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The relationship between entrepreneurial activity, the business cycle and economic openness

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Abstract
We investigate the interplay between entrepreneurial activity, the business cycle and unemployment in relation to the openness of the economy. Also, we explore to what extent the observation frequency (quarterly versus annual data) influences estimation results. Following empirical literature, we estimate a pooled VAR model of the three macroeconomic variables. Using both quarterly and annual data for 19 OECD countries over the period 1998-2007, we find that in the short run (after one quarter), a country’s entrepreneurial activity is stimulated when its business cycle is lagging the world’s business cycle, whereas in the medium run (after one to two years), entrepreneurial activity is stimulated when its business cycle is leading the world’s business cycle. This suggests that a country’s business cycle position relative to the world’s cycle creates different types of entrepreneurial opportunities depending on the time horizon considered. These results apply to relatively open economies only which suggests that economic openness plays a role for entrepreneurial opportunities related to a country’s cyclical performance.

Keywords: Entrepreneurship, self-employment, unemployment, business cycle, observation frequency, world trade, open economies

JEL codes: E32, L26

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1. Introduction

The importance of entrepreneurship for modern economies has been studied widely (see Carree and Thurik, 2010, Parker, 2009, and Van Praag and Versloot, 2007, for surveys). When considering the relation between entrepreneurship and macro-economic variables, there are three major concepts in macro-economics that one can focus on: the level of economic development, the growth of economic development and the business cycle.

First, regarding the relation between entrepreneurship and the level of economic development, the literature suggests that the rate of entrepreneurship is influenced by the level of economic development in a non-linear fashion via intermediate mechanisms such as sector structure, scale economies and occupational choice (Carree et al., 2002).

Second, there exists a literature dealing with the relation between entrepreneurship and the growth of economic development. New-firm start-up rates are often found to influence a region’s economic growth positively (Audretsch and Keilbach, 2004), although this may not be true under all circumstances (Mueller et al., 2008). When static measures of entrepreneurship are analyzed, such as self-employment (business ownership) rates, it is sometimes found that an ‘optimal’ rate of entrepreneurship exists so that economies may have less but also more entrepreneurs than is good for growth of economic development (Carree et al., 2002; Van Praag and Van Stel, 2013; Van Stel et al., 2014). Moreover, earlier investigations suggest that entrepreneurship not only causes economic growth but that economic growth also causes entrepreneurship: a two-way relation between entrepreneurship and macro-economic performance exists (Thurik et al., 2008).

Third, there is a small literature on the interplay between entrepreneurship and the business cycle (Parker, 2012a; 2012b). Large-scale empirical research is lacking. A notable exception is Koellinger and Thurik (2012). Using annual data for 22 OECD countries over the period 1972-2007, they estimate a VAR model that includes unemployment, self-employment and the business cycle and find that entrepreneurship Granger-causes the cycles of the world economy. The question of whether entrepreneurship is leading or lagging the cycle is also dealt with by Parker et al. (2012) using UK data. Lamballais Tessensohn and Thurik (2012) use Global Entrepreneurship Monitor data to examine the interplay between different kinds of nascent entrepreneurship and the business cycle for the period 2001 to 2011 for 21 countries. They find support for the hypothesis that some kinds of entrepreneurship are pre-cyclical with regard to the business cycle. Using Spanish data, Congregado et al. (2012) find that the magnitude of the so-called recession-push effect (i.e., the positive effect of unemployment on self-employment) is non-linear in the business cycle, i.e., the effect is disproportionally stronger when economic circumstances are worse. Faria et al. (2009) present a cyclical model for unemployment and entrepreneurship and find the estimated periodicity of the cycles for four OECD countries to lie between five and ten years.

