THREE ESSAYS ON ENTREPRENEURSHIP

Judit Albiol-Sanchez

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Three Essays on Entrepreneurship

PH.D. DISSERTATION

by

Judit Albiol-Sanchez

UNIVERSITAT ROVIRA I VIRGILI

Faculty of Business and Economics

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Advisors: Mercedes Teruel Carrizosa and Luis Díaz-Serrano

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We STATE that the present study, entitled *Three Essays on Entrepreneurship*, presented by Judit Albiol Sanchez for the degree of Doctor of Philosophy in Economics, has been carried out under our supervision at the Department of Economics of this university, and that it fulfills all the requirements to receive the European/International Doctorate Distinction

Reus, April 16th, 2015

Doctoral Thesis Supervisor	Doctoral Thesis Supervisor
Mercedes Teruel Carrizosa	Luis Díaz-Serrano

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Introduction

The topic of entrepreneurship draws upon the insights of many disciplinary areas including business and management, sociology, psychology, economics, finance and public policy (Sorensen and Chang, 2006). Entrepreneurship as a field of research is widely recognised and it has been claimed as a major driver of economic growth although it was not until the late 1970s that policymakers became conscious of the important contributions that new businesses make to employment and growth (Fritsch, 2011).

The concept of scale economies was proposed by Adam Smith in 1776 and economists, researchers and politicians were focused on the performance of large incumbent firms and largely ignored small firms and entrepreneurship. Acs (2008) states that 'for years, the small firm sector remained a riddle, wrapped in a mystery inside an enigma. Although many people worked in this, it was poorly understood and its role in economic growth was overlooked'. Large datasets of the 1970s enabled researchers to gain a far better understanding of the economics of small firms (Acs, 2008). Since then, there have been large contributions from the literature in both the mathematical and the empirical modelling (van Stel, 2005).

At the end of the 20th century, researchers started to investigate the changing role of small and new firms in industrial economies (Brock and Evans, 1989; Acs and Audretsch, 1993). Globalisation and an increasing importance of knowledge in the production process caused many developed countries to move from a more 'managed' to a more 'entrepreneurial' economy (Audretsch and Thurik, 2000; Thurik et al., 2013). In the former type of economy, large and incumbent firms play a dominant role, exploiting economies of scale in production and R&D in a relatively stable economic environment. In the latter type, small and new firms play an increasingly important role, introducing new products and services in highly insecure economic environments while quickly adapting to rapidly changing consumer preferences (Audretsch and Thurik, 2001).

It seems clear that entrepreneurship has witnessed an increasing number of contributions during the last decades. The literature has emphasised the role of entrepreneurship on economic growth due to its capacity to introduce new processes and products, to put underutilised resources to new uses, to initiate the formation of new industries, and to accelerate the 'gales of creative destruction' (Schumpeter, 1950). Hence, entrepreneurial activity is linked to employment creation, increases in productivity, improvement of living standards and economic growth (Baumol, 1994; Carree and Thurik, 2010; Audretsch and Keilbach, 2008; Thurik, 2009; Koellinger and Thurik, 2012).

Besides, the recent increase of unemployment since the financial crisis exploded in the EU has led to a mismatch between the demand for jobs requiring a certain level of skills and the exiting supply. Enterprises cannot meet their labour demand and skill needs causing a reduction in employees' motivation and effort. Moreover, these individuals feel trapped and unsatisfied in lower level jobs crowding their lower skilled counterparts out of the job market. This situation negatively affects economic competitiveness and growth, increases unemployment, undermines social inclusion and generates significant economic and social costs. Therefore, skill mismatches have come to the forefront of Europe's policy debate (Cedefop, 2010). Keeping this in mind and given that most individuals who report having skill mismatches are in wage employments, a way to overcome it would be making the transition to self-employment.

There is a lack of an agreed-upon definition of entrepreneur and the literature has not yet converged upon a standardised definition of these individuals, a word derived from the French, in the research community (e.g. Van Praag, 1999; Mahoney and Michael, 2004; Thurik and Wennekers, 2004; Van der Sluis and Van Praag, 2008; Harris, 2010). However, there seems to be agreement that entrepreneurship involves creation of something new (Reynolds et al., 2005). In fact, starting up and running a business can merge by different ways: they can start a new firm from scratch and they can

also take over an existing firm. As researchers, our approach to the phenomenon of entrepreneurship depends critically on the databases. For that reason, this thesis uses different measures of entrepreneurship[1]. Hence, the use of different databases enriches this thesis by approaching the entrepreneurial activity from different points of view.

Differences in levels of entrepreneurship according with levels of economic development are emphasised in Audretsch and Thurik (2000, 2001, 2004). It is therefore crucial to understand what drives the entrepreneurial activity among different countries and years. Moreover, entrepreneurship not only contributes to higher levels of economic growth, but also to value or wealth creation both at the firm-level and at the economy-wide level (Hessels, 2008).

So, given the increasing importance of entrepreneurship, this thesis provides new evidence on three broad issues: 1) the dynamic behaviour of entrepreneurial rates, 2) self-employment as a way to escape from skill mismatches and 3) the impact of small versus large firms on economic performance.

Outline of the thesis

This doctoral thesis is focused on understanding entrepreneurship from three different perspectives and comprises three essays. In three out of the five chapters in this book, the topic of entrepreneurship is empirically analysed. Research questions are confronted with different empirical data.

Chapter 1, 'Data and Econometric Methodologies', provides an overview of the databases and econometric techniques used in this thesis. At the macroeconomic level we make use of the Global Entrepreneurship Monitor (GEM), World Data Bank (WDB) and a unique and rich database prepared in part by Panteia/EIM on behalf of the European Commission for the Annual Report on SMEs in the EU (see European Commission, 2010). And at the microeconomic

[1] For a full description go to Chapter 1.

level we exploit the European Community Household Panel (ECHP) database. Regarding the econometric techniques used at the macro level are the Generalised Method of Moments (GMM) and the Ordinary Least Squares. At a micro level, the bivariate probit, the random effects probit and the pooled probit models.

The quantitative empirical research consists of three chapters. *Chapter 2, 'The Relevance of Business Exit for Future Entrepreneurial Activity',* analyses the impact of business exits on future dimensions of entrepreneurial activity at the macroeconomic level. The research uses data from the Global Entrepreneurship Monitor (GEM) and the World Bank for 41 countries. The Generalised Method of Moments (GMM) is chosen to carry out the analysis. The paper differentiates the effect of the two components of total entrepreneurial activity, and the two motivations for it – opportunity and necessity entrepreneurship. The results show a positive and significant effect of business exits over future entrepreneurial activity. In particular, territories with greater business exit rates show higher levels of entrepreneurial activity. Additionally, findings corroborate that, at the national level, business exits imply greater rates of necessity-driven entrepreneurship in less developed economies. The originality of the study is that one would expect that unemployment rates would imply higher levels of necessity entrepreneurship. However, results show that unemployment rates do in fact favour opportunity entrepreneurship levels. This could be due to those government policies that are aimed at promoting entrepreneurship through the capitalisation of unemployment to be totally invested in a new start-up. To the best of our knowledge, this is the first panel data study to link previous exit rates to future dimensions of entrepreneurial activity differentiating among necessity and opportunity motives.

