*9 ECU. The determination of each European currency vis-à-vis the ECU would be the same as the one described in the previous scenario, and would depend on the external performance of each country (equations (20)–(21), which are identical to equations (10)–(11)). However, even if Spain and Germany's currencies were pegged to the ECU, they would float against the US dollar. This implies that the bilateral nominal exchange rate could adjust in such a way that the domestic bond market is in equilibrium (equations (22)–(23)). As regards the exchange rates of the Spanish currency against the US dollar and the German currency, they can be deduced from the other exchange rates (equation (24)).

$$E7_t = \begin{cases} E7_{t-1} & if \quad \dfrac{CA^{SP}_{t-i}}{Y^{SP}_{t-i}} \geq 0 \quad \forall i = 1,2,3,4,5 \\ E7_{t-1}.(1+\pi) & if \quad \dfrac{CA^{SP}_{t-i}}{Y^{SP}_{t-i}} < 0 \quad \forall i = 1,2,3,4,5 \end{cases} \tag{20}$$

$$E8_t = \begin{cases} E8_{t-1} & if \quad \dfrac{CA^{GE}_{t-i}}{Y^{GE}_{t-i}} \geq 0 \quad \forall i = 1,2,3,4,5 \\ E8_{t-1}.(1+\pi) & if \quad \dfrac{CA^{GE}_{t-i}}{Y^{GE}_{t-i}} < 0 \quad \forall i = 1,2,3,4,5 \end{cases} \tag{21}$$

$$E1_t = \frac{Bs^{GE}_t - Bs, b^{GE}_{GE_t} - Bs, cb^{GE}_{GE_t} - Bs, b^{GE}_{SP_t} - Bs, b^{GE}_{RW_t}}{Bd, b^{GE}_{US_t}} \tag{22}$$

$$E2_t = E1_t.E3_t \tag{23}$$

$$E3_t = E7_t/E8_t \tag{24}$$

The adjustment of $E1$ ensures that the German bond market is always cleared. It is also important to note that this closure implies that the changes in $E1$ and $E2$ are such that $E3$ is constant. This must be the case, as this institutional arrangement of the EMS that we are examining implies that intra-European parities are fixed. Hence, if the movements of $E1$ and $E2$ were such that $E3$ changed continuously, the definition $E3 = E7/E8$ would be violated. Given that $E2$ cannot adjust in such a way that the Spanish bond market is in equilibrium (as it is being determined endogenously by the other exchange rates in order to ensure consistency between all exchange rates), it is the Spanish central bank which, via its purchases/sales of domestic bonds, clears the bond market (equation (25)).

$$Bd, cb^{SP}_{SP_t} = Bs^{SP}_t - Bs, b^{SP}_{SP_t} - Bs, b^{SP}_{US_t} - Bs, b^{SP}_{GE_t} - Bs, b^{SP}_{RW_t} \tag{25}$$

It is now necessary to explain how the balance sheet of the central banks of Spain and Germany are kept in equilibrium, taking into account that they are engaged in a fixed exchange-rate arrangement with respect to the ECU. In practice, this does not differ from the case presented in the previous scenario. Thus, the balance sheets are closed identically and stock-flow consistency is ensured in the same way (equations (26)–(29) are identical to equations (15)–(18)).

$$\Delta Bs, cb^{US}_{SP_t} = \frac{\Delta R^{SP}_t + \Delta H^{SP}_t - \Delta A^{SP}_t - \Delta Bs, cb^{SP}_{SP_t}}{E2_t} \tag{26}$$

$$\Delta Bs, cb^{US}_{GE_t} = \frac{\Delta R^{GE}_t + \Delta H^{GE}_t - \Delta A^{GE}_t - \Delta Bs, cb^{GE}_{GE_t}}{E1_t} \tag{27}$$

$$\Delta Bd, cb^{US}_{SP_t} = Bs, cb^{US}_{SP_{t-1}}.\Delta E2_t + \Delta Bs, cb^{US}_{SP_t}.E2_t \tag{28}$$

$$\Delta Bd, cb^{US}_{GE_t} = Bs, cb^{US}_{GE_{t-1}}.\Delta E1_t + \Delta Bs, cb^{US}_{GE_t}.E1_t \tag{29}$$

Finally, it is worth mentioning that, as the exchange rates $E1$ and $E2$ are clearing the German and the Spanish bond market, domestic central banks no longer need to purchase domestic bonds. Hence, the stock of domestic bonds held by the monetary authority of each European country will be constant over time.

