Output Growth Thresholds for Job Creation and Unemployment Reduction in Spain (*)

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ABSTRACT

The Spanish labor market is in great distress. The unemployment rate has increased by 18 percentage points and total employment has fallen by 17 percentage points since the onset of the Great Recession. The issue we wish to address in this paper is one which has drawn a lot of attention in the media, namely: *What would be the required growth rate of real GDP to create net employment and to stop unemployment growing*? Given the different adjustment (hiring and firing) costs for temporary and indefinite contracts, these GDP growth thresholds are likely to depend on the growth of real wages and the composition of salaried employment at each period. Using a CES production function with labour and capital as inputs, we estimate a labour demand equation using annual data over the period 1980-2012 which allows for these considerations in establishing the required thresholds. Our main finding is that, if moderation in real labour costs and plausible shares of temporary work were to remain in the future, GDP growth thresholds would be smaller than those quoted in available reports on this issue.

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I. INTRODUCTION

A duck's quack doesn't echo. This is a fact that people often ignore. There is a huge assortment of opinions in regards to how high unemployment in Spain, especially since the onset of the Great Recession, should be tackled. There are many ideas and proposals, but when analyzed, few will yield solid results.

The labour market has historically been and still is one of the greatest problems in the Spanish economy (see Dolado et al., 2012). Spain was one of the OECD countries with the strictest employment protection legislation (EPL) inherited from the industrial relationships under the francoist regime ("low wages and jobs for life"). Having strict EPL for indefinite contracts does not imply a major problem in upturns since firms do not fire workers then (though they may refrain from creating more jobs). However, in downturns, as is currently evident, high firing costs may lead firms going bankrupt and inhibit workers' relocation from declining sectors to rising ones (see Dolado and Bentolila, 1994, Dolado et al., 2002 and Bentolila et al., 2012). For this reason, following the delayed effects of the two oil prices shocks on the Spanish economy, a drastic reform in 1984 introduced more flexible temporary (mainly fixed-term) contracts for new workers (youth) and for those with lower attachment to the labour market (women). Among other things, this dual labour market implies that temporary jobs bear the burden of employment adjustment during crises. Thus, a segmented labour market has led to a higher unemployment rate that is now especially visible in Spain, particularly among youths, males and immigrants (see Bank of Spain, 2009). By contrast, people in central age groups (prime age workers), mostly under permanent contracts, face lower unemployment.

The ongoing recession has led to practically nonexistent prospects for job growth (see Bank of Spain, 2009). The labour market is stagnant, and as time passes, the levels of unemployment get higher, reaching socially unbearable heights. This raises a key question: Do we need to change the strictness of EPL? To what extent should we make it more flexible? It seems the government has already noticed this after implementing a new labour market reform in February 2012 (Royal Decree Law 3/2012). Among other changes, this reform reduced dismissal costs for employees under permanent contracts,

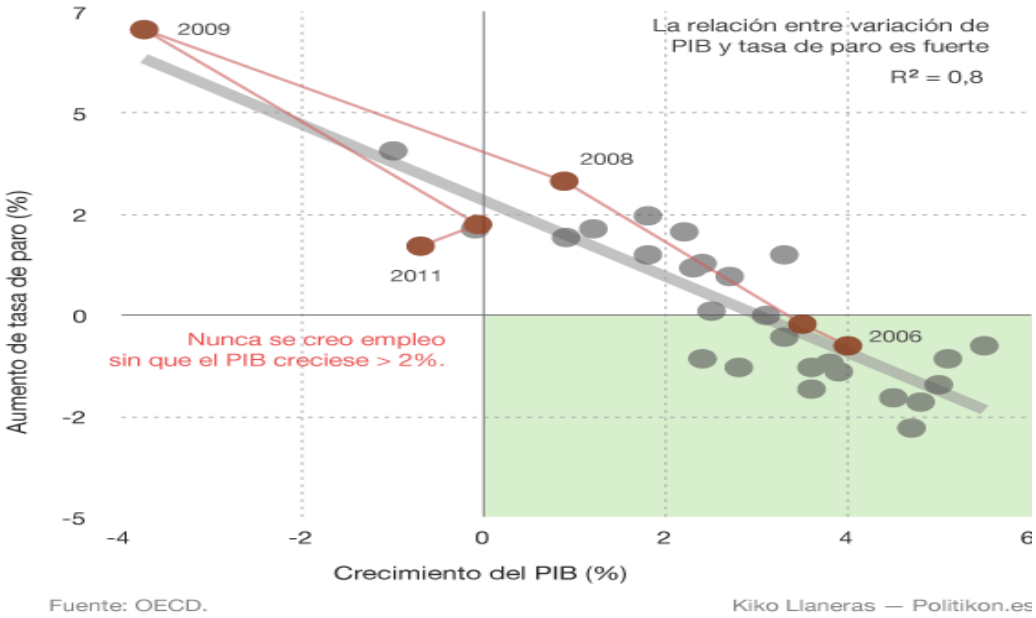
reformed the collective bargaining system facilitating opting-out schemes for firms under sectorial bargaining, and promoted job creation through subsidies for hiring under permanent contracts (see Ministerio de Economía y Competitividad, 2012). These reforms seemingly led to a more flexible EPL. Yet, as a result of less strict EPL in the middle of another recession, the unemployment rate has surged to above 27% by 2013(q1), with more than 6,2 million people on the dole. Unless the Spanish economy recovers soon, the transition process to lower unemployment may be long, perhaps exceeding the thirteen years that it took the Spanish unemployment rate to converge from 24% in 1994 to 8% (the EU average) in 2007.

As mentioned earlier, the aim of all those reforms was to stop unemployment growing and foster net employment creation in the medium/long run. In order to fulfill that goal, a rise in aggregate supply leading to real GDP growth is required, and that is why these reforms are undertaken. As a result, a popular question often posed to economists is: *Which GDP growth would be needed to achieve those goals?*

Often we hear many pundits stating that we would need GDP growth to exceed x% in order to raise employment or reduce unemployment, irrespectively of how wages, TFP or other determinants of labour demand develop. The goal of this paper is to criticize this black-box approach, like, e.g., in a recent report by Fernando Becker (2011) which has received quite a bit of media attention. In this report, the author argues that an annual GDP growth rate of at least 2% is required to stop the rise in unemployment. This result relies simply on plotting changes in the unemployment rate against GDP growth rates over the last three decades (see Figure 1) and then computing the value of the latter for which the former change becomes zero, i.e. where the unemployment rate stabilizes. All other determinants of labour demand, besides output, are simply ignored. In this paper, we show how those estimations ought to be qualified, mainly because one cannot exclusively rely on GDP to explain labour demand. Obviously GDP growth is one of the main determinants of employment/ unemployment but it is far from being the only one (see Layard et al, 2005, and Boeri and Van Ours, 2008).