Using data from the European Community Household Panel (ECHP) covering the period 1994–2001 for 11 of the EU-15 countries and 46,830 individuals, *Chapter 3, 'Is Self-Employment a Way to Escape from Skill Mismatches?',* contributes to the literature by analysing the impact of the transition from salaried employment to

self-employment on self-reported skill mismatches. We restrict our sample to those individuals who are self-employees or salaried employees, aged 18–65, either males or females and working part-time or full-time. Individuals who do not participate in consecutive waves are excluded from our sample. Moreover, we track individuals over time and measure their self-reported skill mismatch before and after the transition. We differentiate among two different samples. The first one, called 'full sample', contains those individuals who remain salaried employees throughout the whole sample period and are used as a control group for those who experience transitions from salaried employment to self-employment. Alternatively, from this 'full sample', we create a subsample consisting of those individuals who switch only once from salaried employment to self-employment and remain in this employment regime until the end of the sample period. In this sample, we consider only individuals who experience the transition, so individuals are compared with themselves before and after the transition. We refer to this as the 'restricted sample'. Our empirical findings indicate not only that the average self-employee is less likely to declare being skill-mismatched but also that those individuals who transit from salaried employment to self-employment reduce their probability of skill mismatches after the transition. The main contribution of this chapter is to analyse how becoming an entrepreneur affects the perception of having skill mismatches.

Chapter 4,"Investigating the impact of small versus large firms on economic performance of countries and industries", investigates the impact of small versus large firms on economic performance of countries and industries. Following earlier work by Audretsch et al. (2002), we assume that an optimal size-class structure exists, in terms of achieving maximal economic growth rates. Such an optimal structure is likely to exist as economies need a balance between the core competences of large firms (such as exploitation of economies of scale) and those of smaller firms (such as flexibility and exploration of new ideas). Accordingly, changes in size-class structure (i.e., changes in the relative shares in economic activity accounted for by

micro, small, medium-sized and large firms) may affect macro-economic growth. Using a unique data base of the EU-27 countries for the period 2002-2008 for five broad sectors of economic activity and four size-classes, we find empirical support which suggests that, on average for these countries over this period, the share of micro and large firms may have been 'above optimum' (particularly in lower income EU countries) whereas the share of medium-sized firms may have been 'below optimum' (particularly in higher income EU countries). This evidence suggests that the transition from a 'managed' to an 'entrepreneurial' economy (Audretsch and Thurik, 2001) has not been completed yet in all countries of the EU-27. The main contribution is the study in size-class structure on macro-economic performance at country and industry level of the European Union (EU-27).

Finally, *Chapter 5, "Conclusions"* draws a discussion of the results obtained in this study, the main conclusions and some lines for further research.

Publications

Chapters 3 to 5 of this work are three empirical essays on topics related to entrepreneurship, both at macroeconomic and at microeconomic levels. Each chapter can be read and considered independently of the rest. The research articles on which this thesis is based are the following:

i. Albiol-Sanchez, J. (2015). The Relevance of Business Exit for Future Entrepreneurial Activity. Currently the paper is accepted to be published in the *Journal of Small Business and Enterprise Development* (forthcoming). A previous version of this paper was published in the working paper series of the Universitat Rovira i Virgili as: Albiol, J. (2014). *The Significance of Business Exit for Future Entrepreneurial Activity* (No. 2072/238221). Different versions of this study have been presented at a seminar in the Universitat Rovira i Virgili (2012), at the XVI Encuentro de Economía Aplicada (2013) and at the

GEM Research Conference on Entrepreneurship and Economic Development (2013).

ii. Albiol-Sanchez, J., Díaz-Serrano, L. and Teruel, M. (2014) Is Self-Employment a Way to Escape from Skill Mismatches?. The paper is now under the process of revision in a journal listed in the ISI-JCR. A previous version of this paper was published in the working paper series of the Universitat Rovira i Virgili as: Albiol, J., Díaz-Serrano, L. and Teruel, M. (2014). *Is Self-Employment a Way to Escape from Skill Mismatches?* (No. 2072/247652). It was presented in three seminars (2013): at Universitat Rovira i Virgili (Spain), and during my PhD stage, at Panteia Research Centre (Netherlands) and at Rotterdam School of Economics (Netherlands) and in the 2nd PhD Workshop in Industrial and Public Economics in Spain (2014).

iii. Albiol-Sanchez, J. and van Stel, A. (2015). Investigating the Impact of Small versus Large Firms on Economic Performance of Countries and Industries. Currently the paper is forthcoming as a book chapter in an edited volume at Springer entitled "Entrepreneurship Nowadays: Between Challenge, Hopes and Fallacies" (Working Title; editors D. Bögenhold, J. Bonnet, M. Dejardin and D. García Pérez de Lema). A previous version of this paper was published in the working paper series of the Universitat Rovira i Virgili as: Albiol, J., and Stel, A. V. (2015). *Investigating the impact of small versus large firms on economic performance of countries and industries* (No. 2072/246966). It was presented at a seminar in the Universitat Rovira i Virgili (2014) and at The Governance of a Complex World: Smart, Sustainable and Inclusive Growth Conference in Italy (2014).

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Chapter 1

Data and Econometric Methodologies

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Chapter 1

Data and Econometric Methodologies

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Chapter 1

Data and Econometric Methodologies

1.1 Introduction

In this chapter we present and describe the data and the econometric methodologies used in the empirical development of the thesis. Each essay of the present thesis is based on a different set of empirical data for different units of observation which enables to investigate the entrepreneurship phenomenon much deeper. This thesis uses the individual level, the firm level and the spatial level such as country level as a unit of observation. In particular, the second chapter (*first essay*) uses data at country level, the third one (*second essay*) combines individual and country level data and the fourth chapter (*third essay*) in this thesis does not only distinguish between different countries, but also between different sectors and/or different time periods and countries by economic development.

1.2 Data

The empirical data used for the *first essay* comes from the Global Entrepreneurship Monitor (GEM) and the World Data Bank (WDB). These databases provide a detailed and comprehensive description of the entrepreneurial activity and countries' characteristics.

The GEM is a unique, unprecedented effort to describe and analyse entrepreneurial processes within a wide range of nations. The data collection is composed of two complementary tools: the Adult Population Surveys (APS) and the National Expert Surveys (NES). We make use of the APS which provides harmonised estimates of the level of entrepreneurial activity. Data collected through these

surveys are based on a representative sample of the adult population of the territory, and from these data it is possible to create national measures of entrepreneurial activity. The best known entrepreneurship measure is the Total Entrepreneurial Activity (TEA), which reflects the proportion of the economically active population that are (1) currently starting a new business or (2) owning or managing a young firm created in the last 42 months. GEM data also allow for the investigation of different entrepreneurial motivations (see Reynolds et al., 2005). Hence, these data represent a solid source of information to develop a valid entrepreneurship model harmonised across countries.

While entrepreneurship is a multifaceted phenomenon with many different meanings and definitions, GEM operationalises entrepreneurship as: 'Any attempt at new business or new business creation, such as self-employment, a new business organization, or the expansion of an existing business, by an individual, a team of individuals, or an established business' (Bosma, 2013).

