Euro area membership and the probability of a sudden stop: an empirical assessment

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Keywords: capital flows, sudden stop, push and pull factors, European Union, Euro Area

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Abstract

Using quarterly data from 1995 until 2014, we investigate whether Euro Area (EA) membership influences the probability of a European Union member state going through an episode of sudden stop or through an episode of bonanza, after controlling for a number of push and pull factors. Overall, our results do not support the claim that EA membership constituted a weakness during the recent financial crisis. On the contrary, we find that EA membership decreases the probability of a sudden stop, all else equal. We find no evidence that being part of the EA has a direct effect on the probability of bonanza. When allowing for interaction effects, our results suggest that EA membership might have mitigated the risk perception arising from higher government debt in the case of bonanzas.

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1. Introduction

International capital movements have the potential to induce a more efficient allocation of capital, but they are a mixed blessing. Large capital inflows into a country (bonanzas), can lead to excessive leverage, asset price booms, loss of international competitiveness, and ultimately to unexpected capital flow reversals whenever investors perceive the return on domestic assets to be suddenly threatened (see Fuentes et. al, 2014, on the economic and policy challenges raised by high capital mobility). In the case of Europe, after a period during which capital flew mostly from the centre to the periphery, the collapse of Lehman Brothers triggered a series of sudden stops, some of which morphed into banking crises, sovereign debt crises, and recessions.[1] This sequence of events raised the question as to whether free capital mobility in the context of the Common Market could threaten the macroeconomic stability that the adoption of a single currency was supposed to bring about. This fear materialized in a policy response, in particular the setting up of a new surveillance mechanism in the scope of the European Semester, the Macroeconomic Imbalances Procedure.[2] The aim of this new mechanism is to limit the size of external imbalances in countries belonging to the Euro Area (EA), a goal that can be interpreted as a light substitute for capital controls.

[1] A discussion of the factors underlying the emergence of large current account deficits in the Euro Area is in Blanchard and Giavazzi (2002). For a thoughtful interpretation of the role of capital flow reversals in the development of the EU crisis, see Baldwin et al. (2015).

[2] EU Regulation Nº1176/2011 on the prevention and correction of macroeconomic imbalances. EU Regulation Nº 1174/2011 on enforcement measures to correct excessive macroeconomic imbalances.

A question that was raised in the context of the European crisis is whether countries belonging to the EA have been more exposed to the boom-bust effects of capital flows than countries that remained outside the EA. The reasoning is two-fold: on one hand, the perception that the currency risk had disappeared among EA countries could have induced a sentiment of safety amongst investors, biasing their portfolio choices. This argument had been already put forward in the context of the Asian Financial crises (see, for instance, Dooley, 1996): exchange rate stability in the context of liberalized but poorly supervised financial systems may create an opportunity for investors to reap private returns that do not fully reflect the social return of the resources being transferred to the recipient country. In light of this reasoning, one would expect countries belonging to the EA to be more exposed to the risk of excessive leveraging caused by capital flow bonanzas than countries that remained outside the EA. On the other hand, during the European debt crisis, it was argued that EA countries were perceived by investors as more risky than other countries with similar problems, on the grounds that they do not have a central bank which in troubled times can support the national Treasury as "lender of last resource" (Giavazzi and Spaventa, 2010, De Grauwe, 2011). In light of this argument, one would expect the probability of a sudden stop to be higher in countries belonging to the EA, everything else constant. To the best of our knowledge, however, there has been no attempt in the literature to formally test whether EA membership has indeed amplified the exposure of a European Union (EU) member state to the risk of extreme capital movements.

This paper investigates whether being part of the EA has influenced the probability of an EU member state to face an extreme capital movement. The paper draws on the literature launched by Calvo, Leiderman, and Reinhart (1993), distinguishing domestic (*pull*) and global (*push*) factors underlying these episodes. In

recent years many papers have been devoted to the analysis of the factors that drive these extreme capital movements, using different databases and approaches (Fernandes-Arias, 1996, Chuhan et al., 1998, Reinhart and Reinhart, 2009, Jevcak and Suardi, 2010, Fratzsher, 2011, Forbes and Warnock, 2012, Gosh et al., 1992, among others; for a survey, see Montiel, 2013). We add to this literature by investigating the specific question as to whether EA membership makes any difference in the likelihood of an extreme capital movement, after controlling for other possible determinants.

In our investigation we use quarterly data from 1995 until 2014, covering countries that are currently part of the EU (France is not included due to data unavailability). Using this sample we first identify the episodes of extreme capital movements, following the methodology proposed by Merler and Pisani-Ferry (2012). As expected, we find a higher prevalence of bonanzas in the period 2000-08, and a higher prevalence of sudden stops after 2008. Next, we investigate whether EA membership has influenced the probability of a member state to face a sudden stop or a bonanza. To address this question we estimate a model for the conditional probability of a country to go through an episode of extreme capital movement (as in Forbes and Warnock, 2012), and assess whether being part of the EA makes any difference.

The paper proceeds as follows. In Section 2 we identify the episodes of extreme capital movements in EU countries after 2001. In Section 3 we investigate which factors better predict the conditional probability of a country to go through an episode of sudden stop or of bonanza, and specifically if EA membership is one of those factors. In Section 4 we conclude.

2. Identifying episodes of extreme capital movements

The first step of our investigation is to identify episodes of sudden stop and of bonanza amongst the EU countries. To this end, we first need a measure for the size of capital flows. Different measures have been proposed in the literature. For instance, Calvo et al. (2004) and Reinhart and Reinhart (2009) focused on the non-reserve financial account, that was estimated indirectly as the sum of the current account minus the central bank's reserves accumulation. Gosh et al. (2012) used information of net capital flows. Other authors focused instead on gross flows in the financial account to distinguish asset-led and debt-led capital flow episodes (for instance, Forbes and Warnock, 2012). A problem with these measures, however, is that they tend to underestimate extreme capital movements in the case of countries that receive significant official support. As pointed out by Merler and Pisani-Ferry (2012), in the case of the EA, an important source of compensatory financing during the financial crises was the accumulation of liabilities through TARGET2 – the mechanism through which the ECB redistributes liquidity across the Euro system. A measure of capital flows ignoring the compensatory role of this financing window would underestimate the shortage of private capital during crisis episodes, as well as the subsequent capital flow recoveries. In light of Merler and Pisani-Ferry (2012), our measure of "private" capital flows is obtained by subtracting from the financial account the changes in TARGET2 balances, as well as the amounts of official disbursements in the context of IMF/EU assistance programme.