FIGURE 1

Relationship between the variation of GDP and unemployment in Spain



More concretely, we will focus here on the Spanish labour market in order to empirically study the GDP growth threshold levels which are required to reach positive employment growth as well as a decline in the unemployment rate. In order to do so, rather than taking the black-box approach discussed earlier, we will estimate a well-founded labour demand equation which depends on GDP, real wages, TFP and the rate of temporary work.

The rest of the paper is organized as follows. In Section II the methodological approach is discused while the empirical results are shown in Section III. Different GDP growth threshold are derived in Section IV. Finally, some concluding remarkss appear in Section IV. Two appendices contain the data sources for the different variables used in the estimation (appendix 1) and some results on parameter stabilty tests from recursive estimation.

II. METHODOLOGICAL APPROACH

Given the above-mentioned goals, the departure point of this paper is to use a Constant Elasticity of Substitution (CES) production function with labour and capital as inputs to derive the corresponding labour demand equation. To

estimate it, annual data from 1980 to 2012 is used which has been drawn from several data sources (see Appendix for details).

As is well known, a CES production function with elasticity of substitution $\sigma > 0$ can be written as follows:

$$Y^{\rho} = A[\delta K^{\rho} + (1-\delta)N^{\rho}] \qquad where\ \ \sigma = \frac{1}{1-\rho}\ \ and\ 0 < \rho < 1 \qquad (1)$$

where Y, N and K are output, labour and capital, respectively, and A is Total Factor Productivity (TFP).

From the first-order condition for profit maximization in a competitive setup, we have the following labour demand equation

$$\frac{\partial Y}{\partial N} = \frac{w}{p} \ \rightarrow\ \frac{\partial Y}{\partial Y^{\rho}}\ \frac{\partial Y^{\rho}}{\partial N} = \frac{1}{\rho} Y^{1-\rho} A(1-\alpha)\rho N^{\rho-1} = \frac{w}{p} \qquad (2)$$

where w/p are real labour costs. Then, taking logs and solving for $\ln N$ yields

$$\ln N = \ln Y - \frac{1}{1-\rho}\ ln\frac{w}{p} + \frac{1}{1-\rho}\ln A \qquad (3)$$

Suppose that $\Delta \ln A = c + \varepsilon$ i.e A behaves like a random walk with drift where ε is a zero-mean i.i.d. disturbance term. Then, differentiating (3) yields

$$\Delta \ln N = c + \Delta \ln Y - \sigma \Delta \ln \frac{W}{P} + \frac{1}{1-\rho}\ln \varepsilon \qquad (4)$$

which we estimate by Ordinary Least Squares (OLS) and Instrumental Variables (IV) imposing the constant-return to scale (CRS) restriction on output (once tested), namely using the regression model

$$\Delta \ln NY = c - \sigma \Delta \ln \frac{W}{P} + v \qquad (5)$$

where lnNY = lnN - lnY. Since EPL may imply sluggish adjustment of employment to output and wages, we also consider the following dynamic specification of (1)

$$\Delta \ln NY = c - \sigma \Delta \ln \frac{W}{P} + \gamma \Delta(lnNY_{-1}) + v \qquad (6)$$

Further, since the sluggishness parameter γ is bound to depend on adjustment costs related to firing costs, we also allow for dependence of this parameter on the share of temporary work among employees, TT, since these

contracts entail much lower severance pay than permanent contracts and therefore are much more flexible (see Hammermesh and Pfann, 1996). This leads to the following estimable regression equation

$$\Delta \ln NY = c - \sigma \Delta \ln \frac{W}{P} + \gamma(1 - \eta TT)\Delta(lnNY_{-1}) + v \qquad (7)$$

where $\sigma, \gamma and\ \eta$ are expected to be positive.

At this stage, it should be noted that all the previous specifications are in first differences since TFP is likely to have a unit root. We have tested for the presence of lagged levels of employment, output and real labour costs, as in an error correction model (ECM). However, all these level terms turn out to be highly insignificant reassessing our specification choice.

II.1 Output growth threshold required to create net employment

From equation (7), we can compute two types of output growth. First, a short-run one which determines how GDP should grow to get constant employment levels in the current period given past employment and real labour costs growth rates. We denote it as $\Delta \ln Yn(SR)$. Any GDP growth rate above $\Delta \ln Yn(SR)$, for a given path of real labour cost, past employment, temporary work and TFP, lead to positive net employment growth. To do so we set $\Delta \ln N$=0 in (7), so that

$$\Delta \ln Yn(SR) = -c + \sigma \Delta \ln \frac{W}{P} - \gamma(1 - \eta TT)\Delta(lnNY_{-1}) \qquad (8)$$

where real labour costs growth and the rate of temporary work are evaluated at each period values.

An alternative threshold would be the long-run one, $\Delta \ln Yn(LR)$ computed as

$$\Delta \ln Yn(LR) = -[c + \sigma \Delta \ln \frac{W}{P}]/[1 - \gamma(1 - \eta TT)] \qquad (9)$$

where the dynamics have been considered and real labour costs growth and the rate of temporary work are evaluated at their sample average values.

II.2 Output growth threshold required to reduce unemployment

Notice that the same approach could be used to estimate another equation where the dependent variable, rather than employment growth, is the change in the unemployment rate, Δu , by using the approximation $u = \ln L - \ln N$, where L is the labour force. In effect, subtracting ΔlnL from both sides of (7), yields

$$\Delta \ln u - \Delta \ln LY = -c + \sigma \Delta \ln WOPAVG + \gamma(1 - \eta TT)(\Delta \ln u - \Delta \ln LY)_{-1} + v \qquad (10)$$

where $\Delta \ln LY = \Delta lnL - \Delta lnY$.

Second, like in (7), we can compute the output growth thresholds that stabilizes the unemployment rate in the short and the long run, for given growth rate of the labour force, which are denoted as $\Delta \ln Yu(SR)$ and $\Delta \ln Yu(LR)$ and are defined as follows,

$$\Delta \ln Yu(SR) = \Delta lnL - c + \sigma \Delta \ln WOPAVG + \gamma(1 - \eta TT)(\Delta \ln u - \Delta \ln LY)_{-1} \qquad (11)$$

$$\Delta \ln Yu(LR) = \Delta lnL - [c - \sigma \Delta \ln \frac{W}{P}]/[1 - \gamma(1 - \eta TT)] \qquad (12)$$

such that for any GDP growth rate above these thresholds, unemployment falls.

