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The 2011-2014 Economic Adjustment Programme for Portugal: A Plausible Counterfactual Scenario

O Programa de Ajustamento Económico para Portugal, 2011-2014: Um Cenário Contrafactual Plausível

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ABSTRACT
The 2007 global financial crisis triggered a severe sovereign debt crisis in Portugal, which led to the need to comply with an Economic Adjustment Programme (EAP) based on fiscal consolidation, among other pillars. According to our literature review, the economic environment in which the adjustment takes place matters. Also, the composition of the adjustment seems to be relevant to its effectiveness, with expenditure-based plans being less contractionary (or even expansionary) than tax-based plans. Our purpose is to understand, through a VAR model, which path the Portuguese economy would have followed without the EAP. Our results suggest that the austerity programme may have been harmful to economic activity in the short run, but in a longer horizon it produced a better outcome than if the EAP had not been implemented. In the absence of the EAP, the tax to GDP ratio would have been below the current ratio, with the inverse happening for the primary public expenditure ratio and for the public debt interest rate. Overall, our results support the likelihood of less disciplined fiscal accounts in the absence of the EAP.
Keywords: adjustment programme, fiscal consolidation, vector autoregressive, counterfactual

JEL Classification: C32; E62; H30

1. Introduction

The 2007 global financial crisis triggered a severe sovereign debt crisis in some European Union (EU) member states, including Portugal. In May 2011, Portugal formalized a request for financial assistance from the EU and the International Monetary Fund (IMF), which provided a loan of €78 billion. The granting of the loan required compliance with an Economic Adjustment Programme (EAP), agreed with the European Commission (EC), the European Central Bank (ECB) and the IMF, based, among other pillars, on fiscal consolidation.[1] The implementation of this programme ended on June 30, 2014. As for fiscal consolidation, the EAP entailed the adoption of a set of tax and public expenditure measures that constituted a case for austerity.[2]

The evolution of GDP, inflation, unemployment, public debt and household savings in the 2000-2007 (before the financial crisis), 2008-2010 (before the EAP regime), 2011-2015 (during the lifetime of the EAP regime[3]) and 2016-2019 (after the EAP regime) periods is presented in Table 1.

Table 1: The economic situation in Portugal, 2000-2019

	2000-2007	2008-2010	2011-2015	2016-2019
Real GDP growth rate	1.5	-0.4	-0.8	2.8
Inflation rate	3.0	1.1	1.4	0.9
Unemployment rate	6.3	9.4	14.4	8.5
Gross public debt as a % of GDP	65.2	87.9	127.8	123.9
Households savings rate	11.0	9.3	8.3	6.9

Notes: Figures displayed refer to annual averages of each indicator (in percent). The households savings rate includes non-profit institutions serving households.
Source: Eurostat database.

The observation of these figures reveals that, during the period of application of the EAP regime, the performance of the Portuguese economy deteriorated, worsening the recessive situation already evidenced during the international financial crisis. It is possible, however, to conclude for some recovery in the period that followed the implementation of the financial assistance programme.

[1] At a press conference held on July 14, 2011, the Portuguese Minister of Finance stated that the EAP was based on three pillars: first, fiscal consolidation aimed at establishing the balance of public accounts; second, actions aimed at maintaining financial stability; and, third, a comprehensive set of structural measures aimed at improving competitiveness and growth potential.

[2] The term austerity is used here to mean an economic policy pattern, composed of public spending cuts and/or tax increases, aiming a fiscal adjustment.

[3] Although formally the implementation of this programme ended on June 30, 2014, the corresponding economic regime is assumed to have lasted until November 25, 2015, when, following parliamentary elections, a new, left-wing, government took office.

Our work intends to contribute to a reflection on the consequences of the application of the EAP regime through a model that, assuming an appropriate representation of the Portuguese economy, allows for the estimation of the results of a counterfactual situation that corresponds to the hypothesis of such economic regime have not been adopted. Our research will hopefully contribute to shed some light on the circumstances that shape the effectiveness of fiscal consolidation plans.

This work is organized in four main sections. Section 2 reviews the relevant economic literature on the effects of fiscal consolidation measures in terms of the economic activity, with the composition of fiscal adjustments deserving a special attention. Section 3 addresses the case of economic adjustment programmes within international assistance requests, providing the link to the Portuguese specific 2011-2014 situation. In section 4, a counterfactual scenario is modelled based on an appropriate representation of the Portuguese economy with the purpose of estimating a plausible scenario that could have taken place had the Portuguese government not called for international assistance. Lastly, in section 5, the main conclusions and possible lines of development are presented.

2. The Literature on the Effects of Fiscal Consolidation

Before proceeding to the analysis of the Portuguese situation, we review the relevant literature on the effects of fiscal consolidation measures in terms of the economic activity, with the composition of fiscal adjustments deserving a special attention.

2.1. Can austerity be expansionary?

In the early nineties of the last century, Giavazzi and Pagano (1990) raised the following question: "Can severe fiscal contractions be expansionary?". This research was the beginning of the production of a vast economic literature on what has been generically labelled expansionary austerity and that has lasted to this day. Giavazzi and Pagano (1990) studied fiscal consolidation processes based on wide cuts in public spending in Ireland and Denmark in the 1980s, considered to be a period of strong expansion of private consumption in those economies. To explain the apparent non-Keynesian effects of the public spending cuts then produced, the authors advanced the hypothesis that direct (Keynesian) effects are more than offset by the change in consumer expectations (hope of a tax reduction in the future) with an impact on private consumption and investment – this became known as the wealth effect. But it should be noted that these authors did not rule out the possibility of growth being boosted by the monetary and exchange rate policies adopted at the time.

Subsequent research focused on the central question of whether austerity could, in the short run and against the Keynesian teaching, lead to the economic growth and on the investigation of some adjacent issues, namely whether: (i) the composition of the adjustment, in terms of expenditure cuts or tax increases, is relevant, (ii) the impact of the adjustment is permanent or transitory, (iii) the impact of the adjustment depends on the state of the economy (a recession or an expansion), and (iv) the level of indebtedness of the economy is

significant. In addition, the literature discusses issues related to the research methodology adopted, the political impacts of the adjustments, the role played by the economic policies adopted in the course of the adjustment processes, or the mechanisms – the wealth effect mentioned by Giavazzi and Pagano (1990) and other mechanisms like the supply side ones – that can theoretically explain the impacts of these processes.

Our literature review is focused on the plausibility of the expansionary austerity hypothesis and on the relevance of the composition of fiscal adjustments.

The literature reveals the existence of two lines of answer to the central question. One line of research concludes for the evidence that austerity can, even in the short term, bring growth to the economy (or, at least, not harm the economic activity); these conclusions were drawn by Afonso (2010), Afonso and Jalles (2014), Afonso et al. (2022), Alesina and Ardagna (1998 and 2010), Alesina and Perotti (1995 and 1996), Alesina et al. (1998), Alesina (2010), and Giavazzi and Pagano (1990); and, for the Portuguese case, Afonso and Sousa (2011). The main argument is a demand side one: the positive effect on private demand more that compensates for the decrease in public demand. Other works denying the evidence of such possibility were carried out by Baker (2010), Bhattacharya and Mukherjee (2013), and Guajardo et al. (2011). This latter trend includes the remarkable study by the IMF "Will it hurt? Macroeconomics effects of fiscal consolidation" (IMF, 2010).

