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*P.D. Koellinger*
*A.R. Thurik*

*Erasmus School of Economics, Erasmus University Rotterdam, EIM Business and Policy Research, Zoetermeer, The Netherlands, and Tinbergen Institute.*

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**Tinbergen Institute Amsterdam**
Roetersstraat 31
1018 WB Amsterdam
The Netherlands
Tel.: +31(0)20 551 3500
Fax: +31(0)20 551 3555

**Tinbergen Institute Rotterdam**
Burg. Oudlaan 50
3062 PA Rotterdam
The Netherlands
Tel.: +31(0)10 408 8900
Fax: +31(0)10 408 9031

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# Entrepreneurship and the Business Cycle

**P.D. Koellinger*, and A.R. Thurik***

*Erasmus School of Economics, Erasmus University, Rotterdam, P.O. Box 1738, 3000 DR, Rotterdam, the Netherlands and EIM Business and Policy Research, P.O. Box 7001, 2701 AA Zoetermeer, the Netherlands, koellinger@ese.eur.nl and thurik@ese.eur.nl

**Abstract**: we study the cyclical pattern of entrepreneurial activity. Results across 22 OECD countries for the period 1972-2007 show that entrepreneurial activity is a leading indicator of the business cycle in a Granger-causality sense. This contradicts existing theoretical hypotheses which predict that entrepreneurship is pro-cyclical or not cyclical. We discuss the causes and implications of this finding which have immense policy relevance during the second economic crisis of the 21st century.

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**Contact**: koellinger@ese.eur.nl

# 1. Introduction

Unlike the first economic crisis of the 21st century the second is of gigantic proportions. This stimulates novel ways of investigating the mechanics of business cycles. The major structural changes in modern economies towards one where entrepreneurship plays an important role (Audretsch and Thurik 2001, Audretsch 2007b) are not mirrored by studies of its role in macroeconomic models of business cycles. There are a few exceptions dealing with the assumed role of entrepreneurship or its derived role. To our knowledge no empirical evidence of the interplay of entrepreneurship and the cycle exists. We test the theoretical predictions found in the literature with real data. Our results reject the two main theoretical predictions – independence and procyclicality. Instead, we find that entrepreneurship – on average across countries - is a leading indicator of the cycle and Granger-causes increases of GDP. This suggests that entrepreneurs have an essential role in explaining business cycle dynamics. And, more specifically, it suggests that entrepreneurs play an important part in recovering from economic recessions. We will discuss the policy implications in our concluding section. In section two related literature is discussed. Section three deals with the analysis of the co-movement of GDP, unemployment and business ownership using data of 22 OECD countries for the period 1972-2007; a robustness check using data of the Global Entrepreneurship Monitor for the period 2001-2006 and an analysis of cross-country heterogeneity. In the discussion of section four our empirical results will be linked to the theoretical ones presented in the section on related research. Also, a further interpretation of our results is given and policy implications are provided.

# 2. Related literature

Bernanke and Gertler (1989) study the influence of entrepreneur's net-worth on borrowing conditions and the resulting investment fluctuations in a neoclassical model of the business cycle. The key to their analysis is the principal-agent problem between entrepreneurs and lenders: only entrepreneurs can costlessly observe the returns to their individual projects while outside lenders must jointly incur a fixed cost to observe these returns. The greater the "collateralizable" net worth of the entrepreneurs' balance sheet, the less will be the expected agency costs implied by the optimal financial contract. Since entrepreneurs' net worth is likely to be procyclical, i.e. entrepreneurs are more solvent during good times; there will be a decline in agency costs and an increase in real investments during booms. The opposite happens during recessions. Hence, an accelerator effect emerges due to the principal-agent problem between entrepreneurs and lenders. The focus of Bernanke and Gertler (1989) is on the real effects caused by random fluctuations in balance sheets (e.g. due to an unanticipated fall in real estate prices) and not on entrepreneurship per se. This is reflected in their simplifying assumption that the share of entrepreneurs in the economy is independent of business cycle fluctuations.

In a related spirit, Carlstrom and Fuerst (1997) extended the work of Bernanke and Gertler (1989) by developing a computable general equilibrium model that can capture the propagation of productivity shocks through agency costs quantitatively. Similar to Bernanke and Gertler, the model of Carlstrom and Fuerst also assumes that the share of entrepreneurs in a population is a constant which does not fluctuate with the cycle. Although this is not a theoretical result, it can be viewed as a natural null hypothesis. This is the first hypothesis we will put to an empirical test.

The only theoretical business cycle model we are aware of that examines the share of entrepreneurs endogenously is Rampini (2004). In this real business cycle model, the risk associated with entrepreneurial activity implies that the amount of such activity should be

procyclical, which also results in the amplification and intertemporal propagation of productivity shocks. The story goes roughly like this: agents are risk averse and can choose between a risk-free production technology (i.e. wage employment) and a risky production technology (i.e. entrepreneurship). Productivity shocks shift the output of both technologies by a constant. As a result, all agents are wealthier during economic booms. The risk-free production technology is always available, which implies no structural unemployment. Furthermore, it is assumed that the expected value of risky entrepreneurship exceeds the opportunity costs of risk-free employment. Hence, all agents prefer entrepreneurship over employment. But the share of entrepreneurs is restricted by a financial intermediary who determines the optimal rate of entrepreneurship knowing the productivity shock of the period, the wealth and preferences of agents, and who designs an optimal incentive contract that allows entrepreneurs to insure a part of their risk via leverage. Since all agents are wealthier as a result of positive productivity shocks and risk aversion is assumed to decrease with wealth, it is optimal to have a higher share of entrepreneurs during economic booms.[1] Furthermore, it is also argued in the spirit of Bernanke and Gertler (1989) and Carlstrom and Fuerst (1997) that agency costs are countercyclical since more utility is lost due to the moral hazard problem when productivity is low. Hence, Rampini (2004) concludes that entrepreneurship is procyclical even if agents have access to financial intermediaries. This is the second hypothesis we will put to an empirical test here.