2.4 A eurozone without the current surplus countries

One of the alternatives that has been put forward by Soros (2012) and Lordon (2013), among others, is a situation in which Germany leaves the eurozone and lets its currency float, while the remaining European countries keep the euro, which could either be pegged to the German currency or float freely. The examination of this alternative does not require many changes with respect to the set-up that we presented in the previous scenarios. First, it is required to delete the notion of the global euro or the ECU, $E9$, and its associated exchange rates $E7$ and $E8$. Second, the German currency/dollar exchange rate, $E1$, which in the 'three euros' case was defined implicitly using $E8$ and $E9$ can now be defined explicitly as the ratio of the supply of German bonds to the US and the demand for German bonds by the US (as we did in the EMS scenario).

Finally, what we called the Spanish currency/German currency exchange rate, $E3$, can be now be called the euro/German currency exchange rate and could either be pegged or float freely. Let us first analyse the case where the euro is pegged to the German currency (1 GE = $E3$ euro).

$$E1_t = \frac{Bs_t^{GE} - Bs, b_{GE_t}^{GE} - Bs, cb_{GE_t}^{GE} - Bs, b_{SP_t}^{GE} - Bs, b_{RW_t}^{GE}}{Bd, b_{US_t}^{GE}} \tag{30}$$

$$E3_t = \begin{cases} E3_{t-1} & if \quad \dfrac{CA_{SP_{t-i}}^{GE} + FA_{SP_{t-i}}^{GE}}{Y_{t-i}^{SP}} \geq 0 \quad \forall i = 1,2,3,4,5 \\ E3_{t-1}.(1+\pi) & if \quad \dfrac{CA_{SP_{t-i}}^{GE} + FA_{SP_{t-i}}^{GE}}{Y_{t-i}^{SP}} < 0 \quad \forall i = 1,2,3,4,5 \end{cases} \tag{31}$$

This new setting requires some small changes in the closure of the model. Basically, the German central bank would no longer purchase foreign assets, as there is no exchange rate to be defended. Thus, its balance sheet would be closed through purchases/sales of domestic bonds (equation (33)). Since the exchange rate would be floating, the domestic bond market would be cleared in the process of the determination of the exchange rate (equation (30)). As regards the central bank of Spain, there would be no major changes, as its exchange rate would still be fixed. Thus, the monetary authority would keep on purchasing/selling US bonds in such a way that the exchange rate is fixed at every point in time (equation (31)).

$$\Delta Bs, cb_{SP_t}^{US} = \frac{\Delta R_t^{SP} + \Delta H_t^{SP} - \Delta A_t^{SP} - \Delta Bs, cb_{SP_t}^{SP}}{E2_t} \tag{32}$$

$$\Delta Bs, cb_{GE_t}^{GE} = \Delta R_t^{GE} + \Delta H_t^{GE} - \Delta A_t^{GE} \tag{33}$$

$$\Delta Bd, cb_{SP_t}^{US} = Bs, cb_{SP_{t-1}}^{US}.\Delta E2_t + \Delta Bs, cb_{SP_t}^{US}.E2_t \tag{34}$$

Another way in which this alternative institutional framework could be introduced is one in which, instead of being fixed, the euro floats against both the German currency and the US dollar. This alternative should ensure that every external imbalance is automatically corrected via exchange-rate adjustments, thereby releasing the central bank from the task of accumulating reserves in order to defend an exchange rate. The drawback of this scenario is that one of the main reasons why the euro was introduced – to avoid the permanent fluctuations of intra-European exchange rates, with the associated adverse effects on international trade – would not be fulfilled. It is worth mentioning, however, that all the countries that stay in the eurozone would still be having a fixed exchange-rate arrangement (as they would share the same currency), which means that at least between them the benefits of a stable exchange rate on international trade would still be reaped.

Adapting the model to this possible alternative is quite simple. We just need to let the euro/German currency exchange rate, $E3$, float. In this case, the euro-bond market would be automatically cleared via exchange-rate movements and the central bank would ensure the equilibrium in its balance sheet through purchases/sales of domestic bonds. The rest of the model would be closed, as in the fixed exchange-rate case.

