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Business Cycles, Unemployment and Entrepreneurial Entry – First Evidence from Germany[1]

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Abstract

We investigate whether people become more willingly self-employed during boom periods or in recessions and to what extent it is the business cycle or the employment status influencing entry rates into entrepreneurship. Our analysis for Germany reveals that start-up activities are positively influenced by unemployment rates and that the cyclical component of real GDP has a negative effect. This implies that new business formation is counter-cyclical. Further disentangling periods of low and high unemployment periods reveals a "low unemployment retard effect".

JEL classification: L26, E 32

Keywords: Self-employment, business cycle, unemployment, start-up

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1. Introduction

There is an ongoing discussion to what extent the business cycle stimulates the rates of entry into entrepreneurship. In particular the question is whether people rather become self-employed during boom periods or recessions. It is also unclear whether relatively high or relatively low unemployment rates exert an impact on entrepreneurial entries. Thus, it is a puzzling question which macro-level factors influence transition rates into self-employment and in what direction?[5]

While there are good reasons to generally expect individual decisions for or against self-employment in response to business cycle fluctuations, there are two competing effects that may occur. On the one hand, potential entrepreneurs may positively react to GDP changes in a way that the number of newly founded businesses and the amount of their investments should increase in an upswing and decline in a downturn. On the other hand, transition rates into self-employment may amplify in recession periods when employment opportunities are rare. This argument would induce low start-up rates in boom periods when employed positions are more easily available.

Both arguments may relate to different types of new businesses and could have considerable consequences for the economy. Expecting high start-up rates in an upswing and low levels of new business formation during a downturn is usually associated with the assumption that the decision to set up an own business is driven by the desire to realize perceived opportunities. In contrast, new firms that are induced by scarcity of employment opportunities are often regarded to be driven by necessity. As a consequence, opportunity entrepreneurship should

[5] There are an increasing number of studies analyzing the factors that influence the transition into entrepreneurship at a micro-level. These approaches revealed that demographic (see e.g. Levesque and Minniti, 2006), educational (Block, Hoogerheide and Thurik, 2012) economic (see e.g. Blanchflower and Oswald, 1998), as well as personality characteristics (see e.g. Caliendo, Fossen and Kritikos, 2009, 2010, 2011, 2012) affect the decision to start an own business.

have a pro-cyclical effect while necessity entrepreneurship would be of counter-cyclical nature.[6]

By simultaneously focusing on the relationship between GDP growth, unemployment, interest-rates and self-employment over the business cycle, this paper investigates which macro-economic conditions influence the *entry* rates into entrepreneurship. Our analysis is – to the best of our knowledge – the first of its kind for Germany where we combine for a 15 year period a variety of data sources that provide us with information on the relevant macro-economic variables. We show that between 1996 and 2010 unemployment rates have positively influenced entry rates into self-employment. We also reveal that GDP growth has a rather negative effect on entrepreneurial entry rates. Interestingly, when we further disentangle periods of relatively low and relatively high unemployment, we find an asymmetric relationship that points to a "low unemployment retard effect." This means that the reduction of new business formation at times when unemployment levels are below the trend are more pronounced than the increase of the number of start-ups in periods when unemployment is high.

The remainder of the paper is organized as follows. In Section 2 we present our research questions in greater detail and discuss how the development of GDP and unemployment may influence entrepreneurial entry. We then describe in Section 3 the datasets used for our analysis. Section 4 is devoted to the econometric approach and the presentation of the results including robustness checks. Section 5 summarizes and discusses our results.

[6] This implies the assumption that there are no longer time lags between the decision to start an own business and putting this decision into practice.

2. Why the business cycle and new business formation may be related

Entry rates into entrepreneurship may be influenced by several macroeconomic forces in different directions. According to the "opportunity pull" argument start-up rates should increase during growth periods because of a positive environment for investments, such as growing demand and widespread optimism about the future development. In line with this reasoning, fewer individuals may be willing to enter self-employment during recession periods when future developments appear relatively uncertain and investments are perceived as risky (Rampini, 2004). In a similar vein, Barlevy (2007) argues that entrepreneurs may tend to introduce radical innovations during growth periods; thereby causing acceleration effects as such innovations eventually create further innovative activities that could induce strong increases in GDP. These claims should lead to pro-cyclical effects of economic growth on entrepreneurial activities.

There are, however, also other forces at work that may offset such pro-cyclical effects. Following occupational choice models (see e.g., Davidsson, 2004), people may switch from employment or unemployment into self-employment if starting an own business appears to be more rewarding than the status-quo. In particular, two macro-economic variables, unemployment rates and interest rates, may influence this calculus. First, due to relatively low levels of unemployment benefits, the occupational choice approach suggests that transitions into self-employment may occur more often during recession periods when the level of unemployment is relatively high. Accordingly, the level of start-ups may be relatively low in boom periods when employment opportunities are available. A second factor that may lead to counter-cyclical effects of new business formation is the development of interest rates. Low interest rates in recessions could stimulate the investment in new businesses while high interest rates in boom periods may prevent some potential founders from setting up their own firm (see e.g. Parker, 2009).