Thus, the particular advantages of GEM data is that even after a relatively short period of data collection, takes a comprehensive socio-economic approach and considers the degree of involvement in entrepreneurial activity within a country, identifying different types and phases of entrepreneurship which differentiates GEM data from other data sets that measure new business registrations (Bosma, 2013). However, there are also some weaknesses. As Hindle (2006) pointed out, the direct application of TEA as an overall measure of entrepreneurial behaviour in a country has limitations. It does not reflect a linear relationship between entrepreneurship and economic development (Acs, 2006), and neither does it reflect any entrepreneurial activity taking place in established, more mature businesses, other than new business spinoffs sponsored by parent companies (Bosma et al., 2012).

Data on the countries' characteristics were obtained from the World Data Bank. This data set uses World Development Indicators (WDI) from the World Bank databases and it comprises information from

various officially recognised international sources. The final panel-data covers a six-year period (2002-2007) and includes information for individuals residing in 41 countries. The selected countries are Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Croatia, Denmark, Finland, France, Germany, Greece, Hong Kong SAR China, Hungary, Iceland, India, Ireland, Italy, Jamaica, Japan, Latvia, Mexico, the Netherlands, New Zealand, Norway, Peru, Russian Federation, Singapore, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Uganda, United Kingdom, United States and Uruguay.

World Data Bank has many advantages: it is freely available and it reflects the latest additions and revisions. Moreover, World Development Indicators are organised around different themes, which makes it easier to work with.

The data used in the *second essay* comes from the European Community Household Panel (ECHP), a standardised multi-purpose annual longitudinal survey carried out at the level of the EU-15 on behalf of the Statistical Office of the European Commission (EUROSTAT). The main advantage of the ECHP is that the questionnaires are standardised. Each year all individuals in the participating countries are asked the same questions; consequently, the information is directly comparable. It contains information not only at the household, but also very detailed data at the individual level. These interviews cover a wide range of topics concerning living conditions. They include detailed income information, financial situation in a wider sense, working life, housing situation, social relations, health and biographical information of the interviewed.

The data collection started in 1994 and was conducted over eight consecutive years. We make use of all waves of the ECHP, thus covering the 1994-2001 period[2], for 11 of the EU-15 countries (Denmark, the Netherlands, Belgium, France, Ireland, Italy,

[2] EU-15 refers to the 15-member states of the European Union before the 1 May 2004 enlargement.

Greece, Spain, Portugal, Austria and Finland). For Austria and Finland the available files cover only the period 1995-2001 and 1996-2001, respectively[3]. Our final sample consists of 172,174 observations belonging to 46,830 individuals.

We use self-employment as a proxy of entrepreneurship. The classification into self-employment in the ECHP is similar as in most data sources. Respondents are asked to classify themselves as employees or self-employed according to their status in their main jobs.

The ECHP is a large scale comparative survey in which the same individuals, residing in private households, are interviewed in consecutive years with interviews approximately one year apart. They are micro-data, allowing us to control for individual and country effects in estimation procedures. As panel data they trace the same individuals allowing us to control for unobserved individual-effects. Furthermore the standardisation of these data facilitates cross-country comparisons (Taylor, 2011).

The empirical data used for the *third essay* comes from a unique and rich database prepared in part by Panteia/EIM on behalf of the European Commission for the Anual Report on SMEs in the EU (see European Commission, 2010). The database provides information on employment, value added, sales and other variables for all 27 countries of the European Union. The information is also disaggregated by sector and size-class. It covers four enterprise size classes and five industries. SMEs are defined as enterprises in the non-financial business economy that employ fewer than 250 workers. The complement of the SME-sector – enterprises that employ 250 or more workers are large scale enterprises (Large). Within the SME-sector, the following size classes are distinguished: micro enterprises, employing less than 10 workers (including self-employed), small enterprises, employing at least 10 but less than 50 workers (including self-employed), and medium-sized enterprises

[3] See Peracchi (2002) for a review of the organisation of the survey.

that employ between 50 and 250 workers (including self-employed). The industry classification is based on the NACE classification system, the European standard for classification of enterprises by industry. In this study, we use NACE Revision 1.1. (sectors D, F, G, H and I – basically the non-financial business economy). In other parts of the economy (e.g., mining; electricity), interplay between small and large firms is less likely to occur. This enables us to compute sales shares and value added growth rates by sector and size-class.

In this last essay, we used entrepreneurship as the share of small firm presence operationalised as the share of small firms in a country's total turnover (i.e., sales). We assume the role of small firms as a vehicle for entrepreneurship.

Hence, the particular advantage of the up-to-date European Commission database is that it provides harmonised data by size-class on value added and employment for almost all individual countries in the EU. It allows us to explain interesting differences across sectors, size classes, countries and regions (such as higher and lower developed countries). However, most data refer to averages which do not do justice to the great variety between enterprises. SMEs range from the self-employed bookkeeper without personnel to the fast growing, innovative and much internationalised ICT firm 200 employees, and everything in between (European Commission, 2010).

To sum up all the above, Table 1.1 gives an overview of the composition of each empirical data used in each essay.

Table 1.1 Databases used in this thesis

Essay	Database	Unit of Observation	Time Unit
1	GEM/WDB	Country-level	2002-2007
2	ECHP	Individual-level	1994-2001
3	PANTEIA/EIM_European Comission	Country-sector level	2002-2008

Source: Own elaboration

1.3. Econometric Methodologies

'The increased availability of panel data from household surveys has been one of the most important developments in applied social research in the last thirty years'

Fitzgerald, Gottschalk and Moffitt (1998, p.252)

Given the dynamic nature of this work, the main tool used is the econometric panel data estimation. In the last decades there has been a growing interest in the use of panel data econometric studies reflecting the availability of new data sets of this type.

The term 'panel data' refers to the pooling of observations on a cross-section of households, countries, firms etc. over several time periods (Baltagi, 2008). Within this term, we can differentiate between micro panels and macro panels. The first are collected for a large number of individuals N and over a short period T. In contrast, macro panels usually involve a number of countries over time.

Hsiao (2003) lists several benefits from using panel data in front of cross-sectional or time-series data sets. These include the following: (i) panel data are able to control for individual heterogeneity; (ii) they give more informative data, more variability, less collinearity among the variables, more degrees of freedom and more efficiency;

(iii) panel data are better able to study the dynamics of adjustment; (iv) panel data are better able to identify and measure effects that are simply not detectable in pure cross-section or pure time-series data; (v) panel data models allow us to construct and test more complicated behavioural models than purely cross-section or time-series data; (vi) biases resulting from aggregation over firms or individuals may be reduced or eliminated (micro panels); and (vii) macro panel data have a longer time series and unlike the problem of nonstandard distributions typical of unit roots tests in time series analysis.

However, there are also some limitations: (i) design and data collection problems; (ii) distortions of measurement errors; (iii) selectivity problems as self-selectivity, nonresponse and attrition; (iv) short time-series dimension; and (v) cross-section dependence.

Here we present the econometric techniques used in the empirical development of this thesis, both at macroeconomic and microeconomic levels, with their main characteristics and descriptions.

