The 'recession-push' hypothesis reconsidered

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Abstract The relationship between unemployment and self-employment has been studied extensively. Due to its complex, multifaceted nature, various scholars have found a large array of different results, so that the exact nature of the relation is still not clear. An important element of the relation is captured by the recession-push hypothesis which states that in times of high unemployment individuals are pushed into self-employment for lack of alternative sources of income such as paid employment. We make two contributions to this literature. First, we argue that official unemployment rates may not capture the 'true' rate of unemployment as it does not include 'hidden' unemployed who are out of the labour force. Therefore, we propose a new method where the 'recession-push' effect relates not only to the (official) unemployed but also to the inactive population. Second, we argue that the magnitude of the recession-push effect is non-linear in the business cycle, i.e. the effect is disproportionally stronger when economic circumstances are worse. We provide empirical support for our hypotheses by estimating an econometric model on Spanish data.

Keywords Cointegration · Non-linear · Entrepreneurship · Self-employment · Unemployment

JEL Classification C32 · J24 · M13

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Introduction

The relation between macroeconomic variables (such as unemployment or economic growth rates) and self-employment has been a traditional source of controversy among economists, caused by an ambiguous prediction provided by the theory (Thurik et al. 2008). On the one hand, the 'recession-push' theory supports the idea that unemployment reduces the opportunities of gaining paid-employment and the expected gains from job search, which "pushes" people into self-employment.[1] Therefore, this theory suggests the existence of a positive relationship between self-employment and unemployment, that is, an opposite relation between the business cycle and the self-employment rate. On the other hand, the 'prosperity-pull' hypothesis represents an opposite interpretation of this relationship: at times of high unemployment firms face a lower market demand. This reduces self-employment incomes and possibly also the availability of capital, while the risk of bankruptcy increases. Thus, individuals are "pulled" out of self-employment. At the same time, self-employment may become riskier because if the venture fails, it is less likely that the self-employed worker can find a job in paid-employment. As a result, a negative relationship between self-employment and unemployment is suggested.

Empirical evidence should be a natural way to solve a controversy of these characteristics. However, evidence has not provided unambiguous results. In this sense, most microeconometric studies[2] appear to support a "prosperity-pull" hypothesis, whereas macroeconometric analyses[3] usually generate ambiguous results or weak evidence in favour of the "recession-push" hypothesis.[4] In this paper we will argue that the mixed set of results in earlier studies is in part due to problems of accurately measuring unemployment. Therefore we develop a new method which uses employment rates instead of unemployment rates to test the "recession push" hypothesis. We apply our new method using a data base for Spain over the period 1976–2004.

There are at least five disadvantages of testing the recession-push hypothesis using unemployment rates. First, it is difficult to distinguish between who is really

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[1] Binks and Jennings (1986) propose a secondary and complementary effect. As firms close down in recessions the availability and affordability of second-hand capital equipment increases, reducing barriers to entry.

[2] See Hamilton (1989), Blanchflower and Oswald (1998), Taylor (1996), and Clark and Drinkwater (1998, 2000) for the UK; Van Praag and Van Ophem (1995), and Bruce (2000) for the US; Lindh and Ohlsson (1996) for Sweden; Carrasco (1999) for Spain; and Reynolds et al. (1994) for an international picture.

[3] Harrison and Hart (1983), Binks and Jennings (1986) and Hamilton (1989) are UK examples. US examples include Ray (1975), Highfield and Smiley (1987), Steinmetz and Wright (1989), Hudson (1989) and Audretsch and Acs (1994). Other examples include Blanchflower (2000), Bögenhold and Staber (1991), Meager (1994), Storey (1991, 1994), Robson (1991, 1996, 1998a, b), Black et al. (1996), Parker (1996), Cowling and Mitchell (1997), Storey and Jones (1987), Acs et al. (1994), Foti and Vivarelli (1994), Lin et al. (2000), Cullen and Gordon (2002), Parker and Robson (2004), Georgellis and Wall (2005), Torrini (2005), and Golpe and Van Stel (2008).

[4] In this sense a correct interpretation of the scope of microeconometric results should play a key role for conciliating the apparently contradictory microeconometric and macroeconometric evidence. For instance, the usual finding of a significant business cycle effect on the probability to become entrepreneur should be well-interpreted. The usual microeconometric estimates are done on the basis of a conditioned probability. Hence, the scope of a significant business cycle effect should be limited only to individuals who have a certain range of characteristics. An incorrect extrapolation of this type of results is a frequent source of misinterpretations.

unemployed and who is out of the labour force. This separation should ideally be made according to who wants a job and who does not. However, official statistics have great difficulty accurately measuring this separation as only individuals fulfilling some criteria of actively searching for a job are entered as unemployed.[5] Hence, many 'hidden' unemployed are not included in the official unemployment statistics, causing a bias of which the magnitude cannot be traced (Congregado 2008).

A second and related drawback of previous studies is the explicit or implicit assumption of a one-to-one relationship between unemployment and self-employment. This is a questionable assumption as participation rates vary in a way that need not be stationary. The extent of underestimating the number of unemployed may be higher in recession periods, i.e. in times where unemployment rates are already high. In other words, in recession periods relatively many unemployed may 'escape' to the status of inactivity by leaving the labor force. This makes it even harder to make a correct assessment of the relation between unemployment and self-employment.

Third, apart from the difficulties of measuring the 'hidden' unemployed, one might argue that also theoretically it may be more accurate to use employment rates instead of unemployment rates. When, in the occupational choice process, an individual considers becoming self-employed, the expected wage income associated to paid employment will be the main opportunity cost of the self-employment option. Hence, in order to evaluate the value of this expected wage income, the employment rate is a much more direct measure than the unemployment rate. In particular, when employment is low, it is likely that the demand for labour is low, and hence wages, or the opportunity costs of self-employment, are low. Of course high unemployment rates are often associated with low employment rates but using unemployment is a more indirect way of evaluating the opportunity cost of self-employment. Again, as argued above, using unemployment is particularly troublesome when there are strong movements between the unemployment and inactivity statuses.

