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Evaluating the Eurozone's Impact on Portugal Amidst Modern Uncertainties

Pedro Bação*, António Portugal Duarte, Fátima Sol Murta*****

Abstract: This paper investigates the impact of euro area membership on the Portuguese economy, focusing on whether the benefits of integration have outweighed the costs amidst ongoing economic uncertainties. Earlier research employed a VAR model with a discrete change in 1999 to capture the impact of adopting the euro. Instead, this paper uses a Smooth Transition Vector Autoregressive (STVAR) model. The STVAR model allows for the possibility that the adoption of the euro had a gradual effect on the Portuguese economy. This assumption better aligns with the historical process that culminated in the euro's adoption, which involved several stages of gradual progress. As expected, we find a positive impact of adopting the euro on inflation stability and interest rates. However, in contrast to previous research, the results presented in this paper indicate that euro area membership has also positively affected Portuguese real per capita GDP.

Keywords: counterfactual analysis; Euro; European Monetary Union; Portugal; STVAR.

JEL classification: E31; E37; E52; F45; O52.

* Faculty of Economics, University of Coimbra, CeBER, Portugal; e-mail: *pmab@fe.uc.pt* (corresponding author).
** Faculty of Economics, University of Coimbra, CeBER, Portugal; e-mail: *portugal@fe.uc.pt*.
*** Faculty of Economics, University of Coimbra, CeBER, Portugal; e-mail: *fasol@fe.uc.pt*.

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1. INTRODUCTION

In periods of significant economic instability and heightened uncertainty, societies tend to reflect on their past and often question their current economic arrangements. Such reflection has become increasingly pertinent in the context of the European project, particularly regarding the eurozone. Criticism of the eurozone has intensified in light of recent challenges, especially during the International Financial Crisis of 2008-2009 and the European Sovereign Debt Crisis of 2010-2012. The main issue of contention was the austerity measures imposed to try to reduce the high levels of debt accumulated in countries such as Greece and Portugal. In these countries, the austerity measures had a strong negative impact on macroeconomic indicators, namely on growth and employment, at least in the short-term. Developments in recent years – namely those associated with the COVID-19 pandemic, ongoing geopolitical tensions that have triggered energy and inflation crises, and the electoral results in several European Union (EU) countries – have again prompted questions about the future of the EU and its most significant creation, the euro. These events have forced member states, including Portugal, to confront the limits and consequences of their membership of the euro area, particularly given the constraints such membership places on national policy autonomy – for a discussion of the Portuguese macroeconomic policy framework, see Alexandre and Bação (2022). When a country's performance is perceived as suboptimal and public dissatisfaction increases, the EU and the euro are readily available as convenient scapegoats.

Critics argue that euro area membership has restricted Portugal's ability to respond to economic shocks by curbing its monetary and fiscal policy tools. In the eurozone, the European Central Bank (ECB) maintains control over monetary policy, meaning that countries such as Portugal are unable to independently adjust interest rates. As a member of the eurozone, Portugal also loses the ability to use currency devaluation as a mechanism for addressing economic imbalances. Consequently, adjustments to gain "competitiveness" through exchange rates are significantly constrained. Additionally, the Stability and Growth Pact imposes strict fiscal rules, placing limits on both budget deficits and public debt levels, and thus narrowing the national fiscal policy options. Furthermore, the common external tariffs of the EU restrict the flexibility of national trade policies, rendering unilateral protectionist measures unfeasible.

On the other hand, some point to the benefits of economic integration that come with shared monetary governance. One of the primary benefits is the maintenance of low and stable inflation rates, which provides a favorable economic environment. Additionally, the elimination of currency exchange costs within the eurozone has significantly reduced transaction costs, further promoting efficiency in cross-border trade. Monetary integration has also enhanced investor confidence, facilitating increased investment within the region. Economic and monetary integration also fosters trade among member countries, which in turn boosts economic activity by simplifying transactions and strengthening economic ties.

Mundell (1961) may be interpreted (e.g., Bayoumi and Eichengreen (1994)) as identifying two features of a country that are important for determining the costs and benefits of entering a monetary union: the nature of shocks and the ease of response. First-generation optimum currency area theory emphasized labour mobility (Mundell, 1961), openness to trade (McKinnon, 1963) and output diversification (Kenen, 1969) as characteristics that would help a country reduce the costs of participating in a monetary union (see the discussion in Silva and

Tenreyro (2010)). Naturally, there was skepticism about whether the future eurozone members would fulfil the requirements for ensuring that the costs did not outweigh the benefits.

One prominent skeptic was Martin Feldstein. For example, in Feldstein (1997), Feldstein wrote that "What is clear to me is that the decision will not depend on the economic advantages and disadvantages of a single currency." (p. 23) and that "My own judgement is that the net economic effect of a European Monetary Union would be negative. The standard of living of the typical European would be lower in the medium term and long term if EMU goes ahead […]" (p. 24). The results reported in Bayoumi and Eichengreen (1994) and in similar papers about business cycle synchronization among EU countries suggested low correlation of shocks – i.e., important differences in the nature of shocks across EU countries – except for those in the "core" (Germany and its closest neighbours). The theoretical model presented in Alesina and Barro (2002) provided some support for participation in a monetary union – especially for a country that "has a history of high inflation and is close in a variety of ways to a large and monetarily stable country" (p. 435), and where the value that the government attaches to "an independent money as a symbol of sovereignty" is weakening (p. 435) –, but it did not specifically address the issue of participation in the eurozone.