III. RESULTS

The outcome of regression (4) is shown in Table 1, where we regress the growth rate of salaried employment ("asalariados", DLN) on the growth rates of GDP (DLGDPR) and of real labour costs (DLW), thus leaving unrestricted the coefficient on output growth. Table 2 in turn shows a similar regression where the dependent variable is now overall employment ("ocupados", DLOC) and the wage variable (WOP) has been constructed, following Gollin (2002), by imputing to the self-employed two-thirds of the wages of the employees, that is $w * s + (1 - s)(\frac{2}{3} * W)$ where s is the share of salaried employees in total employment, and latter converted in real wage using the GDP deflator, P.

Both specifications of the labour demand equation similar results. As expected, the coefficient on real labour costs is negative, thus indicating that

an increase in the growth of real wages would lead to a decrease in the growth of the number of salaried workers, with a value of the elasticity of substitution, σ, ranging between 0.25 and 0.4. The coefficient of GDP is not far from 1 and, although it is statistically different from this null, for lack of a good interpretation as regards increasing returns to scale, in the sequel we impose the restriction of CRS. Further, as it can also be observed, there are clear signs of autocorrelation in the residuals (DWs between 0.8 and 1.0) which point out the need to include dynamics, like in (7).

TABLE 1

Dependent Variable: DLN
Method: Least Squares
Date: 04/29/13 Time: 16:36
Sample (adjusted): 1981 2012
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.019189	0.003735	-5.137642	0.0000
DLGDPR	1.452566	0.122096	11.89694	0.0000
DLW	-0.370495	0.103728	-3.571793	0.0013

R-squared	0.883177	Mean dependent var	0.016651
Adjusted R-squared	0.875120	S.D. dependent var	0.038727
S.E. of regression	0.013685	Akaike info criterion	-5.655921
Sum squared resid	0.005431	Schwarz criterion	-5.518509
Log likelihood	93.49474	Hannan-Quinn criter.	-5.610373
F-statistic	109.6192	Durbin-Watson stat	0.979092
Prob(F-statistic)	0.000000		

TABLE 2

Dependent Variable: DLOC
Method: Least Squares
Date: 05/04/13 Time: 18:37
Sample (adjusted): 1981 2012
Included observations: 32 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.020342	0.003082	-6.599789	0.0000
DLGDPR	1.319813	0.099210	13.30327	0.0000
DLWOP	-0.258960	0.087777	-2.950213	0.0062

R-squared	0.893626	Mean dependent var	0.011673
Adjusted R-squared	0.886289	S.D. dependent var	0.033421
S.E. of regression	0.011270	Akaike info criterion	-6.044281
Sum squared resid	0.003683	Schwarz criterion	-5.906869
Log likelihood	99.70850	Hannan-Quinn criter.	-5.998733
F-statistic	121.8110	Durbin-Watson stat	0.779691
Prob(F-statistic)	0.000000		

In fact, we start by estimating a more general specification than (7), allowing for further lags of $\Delta \ln \frac{W}{P}$. From this specification, we found out that both the contemporaneous and the first lag of real wage growth were very significant and had very similar coefficients. Thus, this finding seems to suggest that an average of both growth rates is the correct covariate, which in the sequel is labeled as DLWOPAVG [$=0.5(\Delta \ln \frac{W}{P} + \Delta \ln \frac{W}{P}(-1))$] .

Table 3 shows the estimates of this dynamic specification. The results show once again that the elasticity of employment with respect to real labour costs is negative and statistically very significant.

TABLE 3

Dependent Variable: DLOY
Method: Least Squares
Date: 05/06/13 Time: 20:17
Sample (adjusted): 1982 2012
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.006705	0.001685	-3.978966	0.0005
DLWOPAVG	-0.452313	0.075149	-6.018853	0.0000
DLOY(-1)	0.939447	0.197680	4.752356	0.0001
TT_DLOY1	-1.887646	0.689176	-2.738989	0.0108

R-squared	0.833550	Mean dependent var	-0.012051
Adjusted R-squared	0.815056	S.D. dependent var	0.015630
S.E. of regression	0.006722	Akaike info criterion	-7.047087
Sum squared resid	0.001220	Schwarz criterion	-6.862057
Log likelihood	113.2299	Hannan-Quinn criter.	-6.986772
F-statistic	45.07030	Durbin-Watson stat	2.215448
Prob(F-statistic)	0.000000		

As expected, the interaction term between the lagged dependent variable and TT has a negative sign, indicating that the dynamics of adjusting temporary employment are faster than those of adjusting permanent workers. For example, absent temporary jobs, the coefficient on the lagged dependent variable would be 0.94 whereas, e.g., with a value of TT equal to 0.22 (about the sample average of TT), it would be 0.53 (=0.94-1.88*0.22). The coefficient on real wages in absolute terms (i.e., the elasticity of substitution in the short run) is 0.45, whereas in the long run it would be 0.96 (=0.452/1-0.53), quite close to unity, which is an estimate widely found in the literature (see, e.g., Hamermesh, 1989, 1993).

One shortcoming of the above results is that OLS may not be an appropriate estimation method if the growth rate of real labour costs is an endogenous variable simultaneously determined with employment. In this case, wages may respond contemporaneously to higher employment within a given year. In such a case, the estimated coefficients will be biased. To check how serious is this problem, we estimate the same equation by the Generalized Method of Moments (GMM), using as IVs for real labour cost growth the corresponding growth rate of the stock of physical capital (DLK) and its lagged value. This variable is available from the Instituto Valenciano de Investigaciones Económicas (IVIE)) website. The insight for using these as IVs is that the adjustment costs to installing new equipment are much higher than those associated to changing employment and therefore the fixed-capital growth rate is predetermined with respect to the dependent variable. The corresponding J-over-identification test confirms this choice of IVs with a p-value of 0.34.