To summarize the different proposals that we have been presenting, Table 1 describes how each of the equations implicit in the crucial roles and columns of the flow of funds would be satisfied. The first three columns describe which variable ensures the equilibrium

Table 1 Alternative closures of the model

Model	B^{SP}	B^{GE}	B^{EZ}	CB^{SP}	CB^{GE}
Current setting	$E1 = E2$	$E1 = E2$	–	Bd, cb_{SP}^{SP}	Bd, cb_{GE}^{GE}
Multiple euros	Bd, b_{SP}^{SP}	Bd, b_{GE}^{GE}	$E9$	Bd, cb_{SP}^{US}	Bd, cb_{GE}^{US}
EMS	Bd, cb_{SP}^{SP}	$E1$	–	Bd, cb_{SP}^{US}	Bd, cb_{GE}^{US}
Eurozone without GE (fixed)	Bd, cb_{SP}^{SP}	$E1$	–	Bd, cb_{SP}^{US}	Bd, cb_{GE}^{GE}
Eurozone without GE (flexible)	$E3$	$E1$	–	Bd, cb_{SP}^{SP}	Bd, cb_{GE}^{GE}

in the market of Spanish, German and European bond markets. The last two columns show which asset adjusts in such a way that the balance-sheet identity of the central banks of Spain and Germany holds at every point in time.

3 ASSESSING THE VIABILITY OF A MULTI-SPEED EUROPE

After presenting several alternatives in which a multi-speed Europe could work, it is time to examine their viability. We make use of the four-country stock-flow consistent model adapted to the institutional framework of the eurozone with the corresponding modifications associated with each specific proposal.[6] The aim of this section is to show the behaviour of some key macroeconomic variables in each of the scenarios described in the previous section. In the remainder of this section we present a comparative analysis of the different scenarios after a negative competitiveness shock in Spain (which is due to the overvaluation of the euro for the Spanish economy, in line with the evidence shown by Duwicquet et al. (2013)).

3.1 The current system

The adoption of the euro by Spain implied, as mentioned before, a loss of competitiveness due to the unfavourable parity at which it entered the eurozone. This can be represented in our model through a sudden increase in the autonomous component of Spain's imports equation and a decrease in the same component of German imports. This shock has a direct effect on the trade balance (see Figure 1). As was observed in the real case during the years that preceded the crisis (and during the crisis itself), the lack of self-correcting mechanisms prevented the Spanish economy from reaching the long-term external equilibrium. As a result, persistent trade (and current-account) deficits started to accumulate, which in turn implied an increase in the stock of debt – in some cases, like Greece's, the debt was mostly public, whereas in other cases, like Spain's, the debt was issued by the private sector.

The impact on the exchange rate of the euro vis-à-vis the rest of the currencies is null (see Figures 2 and 3), as what is lost by Spain is gained by Germany, thereby leaving the overall current account of the eurozone unaffected. Recall that under the current system, even though Spain and Germany are different countries from a political point of view, the

6. The full version of the model can be found here: http://www.univ-paris13.fr/CEPN/IMG/pdf/wp2014_03.pdf.

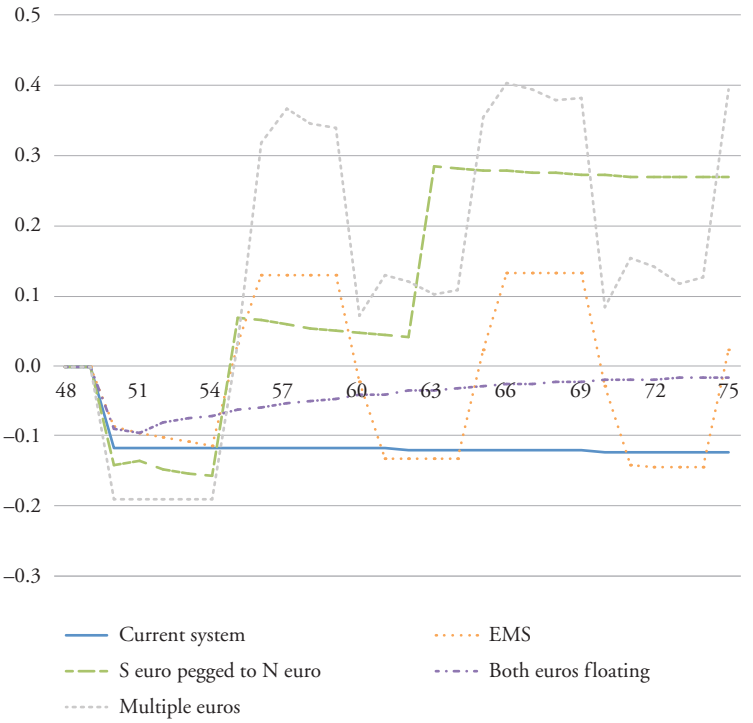

Figure 1 Trade balance Spain (US dollars)

fact that they share the same currency and central bank implies that from a macro-financial perspective they are part of the same entity; that is, the eurozone. Thus, the determination of the euro–dollar exchange rate is explained by both, factors that concern Spain and Germany. In the case of a small open economy that issues its own currency, following some years of current-account deficits the exchange rate would depreciate. But the particular configuration of the eurozone prevented this from happening, since the current account deficits of the South were compensated by the surpluses of the North. In fact, most of these imbalances were internal and were compensated by financial flows going from the North to the South.

