Employment Hysteresis: An Argument for Avoiding Front-Loaded Fiscal Consolidations in the Eurozone

Paulo R. Mota\textsuperscript{1,2}
Abel L. Costa Fernandes\textsuperscript{1,3}
Paulo B. Vasconcelos\textsuperscript{1,4}

\textsuperscript{1} FEP-UP, School of Economics and Management, University of Porto
\textsuperscript{2} CEF.UP, Research Center in Economics and Finance, University of Porto
\textsuperscript{3} NIFIP, Núcleo de Investigação em Finanças Públicas e Política Monetária, University of Porto
\textsuperscript{4} CMUP, Mathematical Research Center, University of Porto
EMPLOYMENT HYSTERESIS: AN ARGUMENT FOR AVOIDING FRONT-LOADED FISCAL CONSOLIDATIONS IN THE EUROZONE

Paulo R. Mota*
University of Porto – School of Economics and Business and CEF.UP†

Abel L. C. Fernandes
University of Porto – School of Economics and Business and NIFIP‡

Paulo B. Vasconcelos
University of Porto – School of Economics and Business and CMUP§

Abstract

The austerity policy applied by the Eurozone peripheral governments under the International Monetary Fund (IMF)/ European Central Bank (ECB)/ European Commission financial assistance programs has contributed to a sharp reduction of aggregate demand, regardless of the unconventional measures undertaken by the ECB. The ECB decreased the interest rate on the main refinancing operations to zero, and is buying assets from banks on a massive scale under the Expanded Asset Purchase Programme. The fact that these extraordinary measures have not been enough to produce a strong recovery, shifts the focus again to fiscal policy. Central to assessing the effects of fiscal policy are the value of impact fiscal multipliers and the size of hysteretic effects. There is widespread evidence that public expenditure multipliers are greater than one when the economy is depressed and the interest rates are close to zero. However, less is known about the importance of hysteresis effects. Using the linear play model of hysteresis we find that hysteresis effects are important in the Eurozone peripheral countries. Large fiscal impact multipliers combined with the presence of hysteresis implies that front-loaded austerity depresses the economy in the short run and these effects may persist in the long run.

JEL Classification E24; E62; J23.

Keywords: Employment, fiscal multipliers, hysteresis

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* Corresponding author: Address; Faculdade de Economia do Porto, Rua Dr. Roberto Frias 4200 Porto - Portugal. Phone: +351 22 557 11 00, E-mail: mpaulo@fep.up.pt.
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‡ Núcleo de Investigação em Finanças Públicas e Política Monetária da Faculdade de Economia do Porto.
§ Centro de Matemática da Universidade do Porto (Centre of Mathematics at the University of Oporto)
1. INTRODUCTION

Fiscal policy had a “Sleeping Beauty” moment in the aftermath of the financial crisis that started in August 2007 (Arestis, 2011, p. 143). In fact, in November 2008 the European Commission launched a coordinated European Economy Recovery Plan (EERP) to provide a temporary discretionary fiscal stimulus of about 1.8% of the combined European Union (EU) GDP to address falling output and rising unemployment, of which two-thirds were to be implemented in 2009 and the remainder in 2010. Besides this, the Stability and Growth Pact was applied in a more flexible manner in order to let the automatic stabilizers operate unconstrained. These automatic stabilizers were projected to support the economies by another 3.2% of the GDP.\(^1\) The objectives were: \(i\) to sustain demand; \(ii\) to sustain employment; \(iii\) to address competitiveness problems; and \(iv\) to ease social hardship.

This expansionary fiscal policy was implemented due to the limited ability of monetary policy to stabilize the economies through reductions in the key ECB interest rates, and through other measures (known as enhanced credit support). The rationale behind the fiscal measures was that the sharp reduction in real GDP in the EU could have long-lasting effects on the economic activity and affect its growth potential, a phenomena technically known as hysteresis (see European Commission, 2009a, p. 1).

Although the fiscal stimulus has been broadly in line with the room for manoeuvre to apply discretionary fiscal policy (see European Commission, 2009b), after 2010, Eurozone peripheral countries like Greece, Ireland, Portugal and later also Spain and Italy had to unwind their fiscal stimulus and implement front-loaded austerity measures (by increasing taxes and especially by cutting government expenditures) in the presence of a growing debt-to-GDP ratio and soaring interest rates. According to the IMF, the European Commission and the ECB these measures are necessary to restore market confidence.

Nonetheless, the austerity policy applied by Eurozone countries that were under adjustment programs contributed to a sharp reduction of aggregate demand, regardless of the conventional and unconventional measures undertaken by the ECB. Furthermore, the interest rate on the ECB main refinancing operations was reduced to zero, and the overnight bank rates in the Eurozone entered slightly into negative territory bringing the

\(^1\) See European Commission (2009a, p. 148).
problem of zero lower bound on interest rates to reality. This have shifted the focus again to fiscal policy - a necessity defended long ago by Keynes (1936).

Central to assessing the impact of fiscal policy are: i) the value of impact fiscal multipliers; and ii) the extent and size of hysteretic effects (see, DeLong and Summers, 2012).

