How sensitive is the business ownership rate to unemployment fluctuations? Evidence of asymmetries in a panel of 23 OECD countries

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Abstract

The aim of this article is to identify whether the relationship running from unemployment to entrepreneurship/self-employed –the so-called 'recession-push' hypothesis- is affected asymmetrically by the labor market dynamics conditions. To this end we employ a panel threshold regression model, proposed by Hansen (1999), in which nonlinearities are introduced by allowing exogenous variable to have a different impact on the endogenous variable depending on the regime. In particular, our estimates provide support to the existence of different responses of cyclical self-employment to cyclical unemployment, depending on the value of the deviation between the observed and natural rate of unemployment one period lagged –i.e. depending on the intensity of the unemployment problem-, which is the threshold variable.

Keywords: entrepreneurship; self-employment; unemployment; recession-push; business cycles; panel threshold models;

JEL classification: L26; J21; J23; J24; E32; C23

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1. Introduction

The resilience -and even resurgence -of self-employment to the crisis, compared with paid employment, has been found in a number of countries, specially in the countries worst affected by unemployment. In some countries, the crisis unleashed an increase in self-employment, while in others this initial increase was followed by a decrease

In principle, these stylized facts could be the result of a voluntary change in the occupational decision given the lower opportunity cost of the paid –employment or the result of a conscient entrepreneurship policy oriented to encourage self-employment turning unemployment in self-employment (Baumgartner and Caliendo, 2008). However, and although it is important the study of the reasons why individuals choose self-employment, from an aggregate perspective the interest should be in knowing if the unemployed persons who have been 'pushed' into self-employment because of the lack of opportunities in getting a job as a paid worker leads positive fluctuations in the business ownership rate or if, by contrast, the relationship between unemployment and self-employment is a negative one –as the 'prosperity-pull' hypothesis stands.[2]

As with any research, Empirical evidence should be the natural way to know what is the net effect.

However, and leaving aside the accurate of different estimation strategies -and the quality of data- used for analysing the validity of these hypotheses one could argue that any empirical approach only can aspire to capture a "net" effect of the recession-push and the

[2] This hypothesis considers that at times of crisis (low paid- employment) firms face a lower market demand. This reduces self-employment incomes pulling out of self-employment those marginal entrepreneurs who cannot resist these new economic conditions (see, the works of Ben-Ner, 1988 and Perotin, 2006 on marginal entrepreneurs). As a result, the relationship predicted by this hypothesis is a negative one.

prosperity-pull effects (see Parker, 2004, p.95 or Thurik et al., 2008).

As a result, the exact nature of the relationship between unemployment and entrepreneurship is very far from being a matter of general consensus amongst scholars. Indeed, the existence of opposite theoretical arguments about the direction and sign of this relationship and the weak and sometimes opposite empirical evidence, are the origin of one of the most recurrent controversies in the field of the Economics of Entrepreneurship.[3]

In this paper we will argue that the mixed set of results in earlier studies is in part due to the predominance of analysis of the long-term relationship in levels and the use of linear models –i.e. ignoring the potential existence of asymmetries in the relationship. The scarce works, which deal with nonlinearities have been analysis at the country level. Compared to previous studies in this article we will use the panel threshold regression model proposed by Hansen (1999) by using the cyclical components of entrepreneurship and unemployment to test the 'recession push' hypothesis, in 23 OECD countries over the period 1976-2004.

A brief survey of previous empirical literature

Empirical multi-country analysis of the relationship between self-employment and unemployment, by using time series, started with the seminal work of Thurik et al. (2008), in which mixed evidence of the two competing hypotheses in 23 OECD countries, by using series in levels. Previously, a growing body of empirical studies had covered other countries (Thurik, 2003 for the UK; Verheul et al, 2006 for Spain; van Stel et al., 2007

[3] See Thurik et al. (2008), Parker (2009) and Congregado, Golpe and van Stel (2012) for detailed discussions on the interplay between unemployment and entrepreneurship.

for Japan, Baptista and Thurik, 2007, for Portugal) and applying other econometric approaches, such as cointegration and error correction models, instead of using the standard VAR analysis (Congregado et al., 2010; Carmona et al., 2012). Table 1, summarises their findings. The weak evidence and the apparently contradicting results have leaded the search of new ways.