The recessive impact of the loss of competitiveness in Spain can be observed in Figure 4, which plots Spain's GDP in national currency. As a result of the deterioration of the trade balance, Spain's GDP drops by 1 per cent and does not recover, as there are no mechanisms that allow for a reversal of the recessionary impact of joining the eurozone. This produces a negative effect on the level of employment, investment and aggregate demand.

3.2 The three-euros scenario

The first proposal that is worth analysing is one where national currencies are restored and coexist with the euro. The advantage of this setting is that each country (or group of countries, which would be grouped according to their economic structure) would have more

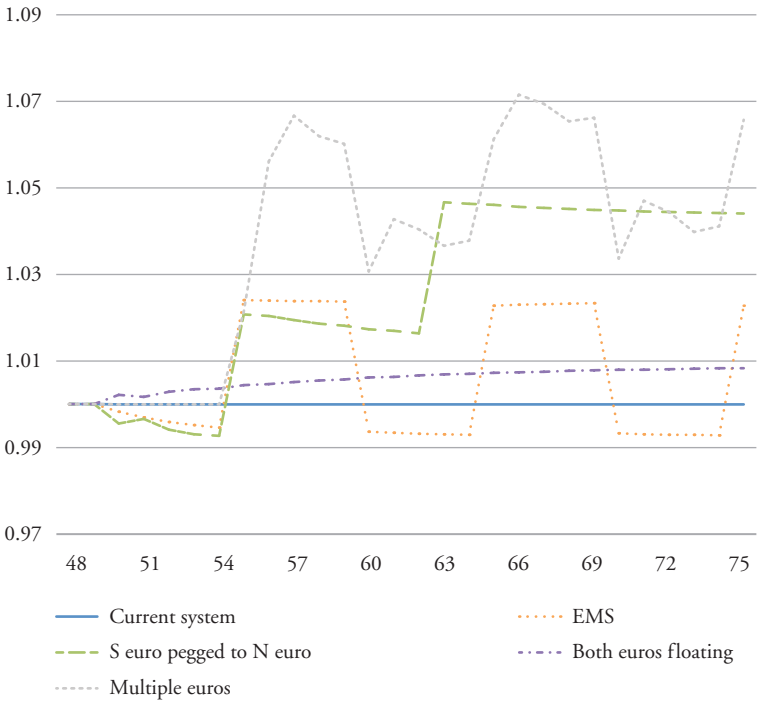

Figure 2 Spanish currency vs US dollar

degrees of freedom to conduct its fiscal and monetary policy. This gain of economic sovereignty would not come at the cost of destroying the achievements of the process of economic integration that have taken place during the last few decades. In other words, the benefits of the unification would be kept, while the drawbacks would be replaced for newly designed institutions.

The negative impact of the competitiveness shock on Spain's GDP can be observed in Figure 4, most of which is explained by the deterioration of the trade balance (see Figure 1). Figure 5 shows that the effect is the opposite in Germany; that is, the trade balance goes into surplus, which in turn increases the rate of growth. As the positive impact in Germany is neutralized by the negative effect in Spain, there is no impact in the rate of growth of the global economy. Thus, the global euro remains unchanged vis-à-vis the US dollar.

However, the negative competitiveness shock implies that Spain starts to accumulate current-account deficits. After five consecutive periods of deficits, the Spanish currency is devalued against the global euro. This adjustment is also observed in the exchange rate vis-à-vis the US dollar (see Figure 2). This devaluation restores Spain's competitiveness, bringing the trade balance into surplus and the growth rate to a positive path. As a result of the higher level of activity, the government starts running a surplus, which implies that the supply of bonds decreases (as the financing needs of the Treasury decrease). This lower supply of bonds denominated in euros translates into an appreciated global euro (recall equation (7)), which also appreciates the German currency (recall that the German currency is pegged to the global euro).