If unemployment combined with low interest rates during recessions indeed stimulates self-employment and if relatively rich employment opportunities and high interest rates in boom periods lead to low levels of start-ups, this may be regarded as an anti-cyclical effect, thus stabilizing the economy. If the “opportunity pull” effect prevails, self-employment could have a destabilizing effect on the economy.[7]

The net outcome of these contradicting effects of demand, unemployment and interest rates on the level of new business formation is, thus, an empirical question. There is only little empirical evidence about the relationship between new business formation and the business cycle, and so far it is inconclusive which of the above mentioned effects is stronger. As to the relationship between GDP growth and entrepreneurship, empirical evidence from the 1990s suggests a pro-cyclical influence of periods of growth and recessions on the number of entrepreneurial entries (see e.g. Grant, 1996, for the US, Carrasco, 1999, for Spain). Interestingly, studies for more recent years show no such cyclicality. In particular, Henley (2004) finds a certain persistence of entrepreneurship independent of the business cycle.[8]

With respect to correlations between unemployment and entrepreneurship there are also mixed findings. Parker (2009) reports, that 1990s era investigations with cross sectional data find a non-significant or negative relationship between the level of unemployment and entry rates into entrepreneurship. Conversely, investigations using

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[7] Although there is considerable reason to assume that the business cycle affects the level of new business formation, there may also exist a causal relationship in the other direction, i.e. that start-ups have also an effect on the business cycle. While an effect of demand or unemployment on the level of new business formation may occur with a considerable time lag, one may also expect that new business formation is a leading time series if start-ups influence the business cycle. Koellinger and Thurik (2012) found first evidence for such an effect. In our analysis, we disregard possible effects of new business formation on employment in subsequent periods.

[8] This finding is supported by recent research at the regional level which also finds a strong argument for persistence of new business formation in the long run (Andersson and Koster, 2011; Fritsch and Wyrwich, 2012).

data from the 2000s find a positive effect. Research based on time-series data also arrived at mixed results. Robson (1998) finds no evidence for a recession push effect for Great Britain while Georgellis and Wall (2000) reveal for the regions of Great Britain (more or less in the same time period of the 80s and early 90s) that a positive influence on entrepreneurial entry rates is detected when unemployment increases. Results pointing to a recession push effect are reported for Finland by Tervo (2006) and Tervo and Niittykangas (1994), and for Italy by Foti and Vivarelli (1994). The latter observation is in line with Blanchflower (2000), who analyzed this relationship for OECD countries and finds a positive link only for two countries, Italy and Iceland, while for all other OECD countries he reports a negative relationship between the level of unemployment and entrepreneurship.

Potential reasons to explain the different findings dependent on the date of the analysis are twofold: Either there has been a change in attitudes by individuals toward entrepreneurship during this time period. This interpretation is in line with the hypothesis of Audretsch and Thurik (2000) who argue for a shift from a managerial to an entrepreneurial society. Or the more recent research had better data quality with more controls available and better methods of analysis (see Parker, 2009).

The existing empirical evidence leaves us with a puzzle: Does any of the possible macroeconomic effects prevail? This paper explores what kind of macro-economic effects influence entrepreneurial entry rates in Germany in what direction. More specifically, we examine in which direction (a) high or low unemployment rates; (b) boom or recession periods in the business cycle measured by GDP development; and (c) changes in interest rates influence entry rates into entrepreneurship. We further investigate to what extent it is the cyclical component of these macro-economic variables that might influence entry rates and to what extent potential influences of the variables are symmetric. Our investigation should reveal whether pro- or counter-cyclical effects unfold a stronger effect on entrepreneurial entries.

While we are not aware of any recent analysis of the relationship between new business formation and the business cycle for Germany[9], such investigations exist for a small number of other countries, as mentioned before. A large part of this research has focused, however, on changes of the stock of entrepreneurs, i.e., the number of entries minus the number of exits (net-entry).

In contrast to these studies, we focus on the gross inflow into self-employment, for three reasons. First, since the number of entries and exits quite often are of about equal size, changes in the stock of self-employment largely conceal changes in the gross flows. Because gross entries show greater variation over time than the respective net-changes in the stock of existing businesses, we expect to identify the relationships in a more direct way than it would be the case for net-entry. Second, the factors that influence exits out of entrepreneurship may be quite different from the determinants of entry (see e.g. Caballero and Hammour, 1994). Analyzing net-entry may, thus, confound these two groups of determinants such that the factors that drive entry and exit can not be clearly distinguished from another.