To illustrate this adjustment we refer to Figure 1. The figure shows, for the case of Portugal, the cumulative capital inflows as a percentage of 2007 GDP (dashed line), and the corresponding measure excluding TARGET2 loans and programme

disbursements (solid line).[3] The data sources are described in the legend to the figure. This figure clearly reveals the important role of official lending in mitigating the shortage of private capital after 2008: while the stock of private capital fell substantially during the financial crisis, the total capital flow, including official loans, fell only slightly. Had we used a measure of capital flows based on the financial account balance alone, we would clearly be underestimating the magnitude of the sudden stop.

Having defined the measure of "private" capital flows, we need a methodology to identify episodes of extreme capital movements. In this paper we follow a method first proposed by Calvo et al. (2004), which consists of identifying a sudden stop as occurring when the year-over-year change in four-quarter private capital flows falls at least two standard deviations below its 5-year historical rolling mean. Once an episode of sudden stop is identified, it is considered to start when the year-on-year change in "private" capital inflows falls one standard deviation below its historical mean, and to end when it crosses back across that same line. A bonanza episode, using a symmetric definition, is a period that starts when the change in four-quarter capital flow increases more than one standard deviation above its rolling mean, and ends when it is no longer one standard deviation above its mean, provided that it reaches the two standard deviations threshold at some point in that period. Different methodologies have been proposed in the literature (see for instance, Reinhart and Reinhart, 2009, Gosh et al., 2012) but the method proposed by Calvo et al. (2004) stands out as one that identifies not only the episodes, but also their duration.

[3] Figures for the other countries are available from the authors upon request.

Figure 2 illustrates the application of this methodology to the case of Latvia.[4] The figure shows the year-over-year changes in four-quarter "private" capital inflows (black line) and the corresponding bands, defined by the mean capital flows plus or minus one standard deviation (grey lines), and plus or minus two standard deviation (dashed grey lines). Since we compute historical rolling means and standard deviations over 20 quarters, we can identify these phenomena only from the third quarter of 2001 until 2014.[5] According to this data Latvia faced a sudden stop that started in the second quarter of 2008 (when the year-over-year change in annual capital flow crossed the one-standard deviation line downwards) and ended in the first quarter of 2010 (when it crossed back over the same line). After 2010 there was an increase in private capital flows, but since the two standard deviation band was not crossed upwards, an episode of bonanza is not identified.

Table A.1 in Appendix contains the exhaustive list of sudden stops and bonanzas identified in our sample according to this criterion. In Figures 3 and 4 we provide a visual illustration of our findings for different groups of countries. In the figures the darker line report the percentage of countries in each group that experienced sudden stops, and the grey bars report the percentage of countries that experienced bonanzas, in each quarter. The upper panel refers to the sample of all EU member states. In the second and third panels we show the corresponding figures for the EA and non-EA sub-samples, respectively, with EA membership assessed at the time of the episode.

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[4] Figures for the other countries are available from the authors upon request.

[5] The sample window varies across countries due to data availability. For most countries the first observation is 1995 Q1. Exceptions are as follows: Croatia (1999 Q1), Poland (2000 Q1), Cyprus (2001 Q1), Belgium and Luxembourg (2002 Q1). France is not considered because of data unavailability.

The figure with all EU countries confirms a higher prevalence of bonanzas in the period that preceded the 2008 crisis, and a higher prevalence of sudden stops during the crisis (similar patterns in Merler and Pisani-Ferry, 2012, and in Gros and Alcidi, 2015). In the EA sample, however, sudden stops and bonanzas are both spread throughout the crisis and until after the ECB's OMT announcement, in Q3 2012.

The fact that a number of EA countries were hit by bonanzas during the 2008-2010 period is not a surprising result. Indeed, the EA group includes a number of core-EU countries that became recipients of the capital that was flowing out of the periphery during the crisis. In our calculations we identify episodes of bonanza during the 2008-2010 financial crisis in Sweden, Netherlands, Germany, Finland, Belgium, Austria, and Luxembourg. By the same token, we document some "sudden stops" in some of these countries in 2013 (Germany, Luxembourg, Netherlands, and Finland), reflecting the improved conditions in the periphery.

To abstract from these interdependence effects, in Figure 4 we make a similar comparison as in Figure 3, but for two sub-samples in each group: EA periphery (EA excluding Germany, Finland, Belgium, Luxembourg, Austria and the Netherlands) and non-EA enlargement countries (Non-EA excluding the United Kingdom, Sweden, Denmark). In the EA group, there is now a lower prevalence of bonanzas during the 2008-2010 crisis, and there is only one sudden stops after Q3 2012. This suggests that some of the episodes that we identify as stops in the EA core economies are mirrored by bonanzas in the EA periphery, and vice-versa.

3. Uncovering the Determinants of Capital Flows

3.1. Pull and push factors

In the literature the factors that drive episodes of extreme capital flows are categorized into pull and push factors. By push factor it is meant a variable that impacts on the supply of funds from creditor countries, such as global uncertainty and global liquidity. Push factors are outside the host (capital importing) country's control. Pull factors refer to variables related to domestic economic conditions, policies, and performance, as well as the recipient country's institutions and creditworthiness. Thus, while push factors ("common shocks") explain mostly the timing of extreme capital movements (waves of capital movements from centre countries to capital-importing countries, and back), pull factors ("idiosyncratic shocks") determine the incidence/geography of these episodes (i.e., why capital flows to a particular country and not to another).