The adjustment of the Spanish currency erodes Germany's competitiveness to such an extent that, some periods later, the German currency needs to be devalued (according to

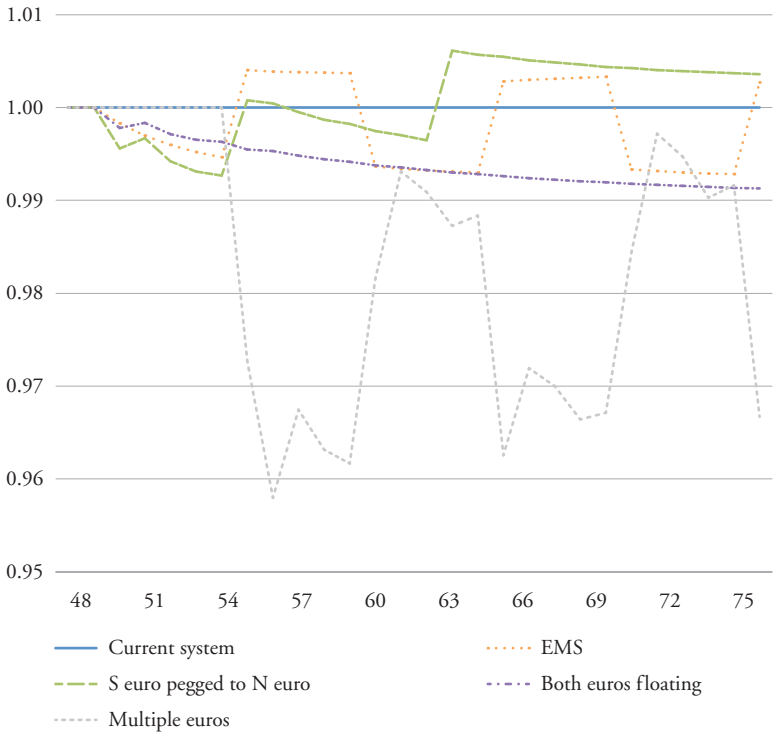

Figure 3 German currency vs US dollar

equation (11)). This improves Germany's trade balance, but worsens that of Spain. As a result, after some periods, the Spanish currency is devalued once again. These dynamics are repeated infinitely. This implies that this setting does not produce stable results over time.[7]

3.3 The EMS scenario

Let us now analyse the impact of the same shock but in a context in which Spain has the capacity to devalue its currency against the ECU (and hence against the German currency) after some periods of accumulating current-account deficits. Figure 2 shows that the immediate impact of the competitiveness shock is such that the Spanish currency appreciates. At first sight, this would seem counterintuitive as Spain is running a trade and current-account deficit. However, it should be noted that the shock has an overall positive effect on global economic growth, thereby increasing the wealth of the private sector of all the country

7. In an extended version of this model (http://www.univ-paris13.fr/CEPN/IMG/pdf/wp2014_03.pdf) we tried out different adjustment criteria for equations (10)–(11). In some cases, instead of setting the adjustment threshold equal to a 0 per cent deficit, we allow for small deficits. This modification helps to stabilize the dynamics, but such a scenario could not last too long as it would imply a continuous loss of foreign reserves. We also set an alternative adjustment criterion that states that the exchange rate is kept fixed as long as the stock of reserves is positive. In this case, balance-of-payments deficits can persist depending on the initial stock of foreign reserves.

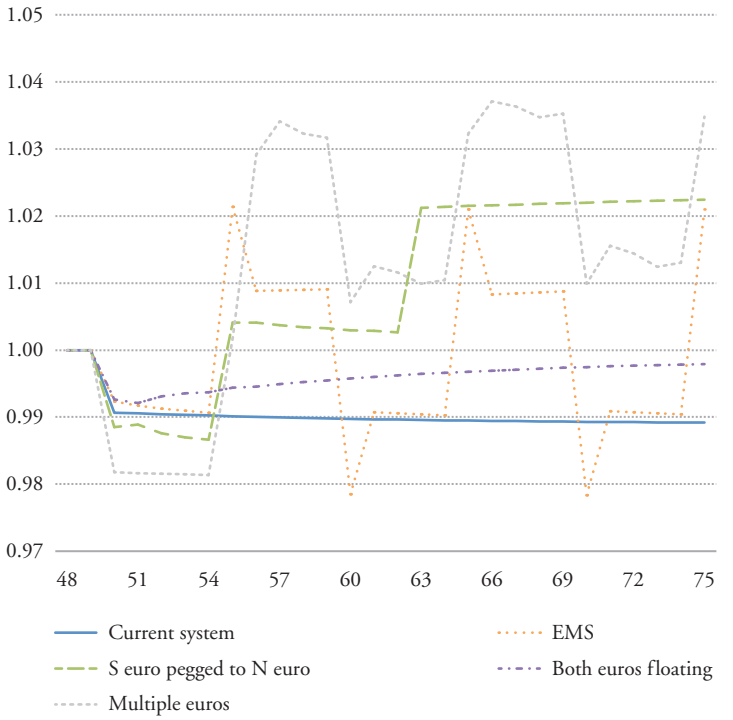

Figure 4 GDP Spain (national currency)