A more positive view of the forthcoming European monetary union was presented in Frankel and Rose (1998). This second-generation view of optimum currency area theory emphasizes the endogeneity of international trade patterns and business cycles. More precisely, the economic behaviour of a country that enters a monetary union is likely to change as a consequence of doing so, and it is likely to change in a way that better suits the country to membership of the monetary union. Therefore, evaluating the desirability of joining a monetary union on the basis of historical data may be misleading. Frankel and Rose (1998) argue that their empirical results provide evidence in support of this hypothesis.

The idea that country characteristics change over time is also central to the approach we take in this paper, with the goal of contributing to the debate on the costs and benefits of euro area membership for Portugal. The main element of our contribution is a counterfactual simulation of the Portuguese economy if it had not joined the eurozone. To produce this counterfactual, we use a Smooth Transition Vector Autoregressive (STVAR) model. Earlier studies, such as Aguiar-Conraria *et al.* (2012) and Bação *et al.* (2013), modelled euro area membership as a discrete change in the economic structure beginning in 1999Q1, when the eurozone officially started. The key limitation of this approach is that it assumes that the impacts of joining the eurozone occurred abruptly at a specific point in time, ignoring the gradual changes and adjustments that accompanied the integration process. In contrast, the STVAR model does not impose that constraint. In an STVAR model, the adjustment may be abrupt, but it may also occur gradually. The actual type of adjustment will depend on the values of the STVAR parameters, which will be estimated from the data. In fact, the estimate might even point to an abrupt change, but at a date different from 1999Q1. Therefore, the STVAR comprises the VAR model with one structural break as a special case.

This change in modeling framework is particularly relevant given the complexity of the European integration process. The adoption of the euro was the culmination of a series of policy decisions beginning with the liberalization of capital movements, the pursuit of the European Single Market, and compliance with the Maastricht Treaty's convergence criteria. These earlier stages of Economic and Monetary Union (EMU) paved the way for the introduction of the single currency. This suggests that the economic behaviour of participating countries, including Portugal, began to evolve well before the formal adoption of the euro in

1999. A gradual modelling approach is therefore more appropriate to capture the realities of this process.

Specifically, we focus on the behaviour of real per capita GDP, inflation, short- and long-term interest rates, and the real effective exchange rate in Portugal. We compare the outcomes observed under eurozone membership with a counterfactual scenario in which Portugal did not join the eurozone, simulating the economy's behaviour under the assumption that pre-euro membership conditions had persisted. Our results indicate that eurozone membership may have produced significant benefits for Portugal, including increased GDP and successful disinflation. These findings stand in contrast to earlier conclusions, which suggested that euro membership imposed a cost on Portugal in terms of GDP growth, while offering a benefit in the form of lower inflation.

The remainder of the paper is structured as follows. Section 2 discusses this paper's relationship to the existing literature on the economic impact of eurozone membership. Section 3 presents the empirical framework, data, and methodology employed in this study. Section 4 provides the results of the STVAR model, including simulations of the counterfactual scenario. Finally, Section 5 offers concluding remarks.

2. RELATION TO PREVIOUS WORK

Before Portugal joined the eurozone, the Portuguese Government commissioned a study (Pinto Barbosa *et al.*, 1998) on the impact of the euro on the Portuguese economy. Unlike our study, Pinto Barbosa *et al.* (1998) computed an ex-ante estimate of the effect of eurozone membership. To this end, they used the model developed by Gaspar and Pereira (1995) to simulate the evolution of the Portuguese economy from 1999 onwards under different assumptions. In their model, the impact on GDP occurs through changes in the interest rate. Therefore, the different scenarios differed based on the assumed level of the interest rate, with the lowest interest rate (i.e., the lowest risk premium) corresponding to the scenario of eurozone participation (the baseline scenario). In the scenario deemed most reflective of not joining the eurozone, the interest rate was only slightly higher (50 basis points) than in the baseline scenario. Comparing these two scenarios, joining the eurozone was estimated to increase real per capita GDP by about 1% after 10 years. However, the justification for such a small difference in interest rates between the two scenarios was that, in the alternative scenario, the same "stability-oriented economic policy," aimed at meeting EU standards, would continue to be followed. Thus, the comparison of the study's two main scenarios focuses on the impact of irrevocably fixing the exchange by entering the eurozone, and excludes what Pinto Barbosa *et al.* (1998) call "regime effects," associated with adopting macroeconomic policies enabling participation in the eurozone. If the alternative to joining the eurozone was to abandon these policies, leading to a 400 basis point rise in the interest rate above the baseline scenario, the study estimated that the benefit of joining the eurozone could increase to 7% of real per capita GDP.