Congregado, Golpe and Parker (2009) find some evidence of procyclicality of entrepreneurship in Spain whereas no evidence is found in the US. Their analysis uses unobserved components models distinguishing hysteresis (interdependent evolution of a non-stationary natural rate and a stationary cyclical component) from natural shocks. Discriminating between employer self-employment and own-account self-employment in Spain the former is established to move procyclical whereas the latter evolves countercyclical.

# 3. Analysis

The present section consists of three parts. The first deals with the analysis of the co-movement of GDP, unemployment and business ownership using data of 22 OECD countries for the period 1972-2007. Both bilateral correlations and a simple three variable vector autoregressive model will be presented. The second is concerned with a robustness check using data of the Global Entrepreneurship Monitor survey for the period 2001-2006. The data material allows for an investigation of various types of nascent entrepreneurship. The third consists of an analysis of cross-country heterogeneity to establish to what degree results are driven by a few countries that exhibit a particular strong relationship between entrepreneurship and the cycle.

## 3.1. Entrepreneurship, unemployment and the cycle using OECD data

We construct a balanced cross country panel for 22 OECD countries[2] for the period 1972-2007 using various data sources. OECD data are used for annual real GDP in constant 2000 prices and national currencies and for standardized unemployment rates.

[1] Alternatively, one could argue that risk preferences remain constant over time but higher wealth of agents during booms reduces liquidity constraints and hence increases entrepreneurial activity (Evans and Jovanovic, 1989).

[2] The included countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and USA. These are the 23 old OECD countries with Germany left out because we are unable to correct for the influence of its unification on the time series.

Entrepreneurial activity per country and year is measured as the share of business owners in the total labor force[3], using data of *Compendia 2007.1* which corrects for measurement differences across countries and over time.[4] This is a broad measure of entrepreneurial activity that includes incorporated self-employed (owner-managers of incorporated businesses) and self-employed with and without employees but excludes unpaid family workers[5]. The business ownership rate also excludes so-called "side-owners' who generate less than 50% of their income by running their own business.

A disadvantage of using business ownership as a measure of entrepreneurial activity is that it does not fully capture early-stage ventures that do not yet generate a substantial contribution to the owner's income. In addition, business ownership rates reflect to some extent existing industry structures rather than the introduction of new economic activity in the Schumpeterian (1934) and Kirznerian (1973) sense.[6] To address these conceptual shortcomings of business ownership rates as a measure of entrepreneurial activity, in section 3.3 we use data from the Global Entrepreneurship Monitor (GEM) as a second measure for robustness checks (Reynolds et al. 2005).

Following the convention to define the business cycle as deviations from long term trend in GDP data, we decompose time series into trend and cycle using the Hodrick-Prescott filter (Hodrick and Prescott 1997), below referred to as the HP filter. The HP filter is a standard method for removing trend movements that has been applied both to actual data and artificial data in numerous studies (see Ravn and Uhlig 2002 for examples). The smoothing parameter $\lambda$ of the filter, which penalizes the acceleration in the trend relative to the business cycle component, needs to be specified. Most of the business cycle literature uses quarterly data and a $\lambda$ value of 1600 which has been suggested by Hodrick and Prescott (1997). Unfortunately, business ownership rates are only available on an annual basis. Since the time period over which aggregation takes place affects the variances of the process at discrete time intervals, the $\lambda$ value has to be adjusted. Ravn and Uhlig (2002) show that the appropriate $\lambda$ value for annual data is 6.25, which is the value we use for our analysis.

Figure 1 shows average deviations of real GDP (corrected for inflation) and business ownership rates from their long term trend across countries. Five cycles are clearly visible. Casual observation of the two cyclical graphs suggests at least two phenomena. First, economic recoveries and boom periods in the last 35 years where typically preceded by rising levels of business ownership. In particular, the long economic upturn in the mid 1990s that culminated in the burst of the high tech bubble in 2000 and the recovery from the recession after 2001 was led by a rise in entrepreneurial activity. In addition, the long recovery from the oil crisis recession 1975-1980 was preceded by an upswing in entrepreneurship which started to increase in 1975 and reached its cyclical peak in 1978. Second, cyclical entrepreneurship typically reaches its maximum and starts declining just before a cyclical boom in GDP reaches its maximum. The only exception from this trend was the boom of 1990 which happened to coincide with the business cycle. Both observations suggest that entrepreneurship is typically a leading indicator of the business cycle.