In empirical work, both push and pull factors have been found to be important drivers of extreme capital movements, depending on the period and the particular sample of countries under consideration. For instance, recent research on EU enlargement countries points to an important role of the global risk and global liquidity push factors, and of the domestic economic activity and liquidity pull factors, as drivers of capital flows in the period before the global financial crisis (Jevcak et al., 2010). As for the recent financial crisis, Fratzscher (2011) analysed data for advanced and emerging economies and found that global liquidity and risk were important drivers of capital flows from 2005 to 2008, while pull factor variables capturing country risk and macroeconomic fundamentals played an important role explaining the pattern of capital flows after 2009.

In this paper we are concerned with a specific pull factor, which is the country status regarding EA membership. Our aim is to test whether this variable affects the probability of an extreme capital movement, after controlling for a range of other pull and push factors. The significance of each particular pull or push factor apart from the EA dummy is of secondary importance in our investigation.

3.2. Variables used

In order to build measures of push factors, one needs to define the "centre". Much of the literature on sudden stops and bonanzas focuses on emerging economies, and henceforth defines the centre simply as the United States (see, for instance, Forbes and Warnock, 2012, Gosh et al, 2012). In the case of EU countries, however, the "external environment" for each individual country should also reflect regional considerations, because of the high degree of real and financial integration (Jevcak et al., 2010). As pointed out by Lane (2013), the United Kingdom has played a special role within Europe as international financial centre. On the other hand, Germany played an important role in the building up of the regional imbalances that emerged before the crisis, and also as a safe even during the financial crisis. For these reasons, in what follows, we take the United States, Germany, and the United Kingdom as the "centre economies". Hence, Germany and the United Kingdom are excluded from the regression analysis.

As observed by Montiel (2013), the most important push factors cited in the literature are the stance of monetary policy in advanced economies (or global liquidity), and the degree of uncertainty in the international economic environment (see also Fratzsher, 2011, and Gosh et al., 2012). Following other authors, we use the Volatility Index (VIX) from the Chicago Board Options Exchange as a measure of global risk, and the year-over-year growth in money and quasi-money (M2) in the US, UK, and the

Euro Area as a measure of global liquidity.[6] Although many authors include interest rates among the push factors, we decide not to do so because interest rate changes can be a cause but also a consequence of sudden stops and bonanzas.

In the following exercise we also test the influence of global economic activity, as measured by the average GDP growth of the three centre economies. The role of this variable as determinant of capital flows is ambiguous. On one hand, Calvo et al. (1993), contended that economic slowdowns in the centre encourage capital flows to the periphery. However, it could be argued that periods of economic boom in the centre give rise to wealth effects that trigger investment abroad (Ferrucci et al., 2004). Hence, we have no *a priori* guess of what the sign of the corresponding coefficient will be.

As for the pull factors, given the sample of countries and the period window, we focus on the level of economic activity and on country risk. In particular, the variables capturing domestic factors will be: an economic sentiment indicator and the real GDP growth (seasonally adjusted), for economic activity; the change in sovereign credit rating, the change in the government debt-to-GDP ratio, the debt-to-equity ratio in the financial sector (financial sector leverage), and the change in the country's net international investment position as a percentage of GDP (NIIP), for the country's creditworthiness and leverage.[7,8]

The measure of credit rating is from S&P and refers to long-term government bonds. We code it into a quantitative variable by assigning a number to each rating, with

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[6] Otherwise stated, the variables used in this paper are from Eurostat.

[7] We thank the referees for suggestions regarding the set of pull variables. We also experimented with the change in government deficit, but results were, in general, not significant.

[8] In the case of Greece, only unadjusted GDP data was available, so we used the X12-ARIMA to generate the seasonally adjusted series. Whenever data on NIIP was of annual frequency, we used cubic interpolation to obtain a quarterly series. In the case of Ireland we used the consumer confidence indicator instead of the economic sentiment indicator that was not available.

the highest value corresponding to the highest rating (AAA=12 and D=1). In the regressions we use the change in credit rating to capture the deteriorating/improving creditworthiness of a country.[9]

3.3. Estimation strategy

Various approaches have been used in the literature to estimate the determinants of capital flows. The differences have to do with the choice of the dependent variable (the level of capital flows versus a dummy variable identifying extreme episodes), on the econometric model (principal components, factor analysis, panel regression, or alternative estimation methods), and the range of variables capturing the push and pull factors (see, for instance, Forbes and Warnock, 2012, Fratzscher, 2011, Jevcak and Suardi, 2010, Calvo et al., 1993). Our estimation strategy follows Forbes and Warnock (2012). More specifically, we estimate a model to assess the factors that influence the conditional probability of a country going through an episode of extreme capital movement. In our analysis we include a dummy variable for countries belonging to the EA, to test the hypothesis of whether being part of the EA influences the probability of a sudden stop or of a bonanza.

As a first approach to our problem we estimate a model including push factors only, with all the idiosyncratic effects captured by country fixed effects. In this initial step the regression model is specified as follows:

$$Prob[e_{it} = 1] = F(\beta_1 \theta_{t-1} + \alpha_i) \qquad (1)$$

[9] In the EA, pension funds and asset managers have to hold certain amounts of securities denominated in Euros. Therefore, large capital movements may occur when the credit rating falls under a certain threshold. We checked for such a threshold effect of the level of the credit rating variable in the model for sudden stops. However, we did not find a statistically significant effect. The Hansen's (1999) bootstrap test also did not reject the null hypothesis of no threshold effect. We thank an anonymous referee for pointing out this issue.

where e_{it} is equal to one if country i is experiencing a bonanza or a sudden stop in period t, θ_{t-1} is a vector of variables capturing the push factors in the previous period, β_1 is the corresponding vector of coefficients, and α_i is the time-invariant effect of country i.