In a speech to the Ecofin meeting in Madrid on April 15, 2010, Alesina (2010, p. 3) stated that evidence accumulated in the literature reveals that "not all fiscal adjustments cause recessions. Many even sharp reductions of budget deficits have been accompanied and immediately followed by sustained growth rather than recessions even in the very short run." Alesina and Ardagna (1998, p. 3) concluded that "several fiscal adjustments have been associated with expansions even in the short run" and also that "fiscal adjustments are expansionary when they occur following a fiscal crisis" (Alesina and Ardagna, 1998, p. 4). Alesina and Perotti (1995, p. 24)'s work led to the conclusion that "major fiscal adjustments do not cause recessions". In an extension of this study, Alesina and Perotti (1996, p. 40) concluded that "a fair amount of evidence suggests that, in some cases, fiscal contractions can be expansionary". Alesina et al. (1998) revisited and updated the work reported in Alesina and Perotti (1995, 1996) and found evidence that "fiscal adjustments are not always associated with reduced growth, or with a deterioration in the macroeconomic environment in general" (Alesina et al. 1998, p. 200). On the contrary and in line with Alesina and Ardagna (1998), the authors concluded that "fiscal consolidations prompted by a fiscal crisis and achieved by trimming government spending often have expansionary effects" (Alesina et al., 1998, p. 241). Alesina and Ardagna (2010, p. 37) "uncover several episodes in which spending cuts adopted to reduce deficits have been associated with economic expansions rather than recessions.". However, Jayadev and Konczal (2010, p. 1) verified that the majority of the episodes used by Alesina and Ardagna (2010) did not see a deficit reduction in the middle of a slump. Where they did, it often resulted in a decline in the subsequent growth rate or an increase in the debt-to-GDP ratio.

As previously mentioned, in 2010, the IMF published a study, which is part of the second line of answer to the central question stated above, concluding that there is no evidence that austerity is expansionary in the short term. This study was carried out from the identification of episodes of fiscal adjustment in advanced economies and obtained as relevant

results that "undertaking fiscal consolidation is likely to have more negative short-term effects if (…) interest rates are near zero and central banks are constrained in their ability to provide monetary stimulus", and that "fiscal consolidation is likely to be beneficial over the long term" (IMF, 2010, p. 113). This is line with Afonso and Martins (2016)'s findings that when fiscal consolidations are not matched by a monetary expansion the non-Keynesian effects disappear.

Baker (2010) has reviewed the arguments that support the hypothesis of expansionary austerity to gauge the suitability of its application to the United States having concluded that "the differences [in the economic environment] between the United States in 2010 and the countries that have successfully gone the route of fiscal austerity to boost growth are large and are very central to the adjustment process" (Baker, 2010, p. 12). Afonso and Leal (2019) found that stringent fiscal consolidations may not be the best strategy to boost economic growth, as the response is expected to be recessive in highly indebted countries that faced recession. Bhattacharya and Mukherjee (2013, p. 4128) also concluded that "fiscal austerity is unlikely to trigger faster growth in the short term, as argued forcefully in IMF (2010). However, the article suggests that the contractionary impact of fiscal consolidation in heavily indebted advanced economies may be offset, at least in part, by higher private consumption."

Guajardo et al. (2011) suggest that the methods used by other studies to identify fiscal consolidation episodes may bias the analysis towards the expansionary austerity hypothesis. By using an alternative method based on the identification of fiscal policy variables directly from historical documents, the authors concluded that there is "little support for the expansionary hypothesis" and that its "main finding that fiscal consolidation is contractionary holds up in cases where one would most expect fiscal consolidation to raise private domestic demand" (Guajardo et al., 2011, p. 29).

Overall, the evidence on the feasibility of expansionary austerity is mixed and the contributions for the output reaction mechanisms are diverse. A complementary explanation is suggested by Alesina et al. (2017a), Alesina et al. (2019) and Jayadev and Konczal (2010), with the argument that the outcome in terms of economic output of fiscal consolidations depends on the state of the business cycle. This is the "when" issue raised in Alesina et al. (2017a) and in Alesina et al. (2019). As reviewed, the economic environment in which the adjustment process takes place matters: not only the economic cycle, but also the conduction of monetary and exchange rate policies as well as the degree of fiscal stress influence the economic outcome of fiscal consolidations.

Besides the analysis of the impact of fiscal consolidations in terms of economic growth, one relevant issue is: why austerity? The answer of Alesina et al. (2019, pp. 1-2) to this question is that governments resort to austerity because countries accumulate debt in excess and experience various crises. The former occurs when the governments do not compensate for deficits produced in recessionary times with surpluses in boom times. Moreover, austerity may also be a consequence of rising public spending in the aftermath of crises triggered by a war, a natural disaster, a pandemic or an external financial or economic crisis, among others. "The bottom line is that austerity measures sometimes are required because of past policy mistakes, or a combination of policy mistakes and unexpected negative shocks. The latter are fortunately relatively rare, so that austerity is almost always the result of poor foresight and overspending relative to tax revenues" (Alesina et al., 2019, p. 2).

2.2. Does the composition of fiscal adjustments matter?

An issue widely discussed in the literature is the relevance of the composition of the fiscal adjustments both on the effectiveness in achieving fiscal consolidation and on the impact on economic activity. According to our literature review, there is a large consensus that expenditure-based adjustments are less contractionary than tax-based adjustments.

Alesina (2010) expressed, during the aforementioned Ecofin meeting, the view that spending cuts are more effective than tax increases in stabilizing debt and avoiding economic downturns. Guajardo et al. (2011) concluded that "spending-based adjustments are less contractionary than tax-based adjustments, particularly after the first year" (Guajardo et al., 2011, p. 25). Alesina et al. (2015b, p. 386) concluded "that fiscal adjustments based on cuts in spending are much less costly, in terms of output losses, than those based on tax increases".

Some studies go further in detailing the most suited components of expenditure to cut in order to guarantee less or non-contractionary effects. Alesina and Perotti (1995, p. 19) concluded that "within expenditure, successful adjustments are characterized by large cuts in transfers and in wage government consumption". Moreover, Alesina and Perotti (1996, p. 1) found that budget adjustments based on cuts in transfers, social security programmes and public wages and employment "induce a more lasting consolidation of the budget and are expansionary" while the adjustments based mainly on broad increases in the tax base "are soon reversed by further deteriorations of the budget and have contractionary consequences on the economy". IMF (2010, p. 103) points out that spending-based deficits cuts that "rely on cuts to transfers, have smaller contractionary effects than tax-based adjustments."

Other contributions conclude that expenditure-based fiscal adjustment may even have expansionary effects. Alesina et al. (1998, p. 198) argue that there is "extended evidence that fiscal corrections relying mostly on spending cuts that are concentrated on government wages and transfers tend to be expansionary, whereas those relying on tax increases are contractionary". Alesina and Ardagna (1998, p. 3) state that "fiscal adjustments concentrated on the spending side and, in particular, on public wages and welfare spending are long lasting, while those which rely primarily on tax hikes do not lead to a permanent consolidation of government finances". Blanchard and Perotti (2002, pp. 1330-1331) extracted results that "consistently show positive government spending shocks as having a positive effect on output, and positive tax shocks as having a negative effect."

Another line of research extends the analysis to the components of the private demand impacted by the fiscal adjustment. Alesina and Ardagna (2013, p. 65)'s results show that "the component of private demand that react more positively to an expenditure-based adjustment is private investment". Afonso and Sousa (2011), in an analysis of the Portuguese economy, concluded that public spending shocks lead to a reduction in private consumption and investment. Romer and Romer (2010)'s work is supported by a methodology based on the historical analysis of the episodes coming from the tax policy (narrative approach) and concludes that tax increases have a large negative effect on investment.

Alesina et al. (2015a) consider that the correct way to study the effects of a fiscal adjustment should be based on the analysis of budgetary change plans (and not on individual budgetary shocks); of this study has resulted (Alesina et al., 2015a, p. S19) that (i) "fiscal adjustments based upon spending cuts are much less costly, in terms of output losses, than

tax-based ones and have especially low output costs when they consist of permanent rather than stop and go changes in taxes and spending", (ii) "the difference between tax-based and spending-based adjustments appears not to be explained by accompanying policies, including monetary policy" and (iii) "it is mainly due to the different response of business confidence and private investment."

Alesina et al. (2017b, pp. 3-4) found that (i) "plans based, on reductions in spending (current and investment) or reductions in transfers (...) cause, on average, a mild recessionary effect after one year from the start of the consolidation, but this effect starts vanishing the following year", (ii) "tax-based adjustments confirm to cause much larger output losses than expenditure-based fiscal consolidation", (iii) "tax-based plans also have long lasting recessionary effects", and (iv) "consumption drops almost equally across components in the short term, but recovers quickly for spending and transfer-based consolidations" but also that (v) "private investments strongly respond to taxes only."

