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Roberto Bande
Departamento de Fundamentos da Análise Económica.
Facultade de Ciencias Económicas e Empresariais.
Avenida do Burgo s/n.
15782 Santiago de Compostela (A Coruña).
e-mail: rbande@usc.es.
Tlf. +34 981 563 100 Ext. 11666. Fax: +34 981 547 134.

LAGGED ADJUSTMENT PROCESSES AND THE NATURAL RATE IN SPAIN: A COMPARISON WITH PORTUGAL

ENTIDADES COLABORADORAS

Fundación Caixa Galicia
Consello Económico e Social de Galicia
Fundación Feiraco
Instituto de Estudios Económicos de
Galicia Pedro Barrié de la Maza

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Lagged Adjustment Processes and the Natural Rate in Spain: a Comparison with Portugal[*†]

Roberto Bande

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Abstract

This paper provides new evidence on the recent evolution of the unemployment rate in Spain. Specifically, we interpret the movements of the unemployment rate under the Chain Reaction Theory, whereby unemployment is viewed as the outcome of the interplay of a series of lagged adjustment processes in the labour market with persistent shocks, such that the unemployment rate needs a certain span of time to endogeneize the effects of such shocks. We show that persistent shocks make the actual Spanish unemployment rate depart from its natural level for prolonged periods of time. Portugal, on the contrary, shows greater labour market flexibility, which allows for faster adjustment, and hence, lower unemployment persistence.

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1 Introduction

Spain and Portugal share many features in their labour markets and in their recent economic history. Specifically, both economies were exposed to the same kind of shocks since 1970, covering a political change (transition from a dictatorship to a democracy), the oil price shock, the accession to the European Union,... Both countries also were similar concerning labour market institutions at the beginning of the seventies, and their performance in terms of GDP growth, inflation and unemployment were satisfactory until that date. Nowadays, the Spanish unemployment rate stands close to 13% while the Portuguese figure is around 4% (being this difference more apparent during the recessions in the eighties and nineties). This paper aims to provide more evidence on these differences.

The unemployment differences between countries (both in levels and in degree of persistence) may be due to a different degree of labour market flexibility. In a recent paper, Bande (2002) has proved that the Spanish and Portuguese labour market show very different degrees of flexibility, understanding flexibility as the ability to internalize the potential shocks that may hit these markets. Under the approach of the Chain Reaction Theory, it has been proved that the Spanish labour market suffers from intense lagged adjustment processes (Portugal enjoys much lower intensity of these adjustment processes), thus generating a greater persistence of unemployment when facing temporary shocks. In addition, it is shown how these adjustment processes may have resulted in a higher increase in the Spanish equilibrium unemployment rate against the Portuguese one. This result confirms the ones obtained by other authors (Castillo, Dolado and Jimeno, 1998) about the fact that Spain shows mechanisms of propagation of the shocks which are much more important than in Portugal.

In view of this evidence, it may be asked if this different degree of flexibility is able to explain the differences in the unemployment rates in both economies. This is the question we are dealing with in the current paper. In this sense, we move away from what have been the two most widely used hypothesis when having to explain the evolution of unemployment, that is, the Natural Rate hypothesis and the hysteresis hypothesis. We focus on the interpretation that Henry, Karanassou and Snower (2000) make about unemployment movements. More exactly, these authors prove that in view of the Chain Reaction Theory, it is possible to interpret the medium-term variations of the unemployment rate as the result of long adjustment processes to persistent shocks, taking as persistent those that are temporal but long-lasting.

In the literature about the differences in the unemployment rates between countries, it is usually argued that these can be explained either on the basis of differences between the institutions of the labour market (degree of centralization of the wage bargaining, degree of employment protection, coverage of the unemployment benefit system,...) or on the basis of different degrees of flexibility that, together with phenomena of hysteresis, result in very high and persistent equilibrium rates. However, the differences between the institutions of the Portuguese and Spanish labour markets are not as marked as to explain such a high differential (Blanchard and Jimeno ,1995, Bover, García, Perea and Portugal, 2001). For this reason, a recurrent topic in the literature about the differences between the Spanish and Portuguese labour markets is wage flexibility (Blanchard and Jimeno, 1995, Castro, González and Osorio, 1997, Castillo et alt., 1998, Marimon and Zilibotti, 1996, Phelps and Zoega, 1997, Bover, García, Perea and Portugal, 1998). Then, it is argued that the Portuguese greater wage flexibility has resulted in a lower degree of job destruction than the one in the Spanish labour markets when facing the negative shocks of the last decades. There is an important supposition underlying this analysis, which is that the shocks that have hit both labour markets have been very similar. Castillo, Dolado and Jimeno (1998) identify, under the methodology of the structural VARs, the most important shocks in both economies, concluding that they have not been very different. For this reason, it is argued, the mechanisms of propagation of the shocks must be the ones that explain the different evolution of the unemployment rate in both countries. More exactly, these authors suggest that the Spanish generous system of unemployment protection may have caused fewer loses of income (and of consumption) to the unemployed workers, which reduces their efforts when searching for a job, and thus generates a greater degree of persistence of unemployment.

In this paper, without contradicting the important results obtained by other authors, we will follow an alternative way. More exactly, we want to analyse the consequences that a different degree of flexibility in the labour market may have had in the evolution of the Spanish and Portuguese unemployment rates when facing persistent shocks. Flexibility in the labour market is here taken as the capacity of absorption of the shocks that a labour market has. Persistent shocks are taken as temporal disturbances that remain present in the labour market for several periods. Similarly to what was exposed in the work of Henry, Karanassou and Snower (2000), we focus on this kind of shocks because we believe that the time they cover is the right one to analyse what happened in the European labour markets in the last decades. Facts such as the rises in the oil prices, the rises in the real interest rates, de-inflationist policies, etc., are not isolated in time, but they have remained present in the economy for long periods. In this sense, this approach allows us to cover the gap between the unit temporary shocks and the permanent shocks, which have been the object of a vast amount of literature.