Did these expectations materialize? Reflecting on the first 10 years of the euro, Martin Feldstein asserted that "The first decade of the EMU has been a clear success" (Feldstein, 2009), before warning of the challenges posed by the international financial crisis. Eventually, the international financial crisis did take a toll on the European project. Doubts regarding Portugal's participation in the eurozone mounted, especially during the sovereign debt crisis—see, e.g., Andrade and Duarte (2015), who focus on the difference between real and

nominal convergence, and Bação *et al.* (2019), who discuss the evolution of expectations in Portugal. Obviously, it is impossible to know with certainty what would have happened had Portugal not joined the eurozone. However, one can use models to estimate the impact of the decision to adopt the euro, conditional on the model's assumptions. Aguiar-Conraria *et al.* (2012) did that using a VAR model with a structural break. Aguiar-Conraria *et al.* (2012) divided their analysis into two periods: pre- and post-1999Q1, the latter being the date when Portugal formally joined the euro area. According to their results, the average annual GDP growth rate would have been 0.6 percentage points higher in the counterfactual scenario, indicating that joining the eurozone had a cost in terms of GDP. On the other hand, the amplitude of the Portuguese business cycle would have been larger if the country had not adopted the euro; thus, joining the euro had a stabilizing effect.

Building on this approach, Bação *et al.* (2013) employed a similar VAR model framework, but incorporated additional macroeconomic variables such as the current account balance, public debt, and unemployment to provide a more comprehensive assessment of euro area membership. Naturally, their study confirmed the earlier conclusion that euro area membership led to decreased GDP while also reducing the inflation rate.

These studies based on the VAR approach, however, share an important limitation: they model eurozone membership as an abrupt, one-time shift in economic conditions starting in 1999Q1. They overlook the fact that joining the eurozone was not merely a matter of adopting a new unit of account and delegating monetary policy to the ECB. Rather, it was the culmination of a process that involved significant policy reforms and gradual convergence with broader European economic standards over many years. Pinto Barbosa *et al.* (1998) assumed that this process would not be reversed in the future, but critics of eurozone membership do not complain only about the cost of having a fixed exchange rate vis-à-vis eurozone countries. Indeed, critics of eurozone membership argue that it imposes limitations on national economic policies, particularly regarding constraints on the budget deficit and public debt, that are detrimental to the well-being of Portuguese citizens.

Rather than imposing a discrete structural break, the STVAR model used in this paper allows for a gradual transition between regimes, which better aligns with the reality of Portugal's economic integration. This approach provides a more flexible structure, which can detect whether the change was abrupt or gradual and whether it occurred at the expected time – in this case, 1999Q1. Note that Akhmadieva and Smith (2019) studied whether the euro caused structural breaks in macroeconomic relations in member countries. They conclude that the "date of the formation of euro is not identified as the most likely date for a structural break in the GDP equations and the GDP growth rate equation shows no structural break for many countries" (p. 246). This conclusion supports our use of the STVAR model. Note also that the STVAR model has already been used in the context of analyzing the impact of EU membership by Greenaway *et al.* (2000). In that case, the STVAR was used to identify the effects of EU enlargement and deepening in the pre-1990 period.

Alternative approaches have been used in other papers. For instance, Söderström (2010) estimated a DSGE model for Sweden and then simulated the model from 1999Q1 onward assuming that the interest rate matched the ECB's interest rate rather than Sweden's actual interest rate. This simulation produced a counterfactual in which Sweden had joined the eurozone as a founding member. Pesaran *et al.* (2007) used a more sophisticated version of a VAR model to construct the counterfactual for both Sweden and the UK. The model used was a Global VAR (GVAR) model, which, instead of modelling each country in isolation,

accounts for the evolution and relative importance of partner countries. A more recent approach uses the "synthetic control" approach proposed by Abadie and Gardeazabal (2003). When applying this approach to estimate the impact of eurozone membership on a country, the counterfactual is obtained as a weighted average of countries not affected by the adoption of the euro. The weights are chosen so that the behaviour of the weighted average before joining the eurozone resembles the behaviour of the country before adopting the euro. The synthetic control methodology was used by Campos *et al.* (2019) to estimate the impact of EU integration, and, more relevant to our purposes, by Puzzello and Gomis-Porqueras (2018) to estimate the impact of adopting the euro. Puzzello and Gomis-Porqueras (2018) did not include Portugal in their sample, but Gabriel and Pessoa (2024) extended their analysis to include all the founding members of the eurozone, as well as Greece, which, in 2001, was the first country to join the euro area after its founding. Gabriel and Pessoa (2024) conclude that Portugal was one of the "mild losers" of the euro, along with France, Germany and Italy.

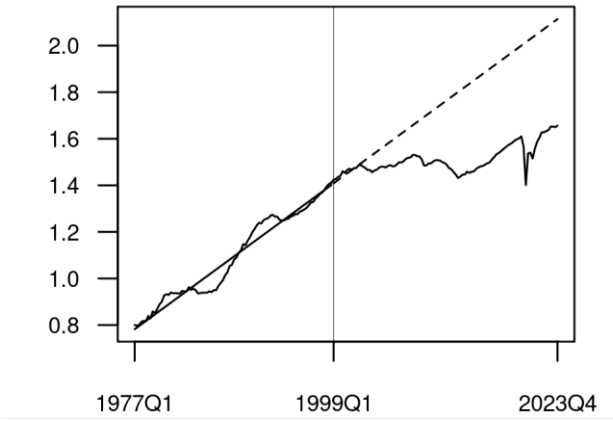

Figure no. 1 – Portuguese real per capita GDP (log)