In a second step we replace the country fixed effects by a set of pull factors. The model to be estimated is:

$$Prob[e_{it} = 1] = F(\beta_0 + \beta_1\theta_{t-1} + \beta_2\alpha_{i,t-1}) \qquad (2)$$

where $\alpha_{i,t-1}$ is a vector of domestic (pull) factors, β_2 is the corresponding vector of coefficients to be estimated, and β_0 is the intercept.

Because sudden stops and bonanzas occur infrequently, a complementary logarithmic (cloglog) framework, where $F(\cdot)$ is the cumulative distribution function of the extreme value distribution, is used.[10] We also assume that the conditional probability of being in a sudden stop or bonanza today does not depend on being in sudden stop or bonanza in previous periods. In estimation, we exclude countries with population less than one million (Luxembourg, Malta, and Cyprus).[11] The number of observations varies across regressions because some regressors have missing values,

[10] Formally, we assume that $F(z) = 1 - \exp[-\exp(z)]$. In our robustness checks we verified that using a multinomial logit model accounting simultaneously for sudden stops and bonanzas, instead of separate complementary logarithmic models for each case, delivers the same qualitative conclusions. Estimation results of the multinomial logit model are available from the authors upon request.

[11] We thank an anonymous referee for this suggestion. Estimation results including these small countries are available from the authors upon request.

and also because we need to exclude countries in which the dummy variable e_{it} always takes a value of zero.

3.4. Regression results for Sudden Stops

Table 1 shows the regression results for sudden stops. Three push factors are considered: global economic activity (the average GDP growth in the centre economies), global risk (the VIX index), and global liquidity (M2 growth in the centre countries).

The estimation results for the model with the push factors and country fixed effects are in column (1). In columns (2) and (3) we add the pull factors, experimenting with the two alternative proxies for domestic economic activity: consumer confidence and GDP growth. In column (4), we present the results when the change in public debt is interacted with the EA dummy. Columns (5) and (6) replicate the estimation exercises in columns (2) and (3), but restricting the sample window to the period before 2010.

The results regarding push factors point to a significant global risk in explaining the probability of a sudden stop, but only when the full sample is considered (columns 1-4). As for global liquidity, the coefficient is significant and with the expected sign (higher global liquidity comes along with a lower probability of sudden stop), but this variable loses significance when domestic economic activity is measured by economic sentiment (columns 3 and 6). The push factor GDP growth is not statistically significant when pull factors are included in the estimation.

A test for the joint significance of the fixed effects in regression (1) is statistically significant (p-value of 9.9%). This suggests a role of country specific (pull) factors in explaining the incidence of sudden stops. This issue is further investigated in regressions (2)-(6).

In regressions (2) and (3) we find that both GDP and economic sentiment have the expected signs (an improvement in economic activity reduces the probability of a sudden stop), and both are significant. Two proxies for creditworthiness and leverage, change in NIIP and change in government debt, are also significant and with the expected signs: a higher government debt increases the probability of sudden stop, and an improvement in the country external position decreases that probability. As for the other pull factors, credit rating and financial leverage, their significance is dependent on which measure of domestic economic activity we are using.

Most notably, the dummy for EA membership is significant and with a negative sign. Hence, EA membership is likely to have reduced the probability of sudden stop, all else equal.

Interesting enough, when a second test on the joint significance of country fixed effects is performed after accounting for the effect of the pull variables in model (2), the null hypothesis of no fixed effects is not rejected (p-value of 15.6%). This suggests that our set of pull variables has captured most of the cross section idiosyncrasies influencing the probability of a sudden stop.

As a further investigation, in regression (4), we experiment with an interaction term involving the EA dummy. In particular, we investigate whether the change in government debt has asymmetric influence on the probability of a sudden stop in EA and in non-EA countries. As shown in the table, the interaction term is not significant, suggesting that the influence of government debt is not different for the two groups of countries.[12]

[12] We also tried interactions between the EA dummy and other proxies of country creditworthiness and leverage, but none was found significant. Results are available from the authors upon request.

For robustness check, in columns (5) and (6) we replicate the estimations in columns (2) and (3), but restricting the sample to the period before 2010. Since this implies a smaller period window, some loss of power is expected. As before, all the coefficients of push and pull factors have the expected signs. However, the push factor VIX is no longer significant. As for the pull factors, there are some changes regarding the significance of the proxies for creditworthiness (most notably, the NIIP becomes non-significant), but the main finding of our previous investigation remains: a negative effect of EA membership on the probability of sudden stop. This result challenges the view that during the European debt crisis EA membership constituted a disadvantage, rather than an advantage (Giavazzi and Spaventa, 2010, De Grauwe, 2011).

An issue that can be raised is that the EA group includes both core and peripheral countries, while the non-EA group is mostly composed of peripheral countries. Since much of the capital flowing out of the periphery during the crisis went to core EA economies, merging core and peripheral countries in the EA group may produce misleading results. A counter-argument is that the distinction between core and peripheral countries is already mediated by the proxy for creditworthiness. Still, other considerations may arise. We cope with these questions by re-estimating the model for sudden stops focusing on peripheral countries only: Austria, Belgium, Denmark, Finland, Netherlands, and Sweden are assumed to be core countries and are excluded from estimation.

The results for the sample of non-core countries, in Table 2, are basically similar to those in Table 1 regarding the significance of push factors, while small differences are found regarding the significance of pull factors (in particular, the change in credit rating is now more significant). Most important, experimenting with alternative variables, and with the two period windows, the same conclusion holds regarding our

main question: EA membership is found to have a negative influence on the probability of a sudden stop.

This evidence suggests that EA membership, rather than a curse, revealed to be an advantage during the European debt crises. Eventually, EA membership acted as a credibility credential, mitigating the perception of risk that otherwise would come along with the erosion of economic circumstances, hence reducing a country's exposure to the risk of a sudden stop.

3.5. Regression results for Bonanza episodes

Tables 3 and 4 show the estimation results for bonanza episodes. In Table 3 all countries are considered; in Table 4 core EU countries are excluded. As before, columns (1) in Tables 3 and 4 refer to regressions in which only push factors and country dummies are included. Columns (2) and (3) add the pull factors, experimenting with the two alternative measures of domestic economic activity. In column (4), we analyse the interaction term involving the change in government debt. In columns (5) and (6) we repeat the exercises in columns (2) and (4) restricting the sample to the period before 2010.

