Real convergence and its illusions*

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Abstract

This paper uses a multi-country dynamic general equilibrium model to illustrate dynamic adjustments in a small open economy undergoing real convergence. Our results indicate that even if catching-up is driven by gradual processes, the dynamic responses of key macrovariables can be far from smooth. We also find that overly optimistic expectations about current or future productivity shifts can generate sizable boom-bust cycles. A comparison across alternative monetary regimes reveals that a flexible exchange rate helps to smooth real convergence processes and misperceptions associated with tradable sector productivity, while it generates more volatility in scenarios based on nontradable sector productivity developments.

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1 Introduction

The world history is full of episodes of long- and medium-term shifts in countries' income per capita positions. This is also true for a relatively homogeneous and developed club of EU economies. Even within the euro area, as suggested by substantial diversity in past growth performance, still persisting differences in per capita output across its member states, and diverse response to the recent financial crisis, the currently observed and possible future macroeconomic asymmetries cannot be attributed only to cyclical factors.

In recent years, an increasing number of cross-country studies have been based on micro-founded multi-country dynamic stochastic general equilibrium (DSGE) models, incorporating nominal and real rigidities sufficient to yield a reasonable empirical fit. While the early attempts usually used models designed to analyze only the cyclical properties of the data,[1] recent advances in constructing large and relatively comprehensive DSGE models have made it possible to construct more sophisticated scenarios, including changes in parameters affecting the selected long-run characteristics of the modelled economies. Two important projects in this area are the Global Economic Model (GEM) maintained at the IMF (Laxton and Pesenti, 2003) and the New Area-Wide Model (NAWM) constructed at the ECB (Coenen et al., 2008a). These models and their offspring have been used in a variety of applications, including scenarios of global current account rebalancing (Faruqee et al., 2005), labour tax reforms (Coenen et al., 2008a), fiscal consolidation (Coenen et al., 2008b), structural reforms (Everaert and Schule, 2006) or globalization (Jacquinot and Straub, 2008).

In this paper, we use the EAGLE, a multi-country dynamic general equilibrium model (Gomes et al., 2010), to analyze possible dynamic adjustments in a relatively small open economy undergoing real convergence processes. For illustrative purposes, we focus our calibration around the Spanish economy. Using the four-country setup of EAGLE, we link it not only to the rest of the euro area, but also to the US and the rest of the world.[2]

We define real convergence as productivity catch-up. While there is probably no need to argue that this kind of long- and medium-term processes is highly relevant for a number of small economies, including current and definitely most of prospective euro area members, we briefly illustrate our case by referring to the past experience of the so-called peripheral countries of the euro area, i.e. Greece,

[1] For instance, building on a closed-economy setup of Smets and Wouters (2003), de Walque et al. (2005) estimate a two-country model linking the euro area and the US.

[2] It has to be stressed that our goal is not to account for and describe in detail all past developments in Spain. Instead, the analysis is aimed to be more general, relevant for any small (current or prospective) member of a monetary union. Therefore, our approach contrasts with a number of empirical papers trying to scrutinize Spain's performance since it joined the euro area (Andres et al., 2010; Lopez et al., 2005; Rabanal, 2009; Sosvilla-Rivero and Herce, 2008).

Ireland, Portugal and Spain. As can be seen from Figure 1, these countries' productivity relative to the rest of the euro area has been far from stable over the period 1970-2005. Looking first at Spain, two distinct periods stand out. During the first one, spanning over the 1970s and most of the 1980s, rapid and sustained catching-up brought the Spanish tradable sector productivity to the average level observed in the rest of the club. Around early 1990s, however, real divergence set off and by now most of the previously accumulated gains have been reversed. Interestingly, fluctuations in the productivity gap calculated for the nontradable industries contributed substantially less to the medium and long-term shifts in Spain's position relative to the rest of the euro area. A similar observation can be made for Ireland, where the rapid productivity acceleration that started in mid-1990s was almost exclusively driven by sectors producing tradable goods. A different picture emerges for Greece, where both tradable and nontradable sectors accounted for the widening of the overall productivity gap till mid-1990s, while the subsequent catching-up could be attributed only to the latter. Finally, Portugal's tradable sector productivity gap relative to the rest of the euro area was very stable throughout the analyzed period and it was the nontradable sector that made some catching-up from mid-1980s to late 1990s possible.

This simple set of illustrations clearly suggests that long- and medium-term processes, which are differently distributed across sectors, can play an important role in accounting for asymmetric developments within the currency union, posing a challenge to common monetary policy. Therefore, examining how a catching-up (or falling behind) economy might respond to such scenarios seems to be highly relevant for understanding the nature and sustainability of the observed divergences within the euro area.[3] Needless to say, this kind of developments will become even more relevant with the euro being adopted by the relatively poor EU member states from the ex-communist block.

Apart from highlighting the real convergence mechanics in a fully-fledged multi-country DSGE setup, we also demonstrate how misperceptions about productivity shifts may contribute to significant fluctuations in macroeconomic variables. We do so by considering scenarios in which the economic agents in our analyzed economy treat a temporary shift in productivity as a permanent one or are faced with optimistic but false news about future productivity developments. Such scenarios can be thought of as a stylized description of expectations-led boom-bust cycles that have been observed in relatively poor European countries after they entered the euro area (the peripheral economies mentioned above) or fixed their currency to the euro (the Baltic countries). As the current euro crisis reveals, such country-

[3]Clearly, productivity developments are not the only plausible sources of real convergence or divergence within the euro area. Gomes et al. (2010) demonstrate that structural reforms increasing competition on labour and product markets may also lead to sizable changes in output per capita across countries. According to Bulir and Hurnik (2008), differences in product and factor market liberalization help to explain inflation differentials in the euro area.

specific developments can easily spill over to the rest of the monetary union, calling for a timely and coordinated policy response.

As pointed out by Collard et al. (2008), the idea of incorporating confusion about the nature (e.g. persistence) of productivity shocks into micro-founded macroeconomic models can be traced back to the seminal contribution by Kydland and Prescott (1982). A classical reference for a model featuring forecast errors about future productivity is Beaudry and Portier (2004). At least since the work by Orphanides (2003) it is well known that this kind of misperceptions may be quite substantial and affect the efficient policy conduct even in relatively developed economies. The importance of true news shocks to aggregate fluctuations has been recently established e.g. by Schmitt-Grohe and Uribe (2008) or Fujiwara et al. (2008), while Christiano et al. (2008) consider a false news shock and demonstrate how it can generate boom-bust cycles.