There is no consensus among economists about the value of fiscal multipliers. Reasonable estimates fall in the range of 0.5 to 2.5 (see Ramey, 2011, and Auerbach and Gorodnichenko, 2012). According to the literature, fiscal multipliers are dependent on the economic cycle and are determined by key country characteristics.

At the core of the austerity programs designed by the IMF, and implemented by Eurozone peripheral countries experiencing difficulties was the assumption that fiscal multipliers at the beginning of the crisis were about 0.5. However, there is recent evidence that these multipliers were underestimated, meaning that they may have been in the range of 0.9 to 1.7 (see Blanchard and Leigh, 2013).

There is also some evidence that the macrodynamics of employment and unemployment are characterized by hysteresis (see, e.g., Blanchard and Summers, 1986, Belke and Göcke, 2001, Cross at al., 2005, and Mota et al., 2012).

In the presence of hysteretic there is no self-adjusting mechanism that brings the economy to an equilibrium level of employment/unemployment that is independent of the stance of monetary and fiscal policies (see, e.g., Franz, 1990, Katzner, 1999, Cross et al., 2005, Setterfield, 2009, Cross, 2014, Göcke and Matulaityte, 2015, and Bassi and Lang, 2016). Indeed, a financial crisis that cause a recession can push the economy, for an equilibrium with low employment/high unemployment due to insufficient demand - a situation recognized by Keynes (1934).

If the empirical literature on the size of fiscal multipliers is vast, less is known about the importance of hysteresis for output and employment/unemployment dynamics.

The main purpose of this paper is to analyse the presence and the size of hysteretic effects in the dynamics of employment in the Eurozone peripheral countries that had to implement front-loaded austerity measures. Although hysteretic effects have been found elsewhere, this is to best of our knowledge the first time that an analysis of the presence


\(^3\) The forecasts underestimated the increase in the unemployment, and the decline in private consumption and investment that resulted from fiscal consolidations (Blanchard and Leigh, 2013).

\(^4\) The fiscal multipliers were underestimated both for public spending and taxes, but the degree of underestimation were higher for public spending (Blanchard and Leigh, 2013).
of hysteresis in these particular countries is conducted by offering an indicator of its intensity.

Indeed, the presence of hysteresis is a key issue for the long run effects of fiscal consolidations. The larger the hysteresis effects the worse are the long-term consequences of front-loaded austerity.

Following the approach to hysteresis based on the presence of non-convex costs of adjustment under uncertainty,\(^5\) we estimate a switching aggregate employment equation, with an unknown splitting factor, from a computational implementation of the linear play model of hysteresis (also known as the friction-backlash model) using quarterly industrial data spanning from January 2000 to June 2018. In fact, the play model of hysteresis describes a dynamics where non-convex adjustment costs creates intervals of weak reaction of employment to forcing variables, and spurts in employment may occur as consequence of a large shocks, or cumulative small shocks in labour demand.

The remainder of paper is structured as follows: Section 2 reviews the relevant literature on the size of the fiscal impact multipliers in times of crisis and on the presence of hysteresis in the dynamics of employment/unemployment. Section 3 describes briefly the model of hysteresis along with the implementation strategy. Section 4 presents our empirical results and section 5 concludes.

2. Literature Review

2.1. Fiscal Multipliers

The literature on the effects of fiscal policy is vast and controversial (see, e.g., Batini et al., 2012, and Gechert, 2013 for a survey). The recent empirical evidence shows that the fiscal multipliers are dependent (among others) on: the cyclical state of the economy; the monetary policy stance; the fiscal policy stance of the trade partners; the key country characteristics.

Firstly, fiscal policy is a powerful tool of macroeconomic stabilization especially in a situation when the economy is in a recession.\(^6\) In this case, expansionary spending is

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\(^5\) See Pindyck (1988) and Dixit and Pindyck (1994) for the case of investment, and Amable et al. (1993), Cross (1995), Belke and Göcke (2001), and Mota et al. 2015 for the case of employment/ unemployment.

\(^6\) Gechert (2013) concludes using a meta regression analysis that the expenditures multiplier increases between 0.6 and 0.8 in recessions. See also Owyang et al. (2013) for the case of the US and UK.
less likely to crowd out private demand (see Almunia, 2010, and Auerbach and Gorodnichenko, 2012). When output is low and the financial system is working poorly, consumption may depend more on current rather than on future income, and investment may depend more on current profits than on future ones. Therefore, the multiplier should be larger (Eggertsson and Krugman, 2012, and Batini et al., 2012).

Secondly, the effectiveness of fiscal policy is greater when interest rates are close to the zero lower bound (see, e.g., Christiano et al., 2011, Eggertsson, 2010, and Romer, 2012). When excess supply prevails in the economy and overnight bank rates reach their lower bounds (a condition that prevails in the Eurozone at the moment), fiscal multipliers can be significantly larger than the ones that are estimated in normal times (DeLong and Summers, 2012).

Thirdly, there is evidence that in downturns expenditure multipliers (public consumption and investment) are significantly larger than tax multipliers in absolute value. This happens because consumers, in a recession, will probably save the amount that results from tax reductions, implying a smaller effect on the aggregate demand if compared with government direct expenditures.