blocks except for Spain. As a result, portfolio investment increases, including the demand for bonds issued by the Spanish government. As long as the financial-account surplus resulting from the demand for Spanish assets is larger than the current-account deficit that arises from the loss of competitiveness, the exchange rate will appreciate. This is, indeed, what explains the downward movement of the exchange rate that is observed between periods 50 and 54. A similar behaviour is observed for the case of the German currency.

According to the institutional setting of this model, Spain is allowed to devalue its currency against the ECU if it registers five consecutive periods of balance-of-payments deficits. Hence, in period 55 a devaluation of 2 per cent vis-à-vis the ECU is introduced. This gain of competitiveness against Germany improves its trade surplus (see Figure 1), thereby inducing an increase in the domestic level of activity (see Figure 4). As regards Germany, the appreciation of its currency vis-à-vis the Spanish currency erodes its competitiveness, thereby reducing its trade, current account and fiscal surpluses. As a consequence, the German government increases the supply of bonds (or reduces the pace at which bonds are withdrawn from the market, in cases where the government is running a surplus), which is reflected in a slight depreciation of the German currency (see Figure 3). The global appreciation of the dollar that results from these movements ends up bringing about a larger devaluation of the Spanish currency vis-à-vis the US dollar (compared to the devaluation against the German currency), which is observed in Figure 2.

The main conclusion that is drawn from this experiment is that in a context in which Spain is allowed to devalue its currency with respect to the ECU (and hence, to the German currency as well), the initial loss of competitiveness can be easily corrected,

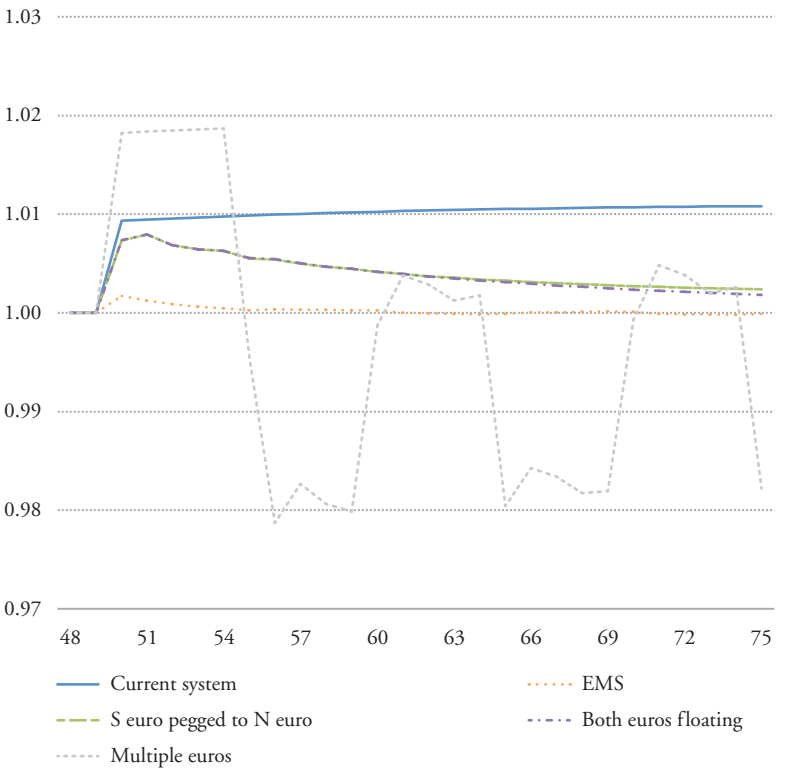

Figure 5 German GDP (national currency)

thereby preventing first a process of unsustainable current-account deficits financed by financial account surpluses and, more importantly, the recessionary effect that the trade deficit may have on the level of activity and employment.

Another point that it is worth making is the instability of such a monetary regime. As is observed in the figures, imposing an adjustment criterion on the exchange rate that is based on the bilateral performance of the current account is prone to generating cycles of continuous devaluations of the intra-European parities. During the times of the EMS this was considered a drawback of the system, mainly because of the difficulties it imposes on international trade. In this regard, the model confirms that taking up the EMS would imply the return to an undesirable situation. Hence, another alternative should be examined.