Fourth, empirical estimates of the self-employment/unemployment relationship invariably confound the above two effects, capturing a "net" effect of the recession-push and the prosperity-pull effects. In addition, reversed causality is also at play in the sense that a higher number of self-employed individuals may bring down unemployment by means of entrepreneurial activities (Thurik et al. 2008, Audretsch et al. 2002).

Fifth and finally, results in some previous studies are conditioned by the investigation of linear relationships, not controlling for non-linearity. If it is the case that in different phases of the business cycle different types of effects prevail, results from linear models could be hiding either of the two effects.

Given that the available empirical evidence proved unable to solve this controversy, we should explore new empirical approaches or take into account some

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[5] In the Spanish case, this problem is particularly serious. On the one hand, it is difficult to understand, for international observers, how Spanish society can assimilate such high unemployment rates without considering the role of the hidden economy in Spain (see Schneider 2005, for an international comparison). In this sense, the high and persistent unemployment rate has been confirmed, in several studies, as a key cause of the size of the shadow economy in Spain (see, Ahn and de la Rica 1997; Alañón and Gómez-Antonio 2005; or Dell'Anno et al. 2007). On the other hand, in 2002, the operational definition of unemployment was changed in Spain, in order to advance towards the European harmonization (COM 1987/2000). As a result, the unemployment series had to be reconstructed according to the new active job search definition.

additional explanatory mechanisms in order to understand and interpret the why and wherefore of the lack of uniformity shown by the empirical evidence. In this sense we explore the recession-push hypothesis from a different perspective: omitting deliberately the use of unemployment rates to avoid the related measurement problems, but, alternatively, analyzing the relationship between paid-employment and self-employment while allowing the employment rate to have an impact as well. As the complement of employment in the adult population is the sum of the (official) unemployed and the inactive population, we basically investigate the interactions between paid-employment, self-employment, and unemployment in a broader sense (including the 'hidden' unemployed). To do this we will employ a vector error correction model (VECM).

In addition, we will investigate both linear and non-linear (cointegration) relationships. In particular, we allow the strength of the 'recession-push' effect to vary according to the employment rate. It is conceivable that the pressure to start their own business is stronger for individuals in a situation of low employment compared to a situation of high employment, as it is harder for individuals to find paid-employment in times of recession. The basic idea behind our approach is the following. The traditional approach for testing the existence of a recession-push (refugee) effects consists of analyzing the relationship between unemployment and self-employment rates, using linear cointegration techniques. Contrary to earlier studies we will test whether or not the relationship is time-dependent (in particular dependent on the business cycle). If the statistical test indicates that the relation is not time-dependent, linear cointegration techniques are sufficient. Otherwise, non-linear techniques should be used.

To carry out this task, we extend earlier analyses in two ways: i) analyzing the relationship between self-employment and paid-employment rates in a VECM linear model, where the error correction term can be interpreted as the employment rate, and given the relationship between the employment and unemployment rates, interpreting the self-employment adjustment process when a shock occurs; ii) testing the possible existence of a nonlinear relationship, as a way to verify if the long-term relationship is time-varying.

In sum, this paper aims at investigating the interactions between paid-employment, self-employment and unemployment (in broad sense) in the framework of a VECM model, using Spanish quarterly data during the period 1976:3–2004:4. Our approach allows us to solve methodological and measurement problems associated with the use of unemployment rates for testing the recession-push hypothesis. In addition, in an attempt to explore the robustness of the results obtained by means of the traditional approach, i.e. analysis of a linear VECM, we will test if the relationships under investigation are time-dependent, by means of a threshold cointegration model.

The paper is organized as follows: The empirical methodology is outlined in the "Econometric methodology" section, the empirical tests are performed in the "Modelling non-linearity" section, while the main conclusions are summarized in the "Conclusions" section.

Econometric methodology

As mentioned above, before employing non-linear econometric methodology we estimate a linear VECM using the maximum likelihood technique. The data used in

the empirical analysis are quarterly observations drawn from the Labour Force Survey (LFS) produced by the Spanish National Institute of Statistics (INE). The sample period ranges from 1976:3 to 2004:4, where self-employment is defined, adopting the ICSE-1993 criteria,[6] as the sum of employers, own-account workers and members of producer's cooperatives.

The benchmark linear model is a finite-order vector autoregression model (VAR) of the following form:

$$x_t = c + \sum_{i=1}^{k} A_i x_{t-i} + \varepsilon_t \qquad (1)$$

In the above model, $x_t = [w_t, s_t]'$ is a vector of non-stationary variables containing the paid-employment rate (w_t) and the self-employment rate (s_t), A_i is a 2×2 matrix of parameters, and ε_t is a 2×1 vector of residuals.[7] Cointegration requires that all the variables have the same order of integration. Before estimating a linear cointegration model we have tested for the order of integration of the paid-employment and the self-employment series. To this end, we have used the modified version of the Dickey-Fuller and Phillips-Perron tests proposed by Ng and Perron (2001). According to these results, s_t and w_t are I(1). We refer to Appendix A, Table 4, for more details.

In order to characterize the long run dynamic adjustments, we can rewrite the equilibrium VAR model as a vector error correction model (VECM). The VAR(k) model can be rewritten in its VECM representation by substracting x_{t-1} from the left and right hand sides:

$$
\begin{aligned}
\Delta x_t &= c + (A_1 - I)x_{t-1} + ... + A_k x_{t-k} + \varepsilon_t = \\
&= c + (A_1 - I)x_{t-1} - (A_1 - I)x_{t-2} + (A_1 - I)x_{t-2} + A_2 x_{t-2} + ... + A_k x_{t-k} + \varepsilon_t = \\
&= c + \underbrace{(A_1 - I)x_{t-1} - (A_1 - I)x_{t-2}}_{(A_1 - I)\Delta x_{t-1}} + (A_1 - I)x_{t-2} + A_2 x_{t-2} + ... + A_k x_{t-k} + \varepsilon_t = \\
&= c + (A_1 - I)\Delta x_{t-1} + (A_1 + A_2 - I)\Delta x_{t-2} + ... + A_k x_{t-k} + \varepsilon_t
\end{aligned}
$$

Hence,

$$\Delta x_t = c + \sum_{i=1}^{k-1} \Gamma_i \Delta x_{t-i} + \Pi x_{t-k} + \varepsilon_t \qquad (2)$$

where $\Gamma_i = -\left(I - \sum_{i=1}^{k-1} A_i\right)$ and $\Pi = -\left(I - \sum_{i=1}^{k} A_i\right)$.