Based on a study of multi-year plans on the output effects of EB (expenditure-based plans) and TB (tax-based plans) austerity, Alesina et al. (2019, p. 116) conclude that "EB plans have very small costs in terms of output losses. The average low costs of the former are the result of some of them producing deeper recessions and other being expansionary. TB plans are associated with deep and long-lasting recessions. The component of aggregate demand that responds very distinctly in the two types of plans is private investment. In fact, investors' confidence (which reflects their expectations about the future) reacts positively to EB plans and negatively to TB ones. Consumers' confidence moves in the same general direction but with a smaller difference between types of plans".

Finally, Alesina et al., (2017a, pp. 33-34) suggest that "the state of the economic cycle may influence the economic outcome of fiscal adjustments, but the composition effect is much more robust" and "the dynamic response of the economy to a consolidation plan does depend on whether this is adopted in a period of economic expansion or contraction".

In short, this literature review highlights the conclusion that the composition of the fiscal adjustment seems to be relevant to its effectiveness and indicates the general way that expenditure-based plans are less contractionary (or even expansionary) than tax-based plans. This result particularly holds when spending cuts are based on wages and welfare items, which is not surprising as the literature emphasises the unproductive nature of current public spending. The empirical evidence is biased towards private investment being positively impacted by expenditure-based adjustments and negatively impacted by tax-based adjustments. As reviewed in the previous paragraphs, some studies emphasize the appropriateness of, when analysing the composition of the adjustment, considering comprehensive budget plans instead of individual shocks and also of taking into account the economic cycle.

3. **Does International Financial Assistance Shape Fiscal Policy?**

In case of a fragile situation in public accounts and a subsequent need for public financing, the government may, theoretically, resort to monetary or market financing. The former mechanism is not available in a situation of central bank independence or integration in a monetary union and the latter may not be possible if there are no lenders or the financing

cost is too high. Governments may then choose not to comply with the debt obligations (which harms the credibility of the country and further increases the cost of financing), to renegotiate the public debt conditions (which, of course, depends on the creditors' will) or to request international financial assistance. This last option was the way out of the financial and public debt crisis that hit Portugal in the aftermath of the last global economic and financial crisis and led to the Portuguese 2011-2014 EAP, negotiated with the EC, the ECB and the IMF, of which fiscal consolidation was a key element. As such, the EAP included an austerity plan based both on spending cuts and tax increases.

Before exploring the hypothesis that a choice different from the adoption of the 2011-2014 EAP would have been a better solution, we must reflect on the need for international financial assistance and stress the main characteristics of the EAP.

3.1. The need for international financial assistance

A financial crisis arises when a loss of confidence in the economy makes agents unwilling to lend or accepting to lend at significantly high interest rates. The sources of financial crises can be external and/or internal and, the weaker the domestic economy, the stronger the effects will be. The external causes are often motivated by sudden unexpected increases or decreases in global demand, which lead to significant increases in the prices of goods and interest rates.

The internal causes may be of various natures but the most common are persistent public deficits. Expectations of an unsustainable public debt undermine the trust of (external and internal) economic agents in government who will find it increasingly difficult to borrow at reasonable interest rates.

Adjustment programmes were introduced in the 1980's (Duncan, 2002), initially with a focus on physical infrastructures and later extended to social assistance. At the time, in the aftermath of the two major oil crises, developing countries, unable to service external debts, were facing serious economic problems. Within this international environment, the role of international financial agencies as lenders of last resort was enhanced.

Soon, it became clear that for the financial aid to be successful, both changes in economic policy as well as structural economic reforms were needed. Microeconomic policies, mainly trade and industry policies, should be at the service of the needed structural changes in the economy. Macroeconomic policies should be designed to enhance economic growth and stabilize the economy, by leading to the reduction of public and external deficits, to the full use of resources and to the stability of prices (including interest rates). However, some conflicts are likely to arise if, for example, the promotion of economic growth is based on weak public finances. In particular, if the country is a member of a common currency area – as Portugal is –, the available macroeconomic tools at the national level are solely the fiscal ones. If the situation is of fragile fiscal accounts, the challenge is to boost the economy and at the same time promote sound public finances. Moreover, structural changes have short-run costs and so getting the people's and the parliament's political support for the reforms is a key part of the process (Duncan, 2002).

So, in exchange for financial assistance, the financing organizations – initially, mainly the IMF and the World Bank – explicitly demand that some changes should be made in the recipient economy. This is often seen as a loss of sovereignty, even though the financial assistance is provided at the invitation of the recipient country.

3.2. The 2011-2014 economic adjustment programme for Portugal

The April 25, 1974 revolution introduced democracy in Portugal, after more than 40 years of dictatorship. This year marked the beginning of persistent budget deficits and the significant increase of public intervention in the economy. According to Marinheiro (2005), in this post-revolution period, one observes a shift to an unsustainable path in the Portuguese fiscal policy.

The entry into the European Community in 1986, and the run-up to the third phase of the Economic and Monetary Union led to increased fiscal discipline in the late 1990s (Marinheiro, 2005). In 1997, Portugal fully complied with the Maastricht convergence criteria and joined the euro area as a founding member. According to Viegas and Ribeiro (2014), the consolidation that occurred in the 1997-2000 period was mainly due to stock-flow adjustments and snow-ball effects, reflecting a weak economic performance. Facing difficulties in keeping fiscal discipline, Portugal became, in 2001, the first euro area member to be subject to an Excessive Deficit Procedure (EDP) for breaking the 3% ceiling for the deficit defined in the Treaty on the European Union and in the Stability and Growth Pact. The Portuguese economy became under an EDP again in 2005 and 2009. Public finances were clearly in an unsustainable path.

The EAP for Portugal was agreed between the Portuguese authorities, the EU and the IMF in May 2011. While in Greece the key driver of the request for external help was the fiscal indiscipline and in Ireland was the real estate market lack of robustness, the need for the Portuguese EAP was mainly due to low productivity growth and large public and external imbalances (European Commission, 2011), which together with the negative developments of the sovereign bond markets forced the Portuguese government to ask for external assistance in April, 2011. At that time, the socialist minority government had resigned after the parliament rejected a proposal for a stability programme, and new elections had been called for June.

The total amount of funding provided for the EAP was of €78 billion, channelled by the European Financial Stabilisation Mechanism, the European Financial Stability Facility and the IMF's Extended Fund Facility. Of this total amount, €12 billion were earmarked for the capital increase of private banks during an initial phase. With a strategy aimed at restoring the confidence of international financial markets and promoting competitiveness and sustainable economic growth, the programme expired on June 30, 2014.

Portugal is now under a post-programme surveillance by the European institutions, and a post-programme monitoring by the IMF. In line with the EU and IMF rules, at this stage of enhanced supervision, the aim is to monitor Portugal's economic situation, with a view to assessing the maintenance of its ability to repay outstanding debt to the European institutions and the IMF. The duration of this stage is directly related to the level of this

debt. The post-programme surveillance stage involves carrying out biannual missions, usually simultaneously, of staff from the EC, the ECB and the IMF (Banco de Portugal, 2019).

4. A Counterfactual Scenario

Fiscal consolidation was one of the three pillars of the 2011-2014 Portuguese EAP. Our literature review suggests that the economic impact of fiscal adjustments is not necessarily negative in the short run, with the composition of the adjustment playing an important role in the outcome. Moreover, as reviewed, the economic environment in which the adjustment process takes place – namely in terms of the degree of fiscal stress, the external environment and the conduction of monetary policy – matters for the outcome of such consolidations.

The purpose of this paper is to help answering the question of how the Portuguese economic path without the fiscal adjustment programme would compare with the actual one. In order to do so, we designed a model that plausibly portraits the relevant economic framework and proceed with its estimation and the discussion of the empirical findings.