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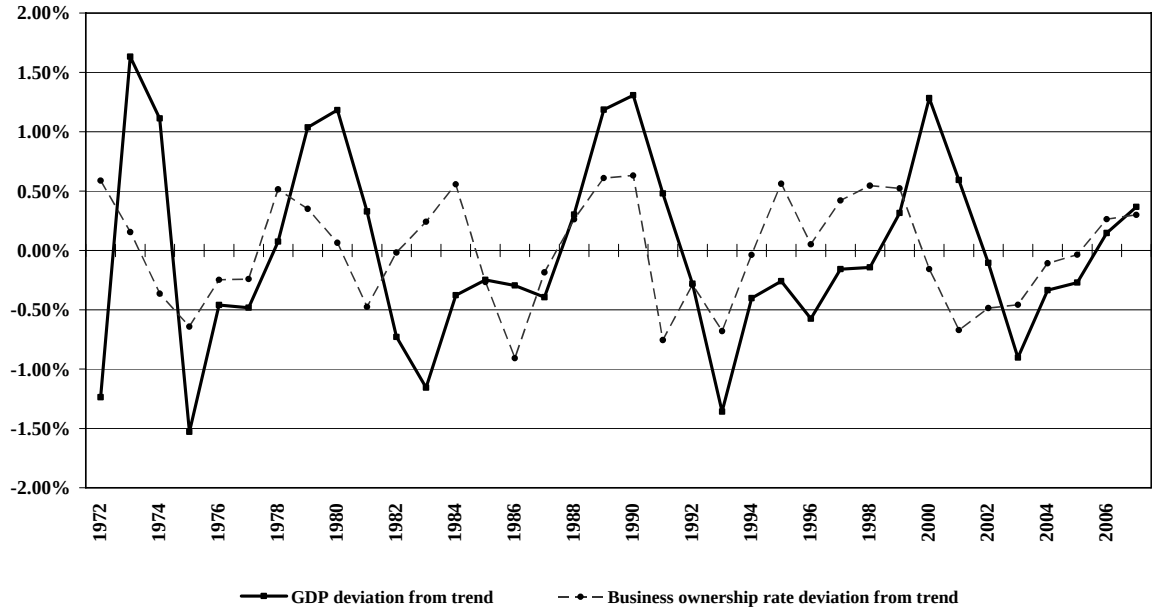
[3] The total labor force is the sum of the employed and the unemployed.

[4] Data are constructed by EIM (Zoetermeer, NL) on the basis of OECD material. See http://www.ondernemerschap.nl for the data and van Stel (2005) for a justification of the method. Quarterly data of business ownership rates are not available.

[5] Unpaid family owners can be regarded as irrelevant for measuring the extent of entrepreneurship since they do not own the business they work for and do not bear responsibility and risk in the same way as 'real' entrepreneurs do.

[6] Despite these disadvantages the business ownership rate is widely used: in Thurik at al. (2008) investigating the interrelationships between entrepreneurship and unemployment; in Erken et al. (2008) measuring the influence of entrepreneurship on Total Factor Productivity and in Carree et al. (2002) studying the influence of economic development.

**Figure 1 - Average deviations of real GDP and self-employment rates from trend in percent across 22 OECD countries**




We investigate the co-movement and phase shifts between trend deviations of real GDP and the business ownership rate in Table 1 using bivariate correlations. The degree of contemporaneous co-movement with real GDP is indicated in the *t* column. The statistic in that column is the correlation coefficient of the cyclical deviations from trend in percent between the two time series. A number close to one would indicate that entrepreneurship is highly *procyclical*; a number close to minus one would indicate high *countercyclicality*. What we find is a number that is not significantly different from zero. This descriptive evidence speaks against Rampini's (2004) hypothesis that entrepreneurship is procyclical.

The remaining columns of the table display correlation coefficients between the time series[7] that have been shifted forward and backward by one to three years, indicating whether one series leads or lags the other. The business-ownership rate tends to lead the cycle by one to two years, meaning that the business-ownership cycle peaks before the GDP cycle. This is consistent with the evidence presented in Figure 1. Although the correlation is not very strong, it is highly significant. In addition, the peak of the business cycle is typically followed by a decline in the business-ownership rate in the three consecutive years. This time pattern of co-movement between the two series speaks against the assumption that entrepreneurship is independent from the cycle (Bernanke and Gertler 1989, Carlstrom and Fuerst 1997).

A possible reason for the observed decline in entrepreneurial activity following an economic boom is better labor market opportunities and hence higher opportunity costs to business ownership. Already Lucas (1978) shows how rising real wages increase the opportunity

[7] Below we will not repeat that time series are 'detrended' or that time series are relative to real GDP, the unemployment rate and the business ownership rate, respectively.

cost of self-employment, inducing marginal entrepreneurs to become employees.[8] To explore the relationship between labor market dynamics and business ownership, we included the unemployment cycle in Table 1. As expected, unemployment is strongly countercyclical and decreases at the peak of the cycle and in the following year. This pattern suggests that unemployment and business ownership rates could indeed be related.

**Table 1 – Cyclical time patterns of real GDP**

| | **Bivariate correlation of real GDP cycle with** | | | | | | |
|---|---|---|---|---|---|---|---|
| Lags in years | *t-3* | *t-2* | *t-1* | *t* | *t+1* | *t+2* | *t+3* |
| **business-ownership rate cycle** | -0.01 (N=704) | 0.08** (N=748) | 0.10*** (N=770) | 0.03 (N=792) | -0.06* (N=770) | -0.11*** (N=748) | -0.08** (N=726) |
| **unemployment cycle** | 0.08** (N=704) | 0.18*** (N=748) | -0.03 (N=770) | -0.45*** (N=792) | -0.34*** (N=770) | 0.05 (N=748) | 0.20*** (N=726) |
| * denotes significance at >90% confidence<br>** denotes significance at >95% confidence<br>*** denotes significance at >99% confidence<br>Data for 22 OECD countries 1972-2007. | | | | | | | |

We explore the cyclical co-movement of unemployment and business ownership rates in Table 2. The correlation coefficients show that unemployment leads the business-ownership cycle by 1 to 2 years. Hence, increasing levels of unemployment are followed by a rise in business ownership. This effect has been labeled as "supply push" in the literature.[9] Furthermore, and maybe more importantly, Table 2 also shows that unemployment figures tend to fall some 1 to 2 years after a surge in business ownership rates. Although this pattern is partly a result of the general upswing in economic activity which tends to follow an expansion of entrepreneurial activity (see Table 1), it is also possible that part of the effect is due to the additional economic activity and the jobs created by new entrepreneurial firms.[10]