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[6] The International Classification by Status in Employment (ICSE-93) consists of the following groups: employees; employers; own-account workers; members of producers' cooperatives; contributing family workers; and workers not classifiable by status.

[7] Let us define the employment rate (e_t) as the employment to population (aged 16+) ratio, the paid-employment rate (w_t) as the paid-employment to population (aged 16+) ratio, the self-employment rate (s_t) as the self-employment to population (aged 16+) ratio, the unemployment rate (u_t) as the unemployment to population (aged 16+) ratio, while the labour participation rate (p_t) consists of the economically active population (aged 16+) as a percentage of the total population of that same age group. The relation between the rates defined above is given by the two following identities: $w_t + s_t = e_t$ and $u_t + e_t = p_t$.

Another decomposition of (1) is given by:

$$\Delta x_t = c + \sum_{i=1}^{k-1} \Gamma_i^* \Delta x_{t-i} + \Pi x_{t-1} + \varepsilon_t \qquad (2')$$

where $\Gamma_i^* = -\left(\sum_{i=1}^{k-1} A_{i+1}\right)$ and $\Pi = -\left(I - \sum_{i=1}^{k} A_i\right)$.

The matrix Π is usually decomposed as:

$$\Pi = \alpha\beta' \qquad (3)$$

where α and β are *nxr* matrices containing the adjustment coefficients and the cointegrating vector, respectively, n is the number of variables, and r is the number of cointegrating relationships (one, in our case). The symbol Δ in Eq. 2 is the first difference operator. In this form all terms in Eq. 2 are stationary, that is, integrated of order zero, denoted *I(0)*.

The lagged residuals from the cointegrating vector $\beta'x_{t-1}$, act as an error correction term. This term captures the extent of disequilibrium for the system of variables with respect to the long-run relation between all variables in the system. The α parameters on the error correction terms in each individual equation indicate the speed of adjustment of this variable back to its long-run value. A significant error correction term (i.e. a significant α parameter) implies long-run causality from the explanatory variables to the dependent variable under consideration.

In our application the system can be written as:

$$\begin{bmatrix} \Delta w_t \\ \Delta s_t \end{bmatrix} = \Gamma(L)\begin{bmatrix} \Delta w_{t-i} \\ \Delta s_{t-i} \end{bmatrix} + \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix}(w_{t-1} - \beta s_{t-1}) + \begin{bmatrix} \varepsilon_t^w \\ \varepsilon_t^s \end{bmatrix} \qquad (4)$$

where α_1 and α_2 indicate the speed of adjustment of each variable back to its long-run value.

We estimated this model using the maximum likelihood procedure developed by Johansen (1988, 1991). Based on statistical tests, we include two lags for the right hand side variables of our model (see Table 5 in Appendix A for details). Importantly, we tested that β does not significantly differ from −1 (see Appendix C), hence when estimating the VECM, we fix the value of β to −1. This implies the error-correction term equals $w_{t-1}+s_{t-1}$, i.e. the error correction term is equal to the employment rate (see also Appendix B). This is convenient for interpretation. We also tested for cointegration, by applying the Johansen reduced rank regression approach. The result of this test is that the null hypothesis of no cointegration ($r=0$) is rejected at the 5% level. Further tests revealed that the number of cointegrating relations is equal to one ($r=1$). Again, more details can be found in Appendix A (Table 6).

The estimation results of the linear VECM are reported in Table 1. Both in the wage-employment equation and in the self-employment equation the error-correction terms are not significant. As the α's are not statistically different from zero, both rates are said to be long-run weakly exogenous with respect to the long-run equilibrium.

However, the non-significance of the α parameters could be due to the presence of nonlinearity in the relation –i.e. the relation could be time-dependent. In particular

Table 1 Linear VECM estimates—paid-employment and self-employment

	Δw_t	Δs_t
c	0.0021	0.0006
	(0.0030)	(0.0017)
Δw_{t-1}	0.6178**	−0.0272
	(0.0916)	(0.0436)
Δw_{t-2}	−0.0026	0.0612
	(0.0680)	(0.0423)
Δs_{t-1}	0.6820**	0.1154
	(0.1568)	(0.0771)
Δs_{t-2}	−0.3146	−0.0490
	(0.1809)	(0.0762)
α	−0.0038	−0.0026
	(0.0073)	(0.0035)

Standard errors are between parentheses

*Significant at the 5-percent level

**Significant at the 1-percent level

the relation could vary according to different stages of the business cycle. In the next section we will account for nonlinearity by applying a two-regime threshold cointegration model, proposed by Hansen and Seo (2002).

Modelling non-linearity

We account for non-linearity by applying a threshold cointegration method. The concept of threshold cointegration characterizes a discrete adjustment, in a way in which the system will reach the long-run equilibrium only when it exceeds or does not reach a critical threshold.