Table 1.2 Methodologies used in this thesis

Essay	Macroeconomic Level	Microeconomic Level
1	Generalized Method of Moments	
2		Random-Effects Probit, Pooled Probit and Bivariate Probit Model
3	Robust Ordinary Least Squares	

Source: Own elaboration

1.3.1. Generalized Method of Moments

In the *first essay*, we test whether business exits leads to a fall in future levels of entrepreneurial activity at the country level. Since we suspect that previous entrepreneurial rates would affect future

levels of entrepreneurial activity, we add the lagged dependent variable as an explanatory variable.

According to Nickell (1981) and Judson and Owen (1999), the presence of the unobserved heterogeneity in panel data models with lagged dependent variables as an explanatory variable would tend to generate biased and inconsistent estimates if the time dimension of the panel is fixed and small. As a result, the Generalised Method of Moments (GMM) proposed by Arellano and Bond (1991) is used as econometric tool. This method treats regression models as a system of equations, one for each period, and the first differences are calculated from the equation so that observed individual heterogeneity is removed. Consequently, lagged levels of the series are used as instruments for the endogenous variables in first differences.

However, this estimator known as 'difference estimator' presents some shortcomings. Lagged levels of explanatory variables are weak instruments for estimating the parameters of the first-difference variables, leading to inconsistent model estimates. Arellano and Bover (1995), Blundell and Bond (1998) and Bond (2002) show that the GMM 'system estimator', which is based on asymptotic and small sample properties, works better. They suggest to instrument endogenous and non-strictly exogenous variables with lags of their own first differences, instead of using lagged values for the variables in levels. Thus, the system GMM model is used in the first essay.

The specification of the regression model is:

$$\Delta y_{it} = \alpha + y_{it-1}\lambda + X_{it}\beta + u_i + u_t + \varepsilon_{it} \qquad (1.1)$$

where Δy_{it} is the change in the outcome variable for *i=1,2,…, N* and *t=1, 2, …, T*; y_{it-1} is the lagged term of the endogenous variable; X_{it} is the set of control variables; u_i is a country-specific effect; u_t is a time-specific effect; ε_{it} is a time-varying error term; and α, λ and β are a set of parameters to be estimated.[4]

[4] For the implementation of the model go to *Chapter 2*.

Since the instruments used in the GMM difference approach are strict subsets of the instruments used in the GMM system estimation, a specific contrast of the additional instruments is reported. The Sargan test of autocorrelation is used to corroborate the presence of serial correlation and the Hansen test of over-identification (Hansen, 1982) is used to contrast the overall validity of the instruments used in the regression. The final models employ the two-step method, although the variances tend to be biased downwards. Therefore, to enhance estimation accuracy, the Windmeijer finite-sample correction method is used (Windmeijer, 2005).

1.3.2. Random Effects vs. Pooled Probit Model

In the *second essay* we examine the relationship between self-reported skill mismatch and transitions from the salaried to the self-employment. One of the most interesting features of our analysis is the use of longitudinal data. It allows us to study observed mobility from salaried employment to self-employment, rather than intentions to move and its impact on the probability of reporting skill mismatch. Since our main outcome variable is a dummy variable, the probit model is used. Hence, the econometric specification can be written as

$$Y_{it} = I(Y^*_{it} > 0) = I\left(T_{it}\lambda + Z^{'}_{it}\gamma + v_{it} > 0\right), \ (i = 1, \dots., N; t = 1, \dots, T) \quad (1.2)$$

where *I(.)* is a binary indicator function that takes the value one if the argument is true and zero otherwise, T_{it} is an indicator of the variable of interest, Z_{it} is a vector of explanatory variables, γ is a set of coefficients to be estimated and v_{it} is the error term.

Equation (1.2) represents the standard pooled probit model, which ignores heterogeneity across individuals. If v_{it} is independent of Z'_{it},

the estimates coming from this model are consistent but might not be asymptotically efficient.

If we make the standard assumption that the error term in Equation (1.2) can be additively decomposed into an unobservable individual-specific component, δ_i, which is constant over time and normally distributed with zero-mean and variance σ_δ^2 , and a time-varying white noise, e_{it}, independent of both δ_i and Z_{it}, then Equation (1.2) becomes:

$$Y_{it} = I(Y^*_{it} > 0) = I(T_{it} + Z'_{it}\gamma + \delta_{it} + e_{it} > 0), \quad (i = 1, \dots., N; t = 1, \dots, T) \quad (1.3)$$

Equation (1.3) corresponds to the standard random effects probit model for which maximum likelihood estimates are generally consistent and asymptotically efficient (see, e.g., Greene, 2000).

This term is the correlation between the composite latent errors, $\delta_i + e_{it}$, across any two time periods and also measures the relative importance of the individual's unobserved effect, δ_i.

So far we know that both the pooled and the random effects model provide consistent estimates under given circumstances. Moreover, after applying the correction expressed in Equation (3.1) the pooled probit model turns out to also be efficient. In addition, the estimated parameters of the correlated random-effects probit model will converge to the estimated parameters of the pooled probit model as ρ tends to zero. If ρ =0, the estimates of the two alternative models will be identical. Therefore, the choice of the pooled models will be condition upon whether the parameter ρ is estimated to be close to zero.

Given both the binary and the panel nature of our data, a natural candidate to model skill mismatch is the random effects probit model. As pointed out, a pooled bivariate probit model is a feasible alternative to address this issue.

1.3.3. Robust Ordinary Least Squares

In the *third essay* we test the hypothesis that changes in size-class structure affect macro-economic performance of industries and countries in the European Union (EU-27). We capture changes in industry structure by changes in the relative importance (share of economic activity) of four firm size-classes (micro, small, medium and large) for five broad sectors of economy. After analysing the data we observe the presence of outliers which can strongly distort and lead to unreliable results. To deal with this, we use a robust regression method which, over the past decade, was made available in popular software packages and has been frequently used both in leading research publications and in industry (Baldauf et al., 2012). Indeed, we perform a robust ordinary least squares estimation which involves both robust estimation of the regression coefficients and the standard errors.

This method estimates a robust regression using iteratively reweighted least squares. The procedure uses two kinds of weighting, Huber weights and biweights[5], but also includes an initial step that removes high-leverage outliers (based on Cook's D). First it performs an initial screening based on Cook's distance > 1 to eliminate gross outliers before calculating starting values and then performs Huber iterations followed by biweight iterations, as suggested by Li (1985).

As Verardi and Croux (2009) state, 'a weighted least-squares estimator can be written as

$$\hat{\theta}_M = arg \sum_{i=1}^{n} \omega_i r_i^2(\theta)\ min$$

[5] The biweight transformation is used in robust analysis. For many applications, it combines the properties of resistance with relatively high efficiency.

where the weights ω_i are however a function of θ and are thus unknown. Using an initial estimate $\tilde{\theta}$ for θ, the weights can be computed and serve as the start of an iteratively reweighted least squares algorithm.

The loss function used is a Tukey Biweight function defined as

$$\rho(u) = \begin{cases} 1 - \left[1 - \left(\frac{u}{k}\right)^2\right]^3 & if\ |u| \le k \\ 1 & if\ |u| > k \end{cases}$$

where k = 4.685. The starting value of the iterative algorithm $\tilde{\theta}$ is taken to be a monotone M-estimator with a Huber $\rho(\cdot)$ function:

$$\rho(u) = \begin{cases} \frac{1}{2}(u)^2\ if\ \ |u| \le c \\ c|u| - \frac{1}{2}c^2\ \ if\ |u| > c \end{cases}$$

where c = 1.345. Moreover, to give protection against bad leverage points, observations associated to Cook distances larger than 1 receive a weight zero.