A third reason for analyzing the gross influx of business founders into self-employment is that this may provide information about the dynamics of the economy. In this context it is often argued that increased entrepreneurial activities in the sense of more new businesses may considerably stimulate economic performance (van Stel, Carree and Thurik, 2005); either because entrepreneurs enter markets with new products or production processes (see Acs and Audretsch, 2003), or because they contribute to increased productivity by contesting established market positions (see Nickell, 1996). Since there are only few indications of important direct positive effects of

[9] The most recent analysis has been conducted by Blanchflower (2000), who studied all OECD countries, including Germany, with data ending in 1996.

business closures on growth, an analysis of gross entry appears to be particularly interesting.

3. Data

3.1 Data on start-up activity, unemployment, and GDP

In our analysis we use two different data sources that provide information about start-up activities in Germany, namely the Business Registration Statistics and the German Micro-Census. To capture the most relevant aspects of the business cycle in the analysis we use real GDP growth and the cyclical component of Hodrick-Prescott filtered real GDP, as well as the unemployment rate, the cyclical component of the Hodrick-Prescott filtered unemployment rate, and interest rates.

Since data for start-up activities tend to have their peculiarities we describe the two data sources that we use in little more detail. The Business Registration Statistics counts the notifications of new businesses recorded in the Business Register (Leiner, 2002), and are a complete inventory count. Every individual starting a legal business as self-employed person, with the appearance of permanency and with the aim of realizing profits, is required to register the business with the municipal trade office. Since 1996 a harmonized recording of business registrations from across Germany is available on a monthly basis.

The main advantages of this source are the prompt recording of the data, the monthly availability, and the fact that solo-entrepreneurs are also included, i.e. those who start with no employees. This data source has, however, several disadvantages, as well. First, it is argued that there is a considerable number of cases where a notification is made but no business is founded, leading to an overestimation of entries (Brüderl, Preisendoerfer and Ziegler, 2009). Second, start-ups by freelancers and in the liberal trades are not covered as they are not

required to register.[10] In total however,, there is evidence that the number of start-ups is rather overestimated in this source (Fritsch, et al., 2002).

The second data source that we use is the German Micro-Census[11], an annual representative survey containing socio-economic information about approximately 820,000 individuals living in 380,000 households.[12] Our analysis draws on 14 waves of the Micro-Census, starting with 1996, when the sample introduced a question for business founders. The classification of individuals as self-employed in the Micro-Census is based on a survey question about the employment status of the respondent. Self-employment as an employment status applies to those individuals who own a business, including self-employed craftsmen as well as freelancers and self-employed persons in the liberal trades. We identify business founders by using the responses to the question about when they have started their present employment or self-employment.[13] Those who became self-employed in the time period between the last and the present survey are classified as business founders. Furthermore, it is also possible for the complete observation period to identify in which quarter of the year the start-up took place (for more details on this data source, see Statistisches Bundesamt, 2009).

The main advantage of this source is its high representativeness and the inclusion of solo-entrepreneurs. Unfortunately, however, the information is available only with a considerable time lag. A further disadvantage of the Micro-Census is that it does not contain sufficient numbers of observations for an analysis at regional levels *below* the

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[10] See Oberlander (2004). There exist no statistics on start-ups by these groups.

[11] Data access was provided on-site in the Federal Statistical Office in Erfurt.

[12] The Micro-Census was started in 1957 as an annual survey of private households and persons in West Germany and was expanded to include East German states in 1991. The aim of this study is to collect nationally representative micro-data about the population structure, economic and social situation of individuals and households.

[13] The corresponding question in the Micro-Census was introduced in 1996.

level of Federal States.[14] Moreover, the statistics do not capture those business founders who entered and exited self-employment between two waves (Fritsch, Kritikos and Rusakova, 2012). Despite these shortcomings, the Micro-Census can be regarded as an appropriate data source for the analysis of self-employment in Germany.

As a consequence of the differences between the two sources with regard to data gathering, they report quite different numbers of start-ups. Despite these differences in absolute number, they show, however, rather similar trends over time, particularly since 2003 (see Section 3.2). We are, thus, able to use the two data sets for mutual robustness checks of our results when analyzing the influence of various macroeconomic variables on start-up activities in Germany.

The number of unemployed persons and unemployment rates are provided by the Federal Employment Agency (FEA, *Bundesagentur für Arbeit*). The FEA defines the unemployment rate as the share of registered unemployed over the working population, i.e. those who are employed or self-employed plus the registered unemployed. To capture a possible cyclical component in the time-series of the unemployment rate we apply the Hodrick-Prescott (HP) filter (Hodrick and Prescott, 1997). The unemployment rate for German Laender is available from 1994 to 2010. Thus, the decomposition into trend and cyclical component is performed over a period of 17 years. The nominal Gross Domestic Product (GDP) on the level of the German Federal States is provided on a yearly basis by *Volkswirtschaftliche Gesamtrechnung der Laender* (Macroeconomic Accounting of the Federal States). Real GDP is calculated using the annual Consumer Price Index (CPI) of the Federal Statistical Office. In the estimation we use the growth rate of real GDP and the cyclical component of the HP-filtered real GDP. The

[14] All numbers taken from the Micro-Census are extrapolated to the entire population in the respective spatial unit (Federal level or States) using the weights provided by the Federal Statistical Office.