Hansen and Seo (2002) provide a vector error-correction model (VECM) in which a cointegration relationship exists between two variables and a threshold effect as an error correction term. As an extension of model (4), a two-regime threshold cointegration model takes the form

$$\begin{bmatrix} \Delta s_t \\ \Delta w_t \end{bmatrix} = \Gamma(L) \begin{bmatrix} \Delta s_{t-1} \\ \Delta w_{t-1} \end{bmatrix} + \begin{bmatrix} \alpha_{11} \\ \alpha_{21} \end{bmatrix}(w_{t-1} - \beta s_{t-1}) + \begin{bmatrix} \varepsilon_t^s \\ \varepsilon_t^w \end{bmatrix} \; with \; (w_{t-1} - \beta s_{t-1}) \leq \gamma$$

$$\begin{bmatrix} \Delta s_t \\ \Delta w_t \end{bmatrix} = \Gamma'(L) \begin{bmatrix} \Delta s_{t-1} \\ \Delta w_{t-1} \end{bmatrix} + \begin{bmatrix} \alpha'_{11} \\ \alpha'_{21} \end{bmatrix}(w_{t-1} - \beta s_{t-1}) + \begin{bmatrix} v_t^s \\ v_t^w \end{bmatrix} \; with \; (w_{t-1} - \beta s_{t-1}) > \gamma$$

(5)

Hansen and Seo (2002) proposed a heteroskedastic-consistent LM test where the null hypothesis of linear cointegration (i.e., there is no threshold effect) is tested against the alternative of threshold cointegration. The test assumes a fixed value of β (−1, in our case). Application of the test for our model reveals that the null hypothesis of linear cointegration is indeed rejected in favour of threshold cointegration. We refer to Appendix A for details (see Table 7).

The estimated threshold is $\hat{\gamma} = 38.82$, with the error correction term defined as $w_t + s_t = e_t$ (i.e., the employment rate). Hence, the first regime would occur when

the employment rate is below 38.82%. This is the relatively unusual regime, including 13% of the observations (namely, 1984:4 to 1986:3; 1987:1; and 1993:4 to 1994:4). By contrast, the usual regime (with 87% of the observations) would occur when the employment rate is above 38.82%.

The estimated two-regime threshold VECM is reported in Tables 2 and 3, where significant error-correction effects appear in the first regime (the estimated α parameters are significant) but not in the second regime.

For the self-employment rate equation, the adjustment coefficient (α) is significantly different from zero when the employment rate is below 38.82%, meaning that a value of the gap below 38.82% in one quarter produces upward pressure on the self-employment rate in the subsequent quarter to restore the long-run equilibrium. By contrast, when the employment rate is above 38.82%, the error-correction term in the self-employment rate equation is not significant. As α is not statistically different from zero, the self-employment rate is said to be long-run weakly exogenous with respect to the long-run equilibrium in this second regime.

The economic interpretation of the above findings is as follows. When the employment rate is very low, or, put differently, the unemployment rate in broad sense (i.e. including the inactive) is very high, this phenomenon in itself causes upward pressure on the self-employment rate. Alternative income options are less numerous hence more people start their own businesses. Importantly though, we do not observe this phenomenon when the employment rate is above the estimated threshold value. These results suggest that the recession-push hypotheses is only valid when economic circumstances are poor, i.e. when employment rates are (very) low.

Table 2 Threshold VECM estimates (Hansen & Seo approach)

Regime 1	$\widehat{\beta} = -1$	$w_{t-1} + s_{t-1} \leq 0.3882$
	Δw_t	Δs_t
c	0.2094*	−0.1477*
	(0.0932)	(0.0739)
Δw_{t-1}	0.2067	−0.3328
	(0.1450)	(0.2083)
Δw_{t-2}	0.3250*	0.3017
	(0.1494)	(0.2791)
Δs_{t-1}	1.1497**	1.0470
	(0.3549)	(0.8736)
Δs_{t-2}	0.0973	−0.1584
	(0.4970)	(0.4074)
α	−0.5388*	0.3865*
	(0.2412)	(0.1870)

Standard errors are between parentheses

Observations percentage: 12.61%

*Significant at the 5-percent level

**Significant at the 1-percent level

Table 3 Threshold VECM estimates (Hansen & Seo approach)

Regime 2	$\widehat{\beta} = -1$ Δw_t	$w_{t-1} + s_{t-1} > 0.3882$ Δs_t
c	−0.0004	0.0000
	(0.0038)	(0.0013)
Δw_{t-1}	0.6302**	0.0017
	(0.1003)	(0.0397)
Δw_{t-2}	−0.0124	0.0433
	(0.0732)	(0.0392)
Δs_{t-1}	0.7331**	0.0743
	(0.1747)	(0.0755)
Δs_{t-2}	−0.2837	−0.1073
	(0.1923)	(0.0725)
α	0.0017	−0.0014
	(0.0089)	(0.0031)

Standard errors are between parentheses

Observations percentage: 87.39%

*Significant at the 5-percent level

**Significant at the 1-percent level

As regards the paid-employment rate equation, the adjustment coefficient (α) is significantly different from zero when the employment rate is below 38.82%, and the effect is negative. We interpret this as a signal that in times of economic recession it is hard to find a job in paid-employment. Hence, the mere phenomenon of low employment causes even more individuals to lose their wage jobs and some of them may be inclined to start their own business, witness the positive α in the self-employment equation in regime 1.

Besides some degree of path-dependency in the wage-employment equation, we note one other interesting result from the table. In both regimes there is a significant positive (causal) effect of the self-employment rate on the paid employment rate, which seems to be quite substantial. This might imply that—at the aggregate level—self-employed individuals create jobs by their entrepreneurial activities. This finding of an 'entrepreneurial' effect for Spain is consistent with findings at the international level reported by Thurik et al. (2008).