1.4. Conclusions

To conclude with this chapter we may highlight the following points:

a) The use of different databases allows us to cope with the entrepreneurial activity from different perspectives.

b) We may observe the phenomena from a microeconomic and also macroeconomic approach.

c) The comparison among countries with different characteristics. We obtain this comparison thanks to the access to data at country level.

d) The temporal window is different for each database. Hence, this also allows us to analyse different time periods.

e) We have adopted the econometric have adapted to the characteristics of the database and to the research question under analysis.

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Chapter 2

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Chapter 2

The Relevance of Business Exit for Future Entrepreneurial Activity

2.1. Introduction

The analysis of the impact of entrepreneurial exit on macroeconomic figures is an interesting information-based input to promote entrepreneurship. In most countries, policymakers employ entrepreneurship as a tool for overcoming stagnating or declining economic activity (Henry and Treanor, 2013; Matlay, 2005). As a result, entrepreneurship has firmly entered into the agendas of policymakers, educators, practitioners and business people (Matlay and Westhead, 2004).

The current economic and financial crisis faced by economies since 2008 has triggered significant debate among policymakers. Many researchers have noted that the labour market experienced its deepest downturn since the post World War II era (Elsby *et al.*, 2011). In particular, this downturn has had an important implication for entrepreneurship rates. Thus, in most developed and developing countries the analysis of entrepreneurial exit has become crucial since it may impact the configuration and the level of competitiveness of local industries. Yet little attention has been paid to the impact of entrepreneurial exits on entrepreneurial entry decision (DeTienne, 2010).

Fritsch and Mueller (2004) argue that market exit should be understood as a necessary element of market selection, and this would likely result in improved competitiveness and employment growth. Also, it is suggested that policymakers should stop

subsidizing firms to minimize the costly exit of newly created firms. Previous research using data from the Global Entrepreneurship Monitor (GEM) shows substantial differences in the dynamics of entrepreneurship across economies (Reynolds *et al.*, 2005; Acs and Varga, 2005; Wennekers *et al.*, 2005). Audretsch and Thurik (2004; 2001; 2000) emphasize the observed correlation between entrepreneurship rates and the level of economic development. Hence, scholars seem to agree that the level of entrepreneurial activity varies systematically across countries (see forexample, Grilo and Thurik, 2008; Rees and Shah; 2006; Blanchflower and Meyer, 1994; Wit and Winden, 1989).

Therefore, it is crucial to assess whether entrepreneurial exit rates contribute to explain future entrepreneurial activity across economies. This study uses GEM data to explain whether business exits lead (or not) to a fall in future levels of entrepreneurial activity at the country level. To enhance estimation accuracy, the Total Entrepreneurial Activity (TEA) rate and its two components—nascent and new business activity rates—have been analyzed. Given that entrepreneurs are heterogeneous in their entry motivations (Ardagna and Lusardi, 2009; Reynolds *et al.*, 2005), the analysis distinguishes between opportunity-driven and necessity-driven entrepreneurial activity.

The data used in this study cover the period 2002–2007 for a sample of 41 countries. The longitudinal nature of the data allows to accurately studying the business exit–entrepreneurial activity relationship. To the best of our knowledge, this is the first longitudinal study linking exit rates to future entrepreneurial activity at the country level.

The reminder of the study is organized as follows. Section 2 provides a brief overview of the entrepreneurship literature. Section 3 describes the data and the econometric methodology. Section 4 presents the results, while the final section provides the concluding remarks.

2.2. Literature review

2.2.1 Business exit

Following DeTienne (2010), business exit understood as the process by which entrepreneurs leave the firm they created—either by removing themselves from the ownership and decision-making structure of the firm, shutting down the business, or discontinuing business activity—is a critical stage of the entrepreneurial process. Entrepreneurial exit not only represents the end of the firm's life cycle, but also has a significant effect on the industry and the local economy. From an industry perspective, entrepreneurial exit rates might represent a change in both the competitive balance of the industry and the configuration of the local industrial fabric, thus providing value to competing rivals (Akhigbe *et al.*, 2003).

Business exit is more than a mere liquidity-related event. At the territorial level, exit rates might be the ultimate consequence of the recycling process of the stock of entrepreneurial firms (DeTienne, 2010). Territories might show high (or low) business exit rates, and these exit rates are path dependent and influence future decisions of entrepreneurs. This way, the regeneration of the population of businesses represents a mechanism to transfer novelty to established firms, with potentially positive and negative effects on the territory's economy (Audretsch, 1995). On the one hand, new firms represent a vital space for introducing innovations into the market (Decker and Mellewigt, 2007). Although, market selection forces often take many of these short-lived firms out of the economy, thus limiting their potential contribution to the economy. On the other hand, and in the background of the current economic downturn, new firms are vulnerable to market conditions, thus increasing their likelihood of being selected out from the industry. This way, economic turbulences might contribute to the consolidation of high-potential new firms, thus facilitating the regeneration of the stock of firms by displacing established businesses (Audretsch, 1995; DeTienne, 2010).

2.2.2. Entry decision: opportunity and necessity motivations

The decision to become an entrepreneur is heterogeneous among individuals mainly because of existing differences in their motivation to start a business. Research in the economics of entrepreneurship distinguishes between opportunity and necessity entrepreneurs (*e.g.*, Block and Wagner, 2010; Ardagna and Lusardi, 2009; Reynolds *et al.*, 2005; Sternberg and Wennekers, 2005). These categories capture the two most influential factors influencing individual to become entrepreneurs (Gilad and Levine, 1986; Shapero and Sokol, 1982). 'Pull' factors arise when people voluntarily engage to pursue a business opportunity, while 'push' factors appear when individuals lack market alternatives and decide to start a business to enter in the labor market.

Scholars have identified four reasons as to why it is important to distinguish between opportunity and necessity entrepreneurs. First, the socio-economic profile of both types of entrepreneurs differ (Amit and Muller, 1995). Second, entrepreneurial motivations may affect business performance (Kautonen and Palmroos, 2009; Hessels *et al.*, 2008). Third, the relationship between the business cycle and the entrepreneurship cycle may vary across entrepreneurial motivations (Koellinger and Thurik, 2009). Fourth, impact of the local entrepreneurial activity on the economy might differ according to the entrepreneurial motivation (Wennekers *et al.*, 2005; Wong *et al.*, 2005).

Although opportunity and necessity entrepreneurship is crucial at the microeconomic level (see Verheul *et al.*, 2010), this distinction is also important at the macroeconomic level. For instance, Wennekers *et al.* (2005); Wong *et al.* (2005) and Acs and Varga (2005) show that opportunity and necessity entrepreneurs have a differentiated impact on economic growth and job creation. More recently, Koellinger and Thurik (2012) study the effect of entrepreneurship levels on future GDP. They show that opportunity entrepreneurship leads the cycle by two years, while necessity entrepreneurship leads the cycle by only one year.