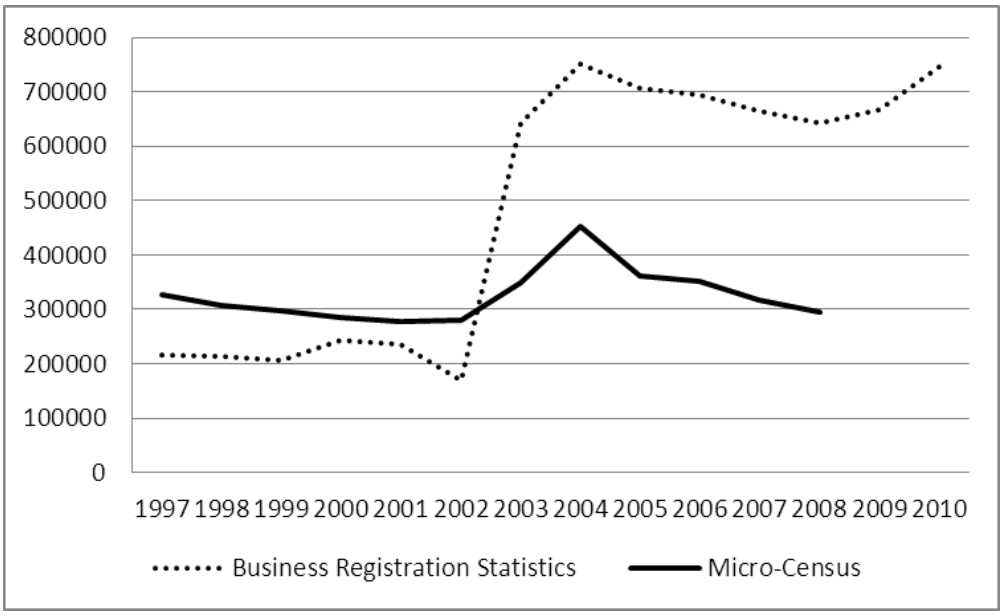
availability of data on real GDP from 1991 to 2010 allows getting an estimation of trend and cyclical component for a period of 20 years.

We further include an annual measure of knowledge capital in our analysis, namely patent applications over civil employment, provided by the Federal Statistical Office. In this way we take into account that knowledge based factors are found to have an impact on start-up activity (De Clercq and Arenius, 2006). Furthermore, following Fritsch and Wyrwich (2012) we include the self-employment rate as a measure of entrepreneurship culture in our estimation. Thereby we account for the fact that new business formation is partly independent of economic factors. The annual self-employment rate is provided by *Volkswirtschaftliche Gesamtrechnung der Laender*. For data on interest rates we use the lending rate of banks for long-term fixed rate loans to enterprises and self-employed persons provided by the German *Bundesbank* until 2003. This series is then linked to the interest rates of German banks for loans to non-financial corporations, available from the German *Bundesbank* from 2003 on.

3.2 Descriptives and correlation analysis of measured start-up activity

We begin our empirical analysis with an overview of the observed start-up activities, unemployment, and the development of GDP over the observation period. According to the Micro-Census, there were more than 1.5 million (about 300,000 per year) transitions into self-employment (as a primary activity) between 1996 and 2000. After a decline in 2001, the number of business founders increased up to a peak of 361,000 in 2005 (Figure 1). During this period the support for start-ups out of unemployment was substantially expanded (see Caliendo und Kritikos, 2010). According to the Micro-Census the number of founders dropped to fewer than 300,000 in 2008 and 2009. Some part of this decline may have been due to a significant reduction of the support for start-ups out of unemployment (see Caliendo und Kritikos, 2009).

Figure 1: Annual number of business registrations and annual number of business formations reported in the Micro-Census



A similar trend is observed in the data from the Business Register, however, as already mentioned, partly at a much higher level. For 1997, the first year of the standardized business register, this source counts 215,000 registrations. In 2004, the number of start-ups, according to this data source, reached its peak with 750,000 registrations. It dropped to 640,000 registrations in 2008, but then almost reached 750,000 again in 2010. The development of the number of business registrations suggests that the reform of the business registration statistic introduced in 2003 led to a large increase in the number of business registrations. A short analysis between the information of the two data sets reveals that the correlations were rather low before the reform and then considerable improved starting in the year 2003 (Table 1).