Notably, the variable capturing global risk (VIX) is significant and with the expected sign in both tables and across all experiments. This is suggestive of a strong role for global risk in determining the timing of bonanza episodes.[13] The proxy for

[13] Using a different methodology, Jevcak et al. (2010) also found a key role for global risk perception as a driver of capital flows to EU enlargement countries.

global economic activity also shows up with significant coefficients, but its significance vanishes in the non-core full sample case.[14]

The tests for joint significance of the fixed effects in column (1) indicate that they are statistically significant (p-values of 3.1% and 0.5% in the cases of Tables 3 and 4, respectively). This suggests a role for idiosyncratic factors in explaining the timing of bonanzas. Whether our set of pull variables successfully captures each country's idiosyncrasies influencing bonanzas is a different story. A test conducted on the joint significance of the country fixed effects after accounting for the effect of the pull variables in the model of column (2) reveals a p-value of 1.9% in the case of Table 3, and a p-value of 0.5% in the case of Table 4. This means that the set of pull factors considered does not capture all the cross-country heterogeneity in the probability of bonanzas.

As for our main question, in no regression the EA dummy is found significant as explanatory of the probability of a bonanza. Regarding the remaining pull variables, only GDP growth and the change of public debt are found significant as explanatory of the probability of a bonanza in columns 2 and 3. The same holds in Table 4, where core countries are removed from the estimation.

The fact that the coefficient on public debt has a positive sign is at odds with its interpretation as a measure of creditworthiness, suggesting instead that governments took opportunity of bonanzas episodes to meet their financing needs. To further investigate this question, we include an interaction term for this variable with the EA dummy (columns 4 of Tables 3 and 4). We find that the coefficient on government debt turns negative in the case of non-EA countries. In the case of EA countries, regardless of whether we consider all countries or the non-core group only, the positive relation between the change in government debt and the probability of bonanza still holds significant. As a robustness check, in columns (6) of Tables 3 and 4 we repeat the exercise in column (4) for the case in which the sample window is restricted to the

[14] The fact that the proxy for global economic activity (GDP growth) has a positive sign when significant in sudden stops and a negative sign when significant in bonanzas is in line with the initial reasoning of Calvo et al. (1993), but not with Ferrucci et al. (2004).

period before 2010. In this case, the change in public debt becomes non-significant, but the corresponding interaction term with the EA dummy remains positive (column 6).[15]

The differential influence of changes in government debt on the probability of bonanza in EA countries and in non-EA countries is suggestive of an indirect role of EA membership on the probability of bonanza: eventually, EA membership may have mitigated the perception of risk that otherwise would come along with a rising government debt, thereby inducing a higher leverage in EA countries, all else equal.

Another finding when the estimation window is restricted to the period before 2010 (columns 5 and 6) is that the proxy for banking leverage obtains a significant coefficient. In this case, however, splitting the sample into EA and non-EA countries does not reveal a differential effect.[16] Thus, it appears that the materialization of bonanza episodes through the accumulation of financial sector liabilities along the period up to 2010 did not impact differentially on probability of bonanzas in EA and non-EA countries.

All in all, the estimation results for bonanza episodes point to an important role of push factors, and in particular to global risk in determining the timing of capital movements. As for pull factors, the evidence is much weaker than the case with sudden stops. Still, the fact that increases in government debt have been positively associated to the occurrence of bonanzas in EA countries but not in EA countries is suggestive that the EA credential may have mitigated the risk perception arising from rising government debts.

4. Conclusions

In this paper we follow the empirical literature on sudden stops and bonanzas to test whether being part of the EA influences the conditional probability of an EU member state going through an episode of extreme capital movements. We document a

[15] It should be noted that the 10% significance test fails only marginally in Table 4, with a p-value of 10.8%. Since the number of observations decreased significantly, we believe that this evidence is still supportive of a positive relationship.

[16] The results of this further test are available from the authors upon request.

higher prevalence of bonanzas amongst EU countries before the 2008 crisis, and a higher prevalence of sudden stops thereafter.

We estimated several models to test whether the probability of an extreme capital movement is influenced by a member state's status regarding EA membership. In this exercise we controlled for alternative push factors (global economic activity, global risk, and liquidity), as well as for idiosyncratic factors (country's economic activity and changes in creditworthiness).

We find that EA membership has reduced the probability of a country going through an episode of sudden stop, all else equal. This result still holds when core countries are removed from the sample and when the sample window is restricted to the period before 2010. This finding questions the claim that EU Member States that maintained their own currencies, and therefore a central bank standing ready to support the respective national Treasuries as a "market maker of last resort" in case of need, were less exposed to changes in market sentiment than similar countries inside the EA.

As for bonanzas, we find an important role for global risk in explaining the timing of capital flows, but the influence of pull variables in determining their geography was found in general weak. In particular, we did not find any evidence of a direct effect of EA membership on the probability of bonanza. When allowing for interaction effects, however, we found a positive relationship between the change in public debt and the probability of bonanza, holding only in the case of EA countries. This suggest that EA membership might have mitigated the risk perception that otherwise would arise from a higher government debt.

This evidence suggests that EA membership acted as a mixed blessing, as far as exposure to extreme capital movements is concerned. On one hand, belonging to the EA may have delivered a credibility credential, thereby protecting the country from the pervasive effects of sudden stops. However, during bonanza episodes, by mitigating the signal arising from an increase in government debt, EA membership may have induced more leverage than that achievable by a similar country outside the EA. Thus, the same type of market failure implied by the sentiment of safety that affected the Asian countries before the 1997 crises may have played a role in the EA, resulting in excessive debt accumulation under neglect. Of course, market agents learn with past mistakes. So, eventually, in the future the "mitigating effect" of EA membership will no longer apply. This is, however, a question that only future data will allow us to respond to.