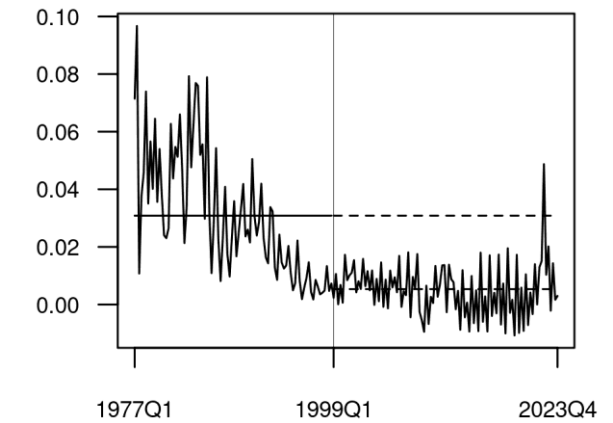

Figure no. 2 – Portuguese quarterly inflation

Overall, the previous literature is not supportive of a significant positive impact of eurozone membership on GDP. In a simplified way, we may say that setting the break date to 1999Q1 amounts to looking at the evolution of the Portuguese economy in the pre-euro years and extrapolating that evolution to the post-1999Q1 period. The situation is illustrated in Figure no. 1 for real per capita GDP and in Figure no. 2 for quarterly inflation. Between 1977Q1 and 1998Q4, real per capita GDP grew at an average annual growth rate of 2.9%, while after adopting the euro, between 1999Q1 and 2023Q4, the growth rate was only 1%. As for inflation, the average annual inflation rate before adopting the euro was 13%, while during the euro period it was only 2%. In the next section, we describe the STVAR approach that we employ in this paper to provide a quantitative estimate of the impact of eurozone membership on the Portuguese economy. As we emphasized above, this approach does not require us to impose 1999Q1 as the date of the structural break. The timing and nature of the transition will be estimated by the STVAR model.

3. THE EMPIRICAL APPROACH

The first subsection presents the STVAR model, while the second subsection presents the data used in the empirical analysis.

3.1 The STVAR Model

Aguiar-Conraria *et al.* (2012); Bação *et al.* (2013) assume that joining the Eurozone is adequately modelled by a one-time change in the parameters (in 1999Q1) in the context of a VAR model. Formally, this may be written as follows:

$$Y_t = D_t(A_0 + A_1 Y_{t-1} + A_2 X_t) + (1 - D_t)(B_0 + B_1 Y_{t-1} + B_2 X_t) + \epsilon_t \quad (1)$$

In equation (1), Y is a vector of endogenous variables, X is a vector of exogenous variables, and D is a dummy variable equal to 1 until 1998Q4 and equal to 0 since 1999Q1. The formulation of the model implies that at the break date (1999Q1) suddenly the coefficients that drive the system change, with the B_i coefficients substituting the A_i coefficients.

The STVAR model may be written as:

$$Y_t = S_t(A_0 + A_1 Y_{t-1} + A_2 X_t) + (1 - S_t)(B_0 + B_1 Y_{t-1} + B_2 X_t) + \epsilon_t \quad (2)$$

where S is the smooth transition variable defined as:

$$S_t = \frac{1}{1 + e^{a(t-t_0)}} \quad (3)$$

Note that S_t is always between 0 and 1. Therefore, the outcome Y_t is a weighted average between the outcome under the first set of parameters $(A_0 + A_1 Y_{t-1} + A_2 X_t + \epsilon_t)$ and the outcome under the second set of parameters $(B_0 + B_1 Y_{t-1} + B_2 X_t + \epsilon_t)$. The standard VAR model is a special case of the STVAR model, which occurs when $S_t = 1$ for all periods before 1999Q1 and $S_t = 0$ afterwards.

Using the STVAR allows for the change in the behaviour of Y_t to occur gradually over time, rather than abruptly. The STVAR may yield a result that indicates that the change has

been abrupt, but does not impose that behaviour. If the change has in fact been abrupt, the STVAR will detect that, even if it did not occur in 1999Q1.

In the STVAR model, two additional parameters, a and t_0, must be estimated. The parameter a determines the speed of the regime change, while t_0 represents the estimated date of that change in the following sense:

- If $a > 0$ and $t < t_0$, then $S_t > 0.5$; the weight of the first regime is larger.
- If $a > 0$ and $t > t_0$, then $S_t < 0.5$; the weight of the second regime is larger.

Therefore, the first regime is dominant before the date corresponding to t_0, while the second regime is dominant after that date. Using the STVAR allows for the possibility that the regime change occurs suddenly in 1999Q1, but also for the possibility that the change occurred at some other date, or that the change occurred gradually over time. Figure no. 3 illustrates various possibilities with increasing speeds of transition. The bottom right panel is close to an abrupt change case.