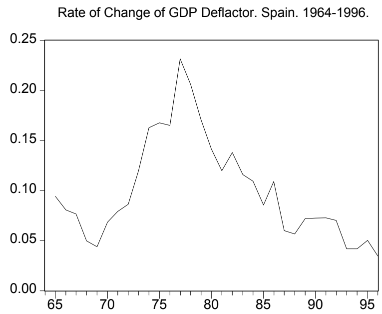
Once a lower degree of flexibility of the Spanish labour market has been identified in Bande (2002), our hypothesis explains that the evolution of the unemployment rate in Spain is linked to long adjustment processes after a series of persistent shocks, and not to a continual and persistent growth of the Natural Unemployment Rate, as has traditionally been argued (see, inter alia Dolado, 1993, De Lamo and Dolado, 1994, Jimeno and Toharia, 1995). To verify this hypothesis, we will firstly try to show how the Spanish economy needs longer adjustment periods than the Portuguese economy to internalize persistent shocks. Secondly, we will present an estimation of the Natural Unemployment Rate for the last decades, showing how this Natural Rate has presented an stability which is much more important than the one presented by the current unemployment rate, and how the distancing of the latter from its natural value can only be explained by the long periods of adjustment. We will show on the contrary, how Portugal, as it presents a greater degree of flexibility in its labour market, needs shorter adjustment periods, so the difference between its current unemployment rate and its natural rate is smaller than the Spanish one.

In this context, the paper presents the following structure. In the next Section, we will proceed to revise the most important estimations proposed in the literature for the Spanish Natural Rate of Unemployment. Next, in Section 3, we will provide empirical evidence on these labour markets and show how the persistence of the shocks affects the persistence of the unemployment rate in both countries. Section 4 presents an estimation of the Natural Unemployment Rate for both economies in the last decades and, finally, Section 5 concludes.

2 Estimations of the NRU and the NAIRU in Spain: methods.

If we observe closely the unemployment rate in Spain for the last three decades together with the evolution of inflation (graphs 1 and 2), we will notice that during the period between the beginning of the seventies and 1978, inflation rose dramatically. From that year, and as a result of the Moncloa Agreements, important anti-inflationist policies were carried out. These reduced progressively the rate of inflation in the Spanish economy. This evolution of inflation has brought about that the literature based on the Natural Rate hypothesis, defends that the growth of inflation during the decade of the seventies must be associated to an important growth in the natural rate, while during the eighties and nineties the reduction of inflation must be related to a natural rate below the observed rate.

Graph 1



Graph 2

If we use a traditional Phillips formula[1], we should observe that

$$\Delta\pi_t = -\beta(u_t - u^*) \tag{1}$$

where $\Delta\pi_t$ is the change in the inflation rate, u_t is the actual unemployment rate and u^* is the natural rate of unemployment. Thus, when the observed rate is below the natural rate, inflation should grow, while when the observed rate is over the natural one, inflation should decrease.

[1]We could use much more complex formulations, although the essential result would not be affected.

For this reason, from this literature, several authors have tried to estimate the NAIRU[2], that is to say, the unemployment rate which is compatible with an stable inflation for the period dealt with. Dolado, Malo and Zabalza (1986) made the first attempt to estimate the NAIRU for the Spanish economy. Under a system of equations of wages, prices and labour demand, they state that for the period 1973-1979, the NAIRU is situated around the 7%, while the average rate observed for the period is around 3.5%. During the eighties, they notice that the NAIRU is around 11.27% for the period 1980-1984, while the observed rate for the same period is 11.42%.

Another NAIRU estimation made for the Spanish economy is the one made by the *Dirección General de Previsión y Coyuntura* (1991) from a system of equations of prices and wages. Under two alternative hypothesis (a vertical Phillips curve in the long-run and a downward sloping Phillips curve in the long-run) they obtain two estimations. Under the first hypothesis, they obtain that, during the seventies, the NAIRU rose to the 10% (in both specifications) while during the eighties the NAIRU rose slightly (an estimate value of 10.8% for the period 1986-1990). However, under the second hypothesis, the NAIRU stayed at much higher levels (16.8% for the aforementioned period).

This result is confirmed by Jimeno and Toharia (1992), who show how the natural rate rises until 1985, and highlight that from that year, the persistence of the observed rate causes the short-term NAIRU to stay at a level close to the observed rate.

De Lamo and Dolado (1993), under an structural model, find that the NAIRU rises progressively until 1993, with an estimated value of the 17% for the period 1991-1993. In any case, it is observed that until the late seventies, the observed rate stays below the natural rate, explaining later dissinflation in terms of a NAIRU below the observed unemployment rate.

Finally, Estrada *et al.* (2000) confirm these results under a wide range of different methodologoes, pointing that, in general, these estimates suffer from uncertainty, as it is not possible to provide confidence intervals for the estimates NAIRUs.

From all these works, it can be concluded that a sustained rise in the natural component of unemployment has taken place, while the NAIRU stayed very close to the observed rate. During the eighties and nineties, different

[2]See Gómez and Usabiaga (1998 and 2001) for a wide survey about estimations of the NAIRU from a critical perspective.

reforms of the labour market have taken place, mainly the introduction of temporariness, the lower degree of generosity of the unemployment benefit, the hardening of the conditions to get to this benefit and the modifications in the contributions to the Social Security System. This fact has not resulted in the expected decrease in the natural rate owing to the important phenomena of hysteresis which, mainly, would be related to the scant degree of wage flexibility that there is in the Spanish economy. This makes the wage-setting to escape from the general conditions of the labour market. This supposed lack of flexibility (which can be further qualified, as authors such as Fernández and Montuenga, 1997, Fernández, Montuenga and Romeu, 2000 and Bande, Fernández and Montuenga, 2001[3] have proved) would bring about direct effects on the natural unemployment rate.

3 Persistence of shocks and unemployment persistence

The Chain Reaction Theory[4] interprets the movements of the unemployment rate as the result of the interaction of a group of lagged adjustment processes and a series of shocks which hit the labour market in such a way that the (temporal or permanent) disruptions take some time in being absorbed. In Bande (2002) the CRT has been verified for the Spanish and the Portuguese labour markets, being found that the Spanish unemployment rate persistence may be interpreted as the result of the interplay of intense lagged adjustment processes in the labour market with shocks that hit the market. In that paper only two types of shock were considered: on the one hand, temporal shocks that had an only period of validity; on the other hand, permanent shocks that stayed for ever. This kind of shocks allowed to analyse the different degree of reaction of the Spanish unemployment rate from the Portuguese one.

However, most of the developed economies in general, and the Spanish and Portuguese in particular, have undergone a type of shocks which does not tally with the ones mentioned here. More exactly, the shocks on the oil prices, on the interest rates, the union pressures after the transition towards

[3]These authors show how the elasticity of the real wage to the general conditions of the labour market differs among manufacturing industries.