Table 1. Summary of empirical studies on the relationship unemployment self-employment using aggregated data

Model	Type of data	Country level vs Multi.country	Econometric approach	Applications in Applied Entrepreneurship Research				
				Authors	Frequency	Period	Unemployment-self-employment relationship	Non Linear
Time series	Levels	UK	OLS regression	Thurik (2003)	Annual	1970 -1998	Pull hypothesis	
		Spain	Bivariate VAR	Verheul et al. (2006)	Annual	1972 -2004	Pull hypothesis	
		Japan	Bivariate VAR	Van Stel et al (2007)	Annual	1972 -2004	Pull hypothesis	
		Portugal	Bivariate VAR	Baptista and Thurik (2007)	Annual	1972 -2004	Weak pull hypothesis	
		EU-12	Den Haan (2000) VAR forecast errors	Congregado et al (2010)	Annual	1983-2008	Mixed Differs across countries (weak)	
		Spain	Den Haan (2000) VAR forecast errors	Carmona et al (2012)	Quarterly	1980:1 - 2009:4	Pull hypothesis	
		Spain	Threshold cointregration Hansen and Seo (2002)	Congregado et al (2012)	Quarterly	1976:3-2004:4	Recession Push hypothesis (only in economic crisis)	✓
	Cycles	US, UK , Ireland, Spain	Generalized fractional processes	Faria et al (2009)	Annual	1972-2004	Two way relationship	
		Australia, Japan, USA, UK, Ireland, Germany, France, Italy and Spain	STAR-EXT	Faria et al (2010)	Annual	1972-2004	S→U, U→S	✓
		EU-12	VAR, Granger and Instantaneous causality	Carmona et al (2010)	Annual	1983-2008	Mixed Differences across countries	
		Spain	VAR, Granger and Instantaneous causality	Carmona et al (2012)	Quarterly	1980:1 - 2009:4	S→U, U→S	
		UK	VAR, Granger causality, Bai-Perron (1998, 2003a, 2003b) Structural breaks	Parker et al (2012)	Quarterly	1978:2 - 2010:3	S→U, U→S	✓
Panel	Levels	17 OECD countries	Static Panel Data	Staber and Bogenhold (1993)	Annual	1972 - 1989	Push hypothesis	
		23 OECD countries	Static Panel Data	Blanchflower (2000)	Annual	1966 - 1996	Mixed relationship	
		13 OECD countries	Static Panel Data	Robson (2003)	Annual	1965 - 1995	No relationship	
		12 OECD countries	Multivariate Panel Cointegration Pedroni Test (1999)	Parker and Robson (2004)	Annual	1972 - 1996	No relationship	

		FMOLS estimates				
	19 OECD countries	Multivariate Panel Cointegration Maddala and Wu test (1999) OLS and DOLS estimates	Torrini (2005)	Annual	22 years	Pull hypothesis
	23 OECD countries	Weighted Least Squares (pooled data)	Carree et al (2007)	Annual	1972 - 2004	Push hypothesis
	17 Spanish regions	Bivariate Weighted VAR (with population as weighting variable)	Golpe and Van Stel (2007)	Quarterly	1979:4 - 2001:4	Pull and Push hypothesis (Pull in the whole sample, push effect only in lower income regions)
	23 OECD countries	Bivariate Weighted VAR (with population as weighting variable)	Thurik et al (2008)	Annual	1974-2002	Pull and Push hypothesis (pull stronger than push effect)
Cycles	22 OECD countries	Trivariate VAR Granger causality Trivariate Panel One-step system GMM	Koellinger and Thurik (2012)	Annual	1972-2008	S→U Recession-push hypothesis
	19 OECD countries	Multivariate VAR Generalized Least Squares	Scholman et al (2012)	Quarterly Annual	2000:1 – 2007:4 1998 – 2008	No relationship
	22 OECD countries	Bivariate correlations	Lamballais et al (2012)	Annual	2001 - 2011	Pull hypothesis