These papers, however, are based on closed-economy models, so they neglect channels arising from international linkages, which are particularly important for relatively open current and prospective euro area members. Also, the earlier contributions consider fluctuations in productivity (expected or unexpected) that are only transitory in nature. We argue that in the case of a catching-up economy, confusing temporary and permanent shocks or illusions about future permanent productivity improvements might be a more relevant description of reality.

Importantly from the policy perspective, we show how the dynamic responses to all these scenarios are shaped by a monetary policy regime. More specifically, we compare our baseline results to a fully floating exchange rate regime. In this respect, our paper is related to a recent work by Karam et al. (2008), who use the GEM to assess the costs and benefits of adopting the euro by a small emerging economy. However, the focus of their contribution are short-run adjustments to a relatively standard set of transitory shocks rather than to long-run processes or misperceptions discussed in this paper. A more analytical approach is offered by Berger (2006) and Sanchez (2007), at the expense of abstracting from a number of channels considered important in contemporaneous DSGE modelling.

Our main results indicate that even if real convergence takes the form of a gradual process, the dynamic responses of key macrovariables may be far from smooth. It follows that they can be easily misinterpreted as manifestations of growing imbalances requiring policy intervention, while, at least from the model perspective, they are just optimal responses of the private sector, given the monetary and fiscal feedback rules. We also find that misperceptions about permanent shifts in productivity can generate sizable boom-bust cycles and so can be relevant in accounting for cyclical deviations

from a sustainable real convergence path. A comparison across alternative monetary regimes reveals that a flexible exchange rate helps to smooth real convergence processes and misperceptions associated with tradable sector productivity. This effect is particularly strong for inflation, non-negligible but substantially weaker for output, consumption and investment, while the current account position is hardly affected. In contrast, the free float usually generates more volatility in scenarios based on nontradable sector productivity developments.

These findings add to the discussion on the optimal monetary regime along the real convergence path. They imply that, for a small open economy that faces rapid and possibly erratic productivity gains in the tradable sector, allowing the exchange rate to float can bring benefits in form of better macroeconomic stability. The clear implication for the prospective euro area members from eastern Europe is the following: giving up monetary autonomy before real convergence has been completed should be accompanied by enhancing the flexibility of fiscal (or macroprudential) policy. Otherwise, effective stabilization of the economy can prove difficult.

The rest of this paper is organized as follows. Section two provides a brief overview of the EAGLE model. Its parameterization and calibration is discussed in section three. Section four defines and presents the real convergence scenarios. An illustration of possible misperceptions along the convergence path is presented in section five. Section six concludes.

2 Bird's-eye view at EAGLE

The EAGLE ("Euro Area and GLobal Economy") model is a relatively large and comprehensive DSGE model, designed to cover four regions of the world economy, two of which constitute a monetary union. The model structure builds largely on the NAWM, extending it in several dimensions.[4] Below, we provide only a brief overview of the main features of EAGLE, referring the reader to the source documents for details.

Except for the monetary policy regimes and some parameter values, each region covered in EAGLE is modelled in a symmetric fashion. The economic areas are linked with each other by bilateral trade relations and international financial markets, assumed to be incomplete and so allowing for only imperfect risk sharing across countries.

Each region is populated by two types of households, differing in their ability to participate in asset markets. One group of households can transfer its wealth intertemporally by holding money, trading

[4]See Jacquinot and Straub (2008) for an intermediate stage between the NAWM and EAGLE.

bonds and accumulating physical capital, while the only asset held by other households is money. There is monopolistic competition on the labour market, so each household acts as a wage setter for its differentiated labour service supplied to firms. Wage rigidities are modelled using the staggered contract setup as in Calvo (1983), augmented with an indexation scheme to past and steady-state consumer price inflation for those who cannot reoptimize.

There are two types of intermediate goods: nontradables and tradables. Each is produced by a continuum of monopolistically competitive firms, using as inputs labour and capital services (allowing for time-varying capacity utilization) supplied by households. Firms set prices of their differentiated output according to the Calvo-type scheme with indexation. Tradable intermediate goods are subject to international trade, with export prices denominated in the importing country's currency.

Different varieties of domestic and imported goods are aggregated by perfectly competitive final goods firms, operating at a country level. Aggregation of imports into a homogeneous import good is subject to adjustment costs whenever the country trade structure changes. The final consumption good is produced by combining nontradables with a bundle of home-made tradables and imported goods. The final investment good is defined in a similar manner, while the final government good has only nontradable content.

The fiscal authority levies both proportional and lump-sum taxes and earns seignorage on outstanding money holdings. On the expenditure side, the government purchases final goods and makes transfer payments to households. Transfers and lump-sum taxes are not evenly distributed across the two types of households, with those having full access to asset markets receiving less and paying more in per-capita terms. The fiscal debt is held in form of government bonds and its long-term target level is achieved by a smooth adjustment in lump-sum taxes.

There are three monetary authorities in the model, one defined for the common currency area and two for the remaining regions. All follow a Taylor-type interest rate feedback rule, specified in terms of deviations of consumer price inflation and output from their target (steady-state) levels, allowing for some interest rate smoothing.

3 Parameterization and calibration

We make one departure from the original EAGLE specification described in Gomes et al. (2010). Rather than assuming that the costs of varying capacity utilization have to be covered by a current flow of final investment goods, we follow Greenwood et al. (1988) and specify these costs in the form of an

increase in capital depreciation. Using this apparently innocuous respecification of the model, we can allow for some (though limited if compared to the parameterization of the NAWM) variation in capacity utilization and still obtain a realistic short-run response of investment to productivity shocks.[5]

The original version of EAGLE is calibrated to represent the following regions of the world economy: Germany, the rest of the euro area, the United States and the rest of the world. Given the main focus of our analysis, which is a relatively small and converging economy, we recalibrate the euro area block in EAGLE to single out Spain rather than Germany. It has to be stressed that this choice does not mean that we aim at fitting exactly the model to the Spanish data (and its cyclical components in particular). We want rather our analysis to be more general and relevant for any present or prospective euro area member with a real convergence potential. Therefore, we keep many of the model parameters symmetric across the four regions, even though making them heterogeneous could increase the overall fit of the model.