Table 1: Correlations

	Business registrations t=0	New businesses (Micro-Census) t=0	Real GDP growth rate t=0	Real GDP growth rate t-1	Unem-ployment rate t=0	Unem-ployment rate t-1
New businesses (Micro-Census) t=0	1997-2008: 0.69*** 1997-2002: 0.04 2003-2008: 0.88***					
Real GDP growth t=0	-0.07	-0.10				
Real GDP growth t-1	-0.20	-0.70***	-0.20			
Unemployment rate t=0	-0.29	0.41	0.11	0.10		
Unemployment rate t-1	-0.26	0.28	0.51**		0.73***	
Unemployment rate t-2	-0.26	-0.30	0.15		0.23	
Interest rate t=0	-0.89***	-0.57**	0.04	0.56**	0.41*	0.36
Interest ratet-1	-0.80***	-0.39	-0.15		0.40*	

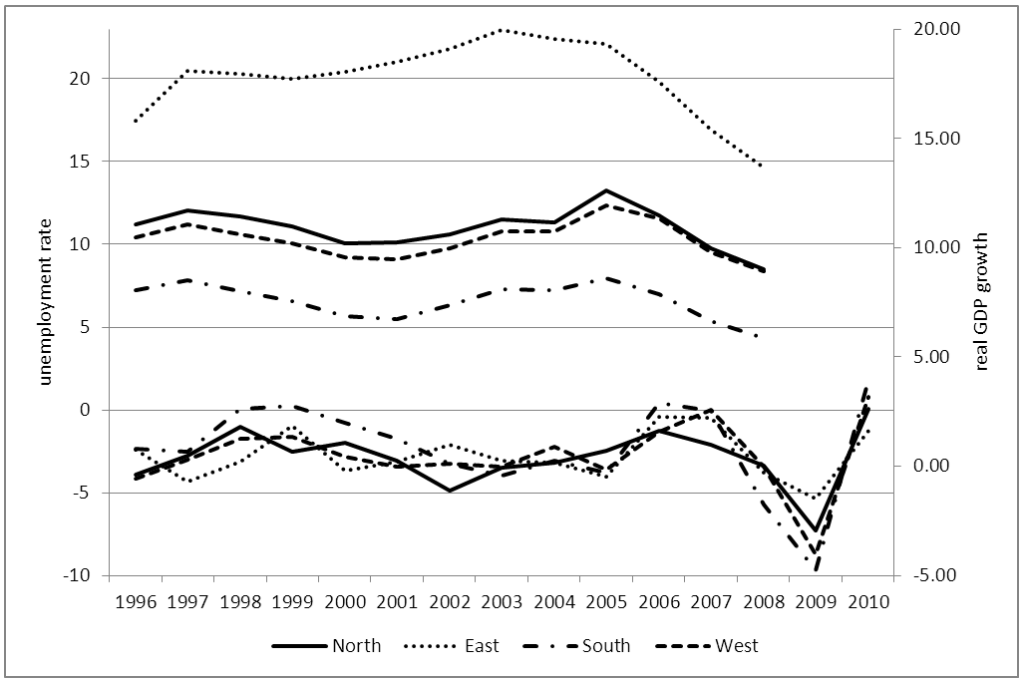
Notes: ***, **, *: statistically significant at 1%, 5% and 10%, respectively.

Since the Micro-Census contains only relatively few start-ups for the smaller Federal States, we aggregate the 16 Federal States to four larger regions (North, South, East, and West) in order to have reasonable numbers of observations.[15]

Over the observation period, the level of unemployment is relatively high in East Germany and low in the south of the country (Figure 2). In all four regions the unemployment rate increased in the early 2000s, peaked around 2005 and then declined through the end of the

[15] The north comprises the Federal States of Bremen, Hamburg, Lower Saxony, and Schleswig-Holstein. Baden-Wuerttemberg and Bavaria make the southern region. East is the territory of the former socialist German Democratic Republic (GDR) plus the former West Berlin and includes the Federal States of Berlin, Brandenburg, Mecklenburg-Pomerania, Saxony, Saxony-Anhalt, and Thuringia. The western region comprises Hesse, North Rhine-Westphalia, Rhineland-Palatinate, and Saarland.

Figure 2: Unemployment rates (upper four lines) and development of real GDP (lower four lines) in the four regions



observation period. The figures for GDP growth show parallel developments in all four regions. The largest real GDP growth rates were reached in the years 2006/2007. Subsequently, the economic crisis led to a sharp decline of real GDP in the years 2008/2009 followed by a quite quick pick-up in the year 2010, with growth rates as high as before the recession (Figure 2).

4. Empirical results

4.1 Econometric approach

Given that the information on business registrations for the 16 German Laender are on an annual basis while the business formations reported by the Micro-Census are for quarters and must be aggregated to a larger geographical scale (North, South, East, and West), we conduct two different types of estimations. Taking the annual number of business registrations per economically active population as the dependent variable, we run regressions with the unemployment rate,

the HP-filtered unemployment rate, real GDP growth, and the HP-filtered real GDP as independent variables. The HP-filter is probably the most frequently used statistical tool to decompose real GDP and the unemployment rate (Shimer, 2005) into a trend and a cyclical component. The two components are estimated in a way that over longer time periods the sum of the deviations of the cyclical component from the trend is close to zero thereby minimizing the variability of the growth component. The so called smoothing or HP filter parameter determines the allowed variability of the growth component. The larger the HP filter parameter, the smoother the trend component is. Following Ravn and Uhlig (2002), a HP filter parameter of 6.25 is used for annual data, and a parameter of 1600 for quarterly data.