TABLE 4

Dependent Variable: DLOY
Method: Generalized Method of Moments
Date: 05/06/13 Time: 20:30
Sample (adjusted): 1982 2012
Included observations: 31 after adjustments
Linear estimation with 1 weight update
Estimation weighting matrix: HAC (Bartlett kernel, Newey-West fixed bandwidth = 4.0000)
Standard errors & covariance computed using estimation weighting matrix
Instrument specification: C DLK DLK(-1) DLOY(-1) TT_DLOY1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.006916	0.000899	-7.691526	0.0000
DLWOPAVG	-0.515193	0.081698	-6.306071	0.0000
DLOY(-1)	0.897944	0.091878	9.773210	0.0000
TT_DLOY1	-1.993400	0.399017	-4.995782	0.0000

R-squared	0.827323	Mean dependent var	-0.012051
Adjusted R-squared	0.808137	S.D. dependent var	0.015630
S.E. of regression	0.006846	Sum squared resid	0.001265
Durbin-Watson stat	2.032102	J-statistic	1.235653
Instrument rank	5	Prob(J-statistic)	0.266311

The results from the GMM estimation are presented in Table 4. They turn out to be very similar to the OLS ones reported in Table 3. The short-run elasticity of substitution is -0.51 (vs. -0.45 by OLS), and the coefficient on the lagged dependent variable (evaluated at TT=0.22) is 0.462 (=0.90-1.99*0.22), against a value of 0.526 by OLS. As for the long-run elasticity of substitution, it yields an estimate of 0.515 (=0.55/1-0.462). This implies a long-run value of this elasticity equal to 0.96, which is again very close to unity. We have also run a Hausman test for the null that the OLS and IV coefficients are the same. To do so, we regress the residuals from (3) on the covariates and the IVs and computed TR**2 of that regression. The corresponding p-value is 0.373, so that the null cannot be rejected. Possibly, the reason why OLS and GMM results do not differ is that wage setting in Spain is backward looking, so that bargained changes in nominal wages react to past inflation (through indexation clauses) and to lagged employment and output growth, rather than to their contemporaneous values or expectations about their future values.

In Appendix 2, we present several graphs gathering evidence about the recursive estimation of specification (7) by OLS, with 1980-1994 as the initial subsample (thus the reported results pertain to 1995-2012). Figure A1 depicts the CUSUM test values which are statistically insignificant at 5% level. Figure A2 presents the recursive residuals with their two-standard deviation confidence intervals. As can be observed there seem to be two potential breaking periods in 2005 and 2012, although the CUSUM test states that the null of stability cannot be rejected. Similar results obtain the recursive

estimated regression coefficients shown in Figure A3, where the upper left and right panels correspond to the constant term and the growth rate of labour costs, respectively, which the lower left and right panels depict the recursive estimated of the coefficients on the lagged dependent variable and its interaction with the share of temporary work. Again there seems to be some jumps in those two years, especially in 2005. Yet the jumps are not large and for this reason we proceed with the analysis under the simplifying assumption of parameter stability. Nonetheless, we intend to look deeper into this issue in our future research agenda.

Tables 5 and 6 present the results for the specification with changes in the unemployment rate as the dependent variable, like in (10). The estimate of the elasticity of substitution is around 0.3 in the short run and about 0.75 in the long run. Yet we can only reject that the latter is significantly different from 1 with a p-value of 0.08. The CUSUM test and the recursive residuals and estimates, reported in Figures A4 to A6 in Appendix 2 point out to a similar evidence as that previously discussed for the employment growth equation, though the potential breaking date seems to be in 2005.

TABLE 5

Dependent Variable: DLULY
Method: Least Squares
Date: 05/07/13 Time: 13:41
Sample (adjusted): 1982 2012
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005558	0.001584	3.509480	0.0016
DLWOPAVG	0.305934	0.064016	4.778993	0.0001
DLULY1	0.974659	0.202247	4.819147	0.0000
TT_DLULY1	-1.758861	0.694377	-2.533007	0.0174

R-squared	0.799483	Mean dependent var	0.011186
Adjusted R-squared	0.777203	S.D. dependent var	0.012497
S.E. of regression	0.005899	Akaike info criterion	-7.308311
Sum squared resid	0.000939	Schwarz criterion	-7.123280
Log likelihood	117.2788	Hannan-Quinn criter.	-7.247996
F-statistic	35.88399	Durbin-Watson stat	2.377212
Prob(F-statistic)	0.000000		

TABLE 6

Dependent Variable: DLULY
Method: Two-Stage Least Squares
Date: 05/07/13 Time: 13:44
Sample (adjusted): 1982 2012
Included observations: 31 after adjustments
Instrument specification: C DLK DLK(-1) DLULY1 TT_DLULY1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.004974	0.001824	2.726297	0.0111
DLWOPAVG	0.250596	0.104548	2.396954	0.0237
DLULY1	0.982985	0.205397	4.785772	0.0001
TT_DLULY1	-1.592058	0.746021	-2.134067	0.0421

R-squared	0.793934	Mean dependent var	0.011186
Adjusted R-squared	0.771037	S.D. dependent var	0.012497
S.E. of regression	0.005980	Sum squared resid	0.000965
F-statistic	29.42483	Durbin-Watson stat	2.448780
Prob(F-statistic)	0.000000	Second-Stage SSR	0.001529
J-statistic	0.060074	Instrument rank	5
Prob(J-statistic)	0.806380		

IV. OUTPUT GROWTH THRESHOLDS

IV.1 Output growth required to create net employment

The outcome of regression (8) is shown in Figure 2 where, after solving for $\Delta \ln Yn(SR)$, yields the GDP growth threshold required to stabilize employment. Our main finding is that this estimate oscillates between -0.7% and 3%, depending on the evolution of the growth rate of real labour costs, past employment grwth and the share of temporary work. Overall, from 1980 to the late 1990s, the threshold seems to be pro-cyclical. Yet, it becomes countercyclical in the last expansion (2000-07) and the onset of the Great Recession (2007-09) where real wages decelerated a lot (due to the large immigration inflows) and accelerated (due to the adjustment to a negative shock via employment shedding rather than via wage deflation), respectively. This diagnosis seems to be confirmed by the analysis of the two components determining $\Delta \ln Yn(SR)$, which are depicted in Figure 3. The first component, labeled as "Real labour cost", captures the term $\sigma \Delta \ln \frac{W}{P}$ (blue line), while the second component, denoted as "Dynamic adjustment", captures the term $-\gamma(1-\eta TT)\Delta(lnNY_{-1})$ (red line). These two components together with the (constant) estimated TFP growth are the counterparts of the GDP growth threshold displayed in Figure 2 which, for convenience, is also included in Figure 3 (green line). As can be observed, the output growth threshold is highly correlated with the first component whereas the contribution of the second components is much less volatile. Thus, in those periods where real wages fell drastically, the threshold even becomes negative given the inertia exhibited by lagged productivity.