Our strategy to calibrate EAGLE can be divided into two standard stages. First, we pin down a subset of parameters governing some key steady-state ratios, using their approximate empirical counterparts.[6] Next, we calibrate the remaining parameters of the model, drawing heavily on the original version of EAGLE, which in turn can be traced back to the parameterization of the NAWM or the GEM, as well as estimated small scale DSGE models for the euro area and the United States (Smets and Wouters, 2003; Christiano et al., 2005; de Walque et al., 2005). A detailed list of the calibrated parameter values are available in the working paper version of this article (Kolasa, 2010).

4 Real convergence scenarios

In this section, we first define our baseline scenarios and express them in terms of model variables, parameters and assumptions. We next use the EAGLE model to inspect the response of the main macroeconomic aggregates to each scenario. We present our results in two variants, highlighting the policy challenges related to adopting the optimal exchange rate regime.

The first variant models a converging economy as a part of a common currency area. The second considers an alternative regime, in which our catching-up economy follows a fully independent monetary policy, with a freely floating exchange rate. In this case, the parameterization of the interest rate feedback rule is the same as for the other three regions of the world economy. In the alternative variant,

[5] See Altig et al. (2005) for a detailed discussion on the relation between costs of varying capacity utilization and a dynamic response of investment to a neutral technology shock.

[6] More precisely, some of the key steady-state ratios give us restrictions on the parameter space rather than fixing them unambiguously. Whenever relevant, these restrictions are observed in the second stage of calibration.

all structural parameters of the model are the same as in the baseline monetary union case. In other words, our exercise just compares the impact of monetary regimes across otherwise identical economies.

Although in general DSGE models are considered to be much more immune to the Lucas critique than less micro-founded approaches, one cannot completely rule out that some of the parameters describing the optimization problems of economic agents are in fact endogenous to the monetary regime. In particular, our simulations neglect the channel discussed by Grubel (2005), according to whom small countries surrendering their monetary sovereignty may benefit from the fact that they import an institutional framework that is free from political influences. All our subsequent results should be interpreted with such caveats in mind.

We base our main catching-up scenario on the sector producing tradable goods. This is motivated by the common description of productivity convergence in the growth literature, based on the diffusion of technological advances between R&D intensive industries, usually open to international trade. Such an assumption also squares well with productivity developments in Spain and Ireland discussed in the introduction and also general real convergence patterns observed in the EU new member states (Bijsterbosch and Kolasa, 2010).

More specifically, we consider a scenario in which a small member of a currency union embarks on the following productivity catching-up path:

$$\left(\frac{A_{T,t}}{A^*_{T,t}} - 1\right) = (1-\alpha)\left(\frac{A_{T,t-1}}{A^*_{T,t-1}} - 1\right) \tag{1}$$

$A_{T,t}$ and $A^*_{T,t}$ are the tradable sector total factor productivity (TFP) levels in the converging economy and the (more developed) rest of the monetary union, respectively, and α is the parameter controlling the speed of convergence. Equation (1) can be seen as the law of motion for the productivity gap, defined as the percentage difference between the current and target TFP, with the latter assumed equal to that prevailing in more advanced economies. A useful feature of this specification is that it implies a declining profile for the speed at which the technological gap is reduced, consistently with a standard description of such processes (Barro and Sala-i-Martin, 1997).

While calibrating the catching-up scenario, we set the initial difference between the current and target TFP in the tradable sector to 11%, which is roughly consistent with Spain's labour productivity gap vis-a-vis the rest of the euro area of 17% observed in 2005 (see Figure 1).[7] The speed of convergence

[7]This is just a stylized and mechanical approximation, calculated by simply correcting the labour productivity gap for factor elasticities of output. Since such a calibration of the TFP gap neglects a number of intratemporal mechanisms present in the model (e.g. intersectoral reallocations, changes in relative prices, consumption-leasure choice, international spillovers), driving it to zero does not result in exact equalization of labour productivity across Spain and the euro area

is calibrated at 0.05, implying that half of the gap between the current and target TFP level is eliminated after about 14 quarters, while after 11 years the gap is reduced to just 1%.

The long-run (i.e. after the catch-up and all short-term adjustments have been completed) impact of this scenario is presented in the first column of Table 1.[8] We can see that higher tradable sector productivity leads to higher steady-state output not only in this sector, but also in the nontradable sector, though naturally to a much lesser extent. Given higher tradable content, investment expands by more than consumption. Higher productivity boosts international trade, with exports gaining in real terms more than four times as much as imports. Since both the original and the new steady-state feature a zero nominal trade balance, this expansion in export volume has to be offset by a depreciation of the terms of trade, i.e. an increase in import prices relative to export prices. Similarly, the new equilibrium on the domestic market requires an increase in the internal real exchange rate, defined as the price of nontradables relative to the price of the domestically consumed tradable basket. In line with the Harrod-Balassa-Samuelson (HBS) effect,[9] the consumer-price-based external real exchange rate appreciates. Due to a positive wealth effect, labour supply declines, leading to a slight decrease in total hours worked. Given the low size of the converging economy, international spillovers related to this scenario are very limited. Output in the rest of the euro area basically does not move, while consumption increases by a notch, following a favourable change in this region's terms of trade. Spillovers to the US and the rest of the world (not reported) are virtually zero.

The dynamic responses of the main macrovariables are plotted in Figure 2. Starting from our first variant (monetary union - solid lines), we first note that the responses in general do not evolve as smoothly as the underlying productivity path described by equation (1). In particular, investment shoots up and then is increasing at a somewhat slower rate. The initial reaction of private consumption relative to its target level is very similar, but then it decelerates significantly and approaches its steady-state at a very low pace. Compared to domestic demand components, the expansion in total output is relatively moderate and smooth, so the trade balance deteriorates. The size of the deficit may be considered as not very high (0.4% of output at the trough), but it is sustained for an extended period of time, turning positive only after eight years, which is when about two-thirds of the convergence process has been completed. Since a mounting foreign debt needs to be serviced, deterioration in the current account is deeper and its negative balance lasts even longer. Interest paid on net foreign liabilities, which at a trough reach nearly 10% of nominal GDP, is the main factor behind deceleration in consumption

in our model simulations presented below.

[8] Changing a monetary regime has no impact on the model's steady-state equilibrium.