[4]See Karanassou and Snower (1993, 1998, 2000), Henry and Snower (1996) and Henry, Karanassou and Snower (2000).

a democracy, etc., have involved disturbances on the labour markets which have not been permanent (in the sense that they have disappeared after some time) nor have been shocks shorter than a year. In other words, these shocks have a marked prolonged nature.

What consequences may this fact have had on the evolution of the unemployment rate? The argument we will put forward is that those economies with a greater degree of flexibility in the labour market will be less affected in unemployment terms than other economies which present a greater labour market rigidity. To develop this argument, on the first place, we will find that, wen facing lagged adjustment processes, the response of the unemployment rate is going to depend not only on the magnitude of those, but also on the interaction of the dynamic characteristics of the shock (that is to say, more persistent shocks generate a greater persistence of the unemployment rate). Secondly, we will show how that interaction may have made the effective unemployment rate to move away from the natural one.

In order to show these ideas in action we need to provide empirical evidence on both labour markets. Specifically, we will estimate with yearly data a system of the type (all variables in logs expect the unemployment rate u_t):

$$a_0(L)N_t = a_1(L)w_t + a_2(L)K_t + a_3(L)X_{1t} + \varepsilon_{1t} \tag{2}$$

$$b_0(L)w_t = b_1(L)N_t + b_2(L)X_{2t} + \varepsilon_{2t} \tag{3}$$

$$c_0(L)L_t = c_1(L)w_t + c_2(L)u_t + c_3(L)Z_t + c_4(L)X_{3t} + \varepsilon_{3t} \tag{4}$$

$$u_t = L_t - N_t \tag{5}$$

where $a_i(L), b_i(L)$ and $c_i(L)$ are polynomials in the lag operator, K_t is the capital stock, Z_t is the working age population and X_{it} are row vectors of exogenous variables. The first equation is the labour demand equation; the second one is the wage setting equation, while the third is the labour force participation equation. Hence, we approximate the unemployment rate through the difference (in logs) of the aggregate employment and aggregate labour force. This systems reflects many of the lagged adjustment processes proposed in the literature. First, the lagged employment terms in the labour demand equation account for the Employment Adjustment effect (Nickell, 1978); the lagged wage terms in the wage equation account for the wage staggering effect (Taylor, 1978), while the lagged employment terms in this equation reflect the Insider membership effect (Lindbeck and Snower, 1987); finally, the lagged labour force terms in the labour force equation account for the labour force inertia effect, and the lagged unemployment terms in this equation reflect the effect that long term unemployed exhert on labour force participation.

With respect to the econometric methodology we may make some important points. The tradition within the analysis of aggregate time series is a three step strategy. First, generally, the order of integration of variables is studied, basically through unit root tests. Once the order of integration is established and homogenized, in a second step, cointegration tests are developed, i.e., the study of possible linear combinations among variables that reduce the order of integration. This indicates a long-run relationship between the variables involved in the cointegration vectors. Once the hypothesis of a long run relationship has been established and estimated (through Engle and Granger methodology, the Johansen approach, etc.), the third step consists in the estimation of the short run dynamics through an error correction model, which measures the speed of adjustment of the model to disequilibria. In spite of the popularity of this approach in time series analysis, it is not exempt of difficulties, generally related to the first step of the strategy, namely, the unit root tests. These tests (Dickey-Fuller, Augmented Dickey-Fuller, Phillips-Perron, etc.) do have a low power, which is a problem that may affect the whole modelling process. In a recent series of papers, Pesaran and Shin (1995) and Pesaran, Shin and Smith (1996), propose an alternative strategy that surrounds the previous problems of the unit root tests. Specifically, these authors show that the Autoregresive Distributed Lag models (ARDL) are an efficient way to estimate long run relationships, as it may be applied irrespectively of whether the variables are I(0) or I(1). Additionally it provides a straightforward economic interpretation of the estimated coefficients. To set the number of lags in each equation, we have estimated different lag structures and have chosen the one that maximizes some information criteria, as AIC (Akaike Information Criteria) or SBC (Swartz-Bayesian Information Criteria). Once the dynamic specification was chosen and estimated, we have conducted a battery of misspecification tests, in order to ensure that our selected equations consist of a well specified linear combination of the variables, and, more importantly, stable, as they all pass the CUSUM and CUSUMQ tests[5]. Finally, to avoid the possibility of cross-equation correlation we have estimated the system by 3 stages least squares

[5]Appendix B summarises the OLS estimation of this system and the misspecification tests.

The results of the estimation of the system for Spanish and Portuguese labour markets are summarized in Tables 1 and 2 respectively.

Table 1

Spain. 1966-1996. 3SLS

[1]	$\Delta N_t = \underset{(0.54)}{2.94} - \underset{(0.07)}{0.39}\, N_{t-2} - \underset{(0.05)}{0.07}\, w_t + \underset{(0.02)}{0.11}\, K_t + \underset{(0.24)}{1.41}\, \Delta K_t - \underset{(0.32)}{0.50}\, \Delta K_{t-1}$ $- \underset{(0.37)}{0.52}\, \Delta IT_t - \underset{(0.01)}{0.06}\, \Delta C_t - \underset{(0.009)}{0.03}\, D_t^{Esp}$
[2]	$\Delta w_t = \underset{(0.37)}{1.20} - \underset{(0.10)}{0.36}\, w_{t-2} - \underset{(0.12)}{0.21}\, u_t + \underset{(0.05)}{0.18}\, b_t + \underset{(0.02)}{0.05}\, C_t - \underset{(0.52)}{0.55}\, IT_t$
[3]	$\Delta L_t = \underset{(0.20)}{-0.23} - \underset{(0.06)}{0.17}\, l_{t-2} + \underset{(0.06)}{0.10}\, \Delta w_t - \underset{(0.07)}{0.22}\, \Delta u_t + \underset{(0.05)}{0.19}\, Z_t$
Notes: Standard errors in parenthesis. See Apendix A for definitions	