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Table 1. Estimation results for Sudden Stops - All countries

	Full Sample				Before 2010	
	(1)	(2)	(3)	(4)	(5)	(6)
Push factors						
GDP growth	-0.352**	0.041	0.030	0.037	-0.105	-0.276
	(0.140)	(0.163)	(0.148)	(0.158)	(0.228)	(0.191)
VIX	0.044***	0.036***	0.032**	0.036***	-0.002	-0.030
	(0.012)	(0.013)	(0.014)	(0.013)	(0.021)	(0.026)
M2 growth	-0.303***	-0.273***	-0.188	-0.274***	-0.637***	-0.092
	(0.075)	(0.091)	(0.122)	(0.091)	(0.242)	(0.276)
Pull factors						
GDP growth		-0.251***		-0.251***	-0.313**	
		(0.087)		(0.087)	(0.133)	
Change in government debt		0.099***	0.074**	0.109**	0.207***	0.174***
		(0.035)	(0.034)	(0.054)	(0.073)	(0.063)
Change in credit rating		-0.369*	-0.306	-0.367*	-0.512*	-0.742**
		(0.204)	(0.232)	(0.206)	(0.304)	(0.304)
Change in net international investment position		-0.122**	-0.140**	-0.123**	-0.050	-0.091
		(0.050)	(0.055)	(0.050)	(0.101)	(0.114)
Change in financial sector leverage		0.001	0.002*	0.001	0.011*	0.013*
		(0.001)	(0.001)	(0.001)	(0.006)	(0.007)
Euro Area		-0.598**	-0.690***	-0.572**	-1.546***	-1.799***
		(0.255)	(0.255)	(0.281)	(0.485)	(0.530)
Economic sentiment			-0.056***			-0.093***
			(0.019)			(0.034)
Euro Area × Change in government debt				-0.016		
				(0.058)		
Country dummies	✓					
N.Obs.	1036	968	956	968	616	604
Wald Chi-Sq.	121.23	137.58	142.76	137.56	87.58	89.75
P-value	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Standard errors in parentheses. ***, **, and * denote significance at 1%, 5% and 10% levels, respectively.

Table 2. Estimation results for Sudden Stops - Non-core countries

	Full Sample				Before 2010	
	(1)	(2)	(3)	(4)	(5)	(6)
Push factors						
GDP growth	-0.281**	0.149	0.096	0.147	0.026	-0.228
	(0.130)	(0.164)	(0.164)	(0.161)	(0.285)	(0.243)
VIX	0.056***	0.052***	0.049***	0.052***	-0.005	-0.029
	(0.011)	(0.013)	(0.011)	(0.012)	(0.025)	(0.030)
M2 growth	-0.334***	-0.279**	-0.185	-0.279**	-0.561**	0.039
	(0.086)	(0.110)	(0.153)	(0.110)	(0.245)	(0.277)
Pull factors						
GDP growth		-0.251**		-0.250**	-0.407***	
		(0.099)		(0.100)	(0.146)	
Change in government debt		0.085**	0.068*	0.091*	0.276***	0.228**
		(0.036)	(0.041)	(0.054)	(0.106)	(0.095)
Change in credit rating		-0.355	-0.309	-0.353	-0.469*	-0.637**
		(0.217)	(0.258)	(0.218)	(0.273)	(0.295)
Change in net international investment position		-0.137**	-0.150**	-0.138**	-0.037	-0.091
		(0.055)	(0.059)	(0.054)	(0.121)	(0.159)
Change in financial sector leverage		0.002*	0.003**	0.002**	0.013**	0.014*
		(0.001)	(0.001)	(0.001)	(0.007)	(0.008)
Euro Area		-0.738***	-0.819**	-0.719**	-1.999***	-2.245***
		(0.268)	(0.335)	(0.318)	(0.582)	(0.656)
Economic sentiment			-0.050**			-0.101***
			(0.023)			(0.035)
Euro Area × Change in government debt				-0.011		
				(0.063)		
Country dummies	✓					
N.Obs.	764	711	699	711	455	443
Wald Chi-Sq.	106.50	119.62	127.37	119.45	80.48	78.66
P-value	0.000	0.000	0.000	0.000	0.000	0.000

Notes: Standard errors in parentheses. ***, **, and * denote significance at 1%, 5% and 10% levels, respectively.

Table 3. Estimation results for Bonanzas - all countries

	Full Sample				Before 2010	
	(1)	(2)	(3)	(4)	(5)	(6)
Push factors						
GDP growth	-0.690***	-0.655***	-0.505***	-0.620***	-0.738**	-0.767**
	(0.200)	(0.215)	(0.178)	(0.209)	(0.364)	(0.375)
VIX	-0.094**	-0.066*	-0.068*	-0.062*	-0.085*	-0.087*
	(0.044)	(0.035)	(0.037)	(0.033)	(0.047)	(0.048)
M2 growth	0.225	0.236	0.242*	0.234	0.436	0.488
	(0.158)	(0.154)	(0.146)	(0.159)	(0.293)	(0.301)
Pull factors						
GDP growth		0.206*		0.208*	0.189	0.197
		(0.119)		(0.122)	(0.166)	(0.170)
Change in government debt		0.098**	0.089	-0.145***	0.074	-0.072
		(0.050)	(0.055)	(0.041)	(0.071)	(0.076)
Change in credit rating		0.392	0.412	0.352	0.365	0.414
		(0.323)	(0.342)	(0.321)	(0.470)	(0.492)
Change in net international investment position		-0.110	-0.107	-0.106	-0.070	-0.074
		(0.096)	(0.098)	(0.092)	(0.121)	(0.119)
Change in financial sector leverage		0.002	0.002	0.002	0.007**	0.007**
		(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Euro Area		0.112	0.002	0.075	0.527	0.499
		(0.357)	(0.321)	(0.375)	(0.849)	(0.829)
Economic Sentiment			0.011			
			(0.026)			
Euro Area × Change in government debt				0.315***		0.272***
				(0.063)		(0.084)
Country dummies	✓					
N.Obs.	902	968	956	968	616	616
Wald Chi-Sq.	65.14	45.72	43.73	52.90	30.43	30.87
P-value	0.000	0.000	0.000	0.000	0.000	0.001