The aim of the current paper is to extend the analysis of Koellinger and Thurik in two directions. First, we examine and compare both the short and medium term interplay between

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1 Country studies based upon this two-way relation include Baptista and Thurik (2007) and Thurik (2003).
2 A second pioneering study in this field is Golpe (2009).
3 The world cycle in Koellinger and Thurik (2012) is defined as the average cyclical deviation from a long-term trend for 22 OECD countries included in their study.
entrepreneurship, the business cycle and unemployment by using quarterly and annual data for 19 OECD countries over the period 1998-2007. By using data of different observation frequencies which cover (almost) the same period of time, we are able to investigate whether relations are different depending on the time horizon. Using annual data, previous studies have found that the relation between entrepreneurship and macro-economic performance differs in the short, medium and long run (Fritsch and Mueller, 2004). However, to our knowledge, the relation has never been studied using cross-country quarterly data. Second, the relation between entrepreneurship, the business cycle and unemployment may be different depending on the openness of the economy. For instance, world trade is an important determinant of entrepreneurial opportunities which in turn may influence the national business cycle. These effects are likely to be stronger in more open economies (Rodrik, 1998). Likewise, the impact of the world’s GDP cycle on an individual country’s labor market is likely to be stronger in more open economies. In order to study these effects, we reparametrize the Koellinger and Thurik model in such a way that the effect of the world cycle is separated from the individual country’s cycle, which in the current paper will be expressed relative to the world cycle.

Hence, the contribution of our paper to existing literature is twofold. First, we investigate the interplay between entrepreneurship, the business cycle and unemployment for different time horizons using quarterly versus annual data. Second, we investigate the role of economic openness in this interplay.

The paper is organized as follows. In section 2 we discuss the quarterly and annual data sets used in this paper, as well as the variables employed in the empirical analysis. Section 3 discusses the model and the estimation method. Section 4 presents the estimation results while section 5 concludes.

2. Data and variables

We use two data sets in this study. First, we use quarterly data from the *OECD Quarterly National Accounts*, in particular quarterly time series on self-employment, unemployment and GDP ranging from the first quarter of 2000 until the last quarter of 2007. Volume estimates of GDP are expressed in millions of U.S. $ using purchasing power parities of 2000. Quarterly self-employment is measured as the share of self-employed (including unpaid family workers) in the total labor force and unemployment as the share of unemployed in the total labor force. These variables have structural breaks due to changes in definition over time. These changes are indicated in the *OECD Quarterly National Accounts* data base. We correct for the structural breaks by applying the average growth rates of the time periods immediately before and immediately after the time of the structural break, i.e., we interpolate the growth rate of the time series surrounding break years.

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4 Some studies analyze quarterly data for single countries: Spain and the United States (Golpe, 2009) and the United Kingdom (Parker et al., 2012).
6 The raw quarterly self-employment series was computed by subtracting the number of employees from total employment.
7 For instance, if a trend break occurs in 2003 we would use the average of the growth rates 2001-2002 and 2003-2004 to estimate the growth rate for 2002-2003. This growth rate is then applied backward to the level of 2003 (instead of forward) so that the most recent data in OECD Quarterly National Accounts always serve as the benchmark level.
Second, we use annual data of these same three variables from Panteia/EIM’s Compendia data set. Corrections for trend breaks as indicated above have also been applied in Compendia. Volume estimates of GDP are expressed in millions of U.S. $ using purchasing power parities of 2000. Self-employment (business ownership) in Compendia is defined to include owner-managers of unincorporated and incorporated enterprises but excludes unpaid family workers and business owners in the agriculture, hunting, forestry and fishing sectors (Van Stel, 2005).\(^8\) Unemployment rates are adapted from *OECD Main Economic Indicators*. The annual data we use cover the period 1998-2007. The quarterly and annual data sets described above apply to different countries. We choose to use the countries for which data are available in both data sets.\(^9\)

We decompose data into a trend and a cyclical component as in equation (1) below. To de-trend, a Hodrick-Prescott (HP) filter is applied on each of the time series of self-employment, unemployment and GDP (Hodrick and Prescott, 1997). De-trending via this filter requires minimization of a function in which a smoothing parameter must be specified. For quarterly data a smoothing parameter lambda with a value of 1600 is advised. Following conventional literature we will use this value. For annual data, we use a parameter value of 6.25, which is advised by Ravn and Uhlig (2002) and applied also by Koellinger and Thurik (2012). We use the HP-filtered cyclical component \(c_{i,t}\) and the trend \(\tau_{i,t}\) from (1) to calculate the percentage deviation of the cyclical component of \(Z_t\) from the trend, expressed as \(\hat{Z}_t\) in (2). This percentage deviation, which expresses the cyclical component relative to the trend, is used in all models in the upcoming sections.

\[
Z_{i,t} = c_{i,t} + \tau_{i,t} \tag{1}
\]

\[
\hat{Z}_{i,t} = \frac{c_{i,t} \cdot 100}{\tau_{i,t}} \tag{2}
\]

Figure 1 illustrates the result of de-trending GDP in the USA from the quarterly data (2000Q1-2007Q4) by graphing the original series and the trend, the difference between these two being the cyclical component.