FIGURE 2

Short-run GDP growth thresholds to increase employment

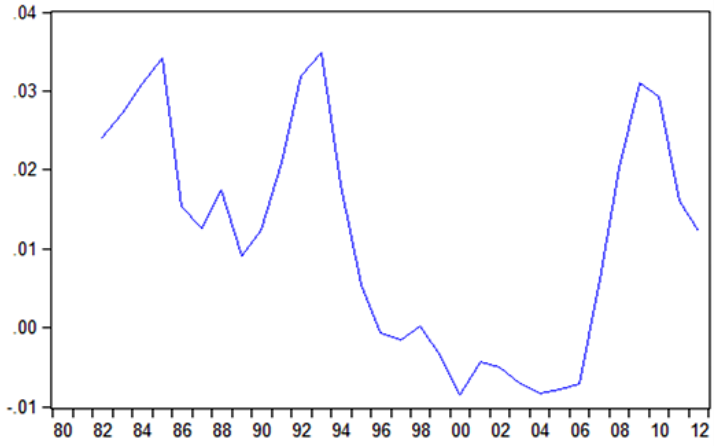
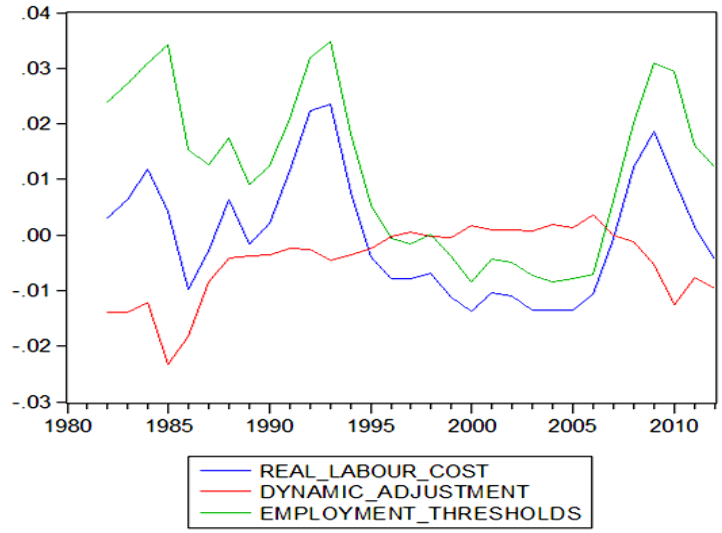


FIGURE 3

Components of the short-run GDP growth threshold to increase employment



Solving for $\Delta \ln Yn(LR)$ yields output thresholds which are fairly different from those found in the short run. For example, as shown in the second column of Table 1, using the average sample values for the growth rate of real labour costs (-0.03%) and share of temporary work (22%) yields that the required output growth rate to stabilize net employment growth is 1.35%, which is one-third lower than that reported in Becker (2012). Further, choosing the lowest value for growth rate of real labour costs (-3.1%) and holding the share of temporary work at its average value, yields an estimate of -1.51 %, which is negative since the fall in real labour costs offsets the decline in output. Conversely, applying the highest growth rate of labour costs (a stunning 6%), output would have to grow above 6.6% in order to create employment. Alternatively, holding the growth rate of labour costs at its sample average and increasing the share of temporary work from its minimum to its maximum values implies that the required output growth declines from 2.7% to just 1% since the adjustment in the latter type of contracts case is much faster. Finally, if we were to extrapolate the 2012 values of both variables (-2% and 24%) to the future, the GDP growth required to create net employment would simply be as small as -0.48% since the patterns both variables are favorable to employment even with declining GDP. In this respect, an alternative perhaps more plausible scenario for the future would be that real wages stay constant while TT reaches 25%. In this

case, the threshold would be 1.24%. Hence, overall it seems that, insofar the Spanish economy initiates a smooth recovery with constant real labour costs, GDP growth around 1.2-1.4% will spur positive net employment creation.

IV.2 Output growth required to reduce unemployment

Figure 4 presents the short-run GDP growth thresholds required to reduce unemployment, while the third column in Table 1 presents the corresponding long-run thresholds. As can be seen, the former present a somewhat similar range of values to those in Figure 2 though, like with the latter, they tend to be lower than the growth rates required to create net employment. According to Figure 4, if GDP grows barely above zero, unemployment is likely to fall in the near future. As before, Figure 5 depicts the contribution to this threshold of the different components in the RHS of (11). The first two components are the same ones as before whereas the third component, "Labour force" (blue line) displays the growth rates of this variable. As can be seen, the output growth threshold required to cut unemployment is highly (positively) correlated with the "Real labour cost" and "Labour force" components, so that when both decelerate the threshold can even become negative

FIGURE 4

Short-run GDP growth thresholds to reduce unemployment

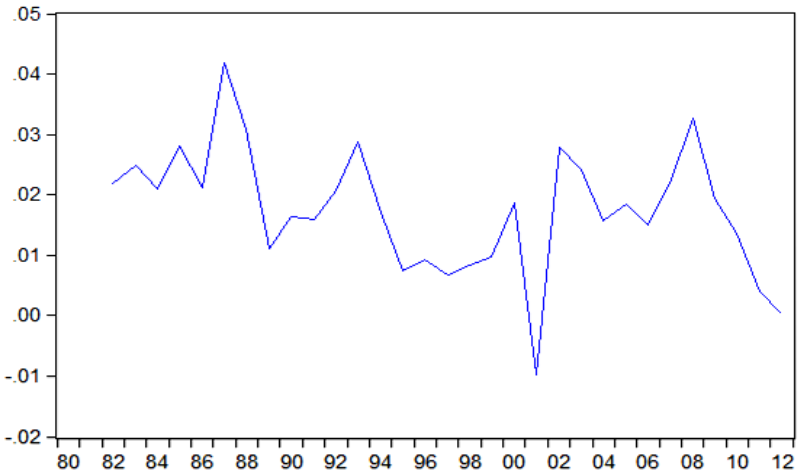
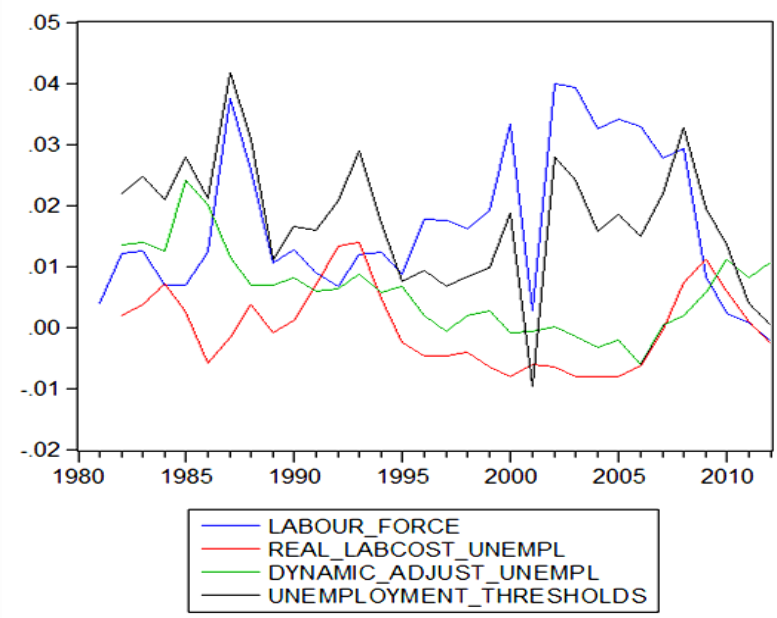