**Table 2 – Cyclical time patterns of business ownership**

| | **Bivariate correlation of business-ownership cycle with** | | | | | | |
|---|---|---|---|---|---|---|---|
| Lags in years | *t-3* | *t-2* | *t-1* | *t* | *t+1* | *t+2* | *t+3* |
| **unemployment cycle** | -0.01 (N=704) | 0.06* (N=748) | 0.07** (N=770) | 0.01 (N=792) | -0.08** (N=770) | -0.08** (N=748) | -0.05 (N=726) |
| * denotes significance at >90% confidence<br>** denotes significance at >95% confidence<br>** denotes significance at >95% confidence<br>Data for 22 OECD countries 1972-2007. | | | | | | | |

The correlation patterns between GDP, unemployment and business ownership suggest co-movement that lends itself to a joint analysis in an autoregressive context. To this end, we estimate a simple three variable vector autoregression model with two lags, VAR(2), including deviations of business ownership, real GDP and unemployment from their trends (Lütkepohl 1993, Greene 2003). Our reduced form VAR(2) expresses each variable as a linear function of its

[8] Also see Schaffner (1993) while Iyigun and Owen (1998), assuming a distribution of risk aversion, argue that with rising economic development and as relatively 'safe' professional earnings rise, fewer individuals are willing to run the risk associated with becoming an entrepreneur.

[9] Oxenfeldt (1943) was one of the first to argue that unemployed individuals or individuals with low prospects for wage-employment may become self-employed to earn a living. This effect of unemployment, lowering the opportunity costs of self-employment and driving individuals to start their own business, is often referred to as the "supply push" or the "push effect of unemployment". Evidence of this effect has been provided in many studies (Gilad and Levine 1986, Storey and Jones 1987, Foti and Vivarelli 1994, Audretsch and Vivarelli 1996, Thurik et al. 2008).

[10] For example, in a study covering all establishments of private sector firms in Denmark, Malchow-Møller et al. (2009) estimate that 8% of total gross job creation in the economy is due to entrepreneurial firms.

own two past values and the two past values of the other two variables. The vector of errors is assumed to be serially uncorrelated with a contemporaneous covariance across equations. Specifically, we estimate

(1) $$\bar{y}_t = \bar{v} + \overline{A_1}\,\overline{y_{t-1}} + \overline{A_2}\,\overline{y_{t-2}} + \overline{u_t} \ ,$$

where

$\overline{y_t} = (y_{1t}, y_{2t}, y_{3t})'$ is a *3 x 1* random vector with
$y_1 =$ business ownership cycle,
$y_2 =$ real GDP cycle, and
$y_3 =$ unemployment cycle,
$\overline{A_1}$ and $\overline{A_2}$ are fixed *3 x 3* matrices of parameters,
$\bar{v}$ is a *3 x 1* vector of fixed parameters, and
$\overline{u_t}$ is assumed to be white noise; that is

$$E(\overline{u_t}) = 0$$
$$E\left(\overline{u_t}\,\overline{u_t}'\right) = \Sigma$$
$$E\left(\overline{u_t}\,\overline{u_s}'\right) = 0 \ \forall \ t \neq s$$

Model specification tests show that $\overline{u_t}$ is normally distributed[11] and variables are covariance stationary[12]. Wald tests for the lags of the endogenous variables are all significant, implying that none of the lagged coefficients is zero. Langrange-multiplier tests for autocorrelation (Johansen 1995) are insignificant for the first lag and significant for the second lag.

Table 3 reports the result of the corresponding Granger-causality tests (Granger 1969). Fluctuations in entrepreneurship help to predict GDP with 95% confidence. Hence, on average across countries we conclude that entrepreneurship Granger-causes the business cycle. Furthermore, fluctuations in entrepreneurship can be predicted by GDP and unemployment with 99% confidence. In other words, entrepreneurial activity is itself influenced by labor market opportunities and business cycle dynamics. For the purpose of the present paper it is important to note that entrepreneurship is far from independent of business cycle dynamics. Instead, entrepreneurs respond to changes in business conditions and labor market opportunities and provide a positive impulse for economies to recover from recessions.

[11] Jarque-Bera, skewness and kurtosis tests are all insignificant.
[12] All the eigenvalues lie inside the unit circle (see Lütkepohl 1993 for the specification of the test).

**Table 3 – Granger-Causality Wald Tests**

| | Dependent Variable in Regression | | |
|---|---|---|---|
| **Regressor** | GDP cycle | Business ownership cycle | Unemployment cycle |
| GDP cycle | 0.01 | 0.00 | 0.00 |
| Business ownership cycle | 0.03 | 0.04 | 0.30 |
| Unemployment cycle | 0.17 | 0.01 | 0.32 |

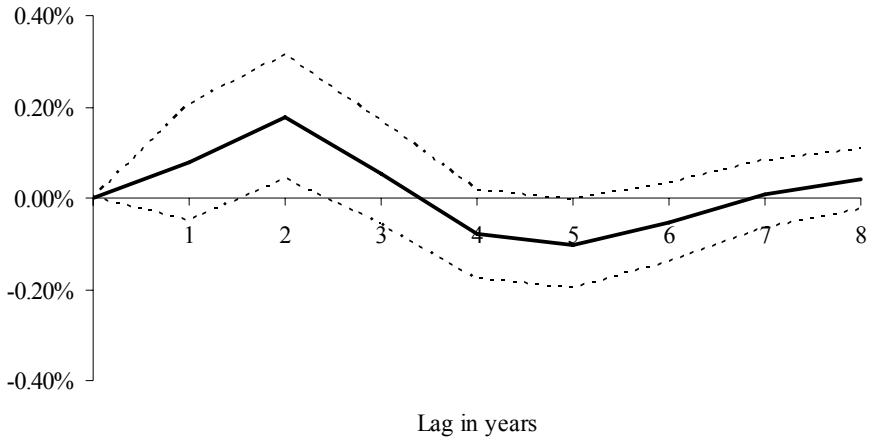
Notes: Results were computed from a vector auto regression with two lags and a constant term over the annual cross-country averages for the 1972-2007 period. Entries show the *p*-values for *Chi2*-tests that lags of the variable in the row labeled **Regressor** do not enter the reduced form equation for the column variable labeled **Dependent Variable**.