Figure 1 plots the error-correction effect, i.e., the estimated response of (changes in) the paid-employment rate (Δw_t) and the self-employment rate (Δs_t) to the discrepancy between them (i.e. to the employment rate) in the previous period, holding the other variables constant. As we can see, for a "high" employment rate (i.e. above the threshold, greater than 38.82%), the response of both series (paid-employment rate and self-employment rate) is nearly zero. However, for a "low" employment rate (i.e. lower than 38.82%), the effect on paid-employment is negative while the effect on self-employment is positive. The latter finding is consistent with the recession-push hypothesis, which can be seen to be only valid for low employment rates.
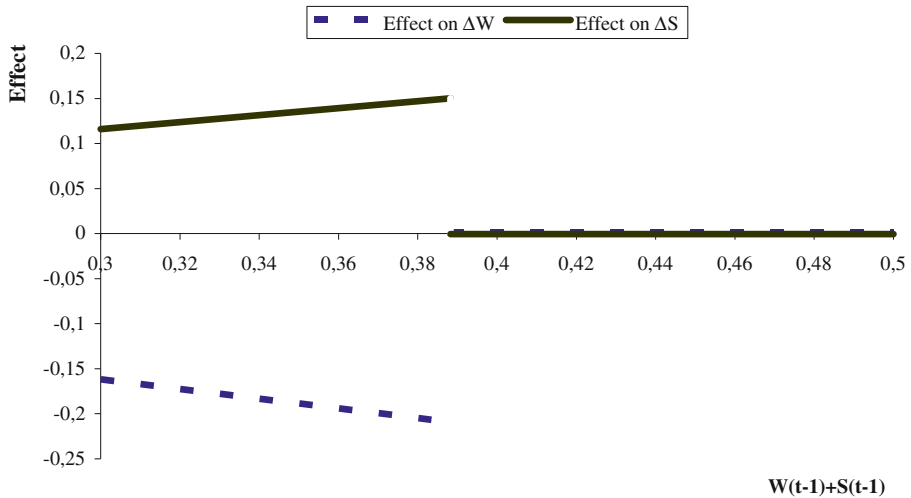
Fig. 1 Response of self-employment and paid-employment rates to error correction (w+s)

In sum, according to our results, the null hypothesis of linear cointegration is rejected in favour of a two-regime threshold cointegration model. Consequently, a system of two regimes would seem to characterize the discontinuous adjustment of the self-employment rate towards a long-run equilibrium, with the threshold parameter—the employment rate—estimated at 38.82 percentage points. Therefore, we have a cointegrating relationship only when the employment rate is below 38.82%. This first regime, or the relatively unusual regime in the Spanish economy (with 12.61% of the observations), is coincident with many of the higher unemployment levels during the period, as we can see in Fig. 2. This figure shows the unemployment rate (u_t), defined as the unemployment to population (aged 16+) ratio, based on the official unemployment data, defining the unemployment threshold as the difference between the active population to population (aged 16+) ratio and the employment ratio. Although in general high unemployment rates correspond to low employment rates and vice versa (which one would expect), the figure shows that the classification of regimes might nevertheless be quite different depending on whether the threshold is computed in terms of employment or in terms of unemployment.[8] This illustrates the importance of defining the threshold in terms of employment.

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[8] We computed the unemployment threshold as follows. Given that our threshold has been defined as an employment rate (38.82%), we have checked that this value corresponds to period 1987/I. In this quarter, the "pseudo" unemployment rate (defined as the difference between active people and employment plus people not included in our self-employment definition), is 9.76%. Using this unemployment rate value, 22 quarters have unemployment rates above this value. Specifically, it concerns periods 1984:4–1986:1 and 1987:1 and 1993:1–1996:3. On the other hand 14 quarters are below the *employment* threshold (1984:4–1986:3 and 1987:1 and 1993:4–1994:4), 12 of which correspond to quarters with values above the *unemployment* threshold. However, considering the 22 periods for which unemployment exceeds the unemployment threshold, only 12 of them correspond to periods where employment is below its specific threshold. This illustrates that it matters a lot whether to compute the threshold in terms of employment or in terms of unemployment.

Fig. 2 Spanish Labour Market indicators. 1976:2–2004:4. Source: Spanish Labour Force Survey. Instituto Nacional de Estadística

Conclusions

The relationship between unemployment and self-employment has been studied extensively. Due to its complex, multifaceted nature, various scholars have found a large array of different results, so that the exact nature of the relation is still not clear. An important element of the relation is captured by the recession-push hypothesis which states that in times of high unemployment individuals are pushed into self-employment for lack of alternative sources of income such as paid employment. We make two contributions to this literature. First, we argue that official unemployment rates may not capture the 'true' rate of unemployment as it does not include 'hidden' unemployed who are out of the labour force. Therefore, we propose a new method where the 'recession-push' effect relates not only to the (official) unemployed but also to the inactive population. Second, we argue that the magnitude of the recession-push effect is non-linear in the business cycle, i.e. the effect is disproportionally stronger when economic circumstances are worse. We account for this possibility by introducing a two-regime threshold cointegration model. Estimating our model with quarterly data for Spain over the period 1976–2004, we find that the recession-push hypothesis is only valid when the employment rate (the number of employed individuals as a percentage of the total population of 16 years and older) is lower than 39%.

Our paper contributes to a better understanding of the relation between self-employment and unemployment. We have shown that the relation varies with the business cycle, operationalised as the employment rate. Our results raise the question why unemployed individuals are more inclined to start their own business when employment levels are low, compared to situations of high employment. An obvious factor to start a business in times of recession would be the lower job offer arrival rate, resulting in too high search costs for finding a paid job. However, we may also think of a second possible reason. If one imagines a situation where members of the labour force (employed and unemployed individuals) support not only children but also adult

(inactive) members of the population (e.g. elderly), then, in times of low employment, the average number of people to be supported (e.g. inactive family members) by an unemployed individual is higher compared to a situation of a flourishing economy (i.e. high employment). This is because the ratio of inactive versus active members of the population is likely to be higher when employment is lower. Hence, on average an unemployment benefit would have to be divided between more people. This might increase pressure for the unemployed to find a (higher) income through self-employment, particularly because the unemployment benefit is only received for a fixed period of time, after which one receives a benefit that is typically lower. This pressure may be felt especially hard when the employment rate is (extremely) low.

Given the current international credit crunch, the regime of low employment, although found only for 13% of the observations during the period 1976–2004, may be particularly relevant in present times. Therefore an important avenue for future research is to investigate the decision processes at the micro level that lead individuals to start businesses in times of recession. In addition, future work could not only fruitfully apply the methodology used in this article to a broader range of countries, but should also seek for differences between different types of self-employment by decomposing the aggregate self-employment rate into its constituent parts (employers, own-account workers and members of producer's cooperatives) in order to determine whether the recession-push effect is being driven by one or more of these elements.