FIGURE 5

Components of the short-run GDP growth threshold to reduce unemployment



Similarly, solving for $\Delta \ln Yu(LR)$ in the long run, and taking into account the average share of temporary employment and real labour costs in our sample yields a GDP growth threshold of 0.26% to stabilize net unemployment growth, showing that it is easier to hold down unemployment (in contrast with 1.35% found for net employment growth). The intuition for this result is that our estimate of average TFP growth, c, in Tables 3 and 4, is negative, in line with the available empirical evidence about this issue (see Escriba and Murgui, 2009). Thus, ceteris paribus, while it increases the output growth threshold to create net employment, it decreases the threshold required to reduce unemployment. As for the future, choosing the 2012 values of the labour costs growth rate, TT and the labour force growth (-0.2%), yields a threshold of -2.42% while for the above-mentioned more realistic alternative scenario (with DlnL=1%), the corresponding threshold would be -0.32%.

TABLE 1

Long-run GDP growth thresholds to create net employment and to reduce unemployment

	$\Delta \ln Yn(LR)$ %	$\Delta \ln Yu(LR)$ %
DLWOP,TT avg.	1.355	0.263
DLWOP min, TT avg.	-1.507	-2.067
DLWOP max, TT avg.	6.577	4.790
TT min, DLWOP avg.	2.725	1.548
TT max, DLWOP avg.	1.015	0.584
TT and DLWOP 2012	-0.480	-1.432

V. CONCLUSIONS

One relevant question often raised in the media is by how much would have GDP in Spain have to grow to create net employment and to reduce unemployment. Historically, based on past evidence, some pundits have identified this output growth threshold to be 2%. In this paper, we claim that labour market reforms leading to changes in the growth rate of labour costs and in the dynamics of employment adjustment may imply that this estimate is too large. Relying on the estimation of a well-founded labour demand equation, we find that these thresholds could be in the range of 0.3% -1.3%, which is quite lower than the above-mentioned popular estimate. Further, if the current developments of real labour cost, the share of temporary work and labour force growth remain similar in the future, even a small negative GDP growth may suffice to achieve both targets.

Our future research agenda aims at estimating wage setting and labour force participation equations so that the partial equilibrium approach adopted here can be extended to a general equilibrium one. Further, issues related to potential parameter instabilities will be considered.

APPENDIX 1: DEFINITION AND DATA SOURCES OF VARIABLES

Real GDP: own computation interpolating data from INE (Instituto Nacional de Estadística) annual data.

DLGDPR: growth rate of Real GDP

OC: Total employment (ocupados: employees and self-employed), EPA- INE

DLOC: growth rate of total employment

AS: Employees (asalariados), EPA-INE

DLAS: growth rate of salaried employment

WOP: real labour costs (labour costs from Global Insight (INE) over GDP deflator (INE)), computed as $w * s + (1 - s)(\frac{2}{3} * W)$ assuming that labour costs for the self- employed are $2/3$ of labour costs for employees (see Gollin, 2002).

TT: share of temporary employment, EPA-INE

u: unemployment rate EPA- INE

DLU: growth rate of unemployment

L: labour force, EPA-INE

K: productive capital stock, IVIE (Instituto Valenciano de Investigaciones Económicas)

DLK: growth of capital stock

APPENDIX 2: OLS RECURSIVE ESTIMATION RESULTS

Figure A1 CUSUM test (employment eqn.)

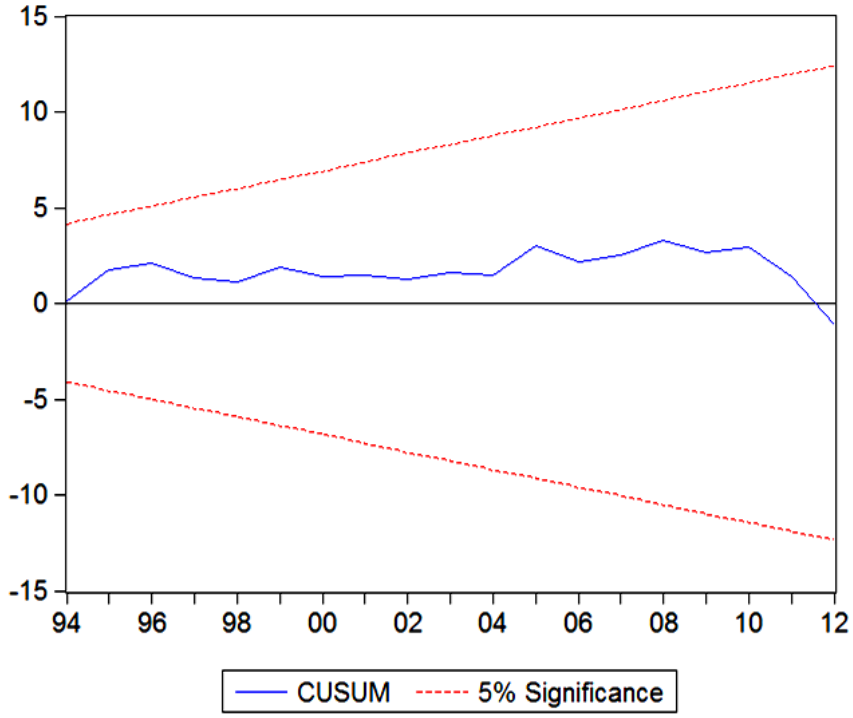


Figure A2: Recursive residuals (employment eqn.)