[9] See Harrod (1933), Balassa (1964) and Samuelson (1964).

discussed above. Increased demand pressures during the first years after the shock push inflation up. Since our economy is only a small part of the monetary union, nominal interest rates remain virtually unchanged and the rise in inflation is quite substantial. Its deviation from the area-wide target falls below 0.2 percentage points only after four years and stays above 0.1 for about a decade. An increased inflation rate relative to the rest of the common currency area can be seen as a manifestation of the HBS effect and results in a strong appreciation of the real exchange rate.

If the exchange rate is allowed to float (dashed lines), it appreciates significantly on impact. The dynamic responses of output, consumption and investment are smoother than it was the case in the monetary union setup. The initial deterioration in the current account balance is also slightly more moderate, but then hardly distinguishable from the union case. Most importantly, a relatively sharp appreciation of the nominal exchange rate virtually allows to eliminate the surge in inflation.

We have argued that productivity convergence based on the tradable sector provides a more realistic description of a typical catching-up process. Still, at least for comparison, it might be useful to see how the response of key macroaggregates would change if our lagging economy embarked on a convergence path based on productivity gains in the nontradable sector.

The scenario is implemented in a similar fashion as the previous one, so the catching-up trajectory evolves in an analogous way as represented by equation (1). We calibrate the initial difference between the current and target nontradable sector TFP level at 4%, which corresponds to a half of Spain's labour productivity gap vis-a-vis the rest of the euro area observed in 2005 (equal to about 13%, see Figure 1). As before, the speed of convergence is set to 0.05.

The long-run effects are presented in the second column of Table 1. They confirm the previous observation that a sector specific productivity shock affects output in both sectors in the same direction. Looking at domestic demand components, one can see that a shift in nontradable sector productivity raises consumption more than investment. This is the opposite to what we observed in the case of the tradable sector productivity scenario and results from differences in the tradable-nontradable composition across these two final goods. One can also note a much smaller than before effect on foreign trade volumes, even if one takes into account that the magnitude of shocks are not the same. The long-run response of the internal and external real exchange rates are just the HBS effect in reverse. A limited expansion of exports over imports implies only a moderate depreciation of the terms of trade, which makes the magnitude of spillovers to Spain's trading partners virtually equal to zero. As before, the wealth effect decreases the labour supply.

The dynamic responses to the convergence scenario in the nontradable goods sector are illustrated in Figure 3. Starting with the monetary union variant (solid lines), the most striking difference compared to the tradable sector scenario is the initial decrease in investment, which is reversed only in the sixth year after the shock. This fall is driven by the expected further rise in productivity (given its gradual rather than instantaneous shift) and the corresponding postponement of investment.[10] A similar mechanism is also at work if productivity convergence is based on the tradable sector. In that case, however, it is more than offset by the expected appreciation of the real exchange rate, which encourages taking loans abroad. The opposite holds true if real convergence relies on nontradable sector productivity gains, as in this case the real exchange rate depreciates. Indeed, as can be seen from the response of the current account, it actually improves and goes negative only after seven years. The same considerations also explain why consumption does not increase as fast as in our previous scenario, but moves more smoothly towards its target level.[11] Consistently with the HBS effect in reverse, productivity gains in the nontradable sector lead to a fall in inflation, which does not die out completely for an extended period of time.

In the free float regime (dashed lines), the exchange rate depreciates sharply. The short-run response of output and its expenditure components is less smooth and regular as in the monetary union case. The nominal exchange rate depreciation and higher demand pressures actually lead to an increase rather than a fall in inflation, which stays above the target for an extended period of time.

5 Misperceptions along the convergence path

We have seen in the previous section that even smooth processes, like gradual productivity catching-up, do not necessarily result in smooth dynamic responses of the main macrovariables. Therefore, without knowing the underlying forces, such developments could be easily misinterpreted as manifestations of growing imbalances, requiring policy intervention to avoid huge boom-bust swings, while in fact they are just optimal (at least from the model perspective) responses of the private sector, given the monetary and fiscal policy feedback rules.

On the other hand, real convergence processes are obviously far more complicated than suggested by the stylized scenarios set up above. In particular, their driving forces are to a large extent neither smooth

[10] See Jacquinot and Straub (2008) for a similar interpretation of this result.

[11] Another (though far less important) reason for a different response of domestic demand to gradual productivity gains in the tradable vs. nontradable sector is higher price flexibility of the former. This results from our calibration, which assumes that prices of exported goods are reoptimized more frequently than prices of goods sold domestically. See Gali (1999) for an exposition of the relation between price stickiness and a dynamic response of hours worked (which can be extended to factor inputs in general) to a permanent productivity shock.

nor deterministic. Transitory productivity shocks coexist with permanent shifts and it may be difficult to distinguish between them straight after they hit the economy. In this section we demonstrate how such misperceptions can generate sizable boom-bust cycles and hence account for the patterns observed in a number of relatively poor European countries after their euro area accession or fixing their currency to the euro.

We consider two misperceptions scenarios. The first is based on confusing a temporary productivity shift with a permanent one. The second scenario concerns optimistic expectations about future productivity, which however fail to materialize.

We define the first misperception scenario as a temporary shift in tradable sector productivity, which rises by 1% and comes back to its original level after two years. However, once the shock hits, it is perceived as permanent and only after it unwinds do the agents realize its true nature.

The dynamic response of selected variables to such a scenario under the monetary union is illustrated in Figure 4 with solid lines, while the dotted line shows the corresponding response to a truly permanent productivity shift. It is clear that if agents are faced with a shock that is perceived as permanent, the economic activity increases, with output and investment even overshooting the new steady-state. The current account deteriorates, the real exchange rate appreciates and inflation rises. Once it becomes clear that the shock is only temporary, the optimal plans of economic agents have to be substantially revised. Consequently, output and domestic demand contract sharply, falling below their initial levels within a year. A nearly instantaneous improvement in the current account balance resembles a "sudden stop". Inflation falls sharply and quickly turns into deflation. As a result, the real exchange rate depreciates.

In the second misperception scenario, the economic agents receive news, according to which tradable sector productivity is going to increase permanently in one year by 1%. After a year, however, this news turns out to be false.