Table 2

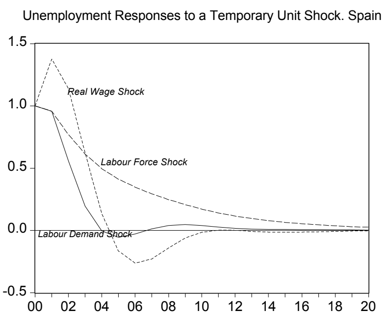
Portugal. 1973-1993. 3SLS

[4]	$\Delta N_t = \underset{(1.77)}{6.43} - \underset{(0.16)}{0.59}\, N_{t-2} - \underset{(0.07)}{0.13}\, w_t + \underset{(0.04)}{0.16}\, K_t + \underset{(0.23)}{0.29}\, \Delta K_t - \underset{(0.02)}{0.03}\, C_t$
[5]	$\Delta w_t = \underset{(0.06)}{-0.26} - \underset{(0.11)}{0.45}\, w_{t-2} - \underset{(0.34)}{0.69}\, u_t + \underset{(0.08)}{0.09}\, \Delta b_t + \underset{(0.01)}{0.09}\, P_t - \underset{(0.04)}{0.19}\, C_t$
[6]	$\Delta L_t = \underset{(2.19)}{0.38} - \underset{(0.12)}{0.39}\, L_{t-2} - \underset{(0.05)}{0.06}\, w_t + \underset{(0.24)}{0.36}\, Z_t - \underset{(0.001)}{0.01}\, D_t^{Por}$
Notes: Standard errors in parenthesis. See Apendix A for definitions	

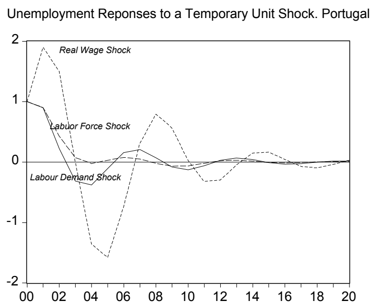
Taking this model as a reference, we will proceed to make a series of simulations that will be the point of departure for our argument[6].

Firstly, let us depict the response of the unemployment rate when facing an unitary temporal shock on the labour demand. When the shock presents these dynamic characteristics, we can see that the Spanish unemployment rate needs a longer period to internalize it. For its part, the Portuguese economy, after a brief initial period, internalizes the shock, even presenting a noticeable over-reaction which implies that, after four years, the unemployment rate is under its initial level. For its part, if the shock was produced on the real wages or on the labour force, the adjustment processes are different between shocks and between economies (see Graphs 3 and 4).

[6] See Bande (2002) for an explanation of these simulations.

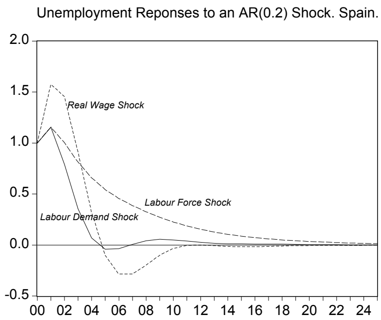


Graph 3

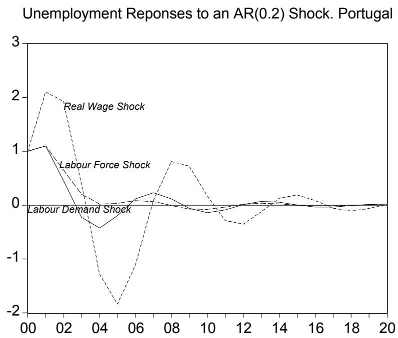


Graph 4

However, as we have mentioned, the magnitude of the adjustments does not depend only on the lagged adjustment processes, but also on how these interact with the characteristics of the shocks. That is why we are going to make another series of simulations trying to show the evolution of the unemployment rate when facing shocks with very different dynamic properties. Firstly, let us consider an autorregressive shock with a 0.2 coefficient, that is to say, a little persistent shock. The responses of the Spanish and Portuguese unemployment rates to these shocks are reflected on Graphs 5 and 6. As can be observed, these responses are similar to the ones obtained when facing a unitary temporal shock, although a slight rise can be observed on the degree of persistence of the unemployment rate in both economies, that is, the unemployment rate needs a slightly longer period of time to absorb the effects of the shock totally.

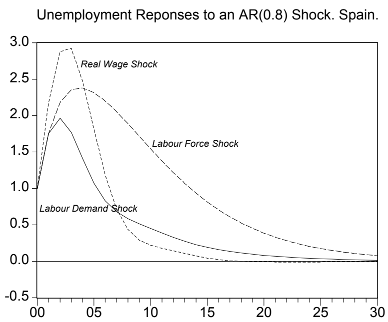


Graph 5

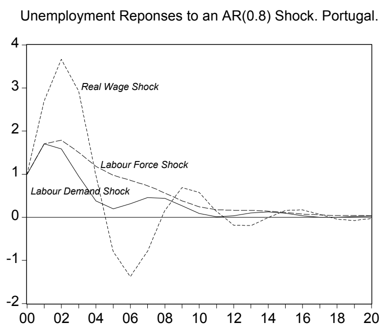


Graph 6

If we now consider an autorregressive shock with a 0.8 coefficient (that is, a much more persistent shock) we obtain the temporal paths reflected on Graphs 7 and 8. We now observe that, when facing this persistent shock, the unemployment rate needs a much longer period of time to internalize fully the effects of the shock, independently of their affecting the labour demand, the real wage or the labour force. This tells us that we are observing that the persistence of unemployment, that is, the period of time that the economy needs to come back to its initial position after a shock, depends not only on the magnitude of the lagged adjustment processes, but also on how these processes interact with the dynamic properties of the shocks.

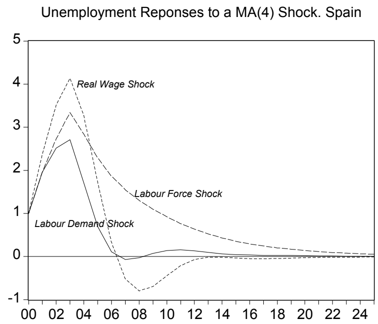


Graph 7

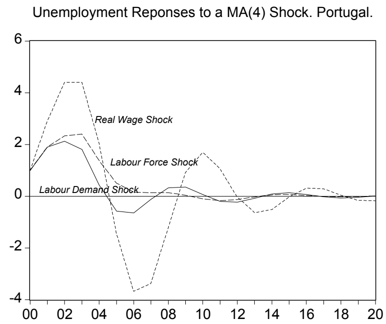


Graph 8

As a last example, we will proceed to simulate the response of the unemployment rate to a moving average type shock (with a 4 coefficient, that is, a unitary shock present for four periods). The temporal path of the unemployment rate in both countries is reflected on graphs 9 and 10. We observe again that a greater temporal effect of the shock involves a greater persistence of the unemployment rate.