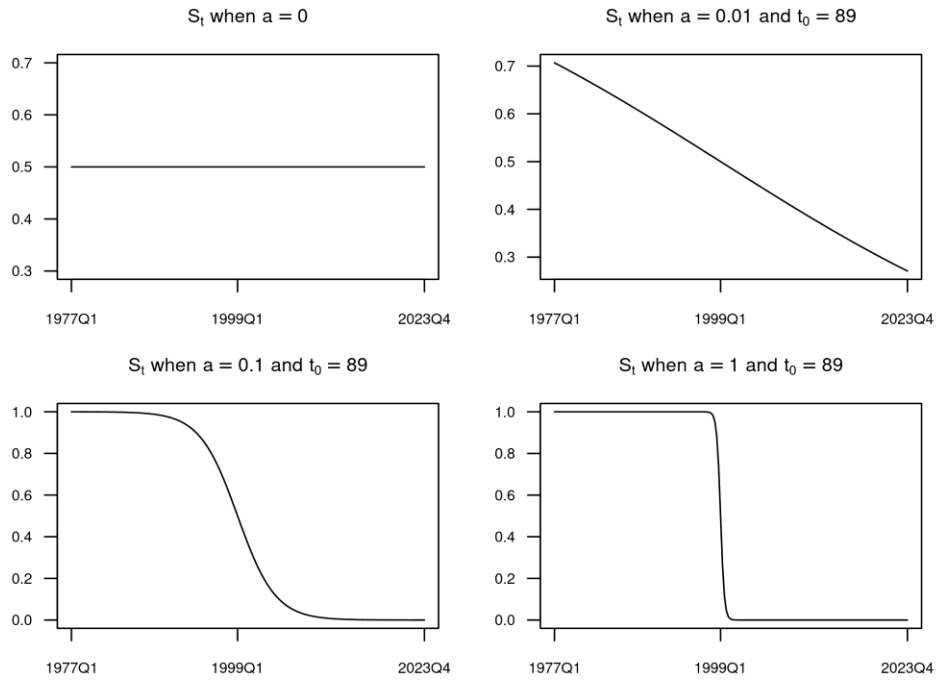

Figure no. 3 – The smooth transition variable with different parameter values

Since our goal is to obtain a point estimate of the evolution of GDP in Portugal, we will not be concerned with the standard deviation of the estimates. One advantage of this fact is that it allows us to estimate the STVAR model by iterating on estimates of a linear model, where the explanatory variables are the original explanatory variables (Y_{t-1} and X_t) multiplied by S_t, and those same variables multiplied by $1 - S_t$. The iteration is performed over a grid of values for a and t_0. The grid for a is 0.01, 0.1, 0.2, …, 10, and the grid for t_0 is 1.5, 2.5, …, 186.5. Having estimated the STVAR, and thus having estimated t_0, we compute the counterfactual by

simulating the model with the coefficients corresponding to the date just before the regime change, i.e., just before S_t switches from being larger than 0.5 to being smaller than 0.5. Therefore, the "break date" corresponds to the first observation for which $S_t < 0.5$, while the last observation in the first regime (call it "base date") is the last observation for which $S_t > 0.5$. Given that our grid contains only half-integers, this is observation $t_B = t_0 - 0.5$; likewise, the break date is observation $t_0 + 0.5$. Consequently, the simulation from the base date onward is computed under the assumption that $S_t = S_{t_B}$ for all $t \geq t_B$.

3.2 Data

The data spans from 1977Q1 to 2023Q4, covering the period before and after Portugal's entry into the euro area. The endogenous variables (Y_t) in our model include the following:

- Portuguese real per capita GDP (log): the quarterly time series sourced from the Banco de Portugal database was divided by the population series obtained from AMECO (which was linearly interpolated to obtain a quarterly time series).
- Portuguese Consumer Price Index (CPI) inflation: the quarterly consumer price index was retrieved from the International Monetary Fund's International Financial Statistics database (IMF-IFS). This was used to compute the quarterly inflation rate as the log difference.
- Portuguese short-term Interest Rate: for the period up until 1998Q4, we used the Banco de Portugal's discount rate from the IMF-IFS, while from 1999Q1 onwards, we utilized the ECB's main refinancing operations rate.
- Portuguese long-term Interest Rate: we used the government bond yield from IMF-IFS until 1985Q4; for the period afterwards the data comes from Eurostat.
- Portuguese real Effective Exchange Rate (log): the data were retrieved from the IMF-IFS. However, we extended the data to the period 1977Q1-1978Q4 using the nominal exchange rate and the consumer price index, as well as their lags.

The exogenous variables (X_t) used in our model are drawn from the broader euro area data and include:

- euro area real per capita GDP (log): real GDP was sourced from the Area-Wide Model (AWM) Database until 1994Q4 and from the ECB thereafter. We linked the two series using the growth rates. The resulting series was divided by the population series obtained from AMECO (as above, linearly interpolated to obtain a quarterly time series).
- euro area GDP deflator Inflation: data for the harmonized consumer price index were also sourced from the AWM Database (until 1996Q4) and the ECB (since 1997Q1). We computed the quarterly inflation rate as the log difference of the resulting series.
- euro area short-term interest rate: we used a German short-term interest rate to represent the euro area short-term interest rate before the creation of the euro. The time series corresponds to the Bundesbank's discount rate until 1998Q4 and to the ECB's main refinancing operations rate since 1999Q1.
- German long-term interest rate: as above, but now for the whole period, we used a German long-term interest rate to represent the euro area long-term interest rate. The time series corresponds to the government bond yield from the IMF-IFS until 1979Q4 and from Eurostat since 1980Q1.