Figure 5 depicts the dynamic response to this false news shock under the monetary union (solid line), together with a hypothetical situation in which the news would be true (dotted line). In qualitative terms, this scenario turns out to result in similar responses as the previous one. On impact, consumption and investment start to rise. Output goes up as well, but not enough to satisfy the domestic demand, so the current account turns negative. Increased demand pressures translate into higher inflation and the exchange rate appreciates. Once the expectations turn out to be an illusion, the economic activity contracts, inflation goes down and turns into deflation, and the exchange rate depreciates. There is also

some improvement in the current account balance, but it takes about another three and a half years before it comes back to zero.

These two narratives, even though stylized, resemble episodes observed in a number of countries, including European economies that were growing fast before the financial crisis. Relative prosperity brought by strong economic growth fuelled overly optimistic expectations about its sustainability. For some relatively poor economies, the mere prospect of joining the euro area was treated as a chance to accelerate real convergence. As a result, private demand boomed and high tax revenues made the fiscal authorities complacent. Revision of these unrealistic plans was a severe hit to private agents and revealed huge fiscal imbalances that resulted in the currently observed sovereign debt crisis in Europe.

Importantly, by comparing across the monetary regimes, one can note that a flexible exchange rate (dashed lines in Figures 4 and 5) tends to somewhat mitigate the boom-bust pattern in the response of output and private demand components. This is also true for inflation, especially in the false news variant. The bottom line is that fixing the currency could have been an important amplifier for the observed expectations-led boom-bust cycles in some European countries discussed above.

Finally, we briefly describe the results for an analogous pair of misperception scenarios based on productivity developments in the nontradable sector (not illustrated in figures). Confusing a transitory shock with a permanent one under the monetary union turns out to lead to qualitatively similar dynamic responses of the key real variables as it was the case with the shock originating from the tradable sector. Naturally, the response of inflation and the real exchange rate are of the opposite sign to what we have seen before. Similar observations can be made in the case of the false news shock, except that it fails to generate a boom-bust cycle in investment. This is related to the initially negative response of investment following expectations of future productivity improvements in the nontradable sector, the mechanics of which we discussed before. If the exchange rate is allowed to float, the response of inflation is smoother. On the contrary, variables describing the real economic activity display much more pronounced swings under a free float than in the common currency case.

6 Conclusion

In this paper we have used EAGLE, a multi-country dynamic general equilibrium model, to analyze dynamic adjustments in a relatively small economy undergoing real convergence processes within a monetary union. We considered a set of scenarios related to productivity catch-up and misperceptions about productivity developments.

Our results indicate that even if real convergence takes the form of a gradual process, the dynamic responses of key macrovariables can be far from smooth. Moreover, misperceptions about productivity shifts can be an important source of cyclical deviations from a sustainable real convergence path. We find that if these processes are related to tradable sector developments, keeping the monetary autonomy helps to reduce the volatility of key macrovariables, especially of inflation, but also (though to lesser extent) of output, consumption and investment. In contrast, being a part of a monetary union seems to smooth developments originating from the nontradable sector.

As we have stressed, even though our quantitative results rely on a model that is calibrated with a focus on the Spanish economy, our findings are aimed to be relevant for other countries, particularly for the EU new member states from central and eastern Europe. All of them are relatively small economies undergoing real convergence processes and some of them have been experiencing significant boom-bust cycles. These countries are also expected to join the euro area, and this will probably happen long before real convergence processes become relatively less relevant for the policy makers. Given the main patterns of real convergence observed in the new member states, i.e. rapid gains in tradable sector productivity and strong export performance, our results suggest that entering the euro area (or the ERM2 system) may be followed by an increase in volatility at an aggregate level, posing a challenge for policy makers. Of course, being a member of the euro area is much more than just sharing a common currency, so our results should not necessarily be interpreted as a suggestion that central and eastern European countries would be better off sticking to their current currencies.

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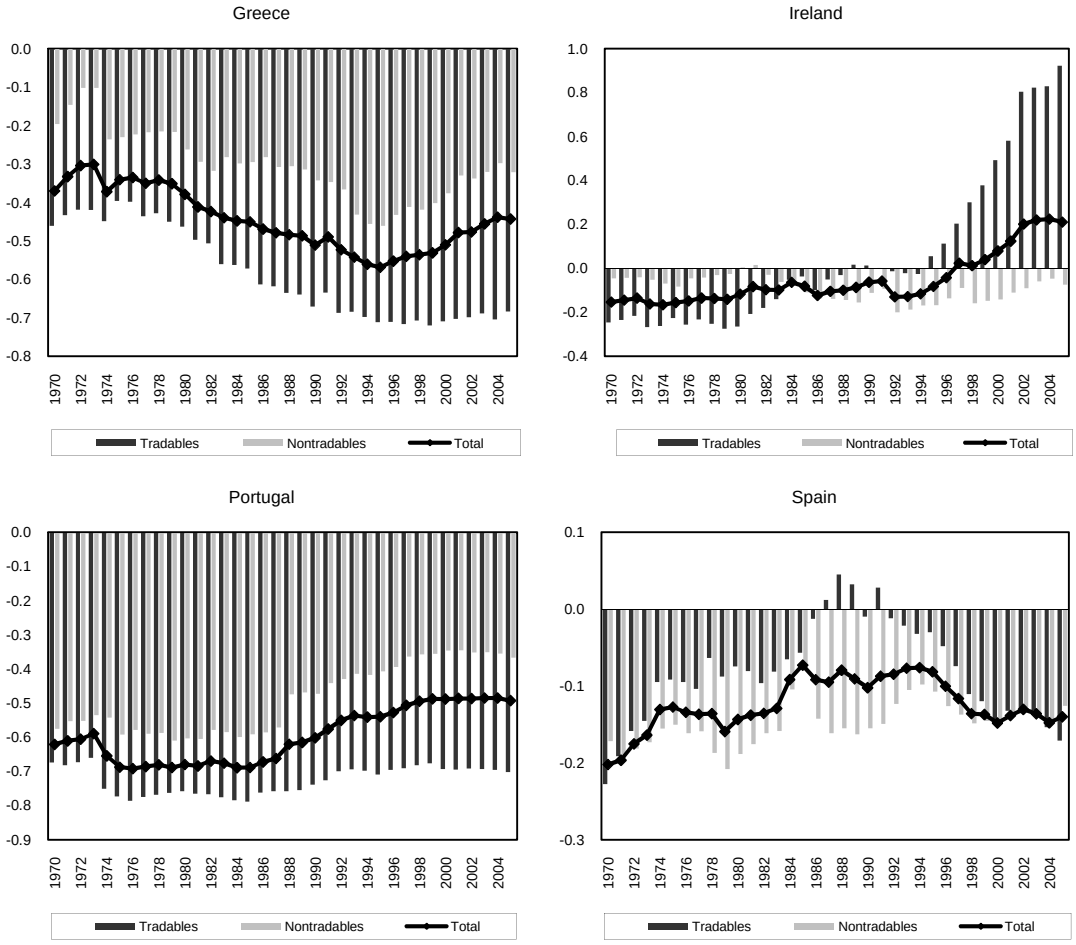
Tables and figures