Based on the estimates from (1), we compute orthogonalized impulse response functions (Sims 1980) that allow to investigate the thought experiment how a random shock in entrepreneurship affects real GDP and unemployment in a later phase, holding everything else constant.

Figure 2 shows that an unexpected 1% rise of the business ownership rate is succeeded by a 0.08% rise of real GDP in year *t+1* and by a 0.18% rise in *t+2*. The plotted 90% confidence interval suggests that the effect is highly significant in the second year after the impulse. In subsequent years, the effect of the positive entrepreneurship shock levels out. Hence, we conclude that entrepreneurship is not procyclical. Instead, it is a leading indicator of the business cycle and Granger-causes upswings.

To illustrate the strength of the effect, consider the following numerical example. The average business ownership rate in our sample across countries for the year 2007 is 13.4%. Now assume that this rate does not change until 2008 when the economy slides into a recession of -3% below its long-term growth path. Then in this scenario, a random increase in the business ownership rate in 2009 to 15.7% of the total labor force across countries (i.e. an increase of 17% compared to 2008) would be sufficient to recover from the recession within two years.

**Figure 2 – Shock in business ownership to real GDP**

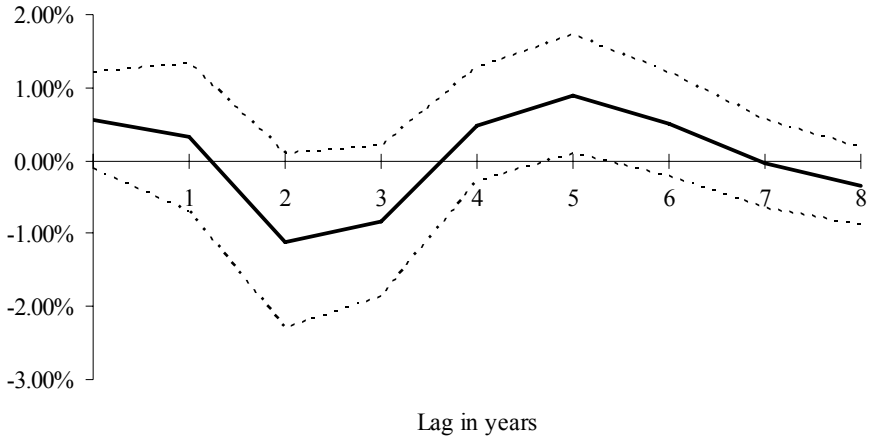



Note: Orthogonalized impulse response function in the business-ownership/unemployment/real-GDP VAR(2), with 90% confidence interval

Similarly, the impulse response in Figure 3 shows that an unexpected increase in the business ownership rate leads to a decrease in unemployment 2-3 years later. The effect is weakly significant.

These observations point to an important function of entrepreneurship particularly in times of economic recessions: an impulse of entrepreneurial activity is typically followed by economic recovery and a decrease in unemployment.

**Figure 3 – Shock in business ownership to unemployment**




Note: Orthogonalized impulse response function in the business-ownership/unemployment/real-GDP VAR(2), with 90% confidence interval

## 3.2. Entrepreneurship and the cycle using GEM data

As a robustness check, we examined a second measure of entrepreneurial activity from a different data source, the Global Entrepreneurship Monitor (GEM). GEM is currently the largest and most widely recognized cross-country research initiative to study the prevalence, determinants and consequences of entrepreneurial activity. The core activity of GEM is the annual compilation of empirical data on entrepreneurial activity based on a random sample of at least 2,000 adult-age individuals in each of the participating countries (Reynolds et al. 2005). The GEM survey uses three questions to identify nascent entrepreneurs:

1. Over the past twelve months have you done anything to help start a new business, such as looking for equipment or a location, organizing a start-up team, working on a business plan, beginning to save money, or any other activity that would help launch a business? (yes, no, don't know / refuse)
2. Will you personally own all, part, or none of this business? (all, part, none, don't know / refuse)
3. Has the new business paid any salaries, wages, or payments in kind, including your own, for more than three months? (yes, no, don't know / refuse)

An individual is coded as a nascent entrepreneur, if he or she answered "yes" to question 1, "all" or "part" to question 2 and "no" to question 3. Thus, a nascent entrepreneur is defined as someone who has, during the 12 months preceding the survey, done something tangible to start a new firm; who expects to own at least part of this new firm and who has not paid wages for more

than three months.[13] GEM data on the prevalence of nascent entrepreneurs in percent of the adult population are available for all the OECD countries of our previous exercise for the time period 2001-2006 with the exception of Luxembourg. However, not all countries participated in GEM every year, yielding an unbalanced panel structure.

An advantage of using GEM data is that nascent entrepreneurs are categorized by their start-up motive (opportunity vs. necessity) and by the self-evaluated innovativeness of their venture. Hence, we can examine if different types of entrepreneurship show different patterns of relation with the business cycle. The differentiation between opportunity and necessity entrepreneurs is available for the entire time period 2001-2006. Nascent entrepreneurs were asked if they are involved in their start-up/firm to take advantage of a business opportunity or because they have no better choices for work (Reynolds et al. 2005). Below, we consider the share of opportunity and necessity nascent entrepreneurs, leaving aside those who said they engaged for both reasons or did not know.