Fourthly, the fiscal multipliers can vary according to the permanent or transitory character of the change in the fiscal instrument. The literature shows that permanent measures yield higher multipliers than temporary ones. For example, a permanent tax cut can lead to higher consumption and consequently to a large multiplier, while a temporary tax cut will probably be saved leading to a small multiplier.

Finally, the fiscal multiplier depends on country characteristics such as: a) the level of development - the government consumption multiplier is larger in industrial countries than in developing ones; b) the level of openness measured in terms of goods and services traded - fiscal multipliers are lower in open economies, due to leakage related to imports, than in closed economies; c) the size of the economy - the larger the economy the larger the proportion of the leakage of spending that occurs through imports that returns through an increased demand for exports. On the other hand there is a higher probability that the increase in government purchases are going to be satisfied by national

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7 Note that the expenditure multipliers are positive while the tax multipliers are negative.
8 For example, Gechert and Rennemberg (2014) conclude using a meta regression analysis that the expenditure multipliers exceed the tax multipliers by about 0.3 in absolute value. See also OECD (2009).
9 See, e.g., Spilimbergo et al. (2009).
10 See, e.g., Ilzetzki et al. (2013), and Kraay (2012).
11 Thus, the fiscal multiplier is a negative function of the marginal propensity to import.
producers, consequently the multiplier is higher. That is the reason we should expect fiscal multipliers of the Eurozone as a whole to be larger than the multipliers of each of its individual countries, implying that the coordination of the fiscal stimulus across countries is important in order to offset the spillover effects to other countries by increasing external demand (see IMF, 2009); d) the level of debt - fiscal multipliers are low in high-debt countries);\textsuperscript{12} and finally e) the importance of the automatic stabilizers - the greater the importance of these stabilizers the smaller the fiscal multiplier, as the automatic response of transfers and taxes neutralizes part of the impact of the initial shock.\textsuperscript{13}

Accordingly, in the present context of the Eurozone, there are strong reasons to believe that fiscal policy has significant effects on output and employment in the short run and that these effects are Keynesian.

2.2. Hysteresis

In its original formulation in the domain of physics of magnetism,\textsuperscript{14} hysteresis, from the Greek ‘coming behind’, is the property of a mathematical system whereby some temporary exogenous shocks can have permanent effects.

Nonetheless, as economic theory seized the notion of hysteresis, it did so in a very loose way if we consider the properties of true hysteretic systems. For that reason, some authors consider that in most cases economics ‘bastardizes’ the use of the expression (see Amable \textit{et al.}, 1994). The word hysteresis was initially applied to unemployment rate in the assertion that a temporary disequilibrium affects the position of the equilibrium point, or creates some friction on the way back to equilibrium (Phelps, 1972). Hysteresis is also used to describe persistence in deviations from equilibria. If shocks originate the deviation of unemployment rate from equilibrium rate, actual unemployment remains in disequilibrium for some time, though the equilibrium rate remains an attractor point in the long run (Layard \textit{et al.}, 1991). Moreover, after the influential articles of Blanchard and Summers (1996, 1997), hysteresis is frequently associated with the presence of a unit root in a linear dynamic system (or zero root in continuous time difference equations). In

\textsuperscript{12} See Ilzetzki \textit{et al.} (2013).
\textsuperscript{13} See Dolls \textit{et al.} (2012).
\textsuperscript{14} The term hysteresis was firstly introduced by the physicist James Alfred Ewing in 1881, in the explanation of the behaviour of electromagnetic fields in ferric metals.
this sense, shocks change the equilibrium path of the system with neither the initial nor shocked position of the system being forgotten.

Note, however that neither of these definitions corresponds to the use of hysteresis in physics and mathematics, where the term was first coined (see Amable et al., 1993; 1994; 1995).

In this paper hysteresis is regarded as a unifying mathematical concept where the dynamics of an input-output system has the properties of: a) non-linearity, since reversing a shock might not bring back the system through the initial path; b) remanence, in the sense that there is a permanent effect on output after the value of the input has been modified and brought back to its initial position; and c) selective memory, for the reason that only non-dominated extremum values of the variables which drive the adjustment have permanent effects on the output (see Amable et al., 1993, and Cross et al., 2005).15

These properties are normally found in the dynamics of employment due to the presence of non-convex hiring and firing costs (see e.g., Bentolila and Bertola, 1990, Bertola, 1992, , and Cross et al., 2005).

Note that this non-convex adjustment costs effect (a labour demand side source of hysteresis) can interact with other labour supply sources of hysteresis, namely human and capital depreciation (see, e.g., Blanchard and Summers, 1986, and Kösters and Belke, 1996) and the insiders-outsiders dynamics (see, e.g., Lindbeck and Snower, 1986, and Blanchard and Summers, 1987), to amplify the band of inaction.

It is also established in the literature that uncertainty (of economic, financial and regulatory kind) interacts with the non-convex employment adjustment cost reinforcing the effects of hysteresis (see, e.g., Dixit, 1989, and Belke and Gökçe, 2001).