Graph 9



Graph 10

From these simulations, we can draw interesting conclusions. Firstly, the one mentioned before, that is, that the adjustment processes interact with the dynamic characteristics of the shocks, thus leading to a greater degree of persistence the more persistent the shock is. Secondly, for each of the shocks, Portugal is observed to be able to absorb the effects in its labour market faster, so it presents a lower degree of persistence. Finally, it must be noticed that the number of periods needed to absorb the shock totally (usually more than 10) is greater than the typical temporal span that can be between different shocks[7].

4 Calculation of an empirical natural rate

In this section, we will proceed to calculate the NRU for the Spanish economy in the period 1970-1995, trying to show how the lagged adjustment processes

[7]For instance, the period of time between both oil prices shocks is 7 years, a shorter period to the one needed for the Spanish economy to absorb fully the first of these shocks.

have much to do when having to account for the difference between the observed rate and the natural one.

The estimated system for Spain can be represented as follows

$$\begin{aligned}(1-B-\beta_2 B^2)n_t &= \beta_3 w_t + C_t^n \\ (1-B-\beta_{11}B^2)w_t &= \beta_{12}u_t + C_t^w \\ (1-B-\beta_{17}B^2)L_t &= \beta_{18}(1-B)w_t + \beta_{19}(1-B)u_t + C_t^L\end{aligned} \quad (6)$$

where B is the lag operator and $C_t^n = \beta_1 + \beta_4 K_t + \beta_5 \Delta K_t + \beta_6 \Delta K_{t-1} + \beta_7 \Delta i_t + \beta_8 \Delta c_t + \beta_9 D$, $C_t^w = \beta_{10} + \beta_{13} b_t + \beta_{14} c_t + \beta_{15} i_t$ and $C_t^L = \beta_{16} + \beta_{20} P_t$. Let $\Phi_1 = (1-B-\beta_2 B^2)$, $\Phi_2 = (1-B-\beta_{11}B^2)$ and $\Phi_3 = (1-B-\beta_{17}B^2)$. In these conditions, the reduced form of the unemployment rate is

$$\begin{aligned}&[\Phi_1\Phi_2\Phi_3 - \Phi_1\beta_{12}\beta_{18}(1-B) - \Phi_1\Phi_2\beta_{19}(1-B) + \beta_3\beta_{12}\Phi_3]\, u_t \\ =\; & -\Phi_2\Phi_3 C_t^n + [\Phi_1\beta_{18}(1-B) - \beta_3\Phi_3]\, C_t^w + \Phi_1\Phi_2 C_t^L\end{aligned} \quad (7)$$

If the adjustment processes were completed in each period, B would be equal to one, so the values of the endogenous variables would be determined by $\widehat{n_t} = \frac{C_t^n + \beta_3 \widehat{w_t}}{-\beta_2}$, $\widehat{w_t} = \frac{C_t^w + \beta_{12}\widehat{u_t}}{-\beta_{11}}$ and $\widehat{L_t} = \frac{C_t^L}{-\beta_{17}}$, so solving for the unemployment rate

$$\widehat{u_t}^{esp} = \frac{\beta_{11}\beta_{17}C_t^n - \beta_3\beta_{17}C_t^w - \beta_2\beta_{11}C_t^L}{\beta_{17}(\beta_2\beta_{11} + \beta_3\beta_{12})} \quad (8)$$

an expression which is only the dynamically stable solution of the reduced form.

Operating in the same way with the system estimated for the Portuguese economy, we find that it can be expressed as:

$$\begin{aligned}(1-B-\beta_2 B^2)n_t &= \beta_3 + C_t^n \\ (1-B-\beta_8 B^2)w_t &= \beta_9 + C_t^w \\ (1-B-\beta_{14}B^2)L_t &= \beta_{15} w_t + C_t^L\end{aligned} \quad (9)$$

where B is the operator of lags and $C_t^n = \beta_1 + \beta_4 K_t + \beta_5 \Delta K_t + \beta_6 c_t$, $C_t^w = \beta_7 + \beta_{10}\Delta b_t + \beta_{11} oil_t + \beta_{12} c_t$ and $C_t^L = \beta_{13} + \beta_{16} P_t + \beta_{17} D$. Let $\Psi_1 = (1-B-\beta_2 B^2)$, $\Psi_2 = (1-B-\beta_8 B^2)$ and $\Psi_3 = (1-B-\beta_{14}B^2)$. In these conditions we derive the reduced form for the unemployment rate as

$$
\begin{aligned}
& \left[\Psi_1\Psi_2\Psi_3 - \Psi_1\beta_9\beta_{15} + \Psi_3\beta_3\beta_9\right] u_t \\
= \;\; & -\Psi_2\Psi_3 C_t^n + \left[\Psi_1\beta_5 - \Psi_3\beta_3\right] C_t^w + \Psi_1\Psi_2 C_t^L
\end{aligned} \tag{10}
$$

and the corresponding unemployment rate in the absence of lagged adjustment processes:

$$
\widehat{u_t}^{port} = \frac{\beta_8\beta_{14}C_t^n + (\beta_2\beta_{15} - \beta_3\beta_{14})C_t^w - \beta_2\beta_8 C_t^L}{(\beta_2\beta_8\beta_{14} - \beta_2\beta_9\beta_{15} + \beta_3\beta_9\beta_{14})} \tag{11}
$$

However, expressions (8) and (11) do not correspond with the natural rates, because these must show the evolution of the permanent components of the exogenous variables, which are abstracted from the cyclical movements. Then, to derive the NRU, we need to isolate the permanent components of the series of exogenous variables in each of the systems.

Let us begin with the Spanish case. The exogenous variables included in the estimations are the capital stock and its growth rate, the rate of indirect imposition and its growth rate, the index of competitiveness and its growth rate, the social benefits per capita and the working age population[8].

In Graphs C.1 , C.2 and C.3 of Appendix C we have reflected the growth rates of the index of competitiveness and of the indirect imposition rate and the level of competitiveness. In all cases, it is reasonable to interpret these temporal series as $I(0)$ in such a way that we suppose that its permanent component converges towards the non-conditioned average of the series, which is equal to 0 in the three cases[9]. As far as the level of the indirect impositive rate, the level of the benefits per capita and the working age population are concerned, the permanent component of these series has been obtained by applying the Hodrick-Prescott filter (Graphs C.4 to C.6). Finally, as far as the capital stock and its growth rate are concerned (Graphics C.7 and C.8), we have supposed that the fall produced in the growth rate in the early nineties is a temporary situation (it is not reasonable to assume that the growth rate of the stock of capital can decrease indefinitely). That is why we take the value in 1990 as the reference (a similar value to the one in 1977) and we assume that the falls produced between 1977 and 1990 and between

[8]The dummy variable included in the estimations, then, would not be included in this Natural Rate.