4.1. The conceptual model

The hypothesis that it would not have been inevitable to have resorted to the EAP, and that the country would not have implemented a fiscal consolidation programme, raises the question of whether the EAP has led the Portuguese economy to perform worse than what would have resulted from the situation of non-adherence to that programme. As in Alesina et al. (2019, p. 117), we "do not know what would have happened without austerity". But we can design a possible, and plausible, scenario grounded on past relations between variables assumed as determinant to this operation.

It is assumed that the economic regime relevant to this exercise is characterized by the following variables: real GDP; tax revenue[4]; primary public expenditure; long-term nominal interest rate; economic sentiment indicator and short-term real interest rate.

The real GDP is the variable adopted to evaluate the economic performance shaped by the economic policy adopted in the country.

Tax revenue determines the volume of resources subtracted from the economy with an implication on economic performance and is an expression of the nature of the selected fiscal policy.

Primary public expenditure determines the volume of public provision of goods and services and is also an expression of the nature of fiscal policy. As reviewed previously, the composition of the fiscal adjustment, in terms of revenue increases or spending cuts, is not irrelevant when it comes to assess the impact of fiscal adjustments on the economy.

The nominal long-term interest rate, representative of the cost of the Portuguese public debt, influences total public expenditure and conditions fiscal policy. It is expected that an increase in this variable will produce a contractionary effect on the economy both by the

[4] Unless otherwise expressed, tax revenue is assumed from now on to include social contributions.

reduction of the public demand and by the adverse expectations that it generates in the economic agents. The inclusion of the long-term nominal interest rate as an endogenous variable represents an extension to Alesina et al. (2019)'s model.

The economic sentiment indicator, that is, the sentiment in the partner economies of the country is a determining factor of external demand and foreign investment. It is expected that the favourable evolution of this indicator, including the perception on the degree of fiscal stress, generates an expansionary effect on the Portuguese economy.

The real short-term real interest rate reflects the monetary policy conducted by the ECB, influencing the economic activity.

The conceptual model underlying this exercise is shown schematically in Table 2, with the selection of the exogenous variables being in line with our literature review which stressed the importance of the economic environment, in terms of the external environment and the conduction of monetary policy influence the economic outcome of fiscal consolidations.

Table 2: The conceptual model

Indicator of the economic regime	Economic nature	Type of variable in the model
Real GDP (*gdp*)	Goal	Endogenous
Tax revenue ratio on GDP (*reven*)	Instrument	Endogenous
Primary public expenditure ratio on GDP (*spend*)	Instrument	Endogenous
Nominal long-term interest rate (*nltr*)	Control	Endogenous
Economic sentiment indicator (*esi*)	Control	Exogenous
Real short-term interest rate (*rstr*)	Control	Exogenous

4.2. The empirical strategy

The method used to develop our empirical analysis consists in estimating an econometric model representing the Portuguese economy and able to capture the effects of the specific economic regime put in place during the EAP (that is, from the second quarter of 2011 to the last quarter of 2015) and in the following period (from the first quarter of 2016 to the last quarter of 2019). We choose to extend the EAP economic regime till the end of 2015, even though the formal end occurred in June 2014, since the government that was in office till the end of 2015 kept the economic guidelines set in the EAP.

This representation of the economy (factual representation[5]) will make it possible to project in the period of application of the EAP and in the subsequent period the economic regime purged of the effects of that application (counterfactual representation).

The values generated by the counterfactual representation for the period of application of the EAP and for the following period will allow comparing the economic performance that could have been achieved without the application of the EAP with the factual economic performance.

The econometric model to support the empirical analysis is an estimated vector autoregressive (VAR) based on quarterly observations ranging from the first quarter of 1999 to the last quarter of 2019[6] for the following variables: real GDP growth rate (*g_gdp*), change in tax revenue to GDP ratio (*v_reven*), change in primary public expenditure to GDP ratio (*v_spend*), change in nominal 10-year Portuguese government bond yield (*v_nltr*), economic sentiment indicator in the EU (*esi*) and real short-term interest rate (*rstr*). The VAR specification also includes two binary variables: one that takes the value 1 for observations in the economic adjustment period (2011Q2 to 2015Q4) and the value 0 for other observations (*eap*) and another that takes the value 1 for observations in the period after the economic adjustment period and the value 0 for other observations (*peap*). The use of high frequency data allows for a more accurate monitoring of the fiscal position.

The variables and their sources are described in the Annex. The variables *log*(*gdp*), *reven*, *spend* and *nltr* were differentiated to ensure stationarity[7]. As for the exogenous variables, despite the evidence of units roots it was decided not to differentiate as suggested in Sims, Stock and Watson (1990) to avoid the loss of relevant information. Table 3 shows the descriptive statistics of these variables.

Table 3: Descriptive statistics, 1999Q2-2019Q4

Variable	Minimum	Average	Maximum	Standard deviation
Real GDP growth rate (*g_gdp*)	-2.55% [2009Q1]	0.24%	2.20% [2000Q1]	0.78
Change in tax revenue ratio (*v_reven*)	-5.55 p.p. [2005Q3]	0.03 p.p.	7.84 p.p. [2018Q3]	2.88
Change in primary public expenditure ratio (*v_spend*)	-16.63 p.p. [2014Q4]	0.02 p.p.	12.46 p.p. [2017Q1]	3.94

[5] Factual representation is distinguished from the actual representation in that it does not capture the effects of variables represented by random disturbances.

[6] Even though provisional data for 2020 is already available, we chose not to include it so that our results are not disturbed by the effects of the Covid-19 pandemics.

[7] The presence of unitary roots in the stochastic processes generating these variables was assessed using the usual Augmented Dickey-Fuller and Phillips-Perron tests complemented by the development of the Kwiatwoski-Phillips-Schmidt-Shin test.

Variable	Minimum	Average	Maximum	Standard deviation
Change in nominal 10-year Portuguese government bond yield (*v_nltr*)	-1.84 p.p. [2012Q2]	-0.05 p.p.	2.53 p.p. [2011Q2]	0.67
Economic sentiment indicator (*esi*)	69.50 [2009Q1]	100.80	116.80 [2000Q2]	9.38
Real short-term interest rate (*rstr*)	-5.55 p.p. [2015Q1]	-0.32 p.p.	5.03 p.p. [2008Q3]	2.26

Notes: The observations for 1999Q1 are used in the calculation of the transformed variables. The quarter in which the minimum or maximum has been reached is given in brackets. As described in the Annex, the GDP and fiscal variables are seasonally adjusted. The number of observations is 83.

The correlation coefficients between the pairs of endogenous variables are, in absolute value, lower than 0.6.

In the VAR specification, it is assumed that the variables *esi* and *rstr* are exogenous variables and the other are endogenous variables. The VAR specification took into account the results of applying standard information criteria for determining the number of lags of endogenous variables. In view of the parsimony required by the small size of the database, the VAR was specified without lags in exogenous variables. The estimated VAR satisfies the stability condition defined in Lütkepohl (2007, p. 15).

The specification adopted has the following assumptions:

- there is no contemporary interaction between the endogenous variables since, due to the high frequency data used, the changes in the values of those variables in one quarter only impact the other variables in the following quarter;
- there was no break in the economic regime in force during the period prior to the entry into force of the EAP;
- during the implementation period of the EAP, an economic regime different from that of the previous period was in force and the values of endogenous variables of the factual representation in that period capture both the effects of the previous economic regime and the effects of the change in the economic regime; and
- in the post-EAP period, a third economic regime was in force and the values of endogenous variables of the factual representation in this period capture both the effects of the economic regime in force before the entry into force of the EAP and the effects of changing that regime.