Appendix A: Statistical tests

In this appendix we present results from several statistical tests which guided us throughout our empirical analysis. First, we show results from unit root tests to see whether or not the variables from our model are stationary. Second, we report the diagnosis on the lag length. Third, we present the Johansen's reduced rank regression approach to test for cointegration. Fourth and finally, we report the tests of threshold cointegration proposed by Hansen and Seo (2002).

Table 4 Unit root tests Ng-Perron

Variable	$\overline{M}Z_\alpha^{GLS}$	$\overline{M}Z_t^{GLS}$	$\overline{M}SB^{GLS}$	MPT^{GLS}	Lags	ADF	Lags
Paid-employment rate	−5.965	−1.552	0.260	4.650	6	−0.219	6
Self-employment rate	0.884	1.231	1.392	125.74	8	−2.116	8
Critical values (Ng and Perron, 2001)							
	$\overline{M}Z_\alpha^{GLS}$	$\overline{M}Z_t^{GLS}$		$\overline{M}SB^{GLS}$	MPT^{GLS}		ADF
1%	−13.80	−2.58		0.17	1.78		−3.49
5%	−8.10	−1.98		0.23	3.17		−2.89
10%	−5.70	−1.62		0.27	4.45		−2.58

Table 5 Results for choosing the lag length of the VAR model based on the AIC, SC and HQ criteria

Lag	AIC	SC	HQ
0	−13.53957	−13.44193	−13.49996
1	−19.29674	−19.10145	−19.21752
2	−19.50893	−19.21601*	−19.39010*
3	−19.51149*	−19.12092	−19.35305

Unit root tests for paid-employment rate and self-employment rate

When using time series data, it is often assumed that the data are non-stationary and thus that a stationary cointegration relationship needs to be found in order to avoid the problem of spurious regression. For these reasons, we begin by examining the time-series properties of the series. We use a modified version of the Dickey and Fuller (1979, 1981) test (DF) and a modified version of the Phillips and Perron (1988) tests (PP) proposed by Ng and Perron (2001) for the null of a unit root, in order to solve the traditional problems associated to conventional unit root tests. Ng and Perron (2001) propose a class of modified tests, M, with GLS detrending of the data and using the modified Akaike information criteria to select the autoregressive truncation lag.

Table 4 reports test statistics of Ng-Perron tests, $\overline{MZ}_\alpha^{GLS}$, $\overline{MZ}_t^{GLS}$, $\overline{MSB}^{GLS}$, MPT^{GLS} and ADF tests. The second part of the table also reports critical values as tabulated in Ng and Perron (2001). All test statistics formally examine the unit root null hypothesis against the alternative of stationarity. At the 5% level, the null hypothesis of non-stationarity for the series in levels, s and w, cannot be rejected, regardless of the test. Accordingly, these two series are $I(1)$.

Testing for the lag length

Cointegration analysis requires the model to have a common lag length. To select the lag length of the VAR we have used the Akaike information criterion (AIC), the Schwarz information criterion (SC), and the Hannan-Quinn (HQ) criterion. Although the SC and HQ criteria suggest that $k=2$, the choice of k based on the Akaike information criterion suggests that $k=3$ is to be preferred. Hence, since the VECM variables are in first-differences, our estimates (see Tables 1, 2 and 3 in the text) incorporate two lags (see Table 5).

Table 6 Johansen cointegration test

H_o:r	$n-r$	λ	λ_{max}test	$\lambda_{max}(0.95)$	λ_{trace}test	$\lambda_{trace}(0.95)$	Lags
0	2	0.1452	17.4125*	14.2646	17.5023*	15.4947	2
1	1	0.0008	0.0896	3.8415	0.0896	3.8415	

*Asterisk denotes rejection at the 5% significance level

Table 7 Hansen-Seo tests of threshold cointegration

	$\sup LM^0$
Cointegrating vector	$\beta = -1$
Threshold parameter	0.388241
Test statistic value	28.3281
Fixed regressor p-value	0.000
Residual Bootstrap p-value	0.008

Testing for cointegration

The results obtained from applying the Johansen reduced rank regression approach to our model are given in Table 6.[9] The two hypotheses tested, from no cointegration $r=0$ (against the alternative of $n-r=2$) to the presence of one cointegration vector ($r=1$) are presented in the first two columns. The eigenvalues associated with the combinations of the $I(1)$ levels of x_t are in column 3. The next column reports the $\lambda_{\max}$ statistics which test $r=0$ against $r=1$. That is, a test of the significance of the largest λ_r is performed. The results suggest that the hypothesis of no cointegration ($r=0$) can be rejected at the 5% level (with the 5% critical value given in column 5). The λ_{trace} statistics test the null that $r=q$, where q=0,1 against the unrestricted alternative that $r=2$. On the basis of this test the null hypothesis is rejected. Hence, the tests for cointegration rank reject the null hypothesis of no cointegration.

Testing for nonlinearity

Hansen and Seo (2002) proposed a heteroskedastic-consistent LM test, namely, sup LM^0 (for a fixed β; $\beta=-1$ in our case) for the null hypothesis of linear cointegration (i.e., there is no threshold effect) against the alternative of threshold cointegration. For the test, the p-value is calculated using a parametric bootstrap method (with 5000 simulations replications), as proposed by Hansen and Seo (2002).[10] Therefore, according to Table 7, threshold cointegration appears at the 1% significance level for

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[9] Johansen's approach is based on maximum likelihood estimation of the VECM, by step-wise concentrating the parameters out, i.e. maximizing the likelihood function over a subset of parameters, treating the other parameters as known, and giving the number r of cointegrating vectors, where the matrix β is the last to be concentrated out.