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\(^8\) Compendia contains harmonized annual data on the number of business owners for 30 OECD countries from 1972 onwards. It is one of the few cross-country data bases on entrepreneurship rates that exist to date, next to the Global Entrepreneurship Monitor and the World Bank Group Entrepreneurship Survey (Marcotte, 2013). See [http://www.entrepreneurship-sme.eu/](http://www.entrepreneurship-sme.eu/) for the data and Van Stel (2005) for the harmonization methods applied to make business ownership rates comparable across countries.

\(^9\) The countries we include are: Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, The Netherlands, Portugal, Spain, Sweden, United Kingdom, Norway, United States, Japan, Canada, Australia and New Zealand.
Three additional variables are used in the present research. The first is the trading rate (TR), an indicator for a country’s economic openness. It is defined as the share of import and export of goods in GDP in the first quarter of 2006, as in (3), and hence measures the trading intensity relative to GDP (Rodrik, 1998). The share of import and export in GDP is the most widely used measure of openness (David, 2007). Second, we use the world’s GDP cycle, as defined in (4). It is an indicator for the extent to which the world economy moves above or below the trend, i.e., whether the world economy is in an upturn or in a downturn. The world’s GDP cycle is measured as the weighted average deviation from the trend (i.e., the weighted average cyclical component) of all 19 countries in the data set, weighted by their GDP share. The third variable is the country deviation variable of GDP as expressed in (5), which measures the extent to which a country’s GDP cyclical component deviates from the world’s GDP cyclical component.

\[ TR_i = \frac{\text{import}_{t2006Q1} + \text{export}_{t2006Q1}}{\text{GDP}_{t2006Q1}} \]  
\[ \overline{\text{GDP}_{\text{world},t}} = \sum_{i=1}^{n} \left( \frac{\text{GDP}_{it}}{\sum_{i=1}^{n} \text{GDP}_{it}} \cdot \text{GDP}_{i,t} \right) \]  
\[ \text{Country DEV}_{it} = \text{GDP}_{it} - \overline{\text{GDP}_{\text{world},t}} \]  

---

10 Seasonally adjusted import and export data are taken from the OECD Quarterly National Accounts.
11 Both for the quarterly and the annual data, we use Purchasing Power Parities (PPP’s) of the year 2000 to express GDP in U.S. $.

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The role of these three variables in the empirical analysis will be illustrated in Section 3.

3. Model and estimation method

Koellinger and Thurik (2012) introduced a model to examine the relation between self-employment, unemployment and GDP at the national level. Their model incorporates lags of each of the variables, making it possible to detect causality between these endogens (Granger, 1969). Following Koellinger and Thurik (2012), we study the relation between (the cyclical components of) self-employment (denoted by $E$), unemployment ($U$) and GDP, jointly in an autoregressive model. In a standard VAR model, each of the three variables is linearly related to lags of its own and lags of the other variables. However, simply adding the country deviation (see equation 5) as exogenous variable could lead to multicollinearity problems, since its correlation with GDP is high. Instead, we prefer a reparametrized VAR model that circumvents this problem:\(^\text{12}\)

\[ Y_{i,t} = \kappa_i + A_1 X_{i,t-1} + A_2 X_{i,t-2} + ... + A_p X_{i,t-p} + \varepsilon_{i,t} \tag{6} \]

where

\[ Y_{i,t} = (\text{GDP}_{i,t} \bar{E}_{i,t} \bar{U}_{i,t})' \tag{7} \]

\[ X_{i,t} = (\text{GDP}_{\text{world},t} E_{i,t} U_{i,t} \text{Country DEV}_{i,t})' \tag{8} \]