Table 1 Long-run impact of real convergence scenarios

	Productivity shock in tradables	Productivity shock in nontradables
Output	5.6	3.0
Tradable	11.2	1.5
Nontradable	2.5	3.8
Consumption	3.6	3.1
Investment	6.5	1.8
Exports	8.2	1.2
Imports	1.9	0.3
Terms of trade	6.2	0.9
Real exchange rate	-3.6	3.9
Internal exchange rate	8.3	-4.7
Hours worked	-1.2	-1.0
Real wage rate	4.9	4.1
REA Output	0.0	0.0
REA Consumption	0.1	0.0

Notes: All variables reported as percentage deviations from their initial steady-state levels.

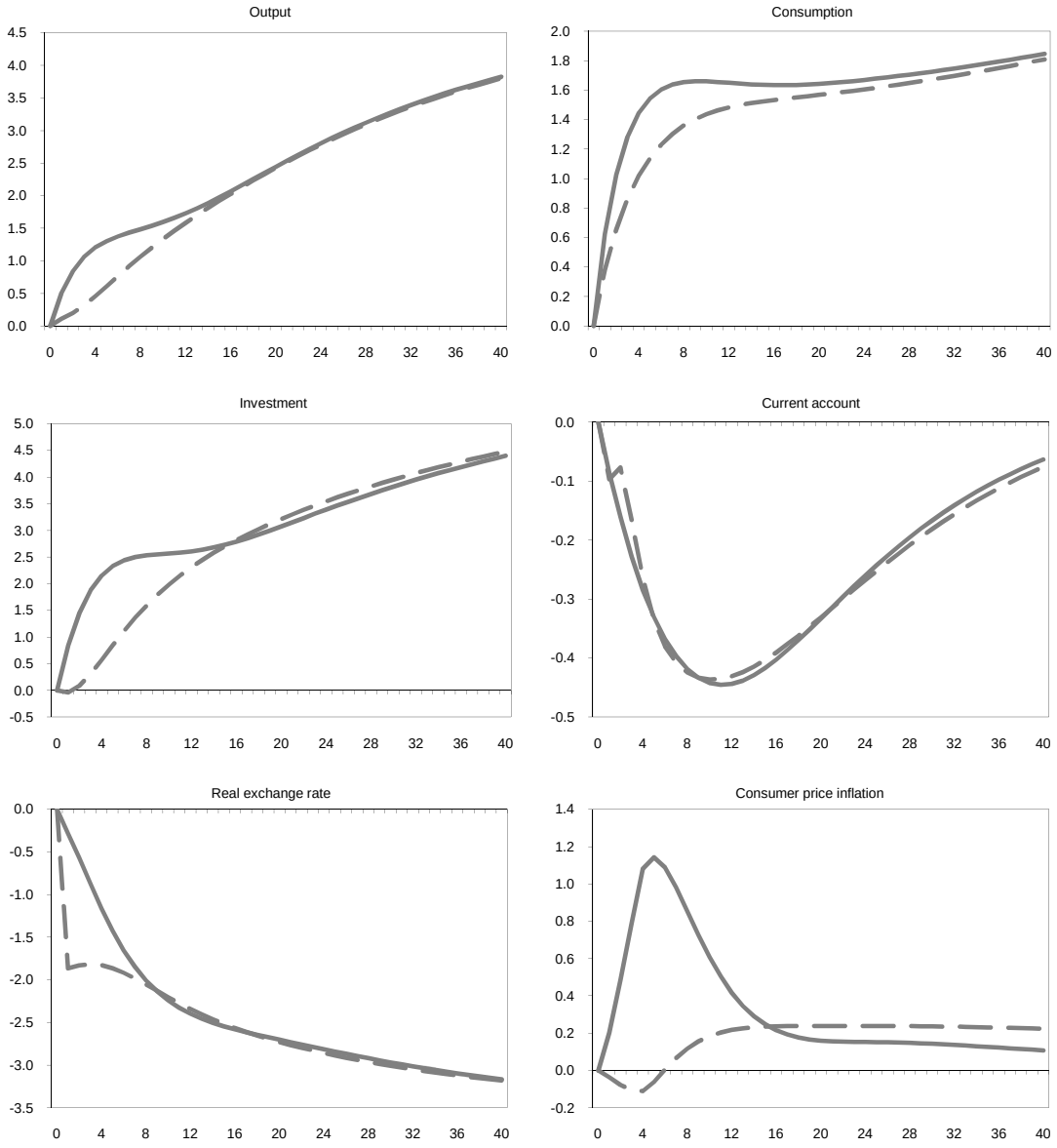
Fig. 1 Productivity gap in the euro area peripheral countries vis-á-vis the rest of the euro area



Notes: The productivity gap is defined as the percentage difference between gross value added per hours worked in a given country and that in the rest of the euro area. Aggregation and comparison is based on industry specific purchasing power parities. The tradable sector comprises the following industries: agriculture (NACE A and B), mining and quarrying (C) and manufacturing (D). The nontradable sector covers the rest of the market economy, i.e. it excludes real estate activities (NACE 70) as well as community and social services (L to O).