Note: X→Y means that causality runs from X to Y. The finding of causality in both directions implies bidirectionality. Two way relationship means relationship between U and E but with not sign estimated. Microeconometric analyses - with individual data - have been intentionally excluded of this summary of aggregated studies.

One of these has been the estimation of panel data models thanks to the availability of comparable international aggregate data on entrepreneurship rates (see, COMPENDIA, van Stel, 2005). The works of Staber and Bogenhold (1993), Blanchflower (2000), Robson (2003), Parker and Robson (2004), Torrini (2005), Carre et al (2007), Golpe and van Stel (2009) or Thurik et al (2008) are examples of panel data estimates of the relationship between unemployment and entrepreneurship. Overall, these panel data estimations provide again an inconclusive picture of the empirical relationship.

Compared to previous studies Koellinger and Thurik (2012) opted who by using a GMM estimation of a dynamic panel data model in a cross-country panel of 22 OECD countries for the period 1972 to 2007 provide evidence of a positive effect of unemployment cycle

on entrepreneurial cycle at the national level (suggesting the presence of a significant 'refugee' effect).

Another potential source of the apparently ambiguity of previous results may be based on the fact that the most part of the empirical analysis on the relationship between self-employment and unemployment has only studied the relationship of the trend, not the cyclical components, with the exception of the works of Sholman et al (2012) for 19 OECD countries, Faria, Cuestas and Mourelle (2010) for a sample of 9 OECD countries, Faria, Cuestas and Gil-Alana (2009) for 4 OECD countries, Congregado, Carmona and Golpe (2010) for the EU 12, Carmona, Congregado and Golpe (2012) for Spain, Congregado, Golpe and Parker (2012) for the US and Spain, Parker, Congregado and Golpe (2012) for the UK, and Koellinger and Thurik (2012) and Lamballais et al (2012), for 22 OECD countries.

Another roots of controversy are the sensitivity of the relationship analysis to the sample of country and the sampling period. Sometimes with different periods opposite results are obtained even for a same country. This last result suggests that we should recognize the potential existence of nonlinearities or asymmetries in the relationship. Indeed one of the most likely reasons of rejection a linear relationship is that the relation is time-varying – i.e. when the relation is different for different economic conditions. In such cases the estimation method should allow for nonlinearity in the relationship. Although relatively scarce, there are some contributions which deals explicitly with nonlinearity: Faria, Cuestas and Mourelle (2010), by using a STAR model with time series data of 9 countries, Congregado, Golpe and Parker (2012), by using an augmented version of the Jaeger and Parkinson model in the US and Spain;, Congregado, Golpe and van Stel (2012) accounted for nonlinearity in this relationship by applying a threshold cointegration model suggested

by Hansen and Seo (2002); and Parker, Congregado and Golpe (2012), for the UK by using a Bai-Perron structural breaks approach (1998, 2003a, 2003b).

However, these works looked for asymmetries but using individual time series data. Instead of, this article extends the extant empirical analysis looking for asymmetries -by using a panel threshold regression model by using the cross-sectional time series data of the cyclical components of entrepreneurship and unemployment- in order to analyse how labour market dynamics determines the changes in the occupational decisions and therefor, the observed fluctuations in the self-employment rates.

The rest of the article is organized as follows: the empirical methodology is outlined in Section 2, while the empirical tests and estimates are performed in Section 3. Finally, the main conclusions are summarized in Section 4.

2. The model specification

As we mentioned, the aim of this article is to investigate whether cyclical unemployment influences subsequent cyclical self-employment.