3.4 The eurozone without Germany scenario

There are, in principle, two relevant experiments to be tested: one in which the euro is pegged to the German currency and another in which both currencies float. Let us start with the first case. If the euro is pegged to the German currency, after having accumulated five consecutive balance-of-payments deficits Spain is allowed to devalue its currency 2 per cent. It should be noted that in this case there is a slightly larger appreciation of the European currencies after the shock and before the adjustment of the Spanish

currency. This is explained by the fact that in the present scenario the shock produces a relatively higher growth effect in Germany (compared to the EMS scenario), which in turn improves the German fiscal balance (due to increased tax collection). As a result, the supply of bonds decreases. In a context where both the US and the rest of the world are growing and exhibiting an increasing stock of wealth, there will be an excess demand for German bonds. This disequilibrium is solved through an appreciation of the German currency, which is larger than in the EMS scenario since public finances are better in the current case. As regards the euro, as it is pegged to the German currency, it will follow the trajectory of the latter.

The evolution of the rest of the variables (GDP, trade balance and public debt) until the adjustment that takes place in period 55 is the same as the one observed in the EMS scenario. Once the Spanish currency is devalued, a positive effect on the trade balance (see Figure 1) and economic growth (see Figure 4) is observed. It should be noted that, following the expansion brought about by the devaluation, there is a contraction of GDP. This is explained by the positive income effect on imports, which slightly erodes the trade balance. After this adjustment has been made, Spain's overall trade balance is in surplus but deteriorating. However, the bilateral trade balance with Germany is in deficit. From this situation, it could be deduced that a 2 per cent devaluation is not enough to bring the intra-European exchanges rates back to equilibrium. Thus, in period 63 a new devaluation is introduced, after which the same effects that had occurred after period 55 take place. The only difference is that in this case the new exchange-rate parity is sufficient to restore Spain's initial competitiveness. No more adjustments take place.

Compared to the two previous scenarios, the case where Germany leaves the eurozone and the remaining countries are pegged to the German currency seems to provide the whole system with a higher level of stability and sustainability in the medium–long run. Moreover, as shown in Figure 5, this higher stability in the South does not come at the cost of a recession in Germany, which exhibits a lower level of growth with respect to the baseline scenario, but positive growth still (the line corresponding to this scenario overlaps with the one representing the case where Germany leaves the euro area and both euros float). The conclusion that can be drawn from this exercise is that a situation in which Germany leaves the eurozone and the South is allowed to adjust its currency to a level that is more consistent with its external equilibrium can be beneficial for all: the South would not find itself immersed in a long-lasting recession with associated high levels of unemployment, and Germany would grow at a slower pace but it would avoid the politically uncomfortable subsidizing of troubled countries. Compared to a pure fiscal union or a scenario in which Germany finances the bail-out of the deficit countries, the institutional setting that was described in these simulations would also save Germany significant fiscal burdens.

Finally, it is worth examining the impact of an institutional setting where Germany leaves the eurozone, and the euro (now the currency of Spain) floats freely. As Figure 2 shows, soon after the competitiveness shock the euro starts to depreciate as a result of the current-account deficits. The opposite behaviour is observed in the case of the German currency. As may be intuited, an exchange-rate arrangement where everything floats freely is prone to produce situations where the variables return to equilibrium. This is indeed what happens, as the initial trade deficit of Spain is progressively corrected as the euro depreciates. Eventually, the trade balance reaches equilibrium and the exchange rate stabilizes.

4 CONCLUSIONS

We began this paper by presenting some of the alternative explanations to the current crisis. We then built a four-country stock-flow consistent model that represents the

eurozone. This model was used to examine the hypothetical scenario of a split-up of the euro into different possible institutional settings, each of them consistent with the equilibrium exchange-rate of the corresponding sub-regions. Our simulations show under which conditions such an institutional framework could work, which we consider an interesting contribution to the debate on the ways out of the crisis. We find that there are different alternatives to solve the causes that, from our point of view, explain the external fragility to which Southern countries were exposed (and which finally materialized under the form of the crisis that has been affecting these economies lately). We find that a multiple-euro framework (or a take-up of the EMS) might produce high levels of instability, unless the system allowed for persistent but small deficits (presumably, lower than the ones observed before the crisis thanks to the possibility of adjusting exchange rates). The results would be much better if Germany left the euro area, but this would come at the cost of the loss of many of the benefits of the process of integration as a whole. In the end, the task consists of finding an institutional setting that produces more balanced results and that can therefore be sustained over time.

