Persistence Change Analysis for Spanish Unemployment Rates by Output Gap: A Time-Varying Parameter Approach

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Abstract

This paper aims to investigate the evolution of the persistence of Spanish unemployment by embodying the output gap in a state-space model over the period of 1972-2015. While the adult unemployment rate is analyzed as the benchmark to explore the aggregate condition, with the use of the disaggregated data by age and gender we aim to further unveil the conceivable heterogeneity among the subgroups. Unlike the existing literature which identifies labor market rigidity as the triggering factor of high unemployment, we utilize the output gap extracted by the Kalman filter in order to discriminate between impacts originated from (demand side) shocks and labor market institutions. The time-varying parameter approach allowing for both abrupt and smooth structural changes of parameters facilitates to explore how unemployment persistence evolves over time in the country whose history is full of crises and labor market reforms. Our estimation results reveal that the presence of lags between the implementation of the policy and its influence on the economy and the interactions between the shocks has induced direction towards the gradual changes in Spain. Estimation results providing evidence in favor of hysteretic effects during the late 1970s and the early 1980s reveal a declining (rising) coefficient for lagged unemployment (output

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gap) in the subsequent years. Whereas abrupt changes of coefficients after 1984 and 1994 reforms coincided with the start of recovery phases, smooth transition of persistence coefficient after 2008 underlies different dynamics.

Özet

İspanyol İşsizlik Direncinin Çıktı Açığı ile Analizi: Zamana Göre Değişen Parametreler Yaklaşımı

Bu çalışma İspanyol işssizlik direncinin 1972-2015 dönemi içerisinde gösterdiği değişimleri çıktı açığını kapsayan ve zamana göre değişen parametrelere izin veren durum uzay (state-space) modeli ile incelemeyi amaçlamaktadır. Yüksek işssizliğin tetikleyici faktörü olarak işgücü piyasasası katılığını gören mevcut yazından farklı olarak, (talep tarafı) şoklar ve işgücü piyasası kurumlarından kaynaklanan etkiler arasında ayrım yapabilmek için Kalman filtresi ile elde edilen çıktı açığını kullanılmaktadır. Geçmişi krizler ve işgücü piyasası reformları ile dolu olan bu ülke için, parametrelerin hem ani hem de yumuşak geçişli yapısal değişikliklerine olanak veren zamanla değişen parametreler yaklaşımı, işsizlik direncinin değişimlerini keşfetmeyi kolaylaştırmaktadır. Elde edilen ampirik bulgular, politika değişikliklerinin uygulamaya geçirilmesi ve bu değişikliklerin ekonomiye olan etkisi arasında gecikmelerin olduğunu ve ayrıca şoklar arsındaki etkileşimden kaynaklı, İspanya işgücü piyasasındaki değişimlerin kademeli olarak gerçekleştini göstermektedir. Tahmin sonuçları, 1970'lerin sonlarında ve 1980'lerin başlarında histerik etkiler lehine kanıt sağlarken, takip eden yıllarda işsizlik direnci (çıktı açığı) için azalan (artan) bir katsayı ortaya koymaktadır. 1984 ve 1994 reformları ekonomik canlanma evrelerinin başlangıcı ile çakışırken, 2008 sonrası direnç katsayısının yumuşak geçişi farklı dinamiklerin varlığını göstermektedir.

1. Introduction

Unemployment is on the front burner of the agenda in the world economy after the severe impacts of the global financial crisis of 2008. Although it may be claimed that the labor markets are more flexible than as they were four decades ago, there is still great room for policy implications. Since the labor market involves human-being factors as distinct from the other markets, the policy recommendations are crucial not

only because of the efficiency concerns but also due to the social dimension of the issue from the perspective of normative economics. In this sense, four main hypotheses come into the picture with the aim of exploring the dynamics of unemployment and producing expedient policy proposals. The natural unemployment rate and the structuralist approach to the natural rate by Phelps (1967, 1968, and 1994) hypotheses propound the presence of an equilibrium rate that the present unemployment rate adjusts eventually even if the shocks lead to transitory divergence from that rate. On the other side, the hysteresis hypothesis by Blanchard and Summers (1986) suggests the absence of such an equilibrium unemployment rate relying on the claim that the shocks permanently adjust the dynamics of unemployment. Consequently, the policies creating temporary shocks may reduce unemployment due to the considerable degree of path dependence. The fourth hypothesis claims the presence of high persistence in unemployment which may be specified under the natural rate hypotheses but also have similar policy implications to the hysteresis scenario as the adjustment span may be exceptionally long without intervention.

A reliable assessment of the dynamic properties of unemployment is important due to their social consequences and their effects on institutions, market structures and expectation formations, and hence on the overall functioning of the economy. Accordingly, they are important for policymakers as well. In this sense, the natural rate and the structural natural rate hypotheses do not involve demand-side policies in order to influence the unemployment rate since the policies can lead to temporary changes, merely. The policy recommendation under these scenarios is more likely to rely on structural reforms affecting the supply-side dynamics. On the other hand, the high or the full persistence hypotheses requires active demand-side policies since the policy impacts tend to be either long-lasting or permanent. As the policy suggestions differ considerably relying on the empirical validity of these hypotheses, the empirical literature put considerable effort into testing these opponent hypotheses. In the empirical literature, while unemployment persistence is characterized by a near unit root process, the hysteresis hypothesis is formulated as a unit root process, and its

rejection provides empirical support for the natural rate hypothesis or the structural natural rate theory depending on whether unemployment is characterized by a stationary process with or without occasional mean shifts.

Earlier empirical studies, including Alogoskoufis and Manning (1988), Elmeskov and MacFarlan (1993), Jaeger and Parkinson (1994), and Røed (1996) failed to reject the hysteresis hypothesis in favor of the natural rate by relying on the standard unit root testing procedures. It is well known that the conventional unit root tests neglecting the presence of the structural breaks, the nonlinear structure, and the near unit root alternative suffer from low power and they are biased towards accepting the false null hypothesis of a unit root. Hence, by incorporation of the structural breaks in unit root testing procedures, Arestis and Mariscal (1999), Ewing and Wunnava (2001), Camarero, Carrion-i Silvestre, and Tamarit (2005), Lee and Chang (2008), Ramirez and Rodríguez (2014), among others, have provided more evidence in favor of stationarity of unemployment and have premediate the structuralist approach to the natural rate against the hysteresis. By the same token, the studies allowing for nonlinearity, including Bianchi and Zoega (1998), León-Ledesma and McAdam (2004), and Fosten and Ghoshray (2011), have supported the natural rate hypothesis, essentially. Overall, the support for the stationarity of the unemployment series seems to increase once the modified unit root tests are utilized based on different concerns.

The majority of these studies, however, do not directly incorporate the measurement of the persistence degree of unemployment which emerges as a critical issue beyond purely testing the natural rate and hysteresis hypotheses. That is to say, even though the testing procedure supports the natural rate hypothesis, the degree of persistence matters in terms of the magnitude and the timing concerning the absorption of the shocks in the economy. For this reason, although the natural rate hypotheses are supported, there might still be room for the demand side policies on the basis of the persistence level, as supported by the empirical findings of Tscherning and Zmmemann (1992) and Cuestas, Gil-Alana, and Staehr (2011). From a fractional integrational

viewpoint, Tscherning and Zmmemann (1992) and Cuestas et al. (2011) have observed high persistence in the unemployment rates of Central and Eastern European countries, even though the hysteresis hypothesis is rejected. The degree of persistence of unemployment is discussed further in studies, including Mitchell (1993), Papell, Murray, and Ghiblawi (2000), and Lee and Chang (2008), through the calculation of half-lives. Although Papell et al. (2000), and Lee and Chang (2008) accounted for the fact that the degree of persistence of unemployment does not remain constant over time by integrating structural breaks into the calculation of half-lives, they allow only for abrupt changes in persistence. However, given that structural changes generally take a period of time to take effect in an economy, it could be more plausible to anticipate the degree of persistence of unemployment to change smoothly rather than abruptly. In this sense, Anderton (1998), Edwards and Edwards (2000), and Srinivasan and Mitra (2012) have utilized the time-varying parameter approach to provide more precise conclusions about how the degree of persistence of unemployment evolved over time.