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15 Non-dominated extrema are local input extrema that are not followed by higher values of the input (see Cross et al., 2005).
3. MODEL AND DATA SET

3.1. Model and Empirical Implementation

In order to explain the aggregate dynamics of employment, we apply the Preisach phenomenological model of hysteresis developed by Krasnosel’skii and Pokrovskii (1989) and Mayergoyz (1986; 2003).

Preisach-type models furnish an aggregation procedure of the employment decision of a multitude of individual heterogeneous firms facing non-convex adjustment costs\(^{16}\) and assess uncertainty in dissimilar ways.\(^{17}\)

At the firm level the presence of non-convex employment adjustment costs leads to an employment decision being conditional on two separate thresholds of the expected return, \(Y_{\text{exit}, j}\) and \(Y_{\text{entry}, j}\), corresponding to trigger values of aggregate demand, \(Y_t\), that induce the firm \(j\) to exit the market (or to contract the level of employment), and to enter the market (or to expand the level of employment), respectively. In the context of the Preisach model this behaviour is described by a non-ideal relay hysteresis operator, \(\mathcal{R}_{Y_{\text{exit}, j}Y_{\text{entry}, j}}\).

At the aggregate level, assuming that the level of employment of every heterogeneous active firm is one, and assuming an arbitrary density function of the individual firms in the Preisach triangle, \(u(Y_{\text{exit}, j}, Y_{\text{entry}, j})\), the aggregate employment, \(N(t)\), can be fully described by equation (1):\(^{18}\)

\[
N(t) = \iint_T u(Y_{\text{exit}, j}, Y_{\text{entry}, j})\mathcal{R}_{Y_{\text{exit}, j}Y_{\text{entry}, j}} dY_{\text{exit}, j} dY_{\text{entry}, j}
\]  

The main result is that for cycles of variation in aggregate demand there is a continuous macroeconomic hysteresis loop for aggregate employment (see Figure 2 in Mota and Vasconcelos, 2012, p. 99). At the aggregate level every reversal of the direction of \(Y_t\) leads to a structural break in the employment-aggregate demand relationship represented by a continuous transition between different curves (branches). After a

\(^{16}\) The justification for the presence of these costs can be found in Hamermesh and Pfann (1996) and Pindyck (1991).

\(^{17}\) See Lang and Peretti (2009).

\(^{18}\) For a complete explanation of the Preisach model of hysteresis see Krasnosel’skii and Pokrovskii (1989) and Mayergoyz (2003). For an application to the employment dynamics see Cross (1995), Cross et al. (2005), and Mota and Vasconcelos, (2012).
reversal of the path followed by $Y_t$ there is a weak response of employment that will evolve into a strong one, once the entry or exit thresholds of many firms are passed. Whenever direction of the aggregate demand changes, a continuous branch-to-branch transition occurs, implying that transitory changes in $Y_t$ can lead to permanent variations in $N_t$.

In the empirical work, we apply the linear play model of hysteresis that can be viewed as a piecewise-linear approximation of the Preisach hysteresis loop, where the slope of the (linear) functions describing the employment-aggregate demand relationship changes every time there is an inversion in path followed by aggregate demand (see Mota et al. 2015, Figure 1, p. 552).\textsuperscript{19}

We assume in line with Göcke (2001) and Mota et al. (2012; 2015) that: \(i\) only two different slopes are considered - a small one, $\beta_1$, representing the weak relationship (along a play line\textsuperscript{20}) between aggregate employment and the aggregate demand that occurs after a reversal in the path followed by aggregate demand, and a large one, $\beta_1+\beta_2$, representing the strong relationship (along a spurt line) between employment and the aggregate demand that occurs once the entry or exit thresholds of many firms are passed (see Mota et al., 2015, Figure 1, p. 552).\textsuperscript{21}

Following Belke and Göcke (2001), and Mota et al. (2015), we estimate linear switching employment equation where the change in aggregate employment, $N_t$, induced by a change in the aggregate demand, $Y_t$, as divided between a weak reaction along a play line and a strong reaction along a spurt line, when $y_t$ changes sufficiently:\textsuperscript{22}

$$
N_t = \beta_0 + \beta_1 Y_t + \beta_2 SPURT_t + \beta_3 W_t + \beta_4 t + \varepsilon_t
$$

(2)

where $SPURT_t$ is a hysteresis transformed input variable that results from the $Y_t$ series with all small changes ($\Delta Y_t < PLAY_t$) filtered out. In this model, $\beta_1$ gives the reaction of aggregate employment, $N_t$, along the play line, while $\beta_2$ is the difference of the reaction of $N_t$ along the spurt line and the play line caused by aggregate demand changes. We also include in the equation as non-hysteretic regressors, the real wage, $W_t$, and a time trend,

\textsuperscript{19} See Kranosel’skii and Pokrovskii (1989) and Visitić (1994) for a general description of the model. See also Göcke (2001) and Mota et al. (2012, 2015), for an application to the dynamics of aggregate employment.

\textsuperscript{20} The term is used due to its analogy to play in mechanics.

\textsuperscript{21} $\beta_2$ is the remanence parameter (see Göcke, 2001).