[10] The test is denoted by $\sup LM^0 = \sup_{\gamma_L \leq \gamma \leq \gamma_U} LM(\beta_0, \gamma)$, where β_0 is the known value of β (in our case $\beta=-1$). The sup LM^0 is a heteroskedastic-consistent LM test statistic for the null hypothesis of linear cointegration against the alternative of threshold cointegration. We have used the bootstrap method developed by Hansen and Seo (2002) to calculate asymptotical critical and p-values.

the sup LM^0 test, i.e., when β is fixed,[11] so that the null hypothesis of linear cointegration is strongly rejected.

Appendix B: Derivation of model and error correction term interpretation

This appendix shows for our application that the error-correction term in the VECM can be interpreted as the employment rate.

Our benchmark model is given by the following expression, (rates expressed in levels):

$$w_t = \mu + \beta s_t + \varepsilon_t,$$

the estimates of which are presented in Table 8 in Appendix C.

In order to contribute to a correct interpretation of the error correction term, observe that the error correction mechanism is derived from the relationship in first differences:

$$\begin{cases} \Delta s_t = \gamma_0^s + \gamma_1^s \Delta s_{t-1} + \gamma_2^s \Delta w_{t-1} + \alpha^s \varepsilon_{t-1} \\ \Delta w_t = \gamma_0^w + \gamma_1^w \Delta s_{t-1} + \gamma_2^w \Delta w_{t-1} + \alpha^w \varepsilon_{t-1} \end{cases}$$

If $\beta = -1$, then

$$w_t = \mu + (-1) s_t + \varepsilon_t \Rightarrow \varepsilon_t = w_t - \mu + s_t$$

Hence

$$\begin{cases} \Delta s_t = \gamma_0^s + \gamma_1^s \Delta s_{t-1} + \gamma_2^s \Delta w_{t-1} + \alpha^s (w_t - \mu + s_t)_{t-1} \\ \Delta w_t = \gamma_0^w + \gamma_1^w \Delta s_{t-1} + \gamma_2^w \Delta w_{t-1} + \alpha^w (w_t - \mu + s_t)_{t-1} \end{cases}$$

$$\begin{cases} \Delta s_t = \gamma_0^s - \mu \alpha^s + \gamma_1^s \Delta s_{t-1} + \gamma_2^s \Delta w_{t-1} + \alpha^s (w_t + s_t)_{t-1} \\ \Delta w_t = \gamma_0^w - \mu \alpha^w + \gamma_1^w \Delta s_{t-1} + \gamma_2^w \Delta w_{t-1} + \alpha^w (w_t + s_t)_{t-1} \end{cases}$$

As $e_t = w_t + s_t$

$$\begin{cases} \Delta s_t = c_0^s + \gamma_1^s \Delta s_{t-1} + \gamma_2^s \Delta w_{t-1} + \alpha^s e_{t-1} \\ \Delta w_t = c_0^w + \gamma_1^w \Delta s_{t-1} + \gamma_2^w \Delta w_{t-1} + \alpha^w e_{t-1} \end{cases}$$

where

$$\begin{cases} c_0^s = \gamma_0^s - \mu \alpha^s \\ c_0^w = \gamma_0^w - \mu \alpha^w \end{cases}$$

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[11] It can be shown that the long-term parameter between both series is close to −1 (see Table 9 in Appendix C). Therefore we have used the threshold cointegration test sup LM^0, for a fixed β equal to −1, in order to facilitate interpretations. Note that the ECM term $(w_{t-1} - \beta s_{t-1})$ is now $(w_{t-1} - (-1) s_{t-1}) = e_{t-1}$, i.e., the employment rate.

Appendix C: Testing for the value of β

Table 8 reports OLS results for the relation between wage-employment and self-employment. Table 9 reports a Wald test where we test the null hypothesis of $\beta=-1$, which is a basic assumption for fixing the beta value in order to facilitate the threshold interpretation. Using the Wald test, we cannot reject the null hypothesis.

Table 8 OLS results for the relation between wage-employment and self-employment

$w_t = \mu + \beta s_t + \varepsilon_t$	
μ	β
0.411*	−0.834*
(0.024)	(0.214)

Standard errors are between parentheses

*Significant at the 1-percent level

Table 9 Wald test $H_0 : \beta = -1$

Test statistic	p-value
F-statistic	0.440
Chi-square	0.439

References

Acs, Z. J., Audretsch, D. B., & Evans, D. S. (1994). T*he determinants of variation in the self-employment rates across countries and over time*. CEPR Discussion Paper 871.

Ahn, N., & de la Rica, S. (1997). The underground economy in Spain: an alternative to unemployment? *Applied Economics, 29*, 733–743.

Alañón, A., & Gómez-Antonio, M. (2005). Estimating the size of the shadow economy in Spain: a structural model with latent variables. *Applied Economics, 37*, 1011–1025.

Audretsch, D. B., & Acs, Z. J. (1994). New firm start-ups, technology and macroeconomic fluctuations. *Small Business Economics, 6*, 439–449.

Audretsch, D. B., Carree, M. A., van Stel, A. J., & Thurik, A. R. (2002). Impeded industrial restructuring: the growth penalty. *Kyklos, 55*(1), 81–98.

Binks, M., & Jennings, A. (1986). Small firms as a source of economic rejuvenation. In J. Curran, J. Stanworth, & D. Watkins (Eds.), *The survival of the small firm* (Vol. 1, pp. 19–37). Aldershot: Gower.

Black, J., de Meza, D., & Jeffreys, D. (1996). House prices, the supply of collateral and the enterprise economy. *Economic Journal, 106*, 60–75.

Blanchflower, D. G. (2000). Self-employment in OECD countries. *Labour Economics, 7*, 471–505.

Blanchflower, D. G., & Oswald, A. J. (1998). What makes an entrepreneur? *Journal of Labour Economics, 16*, 26–60.

Bögenhold, D., & Staber, U. (1991). The decline and rise of self-employment. *Work Employment and Society, 5*, 223–239.

Bruce, D. (2000). Effects of the United States tax system on transitions into self-employment. *Labour Economics, 7*, 545–574.