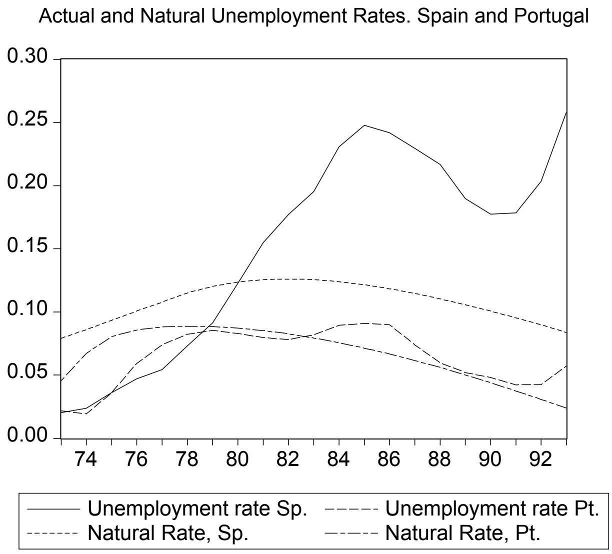
[9]Hypothesis verified through the estimation of an ARIMA model for each of the variables.

1991 and 1996 are temporal, thus generating the corresponding series for the level of stock of capital[10].

In the case of Portugal, the exogenous variables which have been used in the estimation are the level and the growth rate of the capital stock, the index of competitiveness, the growth rate of the social benefits, the oil prices and the working age population. We will proceed to extract the permanent components of these series using the same methodology as in the Spanish case. More exactly, and after observing the series corresponding to the level of competitiveness, the growth rate of the social benefits and the oil prices, we assume their stable behaviour and their convergence to the non-conditioned average of the sample (zero, 0.05 and 2.5 respectively). Thus, these variables are treated as $I(0)$ (Graphs C.9 , C.10 and C.11). As far as the working age population is concerned, the Hodrick- Prescott filter is applied (Graph C.12). Finally, as far as the capital stock and its growth rate are concerned, the same method as in the Spanish case is applied, assuming again that the variation in the growth rate in the last years of the sample are temporal movements (Graphs C.13 and C.14).

Thus, to calculate the Natural Unemployment Rate in both economies, we substitute these permanent values of the exogenous variables in the expressions corresponding to the equilibrium rate (expressions (8) and (11)), and we obtain the result in Graph 11, in which the current and natural rates for each of these economies are shown. In this graph, it can be observed that the Spanish and Portuguese natural unemployment rates have stayed reasonably stable throughout these last decades, in particular much more stable than the corresponding current rates.

[10] More exactly, given the series of the rate of the capital stock growth, from the initial date of this series, we apply the formula $\widehat{K_t} = \widehat{K}_{t-1} + \Delta K_t$.



Graph 11

More exactly, we can highlight three important characteristics. Firstly, we observe that the Spanish natural unemployment rate is not much higher than the Portuguese one. In fact, in mid-seventies, that rate was very similar (around 8% in Spain and 4% in Portugal), which can reflect the similarity of the institutions responsible for that natural rate. Secondly, we observe how the natural rate has grown in Spain from the mid-seventies to the mid-eighties, which can be a reflection of the deep structural problems this economy was facing. Since the mid-eighties, the natural rate has decreased continuously, which may be the reflection of all the liberalizing policies of the labour market which have been carried out since 1984, when the law for the temporary contracts is passed. However, Portugal has observed how, from the mid-seventies, its natural rate decreases gently, standing around 4% in 1993 (the rate for Spain is 10%). Finally, and very important, it is observed that in Spain, the current unemployment rate is very different from the natural rate, while in Portugal the current rate is always very similar to the natural rate. This can be interpreted as a result of the interaction between the persistent shocks and the mechanisms of temporal propagation. As Portugal presents not very intense mechanisms of propagation, the persistent shocks have not a strong effect on the unemployment rate (which remains near its natural value). On the contrary, Spain presented intense adjustment processes, which together with the fact that they are complementary and interact with the dynamic characteristics of the shocks, make the current rate diverge from its natural rate. That is to say, the series of shocks that have hit the Iberian economies has not involved an increase in the equilibrium unemployment rate but it has been followed by long adjustment periods in Spain.

5 Conclusions.

In this paper, we have tried to provide an alternative explanation of the evolution of the Spanish unemployment rate in the last decades comparing this evolution with the one of the Portuguese unemployment rate. Following the approach of the Chain Reaction Theory, we showed how the recent evolution of the Spanish unemployment rate can be interpreted as the result of the interplay of a series of persistent shocks with a group of lagged adjustment processes present in the labour market, which are complementary between each other and with the dynamic characteristics of the shocks.

More exactly, we showed how in the period between the mid-seventies and mid-nineties, the empirical natural unemployment rate of the Spanish economy has remained much more stable than the current rate, reaching a ceiling of 12%, and then this rate decreased from 1984. How can we interpret, then, the diversion of the current rate with respect to this natural rate?. The answer is in the adjustment processes. We have showed how when facing different types of shocks, the Spanish economy needed long periods of time to absorb them fully. More exactly, it has been showed that the more persistent the shocks are, the longer this period is. There is a vast amount of literature that has identified a series of shocks that have affected the labour market, shocks that in many occasions presented persistent characteristics. When facing the difficulties to internalize the shocks, the Spanish economy is hit by new shocks before having been able to internalize the previous ones.

It has been shown (Bande, 2002) that the Portuguese economy exhibited lagged adjustment processes which were much less intense than in the Spanish economy. Thus, it was easy to show that the distance between its natural rate and its observed rate was smaller than in Spain. By calculating this empirical natural rate for Portugal, we prove that, really, the Portuguese natural rate has remained very close to its current rate.