In addition, the GEM surveys 2002-2004 included three follow-up questions relating to the innovativeness of the business idea of individuals who qualify as nascent entrepreneurs. These follow-up questions ask the nascent entrepreneur about the novelty of the technology she attempts to use, the novelty of the product or service to her potential customers, and the expected degree of competition in the market she wishes to enter (Hessels et al 2008). Hence, these questions can be used to construct a profile of the innovativeness of business ideas pursued by nascent entrepreneurs. We define purely imitative entrepreneurs as nascent entrepreneurs who have neither a product nor a process innovation and expect many business competitors in the market they enter (Koellinger 2008). Due to the short time series of GEM data, we do not decompose these time series and restrict our analysis to bivariate correlations with GDP deviations from trend.

Table 4 summarizes the bivariate correlations of the lagged variables. Nascent entrepreneurship (row 1) exhibits a pattern similar to the business-ownership rate in Table 1: nascent entrepreneurial activity is followed by a significant increase in GDP two years later. Two differences to Table 1 are noteworthy. First, the strongest positive correlation between nascent entrepreneurship and future GDP is found in t-2, while the peak in the business ownership is a little later, in t-1. This is what we should expect given that the GEM measure captures entrepreneurial activity in an earlier stage, before most ventures start to contribute significantly to the entrepreneur's income. Second, the correlation coefficients are higher for the GEM measure (although the significance levels are lower due to the much smaller number of observations). Given that the GEM measure was constructed to measure entrepreneurship and is not just a side-product of official labor-market statistics, one would also expect that it is a better measure of entrepreneurial activity in the Schumpeterian (1934) or Kirznerian (1973) sense. Hence, finding stronger correlations between the GEM measure and GDP adds credibility to our previous findings.

Interestingly, a comparison of the coefficients in rows 2 and 3 shows that innovative entrepreneurship has a much stronger positive impulse on the economy than imitative entrepreneurship. In fact, innovative entrepreneurship has the strongest positive correlation with future GDP of all measures of entrepreneurial activity included in this study. Again, this is what we should expect if innovative new businesses exhibit on average higher growth and better survival chances than imitative start-ups (Henrekson and Johansson 2009).

[13] GEM uses the information on the duration that wages have been paid to differentiate between nascent, young, and established entrepreneurs.

The comparison between start-up motives (row 4 and 5) indicates that opportunity entrepreneurship leads the cycle by two years, while necessity entrepreneurship leads the cycle by only one year and exhibits some mildly pro-cyclic features. A somewhat speculative explanation for the lagging behind of necessity entrepreneurship has to do with the 'legitimation' or 'moral approval' of entrepreneurship within a culture (Etzioni, 1987). In this case, if there is a higher level of 'legitimation' of entrepreneurship, then it will manifest itself widely, resulting in more attention for entrepreneurship within the educational system, a higher social status of entrepreneurs, and more tax incentives to encourage business start-ups. Obviously, this results in a higher supply of entrepreneurship. It may be that here we observe the cyclical variant of what Etzioni proposed as a cross section structural cause: the opportunity entrepreneurs pave the way for necessity entrepreneurs.

**Table 4 - Cyclical time patterns of real GDP with nascent entrepreneurial activity**

| | **Bivariate correlation of real GDP cycle with** | | | | | | |
|---|---|---|---|---|---|---|---|
| Lags in years | *t-3* | *t-2* | *t-1* | *t* | *t+1* | *t+2* | *t+3* |
| **Nascent entrepreneurship** | 0.12 (N=72) | 0.19* (N=92) | 0.11 (N=109) | 0.03 (N=109) | -0.05 (N=109) | -0.09 (N=109) | -0.13 (N=109) |
| **Innovative nascent entr.** | 0.06 (N=55) | 0.29** (N=55) | 0.22 (N=55) | 0.00 (N=55) | -0.13 (N=55) | -0.22 (N=55) | -0.07 (N=55) |
| **Imitative nascent entr.** | 0.00 (N=55) | 0.18 (N=55) | 0.15 (N=55) | 0.10 (N=55) | -0.04 (N=55 | -0.19 (N=55) | 0.01 (N=55) |
| **Opportunity nascent entr.** | 0.12 (N=71) | 0.20* (N=91) | 0.08 (N=108) | 0.03 (N=108) | -0.06 (N=108) | -0.09 (N=108) | -0.12 (N=108) |
| **Necessity nascent entr.** | -0.03 (N=71) | 0.09 (N=91) | 0.19** (N=108) | 0.14 (N=108) | 0.06 (N=108) | -0.01 (N=108) | -0.12 (N=108) |

* denotes significance at >90% confidence
** denotes significance at >95% confidence
*** denotes significance at >99% confidence
Data for Australia, Belgium, Canada, Denmark, Finland, France, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK and USA.

## 3.3. Country heterogeneity

Up to this point, we reported results for (unweighted) averages across countries. In addition to the analyses reported above, we repeat all analyses for every individual country. Table 5 presents the Granger-causality Wald tests of the business-ownership rate on real GDP.