$A_1$ and $A_2$ are $3 \times 4$ matrices,

$\kappa_i$ is a $3 \times 1$ vector and

$\varepsilon_{i,t}$ is also a $3 \times 1$ vector and assumed to be white noise, implying that:

\[ E[\varepsilon_{i,t}] = 0 \tag{9} \]

\[ E[\varepsilon_{i,t}\varepsilon_{j,t}'] = \Omega \quad \forall \ i, j, t \tag{10} \]

\[ E[\varepsilon_{i,t}\varepsilon_{j,s}'] = 0 \quad \forall \ t \neq s, \forall \ i, j \tag{11} \]

We emphasize that all variables in the $Y_{i,t}$ vector are percentage deviations of the cyclical component from the trend. Since the set of explanatory variables is the same in each of the three sub-equations, estimating the system with Generalized Least Squares (GLS) is equivalent to performing OLS on each sub-equation. The trading rate is used to classify the countries in two groups: relatively less open economies ($TR<0.2$) and relatively more open economies ($TR>0.2$).\(^\text{13}\)

Since we have two groups of countries, every sub-equation requires two OLS estimation procedures, one for each group. We estimate the parameters for both the quarterly and annual data

\(^{12}\) See the Appendix for a proof that this is in fact a reparametrization of a standard VAR model.

\(^{13}\) Using this cut-off value, the number of countries in each group is approximately equal. The group of relatively less open economies includes Canada, United Kingdom, France, Portugal, Italy, Spain, New Zealand, Australia, Japan, Greece and the United States. The group of relatively more open economies includes Belgium, The Netherlands, Ireland, Denmark, Austria, Norway, Sweden and Finland.
sets and report conservative fixed effects panel estimates, similar to Koellinger and Thurik (2012).  

Introducing the trading rate enables to explore if and how these different groups of countries (i.e., relatively less open and more open economies) behave differently. The country deviation variable enables to investigate the impact of a country’s cycle outperforming the world’s cycle. By estimating parameters using both quarterly and annual data, we are able to examine both the short term and medium term dynamics and the differences between them.

4. Estimation results

This section provides the results of the model described in equations (6)-(11). Tests show that the appropriate number of lags is two (i.e., p=2 in equation 6). We present each regression column-wise for the three dependent variables. Moreover, each dependent variable has two equations in which countries are grouped according to their trading rate. For the quarterly data, we have data for the period 2000Q1-2007Q4. However, due to the lags in the model, two observations are lost, so that for each country, 30 observations are available (2000Q3-2007Q4). Results are presented in Table 1.

Table 1 displays the parameter estimates using the quarterly data. The effect of the world’s cycle on the cycle of individual countries is positive, suggesting that, on average, economies benefit from a booming world economy, at least in the short run (note that we are considering lagged effects of one and two quarters). The effect is somewhat larger for more open economies (1.74-0.62=1.12 versus 1.42-0.51=0.91). With one exception, results for self-employment and unemployment are not significant. The effects of the country deviation variables point at path-dependency: if the country’s cycle outperforms the world’s cycle in a certain quarter, this will have a net positive effect on the country’s cyclical component in the next two quarters (0.88-0.25=0.63 for less open economies and 0.39+0.14=0.53 for more open economies).

Results for the second equation, explaining self-employment, show that a rise (fall) in entrepreneurial activity is followed by a subsequent rise (fall) of this activity one quarter later, in both groups of countries (0.60 versus 0.52). This result points at positive path-dependency in self-employment in the short run. Concerning unemployment, even though ‘push’ and ‘pull’ effects are found to be different in both quarters and between both groups of countries, the net effect of unemployment on self-employment over two quarters is close to zero (-0.081+0.077=-0.004 versus 0.039-0.041=-0.002). The country deviation variable appears to have a negative effect on self-employment: if a country’s GDP cycle is leading the world’s GDP cycle, entrepreneurial activity in that country decreases. Interestingly, this effect only occurs for countries with a high trading rate (i.e., more open economies; the effect is -0.51). This finding may be explained as follows. In an open economy which is booming, it is likely that more high-quality paid jobs in exporting sectors will become available as a result of which the demand for highly qualified employees increases. This increased demand pushes up wage levels which, in turn, will cause ‘marginal’ entrepreneurs to become wage-employed, thereby reducing the number of entrepreneurs in the labor market (Lucas, 1978). Interpreting this finding from a different angle, if a country’s GDP cycle is lagging the world’s GDP cycle, the number of paid jobs will be lower, and more labor market participants will turn to self-employment as their best employment option. Hence, increased entrepreneurial activity

14 In line with Koellinger and Thurik (2012), OLS and fixed effects give almost identical results.
in the short run resulting from lagging the world’s business cycle may be more necessity-based in nature.