\textsuperscript{22} The details of the empirical implementation of the play model can be found in Belke and Göcke (2001) and in Mota et al. (2012, 2015).
due to the secular decline of employment in industry caused by technological change (all the variables are in logarithms).\textsuperscript{23}

The presence of hysteresis is tested by looking to the significance of the transformed real production variable, $SPURT_t$. The presence of hysteresis is corroborated if $\beta_2$ is significantly greater than zero.\textsuperscript{24}

In line with the algorithm presented in Belke and Göcke (2001) and Mota et al. (2012; 2015), we wrote a MATLAB program to generate the hysteresis transformed real production variable, $SPURT_t$.

Assuming a cointegrating relationship between the variables, the algorithm estimates the $R^2$ of the employment equation associated to each combination of those four play values using Fully Modified Least Squares (FM-OLS). The program selects the combination that maximises the $R^2$ of the employment equation.

This implementation of the play model follows more close the mathematical concept of hysteresis allowing to distinguish it in the date in particular from other employment dynamics with close characteristics such as non-linearity or multiple equilibrium, which is not possible with the traditional non-linear times series models like threshold autoregressive (TAR), or smooth transition autoregressive (STAR).\textsuperscript{25}

As mentioned before, it is not correct also to associate hysteresis with the presence of a unit root in a linear system. In fact the implied dynamics is not even observational equivalent. Consequently, non-stationary econometrics would fail both theoretically and empirically to capture the presence of hysteresis (see, e.g., Amable et al., 1993; 1994, and Göcke, 2002).

Finally, the choice of FM-OLS estimator against the alternative of the error correction mechanism specification (ECM) is justified by the modelling methodology. In fact, instead of a unique, path-independent equilibrium level of employment that works as an attractor, our hysteresis model delivers an equilibrium state that is influenced by the historical sequence of employment adjustments. Therefore, as all values of the aggregate employment are equilibrium values, the distinction between a short and long run dynamics implicit in the ECM does not apply.

\textsuperscript{23} $\varepsilon_t$ is a random disturbance term.
\textsuperscript{24} See Hallet and Piscitelli (2002).
\textsuperscript{25} See Hallet and Piscitteli (2002).
3.2. Data

In the estimation we use industrial quarterly data from the EUROSTAT – General Statistics, Industry Commerce and Services.

Aggregate employment, $N_t$, is measured by the logarithm of the index of the number of employees in industry adjusted by the number of working days. We use as the proxy of aggregate demand the logarithm of the index of real production in industry adjusted by the number of working day, $Y_t$. Real wages, $W_t$, are measured by logarithm of the index of gross wages in industry deflated by the general consumer price index. All series are seasonally adjusted.

Data covers the period from the first quarter of 2000 to the second quarter of 2018, and includes the three countries that were under IMF/ ECB/ European Commission/ adjustment programs (Greece, Ireland and Portugal), and Spain that applied voluntarily austerity measures. Germany, France, and the Eurozone (18 countries) are also considered for comparison purposes. We offer some descriptive statistics in Appendix 1.

4. Estimation Results

As standard inference procedures do not apply to regressions which include non-stationarity variables, before estimating Equation (2) we apply the augmented Dickey-Fuller unit root test to the series in levels and to their first differences (see Table 1). For all the variables in levels the augmented Dickey-Fuller test statistic is larger than the 5% critical value (-2.91) indicating that we do not reject the presence of a unit root. For the first difference of the series we reject the hypothesis of the existence of a unit root (in this case, the test statistic is smaller than the 5% critical value for all the variables). Accordingly, the series used in the regressions are non-stationary in levels and are integrated of order one.

26 We do not include Italy, a country that also faced difficulties and applied austerity measures, due to unavailability of industrial employment quarterly data.
27 In the case of the real production for the Eurozone, and the real wage for Spain we do not reject the hypothesis the existence of a unit root for a significance level of 1% only.
Table 1: Augmented Dickey-Fuller Test Statistics (5% critical value: -2.91)

<table>
<thead>
<tr>
<th>Country</th>
<th>( N_t )</th>
<th>( Y_t )</th>
<th>( S P U R T_t )</th>
<th>( W_t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>Level</td>
<td>0.856</td>
<td>0.856</td>
<td>-2.64</td>
</tr>
<tr>
<td>Ireland</td>
<td>Level</td>
<td>-1.105</td>
<td>-2.712</td>
<td>-0.251</td>
</tr>
<tr>
<td></td>
<td>1st Difference</td>
<td>-10.148</td>
<td>-8.254</td>
<td>-0.962</td>
</tr>
<tr>
<td>Portugal</td>
<td>Level</td>
<td>-1.681</td>
<td>-0.518</td>
<td>-1.305</td>
</tr>
<tr>
<td></td>
<td>1st Difference</td>
<td>-3.228</td>
<td>-8.513</td>
<td>-0.833</td>
</tr>
<tr>
<td>Spain</td>
<td>Level</td>
<td>-0.961</td>
<td>-0.475</td>
<td>-0.794</td>
</tr>
<tr>
<td></td>
<td>1st Difference</td>
<td>-2.984</td>
<td>-7.223</td>
<td>-4.098</td>
</tr>
<tr>
<td>Germany</td>
<td>Level</td>
<td>-2.451</td>
<td>-1.967</td>
<td>-2.431</td>
</tr>
<tr>
<td></td>
<td>1st Difference</td>
<td>-3.421</td>
<td>-4.434</td>
<td>-3.216</td>
</tr>
<tr>
<td>France</td>
<td>Level</td>
<td>-1.563</td>
<td>-1.666</td>
<td>-1.990</td>
</tr>
<tr>
<td></td>
<td>1st Difference</td>
<td>-2.881</td>
<td>-4.300</td>
<td>-4.318</td>
</tr>
<tr>
<td>Eurozone(18 countries)</td>
<td>Level</td>
<td>-0.678</td>
<td>-3.404</td>
<td>-1.719</td>
</tr>
<tr>
<td></td>
<td>1st Difference</td>
<td>-4.141</td>
<td>-4.226</td>
<td>-3.765</td>
</tr>
</tbody>
</table>