**Table 5 – Heterogeneity across countries in Granger causality of business ownership on real GDP cycles**

| Country | Granger causality Wald test |
|---|---|
| Australia | 0.12 |
| Austria | 0.09 |
| Belgium | 0.09 |
| Canada | 0.28 |
| Denmark | 0.30 |
| Finland | 0.43 |
| France | 0.38 |
| Greece | 0.34 |
| Iceland | 0.70 |
| Ireland | 0.05 |
| Italy | 0.58 |
| Japan | 0.12 |
| Luxembourg | 0.30 |
| Netherlands | 0.86 |
| New Zealand | 0.92 |
| Norway | 0.05 |
| Portugal | 0.83 |
| Spain | 0.43 |
| Sweden | 0.72 |
| Switzerland | 0.73 |
| United Kingdom | 0.76 |
| USA | 0.01 |
| Notes: Results were computed from VAR(2) in equation (1) for the period 1972-2007. | |

Table 5 shows significant heterogeneity in the relationship between the business ownership rate and the business cycle across countries. Only 7 out of 22 countries exhibit a significant Granger-causality of entrepreneurship on the cycle. One of these 7 countries, the USA, has an atypical pattern in the impulse-response function: a small positive impulse of entrepreneurship on GDP in year *t+1* is followed by a significant negative impulse in *t+2*. It is also noteworthy that the aggregate result (Granger causality Wald test of 0.03, see table 3) is more significant than the result in 21 out of 22 countries. The only exception to this is the USA which already is an outlier in terms of the impulse-response function. Hence, we conclude that the aggregate result across countries is not driven by a few countries that exhibit a particularly strong relationship between entrepreneurship and the cycle.

But how else can we make sense of cross-country heterogeneity? A starting point is recognizing that averaging across countries eliminates random shocks in the data that occur in a particular country and year ($u_{it}$), but not those shocks that are systematic across countries for a particular year ($u_t$). Country-specific noise ($u_{it}$) could simply result from the fact that many country-specific variables influence the business cycle that are unanticipated by entrepreneurs, such as random shocks in government spending, taxes, (de)-regulatory incentives or monetary policy. For example, Leamer (2009) argues that the excessive volatility of US interest rates set by the Fed between 2000 and 2005 contributed to the rise and burst of the US real estate bubble in 2008 and the subsequent recession. Apparently, such unanticipated policy shocks can have strong effects on cyclical dynamics that overshadow the "real" impulses coming from innovations and entrepreneurial activity. This could explain why averaging across countries yields a much stronger and clearer picture than a country-by-country analysis: random country-specific policy

shocks are averaged out, reducing noise and disclosing the "real shocks" entrepreneurial activity exerts on the (world) economy.

# 4. Discussion

Our results suggest an important, active role of entrepreneurs in the business cycle. Rather than passively reacting to productivity shocks or ignoring them, entrepreneurs seem to create positive productivity shocks and innovations that give an impulse to the economy. This active role of entrepreneurs in the business cycle has been largely ignored up to now. In particular, the few theoretical models of the business cycle that incorporate entrepreneurial activity do not take into account the opportunity costs of potential entrepreneurs (i.e. accepting a potentially more attractive wage job) and hence failed to see the connection between the labor market, entrepreneurial behavior and the cycle.

Our results strongly reject the two hypotheses that (1) the share of entrepreneurs in the population is independent from the cycle (Bernanke and Gertler, 1989, Carlstrom and Fuerst, 1997) and that (2) the share of entrepreneurs is procyclical (Rampini, 2004). The first hypothesis is not an explicit theoretical result but rather a convenient modeling assumption. Hence, it may not come as a big surprise that the empirical data contradict it. But why do we fail to find the pattern Rampini's (2004) model suggests?

One potential reason is that Rampini assumes decreasing absolute risk aversion of agents. This assumption drives the conclusion that entrepreneurial activity is pro-cyclical because it implies that a higher average wealth of agents as a result of positive productivity shocks leads to a higher optimal share of entrepreneurs. However, prospective entrepreneurs might not be primarily concerned about *expected* payoffs in evaluating the attractiveness of different occupational choices. Rather, they might evaluate their current income relative to some reference point such as the average income or their previous income.[14] Agents who have a current income that falls below this reference point, for example as a result of losing their job in a recession, may exhibit risk seeking behavior (Kahneman and Tversky 1979, Payne, Laughhunn and Crum 1981, Wehrung 1989, Tversky and Kahneman 1992, Tversky and Wakker 1995). The mechanism leading to pro-cyclical entrepreneurship in Rampini's model would cease to work if a significant share of the population exhibits increasing absolute risk aversion, in particular if this share would increase during recessions.

A second reason is Rampini's assumption that on average entrepreneurs make profits that exceed their opportunity costs. This seems to be at odds with empirical evidence. New entrepreneurs have extremely high drop out rates. For example, Evans and Leighton (1989) report for the United States that about a third of entrants leaves self employment within three years. Similarly, Dunne, Roberts and Samuelson (1988) study US Census of Manufacturers' data and find that on average 61.5% of all firms exit in the first five years following the first census in which they are observed. Such high failure rates have repercussions on the financial attractiveness of entrepreneurship: using US data, Hamilton (2000) shows that staying in a wage job or moving back to it makes more economic sense than starting a new business, except for the highest 25% of entrepreneurial incomes. Hence, contrary to expectation, entrepreneurship is a career choice that does not pay on average. In addition, entrepreneurial investments into their

[14] The minimum wage level can also be an evaluation point for countries with a generous social safety system. Nooteboom (1985) developed a theory where retail profit margins are influences by the minimum wage level. See also Nooteboom and Thurik (1985).

own companies also exhibit comparatively low returns: Moskovitz and Vissing-Jørgensen (2002) have investigated the risk-return profile of investments in private enterprises and found them to be inferior to those in publicly traded assets such as stocks. In essence, empirical evidence suggests that entrepreneurship is not a wise career or investment choice from a purely monetary perspective. The low payoffs to entrepreneurship have been attributed to non-financial preferences such as a taste for independence and being your own boss (Blanchflower and Oswald 1998, Blanchflower 2000, Blanchflower et al. 2001, Benz and Frey 2008, Block and Koellinger 2009) and judgmental errors such as overconfidence and excessive optimism of entrepreneurs (Cooper et al. 1988, Camerer and Lovallo 1999, Koellinger et al. 2008).