The last equation, explaining unemployment deviations from the trend, shows that the world’s GDP cycle has a negative effect on unemployment. A booming world economy contributes to lower unemployment rates. The net negative effect over two quarters is bigger for more open economies (\(-2.66-0.18=-2.84\) versus \(-3.40+1.94=-1.46\)). This is not surprising as more open economies’ labor markets are likely to be more interconnected with worldwide cyclical developments than less open economies’ labor markets. We also see a short-run negative association between self-employment and unemployment (\(-0.21\) versus \(-0.091\); the latter effect is not significant though), suggesting that some start-ups immediately hire employees at the start of the business. The results also show a certain degree of positive short-term path-dependency for unemployment (0.90 versus 0.82). Finally, a positive country’s cycle relative to the world’s cycle seems to contribute to lowering unemployment in the short run (-1.40 versus -0.49).

Table 1: Fixed effects estimation results using quarterly data (2000Q3-2007Q4)

<table>
<thead>
<tr>
<th></th>
<th>GDP_{it} \text{TR &lt; 0.2}</th>
<th>GDP_{it} \text{TR &gt; 0.2}</th>
<th>E_{it} \text{TR &lt; 0.2}</th>
<th>E_{it} \text{TR &gt; 0.2}</th>
<th>U_{it} \text{TR &lt; 0.2}</th>
<th>U_{it} \text{TR &gt; 0.2}</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP_{world,t-1}</td>
<td>1.42*** (14.69)</td>
<td>1.74*** (9.77)</td>
<td>-0.087 (0.23)</td>
<td>-0.22 (0.36)</td>
<td>-3.40*** (5.70)</td>
<td>-2.66*** (2.79)</td>
</tr>
<tr>
<td>GDP_{world,t-2}</td>
<td>-0.51*** (4.63)</td>
<td>-0.62*** (2.95)</td>
<td>-0.24 (0.56)</td>
<td>0.39 (0.54)</td>
<td>1.94*** (2.84)</td>
<td>-0.18 (0.16)</td>
</tr>
<tr>
<td>E_{t-1}</td>
<td>0.0049 (0.34)</td>
<td>-0.016 (0.81)</td>
<td>0.60*** (10.77)</td>
<td>0.52*** (7.71)</td>
<td>-0.21** (2.32)</td>
<td>-0.091 (0.88)</td>
</tr>
<tr>
<td>E_{t-2}</td>
<td>0.0046 (0.32)</td>
<td>-0.0060 (0.30)</td>
<td>-0.077 (1.40)</td>
<td>0.0029 (0.04)</td>
<td>0.14 (1.58)</td>
<td>-0.11 (1.09)</td>
</tr>
<tr>
<td>U_{t-1}</td>
<td>-0.0022 (0.24)</td>
<td>-0.030** (2.38)</td>
<td>-0.081** (2.26)</td>
<td>0.039 (0.89)</td>
<td>0.90*** (15.82)</td>
<td>0.82*** (12.28)</td>
</tr>
<tr>
<td>U_{t-2}</td>
<td>-0.008 (0.95)</td>
<td>0.011 (0.92)</td>
<td>0.077** (2.24)</td>
<td>-0.041 (0.98)</td>
<td>-0.091* (1.66)</td>
<td>-0.04 (0.60)</td>
</tr>
<tr>
<td>Country DEV_{t-1}</td>
<td>0.88*** (15.50)</td>
<td>0.39*** (5.47)</td>
<td>0.13 (0.61)</td>
<td>-0.51** (2.06)</td>
<td>-1.40*** (3.98)</td>
<td>-0.49 (1.30)</td>
</tr>
<tr>
<td>Country DEV_{t-2}</td>
<td>-0.25*** (4.48)</td>
<td>0.14** (1.97)</td>
<td>0.032 (0.15)</td>
<td>0.044 (0.18)</td>
<td>0.94*** (2.71)</td>
<td>-0.50 (1.32)</td>
</tr>
<tr>
<td>R^2_adj</td>
<td>0.81</td>
<td>0.76</td>
<td>0.34</td>
<td>0.27</td>
<td>0.85</td>
<td>0.85</td>
</tr>
<tr>
<td>N</td>
<td>330</td>
<td>240</td>
<td>330</td>
<td>240</td>
<td>330</td>
<td>240</td>
</tr>
</tbody>
</table>