We also tested for cointegration using the Johansen Test Procedure. Applying the trace test performed with four lags in the VAR representation and with an intercept and time trend in the cointegrating equation the hypothesis of a single cointegrating vector relating the variables for all the countries is not rejected. The trace test statistic (see Table 2. column 9) is greater than the 5 per cent critical value (63.876).

As the series are cointegrated, we start by estimate Equation (2) using Fully Modified Least Squares (FM-OLS), which is an asymptotically efficient estimator of long-run economic relationships, and leads to conventional chi-squared criteria for inferential purposes with respect to coefficients (fully modified Wald tests).\(^{28}\)

The method modifies least squares with semiparametric corrections that account for serial correlation effects and for endogeneity in the regressors that result from the

\(^{28}\) Cointegration techniques to estimate a hysteresis equation is also applied by Piscitelli et al. (2000).

Table 2 (column 2) presents the estimated values of the play interval, $PLAY$, obtained through the process of grid search over the set of admissible values of $PLAY$. The width of the play interval, $PLAY$, is used as an indicator of the presence of hysteresis in the dynamics of employment as in Mota et al. (2015). The estimates of the employment elasticity along the play lines, $\beta_1$, and the increment of this same elasticity along the spurt lines, $\beta_2$, are displayed in columns 4 and 5. The employment elasticity along the spurt lines is given by $\beta_1 + \beta_2$. Applying a fully-modified Wald test, which uses conventional chi-squared criteria for inferential purposes with respect to the coefficients, we find that $\beta_2$ is significant in all the cases. The results indicate that the reaction along the play lines is non-significant while the reaction along the spurt lines is positive and strongly significant. This implies that employment change requires sufficiently large demand shocks.

The estimated values for $PLAY$ reflect large periods of inaction in Portugal, Spain, Greece, and in the Eurozone as a whole, where a large $PLAY$ is necessary to achieve the maximum goodness of fit of the employment equations. Intermediate $PLAY$ estimates are obtained for France and Germany. Consequently, we identify signs of hysteresis in the dynamics of employment in the great majority of the considered countries with the possible exception of Ireland for which $PLAY$ is small.

Given that the value of the fiscal multipliers and the degree of hysteresis due to uncertainty are higher the deeper the recession is, and considering that hysteresis depends also on the rigidity of the labour markets, these results are not surprising. Deep recessions

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29 With the exception of Spain and France, where the sign of the original real production variable turns negative with the inclusion of the hysteric variable, $SPURT_t$. 
and labour market rigidity in Portugal, Spain and Greece originate strong hysteresis effects, while moderate recessions or stagnation combined with moderate labour market rigidity produced less hysteresis effects in countries such as France and Germany. The weak signs of hysteresis found in Ireland are typical of countries with relatively flexible labour markets.

Our results are in line with recent empirical literature that follows the original concept of hysteresis, starting with Belke and Göcke (2001) that found hysteresis in the dynamics of employment in Germany. In the same vein Mota and Vasconcelos (2012), and Mota et al. (2012) found important hysteresis effects in the dynamics of employment in Portugal. The results are also consistent with previous estimates of play values where three groups of countries can be distinguish. The play width estimates are usually low for Anglo-Saxon countries, high for countries such as Slovakia, Belgium, Slovenia, and Luxemburg (slightly above average for Portugal). Intermediate values are estimated for countries such France, Germany and Spain (see Mota, et al. 2015). Besides these estimates are correlated with the indexes of employment protection legislation built by OECD (see Mota, et al. 2015) which implies that the estimates of the play have an economic meaning.