As starting point, the reduced-form cyclical relationship between unemployment and self-employment rates involves estimating the following equation:

$$\Delta s_{it} = \mu_i + \beta \Delta u_{it} \qquad (1)$$

where Δs and Δu are the rates of growth of the self-employment and unemployment rates, respectively, in the period *t* for the country *i*.

We can also consider a 'gap' specification, in which the Hodrick-Prescott filter (1997) is used for producing the trend components. In this specification unemployment and self-employment are measured in terms of the cyclical components or deviations from long-term trends. In general, the empirical relationship can be represented by the following set of equations:

$$u_{it}^{c} = u_{it} - u_{it}^{n} \qquad (2)$$

$$s_{it}^{c} = s_{it} - s_{it}^{n} \qquad (3)$$

$$s_{it}^{c} = \mu_i + \beta u_{it}^{c} + \varepsilon_{it} \qquad (4)$$

where u_{it}^{c} captures the cyclical unemployment (output gap), u_{it} is the log of the actual unemployment rate and u_{it}^{n} is the natural or trend level of the unemployment rate; correspondingly s_{it}^{c} represents the cyclical self-employment rate (self-employment gap), s_{it} is the observed self-employment rate and s_{it}^{n} is the natural self-employment rate.[4] In contrast to equation (1), equation (4) requires information about unemployment and self-employment trends or equilibrium rates, which are unobservable.

Equation (4) can be extended by adding lagged cyclical self-employment $-S_{it-1}^{c}$- in the equation for removing the serial correlation which arises in the equation (4).

$$s_{it}^{c} = \mu_i + \beta u_{it}^{c} + \delta S_{it-1}^{c} \varepsilon_{it} \qquad (4')$$

In the equation, the deviation of the business ownership rate in country *i* in year *t* from the equilibrium rate is the variable to be explained. Cyclical self-employment –a push factor for business ownership and lagged self-employment –factor included for capturing the inertia- are the two explanatory variables included in the benchmark specification. The expected sign of the parameter β is negative positive if the recession-push hypothesis holds.

Asymmetry

There are several reasons why we should test for asymmetry. The most important is that ignoring asymmetry when it is present, leads to misspecified models, what produces not only bad forecasting but also erroneous inference in hypothesis testing. To circumvent this problem, we are going to augment our benchmark equation by allowing for different

[4] In a broad sense, we can think in this natural rate in terms of an equilibrium rate of business ownership. Following Carre, van Stel, Thurik and Wennekers (2002) this rate is a function of the stage of economic development.

effects between different regimes defined by both in the unemployment and the self-employment data.

To this end, we apply a class of panel threshold models developed by Hansen (1999) to characterize the relationship between unemployment and self-employment, in which parameters vary not only across individuals but also with time, allowing the presence of asymmetries in the self-employment dynamics depending on the labour market dynamics. The model is now defined as:

$$s_{it}^{c} = \mu_i + \beta_0 u_{it-1}^{c} \mathbb{I}(d_{it} \leq k) + \beta_1 u_{it-1}^{c} \mathbb{I}(d_{it} > k) + \varepsilon_{it} \quad (6)$$

where μ_i is a fixed effect, d_{it} is the threshold variable and *k* is the threshold parameter. $\mathbb{I}$ is the Heaviside indicator function which equals 1 when the threshold condition is satisfied and 0 otherwise. In sum, in this model the observations are divided into two regimes depending on whether the threshold variable d_{it} is smaller or greater than the threshold parameter *k*. The two regimes are distinguished by different regression slopes β_0 and β_1.