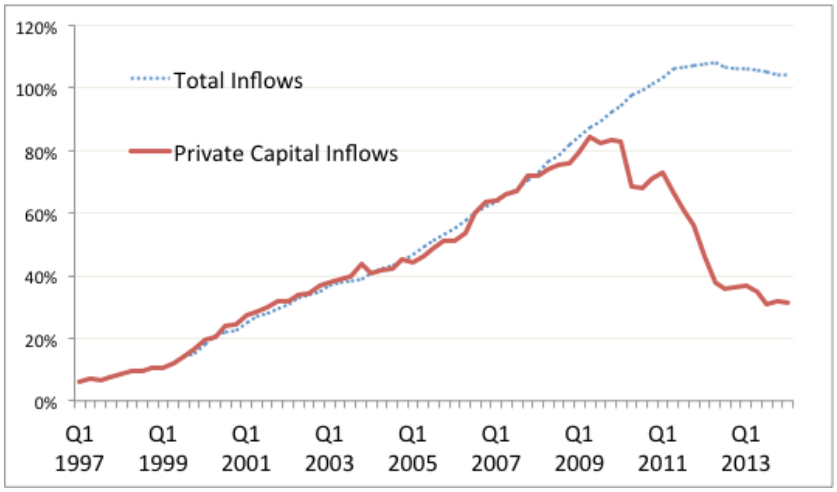
Notes: Standard errors in parentheses. ***, **, and * denote significance at 1%, 5% and 10% levels, respectively.

Table 4. Estimation results for Bonanzas - non-core countries

	Full Sample				Before 2010	
	(1)	(2)	(3)	(4)	(5)	(6)
Push factors						
GDP growth	-0.433	-0.285	-0.170	-0.220	-0.742***	-0.765***
	(0.520)	(0.598)	(0.529)	(0.601)	(0.249)	(0.273)
VIX	-0.196***	-0.153***	-0.154***	-0.144***	-0.323***	-0.327***
	(0.059)	(0.052)	(0.057)	(0.051)	(0.014)	(0.014)
M2 growth	0.246	0.185	0.136	0.187	1.531***	1.611***
	(0.250)	(0.240)	(0.241)	(0.255)	(0.154)	(0.235)
Pull factors						
GDP growth		0.271**		0.272**	0.300	0.330
		(0.120)		(0.127)	(0.454)	(0.504)
Change in government debt		0.152**	0.143*	-0.105*	0.031	-0.083
		(0.072)	(0.086)	(0.056)	(0.101)	(0.085)
Change in credit rating		0.278	0.249	0.264	-0.027	0.055
		(0.362)	(0.379)	(0.349)	(0.519)	(0.529)
Change in net international investment position		-0.208	-0.194	-0.196	-0.162	-0.165
		(0.137)	(0.127)	(0.133)	(0.197)	(0.211)
Change in financial sector leverage		0.002	0.002	0.003	0.014***	0.014***
		(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
Euro Area		0.098	-0.045	0.049	1.628	1.588
		(0.504)	(0.406)	(0.531)	(1.272)	(1.297)
Economic sentiment			0.033			
			(0.044)			
Euro Area × Change in government debt				0.319***		0.315
				(0.102)		(0.196)
Country dummies	✓					
N.Obs.	680	711	699	711	455	455
Wald Chi-Sq.	81.49	66.19	67.72	71.61	43.66	43.48
P-value	0.000	0.000	0.000	0.000	0.000	0.000

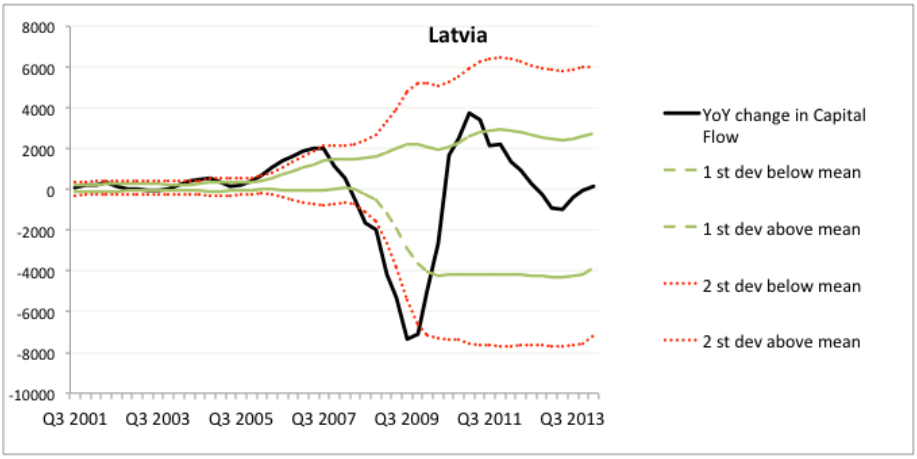
Notes: Standard errors in parentheses. ***, **, and * denote significance at 1%, 5% and 10% levels, respectively.