Hessels *et al.* (2008) provide empirical evidence on the differences across economies. Additionally, Shane and Kolvereid (1991) and Baum *et al.* (1993) find that there is a different frequency between motivations and needs between countries. Wennekers *et al.* (2005) and Levie and Autio (2008) highlight the necessity to consider the country conditions to explain the determinants of opportunity and necessity entry decisions.

Shane *et al.* (2003) urge scholars to control for opportunity identification in studies on entrepreneurial motivations. Recent empirical evidence seems to confirm this call. The distinction between opportunity and necessity entrepreneurship has important consequences for policymaking as policy measures should accommodate the entrepreneurs' profile (and their motivations) to accurately stimulate entrepreneurship.

2.2.3 Linkages between entrepreneurial exit and entry

Building on the theoretical deductions made by Geroski (1995) and Bartelsman *et al.* (2005), the process of business dynamics encompasses business entry and exit, and these processes are significantly correlated across most industries and territories. Moreover, labor mobility across firms is an important source of knowledge spillovers, and thereby of productivity growth (Millán *et al.*, 2013; Power and Lundmark, 2004; Cooper, 2001; Breschi and Lissoni, 2001; Stephan, 1996).

From an industry perspective, specific characteristics, such as the displacement effect exerted by firm exit and entry in firm dynamics over time, along with region-specific characteristics (*e.g.*, value added per capita, endowment of technological factors, operating specialization, population density, entrepreneurial spillovers, the presence of industrial districts and their agglomeration economies) may have an effect on the economy's business exit rates.

On the one hand, one might expect to find a fringe of 'revolving door' firms with a low survival probability, continuously entering and

exiting the market. This exacerbates resource allocation processes in the economy, thus limiting the potentially positive impact of new firms on the economy. On the other hand, firm exit is not necessarily harmful to the economy as this event linked to industry dynamics allows the exploitation of new technological and entrepreneurial opportunities. Also, firm exit might indirectly stimulate firm entry by releasing resources into the economy (Carree *et al.*, 2011; Pe'er and Vertinsky, 2008). Based on these arguments it is argued that business exit rates act as a catalyst for the enhancement of the regeneration of the stock of businesses in the economy. Thus, I hypothesize that business exit is positively associated with future territorial entry rates.

At this point, it is worth noting that the expected effect of exit rates on entry rates is heterogeneous across territories as a result of the dissimilarities in the way through which entrepreneurs engage in entrepreneurial activities (Hessels *et al.*, 2011). For the purposes of this study, the analysis focuses on the motivation underlying the entrepreneurial activity at the country level, that is, identification of entrepreneurship driven by opportunity or necessity motivations.

Entrepreneurs driven by opportunity motivations develop business ideas that are considered valuable. These entrepreneurs exploit these projects on the basis of expected future economic profits and increased market shares as a result of the value added of their products/services (Baron, 2006; Shane and Venkataraman, 2000). Moreover, these individuals observe third-person opportunities around them and evaluate the feasibility and desirability of their pursuit (Autio *et al.*, 2013).

Wealthier countries show a higher demand of goods and services, creating more opportunities to start new businesses (Minniti *et al.*, 2005; Van Stel *et al.*, 2007). These countries have greater potential demand, more capacity to absorb new products and refine existing ones, greater access to financial resources, and higher human capital levels (Van Stel *et al.,* 2007; Wong *et al.*, 2005; Reynolds *et al.*, 2002). Hence, entrepreneurial exit rates will cover

entrepreneurial spillovers, offering a fringe for future entrepreneurial activity. Thus, exit will likely positively impact entry rates in the sense that a less crowded market offers more market opportunities and less competition to firms, which provides a stimulus to entrepreneurship (Burke and Van Stel, 2014).

On the contrary, less developed economies tend to have a higher proportion of necessity entrepreneurship because of lower standards of living and the need to survive (Koster and Rai, 2008). Individuals are pushed into entrepreneurship driven by the lack of employment options, seeking short-term projects which are not influenced by demand (Kelley *et al.*, 2012; Van Stel *et al.,* 2007; Acs, 2006; Wong *et al.*, 2005). Therefore, in these countries entrepreneurial activity represents the last resort for individuals and other options for economic activity are absent or unsatisfactory (Wong *et al.*, 2005).

Additionally, in developing and underdeveloped territories individuals lack an efficient banking system that channels financial resources to the creation of new ventures and local demand tends to be limited, which in turn hampers the innovation capacity of these entrepreneurs (Van Stel *et al.*, 2004). In these countries individuals are faced with hard market conditions, which decreases the opportunity cost of business exit and favors over-entry rates. Therefore, I hypothesize that in developing and underdeveloped economies exit rates will have a negative impact on future business entry rates.

2.3. Data and Method

2.3.1. Data

The data used in this study come from two databases: the Global Entrepreneurship Monitor (GEM) Adult Population Surveys (APS) and the World Data Bank (WDB) provided by the World Bank. The

sample includes information for 41 countries covering the period 2002–2007.

The GEM Adult Population Surveys (APS) provide harmonized estimates of the level of entrepreneurial activity. Data collected through these surveys are based on a representative sample of the adult population of the territory, and from these data it is possible to create national measures of entrepreneurial activity. The best known entrepreneurship measure is the Total Entrepreneurial Activity (TEA), which reflects the proportion of the economically active population that are (1) currently starting a new business or (2) owning or managing a young firm created in the last 42 months. GEM data also allow for the investigation of different entrepreneurial motivations (see Reynolds *et al.*, 2005). Hence, these data represent a solid source of information to develop a valid entrepreneurship model.

Data on the countries' characteristics was obtained from the World Data Bank. This data set uses World Development Indicators (WDI) from the World Bank databases and it comprises information from various officially recognized international sources. The final panel-data covers a six-year period (2002-2007) and includes information for individuals residing in 41 countries. The selected countries are Argentina, Australia, Belgium, Brazil, Canada, Chile, China, Colombia, Croatia, Denmark, Finland, France, Germany, Greece, Hong Kong SAR China, Hungary, Iceland, India, Ireland, Italy, Jamaica, Japan, Latvia, Mexico, Netherlands, New Zealand, Norway, Peru, Russian Federation, Singapore, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Uganda, United Kingdom, United States and Uruguay.

2.3.2 Variable definition

The main advantage of using GEM data is that the entrepreneurial activity rate (TEA) can be decomposed into those individuals who are (1) currently starting a new business or (2) owning and managing a young firm created in the last 42 months. Additionally, entrepreneurs are categorized by their start-up motivations: opportunity versus necessity. It should be noted that I excluded from the TEA rate those individuals who state that they engaged in entrepreneurship for either both reasons or reasons unknown (Koellinger and Thurik, 2012).

Thus, the different stages of entrepreneurial activity and entrepreneurial motivations show dissimilar patterns, and following the theoretical framework these differences can be explained by previous rates of entrepreneurial exit. Therefore, the five dependent variables, which are proxies of the entrepreneurial activity level, follow. First, TEA is the proportion of the adult population who are actively involved in setting up a new business (nascent entrepreneurship rate) and/or currently own and manage a business that is less than 42 months (new business rate). Second, nascent entrepreneurship Rate (*Nascent*) is the proportion of the adult population actively involved in the creation of a new business which they will own. Third, new business rate (*New Business*) is the proportion of the adult population that currently own-manages a new business created in the last 42 months. Fourth, opportunity entrepreneurship (*Opportunity Entrepreneurship*) is the proportion of the adult population that is involved in entrepreneurial activities (TEA) by opportunity motivations. Fifth, necessity entrepreneurship (*Necessity Entrepreneurship*) is the proportion of the adult population engaged in entrepreneurial activities by necessity motivations.