However, there is no reason for imposing just two regimes. A more general specification with *r* thresholds takes the form of:

$$s_{it}^{c} = \mu_i + \beta_0 u_{it-1}^{c} \mathbb{I}(d_{it} \leq k_1) + \beta_1 u_{it-1}^{c} \mathbb{I}(k_1 < d_{it} \leq k_2) + \cdots + \beta_r u_{it}^{c} \mathbb{I}(d_{it} > k_r) + \varepsilon_{it} \quad (7)$$

As general strategy and once the threshold parameter is estimated, the next step is to check the null hypothesis that describes the linearity –i.e. $\beta_0 = \beta_0 -$ by means of a likelihood ratio test. Once the threshold effect is proved, the same procedure –in a sequential way- applies for testing a specification with r regimes versus r+1 regimes.

3. Estimation and results

This section presents the empirical results for relationship represented by equation (7), based on two alternative threshold variables: the lagged cyclical self-employment and the lagged cyclical unemployment.

The empirical results obtained are presented in several steps. Firstly, we discuss on the stationary properties of the entrepreneurship and unemployment series. Secondly, we check the null of linearity and in case of rejection we look for the 'best' threshold variable. Thirdly, we report estimates of the relationship for the different regimes defined by the selected threshold variable.

Data

The sample is composed of annual data of 23 OECD countries for the period 1972-2009. As we mentioned above, and in common with most previous studies, entrepreneurship is operationalized in terms of *business ownership rate -i.e.* the number of business owners divided by total labour force.[5]

The second time series is the *Harmonised Unemployment rate*, whose source is OECD Main Economic Indicators.

Stationary properties

Initially, we are interested in studying the stationary properties of the self-employment rate and GDP series. At this point, we use a battery of traditional panel unit root tests: the Fisher-ADF and the Fisher-PP proposed by Maddala and Wu (1999), the tests proposed by Hadri (2000), Breitung (2000) or those proposed by Levin, Lin and Chu (2002), and Im, Pesaran and Shin (2003). The null hypothesis of non-stationarity -except in the Hadri's test, in which the null is stationarity- cannot be rejected. As a result, we can reach a non-stationary conclusion on the two variables.

[5] These data are taken from EIM's COMPENDIA data base (version 2009.1). Business owners or self-employed workers are defined as the total number of unincorporated and incorporated self-employed outside the agriculture, hunting, forestry and fishing industries, who carry out self-employment as their primary employment activity -see Van Stel (2005, p. 108)-.

Table 1: Unit root tests in panel data

Statistic	Self-employment		Unemployment	
	Without trend	Trend	Without trend	Trend
LLC	-1.008	0.902	-0.880	2.135
Breitung		5.263		2.799
IPS	0.978	3.824	-0.622	2.645
Fisher-ADF	38.287	26.372	48.000	20.192
Fisher-PP	35.857	36.537	45.088	22.741
Hadri	13.425***	9.301***	6.831***	10.437****

Notes: LLC and IPS represent the panel unit roots test of Levin et al. (2002) and Im et al. (2003), respectively. Fisher-ADF and Fisher-PP represent the Maddala and Wu (1993) Fisher-ADF and Fisher-PP panel unit root tests, respectively.*** indicates statistical significance at the 1 percent level. Probabilities for Fisher-type tests are computed by using an asymptotic chi-square distribution. All other tests assume asymptotic normality. A time trend and an intercept included in all underlying specifications. The modified AIC was used to select the optimal lag length.

Threshold variables

Once the time series are detrended, we must check the null of linearity and determine the 'best' threshold variable. We consider two potential candidates in turn: cyclical self-employment and cyclical unemployment, lagged by one period.

On the one hand, it appears logical that past cyclical self-employment influences in the regime switching: a higher cyclical self-employment rate implies a different impact on future self-employment rates –inertia-. On the other hand, it is also possible that a higher cyclical unemployment rate -the lack of job offers lasting for longer than one year- can lead changes into the initial occupational decisions (deciding to become entrepreneurs as last resort) than a lower level.