Given these assumptions, the specified VAR is given by:

$$\widehat{x_t} = \widehat{B_0} + \left(\widehat{B_1}L + \widehat{B_2}L^2 + \widehat{B_3}L^3 + \widehat{B_4}L^4\right)x_t + \widehat{B_5}z_t + \widehat{B_6}\,\text{eap} + \widehat{B_7}\,\text{peap} + \varepsilon_t \qquad (1)$$

where:

- x_t stands for the 4x1 vector of endogenous variables: g_gdp, v_reven, v_spend and v_nltr;
- z_t stands for the 2x1 vector of exogenous variables: esi and rstr;
- L stands for the one-quarter lag operator;
- $\widehat{B_0}$ stands for the 4x1 vector of independent terms;
- $\widehat{B_1}$, $\widehat{B_2}$, $\widehat{B_3}$ and $\widehat{B_4}$ stand for the 4x4 matrix with the coefficients associated with one-quarter, two-quarter, three-quarter and four-quarter lagged endogenous variables, respectively;
- $\widehat{B_5}$ stands for the 4x2 matrix with the coefficients associated with the contemporary *esi* and *rstr* variables;
- *eap* stands for a binary variable that assumes the value 1 in the period from the second quarter of 2011 to the fourth quarter of 2015 and that assumes the value 0 otherwise;
- $\widehat{B_6}$ stands for the 4x1 vector with the coefficients associated with the *eap* variable;
- *peap* stands for a binary variable that takes the value 1 in the period from the first quarter of 2016 to the fourth quarter of 2019 and that takes the value 0 otherwise;
- $\widehat{B_7}$ stands for the 4x1 vector with the coefficients associated with the *peap* variable; and
- ε_t stands for the 4x1 estimated vector with the error terms, assuming that $E(\varepsilon_t) = 0$, $E(\varepsilon_t \varepsilon_t') = \Omega$ and $E(\varepsilon_t \varepsilon_{t-1}) = 0$ for whatever element of the vector ε_t.

Table 4 presents the results of this estimation.

Table 4: Baseline VAR estimation results, 2000Q2-2019Q4

	g_gdp_t	v_reven_t	v_spend_t	v_nltr_t
intercept	-5.281 [-4.179] ***	-3.742 [-1.032]	17.061 [2.861] ***	-1.365 [-1.034]
g_gdp_{t-1}	-0.130 [-1.030]	0.444 [1.226]	0.445 [0.748]	-0.097 [-0.737]
g_gdp_{t-2}	-0.031 [-0.267]	-0.268 [-0.812]	0.073 [0.135]	-0.02 [-0.165]
g_gdp_{t-3}	-0.11 [-1.045]	-0.103 [-0.341]	1.096 [2.202] **	-0.063 [-0.572]
g_gdp_{t-4}	-0.158 [-1.566]	0.087 [0.300]	-0.457 [-0.963]	-0.046 [-0.442]
v_reven_{t-1}	-0.098 [-2.132] **	-1.159 [-8.742] ***	0.197 [0.903]	0.005 [0.111]
v_reven_{t-2}	-0.052 [-0.879]	-1.045 [-6.112] ***	0.273 [0.971]	-0.009 [-0.144]
v_reven_{t-3}	-0.083 [-1.420]	-0.881 [-5.245] ***	0.282 [1.022]	-0.033 [-0.532]
v_reven_{t-4}	-0.088 [-1.873] *	-0.122 [-0.906]	0.222 [1.002]	0.004 [0.083]
v_spend_{t-1}	0.012 [0.454]	-0.048 [-0.659]	-1.038 [-8.595] ***	-0.01 [-0.364]
v_spend_{t-2}	0.013 [0.415]	-0.003 [-0.037]	-0.692 [-4.550] ***	-0.007 [-0.200]
v_spend_{t-3}	0.022 [0.705]	0.002 [0.025]	-0.604 [-4.037] ***	-0.029 [-0.866]
v_spend_{t-4}	-0.002 [-0.092]	0.021 [0.306]	-0.338 [-2.934] ***	-0.012 [-0.454]
v_nltr_{t-1}	-0.128 [-1.017]	0.077 [0.213]	-0.658 [-1.112]	0.613 [4.678] ***
v_nltr_{t-2}	-0.048 [-0.336]	0.523 [1.266]	0.36 [0.529]	-0.123 [-0.818]
v_nltr_{t-3}	-0.301 [-2.119] **	-0.534 [-1.309]	-1.289 [-1.922] *	0.146 [0.985]

	g_gdp_t	v_reven_t	v_spend_t	v_nltr_t
v_nltr_{t-4}	-0.249 [-1.895] *	-0.138 [-0.365]	1.258 [2.028] **	-0.303 [-2.203] **
esi_t	0.056 [4.256] ***	0.038 [1.022]	-0.167 [-2.701] ***	0.015 [1.067]
$rstr_t$	0.093 [2.351] **	0.064 [0.562]	0.066 [0.354]	0.027 [0.651]
eap_t	-0.347 [-1.826] *	0.726 [1.330]	-2.039 [-2.271] **	-0.247 [-1.244]
$peap_t$	0.388 [2.029] **	-0.456 [-0.830]	-0.608 [-0.674]	-0.102 [-0.510]
R-squared	0.599	0.778	0.668	0.451
F-statistic	4.333 ***	10.173 ***	5.832 ***	2.387 ***
Number of observations (after adjustments)	79	79	79	79

Notes: *t-statistic* in given in brackets. ***, ** and * indicate levels of significance of 1%, 5% and 10%, respectively.

Considering each VAR equation and applying the F test we conclude for the global significance at the level of 1%.

It is assumed that the most relevant variable for the current exercise is real GDP as the economic performance is measured, under conditions of low inflation, by the trajectory of that variable. It is also assumed that the path of employment depends on the behaviour of real output.

Regarding the estimated VAR, the following strategy is developed focusing on the period from the second quarter of 2011 to the last quarter of 2019:

– recursively generate the series of values of the endogenous variables corresponding to the factual situation (*g_gdpf*, *v_revenf*, *v_spendf* and *v_nltrf*);
– recursively generate the series of values of the endogenous variables corresponding to the counterfactual situation (*g_gdpc*, *v_revenc*, *v_spendc* and *v_nltrc*);

and based on the values of these series, the following series are generated:

– *ga_gdpf* and *ga_gdpc*, corresponding to real gross domestic product growth rates, measured each quarter by the annual equivalent in factual and counterfactual situations, respectively;
– *revenf* and *revenc*, corresponding to the tax revenue ratio in factual and counterfactual situations, respectively;
– *spendf* and *spendc*, corresponding to the primary public expenditure ratio in factual and counterfactual situations, respectively;

– *nltrf* and *nltrc*, corresponding to the nominal long-term interest rate in factual and counterfactual situations, respectively; and
– *taxgapf* and *taxgapc*, corresponding to the differences between *spend* and *reven* in factual and counterfactual situations, respectively; and
– finally, the variables *vcf_gdp*, *vcf_reven*, *vcf_spend*, and *vcf_nltr* are generated, corresponding to the differences, in percentage points, between the counterfactual and factual values as described in the previous indent, which allows comparing the results that would be obtained for the counterfactual situation (that is, not capturing the effects of the austerity policy) with those obtained for the factual situation (that is, capturing the effects of austerity policy).

The persistence in maintaining high tax gaps (that is, the part of primary public expenditure not covered by tax revenue) in the counterfactual situation would probably not be accommodated by public debt markets. Therefore, the empirical strategy is adjusted by imposing ceilings on the tax revenue and primary public expenditure ratios corresponding to the levels at which these ratios were in the first quarter of 2011.

4.3. The empirical results

Table 5 summarizes the results obtained with the application of the strategy described in the previous section.