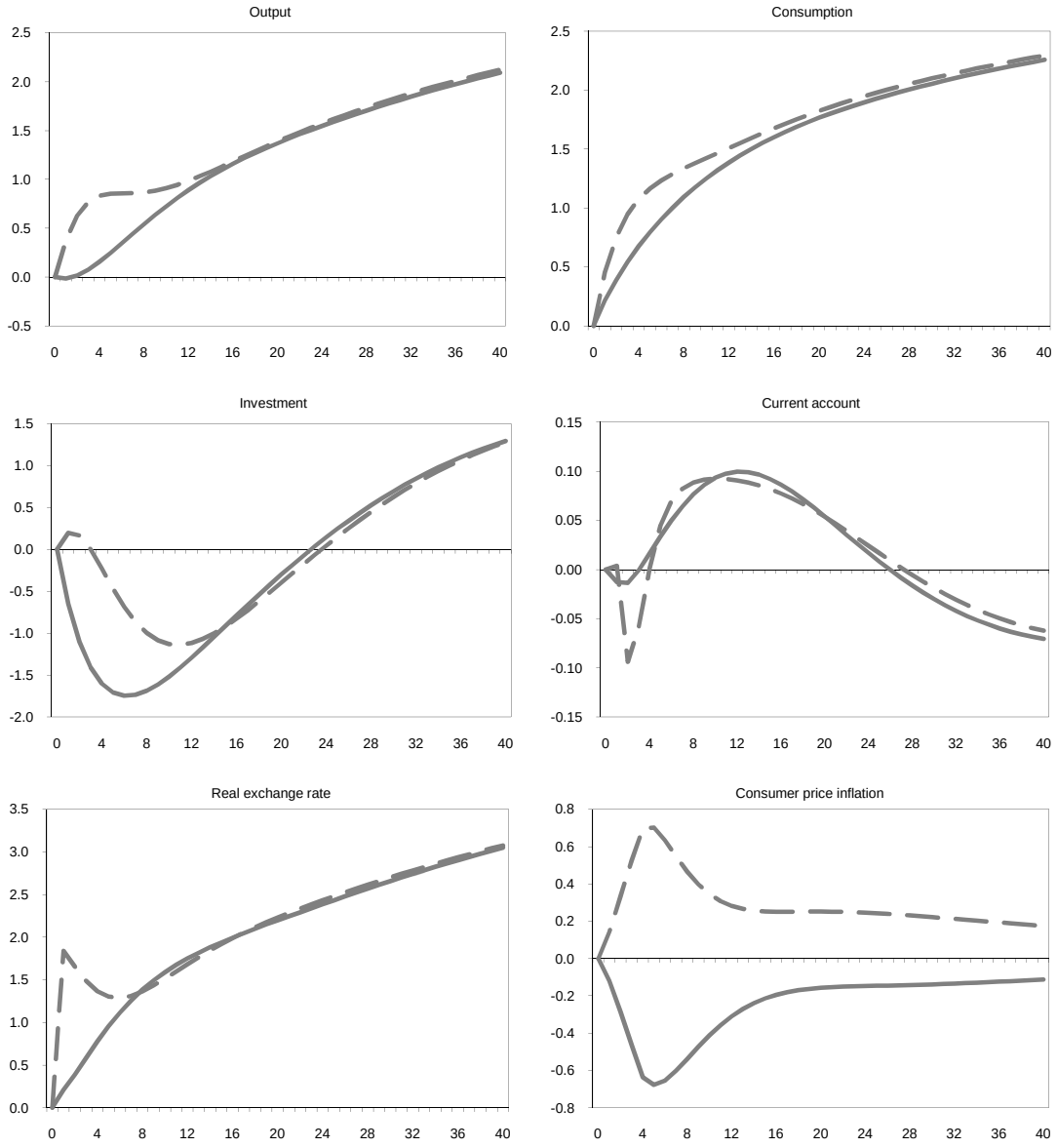
Source: Own calculations based on data from EU-KLEMS.

Fig. 2 Dynamic responses to productivity convergence in the tradable sector



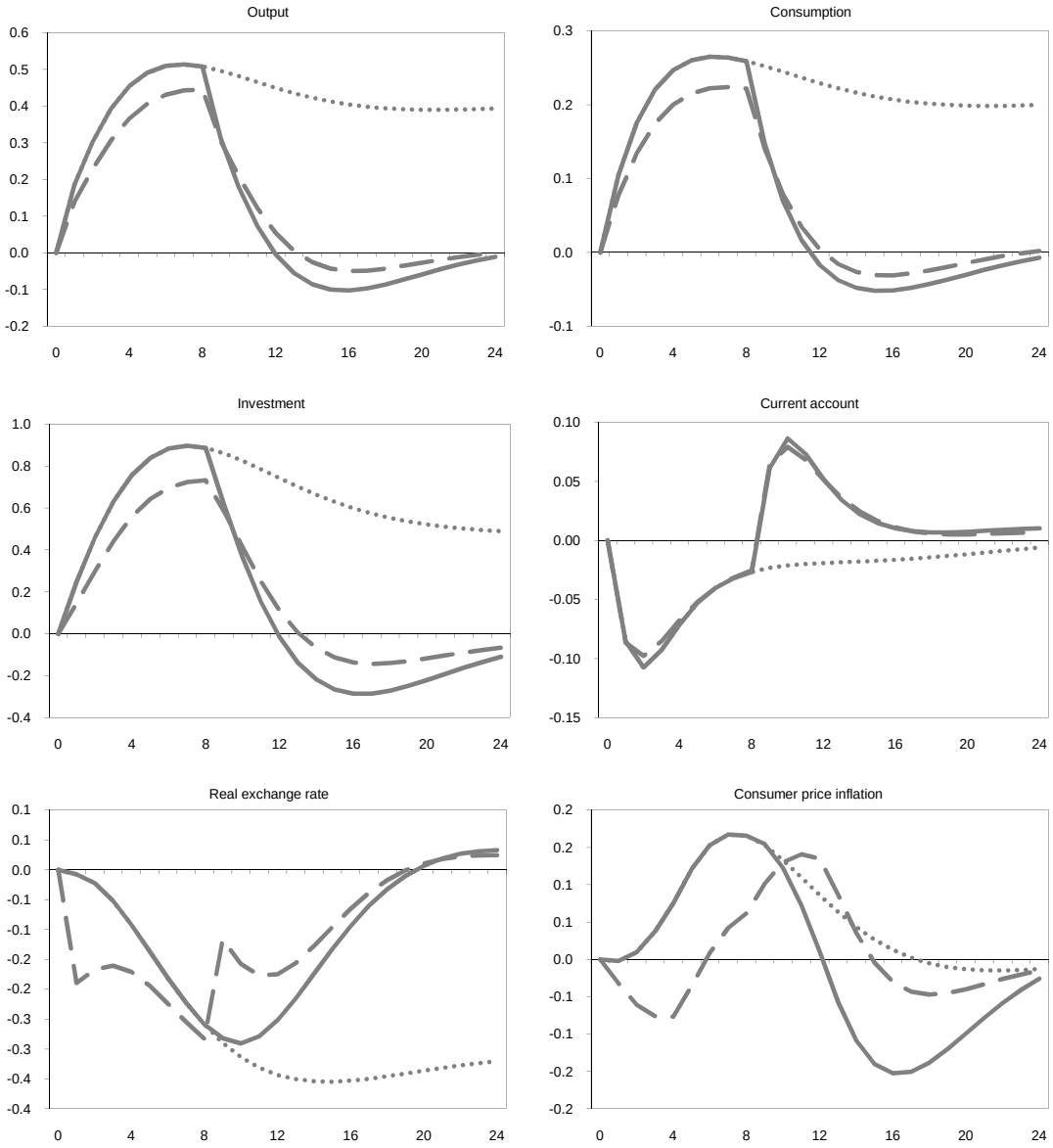
Notes: The solid lines illustrate the dynamic responses under the monetary union, while the dashed lines show the flexible exchange rate regime. The current account balance is expressed relative to nominal GDP and, together with consumer price inflation and the short-term interest rate, reported as percentage point deviations from their initial steady-state levels. All remaining variables are reported as percentage deviations.