As it is usual in the estimation of a panel threshold regression models, we discriminate amongst these two candidates according the following criteria: we select as threshold variable one that minimizes the sum of squared residuals (Hansen, 1999) and that leads to the strongest rejection of the linearity hypothesis. After selecting the threshold variables, the estimation of the panel threshold regression model involves to check, whether the threshold effect is statistically significant relative to a linear specification and to determine the number of thresholds. In particular, the null hypothesis (linearity) is tested by a likelihood ratio test where the sum of the squared residuals of a specification

with *r* regimes is tested again a specification with *r+1* regimes. The process stops when the null is not rejected.

Table 2. Linearity test and tests for threshold effects

Regimes	Threshold variables	
Test for single threshold (two regimes)	S_{t-1}^{C}	u_{t-1}^{C}
RSS	47.689	47.403
F_1	3.144	8.154
p-value	0.560	0.037
(10%, 5%, 1% critical values)	(7.283, 8.216, 12.036)	(6.110, 7.845, 10.996)
Test for double threshold (three regimes)		
RSS		47.343
F_2		1.046
p-value		0.970
(10%, 5%, 1% critical values)		(7.433, 9.118, 12.789)

Note: F_1 and F_2 are the likelihood ratio statistics, p-values are obtained with 300 simulations (Hansen, 1999). RSS: Residuals Sum of Squared.

The results of the linearity tests and the determination of the number of thresholds are reported in table 2. The likelihood ratio test F_1 clearly lead to the rejection of the null hypothesis of linearity of the relationship, only when the lagged cyclical unemployment is the threshold variable selected. This evidence corroborates the decision of estimating the model in non-linear form and this means that there are at least two regimes. According to Hansen's procedure, it would be necessary to estimate and test two thresholds, and so on, until the corresponding F-test is statistically non-significant. Following this strategy, the likelihood ratio test F_2 is not statistically significant at level of 10 percent for lagged cyclical unemployment. Therefore, the selected model is one with two regimes where the optimal threshold variable is the cyclical unemployment lagged one period.

Threshold values for this model of two regimes and the estimates of the parameters of the panel transitions regression model and the corresponding *t-statistics* based on standard errors corrected for heteroskedasticity are reported in tables 3 and 4.

Table 3.Threshold estimates.

	Estimate	95% confidence interval
$\hat{\gamma}_1^r$	0.838	[-1.188, 1.118]

Threshold estimate shows when the transition between the two regimes occurs. For example, if cyclical unemployment is greater than 0.838, the country concerned switches to the second regime. Hence, the first regime would occur when the cyclical component of the unemployment rate is below 0.838. As we can see this is the usual regime (see table 5). By contrast, the relative unusual regime would occur when the cyclical unemployment is above 0.838.

Table 4. Regression estimates: single threshold model

Regressor and Regime	Coefficient estimate
$u_{it}^c I(u_{it-1}^c \leq 0.838)$	-0.019* (0.010)
$u_{it}^c I(u_{it-1}^c > 0.838)$	0.038*** (0.015)

Note: Standard error in brackets. ***,** and * significance level at 1%, 5% and 10% respectively.

The estimated two-regime threshold panel regression model is reported in Table 4, where significant effects appear in both regimes.

In the cases in which the deviation between the observed and the natural unemployment rate is higher than 0.838 the relationship between the cyclical self-employment and the cyclical unemployment is positive –i.e. a value of the unemployment gap above 0.838 produces upward pressure on the self-employment rate in the subsequent year. By contrast, when the cyclical unemployment is below the threshold –i.e. the most usual regime-, a negative shock in the employment rate leads a reduction in the self-employment rate.

The interpretation of the previous findings is as follows. When the cyclical unemployment is very high, negative shocks in employment causes upward pressure on the self-employment rate. Job offers become scarcer due to the decline in the economic

activity hence more people start their own businesses face the lack of opportunities of jobs in the salaried sector. Importantly though, we observe the opposite phenomenon when the cyclical unemployment rate is above the estimated threshold value. These results suggest that the recession-push hypothesis is only valid when economic circumstances are poor, i.e. when cyclical unemployment rates are (very) high.