In this study, we aim to investigate unemployment persistence in Spain over the period of 1972-2015. While the adult unemployment rate is analyzed as the benchmark to explore the aggregate condition, with the use of the disaggregated data by age and gender we aim to further unveil the conceivable heterogeneity among the subgroups. Although rising unemployment has been a prevalent experience shared by almost all European countries during the 1970s and 1980s, signals of heterogeneity among them have become apparent in the 1990s. In this respect, Spanish unemployment occupies a great place in the literature as a result of its high levels and the claims of considerable persistence compared to unemployment in other European countries experiencing alike shocks. Methodologically, while existing studies on Spanish unemployment utilized unit root tests taking sudden structural breaks or potential nonlinearity into account (Arestis & Mariscal, 2000; Everaert, 2001; Olmedo, 2011; Ramirez & Rodríguez, 2014) or used fractional integration approaches (Garcia-del Barrio & Gil-Alana, 2009), we employ a state-space model using a Kalman filter, which allows for time-varying coefficients and dynamic smooth structural changes. The Spanish economy has

experienced a great transformation in the last four decades including a regime change, participation in the EU, several economic crises and a vast number of labor market reforms. Furthermore, the presence of lags between the implementation of new policies and their influences on the economy; the feedback effects alternating magnitude of the shocks; and the interactions between the shocks, and the institutions might induce direction towards gradual changes and put forward the time-varying parameter approach as a flexible alternative to investigate the persistence of unemployment. While investigating the dynamics of unemployment, it is important to discriminate between the shocks arising from the cyclical movements of output and the inflexibility propagated by labor market institutions. As emphasized by Berger and Everaert (2006), ignoring the impacts of the demand shocks may mislead the interpretation concerning the role of institutions. To this aim, Edwards and Edwards (2000) utilize the output gap as an explanatory variable in their analysis for the Chilean economy. Similarly, to account for both the claims regarding the high cyclical component in the Spanish unemployment and the rigid structural component, our model incorporates the output gap to the persistence analysis of unemployment. To the best of our knowledge, this study is the first attempt to explore the persistence dynamics of the Spanish unemployment rate by incorporating the output gap in a time-varying parameter framework. By the virtue of the output gap allowing to discover the extent of cyclical unemployment, the interpretation of the lagged unemployment coefficient becomes reflective for the institutional features of the labor market. Thus, the persistence coefficient is expected to display the adjustments due to the policy changes associated with the claim that considerable bootstraps component in the Spanish unemployment rate can be altered via the labor market policies by Bentolila and Blanchard (1990).

Overall, our empirical results suggest the presence of extreme rigidities in unemployment until the mid-1990s. On the other hand, the decreases of the persistence coefficient in the mid-1980s and the 1990s enable to evaluate the extent of the major labor market reforms in 1984 and 1994. It may be claimed that the resilience of the labor markets has improved gradually despite its limited extent. The empirical findings

by utilizing the female-male unemployment separately, in other respects, emphasize that the articulation of females to the labor market has emerged under relatively flexible circumstances during the late 1970s and the 1980s. However, the labor market reforms seem to be rather influential in reducing the persistence coefficient of males compared to females. Apart from the sharp changes of the persistence in the reform periods coincided with the recovery phases, a smooth decline of the persistence under the adverse economic conditions after 2008 suggests the validity of the discouraged worker effects for the male labor force whereas the response of the female labor force is not alike. On the other side, the analysis conducted for youth unemployment reveals that the sensitivity of unemployment to the cyclical movements of output compared to the adult group.

The rest of the study is organized as follows. Section 2 presents a general overview of the Spanish economy and the labor market developments. Section 3 clarifies the methodology used in the paper. The empirical results are discussed in Section 4 and the conclusions are presented in Section 5.

2. Overview of the Spanish Economy

In this chapter, we first provide a general overview of the Spanish economy and then review the labor market developments in Spain to provide background information regarding the persistence mechanisms of Spanish unemployment.

2.1 General Overview

The 1970s, the decade of structural changes, are critical for understanding the initial conditions triggering the following transformation process. To start with, the adverse price shocks arising from the initial oil shock in 1973 became prominent in this period despite the earlier absorption attempts (Dolado & Jimeno, 1997). Also, proceeding with a long period of restrictive labor market policies, the legalization of trade unions in

1977 and attempts to soften the transition process have created great wage pressures in the economy. Although there were extensive attempts including the devaluations of Peseta in 1976 and 1977, the Moncloa agreements, the restrictive stance of monetary policy to control the price level, the second oil shock and the reductions in import restrictions in 1979 have boosted the price level further. On the other hand, the expansionary fiscal policy has been conducted with the aim of improving Welfare State (Bentolila & Juan, 2006). Generally speaking, it may be claimed that the shocks widespread in Europe have coincided with the country-specific shocks drastically during the 1970s.

In the first half of the 1980s, the impact of the shocks combined with the political instability has given rise to an economically slack phase in the economy. The ongoing restructuring process of the economy has stagnated in such a way that the wage pressures and the high level of real interest rates have deteriorated the investment motivations (Bentolila & Blanchard, 1990). On the other hand, as illustrated in Figure 1, the recovery period emerging gradually has gained expeditious momentum after 1984. In the second half of the decade, participation in the European Community (EC) in 1986 and the European Monetary System (EMS) in 1989 have created a substantial boost in the economy. The high inflation experienced in the 1970s has decreased, and the high-interest rates and the overvaluation of the exchange rate have been used on the purpose of attracting the capital flows (Dolado & Jimeno, 1997). The fiscal policy that has turned out to contractionary in the late 1980s has emerged as a limited tool due to the restrictions brought by the monetary side. Hence, the developments of the 1980s can be interpreted in the light of the positive impacts of the rising synchronization to the European cycle.
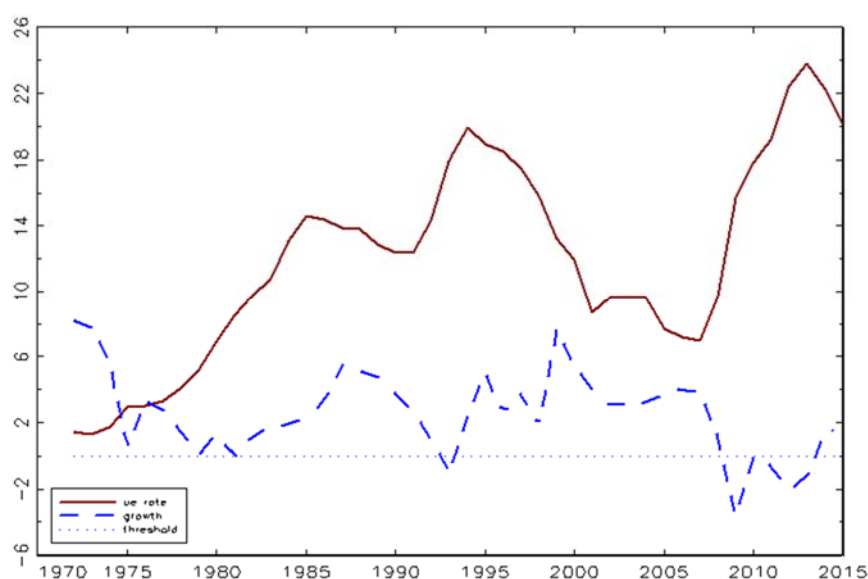
Source: IMF, International Financial Statistics

Figure 1 GDP, Percentage Change, 1972-2015

However, the crisis directed by the European Exchange Rate Mechanism (ERM) after the reunification of Germany in 1989 has led to a substantial decrease in the growth rates during the initial half of the 1990s as reflected in Figure 1. On the other hand, the developments advancing the European integration process, the establishment of the union by the Maastricht Treaty in 1992 and the ESM in 1993 have changed the direction of the Spanish economy, considerably. As explained by Estrada, Jimeno, de Molina, and Luis (2009) the required reforms and policy changes with the aim of fulfilling the convergence criteria of the treaty have motivated fiscal consolidation and declining interest rates from 1995. Hence, the performance of the economy has been characterized by positive growth rates and stability, supported by price and wage moderation since the late 1990s till 2007. While the Spanish economy has been classified as one of the European countries that displaying the strongest growth as reported by OECD (2006), Alberola, Estrada, and Santabárbara (2014) propound that the growth rates were somehow excessive considering the ongoing dynamics of the period from the late 1990s. Similarly, Estrada et al. (2009) have reported that notable

imbalances were accumulated in the economy such as the rising household and corporate debt, the construction boom and the building up of the foreign debt. Consequently, the Great Recession hit the economy in a rather severe way and the following Sovereign Debt Crisis has depressed the ongoing problem further.