Carrasco, R. (1999). Transitions to and from self-employment in Spain: an empirical analysis. *Oxford Bulletin of Economics and Statistics, 61*(3), 315–341.

Clark, K., & Drinkwater, S. (1998). Ethnicity and self-employment in Britain. *Oxford Bulletin of Economics and Statistics, 60*, 383–407.

Clark, K., & Drinkwater, S. (2000). Pushed out or pulled in? Self-employment among minorities in England and Wales. *Labour Economics, 7*, 603–628.

Congregado, E. (Ed.). (2008). *Measuring entrepreneurship; building a statistical system*. NewYork: Springer.

Cowling, M., & Mitchell, P. (1997). The evolution of UK self-employment: a study of government policy and the role of the macroeconomy. *The Manchester School of Economic and Social Studies, 65*, 427–442.

Cullen, J. B., & Gordon, R. H. (2002). *Taxes and entrepreneurial activity: theory and evidence for the US*. NBER Working Paper 9015. Cambridge, MA: NBER.

Dell'Anno, R., Gómez-Antonio, M., & Pardo, A. (2007). The shadow economy in three Mediterranean countries: France, Spain and Greece. A MIMIC approach. *Empirical Economics, 33*, 51–84.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association, 74*, 427–431.

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica, 49*, 1057–1072.

Foti, A., & Vivarelli, M. (1994). An econometric test of the self-employment model: the case of Italy. *Small Business Economics, 6*, 81–93.

Georgellis, Y., & Wall, H. J. (2005). Gender differences in self-employment. *International Review of Applied Economics, 19*(3), 321–342.

Golpe, A., & van Stel, A. (2008). Self-employment and unemployment in Spanish regions in the period 1979–2001. In E. Congregado (Ed.), *Measuring entrepreneurship; building a statistical system* (pp. 191–204). NewYork: Springer.

Hamilton, R. T. (1989). Unemployment and business formation rates: reconciling time series and cross-section evidence. *Environment and Planning, 21*, 249–255.

Hansen, B. E., & Seo, B. (2002). Testing for two-regime threshold cointegration in vector error-correction models. *Journal of Econometrics, 110*, 293–318.

Harrison, R. T., & Hart, M. (1983). Factors influencing new business formation: a case study of Northern Ireland. *Environment and Planning, 15*, 1395–1412.

Highfield, R., & Smiley, R. (1987). New business starts and economic activity: an empirical investigation. *International Journal of Industrial Organization, 5*, 51–66.

Hudson, J. (1989). The birth and death of firms. *Quarterly Review of Economics and Business, 29*, 68–86.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control, 12*(2), 231–254.

Johansen, S. (1991). Estimation and hypothesis testing of cointegrated vectors in Gaussian vector autoregressive models. *Econometrica, 59*, 1551–1580.

Lin, Z., Picot, G., & Compton, J. (2000). The entry and exit dynamics of self-employment in Canada. *Small Business Economics, 15*, 105–125.

Lindh, T., & Ohlsson, H. (1996). Self-employment and windfall gains: evidence from the Swedish lottery. *Economic Journal, 106*, 1515–1526.

Meager, N. (1994). Self-employment schemes for the unemployed in the European Community. In G. Schmid (Ed.), *Labour market institutions in Europe* (pp. 183–242). New York: M.E. Sharpe.

Ng, S., & Perron, P. (2001). Lag length selection and the construction of unit root tests with good size and power. *Econometrica, 69*, 1529–1554.

Parker, S. C. (1996). A time series model of self-employment under uncertainty. *Economica, 63*, 459–475.

Parker, S. C., & Robson, M. T. (2004). Explaining international variations in self-employment: evidence from a panel of OECD countries. *Southern Economic Journal, 71*, 287–301.

Phillips, P. C. B., & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika, 75*, 335–346.

Ray, R. N. (1975). Self-employed Americans in 1973. *Monthly Labor Review, 98*, 49–54.

Reynolds, P. D., Storey, D. J., & Westhead, P. (1994). Cross-national comparisons of the variation in new firm formation rates. *Regional Studies, 28*, 443–456.

Robson, M. T. (1991). Self-employment and new firm formation. *Scottish Journal of Political Economy, 38*, 352–368.

Robson, M. T. (1996). Macroeconomic factors in the birth and death of UK firms: evidence from quarterly VAT registrations. *The Manchester School of Economic and Social Studies, 64*, 170–188.

Robson, M. T. (1998a). Self-employment in the UK regions. *Applied Economics, 30*, 313–322.

Robson, M. T. (1998b). The rise in self-employment amongst UK males. *Small Business Economics, 10*, 199–212.

Schneider, F. (2005). Shadow economies around the world: what do we really know? *European Journal of Political Economy, 21*, 598–642.

Steinmetz, G., & Wright, E. (1989). The fall and rise of the petty bourgeoisie: changing patterns of self-employment in the postwar United States. *American Journal of Sociology, 94*, 973–1018.

Storey, D. J. (1991). The birth of new firms—does unemployment matter? A review of the evidence. *Small Business Economics, 3*, 167–178.

Storey, D. J. (1994). *Understanding the small business sector*. London: Routledge.

Storey, D. J., & Jones, A. M. (1987). New firm formation—a labour market approach to industrial entry. *Scottish Journal of Political Economy, 34*, 37–51.

Taylor, M. (1996). Earnings, independence or unemployment: why become self-employed? *Oxford Bulletin of Economics and Statistics, 58*, 253–266.

Thurik, A. R., Carree, M. A., van Stel, A. J., & Audretsch, D. B. (2008). Does self-employment reduce unemployment? *Journal of Business Venturing, 23*(6), 673–686.

Torrini, R. (2005). Cross-country differences in self-employment rates: the role of institutions. *Labour Economics, 12*, 661–683.

Van Praag, C. M., & Van Ophem, H. (1995). Determinants of willingness and opportunity to start as an entrepreneur. *Kyklos, 48*, 513–540.