However, when the difference between the observed and natural unemployment rates is small in magnitude, the relationship is negative. In other words, the smoothest negative shocks on employment rates, or the positive ones leads substantial decreases in self-employment rates as pull hypothesis stands.

According to the estimated threshold values, we can deduce the distribution of the countries among the different regimes (table 5) and plot these transitions, taking into consideration time and countries (Figure 1).

Table 5. Data distribution between regimes and countries

	Lower (first)	**Upper (second)**
Australia	32	6
Austria	37	1
Belgium	30	8
Canada	31	7
Denmark	29	9
Finland	29	9
France	33	5
Germany	31	7
Greece	35	3
Iceland	35	3
Ireland	26	12
Italy	34	4
Japan	38	0
Luxembourg	37	1
The Netherlands	29	9
New Zealand	32	6
Norway	35	3
Portugal	28	10
Spain	28	10
Sweden	30	8
Switzerland	36	2
United Kingdom	27	11
United States	30	8

Note: The threshold variable is the cyclical unemployment lagged by one period.

We observe that the majority of observations are in the first regime, which correspond to a negative relationship. However, observations of Ireland, Portugal, Spain and the UK are often in the second regime. Importantly, in 2009, the last year of our sample only nine countries were in the first regime (Austria, Belgium, Germany, Japan, Luxembourg, The Netherlands, Norway, Switzerland, and the US).

In sum, according to our results, the null hypothesis on the existence of a linear relationship is rejected in favor of an asymmetric one, characterized by a two-regime model, in which two opposite relationships characterize the dynamic adjustment path of the self-employment rate to unemployment shocks, depending on the magnitude of the cyclical unemployment. Only the most severe job destruction processes will lead increases positive shocks on self-employment rates.

4. Conclusions

There is an extended body of empirical literature on the relationship between unemployment and self-employment, but the exact nature of the relation is still a matter of concern. The lack of conclusive findings given the lack of robustness of a great part of extant research may be due to the limitations that the availability of data has imposed on the use of self-employment time series. In fact, traditionally time-series analysis of self-employment has been one of the least developed areas in the Economics of self-employment due to the low frequency and to the limited availability of long time series and harmonized data for multi-countries studies.

In addition previous arguments, findings on the relationship seem to be highly dependents of the time-span. This fact should put the possibility of a time-varying relationship at the centre of attention in the research agenda. Therefore, we must look for econometric approaches that should allow for nonlinearity in the relationship.

In that sense, the availability of a relatively long panel allow to apply a panel threshold regression model, in order to look for 'potential' asymmetries in the relationship exploiting the two dimensions of our data base.

Estimating the relationship with annual data for 23 OECD countries over the period 1972-2009, we find that the recession-push hypothesis is only valid when the cyclical unemployment rate is higher than 0.838. In other words, in times of high unemployment individuals are pushed into self-employment for the lack of alternative sources of income. Therefore, we can argue that the magnitude of the recession-push effect is non-linear depending on the labour market cycle, i.e. the effect only exists when unemployment is above the threshold.

Our results reflect that unemployed individuals are more inclined to start their own business when unemployment levels are high, compared to periods of low unemployment. An obvious factor to start a business in times of recession would be the lower job offer arrival rate, resulting in too difficulties for finding a paid job –specially for those who have the lowest educational attainment. Given the current international crisis, the regime of high unemployment, may be particularly relevant in present times in the most countries.

As with any research, there are limitations to this study. In particular, any aggregate study results should be interpreted with caution given that the composition of self-employment may be extremely different between countries –not only in terms of the type of business –SMEs versus large companies- but also in terms of the relative weights of employers and own-account workers in the business ownership. In addition, sectoral diversity between countries likely also plays an important role in explaining differences in

equilibrium rates of entrepreneurship and likely in the interplay between entrepreneurship and unemployment.

On this bases, an important avenue for future research should 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.

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