2.2 The Labor Market and Unemployment: The Persistence Mechanisms

Given the severity of the shocks on the GDP illustrated by Figure 1, it appears from Figure 2 that the response of the labor markets to these shocks has remained highly restricted in the 1970s whereas the unemployment rates have shown ample upsurges from the late 1970s. As indicated by Dolado, Sebastián, and Vallés (1993), there might be labor hoarding practices in the labor markets over this period due to the strictness of the Employment Protection Legislation (EPL). The strictness of the EPL gives rise to slow adjustments over the cycle because of the great cost of firings during the adverse macroeconomic conditions causing (OECD, 1996). That is to say, it smooths the volatile behavior of the employment and unemployment over different phases of the cycle but it is also a potential source of the persistence for the already unemployed group.

As displayed in Figure 2, the adult unemployment rate exceeded 10 percent in 1982. The response of the youth unemployment rate was even more severe as the unemployment rate reached nearly to 40 percent in 1985 from 10 percent in 1977. Despite the flexibilization attempts by the Workers Statute in 1980, the unemployment rates have maintained its escalating trend until the mid-1980s as displayed in Figure 2. In 1984, the second labor market reform stimulating the utilization of temporary and fixed-term contracts has taken place. As observed in Figure 4, the share of employees with temporary contracts has been more than doubled after a couple of years they introduced. These types of contracts may be useful to improve the functioning of the labor market since they will potentially reduce mismatch problems by enabling employers to screen employees. In this respect, they are useful for the long-term

unemployed people and new entrants to the labor market. Furthermore, Dolado, García-Serrano, and Jimeno (2002) have emphasized that they potentially have reduced the extent of hysteresis by decreasing the cost of fires in the presence of adverse shocks. In this respect, the declining volatile behavior of the output versus the amplified volatile behavior of the employment during the 1980s compared to the 1970s is understandable in the light of developments regarding the boom of temporary contracts in the economy beyond the favorable impacts of the expansion.
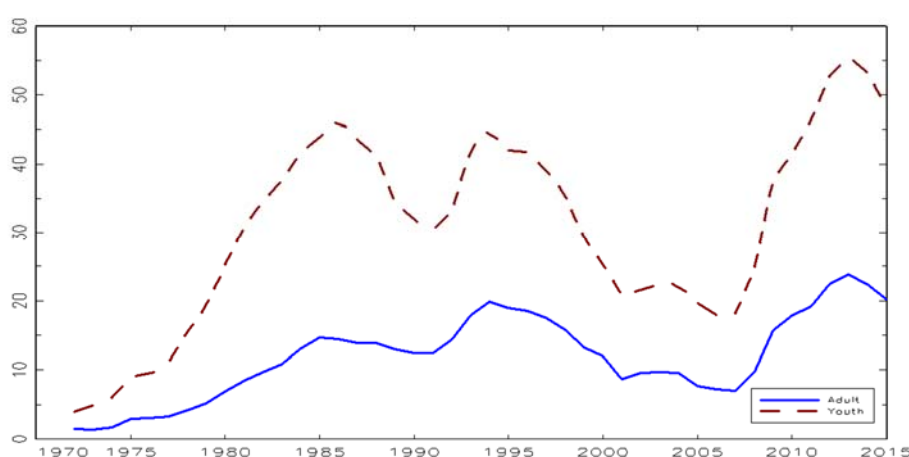
Source: ILOSTAT

Figure 2 Unemployment Rate by Age, 1972-2015

On the other hand, the disaggregated rates as displayed in Figure 3 indicate that the rise in the unemployment rate of the female has retained until 1988 despite the detectable impacts of the reform in the male group immediately after 1985. The seemingly contrasting evidence in Figure 4 which demonstrates the higher share of temporary contracts for female unemployment compared to male unemployment may be clarified via Figure 5(b), which displays the participation rates. As apparently seen from Figure 5(b), the participation of female workers in the labor force has followed a gradual upward trend. On the other hand, the participation rate of male workers has been fairly stable over the period. Therefore, although these two groups have

experienced divergent unemployment paths, the decline of the unemployment rates even under the increasing participation rate of females provides apparent evidence for the employment performance of the economy during the late 1980s.

When the infant flexibility of the labor markets has been tested by the adverse cyclical effects, the total unemployment rates climbed from 12.4 (30.5) percent in 1991 to 19.9 (45) percent in 1994 for the adult (youth) (Figure 2). Although the positive effects of the temporary contracts have been prominent during the previous expansion, the other side of the medallion has become apparent in the subsequent downturn. For example, OECD (1999) remarks that the utilization of specific type of fixed-term contracts with training obligations improved the employment opportunities for the young people in Germany in contrast to Spain where these contracts have been substituted by regular fixed-term contracts to obtain a cost advantage, probably. Despite the enormous hike of the temporary contracts [3], the low conversion rates to the permanent contracts and even shifts from the permanent contracts to the temporary ones as shown by Alba-Ramirez (1991) lead to the interpretation that they have been treated as substitutes to the permanent contracts. In this respect, they could not go substantially beyond to be a cost advantage to the firms although they have raised labor flows and the volatile behavior of the employment. Also, the different levels of protection and the wage differentials between the temporary and permanent contracted workers have built duality in the labor markets (Bentolila & Dolado, 1994). Concerning the insider-outsider theory, the fragmentation between these different types of contracts may be seen as another source of the persistence mechanism. In order to reduce the duality and provide a well-organized flexibilization framework, the reforms of 1994 and 1997 have attempted to subsidize the permanent contracts, reduce the employment protection of the permanent contracted workers and increase control mechanisms on the temporary contracts as explained by Ramirez and Rodríguez (2014). However, as presented in Figure 3, the share of temporary workers has stayed above 30 percent by decreasing

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[3] See OECD (2002) for the utilization of these types of contracts in the other European countries.

only moderately during the second half of the 1990s. By these reforms, specific groups such as females and young workers have been explicitly targeted. After 1996, declining participation rates of the youth population from 1986 has switched to a growing trend that can be understood through the impacts of the reforms combined with the positive cycle effects.
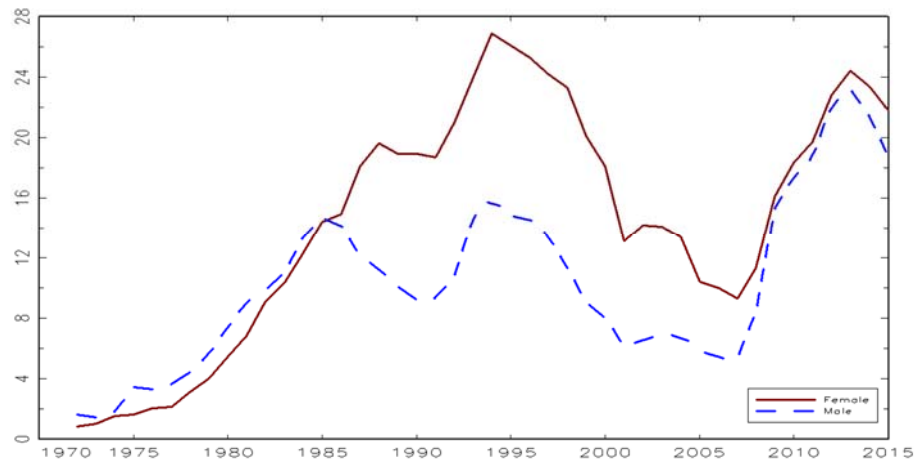
Source: ILOSTAT

Figure 3 Unemployment Rate by Gender, 1972-2015
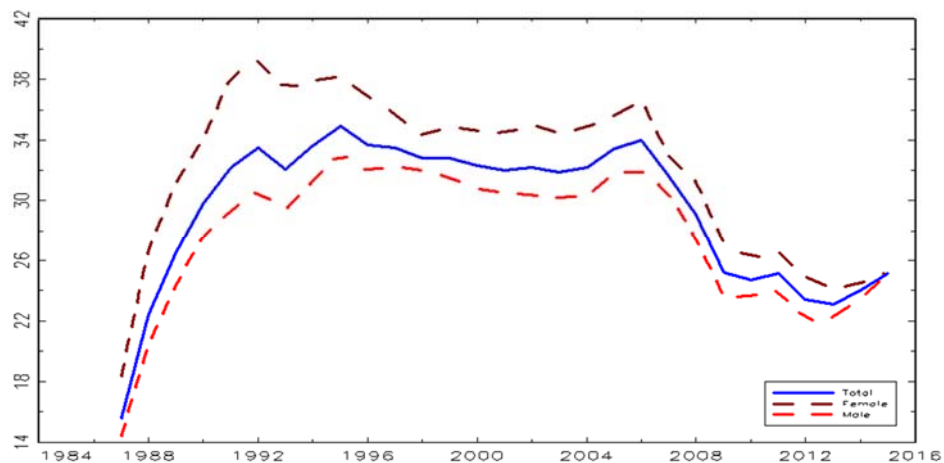
Source: ILOSTAT, EU Labor Force Survey