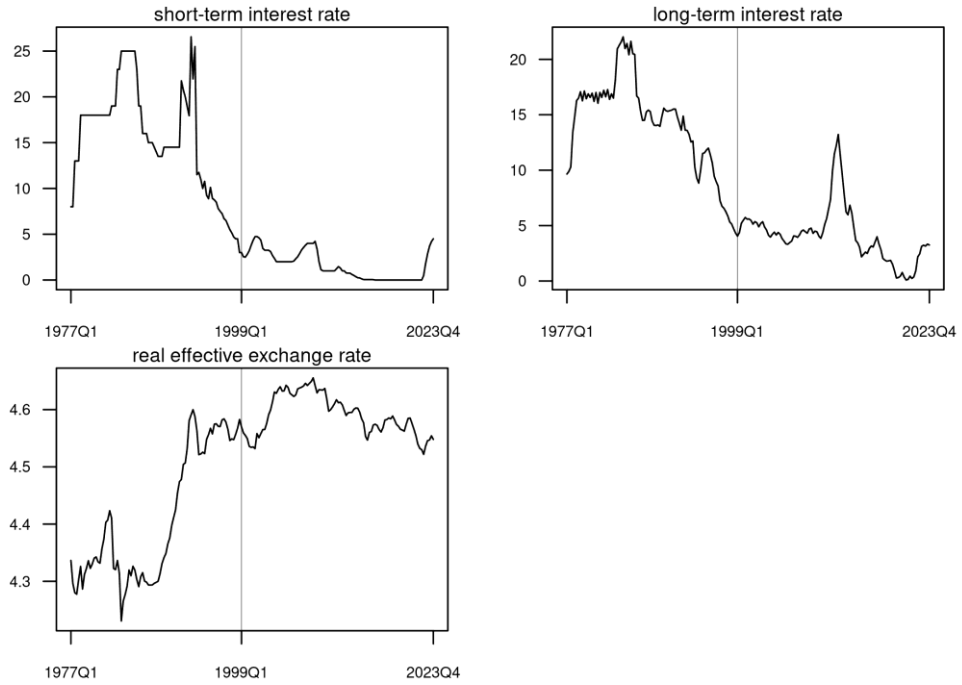

Figure no. 4 – Additional time series for Portugal

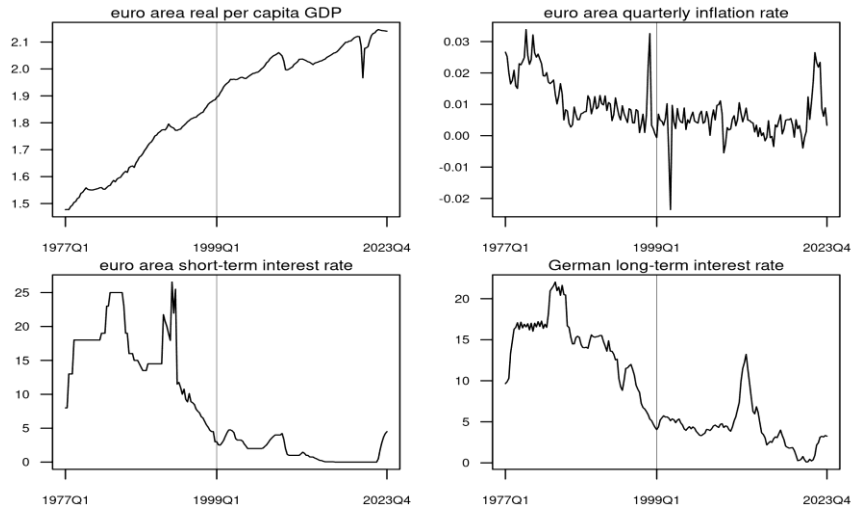

Figure no. 5 – Exogenous time series

Figure no. 4 shows the evolution of the Portuguese short term interest rate, long term interest rate and real effective exchange rate (real per capita GDP was already shown in Figure no. 1, and quarterly inflation was in Figure no. 2). Figure no. 5 shows the evolution of the exogenous variables.

4. RESULTS

We began by estimating the model described in the previous section. As discussed in the next subsection, the model was not robust. Therefore, we proceeded to estimate a second version of the model. The second version of the model, described in second subsection below, provides our estimate of the impact of the euro on the Portuguese economy.

4.1 The basic STVAR model

When we estimate the basic STVAR model presented in the previous section, the estimated a is 5.7 and the estimated t_0 is 65.5, which implies that the regime change occurred in 1993Q2. These estimates also imply that the change was fairly abrupt; see Figure no. 6. We will return to this issue below.

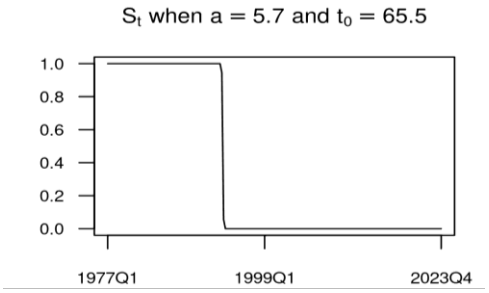

Figure no. 6 – The smooth transition variable in the basic model

Figure no. 7 shows the counterfactual for GDP obtained using the basic model. The figure suggests that after an initial period of approximately ten years, during which simulated GDP was slightly below actual GDP, the paths of simulated and actual GDP become very similar. This finding contradicts previous literature. But what about the endogenous variables of the model? Figure no. 8 shows the actual and simulated paths for inflation, the exchange rate, and interest rates. Some of the simulated paths appear somewhat unusual. The model estimates that the long-term interest rate would have remained at a high level, similar to its level before the break date. However, the simulated paths for inflation, the exchange rate, and interest rates are explosive. Therefore, the model appears to produce inconsistent results.