Note: Fixed effects parameter estimates and corresponding (absolute) t-values in parentheses. One, two or three asterisk(s) denote(s) significance at 90, 95 and 99 percent confidence level, respectively. The variables GDP, E, and U represent the cyclical component relative to the trend of GDP, self-employment, and unemployment, respectively, while TR measures the share of import and export of goods in GDP. The variable Country DEV measures a country’s GDP cyclical component in deviation from the world’s GDP cyclical component. HP-filtered quarterly data (lambda=1600) originate from OECD Quarterly National Accounts. No unit roots found in the system.

Table 2 shows the parameter estimates of the analyses using the annual data. Since the lags have different lengths compared to Table 1 (years instead of quarters) results are not necessarily
similar to those obtained in Table 1. Two results are noteworthy. First, the contribution of a thriving world economy to bringing down unemployment is not only big when considering the first two subsequent *quarters*, but also when considering the first two *years* following a strong world cycle. Similar to the short-term quarterly results, also the annual results show that this effect is much stronger for more open economies, as compared to less open economies (-5.36 as compared to -2.49). Second, when considering annual lags, we see that in more open economies, the effect of a positive country cycle (i.e., the *country deviation* variable) on entrepreneurship is positive (effect over two years is 0.70+1.20=1.90). Possibly, when demand for products and services in a country is high, this creates opportunities for new entrepreneurs entering the market with new product/market combinations. We surmise that this type of entrepreneurship is more opportunity-based in nature. The results suggest that contact with foreign business partners is important in order to actually create new entrepreneurial activity from a booming economy. This is consistent with export spillover theory arguing that international trade promotes knowledge spillovers from which particularly new firms are likely to benefit (Aitken et al., 1997; De Clercq et al., 2008). The results also suggest that it takes some time (i.e., years instead of quarters) for this type of entrepreneurship to emerge.

One more finding in Tables 1 and 2 worth noticing is that, with some exceptions, the relationship between self-employment and unemployment is relatively weak (in both directions). This can be explained by the short time lags incorporated in the estimation models, i.e., two quarters and two years for Tables 1 and 2, respectively. Empirical literature generally finds longer lags for the influence of self-employment on unemployment and the vice versa relation. For both directions of causality, Thurik et al. (2008) find the impact to be strongest after eight years (see their Table 3). It takes time before higher unemployment rates actually induce a substantial number of individuals to become self-employed. Likewise, it takes time before new firms actually contribute to unemployment reduction at the macro-economic level, either by employing personnel themselves or by stimulating and challenging incumbent firms to increase their performance (Fritsch and Mueller, 2004).
Table 2: Fixed effects estimation results using annual data (1998-2007)