Figure 4 Share of Temporary Employees by Sex, 1987-2015

In spite of the further attempts to reduce the duality as in 2001 reform, the share of temporary contracts has shown no tendency to decline until the reform in 2006 as displayed in Figure 4. Given the numerous number of reforms taken place until the Great Recession period, the flexibilization performance may be examined as a success story on the basis of high unemployment rates of the history. However, Alberola et al. (2014) have also indicated that the labor market reforms were not sufficient in a way that they have removed the rigidities and functionalize the labor market. On the contrary, the existing duality has been fueled further due to low skilled immigrant flows to the country from the late 1990s. In this respect, it is stated that the real adjustment has been avoided as the growing share of the construction sector has created further employment opportunities for this flexible segment of the labor market. Consequently, the adult unemployment rate has climbed to 15.7 percent in 2009 from 7 percent in 2007. These trends have undergirded by the Sovereign Debt Crisis and adult unemployment has soared above 20 percent. In this period, it is stated that more than 40 percent of the job destruction in the construction sector (Horwitz & Myant, 2015). In this respect, it may be understandable why the male and female groups have suffered disproportionally from the adverse conditions as emphasized by Figure 3. Concerning the participation rates displayed in Figure 5, decreasing trends associated with the discouraged workers were noticeable for all groups evidently except the stabilization of the rising female participation around 2012 following the modest rises after 2008. In the following years, the effort has been also put into improving internal flexibility measures in order to alleviate the severity of the crisis sequence. For this reason, the firms have been allowed to adjust the working conditions of their employees in addition to the relaxing of the EPL (Ramirez & Rodríguez, 2014).
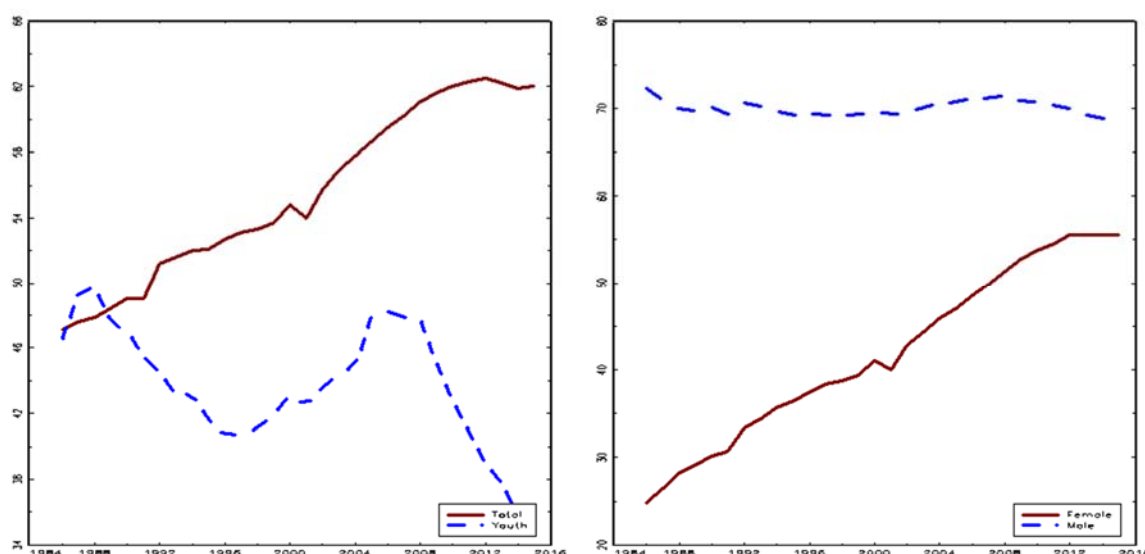
Source: ILOSTAT, EU Labor Force Survey

Figure 5 Labor Force Participation Rates by
(a) Age and (b) Sex (for Adults), 1986-2015

3. Methodology

In this study, we apply a time-varying parameter approach to the unemployment rate series by utilizing the lagged unemployment rate and the output gap as explanatory variables. In order to extract the output gap, three detrending techniques namely the Hodrick-Prescott (HP) filter, Beveridge Nelson (BN) decomposition, and the Kalman filter are used. Following a brief introduction of the time-invariant version of the model in Section 3.1, the state-space model allowing for time-varying parameters is elucidated in Section 3.2. The decomposition methods for generating the output gap are then covered in Section 3.3.

3.1 The Time-Invariant Parameters Model

Although the autoregressive unemployment variable is frequently utilized in the traditional persistence analysis, it is not sufficient to differentiate between the impacts

of the potential inertia explanations in the labor markets and the transitory macroeconomic shocks. With the interest of obtaining a comprehensive proxy for the cyclical effects, the Okun's law suggesting the presence of an inverse relationship between the unemployment and the output gap may be exploited in econometric terms. On the basis of this rationale, the persistence of the unemployment rate can be investigated in a standard time-invariant regression model as:

$$u_t = \beta_0 + \beta_1 u_{t-1} + \beta_2 g_t + \varepsilon_t \tag{1}$$

where u_t and u_{t-1} are the current and the lagged unemployment rates, g_t is the output gap in the present period and ε_t is the stochastic disturbance term. In this representation, the coefficient β_0 demonstrates the level of unemployment rate conceivably associated with the labor supply dynamics and/or the long-term trends of the output market which cannot be captured by the phase of the business cycle. The coefficient β_1 is the persistence parameter displaying the extent of the unemployment rate in the preceding period on explaining the current unemployment rate. The interpretation of this parameter gives rise to further implications concerning the empirical relevance of the natural rate or the hysteresis hypothesis. More specifically, while the case of $\beta_1 \geq 1$ points to evidence in favor of the hysteresis, $|\beta_1| < 1$ provides empirical support for the natural rate hypothesis. Lastly, the coefficient β_2 measures the impact of the transitory output movements on the unemployment rate. An inverse relationship is anticipated between the output gap and the unemployment rate since the job creation, and the destructive effects of the business cycle are expected to be reflected in the labor markets. More specifically, the anti-cyclical behavior reveals that if the output gap is negative, the production below the potential level triggers a rise in the unemployment rate. The adjustment process takes place if the dynamics of the labor markets are responsive to the temporary output changes. Hence, it is important to note that the coefficient β_2 is more likely to be related to the cyclical element in the

unemployment rate as suggested by the Okun's Law whereas the structural motions of the unemployment are reflected by the coefficients β_0 and β_1.

Although model (1) enables us to examine the persistence in unemployment via incorporating the output gap, this conventional time-invariant approach suffers from severe shortcomings. Primarily, the time span covered contains great potential for the presence of structural changes due to numerous crises and the policy actions as reviewed in Section 2. Although the effect of the structural changes could be integrated into the model by using alternative methods, like dummy variables, the determination of the accurate breakpoints could be problematic. Moreover, even if if the exact times of the crises or the policy changes are recognized, their reflections in the economy may be realized with some certain lags. That is, as the economic agents adjust their expectations conditional to the circumstances, the responses probably take place after the realization of the changes. In this sense, it is more plausible to anticipate the impacts of t certain structural changes to evolve gradually rather than abruptly as a result of the interactions of the variables and the feedback mechanisms embedded in the economy. Since the conventional time-invariant model is lack of this flexibility as it cannot incorporate the potential lag effects and the smooth transition mechanisms, we continue with the time-varying parameters model.

3.2 The Time-Varying Parameters Model

We allow the unemployment persistence and the relationship between unemployment and output gap to evolve gradually over time and form the following time-varying parameters model in the state-space form:

$$u_t = \mathbf{x}_t \boldsymbol{\beta}_t + \varepsilon_t \tag{2}$$

$$\boldsymbol{\beta_t} = \boldsymbol{\Phi}\boldsymbol{\beta_{t\text{-}1}} + \mathbf{v_t} \tag{3}$$

Equation (2) is the observation or measurement equation with $\mathbf{x}_t$ being the vector of regressors covering a constant term, u_{t-1} and g_t and ε_t the iid disturbance term

following a normal distribution with zero mean and the variance of σ^2. In the state or transition equation (3), $\boldsymbol{\beta_t}$ refers to the unobserved state vector formed as $\boldsymbol{\beta_t} = \left(\beta_{0t} \ \ \beta_{1t} \ \ \beta_{2t} \right)'$, $\boldsymbol{\Phi}$ is a 3×3 transition matrix and $\mathbf{v_t}$ is the vector of normally distributed iid disturbances with zero mean and variance-covariance matrix $\mathbf{Q}$. $\mathbf{Q}$. In this representation, it is assumed that the disturbances in the measurement and transition equations are independent and $\boldsymbol{\Phi} = \mathbf{I}$ so that $\boldsymbol{\beta_t}$ follows a random walk process.