One possible explanation is that the estimation of the model is affected by the turbulence in the early 1990s within the Exchange Rate Mechanism of the European Monetary System, which forced the withdrawal of the British pound from the mechanism. To account for this possibility and assess the robustness of these results, we added a dummy variable for 1993Q2 to the model. The resulting model is discussed in the next subsection.

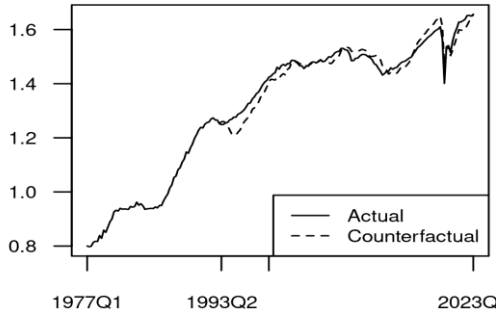

Figure no. 7 – Actual and counterfactual (log) GDP in the basic model

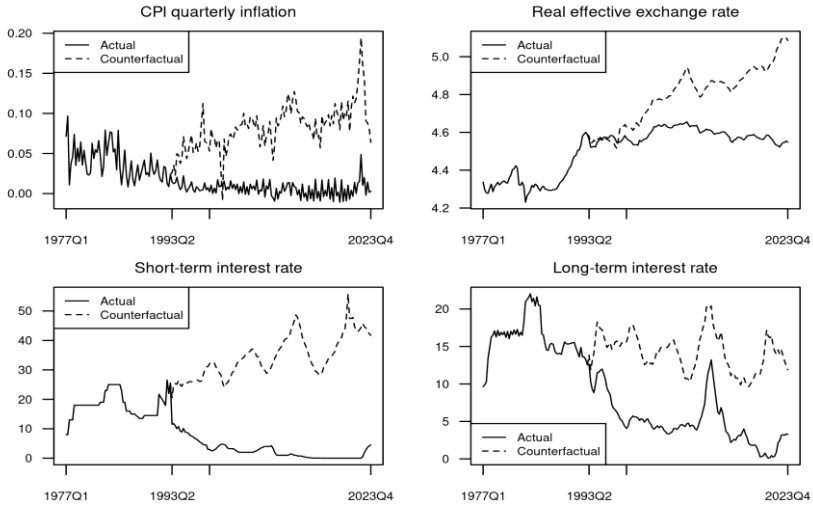

Figure no. 8 – Simulated paths in the basic model

4.2 The model with a dummy for 1993Q2

When a dummy variable for 1993Q2 is included in the model, the change in the coefficients of the model occurs gradually rather than abruptly (see Figure no. 9). The estimates of the smooth transition parameters are now 0.1 for a and 49.5 for t_0, which implies that the break date is 1989Q2.

According to the evolution portrayed in Figure no. 10, euro area membership has had a positive impact on Portuguese real per capita GDP. Compared to a counterfactual scenario in which Portugal did not join the euro area, our results indicate that GDP growth has been consistently higher under euro area membership. By the end of the study period (2023), real per capita GDP was estimated to be approximately 17% higher than in the counterfactual scenario. Figure no. 11 depicts how the difference between actual and counterfactual real per capita GDP evolved over time. It shows that most of the gain occurred before the start of the euro: by 1999Q1, actual GDP was already about 10% larger than counterfactual GDP.

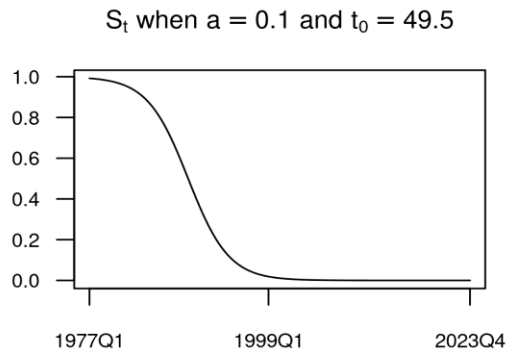

Figure no. 9 – The smooth transition variable in the model with the 1993Q2 dummy

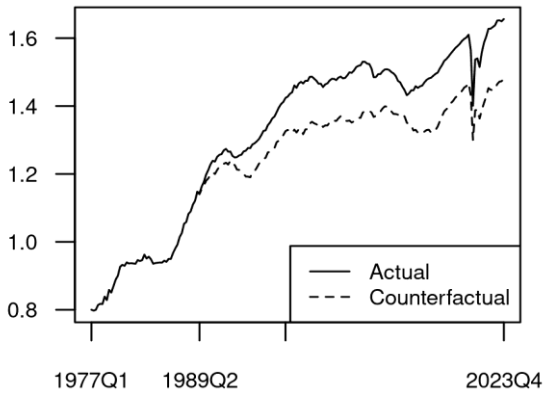

Figure no. 10 – Actual and counterfactual (log) GDP in the model with the 1993Q2 dummy