<table>
<thead>
<tr>
<th></th>
<th>$\overline{\text{GDP}}_{t,t}$</th>
<th>$\overline{E}_{t,t}$</th>
<th>$\overline{U}_{t,t}$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$TR &lt; 0.2$</td>
<td>$TR &gt; 0.2$</td>
<td>$TR &lt; 0.2$</td>
</tr>
<tr>
<td>$\overline{\text{GDP}}_{\text{world},t-1}$</td>
<td>0.22 (1.35)</td>
<td>0.61***</td>
<td>-0.22 (0.77)</td>
</tr>
<tr>
<td>$\overline{\text{GDP}}_{\text{world},t-2}$</td>
<td>-0.49*** (3.08)</td>
<td>-0.35* (1.83)</td>
<td>-0.33 (1.18)</td>
</tr>
<tr>
<td>$\overline{E}_{t,t-1}$</td>
<td>-0.033 (0.68)</td>
<td>0.0098 (0.19)</td>
<td>0.40*** (4.54)</td>
</tr>
<tr>
<td>$\overline{E}_{t,t-2}$</td>
<td>-0.037 (0.80)</td>
<td>0.010 (0.16)</td>
<td>-0.43*** (5.25)</td>
</tr>
<tr>
<td>$\overline{U}_{t,t-1}$</td>
<td>-0.042** (2.45)</td>
<td>-0.037** (2.39)</td>
<td>0.018 (0.58)</td>
</tr>
<tr>
<td>$\overline{U}_{t,t-2}$</td>
<td>-0.0060 (0.38)</td>
<td>0.028** (2.10)</td>
<td>-0.026 (0.92)</td>
</tr>
<tr>
<td>Country $\text{DEV}_{t,t-1}$</td>
<td>0.12 (0.98)</td>
<td>0.13 (0.68)</td>
<td>-0.069 (0.32)</td>
</tr>
<tr>
<td>Country $\text{DEV}_{t,t-2}$</td>
<td>-0.46*** (3.92)</td>
<td>-0.10 (0.55)</td>
<td>-0.19 (0.93)</td>
</tr>
<tr>
<td>$R^2_{adj}$</td>
<td>0.18</td>
<td>0.24</td>
<td>0.25</td>
</tr>
<tr>
<td>$N$</td>
<td>110</td>
<td>80</td>
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Note: Fixed effects parameter estimates and corresponding (absolute) t-values in parentheses. One, two or three asterisk(s) denote(s) significance at 90, 95 and 99 percent confidence level, respectively. The variables $\overline{\text{GDP}}, \overline{E}$, and $\overline{U}$ represent the cyclical component relative to the trend of GDP, self-employment, and unemployment, respectively, while $TR$ measures the share of import and export of goods in GDP. The variable $\text{Country DEV}$ measures a country’s GDP cyclical component in deviation from the world's GDP cyclical component. HP-filtered annual data (lambda=6.25) originate from the Compendia data set. No unit roots found in the system.

Koellinger and Thurik (2012) use several methods to study the interplay between entrepreneurial activity, the business cycle and unemployment. When averaging observations across countries, they find evidence that entrepreneurship Granger-causes the cycles of the world economy. When estimating their model separately by country, they find considerable heterogeneity of coefficients across countries, which they explain by influences of national policy and country-specific conditions. The present study clearly suggests that economic openness is one of these conditions that influence the interplay between entrepreneurial activity, the business cycle and unemployment.

5. Conclusions

The second economic recession of the 21st Century started in 2008 and was deep and persistent. This stimulates novel ways of understanding the mechanics of business cycles. In the present paper we attempt to contribute by investigating the link between entrepreneurial activity, the business cycle and unemployment using the analysis of Koellinger and Thurik (2012) as a starting point. We extend their study – a pooled VAR model of these macro-economic variables – by exploring to what extent the observation frequency (quarterly versus annual data) influences
estimation results. We also investigate to what extent results differ between more open and less open economies. Using both quarterly and annual data for 19 OECD countries over the period 1998-2007, we find that in the short run (after one quarter), a country’s entrepreneurial activity is stimulated when its business cycle is lagging the world’s business cycle, whereas in the medium run (after one to two years), entrepreneurial activity is stimulated when its business cycle is leading the world’s business cycle. This suggests that a country’s business cycle position relative to the world’s cycle creates different types of entrepreneurial opportunities depending on the time horizon considered. In particular, entrepreneurial opportunities emerging in the short run (medium run) as a result of lagging (leading) the world’s business cycle may be more necessity-based (opportunity-based) in nature. As we also find that these results apply to relatively open economies only, it is suggested that economic openness plays a role in creating these entrepreneurial opportunities related to a country’s cyclical performance.