After forming the state-space model, the Kalman filter approach can be utilized to derive the optimal estimate of the unobserved state vector $\boldsymbol{\beta_t}$. Generally, the Kalman filter method can be described as a recursive algorithm for computing the optimal estimator of the unobserved state vector at time *t*, given the information available at time *t-1*. The estimation of the time-varying parameters model given by equations (2) and (3) through the Kalman filter encompasses two steps for all *t* in the range of 1,….,*T* as:

i) Calculate the predictions for the state vector $\boldsymbol{\beta_t}$ and its variance-covariance matrix $\mathbf{P_t}$ conditional on information up to *t-1* as:

$$\hat{\boldsymbol{\beta}}_{t|t-1} = \boldsymbol{\Phi}\hat{\boldsymbol{\beta}}_{t-1|t-1}$$

$$\mathbf{P}_{t|t-1} = \boldsymbol{\Phi}\mathbf{P}_{t-1|t-1}\boldsymbol{\Phi}' + \mathbf{Q}$$

ii) Update the predictions with the inclusion of a new observation as:

$$\hat{\boldsymbol{\beta}}_{t|t} = \hat{\boldsymbol{\beta}}_{t|t-1} + \mathbf{K}_t \eta_{t|t-1}$$

$$\mathbf{P}_{t|t} = \mathbf{P}_{t|t-1} - \mathbf{K}_t \mathbf{x_t} \mathbf{P}_{t|t-1}$$

$$\mathbf{K}_t = \mathbf{P}_{t|t-1} \mathbf{x_t}' \mathbf{f}_{t|t-1}^{-1}$$

$$\mathbf{f}_{t|t-1} = \mathbf{x_t} \mathbf{P}_{t|t-1} \mathbf{x_t}' + \sigma^2$$

$$\eta_{t|t-1} = u_t - \mathbf{x}_t \hat{\boldsymbol{\beta}}_{t|t-1}$$

where $\hat{\boldsymbol{\beta}}_{t|t-1}$ is the estimate of the unobserved state vector in the current period *t* conditional on the previous period $t-1$, $\mathbf{P}_{t|t-1}$ is the conditional variance-covariance

matrix of the unobserved state and $\eta_{t|t\text{-}1}$ is the prediction error that contains new information relative to the previous one with $\mathbf{f}_{t|t\text{-}1}$ being its conditional variance-covariance matrix. $\mathbf{K}_t$ is the Kalman gain, which plays a central role in the update equations since it determines the degree of the update on the basis of the conditional information available in the previous period and the new information realized in the current period. $\mathbf{K}_t$ is an increasing function of the uncertainty associated with $\hat{\boldsymbol{\beta}}_{t|t\text{-}1}$, and therefore it is obvious that higher uncertainty will boost the Kalman gain and produce higher weight for new information. An important practical issue in this algorithm is the identification of the initial values $\hat{\boldsymbol{\beta}}_{0|0}$ and $\mathbf{P}_{0|0}$. In that sense, following the existing literature, we use $\hat{\boldsymbol{\beta}}_{0|0} = \begin{pmatrix} 0 & 0 \end{pmatrix}'$ and $\mathbf{P}_{0|0} = \mathbf{I}$ as the initial values of the algorithm[4].

After assigning the initial conditions, the iteration process takes place until the whole sample is covered and it produces the recursive estimate of the state vector $\boldsymbol{\beta}_t$ and its variance-covariance matrix $\mathbf{P}_t$ conditional on the unknown parameters of the state-space model $\mathbf{Q}$ and σ^2. To estimate those parameters, we continue with the maximum likelihood estimation (MLE) and construct the following log-likelihood function, which is based on the recursive estimates observed from the Kalman filter in each period:

$$\ln L = -\frac{1}{2}\ln\left(2\pi\left|\mathbf{f}_{t|t-1}\right|\right) - \frac{1}{2}\sum_{t=1}^{T}\eta'_{t|t\text{-}1}\mathbf{f}_{t|t-1}^{-1}\eta_{t|t\text{-}1}$$

To finalize the optimal estimation of the state vector and its variance-covariance matrix, the log-likelihood function is maximized with respect to the unknown parameters $\mathbf{Q}$ and σ^2.

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[4] See Harvey (1990) for futher details on the state-space models and the Kalman filter method.

3.3 Decomposition Procedures for the Output Gap

The output y_t can be represented in a formal set up as:

$$y_t = \tau_t + g_t \tag{4}$$

where τ_t represents the trend or permanent component and g_t stands for the cycle or transitory component of the output. The literature on the decomposition of the trend and the cycle components offers a vast number of ways. In this analysis, three commonly applied detrending procedures are utilized in order to explore the most suitable filter for our empirical analysis since the literature does not present a "one-size-fits-all" solution. After providing a brief review of the Hodrick-Prescott (HP), the Beveridge-Nelson (BN) and the Kalman procedures concerning the cycle extraction, the section concludes with the comparison of these techniques and their criticisms concerning both the technical features and their implications for economic theory.

3.3.1 The Hodrick-Prescott Filter

The filter by Hodrick and Prescott (1997) suggests identifying trend and cycle components through the following minimization problem:

$$\sum_{t=1}^{T}(y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1}\left[\left(\tau_{t+1} - \tau_t\right) - \left(\tau_t - \tau_{t-1}\right)\right]^2 \tag{5}$$

where T indicates the number of observations and $\lambda \geq 0$ is the smoothness parameter. In this framework, the sum of the squared of the cycle is minimized in a similar fashion to the ordinary least square (OLS) estimation. The trend component is obtained by the first-order conditions and the cycle is extracted as the difference between the actual series and the estimated trend. Thus, the cyclical component is obtained similarly to a residual term with the assumption of zero average value over a long time horizon. The smoothness parameter λ has a crucial role in this approach, it controls the trade-off

between the size of the error and the smoothness of the trend. Obviously, when λ approaches to zero, the trend becomes identical to the original series and the cycle disappears and when λ goes to infinity the trend turns into a linear trend, and the cycle captures all the variation in the original series.

Despite the extensive use of the HP filter in empirical studies, it suffers from serious limitations in technical terms. The major drawback of the HP filter comes from the difficulty in the identification of the appropriate smoothness parameter λ. It is not determined from an optimization procedure but as a matter of choice of empirical investigators, it is assumed on the basis of prior knowledge taken from the real business cycle literature. However, as discussed in many papers, including Phillips and Jin (2015), characteristics of the filter could be extremely sensitive to the choice of the smoothness parameter. Secondly, no irregular component is assumed in the decomposition procedure and therefore it is subsumed as part of the cyclical component, which might produce spurious cyclicality in the series.

3.3.2 The Beveridge-Nelson Decomposition

The decomposition method proposed by Beveridge and Nelson (1981) assumes that the original series follows a non-stationary ARIMA process and its first-difference has a stationary ARMA(p,q) structure as:

$$\phi(L)\Delta y_t = \mu + \theta(L)\varepsilon_t$$

where $\phi(L) = 1 - \phi_1 L - \phi_2 L^2 - ...... - \phi_p L^p$, $\theta(L) = 1 + \theta_1 L + \theta_2 L^2 - ...... + \theta_p L^p$ and ε_t is $iid(0, \sigma^2)$.

Then, by using its infinite-order moving average (MA) representation,

$$\Delta y_t = \mu + \psi(L)\varepsilon_t = \mu + \sum_{j=0}^{\infty} \psi_j \varepsilon_{t-j}$$

where $\psi(L) = \theta(L)/\phi(L)$, the permanent component or trend τ_t, which follows a random walk process, is defined as:

$$\tau_t = \mu + \tau_{t-1} + \psi(1)\varepsilon_t \tag{6}$$

The stationary transitory component or cycle g_t is defined as the difference between y_t and the trend as:

$$g_t = y_t - \tau_t = \tilde{\psi}(L)\varepsilon_t \tag{7}$$

where $\tilde{\psi}(L) = -\sum_{k=j+1}^{\infty} \psi_k$. Empirically, the first step of the BN decomposition is the specification and the estimation of an appropriate ARMA(p,q) model for Δy_t. Once it is estimated, an estimate of $\psi(1) = \theta(1)/\phi(1)$ is observed and then estimates of τ_t and g_t are derived by replacing the disturbance term ε_t with the ARMA residuals. The main disadvantage of the BN decomposition might be its implicit perfect negative correlation assumption between the trend and cycle innovations due to sharing the same innovation ε_t. The second disadvantage could be its sensitivity to the ARMA specification and the loss of the first observation due to differencing the original series.