As for the covariates, the main independent variable relates to the proportion of the adult population who have shut down, discontinued or quit a business they owned and managed, in any

form of self-employment, or selling goods or services to anyone during the past year (*Exits*). This variable includes a wide array of exit reasons; however, the analysis of the underlying motivation to exit the market is out of the scope of this paper.

In addition, a set of control variables is included. First, more developed economies offer a larger market potential and greater infrastructure for start-ups (Wennekers *et al.*, 2005; Parker and Robson, 2004). Thus, the lagged logarithm of the Gross Domestic Product per capita, expressed at 2005 constant prices in PPP international US dollars (*lnGDP_pc*), is used as a measure of the economic development of the analyzed countries. Second, the interaction term between the lagged log of the GDP per capita and exit rates (*lnGDP_pc X Exits*) allows at capturing the potentially differentiated effect of exit rates at different levels of economic development.

Third I include unemployment variables, measured as the proportion of the labor force that is without work but available for and seeking employment. This variable helps capture push factors for necessity entrepreneurship, assuming that jobless individuals will likely start a business, and as a pull factor according to the theories on entrepreneurial capability and income choice (Koellinger and Thurik, 2012; Verheul *et al.*, 2002; Wennekers *et al.*, 2005; Rocha and Sternberg, 2005; Wong *et al.*, 2005;Audretsch and Thurik, 2000; Evans and Leighton, 1990).

Fourth, three socio-cultural factors widely used in the entrepreneurship research are included in the analysis. The first factor considered is the level of perceived entrepreneurial skills among the adult population (*Entrepreneurial Skills*). Previous studies by Arenius and Minniti (2004), Driga *et al.* (2009), Vaillant and Lafuente (2007), among others, have shown the explanatory power of this variable when it comes to assess entrepreneurial entry decisions. The second socio-cultural factor analyzed is the proportion of the adult population who personally know a recent entrepreneur, that is, the role models effect (*Role Model*) (Bosma *et al.*, 2012;

Lafuente *et al.*, 2007; Venkatamaran, 2004). The OECD (2003) and the European Commission (2003) identify the presence of entrepreneurial role models (who have created new businesses over the past two years within one's personal social circle) as one of the most important socio-cultural traits for entrepreneurship (Vaillant and Lafuente, 2007). Similar to previous studies (Koellinger *et al.*, 2007; Lafuente *et al.*, 2007; Arenius and Minniti, 2005; Simon *et al.*, 1999), the last socio-cultural factor introduced in the study deals with the proportion of the adult population who state that the social fear to business failure is an obstacle for engaging in entrepreneurial activities (*Fear of Failure*).

The possibility of estimating the independent influence of each analyzed time period (year) is introduced into the analysis in the form of dummy variables. The selection of a reference point for a set of dummy variables requires careful consideration because it significantly influences the interpretation of coefficients. In this study, parameter estimates for the time dummy variables are evaluated relatively to 2002. The beginning year of the time series was chosen so the influence of each successive year on country rates of total entrepreneurial activity across the entire study period could be assessed.

Table 2.1 presents the descriptive statistics for the selected variables. It can be seen that the rate of entrepreneurial activity in the sampled countries is 7.90% (nascent entrepreneurship rate: 4.50%, new business owner rate: 3.72%). Also, entrepreneurship is mostly driven by opportunity motivations (5.82%), and in the final sample the rate of business exit stands at 2.84%.

Table 2.1 Descriptive statistics (2002-2007)

Variable	Obs	Mean	Std. Dev.	Min	Max
Total Entrepreneurial Activity	109	7.902	5.194	1.905	31.640
Nascent	109	4.504	2.694	1.062	16.009
New Business	109	3.720	3.281	0.435	18.595
Opportunity Entrepreneurship	109	5.825	3.468	1.108	17.876
Necessity Entrepreneurship	109	1.737	2.160	0.152	14.399
Exits	109	2.839	3.225	0.458	29.979
Fear of Failure	109	35.465	9.393	17.081	61.511
Entrepreneurial skills	109	44,52	12,41	8,65	78,39
Role Model	109	38,71	9,69	16,88	73,46
lnGDP_pc	109	10.027	0.627	6.752	10.779
lnGDP_pc × Exits	109	31.285	26.414	4.441	160.224
Unemployment	109	7.476	4.160	1.2	26.7
Female Unemployment	109	8.515	5.124	1.1	30.7
Male Unemployment	109	6.694	3.643	1.3	26.8

Source: Self-device from GEM and WDB databases.

For illustrative purposes, Table 2.2 provides descriptive statistics for the sample distinguishing by the GDP per capita. Here it can be seen that the rate of entrepreneurial entry and exit is higher for low-income countries. Additionally, only 0.86% of the adult population in high-income countries is involved in necessity-driven entrepreneurship, while this proportion stands at 3.85% in the sample of low-income countries.

Table 2.2 Descriptive statistics according with GDP per capita

	Less than 20,000 US$		More than 20,000 US$	
	Mean	Std. Dev.	Mean	Std. Dev.
Total Entrepreneurial Activity	11,079	7,390	6,582	3,169
Nascent	5,654	3,566	4,026	2,083
New Business	5,802	4,938	2,855	1,664
Opportunity Entrepreneurship	6,880	4,520	5,386	2,845
Necessity Entrepreneurship	3,854	3,006	0,857	0,523
Exits	4,812	5,322	2,019	0,953
Fear of Failure	34,485	7,759	35,873	10,012
Entrepreneurial skills	49,66	16,26	42,39	9,76
Role Model	39,07	10,78	38,56	9,27
lnGDP_pc	9,197	0,535	10,372	0,176
lnGDP_pc × Exits	52,200	39,099	22,593	10,354
Unemployment	9,828	6,076	6,499	2,497
Female Unemployment	11,281	6,961	7,365	3,603
Male Unemployment	8,734	5,518	5,847	1,990

Source: Self-device from GEM and WDB databases.
Notes:
1. Observations for countries with GDP per capita < 20000$ is 32.
2. Observations for countries with GDP per capita ≥ 20000$ is 77.

From the summary statistics one might suspect that entrepreneurial activity varies depending on the country's economic conditions. Thus, kernel-weighted local polynomial smoothing techniques are used to obtain non-parametric estimates of the dependence of TEA on the lagged GDP per capita. The results are presented in Figure 1, and they show that there is a seemingly negative relation between the GDP per capita and the TEA. The figure shows a non-linear relationship, and particularly negative for low-income countries. However, one could argue that the relationship between GDP per capita and TEA also varies according to the components of the latter and also according to the different

motivation to become an entrepreneur. Figures 2a and 2b show that the sensitivity of the TEA to the economic conditions is greater when necessity entrepreneurship is analyzed.

Figure 1: Total Entrepreneurial Activity versus per capita Gross Domestic Product.