In order to account for the break in the Business Registration Statistic in the year 2003, we include a dummy variable (before 2003 = 0; 2003 and later = 1). If we account for this dummy variable, our dependent variable, the number of business registrations per economically active population, is stationary. This was tested using the Breitung panel stationarity test (Breitung, 2000). All explanatory variables are stationary and lagged by one period in order to avoid endogeneity problems. The fixed effects method is applied in order to control for all time-invariant region-specific effects.[16] We report the results in Table 2.

In the second estimation, we use the quarterly data on business formations reported by the Micro-Census. Unfortunately, quarterly GDP data is only available for Germany as a whole and not for individual German states or regions. For this reason, we regress business formation per economically active population on different lags of the quarterly unemployment rate and on lags of the HP filtered unemployment rate. Because unemployment rates for successive

[16] The Hausman test suggests that the application of the random effects estimation procedure would be inappropriate.

quarters are highly correlated, we do not include more than one time lag into one regression in order to avoid multicollinearity problems. This strategy should reveal the average time lag that is relevant for new business formation that is induced by unemployment. The results of the fixed effects estimations are presented in Table 3.

4.2 Estimation Results and Robustness Checks

Tables 2 and 3 contain the estimation results of the fixed effects model for the two different kinds of data sources for start-up activities in Germany allowing us to test our main research questions (Section 2). Table 2 provides evidence that it is, in particular, the unemployment level of the previous year (t-1) that has a significantly positive effect on the level of business registrations. According to these results a ten percent increase in the unemployment rate results in a three to four percent increase in business registrations per active population in the following period. The unemployment rate of the penultimate year (t-2) proves not to be statistically significant. The coefficient of the cyclical component of the unemployment rate is also significantly positive. This shows that in Germany the level of unemployment *and* its deviation from the long term trend have a stimulating effect on the formation of new businesses.

While there is no effect of GDP growth on the level of business registrations we find a significant *negative* coefficient for the effect of the cyclical component of real GDP in the previous year (t-1). The negative sign of the coefficient indicates that better than average economic conditions lead to lower numbers of business registrations per economically active population and vice versa. This observation corresponds to the effect of unemployment on entrepreneurial entries. According to the negative sign for the deviation of GDP from the trend, a possible “opportunity pull” effect does not exist or it is overcompensated by other factors such as good employment

Table 2: The effect of unemployment, GDP, and interest rates on business registrations

Dependent Variable: *Log business registrations*								
	I	II	III	IV	V	VI	VII	VIII
Log unemployment rate t-1	0.42*** (0.15)	0.29** (0.15)	–	–	–	–	–	–
Log unemployment rate t-2	–	–	–	–	0.01 (0.16)	0.03 (0.19)	–	–
HP log unemployment rate t-1	–	–	0.74*** (0.29)	0.51* (0.30)	–	–	–	–
HP log unemployment rate t-2	–	–	–	–	–	–	-0.06 (0.29)	-0.13 (0.33)
Real GDP growth t-1	-1.73 (1.14)	–	-1.04 (1.10)	–	–	–	–	–
Real GDP growth t-2	–	–	–	–	-0.39 (1.24)	–	-0.35 (1.24)	–
HP log real GDP t-1	–	-3.49** (1.58)	–	-3.18** (1.67)	–	–	–	–
HP log real GDP t-2	–	–	–	–	–	-0.30 (1.97)	–	-0.79 (1.83)
Log interest rate t-1	-0.25 (0.23)	-0.18 (0.23)	-0.01 (0.24)	-0.02 (0.24)	-0.23 (0.43)	-0.22 (0.24)	-0.26 (0.26)	-0.26 (0.26)
Constant	-3.67*** (0.55)	-4.12*** (0.55)	-5.05*** (0.46)	-5.04*** (0.45)	-4.55*** (0.52)	-4.61*** (0.58)	-4.59*** (0.48)	-4.59*** (0.48)
Breakdummy	0.90*** (0.06)	0.92*** (0.06)	0.93*** (0.06)	0.93*** (0.06)	0.89*** (0.06)	0.89*** (0.07)	0.88*** (0.07)	0.88*** (0.07)
R^2 within	0.77	0.77	0.76	0.77	0.76	0.76	0.76	0.76

Notes: Fixed effects estimations for 16 German Laender with annual data, 224 or 208 observations; ***, **, *: statistically significant at 1%, 5% and 10%, respectively; standard errors in parentheses; fixed effects are always jointly significant at the one percent level. The high R^2 is basically driven by the dummy variable.

opportunities in boom periods. The interest rate for enterprises and self-employed persons is not statistically significant in any specification when the business register data are used.