3.3.3 The Kalman Filter

The trend-cycle decomposition could be also formed as an unobserved component model by using the Kalman filter in a similar fashion to the time-varying parameters approach discussed in Section 3.2. In the state-space representation, while equation (4) is the measurement equation, the transition equations are set as:

$$\tau_t = \delta + \tau_{t-1} + v_{1t}$$
$$g_t = \phi_1 g_{t-1} + \phi_2 g_{t-2} + v_{2t}$$
$$v_{1t} \ iid \ N\left(0, \sigma_1^{\,2}\right) \tag{8}$$
$$v_{2t} \ iid \ N\left(0, \sigma_2^{\,2}\right)$$
$$E\left(v_{1t} v_{2t}\right) = 0 \quad \forall t, \forall s$$

In this setup, the trend component, τ_t, is assumed to follow a random walk process with drift whereas the cyclical component, g_t, follows a stationary autoregressive process (AR) of order 2. Unlike the HP and the BN approaches extracting the cycle residually, in this setting the cycle component is allowed to have its own dynamics in this framework. Moreover, the innovations to the trend and the cycle are assumed to be originated from completely disparate sources so that v_{1t} is the permanent shock and v_{2t} is the transitory shock and they are assumed to be uncorrelated. Given the structure, the Kalman iterations are utilized for estimation of the unobserved components as discussed in Section 3.2.

The Kalman filter and the BN decomposition diverge mainly on the basis of the assumptions regarding the correlation between the trend and cycle components. As emphasized by Clark (1987), although the zero correlation assumption of the Kalman filter may not be true, it is more outstanding than the perfect correlation assumption of the BN approach. Especially, in economic terms, it is clear that the shocks affecting the cyclical component do not necessarily influence the permanent component. More extremely, the dichotomy assumption utilized in the macroeconomic theory differentiates starkly between the impacts of the transitory shocks and the permanent shocks.

4. Empirical Results

In this section, we first discuss estimation results for the output gap observed from the HP filter, the BN decomposition and the Kalman filter and investigate the results with respect to the fit of the data to the corresponding chronologies of the shocks reviewed in Section 2.1. Subsequent to the filter choice, we present the empirical findings of the time-varying parameters model.

4.1 Decomposition Results

Given the diversified assumptions of the filters, Figure 6 displays the alternative output gap estimations. To start with the HP filter estimates, the results seem to be completely consistent with the expectations regarding the alternative choice of the smoothness parameter λ. Apparently, the greater λ allows for the greater variation in the cyclical term as a result of the higher degree of smoothing in the trend component. As clearly demonstrated in Figure 6, the output gap estimate of the HP filter with $\lambda = 6.25$ neglects the recessionary dynamics in the late 1970s entirely, whereas the filter with $\lambda = 100$ displays somehow compatible results to the tendencies of that period. On the other hand, the latter parameter choice suggesting the presence of a slack period in the second half of the 1990s which coincides with the recovery period as reviewed in Section 2.1, may be interpreted as misleading. Therefore, in addition to the limitations of the mechanical use of the HP filter in general sense; there are notable signs of spurious cyclicality in this specific application to the Spanish economy.
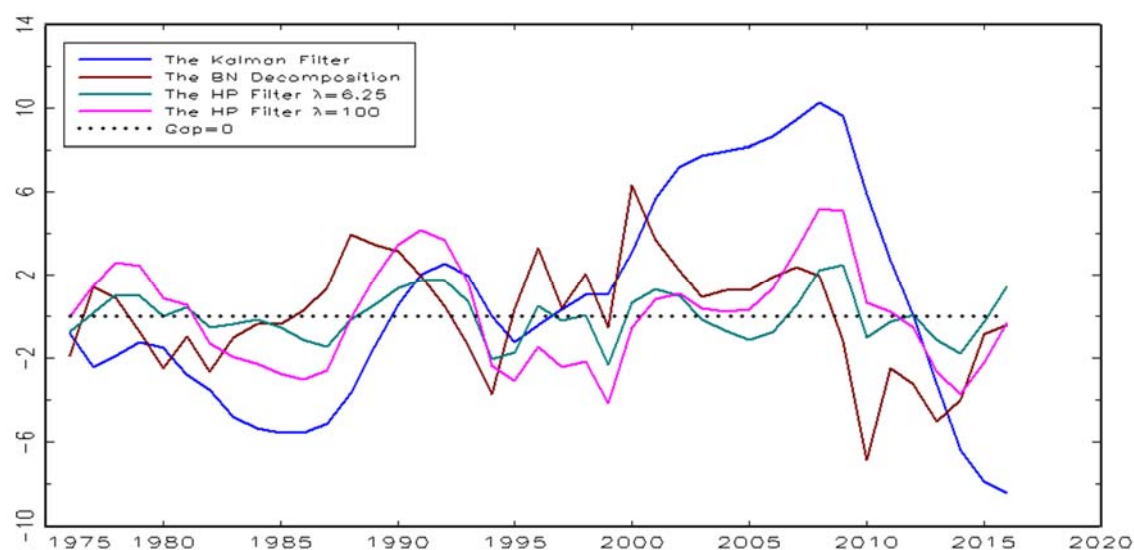
**Figure 6** Output Gap Estimates, Percentage, 1975-2015

On the other hand, the output gap estimated by the BN decomposition suggests rather abrupt movements over time, as the cycle compensates for the changes in the permanent trend component, contemporaneously. Regarding the Spanish economy, the output gap estimated by the BN decomposition seems to coincide with the traditional chronologies better than the HP filter results. Especially, the economically slack periods are reflected consistently with the general overview until the mid-1990s to a great extent. After that, the suggested volatile behavior during the second half of the 1990s cannot be justified with the developments observed in the economy. Moreover, the inflated output in the 2000s and the fizzling out process in the aftermath of the period are not revealed in the estimate. Conceivably, the restricted role of the cycle to the long-run trend movements fails to generate proper dynamics of the Spanish economy.

The output gap estimated by the Kalman filter which identifies the cycle as a stationary AR(2) process displays smoother transitions compared to the other methods. In this method, the output gap is driven by the cyclical shocks being independent of the shocks inducing movements in the permanent component. Although zero correlation among these unobserved components might sound like a strict assumption, the greater

importance is attached to estimate the cycle by allowing separate dynamics from the trend process. Since the cyclical component is utilized as an explanatory variable in this study, it is preferable that the gap component contains information beyond the restrictions imposed by the trend estimates. Among the other alternatives, the Kalman filter provides a unique option to not extract the cycle like an irregular component of the series. Moreover, the chronology of the shocks reviewed in Section 2.1 is represented properly by this filter. Specifically, as remarked by Estrada et al. (2009) and Alberola et al. (2014), the output level beyond the sustainable measures during the 2000s and the severe adverse effects of the European Debt Crisis in the aftermath of the Great Recession are captured only in this decomposition approach, prominently. By considering the technical strengths and the harmony with the country-specific dynamics, the Kalman filter estimate of the output gap is used in the following analysis.