Figure 1. Cumulative Total and Private Capital Inflows - Portugal (% of 2007 GDP)



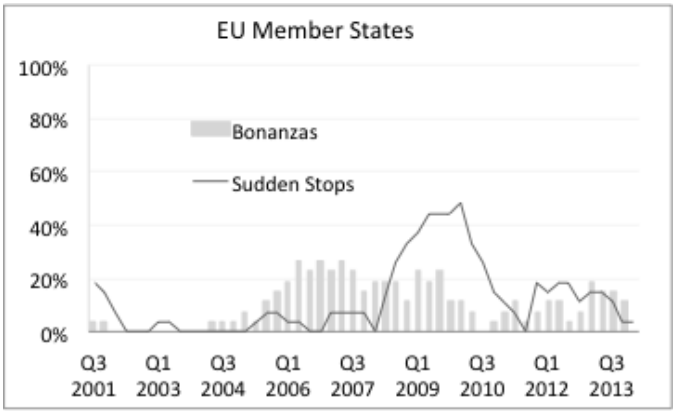
Notes: The figure shows the cumulative values of "private capital flows" (solid line) and of total capital flows (dashed line) for Portugal, as a percentage of 2007 GDP at current market prices. Total capital flows correspond to the Financial Account Balance. The Proxy for private capital inflows corresponds to the Financial Account Balance minus the period changes in TARGET2 balances and IMF/EU programme disbursements. Source: Own calculations based on data from the Eurostat (Financial Account), "Euro crisis monitor" (end-of-quarter Target 2 balances), and the IMF/European Commission (disbursements in the scope of official assistance to programme countries).

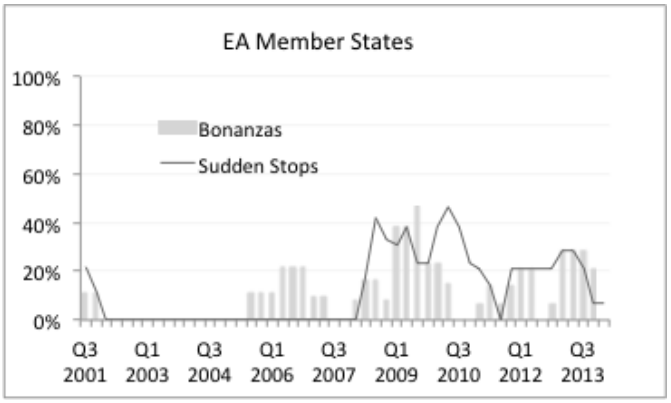
Figure 2. Identification of sudden stops and bonanzas - Latvia

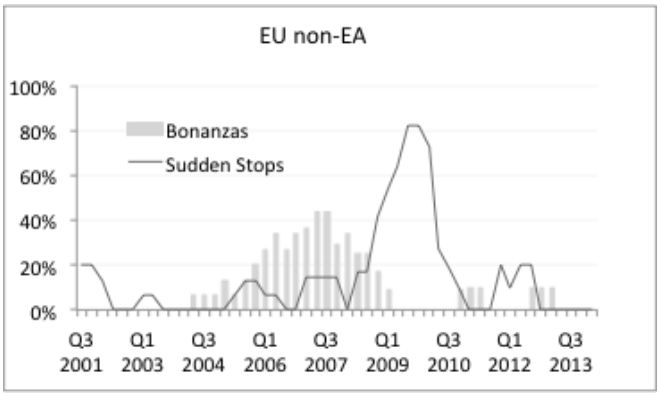


Source: Own calculations based on data from the Eurostat, Euro crisis monitor, the IMF, and the European Commission. Notes: let C_t denote the four-quarter moving sum of gross capital flows. Its YoY change is defined as $\Delta C_t = C_t - C_{t-4}$ (black solid line). Next, we compute the rolling mean and standard-deviation of ΔC_t over the last 20 quarters. A Sudden Stop occurs when the actual ΔC_t falls two standard deviations below the rolling mean (dashed lines). The Sudden Stop is said to begin when it falls one standard deviation below mean (grey line), and to end when it crosses back over that line. A symmetric criterion applies to identify bonanza episodes.

Figure 3. Share of EU countries experiencing Sudden Stop and Bonanza: all member states (top panel), Euro area member states (middle panel), and non-EA member states (bottom panel)

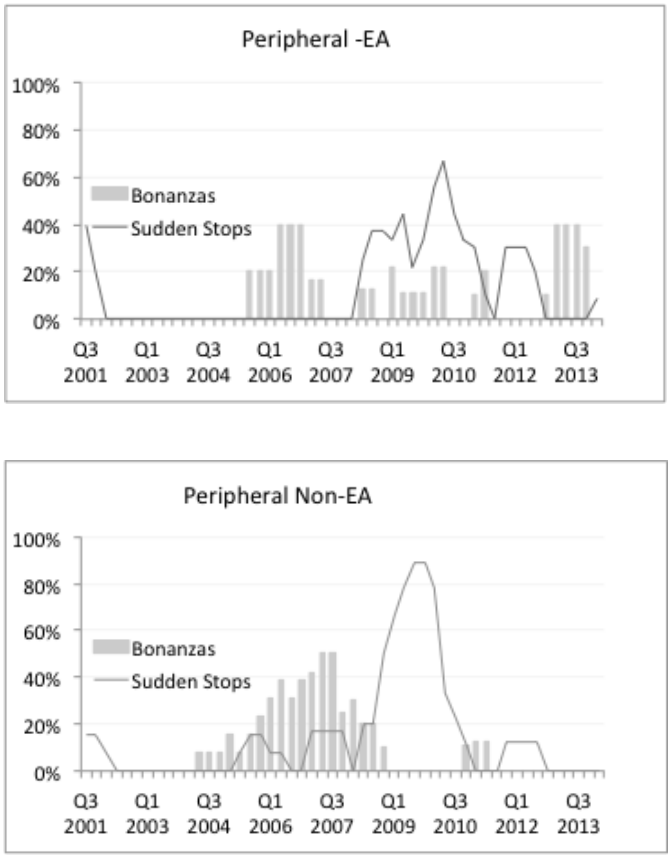






Source: Table A.1. Notes: Dark lines: percentage of countries in the corresponding sample facing a sudden stop episode; grey bars: percentage of countries in the corresponding sample facing an episode of bonanza. EA membership is assessed at the timing of the event.

Figure 4. Countries in Sudden Stop and Bonanza, peripheral EA versus peripheral non-EA (% of countries in the corresponding group)



Source and notes: Same as Figure 3. The peripheral EA sample corresponds to the EA sample minus Germany, Finland, Austria, Belgium, the Netherlands and Luxembourg. The peripheral non-EA sample corresponds to the non-EA countries minus Sweden, Denmark and the United Kingdom.