Thus, it is fair to say that our results corroborate the hypothesis of the presence of hysteresis in the aggregate employment in the select countries, with the possible exception of Ireland.
Table 2: Estimation Results

<table>
<thead>
<tr>
<th>Country</th>
<th>ŋߠ</th>
<th>(ߚ଴)</th>
<th>ŋߜ</th>
<th>(ߚଵ)</th>
<th>ŋܤ.getSeconds(6)</th>
<th>(ߚଶ)</th>
<th>ŋを持って帰る</th>
<th>(ߚଷ)</th>
<th>T</th>
<th>(ߚସ)</th>
<th>ŋocese</th>
<th>(18 countries)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>0.072</td>
<td>5.111***</td>
<td>-0.137</td>
<td>(ߚଷ)</td>
<td>0.884***</td>
<td>7.630</td>
<td>0.076</td>
<td>(ߚସ)</td>
<td>0.954</td>
<td>79.687</td>
<td>0.900</td>
<td>15.141</td>
</tr>
<tr>
<td>Ireland</td>
<td>0.020</td>
<td>8.758***</td>
<td>-0.494</td>
<td>(ߚଷ)</td>
<td>0.997*</td>
<td>1.891</td>
<td>-0.357</td>
<td>(ߚସ)</td>
<td>0.912</td>
<td>74.414</td>
<td>0.950</td>
<td>11.583</td>
</tr>
<tr>
<td>Portugal</td>
<td>0.102</td>
<td>5.771***</td>
<td>-0.163</td>
<td>(ߚସ)</td>
<td>0.395***</td>
<td>4.257</td>
<td>-0.012</td>
<td>(ߚସ)</td>
<td>0.989</td>
<td>66.876</td>
<td>0.984</td>
<td>7.7427</td>
</tr>
<tr>
<td>Spain</td>
<td>0.113</td>
<td>4.976**</td>
<td>-0.602***</td>
<td>(ߚସ)</td>
<td>0.833**</td>
<td>2.889</td>
<td>-0.003</td>
<td>(ߚସ)</td>
<td>0.994</td>
<td>81.203</td>
<td>0.840</td>
<td>8.023</td>
</tr>
<tr>
<td>Germany</td>
<td>0.050</td>
<td>0.813***</td>
<td>0.003</td>
<td>(ߚସ)</td>
<td>0.192***</td>
<td>3.672</td>
<td>0.833***</td>
<td>( bidi )</td>
<td>0.970</td>
<td>101.41</td>
<td>0.964</td>
<td>6.994</td>
</tr>
<tr>
<td>Eurozone (18)</td>
<td>0.090</td>
<td>4.738***</td>
<td>-0.079</td>
<td>( bidi )</td>
<td>0.251*</td>
<td>1.824</td>
<td>0.084</td>
<td>( bidi )</td>
<td>0.940</td>
<td>80.917</td>
<td>0.864</td>
<td>8.943</td>
</tr>
</tbody>
</table>

t-statistics are in parentheses. 
***, **, * Significant at 1, 5, and 10 per cent respectively.

The 5% significant critical value is 63.876.
5. CONCLUSIONS

In this paper we estimate a switching employment equation based on the play model of hysteresis to uncover signs of hysteresis in the European peripheral countries that had to implement adjustment programs as a condition to receive financial assistance from IMF/ECB/ European Commission, and in Spain that voluntarily applied austerity measures.

We have found significant hysteresis effects in the employment dynamics of the Eurozone, especially in Portugal, Spain, and in Greece (less in Ireland). At least for Portugal this effect was already known at the time of the signature of the adjustment program (see Mota, 2008).

Strong fiscal policy effects (large fiscal impact multipliers) at the zero lower bound combined with the presence of hysteresis have two implications. Firstly, following a recession front-loaded austerity depresses the economy in the short run, affects the animal spirits and it may lead to self-fulfilling prophecies. The negative effects may also persist in the long run. Hence, the long term multiplier can be substantially larger than the impact multiplier. Secondly, the negative effects of austerity on growth counteract the direct impact of the reduction of government expenditures. For this reason it fails also to achieve debt-to-GDP reductions, and it may contribute to an increase in the yields of sovereign bonds leading a country to a down spiral.

This is particularly dangerous in the Eurozone because member states issue debt in a currency that they do not control, and for which they have no lender of last resort. The consequence is that there is no guarantee that there will always be enough funds to pay out the bond holders. In addition, there is no central fiscal authority capable of provide large and sustainable fiscal transfers among Eurozone countries to deal with asymmetric
shocks that frequently occur in an area that is not an optimal currency area a la Mundell. Consequently, the debt of a country is not guaranteed by the other Eurozone members.

Without these guarantees, bond markets are prone to liquidity crisis and contagion (as happened with Ireland, Portugal, Italy and Spain). Therefore, a loss of confidence in a country’s ability to fulfil its commitments as a debtor may actually lead to its default (even in the presence of sound fundamentals) so, expectations are self-fulfilling (see De Grauwe and Ji, 2012).

In such cases, countries can become entrapped in a bad debt equilibrium, meaning that the increased debt service due to a higher risk premium, with everything else equal, implies a higher probability of default or repudiation of sovereign debt (Calvo et al., 1988 and Eichengreen et al., 2005). These problems can be aggravated by the existence of a doom loop between government bonds and the banking system, when major banks are heavily exposed to bonds of their home sovereigns that are at the risk of default.

The results of this paper have important implications to the way macroeconomic policy should be conducted.