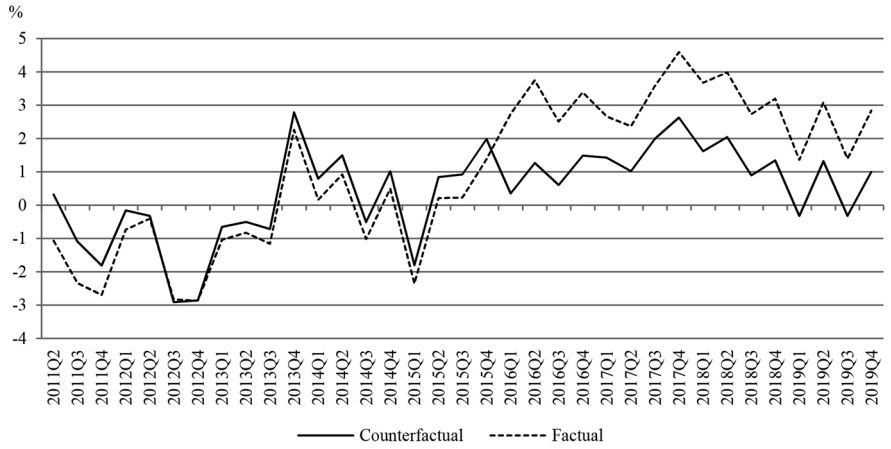
Table 5: Empirical results, 2011Q2-2019Q4

		Contrafactual situation	Factual situation	Contrafactual-factual change
Real GDP growth rate (in annual equivalent rates)	Minimum	-2.9 %	-2.9 %	-2.5 p.p.
	Average	0.4 %	1.0 %	-0.5 p.p.
	Maximum	2.8 %	4.6 %	1.4 p.p.
	Standard deviation	1.4 p.p.	2.2 p.p.	1.3 p.p.
Tax revenue ratio	Minimum	32.7 %	34.1 %	-3.5 p.p.
	Average	33.9 %	36.0 %	-2.1 p.p.
	Maximum	34.8 %	37.3 %	-0.3 p.p.
	Standard deviation	0.6 p.p.	0.9 p.p.	0.8 p.p.
Primary public expenditure ratio	Minimum	41.7 %	39.2 %	-3.4 p.p.
	Average	44.0 %	43.4 %	0.7 p.p.
	Maximum	45.0 %	48.4 %	2.7 p.p.
	Standard deviation	1.3 p.p.	3.1 p.p.	2.0 p.p.
Nominal long-term interest rate	Minimum	7.8 %	0.6 %	0.2 p.p.
	Average	9.2 %	3.3 %	5.9 p.p.
	Maximum	11.3 %	7.7 %	10.8 p.p.
	Standard deviation	1.2 p.p.	2.0 p.p.	3.0 p.p.
Tax gap	Minimum	6.9 p.p.	2.3 p.p.	-2.8 p.p.
	Average	10.1 p.p.	7.3 p.p.	2.8 p.p.
	Maximum	12.3 p.p.	13.8 p.p.	6.2 p.p.
	Standard deviation	1.8 p.p.	3.9 p.p.	2.7 p.p.

The following figures show the behaviour over time of the real GDP growth rate and of the change in the tax revenue ratio, in the primary public expenditure and in the nominal long-term interest rate in factual and counterfactual situations. As explained before, the counterfactual scenario is assumed to be a plausible one, in which the ceilings of the tax revenue and the primary public expenditure ratios were set at the levels of the corresponding ratios in the first quarter of 2011.

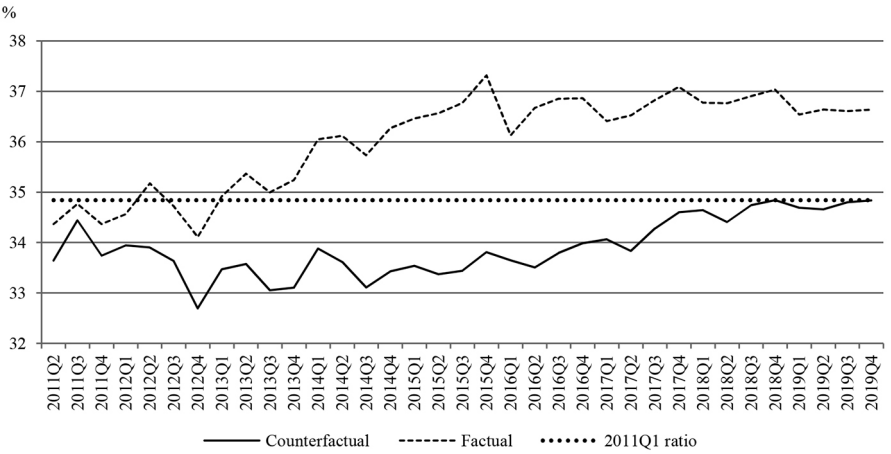
Figure 1 suggests that, in the absence of the EAP, the real GDP growth rate would have been negative on average but higher until 2013Q3 (+0.5 p.p. higher on annual equivalent average corresponding to -1.1% *versus* -1.6%), would have been positive on average and also higher between 2013Q4 and 2015Q4 (+0.5 p.p. higher on annual equivalent average corresponding to +0.8% *versus* +0.3%) and would have been positive on average but lower from 2016Q1 (-1.9 p.p. lower on annual equivalent average corresponding to +1.1% *versus* +3.0%). Therefore, there is evidence that the austerity plan may have been harmful in terms of the economic activity in the short run, but in a longer horizon the austerity policy produced a better outcome than the one without the EAP application.

Figure 1: Real GDP growth rate (annual equivalent), 2011Q2-2019Q4



The counterfactual scenario outlined in this exercise – which, it must be remembered, would imply the adoption of a budget constraint limited by the tax revenue and primary public expenditure ratios in 2011Q1 (34.8% and 45.0%, respectively) – would lead to a level of the tax revenue ratio standing at 33.9% on average and on an upward trend (Figure 2), where the 34.8% threshold is often non-effective. However, in the absence of the fiscal adjustment, the tax ratio would remain persistently below the factual one.

Figure 2: Tax revenue ratio, 2011Q2-2019Q4



The counterfactual scenario could have led to the level of the primary public expenditure ratio being lower than in factual scenario until 2014Q3 and being higher afterwards. The expenditure threshold (45.0%) would be effective until 2015Q1; afterwards, the counterfactual ratio would have followed with a downward trend (Figure 3).

Figure 3: Primary public expenditure ratio, 2011Q2-2019Q4

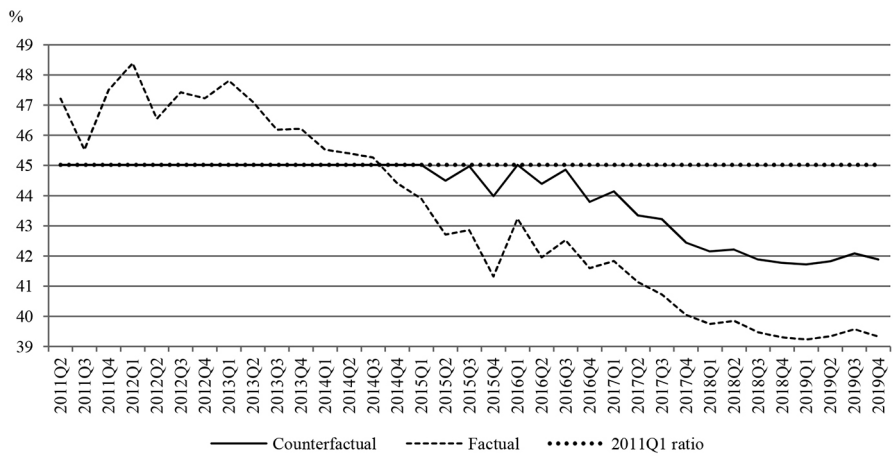
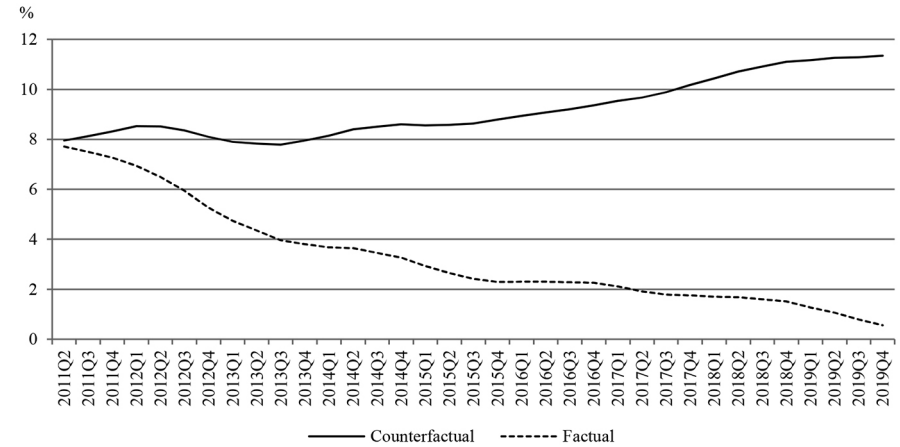


Figure 4 suggests that the long-term interest rate, representative of the public debt cost, in the counterfactual situation could have followed an upward trend in opposition to the downward trend of the factual scenario. This result is consistent with the likelihood of less disciplined fiscal accounts in the absence of the EAP.