Fig. 3 Dynamic responses to productivity convergence in the nontradable sector



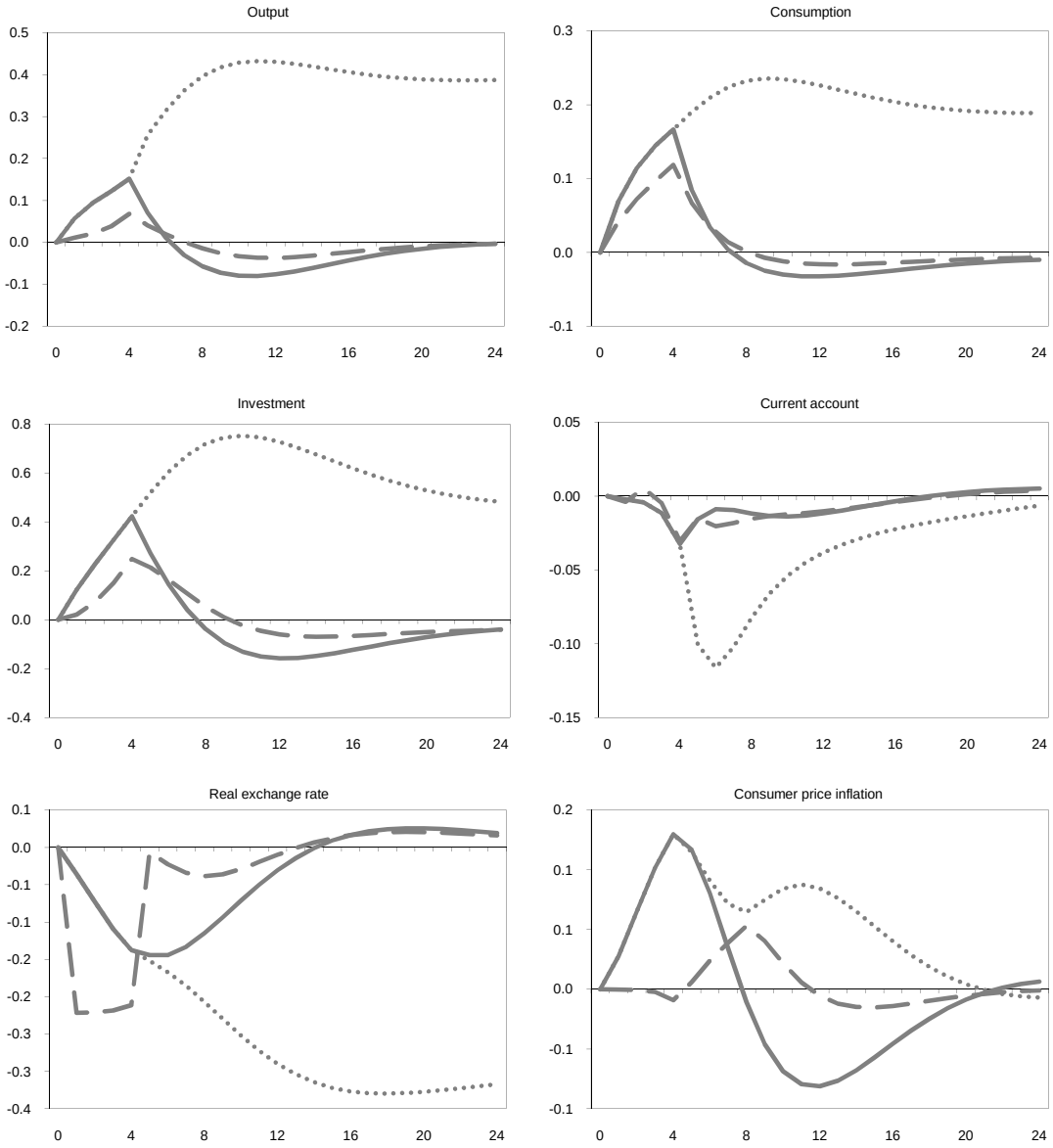
Notes: The solid lines illustrate the dynamic responses under the monetary union, while the dashed lines show the flexible exchange rate regime. The current account balance is expressed relative to nominal GDP and, together with consumer price inflation and the short-term interest rate, reported as percentage point deviations from their initial steady-state levels. All remaining variables are reported as percentage deviations.

Fig. 4 Transitory (but perceived as permanent) productivity shock in the tradable sector



Notes: The solid lines illustrate the dynamic responses under the monetary union, the dashed lines show the flexible exchange rate regime, while the dotted lines show how the economy would evolve (in the monetary union variant) if the shock was indeed permanent. The current account balance is expressed relative to nominal GDP and, together with consumer price inflation and the short-term interest rate, reported as percentage point deviations from their initial steady-state levels. All remaining variables are reported as percentage deviations.

Fig. 5 Expected (but failing to materialize) productivity shock in the tradable sector



Notes: The solid lines illustrate the dynamic responses under the monetary union, the dashed lines show the flexible exchange rate regime, while the dotted lines show how the economy would evolve (in the monetary union variant) if the news was true. The current account balance is expressed relative to nominal GDP and, together with consumer price inflation and the short-term interest rate, reported as percentage point deviations from their initial steady-state levels. All remaining variables are reported as percentage deviations.