In the aftermath of financial crisis, to avoid deep recessions, automatic stabilizers should be allowed to operate in full, which in turn lead to high public deficits. As the automatic stabilizers are not sufficiently strong, and were weakened due to the harsh austerity measures implemented by the Eurozone peripheral countries, the priority should be given to the recovery of the aggregate demand through a sustained program of public investment at the Eurozone level. In the presence of investment multipliers that are typically greater than one, this policy will also contribute for a reduction of the debt to GDP ratio, and to prevent the government bonds yields to increase (see DeLong and Summers, 2012).
Noteworthy is that the stimulus should be large enough and applied for period long enough to break the firms’ employment band of inaction that results from the non-convex adjustment costs and uncertainty.¹

As the economy recovers non-discretionary government spending declines and taxes revenues rise. Thus, the public deficit improves due to automatic stabilizers, which may dispense the need to implement discretionary cuts in public expenditures or taxes rise. The consequence is that the public deficit should not be a policy objective, as it endogenous to full employment, and to price and financial stability goals (see Wray, 2012).

Nonetheless, the Eurozone member states have imposed on themselves constraints and various rules regarding deficits and debt (through the Stability and Growth Pact with its several reforms) that limited their ability to respond to crisis with fiscal stimulus. They also gave up their currencies in favour of the euro managed by an independent and non-accountable ECB, whose single monetary policy final objective is to ensure price stability, and that have neither the ability, nor the wish to finance government expenditures. While fiscal policy remained in the hands of each national government.

To alleviate the self-imposed constraints on fiscal and monetary policy that Eurozone countries have established, and that make them dependent on financial markets and taxes for funding their expenditures, reforms in three main areas should be implemented.

Firstly, in a political context where is very difficult to abandoned the Stability and Growth Pact altogether a less ambitious although important reform that takes into account both cyclical factors and public investment in the definition of public deficits is to adopt

¹ Note that for monetarily sovereigns countries (as it is the Eurozone as a whole) there are no natural financial constraints to government spending, as it can always afford to buy any goods and services denominated in its currency. The main problem with excessive (beyond full employment) spending by the government is inflation and not the risk of insolvency (see, e.g., Wray 2012, and Ehnts, 2016).
a modified golden rule consisting in achieving a cyclically-adjusted net of public investment balanced public budget (as defended by authors such as Creel, 2003, and Blanchard and Giavazzi, 2004). The rationale for excluding public capital expenditures from the public deficit’s target is linked to the necessity of spreading the costs of public capital formation over the years during which they will be used.

Secondly, steps should be made to create a Fiscal Authority at the Eurozone level, with the capacity to issue debt, and to spend on the necessary scale on public investment programs, and to stabilize Eurozone economy through countercyclical fiscal transfers from the central authority to member states.

Thirdly, the maintenance of a high level of aggregate demand should be added as a final objective of the ECB, following other central banks like the Federal Reserve in the USA. This should help the ECB to act as a sovereign lender of last resort to allow countries facing liquidity problems due to self-fulfilling market panics to issue debt at reasonable interest rates. Within this new dual mandate the ECB is in good position to help financing public investment projects by buying on a larger scale specifically treasury bonds issued to finance these projects during times where governments are unable to get funds from financial markets at normal interest rates. This can be done in the context of quantitative easing programs, but without the implicit conditionality of the application of austerity measures with the objective of an aggressive consolidation of the public deficit. Thus, quantitative easing should be used as a quasi-fiscal instrument.

Indeed, the coordination between the ECB and the new Eurozone fiscal authority would be decisive to improve the macroeconomic policy mix, to complete the recovery and to ensure a permanent high level of employment.
REFERENCES


https://ssrn.com/abstract=826285 or http://dx.doi.org/10.2139/ssrn.826285


**Appendix 1: Descriptive Statistics of the Variable Used in the Estimation of the Model**

<table>
<thead>
<tr>
<th></th>
<th>$N_t$</th>
<th></th>
<th>$Y_t$</th>
<th></th>
<th>$W_t$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>130.2</td>
<td>21.7</td>
<td>159.9</td>
<td>79.8</td>
<td>121.2</td>
</tr>
<tr>
<td>Ireland</td>
<td>107.9</td>
<td>12.7</td>
<td>129.3</td>
<td>88.2</td>
<td>66.43</td>
</tr>
<tr>
<td>Portugal</td>
<td>116.5</td>
<td>16.5</td>
<td>149.3</td>
<td>98.3</td>
<td>110.2</td>
</tr>
<tr>
<td>Spain</td>
<td>117.4</td>
<td>15.3</td>
<td>137.9</td>
<td>94.0</td>
<td>113.9</td>
</tr>
<tr>
<td>France</td>
<td>112.5</td>
<td>11.6</td>
<td>132.2</td>
<td>98.3</td>
<td>105.0</td>
</tr>
<tr>
<td>Germany</td>
<td>98.54</td>
<td>3.11</td>
<td>104.6</td>
<td>93.0</td>
<td>92.6</td>
</tr>
<tr>
<td>Eurozone</td>
<td>107.7</td>
<td>6.9</td>
<td>119.2</td>
<td>99.5</td>
<td>99.0</td>
</tr>
</tbody>
</table>

Source: Eurostats
Editorial Board (wps@fep.up.pt)

also in http://ideas.repec.org/PaperSeries.html