Figure no. 11 – Difference between actual and counterfactual GDP

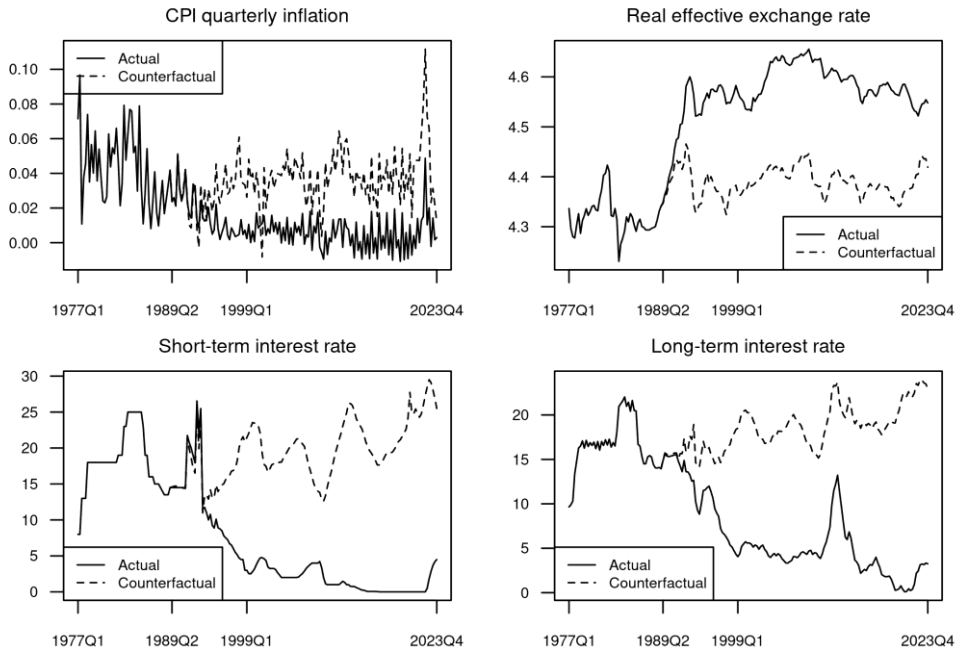

Figure no. 12 – Simulated paths in the model with the 1993Q2 dummy

Figure no. 12 shows the difference between actual and counterfactual values for the other endogenous variables of the model. One clear benefit of the nominal convergence process required for eurozone membership was the successful disinflation observed in Portugal. Unsurprisingly, the counterfactual simulations indicate that Portugal would have faced higher inflation without euro area membership. Another clear benefit of euro area membership is the decline in both short- and long-term interest rates in Portugal. Again unsurprisingly, the STVAR results show that both short- and long-term interest rates were lower and less volatile in the post-euro period compared to the counterfactual scenario. The results concerning the real effective exchange rate indicate that, had Portugal not joined the eurozone, the real effective exchange rate would not have appreciated as much as it did.

The results reported in this subsection differ noticeably from those in the previous subsection. The conclusions of the previous version of the model were not robust; introducing a dummy for 1993Q2 altered the conclusions as described. But is this second version of the model itself robust? We performed two robustness tests. First, we added a dummy for each quarter from 1992Q2 to 1993Q3, the period associated with the European Monetary System crisis of the early 1990s, during which the band and parity of the Portuguese Escudo changed several times. The second robustness test involved adding a dummy for the Covid crisis (2020Q2), which caused an unusual recession, combining an extremely large magnitude with an extremely short duration. In both cases, the conclusions remained unchanged.

5. CONCLUDING REMARKS

This study contributes to the ongoing debate about the costs and benefits of euro area membership for Portugal by presenting an estimate of the macroeconomic impact of integration into the eurozone. Using a Smooth Transition Vector Autoregressive (STVAR) model, we compared actual economic indicators with a counterfactual scenario in which Portugal did not join the euro area. More specifically, we projected the path of macroeconomic indicators under the assumption that the nominal convergence process required to join the eurozone stopped halfway.

Our findings suggest that eurozone membership has yielded several benefits, including increased real per capita GDP, successful disinflation, and lower interest rates. By the end of the study period in 2023, real per capita GDP was estimated to be approximately 17% higher than in the counterfactual scenario, with much of this gain occurring before the official adoption of the euro in 1999.

Our estimates differ from those reported in previous studies. The primary factor behind this is that the use of the STVAR model allows us to consider that part of the benefits of joining the eurozone were achieved in the years preceding the creation of the euro, during the nominal convergence process. Naturally, the results present in this paper offer one interpretation of the historical data, not necessarily the definitive one. Nevertheless, we are convinced the STVAR's ability to account for the transition period is an advantage relative to the VAR models used in earlier studies.

The benefits and costs of eurozone membership are increasingly being weighed against a backdrop of rising uncertainty, driven by factors such as geopolitical tensions, rapid technological advancements, and the growing influence of populist parties across Europe. The economic stability provided by eurozone membership has been beneficial in shielding member countries from currency volatility and in providing a unified framework to respond to challenges, as seen during recent crises, such as those associated with Covid and inflationary pressures. Meanwhile, the rise of populist parties, often critical of European integration, reflects public concerns over the limitations that eurozone membership imposes on national sovereignty. The one-size-fits-all approach of the eurozone is unlikely to please everyone, yet the costs appear to be worth bearing. Part of the benefit of being in the eurozone is precisely the fact that it provides a framework for stability, limiting the potential for reckless policies.

Happy birthday to the euro!

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ORCID

Pedro Bação https://orcid.org/0000-0002-3340-1068
António Portugal Duarte https://orcid.org/0000-0002-5388-0051
Fátima Sol Murta https://orcid.org/0000-0001-7652-7405

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