The regression results using quarterly data on business formation from the Micro-Census confirm our finding that high levels of unemployment have a stimulating effect on entries into self-employment (Table 3 - I). According to the coefficients for the different lags of the unemployment rate, this effect is largest during the first four quarters and remains significantly positive up to six quarters. During the following quarter the coefficient is not significant anymore. The

Table 3: The effect of quarterly unemployment and interest rates on new business formation

I. Unemployment rate (unfiltered)				II. HP filtered unemployment rate				III. HP filtered unemployment rate – periods with negative deviations from trend only			
	Coefficient	Standard error	R^2 within		Coefficient	Standard error	R^2 within		Coefficient	Standard error	R^2 within
Log ur t-1	0.68***	0.08	0.61	HP log ur t-1	0.94***	0.17	0.54	HP log ur t-1	1.85***	0.4	0.68
Log ir t-1	-0.51***	0.09		Log ir t-1	-0.36***	0.10		Log ir t-1	-0.25**	0.13	
Log ur t-2	0.70***	0.09	0.6	HP log ur t-2	0.89***	0.18	0.53	HP log ur t-2	1.23***	0.36	0.65
Log ir t-1	-0.45***	0.09		Log ir t-1	-0.34***	0.10		Log ir t-1	-0.25*	0.14	
Log ur t-3	0.67***	0.1	0.57	HP log ur t-3	0.67***	0.19	0.5	HP log ur t-3	0.78**	0.31	0.63
Log ir t-1	-0.41***	0.09		Log ir t-1	-0.37***	0.11		Log ir t-1	-0.29**	0.14	
Log ur t-4	0.60***	0.11	0.54	HP log ur t-4	0.38*	0.2	0.47	HP log ur t-4	0.44	0.3	0.61
Log ir t-1	-0.38***	0.10		Log ir t-1	-0.43***	0.11		Log ir t-1	-0.32**	0.14	
Log ur t-5	0.50***	0.12	0.51	HP log ur t-5	0.03	0.21	0.46	HP log ur t-5	0.07	0.3	0.6
Log ir t-1	-0.38***	0.10		Log ir t-1	-0.52***	0.12		Log ir t-1	-0.38**	0.15	

Notes: Dependent Variable*: Log new businesses (Micro-Census); independent variables: ur – unemployment rate, ir – interest rates.* Quarterly fixed effects estimation with seasonal dummy variables; regions North, South, East, West; T=49 (Q1 1997 - Q1 2009); ***, **, *: statistically significant at 1%, 5% and 10%, respectively; seasonal dummy variables are always jointly significant at the one percent level; coefficients from individual estimations (not jointly estimated); number of observations in regression with negative deviations from trend only = 96.

cyclical component of the unemployment rate shows a similar pattern (Table 3 – II). The positive coefficients for the first quarters imply that more people decide to start their own business when the unemployment rate is above its long-term trend and accordingly, fewer people do so when the unemployment rate is below its long-term trend.

In a next step, we test whether the effect of unemployment on the level of new business formation is symmetric or whether there are different intensities in recessions and in boom periods. Therefore, we regress business formation separately on positive and on negative deviations of the unemployment rate from its trend.[17] We find that negative deviations have a statistically significant positive effect on the level of new business formation (Table 3-III) while unemployment rates above the long-term trend have no statistically significant effect[18]. The statistically significant positive effect of negative deviations of the unemployment rate from its trend implies lower levels of new business formation at times when the unemployment rate is below 'normal'. This means that well available employment opportunities lead to reduced start-up activities, while unemployment above the trend does not induce *significantly* more start-ups above 'normal'. The effect of the interest rate in the regression results presented in Table 3 is, now, when quarterly data are used, statistically significant with a negative sign indicating that higher interest rates lead to lower levels of business creation.

Overall, our results provide evidence for the following insights: (1) unemployment rates and entrepreneurial entry rates are positively related. (2) The relationship between the unemployment rate and new business formation is asymmetric in the sense that below average

[17] Since the GDP data for Laender are only available on a yearly basis, there are not enough cases in our data to allow for this type of analysis for positive or negative deviations from the GDP trend.

[18] The results for the positive deviations are not presented in Table 3 due to their non-significance.

unemployment leads to lower levels of new business formation while unemployment above the trend does at least not induce *significantly* more start-ups. (3) Thus, putting the first two findings together we observe that unemployment has a rather counter-cyclical influence on entrepreneurial entries with a certain asymmetry pointing to what may be termed a “low unemployment retard effect”. (4) GDP development has a counter-cyclical influence on entrepreneurial entry rates. (5) There is a statistically significant negative relationship between the interest rate and the level of start-ups, but only when quarterly data are used.