The analysis allows us to interpret the evolution of the unemployment rate in Spain from an alternative point of view rather than the one that up to now has been defended in the literature. First, and as many authors have highlighted (see, *inter alia*, Roca, 1995, Galbraith, 1999), the interpretation of the rise in the unemployment rate as a rise in the natural component is still in conflict with the recent evolution of the determinants of the said component[11]. Given the series of reforms that have been produced[12] in the institutions of the labour market, we should have observed a reduction of the natural component, that has not been identified in the different estimations which have been made. This has been justified on the basis of the hysteresis hypothesis, according to which the wages rigidity in the Spanish economy has made the process of wages determination to be isolated of the general conditions of the labour market. When facing the series of shocks that have affected the Spanish economy these years, the hysteresis has involved a permanent rise in the equilibrium unemployment rate.

According to our approach, on the contrary, we not only consider wage flexibility (or rigidity) but also, at the same time, other phenomena are taken into account, which can be the cause of a high degree of persistence in the unemployment rate (such as turnover costs (Nickell, 1979, or Blanchard and Summer, 1987), the influence that the unemployed people may have on the wages determination, the lack of co-ordination in the wages setting or the phenomenon of the discouraged worker). The joint consideration of all these factors has led us to the conclusion that the degree of flexibility of the Spanish labour market is low, above all when comparing it with the Portuguese one. This low flexibility involves, on the one hand, more intense mechanisms of propagation of the temporal shocks (that is to say, longer adjustment periods); on the other hand, it involves a slower adaptation to permanent shocks

[11] In fact, the authors who defend this hypothesis have decided to concentrate their explanations on the evolution in the interest rates or on the evolution of the growth rate of productivity (Phelps, 1994, Nickell, 1998).

[12] In 1984, the temporary contracts are introduced and throughout the eighties and early nineties, all the measures were devoted to the flexibilisation of the labour market with the reduction of the coverage of unemployment benefit, the hardening of the conditions to receive it, etc. In 1997, owing to the apparent failure of the flexibilising measures and after the new social agreement between unions, firms and the Government, some measures of hiring promotion begin to be taken. Finally, in 2001, a new reform that reduces the price of unfair dismissal is put into practice. In 2002, the government is planning a new reform of the unemployment benefit system.

in the Spanish case.

If to this series of factors it is added that the adjustment processes interact with the dynamic characteristics of the shocks and that the shocks which have hit the European economies in the last decades have had a marked persistent character, it can be concluded that the effect of these shocks, working through the lagged adjustment processes, may have had very prolonged effects on the unemployment. We must not look down on the role that the "idiosyncratic" shocks may have played in Spain, such as the incorporation of the women to the labour market, the massive destruction of agricultural employment, etc...In any case, these shocks must have been followed by long adjustment processes (owing to the lack of flexibility)

Portugal, on the contrary, present a more reduced intensity of the adjustment processes, which allows it to internalize faster the shocks which are "common" to the rest of the Western economies. When it is added to the analysis the fact that many of the Spanish idiosyncratic shocks have not taken place in Portugal (where there has not been an industrial restructuring yet, the woman joined the labour market long ago, the incorporation to the EU was the result of a longer adaptation process than the Spanish one,...), we reach the conclusion that thanks to this greater flexibility, Portugal has been able to overcome the shocks without incurring a cost in unemployment terms.

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A Definition of Variables

Annual data has been taken from the OECD Statistical Compendium database. The variables used and their definitions are summarized in the following box.

Variables
N_t: log of total employment
w_t: log of real compensation by employee.
L_t: log of the labour force
u_t: Unemployment rate, defined as $L_t - N_t$
K_t: log of real business capital stock
IT_t: Indirect Taxes as a percentage of GDP
C_t: log of real competitivnes, defined as $\frac{\text{Import Deflactor}}{GDP \text{ Deflactor}}$
D_t: Dummy variable, 0 until 1977, 1 since 1978
b_t: log of real Social Security Benefits
Z_t: log of working age population
Source: OECD Statistical Compendium

Also, two dummy variables have been included in the estimations, one for each country. These variables try to capture qualitative information that have affected both labour markets, and help to increase the estimates stability. More precisely, D_t^{sp} takes a value of 0 until 1983, taking value 1 since then. This variable tries to capture the effect that the introduction of temporary contracts exerted on the labour market, starting a series of liberalization laws.

On the Portuguese side, D_t^{Pt} is a dummy variable with value 1 between 1974 and 1987, trying to capture the effect on wages of the political change together withe the arrival of half million people from the former colonies.

B OLS estimation and misspecification tests

Next, we provide the estimation of the showed system in the text 2 for Spain and Portugal, by Ordinary Least Squares. As can be observed, the estimated coefficients are similar to those presented in tables 1 and 2.

Table B1

Spain. 1966-1996. OLS

[1]	$\Delta N_t = \underset{(0.54)}{2.34} - \underset{(0.07)}{0.30} N_{t-2} - \underset{(0.06)}{0.09} w_t + \underset{(0.03)}{0.11} K_t + \underset{(0.28)}{1.54} \Delta K_t - \underset{(0.35)}{0.81} \Delta K_{t-1}$ $- \underset{(0.45)}{0.60} \Delta IT_t - \underset{(0.01)}{0.05} \Delta C_t - \underset{(0.007)}{0.02} D_t^{Esp}$
[2]	$\Delta w_t = \underset{(0.38)}{1.14} - \underset{(0.10)}{0.34} w_{t-2} - \underset{(0.13)}{0.18} u_t + \underset{(0.05)}{0.16} b_t + \underset{(0.03)}{0.05} C_t - \underset{(0.55)}{0.58} IT_t$
[3]	$\Delta L_t = \underset{(0.19)}{-0.07} - \underset{(0.06)}{0.16} l_{t-2} + \underset{(0.05)}{0.04} \Delta w_t - \underset{(0.07)}{0.16} \Delta u_t + \underset{(0.05)}{0.15} Z_t$
Notes: Standard errors in parenthesis	

Table B.2

Portugal. 1973-1993. OLS

[4]	$\Delta N_t = \underset{(2.9)}{7.43} - \underset{(0.28)}{0.71} N_{t-2} - \underset{(0.08)}{0.05} w_t + \underset{(0.09)}{0.20} K_t + \underset{(0.38)}{0.08} \Delta K_t - \underset{(0.03)}{0.01} C_t$
[5]	$\Delta w_t = \underset{(0.08)}{-0.20} - \underset{(0.13)}{0.36} w_{t-2} - \underset{(0.44)}{0.55} u_t + \underset{(0.10)}{0.16} \Delta b_t + \underset{(0.02)}{0.07} P_t - \underset{(0.05)}{0.17} C_t$
[6]	$\Delta L_t = \underset{(2.49)}{-3.3} - \underset{(0.17)}{0.49} L_{t-2} - \underset{(0.05)}{0.06} w_t + \underset{(0.31)}{0.69} Z_t - \underset{(0.01)}{0.03} D_t^{Por}$
Notes: Standard errors in parenthesis	