4.2 Time-Varying Parameters Model Results

Having estimated the state-space models given by equations (2) and (3) for adult, youth, female and male unemployment separately, the estimated persistence coefficient along with its 90% confidence interval are plotted in Figure 7. Starting with adult unemployment, the uninterrupted rise of the coefficient from 1977 to 1985 may be explained through the rigid labor practices such as the strict employment protection and it is consistent with the increasing unemployment duration as reviewed in Section 2.1. In this period, the smoothing role of the employment protection in the labor market flows over the business cycle leads to inertia in the unemployment rate due to unfavorable macroeconomic circumstances. The persistence coefficient reaching one in 1980 and exceeding this level in the following years propounds the presence of hysteretic effects until 1986.
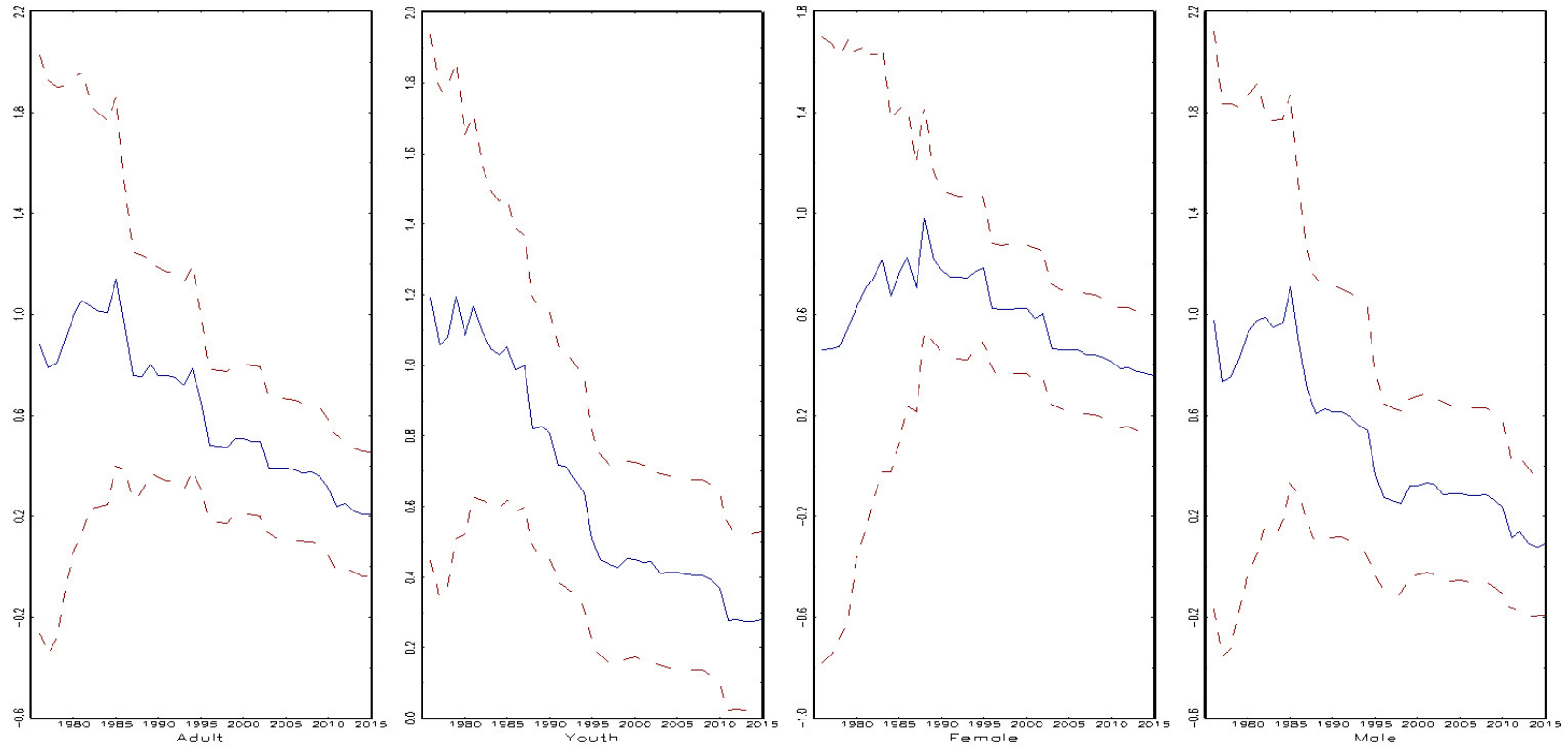
Note: Dashed lines represent 90 percent upper and lower confidence intervals of the parameters.

Figure 7 Time-varying Persistence Coefficients Estimates

From 1985 to 1987, on the other hand, the persistence coefficient shows a tremendous decline in the aftermath of the1984 reform. Although the persistence coefficient is still at high levels in the second half of the 1980s, the hysteretic impacts regarding the value of the coefficient are eliminated after 1985. The stable time path of the persistence coefficient in the first half of the 1990s seems to be interrupted by another downward shift in the 1994-1996 period accompanied by the labor market reform in 1994. Furthermore, with the observed downward shift, the Spanish unemployment that is identified by the hysteresis hypothesis over the period of 1976-1996 according to the confidence intervals, turns into a stationary process.

The persistence coefficient moving below 0.5 indicates that the high persistence hypothesis describing the previous decade from the second half of the 1980s is no longer relevant. The decrease of the EPL for the workers with permanent contracts with the aim of alleviating duality in the labor markets may explain the decline of the coefficient after the 1994 reform. In other respects, as mentioned in Section 2.2, the attempts to decrease the share of temporary contracts stayed pretty much limited. Therefore, even if the abruptly declining link between the past and the current unemployment is supportive in terms of the resilience of the labor markets, they also become more fragile to the shocks due to the unrestrainable utilization of the temporary contracts. In the following period, the downward movement of the persistence coefficient is accelerated strikingly between 2002 and 2003 following the reforms in the early 2000s with similar aspects to the 1994 and 1997 reforms. The smoothly diminishing transformation of the persistence coefficient from 0.38 in 2008 to 0.21 in 2015 conceivably reflects the discouraged worker effects as indicated by the increasing incidence of the discouraged workers in the labor force as provided by OECD (2018).

Regarding the youth-adult comparison, the overall trends of the persistence coefficients are similar for both groups. That is to say, the effects of the reforms are more likely to coincide regarding the timing of the changes. On the other hand, several disparities are worth to mention. Initially, the higher persistence coefficient for the

period 1970-1987 suggests that the hysteretic effects are more of an issue for the youths than the adults. Moreover, the movements of the persistence coefficient seem to be smoother than the evolution of the persistence coefficient of the adult group. In this respect, it may be claimed that the decline of the coefficient of youths is induced both by the impacts of the reform in 1984 and also by the decreasing participation effects after 1988 as displayed in Figure 5. On the other hand, the effects of the reforms specifically targeted youth people during the 1990s on the persistence coefficient seem to be limited possibly as a result of the rising participation rates after 1996. By the same token, the impacts of the reforms in the early 2000s are less noticeable through the persistence coefficient of the youths different from the adults.

Regarding the female and male groups, it is seen that the difference between those groups has emerged from the initial years of the analysis. As explained in Section 2.2, the low participation levels of females to the labor force started to raise during the 1980s might lead the upward movements of the persistence coefficient to be more limited compared to the persistence of male unemployment. Especially, even though the persistence coefficient of female exhibits highly volatile behavior until the late 1980s, it never reaches to one except 1988. On the other hand, the persistence coefficient of the male suggests the presence of the hysteretic effects until 1986. In this period, it is noticeable that although the female persistence coefficient responds with certain lag effects to the policy changes, the articulation of the female emerging under rather flexible labor market conditions than the male prevents the persistence mechanism to operate fully as in the case of hysteresis. On the other hand, it is observed from Figure 6 that the impacts of the reforms in the second half of the 1990s are rather limited for the female compared to the male though they explicitly target them. Overall, the results suggesting the limited effects of these reforms for both the female and the youth groups may lead to question to what extent these reforms achieved their aim to protect the vulnerable groups in the labor markets. The persistence coefficients of these groups after 2009 indicate that the discouraged worker effects may be more relevant for the male group than the female. On the contrary, the persistence coefficient of the

female is relatively stable probably due to the added worker effects as claimed by Addabbo, Rodríguez-Modroño, and Gálvez-Muñoz (2013) compensating for the discouraged workers.