In the absence of strictly financial preferences and optimal decision making, there is no obvious reason why positive productivity shocks and countercyclical agency costs would imply procyclical entrepreneurship. In fact, one might even argue that the tendency of entrepreneurs to be overconfident leads to an information structure that is opposite to the classic principal-agent-problem assumed by Bernanke and Gertler (1989), Carlstrom and Fuerst (1997) and Rampini (2004): instead of borrowers being better informed than lenders, it may be that banks are more realistic and more efficient processors of relevant information than the entrepreneurs seeking finance. De Meza and Southey (1996) show theoretically that this perspective performs better in explaining the stylized facts about entrepreneurship.

Our interpretation of the present empirical findings is that entrepreneurs exert a part of the "real shocks" and "innovations" that drive dynamics in real-business-cycle models.[15] However, in contrast to the standard assumption that such shocks are exogenous; our results show that the share of entrepreneurs in the population systematically responds to changes in GDP and labor market conditions. In particular, entrepreneurship tends to rise in response to a lack of employment alternatives in economic recessions. While unemployment surges during recessions (Kydland and Prescott 1990, Hall 2005, Elsby et al. 2009), this increase in unemployment causes a lagged raise in self-employment as a result of a lack of employment alternatives (Evans and Leighton 1990, Caliendo and Uhlendorff 2008, Thurik et al. 2008). Even though many nascent entrepreneurs seem to be "forced" into self-employment by a lack of wage employment opportunities during recessions, this new entrepreneurial activity helps the economy to recover from the trough. To paraphrase Dr. Johnson, "hanging is a powerful stimulus to imagination" (found in Baumol 2002, p. 10) and the alternative of unemployment can cause people to start businesses with rather wild, innovative ideas. In fact, Koellinger (2008) shows that nascent entrepreneurs who were previously unemployed pursue more innovative ventures. Of course, many of them will ultimately fail, but some will turn out to be growth miracles. This additional entrepreneurial impulse during recessions can stimulate the economy and eventually create new jobs, which will in turn raise the opportunity costs to start a business for other agents. The subsequent increase in wages and inflation goes along with a drop in entrepreneurial activity and indicates the next coming recession. Hence, the business cycle with an endogenous share of entrepreneurs in the population becomes more similar to a 'perpetuum mobile'. Adopting this causal interpretation of our empirical results means adopting a story of a self-perpetuating business cycle. This story has the potential to reduce our dependence on the assumption of exogenous shocks to explain the continuing reoccurrence of the cycle.

Our results are limited by the fact that a more fine-grained analysis using quarterly data, longer time frames and the inclusion of non-OECD countries is currently not possible due to a lack of available data. However, we do not see obvious conceptual reasons why we would expect

[15] This interpretation is related to a similar one explaining the structural forces that lead to the creation of knowledge, its diffusion and commercialization and the role played by entrepreneurship (Audretsch 2007a, Braunerhjelm 2008).

to find different results if these data would be available. Moreover, it is doubtful if quarterly data would contribute to the fine-tuning of our models since the time span between the idea of setting up a business and realizing its setup may vary considerably depending upon many factors like the level of novelty of the product, the financial means of the founder, her or his determination, specific regulatory obstacles, etc (Grilo and Thurik, 2008). Since these factors and their influence are expected to vary over time and country, shorter time spans will bring about new measurement issues. The same holds for terminating a business. The use of non-OECD countries would pay off since time and again the level of economic development has been proven to influence the relation between entrepreneurship or small firms' share and economic growth (van Stel et al. 2005, Beck et al. 2005).

The second crisis of the 21st century is a financial one, a global one and a very serious one. So, it needs a comprehensive cleaning up of the banking sector, international coordination to prevent beggar-thy-neighbor sentiments and stimulation of demand. There are disagreements about the latter Keynesian remedy. A Schumpeterian remedy is no full substitute for the Keynesian one but should be seriously considered. Its tradition tells us that economic structure plays an important role. The essential question in this tradition is to what extent an economic structure uses the input factors most efficiently. This efficient structure does not change as long as the underlying determinants remain the same. These determinants have changed dramatically since the advent of the information and communication technology revolution which together with the fall of communism led to the entrepreneurial economy (Audretsch and Thurik 2001) or even to the entrepreneurial society (Audretsch, 2007b). Also, entrepreneurship and its innovative component, is shown to contribute to economic growth.[16] The present analyses show that entrepreneurship not only plays a role in the structural sense but also in the cyclical sense. The intrinsic forces of the entrepreneurial economy could help fight the crisis. We give three examples. First, the effect of unemployment on entrepreneurship depends upon the level of unemployment benefits (Koellinger and Minniti 2009). Demand stimulation through raising unemployment benefits, which is the European instinct, is detrimental to recovery. Second, the cry for more regulation after the demise of the banking sector should not lead to an increase in other (entrepreneurial) parts of the economy.[17] Third, when also non-banking firms start applying for financial support arguing that they are 'system players', the question should be raised whether to support incumbent industries or future ones which may grow out of current entrepreneurial initiatives.

Clearly, an essential question is to what extent the second economic crisis of the 21st century is similar to the other crises in the 1972-2007 period when it comes to its response to entrepreneurial activity. The depth of the crisis makes it certainly different from the earlier ones. But the increasing importance of entrepreneurial energy points at the Schumpeterian policy option.

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[16] See Audretsch (2006) for a fine collection of scholarly contributions.

[17] Red tape is shown to be a major obstacle for entrepreneurial initiatives in a study covering 18 European countries and the US (Grilo and Thurik 2008).

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