Our findings have policy implications regarding the composition of the labor force in more open economies. In particular, our results suggest that when open economies are booming, the share of self-employed in the labor force may be decreasing in the short run but increasing in the medium run. Policy makers may consider compensating the short term self-employment drop in more open economies by specific short-term measures such as temporary fiscal stimuli. As noted above, our paper also has policy implications regarding the different types of entrepreneurship that may result from recession versus boom periods (i.e., necessity-based versus opportunity-based), and regarding the different time lags with which these different types of entrepreneurship emerge following a recession or boom period. As is often the case in the world of policy measures, their (expected) outcomes depend to a large extent upon environmental conditions like openness of the economy and phase of the business cycle. Uniform prescriptive measures remain the ground for misunderstandings and failures. The results of the present paper need replication to underpin the fine-tuning of policy measures throughout the business cycle and depending upon the degree of openness of the economy.

Regarding the role of economic openness, a limitation of our study is the small set of countries included in our estimation sample. As we only study OECD countries, the variation in economic openness is not that large. In particular, on a worldwide scale, the countries in our study could all be considered relatively open economies. Still, within this set of relatively open economies, it is interesting to study differences between relatively more and less open economies. A further limitation of our study is that quarterly and annual data were jointly available for 19 (OECD) countries only. Also, our data period ends in 2007 so that the impact of the current crisis is not incorporated in the study. Future research should focus on using more recent data for a broader range of countries. Furthermore, as results may differ by sector of economic activity, a sectoral distinction may create additional insights too, in particular since some industries are more internationally orientated than others.

Finally, the current paper suggests that, depending on the time horizon considered, different types of entrepreneurial opportunities – in particular, necessity-based versus opportunity-based – may emerge from a country’s relative business cycle position. It may be argued that this classification of types is closely related to Kirznerian versus Schumpeterian entrepreneurship, where the latter type relates to innovation-producing entrepreneurial activity, whereas the former type is more about re-establishing market equilibrium by spotting and exploiting existing business

15 See Lamballais Tessensohn and Thurik (2012).
opportunities, possibly involving adoption of innovations developed abroad. The cyclical effect of Kirznerian versus Schumpeterian entrepreneurship is worth to be investigated more deeply.
References


Appendix

Proof that equation (6) is a reparametrization of a standard VAR model

Let the superscript of a matrix denote the operator that returns a submatrix containing the columns mentioned in the superscript, e.g. $X^{s:m}$ is a matrix containing columns $s$ through $m$ of matrix $X$. Furthermore, let the subscript $\text{diag}$ denote the operator that creates a diagonal and hence symmetric matrix $S$ of size $l \times l$ from a column vector $x$ of length $l$, such that $S_{ii} = x_i \forall i = 1 ... l$ and by definition $S_{ij} = 0 \forall i \neq j$. Then, equation (6) can be written as a standard $VAR(p)$ model with additional exogenous variables. The model from equation (6) can be rewritten as follows:

$$\begin{pmatrix} \text{GDP}_{i,t} \\ E_{i,t} \\ \bar{U}_{i,t} \end{pmatrix} = \kappa_i + A_1 X_{i,t-1} + A_2 X_{i,t-2} + ... + A_p X_{i,t-p} + \varepsilon_{i,t} =$$

$$A_1^{\frac{1}{4}} \begin{pmatrix} \text{GDP}_{i,t-1} \\ E_{i,t-1} \\ \bar{U}_{i,t-1} \end{pmatrix} + ... + A_p^{\frac{1}{4}} \begin{pmatrix} \text{GDP}_{i,t-p} \\ E_{i,t-p} \\ \bar{U}_{i,t-p} \end{pmatrix} + \varepsilon_{i,t} + (A_1^d - A_1^p)_{\text{diag}} \begin{pmatrix} \text{GDP}_{\text{world},t-1} \\ \text{GDP}_{\text{world},t-1} \\ \text{GDP}_{\text{world},t-1} \end{pmatrix} + ... + (A_p^d - A_p^p)_{\text{diag}} \begin{pmatrix} \text{GDP}_{\text{world},t-p} \\ \text{GDP}_{\text{world},t-p} \\ \text{GDP}_{\text{world},t-p} \end{pmatrix} + \kappa_i$$

The above shows that the model in (6) is in fact a reparametrization of a standard $VAR(p)$ model with additional exogenous variables.
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