Figure 4: Nominal long-term interest rate, 2011Q2-2019Q4



The combination of the counterfactual situation for the two budgetary variables would lead to smaller tax gaps by 2013Q2 (-1.1 p.p. on average, corresponding to 11.4% *versus* 12.5%) and the larger tax gaps as of 2013Q3 (+4.2 p.p. on average, corresponding to 9.7% *versus* 5.5%) (Figure 5).

Figure 5: Tax gap (primary public expenditure ratio - the tax revenue ratio), 2011Q2-2019Q4

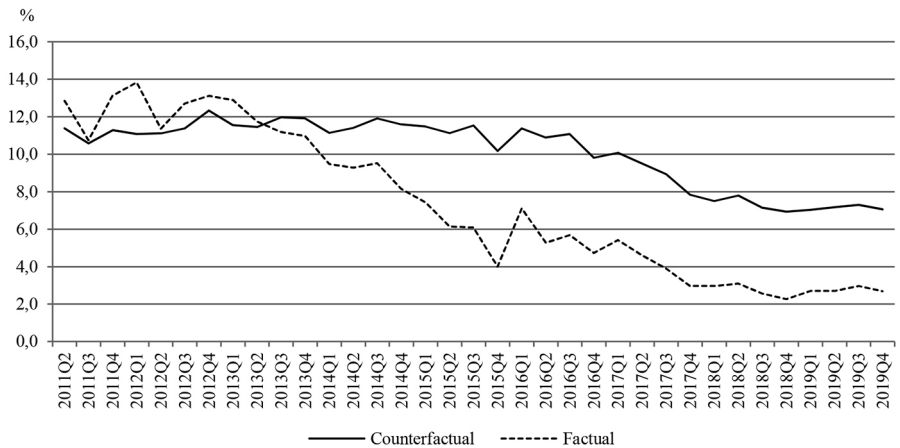
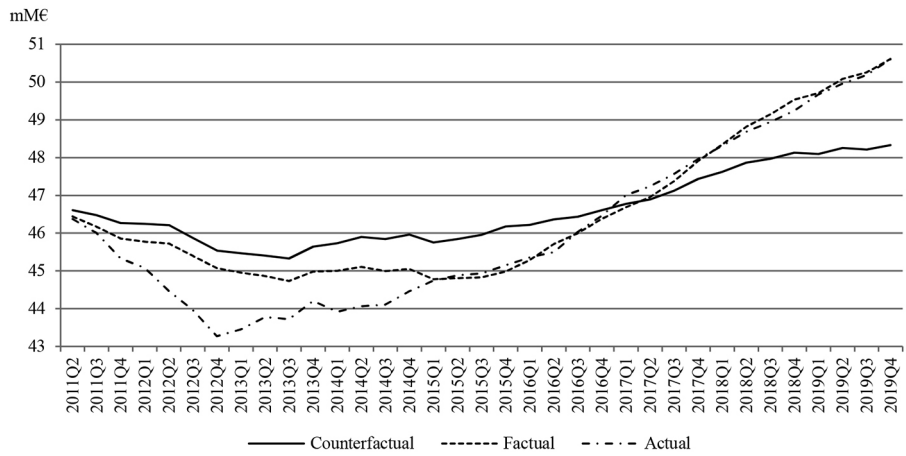


Figure 6 shows the trajectory of real GDP at levels (2015 prices) in the counterfactual, factual and actual representations.

Figure 6: Real GDP at levels (2015 Mm€), 2011Q2-2019Q4



4.4. Alternative specifications

In order to allow for a further assessment of the baseline model, its specification was changed in two directions:

– assuming that the economic regime in force during the adjustment period (2011Q2-2015Q4) would persist in the following period (2016Q1-2019Q4) (alternative A); and
– reducing to 1 the number of lags of endogenous variables and introducing interactive dummy variables with the other variables in order to admit different slopes for *pre-eap*, *eap* and *peap* periods (alternative B).

Except for the variable *v_nltr* in B, these alternatives do not improve the model quality.

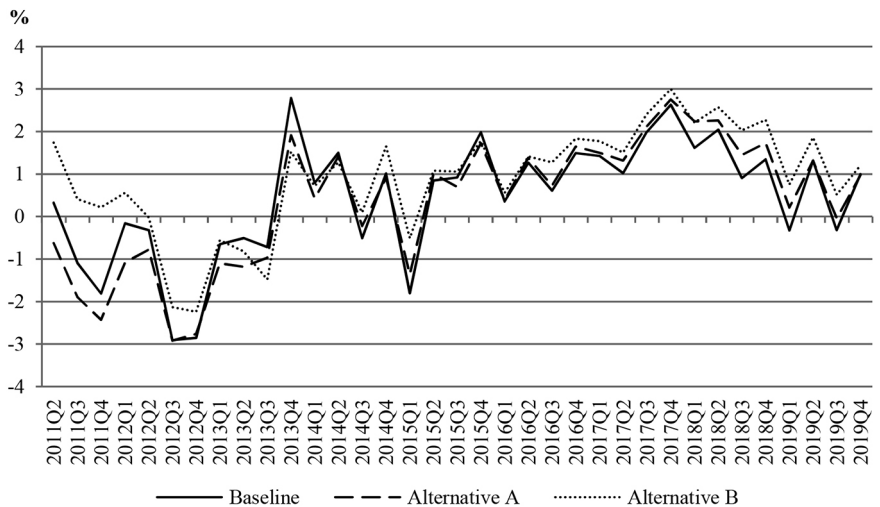
Table 6 summarizes the values of the R^2 and the *p-value* of the F test that support these results.

Table 6: R^2 and P-values of the baseline and alternative specifications

Equation	Specification	R^2	p-value
g_gdp	Baseline	0.599	0.000
	Alternative A	0.538	0.000
	Alternative B	0.415	0.017
v_reven	Baseline	0.778	0.000
	Alternative A	0.768	0.000
	Alternative B	0.502	0.001
v_spend	Baseline	0.668	0.000
	Alternative A	0.659	0.000
	Alternative B	0.530	0.000
v_nltr	Baseline	0.451	0.005
	Alternative A	0.448	0.004
	Alternative B	0.461	0.004

Figure 7 shows the path of the counterfactual real GDP growth rate in the baseline and in the alternative specifications revealing no significant differences.

Figure 7: Counterfactual real GDP growth rate (annual equivalent): Baseline versus alternative specifications, 2011Q2-2019Q4



Note: Alternative A means that it is assumed that the economic regime in force during the adjustment period (2011Q1-2015Q4) would have persisted in the following period (2016Q1-2019Q4). Alternative B corresponds to the reduction in the number of lags in endogenous variables to 1 and the introduction of interactive dummy variables with the other variables.

5. Conclusion

The global financial crisis of 2007 and the resulting sovereign debt crisis determined Portugal's resort to an international financial assistance that entailed the adoption, among others, of an austerity programme composed of public spending cuts and tax increases. The question that emerges is whether the adoption of this programme – which was followed by the deterioration of the Portuguese economy performance – could have been ruled out in favour of a better solution.

The literature review highlights the two following issues. The first is that the plausibility of an expansionary austerity hypothesis is not to be rejected even though the circumstances in which it may take place matter. The second is that the composition of the fiscal adjustment seems to be relevant to its effectiveness and indicates the general way that expenditure-based adjustments are less contractionary (or even expansionary) than tax-based adjustments.

When the country's fiscal position becomes fragile (with the accumulation of fiscal deficits and public debt) and public financing cannot depend on the monetary issuance, on the financial market or on the restructuring of public debt, the use of international financial assistance is often inevitable. In Portugal, an economic adjustment programme, the EAP, was agreed in May 2011 between the Portuguese authorities, the EU and the IMF.