Table 4: The effect of unemployment and GDP on business registrations with controls

Dependent Variable: Log business registrations				
	I	II	III	IV
Log unemployment rate t-1	0.42** (0.14)			
HP log unemployment rate t-1		0.79*** (0.27)		
Real GDP growth t-1			-1.16 (1.09)	
HP log real GDP t-1				-5.19*** (1.47)
Log difference patent intensity	0.31* (0.18)	0.29 (0.18)	0.31* (0.19)	0.32* (0.18)
Log self-employment rate			0.15** (0.07)	
Constant	-4.2*** (0.31)	-5.10*** (0.03)	-4.7*** (0.19)	-5.11*** (0.03)
Breakdummy	1.0 (0.04)***	0.97*** (0.04)	0.94*** (0.04)	0.98*** (0.04)
R2 within	0.79	0.79	0.79	0.80

Notes: Fixed effects estimations with 192 observations.***, **, *: statistically significant at 1%, 5%, 10%, respectively; standard errors in parentheses.

In order to test the robustness of our results we run one further type of regression where we include two variables that control for determinants of entry other than unemployment. The first variable, the self-employment rate, stands for entrepreneurship capital or ‘culture’ in

a region (Fritsch and Wyrwich, 2012). This variable accounts for the observation that there is a pronounced tendency of a long term stability of relatively high or relatively low regional levels of new business formation. The second variable, patent intensity, is the number of patent applications over active population, and represents the generation of knowledge that may constitute a basis for start-ups. As patent intensity turns out to be non-stationary and may result in spurious regression, we used the stationary first log differences. The results (Table 4) partly confirm earlier analyses that found a considerable effect of regional R&D and of the level of new business formation in previous years (Fritsch and Wyrwich, 2012). More importantly, the results of the robustness checks show that all variables that have been statistically significant in the baseline models, i.e. the coefficients of the unemployment rate, the cyclical component of the unemployment rate, and of real GDP remain statistically significant and keep their signs. Thus, they turn out to be stable when these additional variables are included.

5. Discussion and conclusion

We analyzed to what extent variables representing the business cycle (particularly GDP, unemployment, and interest rates) influence gross entry into entrepreneurship. Our results show that the rate of unemployment exhibits a significant influence on entry rates into entrepreneurship. More specifically, we find a significantly positive relationship between the level of unemployment and new business formation with a time lag of up to one and a half years. This effect is asymmetric in the sense that unemployment rates below the trend lead to lower levels of new business formation, while unemployment above the trend has no significant “push” effect. We conclude that there exists a “low unemployment retard effect.”

With regard to GDP, we find that people are induced to become self-employed during recessions. A statistically significant negative relationship could be found between new business formation and

deviations of GDP from the Hodrick-Prescott filtered trend, indicating relatively low levels of start-ups during boom periods and relatively high levels when the level of the GDP is below the trend. As such, GDP development does not statistically significant affect gross entry.

All of our findings point to the counter-cyclical effects of macro-economic variables. Poor economic conditions seem to encourage transitions into entrepreneurship. At the same time our results make clear that there is no evidence of a stimulating effect of boom periods on self-employment. If such an “opportunity pull” effect exists, it is compensated by the fact that low unemployment tends to impair the formation of new businesses. Thus, our analysis provides evidence that entrepreneurs are not only important for an economy because they create new products and contest established market positions, but because they also could play a role as stabilizers during the business cycle.

Future research should, therefore, try to make longer time-series available and include additional control variables that might provide additional insights into the interplay between macro-economic conditions, industry- as well as region-specific factors, and individual level characteristics. It seems quite likely that the relationship between the business cycle and entrepreneurial entries differs between industries and between types of regions. Moreover, there may be interaction effects between certain socio-demographic characteristics and the macro-economic variables that influence transitions into self-employment during different periods of the business cycle. Another open question concerns the differing characteristics of new businesses that are established during boom periods and those during recessions. This issue is important because the quality of start-ups in terms of persistence, growth, and innovativeness determines their effect on the overall economy.

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Appendix

Table A1: Definition of Variables and data sources

Variable	*Definition*	*Data source*
Rate of business registrations	Number of new business registrations over civil labor force	Business Registration Statistics
New business formation rate	Number of new businesses (extrapolated to the entire population) over civil labor force	Micro-Census
Self-employment rate	Number of self-employed persons (first employment) over civil labor force	Federal Statistical Office, Working Committee "Volkswirtschaftliche Gesamtrechnung der Laender"
Patent intensity	Number of patent applications over civil labor force	Federal Statistical Office
Unemployment rate	Number of registered unemployed persons over the entire working population	Federal Employment Agency
Real Gross Domestic Product	Nominal GDP divided by the annual consumer price index (CPI) of the Federal Statistical Office	Federal Statistical Office, Working Committee "Volkswirtschaftliche Gesamtrechnung der Laender"
Interest rate	Lending rates of banks, long-term fixed-rate loans to enterprises and self-employed persons, EUR 100,000 and more but less than EUR 500,000, effective interest rate, available until 2003; from 2003 on linked to effective interest rates of German banks, loans to non-financial corporations with a maturity of over 5 years	Deutsche Bundesbank