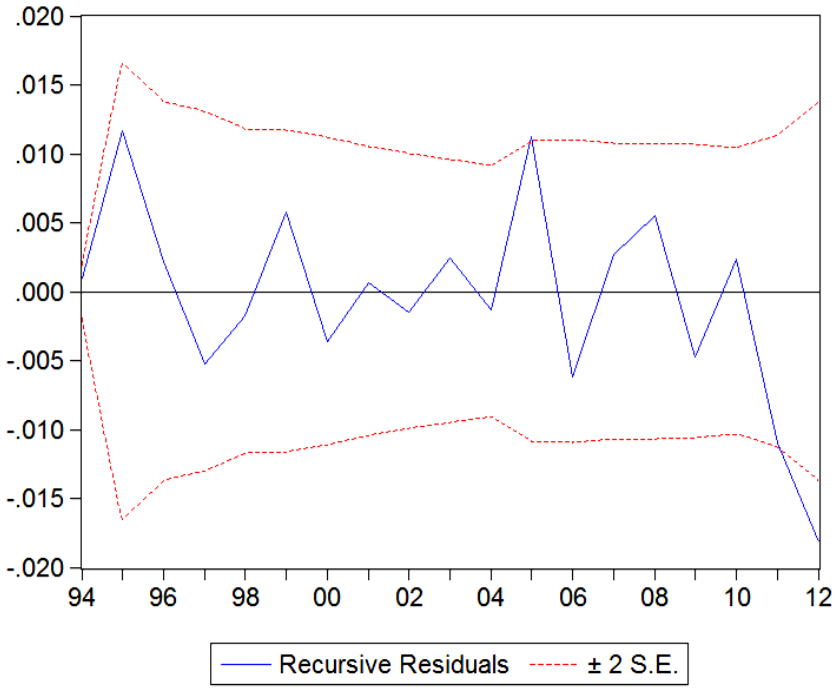


Figure A3: Recursive estimates of the coefficients (employment eqn.)

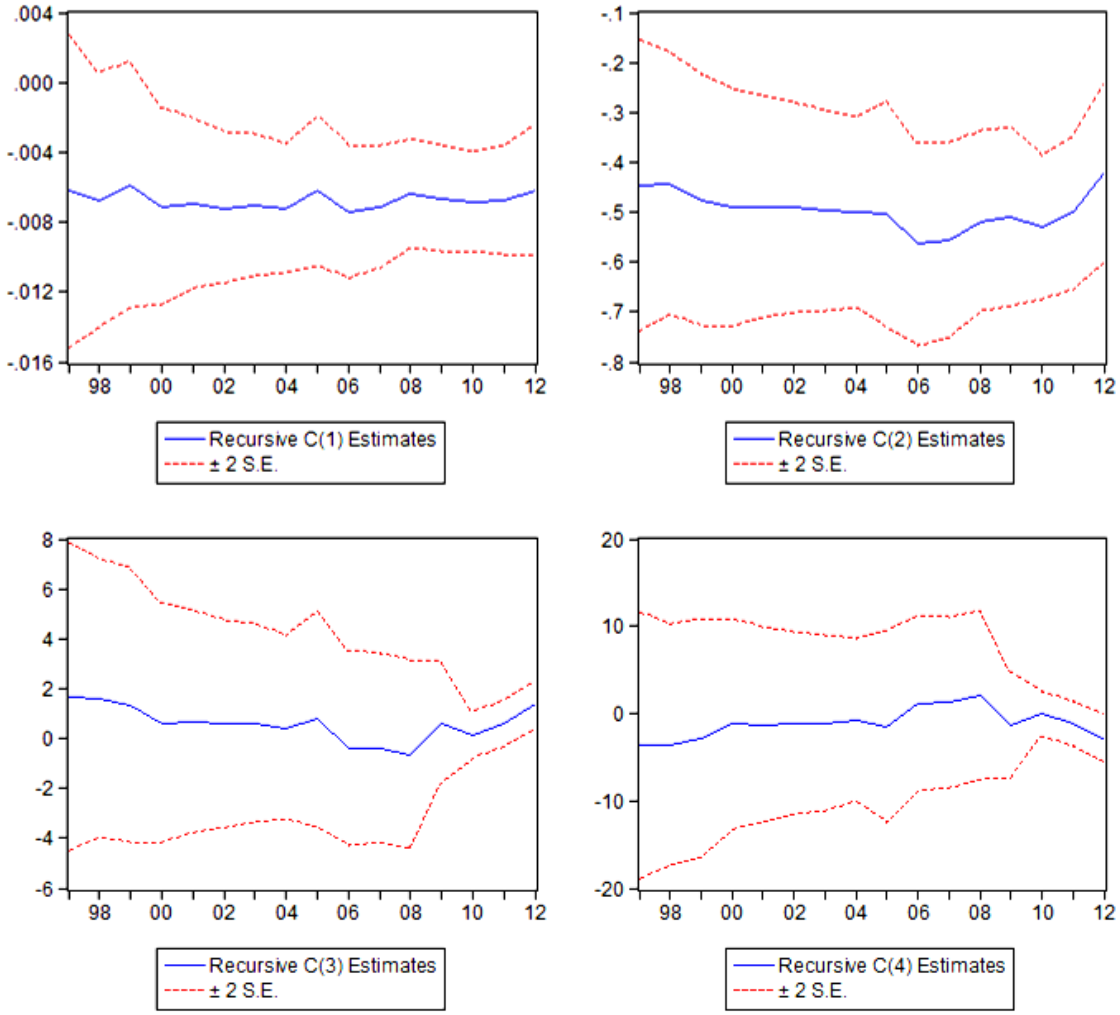


Figure A4 CUSUM test (unemployment eqn.)

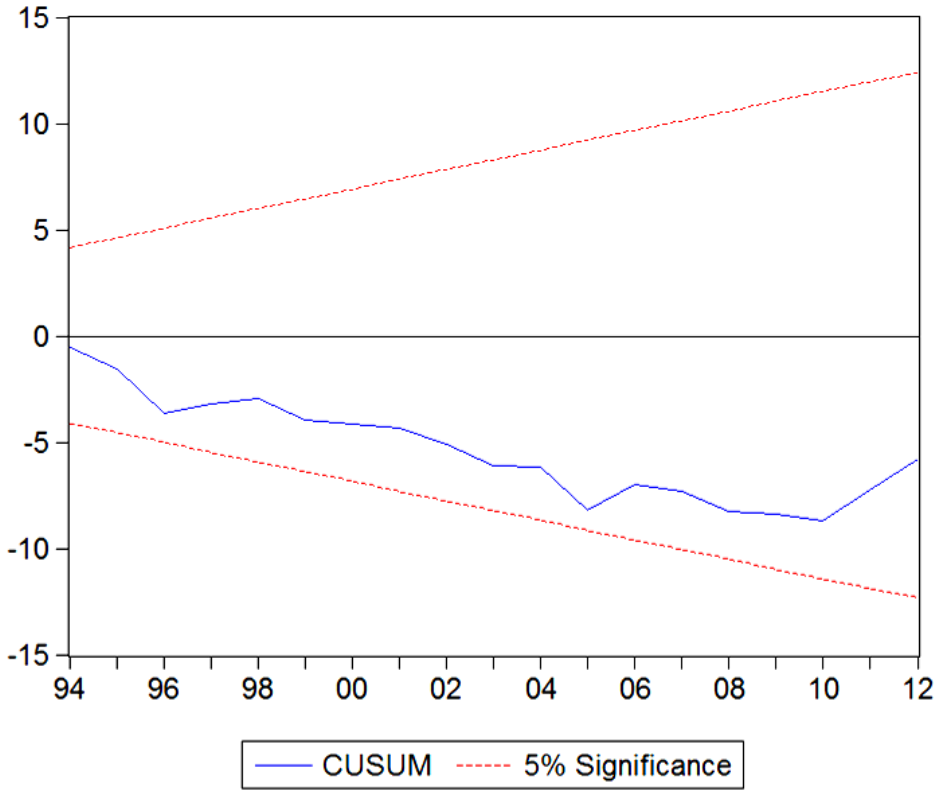


Figure A5: Recursive residuals (unemployment eqn.)