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APPENDIX

Table A1 Social accounting matrix and balance sheet of Germany plus ECB

	Germany							ECB		Total
	Households	Firms		Com. banks		Government	Central bank			
		Current	Capital	Current	Capital		Current	Capital	Current	Capital	
C	$-C_t^{GE}$	C_t^{GE}									0
I		I_t^{GE}	$-I_t^{GE}$								0
G		G_t^{GE}				$-G_t^{GE}$					0
$X-IM$		NX_t^{GE}									0
W	W_t^{GE}	$-W_t^{GE}$									0
T	$-Th_t^{GE}$	$-Tf_t^{GE}$				T_t^{GE}					0
$rd.Md$	$rd_{t-1}^{GE}.Md_{t-1}^{GE}$			$-rd_{t-1}^{GE}.Md_{t-1}^{GE}$							0
$rl.L$		$-rl_{t-1}^{GE}.Ld_{t-1}^{GE}$		$rl_{t-1}^{GE}.Ld_{t-1}^{GE}$							0
$rs.R-$				$rs_{t-1}^{GE}.R_{t-1}^{GE}$			$-rs_{t-1}^{GE}.R_{t-1}^{GE}$				0
$r.A$				$-r_{t-1}^{GE}.A_{t-1}^{GE}$			$r_{t-1}^{GE}.A_{t-1}^{GE}$				0
$rb^{US}.B^{US}$				$rb_{t-1}^{US}.Bd, b_{GE_{t-1}}^{US}$			$rb_{t-1}^{US}.Bd, cb_{GE_{t-1}}^{US}$		$rb_{t-1}^{US}.Bd_{ECB_{t-1}}^{US}$		0
$rb^{RW}.B^{RW}$				$rb_{t-1}^{RW}.Bd, b_{GE_{t-1}}^{RW}$							0
$rb^{SP}.B^{SP}$				$rb_{t-1}^{SP}.Bd, b_{GE_{t-1}}^{SP}$					$rb_{t-1}^{SP}.Bd_{ECB_{t-1}}^{SP}$		0
$rb^{GE}.B^{GE}$				$rb_{t-1}^{GE}.Bd, b_{GE_{t-1}}^{GE}$		$-rb_{t-1}^{GE}.Bs_{t-1}^{GE}$	$rb_{t-1}^{GE}.Bd, cb_{GE_{t-1}}^{GE}$		$rb_{t-1}^{GE}.Bd_{ECB_{t-1}}^{GE}$		0
Div											0
Profits		$-Pf^{GE}$	Pf^{GE}	$-Pb^{GE}$		$+Z$	Pcb^{GE}		$-Pcb^{ECB}$		0

ΔH	$-\Delta Hd^{GE}$							$\Delta Hs,\ cb^{GE}$			0
ΔMd	$-\Delta Md^{GE}$				ΔMd^{GE}						0
ΔL			ΔL^{GE}		$-\Delta L^{GE}$						0
ΔR					$-\Delta R^{GE}$			ΔR^{GE}			0
ΔA					ΔA^{GE}			$-\Delta A^{GE}$			0
ΔB^{US}					$-\Delta Bd, b_{GE}^{US}$						0
ΔB^{RW}					$-\Delta Bd, b_{GE}^{RW}$						0
ΔB^{SP}					$-\Delta Bd, b_{GE}^{SP}$						0
ΔB^{GE}					$-\Delta Bd, b_{GE}^{GE}$	ΔBs^{GE}		$-\Delta Bd, cb_{GE}^{GE}$			0
Total	0	0	0	0	0	0	0	0	0	0	0

$Z = Pcb^{GE} + (1-\alpha)P^{ECB} + Pb^{GE}$

Table A2 Balance sheet

Households	Firms	Com. banks	Government	Central bank
Hd^{GE}	–	–	–	Hs, cb^{GE}
Md^{GE}	–	$-Md^{GE}$	–	–
–	K^{GE}	–	–	–
–	$-L^{GE}$	L^{GE}	–	–
–	–	R^{GE}	–	$-R^{GE}$
–	–	$-A^{GE}$	–	A^{GE}
–	–	Bd, b_{GE}^{US}	–	–
–	–	Bd, b_{GE}^{RW}	–	–
–	–	Bd, b_{GE}^{SP}	–	–
–	–	Bd, b_{GE}^{GE}	$-Bs^{GE}$	Bd, cb_{GE}^{GE}