Next, we analyze the evolution of the output gap coefficient, which will indicate the extent of the cyclical component in the unemployment series. Although it is anticipated to be negative, the positive coefficient of the output gap for adult unemployment, as plotted in Figure 8, indicates the absence of an expected connection between labor and output markets until 1986. As mentioned in Section 2.2, the signs of labor hoarding are present during the economic downturn in this period. The estimation results show that instead of the transmission mechanism of the shocks through the cyclical unemployment as expected in a flexible labor market, the interaction of the shocks with the rigid institutions give rise to the complex and possibly amplified effects in the labor markets. In this sense, the first decade of the analysis from 1976 is characterized by an extreme form of inflexibility in the labor markets as remarked jointly by the explosive behavior of the persistence coefficient and the positive sign of the output gap coefficient. Although the output gap coefficient turns to be negative in 1987 after a sharp decline from 1985 onwards, the coefficient is statistically insignificant until the 2000s except 1996. During the 2000s, significant output gap coefficient in several years may be understandable as the strengthening of the cyclical component of the unemployment, after the period of the stabilization policies aiming to achieve the requirements of the Maastricht treaty during 1990s.
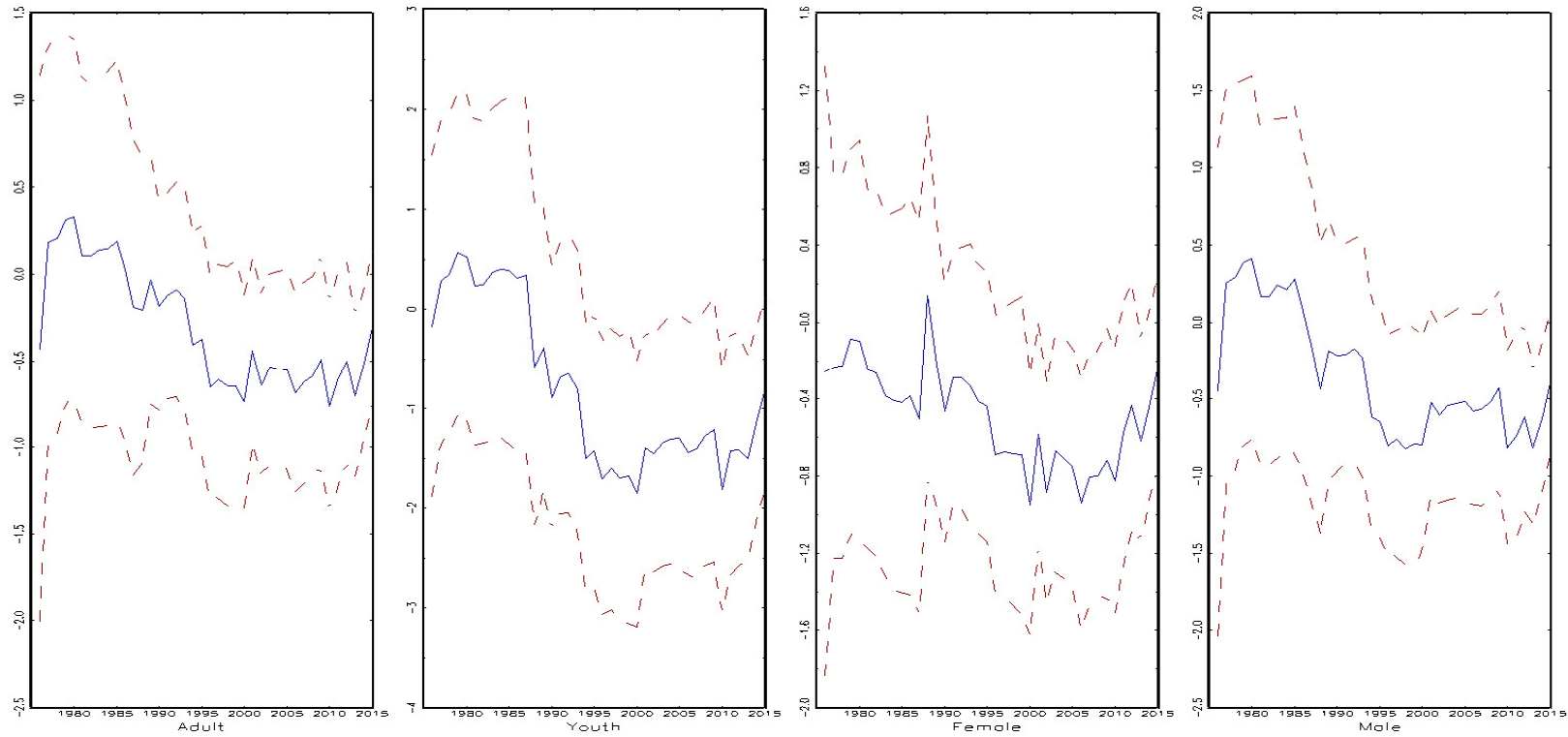
Note: Dashed lines represent 90 percent upper and lower confidence intervals of the parameters.

Figure 8 Time-varying output-gap coefficients estimates

Also, the effects of the recovery during the second half of the 1990s on the labor markets may give rise to the extent of cyclical unemployment to be important in the economy as implied by the output gap coefficient. Hence, the time paths of both the persistence coefficient and the output gap coefficient point out the improvement of the flexibility in the labor markets gradually after the 1990s. However, it is important to note that the significance of the output gap coefficient limited to the several years indicates the restrained role of the cyclical component in unemployment rates of the benchmark group. On the other hand, the cyclical impacts of the Great Recession are reflected as the minimum point of the coefficient in 2010 with certain lag effects after 2008. The insignificance of the coefficient in 2011 and 2012 turn to be significant and it increases strikingly in 2013 to a similar level to 2010 by manifesting the extent of the rise in cyclical unemployment.

As demonstrated by Figure 8, the output gap coefficient of the youth follows a substantially decreasing trend over the period of 1992-1996 similar to the output gap coefficient of the adult displaying positive sign until 1988. Different from the adult, however, the output gap coefficient of the youth turns to be statistically significant in 1994 and remains significant except 2009 and 2015 during the rest of the period. The extent of the decline in the youth output gap coefficient greater than the adults indicates the cyclical unemployment constitutes a relatively substantial part of the youth unemployment. In this sense, although the youth unemployment suffers from extreme rigidity as mentioned by the interpretations of the persistence coefficient in the pre-1990s, the cyclical component comes into forefront after1994 probably as a result of the over-utilization of the temporary contracts in a period with rising labor force participation rates (Figure 5). The flexibility measures taken in the labor markets give rise to a high dependence of the youth unemployment to the output movements in this sense. Similar to the output gap coefficient of the adult, the response of the youth gap coefficient to the 2008 crisis displays the maximum effect in 2010 which is more profound than the response of the adults. After that period the coefficient decreasing only slightly shows the severe impacts of the crises operated through the cyclical

unemployment different from the adult group which the cyclical component is relatively limited.

Comparing the output gap coefficient for males and females, it is seen that the articulation of females to the labor market under rather flexible labor market conditions is reflected by the negative coefficient during the late 1970s and 1980s in contrast to the positive coefficient in the case of males. The output gap coefficient for the female group becomes significant in the 2000-2010 period. On the other hand, the output gap coefficient of males becomes significant during the period 1996-2002 and this reflects the importance of the recovery during the second half of the 1990s. For males, the output gap coefficient of males becomes significant again after 2010 following its statistical insignificance during the 2003-2009 period which demonstrates the limited impacts of the expansion period on the labor markets for male unemployment. Different from the estimated output gap coefficient of male unemployment which shows similar movements to the benchmark adult group, the alternated sensitivity of the gap coefficient for female unemployment over the different phases of the economy arouses the suspicion regarding the presence of the asymmetry in the coefficient.

5. Conclusion

This study scrutinizes the extent of the unemployment persistence in the presence of output gap for Spain over the period of 1972-2015. Based on the historical information presenting numerous numbers of crises and the policy changes during the last four decades, the analysis aims to unveil the impacts of these structural transformations which are either in the form of sudden breaks or the smooth transitions on the claimed inertia in labor markets. To this end, the time-varying parameters model is utilized in order to capture the proper dynamics of the unemployment rates without imposing any prior assumptions regarding the timing, number and structure of the changes. Furthermore, in order to examine the conventional claim that the labor market rigidities give rise to higher unemployment in the European context; the output gap is utilized in

addition to the lagged unemployment. In this way, disclosing the rough sources of unemployment as the structural or the cyclical is targeted.

In order to obtain the output gap which is not a directly observable variable, three decomposition procedures are used. Following the selection of the Kalman filter on the basis of both technical convenience and the relevance to the Spanish data, we proceed to the state-space model comprising the time-varying parameters. The empirical analysis uncovers the rigidity of the labor markets displayed by the explosive behavior of the persistence coefficient until the mid-1980s, while a decreasing trend is observed in the persistence in the aftermath of the labor market reforms in 1984 and 1994. The disaggregated data on the basis of gender reveals that the integration of females to the labor force coinciding with the measures attempting to flex labor market institutions after the early 1980s has led to a relatively stable behavior of the persistence coefficient compared to males. Yet the impacts of the reforms demonstrated by the persistence coefficient remarks that the rigidity of the unemployment rate of the male has been affected relatively more than that of the female. Overall, it may be concluded that the resilience of the labor markets has advanced substantially following the periods when the labor market reforms coincided with the economic recovery phases. However, the smooth decline pattern of the persistence coefficient during the crises of the late 2000s and the early 2010s conceivably indicates the discouraged worker effects besides the potential impacts of the reforms during the economically slack period.

On the other side, the positive sign of the output gap coefficient during the late 1970s and the first half of the 1980s, contrary to the negative sign expectations implied in the context of Okun's Law, confirms the rigidity claims by the persistence coefficient further. Following the substantial transformation during the early 1990s, the rising sensitivity of unemployment to the output gap displays the importance of the cyclical component for the next period. The cyclical link which is considerably greater for the youth compared to the adult reveals the substantial importance of the output side effects

on the youth labor markets. In this respect, the fragility of the youth unemployment to the cyclical shocks calls for further policy implications.

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