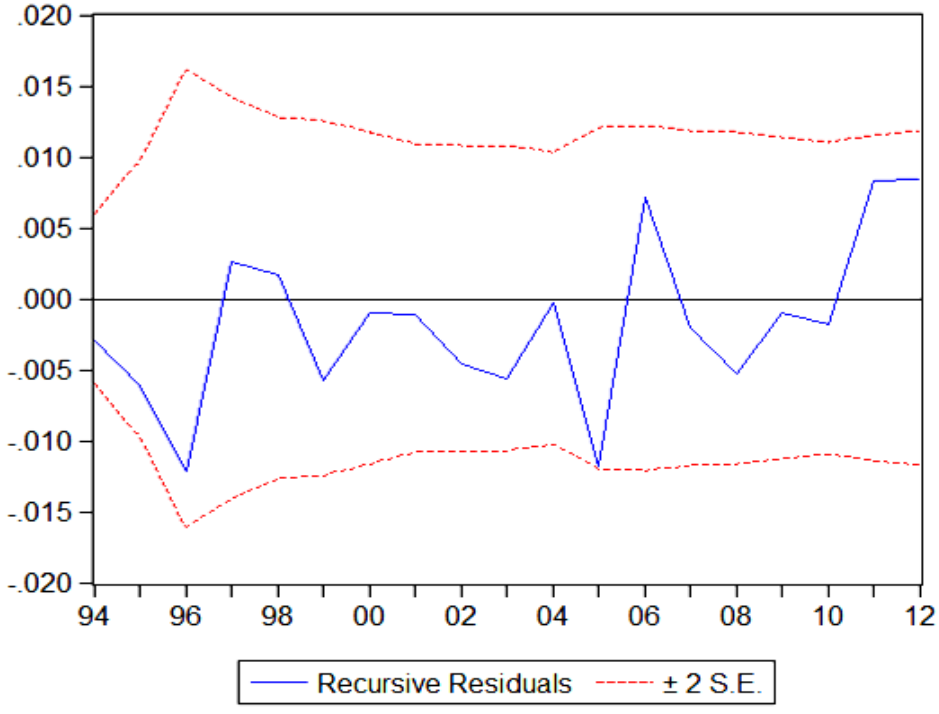
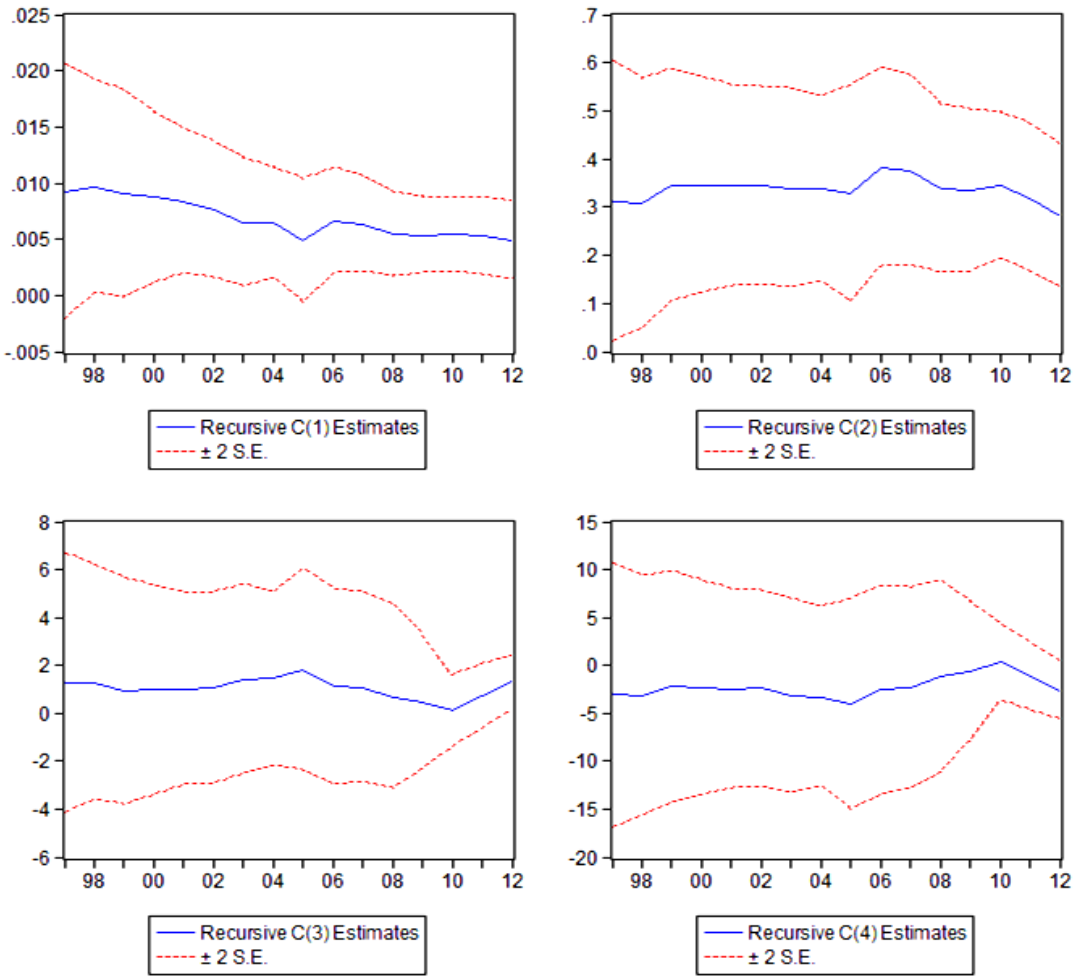


Figure A6: Recursive estimates of the coefficients (unemployment eqn.)



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