Table B.3

Diagnostic Tests. OLS estimation

Equation→	[1]	[2]	[3]	Equation→	[4]	[5]	[6]
$SC\,[(\chi^2(1))]$	1.01	3.25	4.1	$SC\,[(\chi^2(1))]$	1.86	2.28	3.63
$LIN\,[(\chi^2(1))]$	0.74	3.7	0.03	$LIN\,[(\chi^2(1))]$	0.14	0.46	0.02
$NOR\,[(\chi^2(2))]$	2.72	1.18	2.03	$NOR\,[(\chi^2(2))]$	1.06	1.59	0.45
$HET\,[(\chi^2(1))]$	0.60	0.28	2.3	$HET\,[(\chi^2(1))]$	0.01	0.82	1.45
$ARCH\,[(\chi^2(1))]$	0.53	0.11	3.5	$ARCH\,[(\chi^2(1))]$	1.8	0.28	2.38

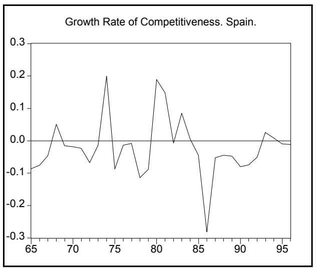
SC stands for Serial Correlation, LIN for linearity, NOR for normality, HET for heterocedasticity and ARCH for Autorregresive Conditional Heterocedasticity.

Notes: 5% Critical Values:

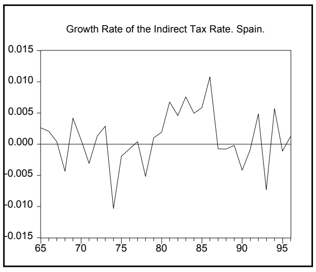
$\chi^2(1) = 3.84$

$\chi^2(1) = 5.99$

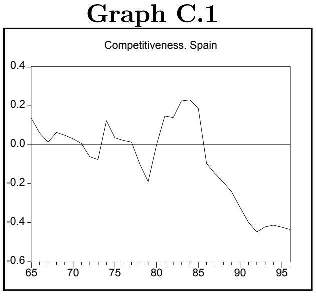
C Graphs of the exogenous variables



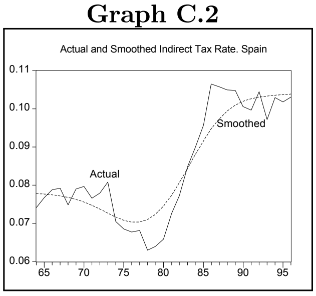
Graph C.1



Graph C.2



Graph C.3



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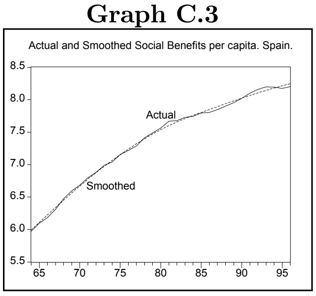

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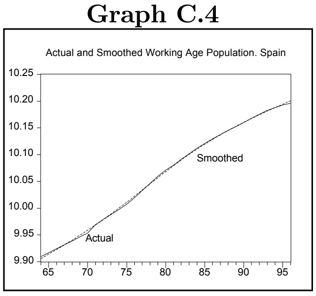
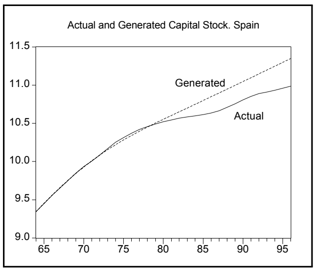
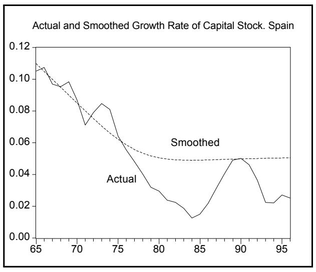


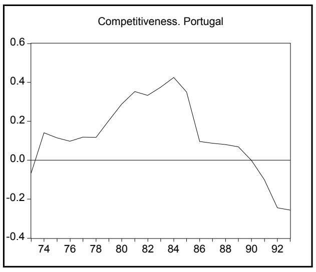
Graph C.6



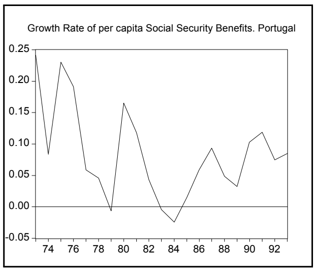
Graph C.7



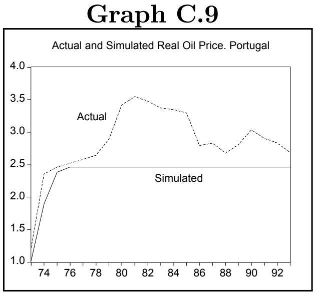
Graph C.8



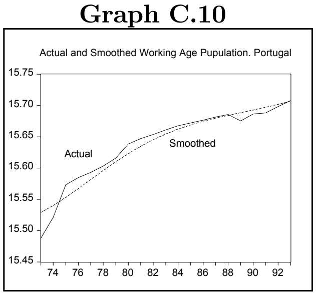
Graph C.9



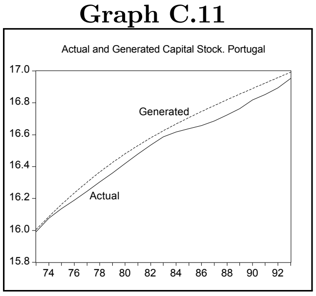
Graph C.10



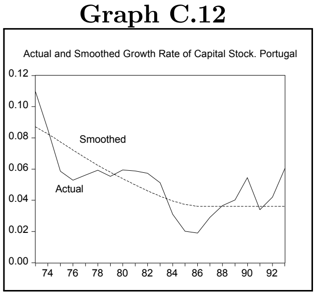
Graph C.11



Graph C.12



Graph C.13



Graph C.14

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