The method adopted in our counterfactual empirical analysis consists in estimating an econometric model representing the Portuguese economy and able to capture the effects of the specific economic regime put in place during the EAP (2011Q2-2015Q4) and in the following period (2016Q1-2019Q4). Our counterfactual scenario is assumed to be a plausible one, in which the ceilings of the tax revenue and the primary public expenditure ratios were set at the levels of the corresponding ratios in the first quarter of 2011.

According to our empirical results, there is evidence that the austerity programme may have been harmful for the economic activity in the short run, but in a longer horizon the austerity policy would produce a better outcome than the one without the EAP application.

The counterfactual scenario outlined in this exercise would lead to a level of the tax revenue ratio standing persistently below both the 2011Q1 threshold and the factual path. As for the primary public expenditure ratio, the 2011 threshold would have been effective by 2015 and then the ratio would have remained on a downward trend, albeit at higher levels than in the factual situations.

Accordingly, the combination of the counterfactual situation for the two budgetary variables would lead to larger tax gaps from 2013Q3 onwards.

The long-term interest rate, representative of the public debt cost, in the absence of an adjustment programme, could have followed an upward trend in opposition to the downward trend of the factual scenario. This result is consistent with the likelihood of less disciplined fiscal accounts in the absence of the EAP.

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Annex

A. THE DATABASE

Real gross domestic product (*gdp*)

The values for this variable were taken from the Eurostat series "Gross domestic product at market prices, chain linked volumes (2015) [*namq_10_gdp*]" and are expressed as million euro. The series values were seasonally adjusted by Eurostat.

Tax revenue ratio (*reven*)

The values for this variable were composed by the addition of the indicators "Taxes on production and imports, receivable", "Current taxes on income, wealth, etc., receivable", "Capital taxes, receivable" and "Net social contributions, receivable" from the Eurostat series "Quarterly non-financial accounts for general government [*gov_10q_ggnfa*]". The values are expressed as a percentage of the gross domestic product. The series values were seasonally adjusted applying the "*seas(m)*" filter processed in software EViews.

Primary public expenditure ratio (*spend*)

The values for this variable were composed by the difference between the indicators "Total general government expenditure" and "Interest, payable" from the Eurostat series "Quarterly non-financial accounts for general government [*gov_10q_ggnfa*]". The values are expressed as a percentage of the gross domestic product. The series values were seasonally adjusted applying the "*seas(m)*" filter processed in software EViews.

Nominal long-term interest rate (*nltr*)

The values for this variable were taken from the Bank of Portugal series "BPstat/ Statistics Online/Data domains/Securities/Secondary market/Yield on fixed rate treasury bonds residual maturity-10 years-monthly" and correspond to the quarterly average of the monthly rates. The values are expressed as annual percentages.

Economic sentiment indicator (*esi*)

The values for this variable were taken from the Eurostat series "Sentiment indicators/ Monthly data /Economic sentiment indicator [*ei_bssi_m_r2*]". These values are seasonally adjusted. The values correspond to the quarterly average of the three values in each quarter. A value of 100 indicates a neutral situation, values greater than 100 indicate a positive sentiment and values below 100 indicate a negative sentiment. The geographic reference of the indicator is the EU.

Real short-term interest rate (*rstr*)

The values of this variable come from the application of the following transformation operator: $rstr_t = nstr_t - inf_t \times 4$.

The values for $nstr_t$ (*nominal short-term interest rate*) were taken from the European Central Bank website in "Statistics Bulletin/Monetary policy statistics/1.2 Key ECB interest rates" and correspond to the quarterly average of the "Main refinancing operations" (variable rate tenders/minimum bid rate between June 28, 2000 and October 14, 2008; fixed rate in other observations) daily interest rates. The values are expressed as annual percentages. The values for inf_t (*inflation*) were taken from the Eurostat series "Gross domestic product at market prices, price index (implicit deflator), percentage change on previous period, euro [*namq_10_gdp*].

Output gap (*outgap*)

The values of this variable come from the application of the following transformation operator: $outgap_t = \left(\frac{gdp_t - gdpast_t}{gdpast_t} \right) \times 100$, where $gdpast_t$ represents the potential output in period t obtained by applying the HP filter (lambda = 1600).

Economic adjustment period (*eap*)

It is a binary variable that takes the value 1 for observations in the economic adjustment period (from 2011Q2 to 2015Q4) and the value 0 for observations in the other periods.

Post-economic adjustment period (*peap*)

It is a binary variable that takes the value 1 for observations in the period after the economic adjustment period (from 2016Q1) and the value 0 for observations in the other periods.

Additionally, the following transformations were adopted.

Rate of change in real gross domestic product (*g_gdp*):
$g\_gdp_t = [lognatural(gdp_t) - lognatural(gdp_{t-1})] \times 100$;

Change in tax revenue ratio (*v_reven*): $v\_reven_t = reven_t - reven_{t-1}$;
Change in primary public expenditure ratio (*v_spend*):
$v\_spend_t = spend_t - spend_{t-1}$;

Change in nominal long-term interest rate (*v_nltr*): $v\_nltr_t = nltr_t - nltr_{t-1}$;
Change in economic sentiment indicator (*v_esi*): $v\_esi_t = esi_t - esi_{t-1}$;
Change in real short-term interest rate (*v_rstr*): $v\_rstr_t = rstr_t - rstr_{t-1}$

B. SUMMARY OF THE UNIT ROOT TESTS

Variable	Test	Test for unit root/ stationarity	Include in test equation	t-Statistic	p-value	LM-Statistic	
Lrgdp	adf	level	intercept	-0,9014	0,7832		
			trend	-1,2794	0,8860		
		1.ª diferença	intercept	-6,1149	0,0000		No unit root
			trend	-6,0825	0,0000		No unit root
	pp	level	intercept	-1,1692	0,6844		
			trend	-1,5336	0,8100		
		1.ª diferença	intercept	-6,3551	0,0000		No unit root
			trend	-6,3188	0,0000		No unit root
	kpss	level	intercept			0,5083	Stationary
			trend			0,1415	
		1.ª diferença	intercept			0,1868	
			trend			0,1860	Stationary
reven	adf	level	intercept	-1,2615	0,6438		
			trend	-2,5905	0,2858		
		1.ª diferença	intercept	-15,5606	0,0001		No unit root
			trend	-15,4582	0,0001		No unit root
	pp	level	intercept	-8,1933	0,0000		No unit root
			trend	-11,3172	0,0000		No unit root
		1.ª diferença	intercept	-42,2526	0,0001		No unit root
			trend	-42,6225	0,0001		No unit root
	kpss	level	intercept			1,1482	Stationary
			trend			0,0787	
		1.ª diferença	intercept			0,0864	
			trend			0,0835	

Variable	Test	Test for unit root/ stationarity	Include in test equation	t-Statistic	p-value	LM-Statistic	
spend	adf	level	intercept	-2,9831	0,0407		No unit root
			trend	-2,8505	0,1841		
		1.ª diferença	intercept	-19,9425	0,0001		No unit root
			trend	-7,6570	0,0000		No unit root
	pp	level	intercept	-6,6638	0,0000		No unit root
			trend	-6,6749	0,0000		No unit root
		1.ª diferença	intercept	-40,5675	0,0001		No unit root
			trend	-72,4941	0,0001		No unit root
	kpss	level	intercept			0,2983	
			trend			0,2460	Stationary
		1.ª diferença	intercept			0,3228	
			trend			0,1127	
nltr	adf	level	intercept	-2,3244	0,1669		
			trend	-2,4877	0,3334		
		1.ª diferença	intercept	-4,5594	0,0003		No unit root
			trend	-4,5732	0,0022		No unit root
	pp	level	intercept	-1,6221	0,4669		
			trend	-1,8225	0,6850		
		1ª diferença	intercept	-4,5858	0,0003		No unit root
			trend	-4,6085	0,0019		No unit root
	kpss	level	intercept			0,2019	
			trend			0,1561	Stationary
		1.ª diferença	intercept			0,1300	
			trend			0,0342	