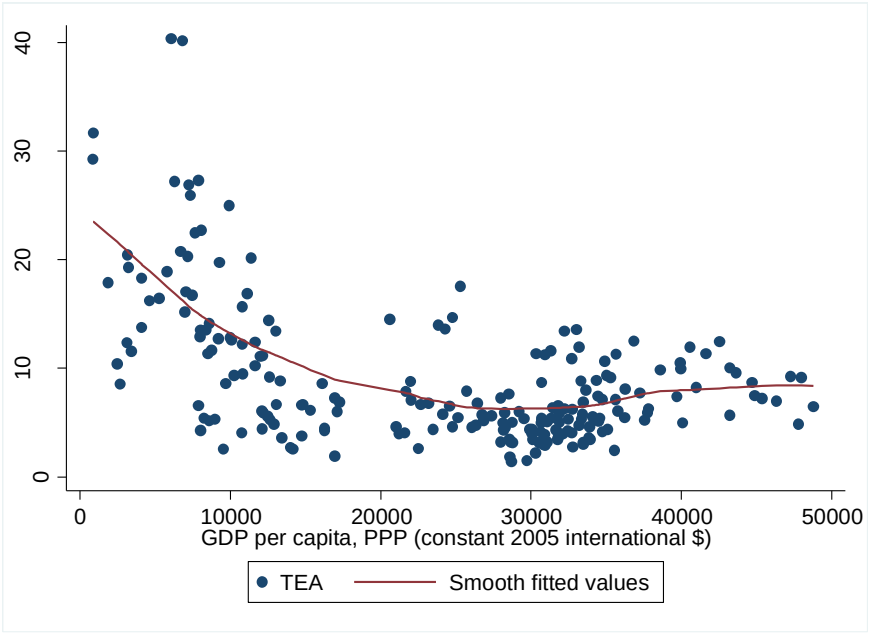


Figure 2a: Opportunity Entrepreneurship versus per capita GDP.

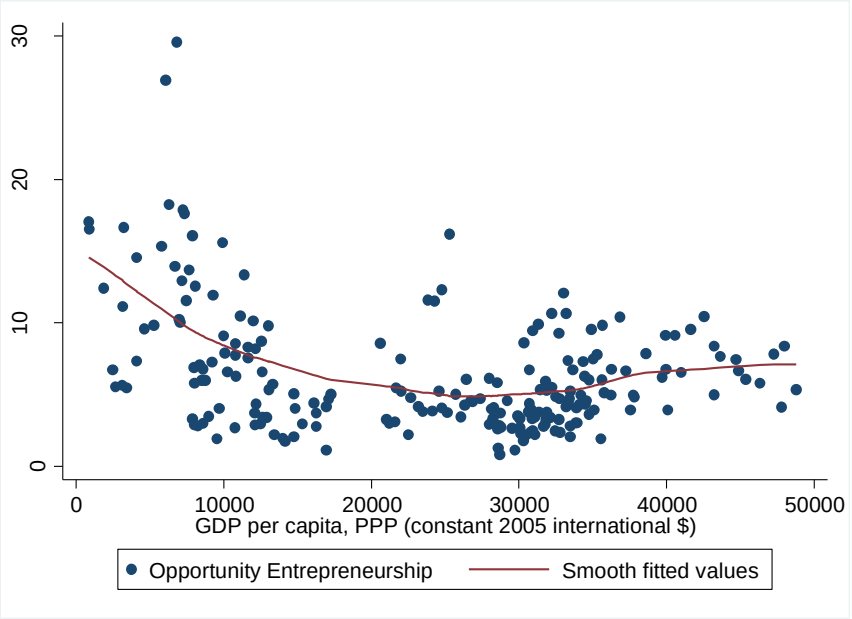
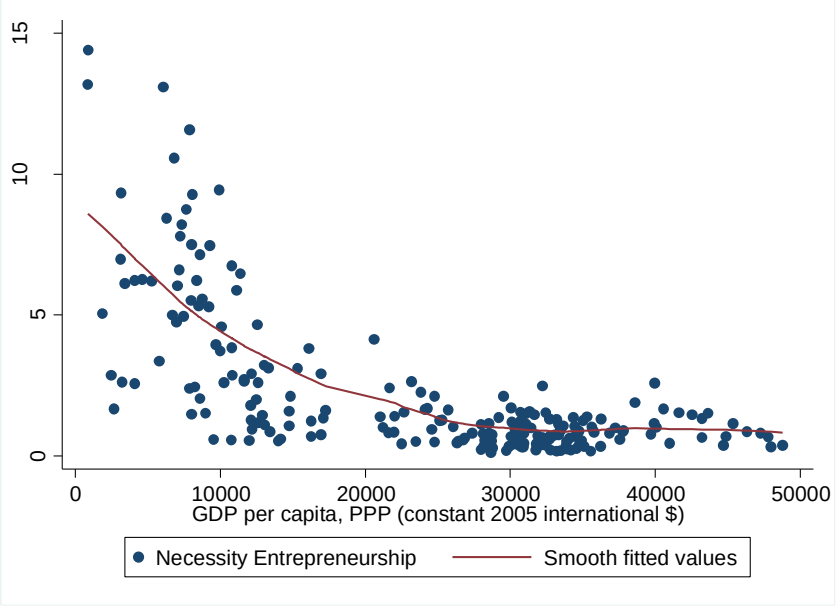


Figure 2b: Necessity Entrepreneurship versus per capita GDP.



2.3.3. Method

In order to test whether business exits leads to a fall in future levels of entrepreneurial activity at country level I estimate the following regression model:

$$\Delta y_{it} = \alpha + y_{it-1}\lambda + Exits_{it}\delta + X_{it}\beta + u_i + u_t + \varepsilon_{it} \quad (1)$$

where Δy_{it} is the change in the total entrepreneurial activity rate in country i at period t, more specifically $\Delta TEA_{it} = TEA_{it} - TEA_{it-1}$; $Exits_{it}$ is the key explanatory variable ;X_{it} is the set of control variables; u_i is a country-specific effect; u_t is a time-specific effect; ε_{it} is a time-varying error term, and α, λ and β are a set of parameters to be estimated. The lagged term of the endogenous variable (y_{it-1}) is included to account for the effect of the variation rate in the dependent variable, which may depend on previous entrepreneurial activity levels, i.e., countries with a higher entrepreneurship rate in *t-1* will likely grow at a different rate from *t-1* to *t*.

The main coefficient estimate of interest is δ, which reflects the effect of the previous exit rates (*Exits*) on the rate of entrepreneurial activity (*TEA*). A positive sign of δ would imply that business exit rates entail a greater level of entrepreneurial activity in subsequent periods. But, a negative sign would imply that business exit rates would result in future lower levels of entrepreneurship.

The outcome variable (Δy_{it}) reflects the changes in the level of entrepreneurial activity in a given country. To enhance estimation accuracy, the TEA components are separated by distinguishing between nascent activity (*Nascent*) and new business owner (*New Firm*). Moreover, model specifications also differentiate opportunity-driven (*Opportunity Entrepreneurship*) from necessity-driven entrepreneurship rates (*Necessity Entrepreneurship*).

The set of explanatory variables included in the analysis follows: 1) the lagged logarithm of the GDP per capita (*lnGDP_pc*); the

interaction term between the lagged logarithm of the GDP per capita and business exit (*lnGDP_pc X Exits*) to control for differences in income levels and exit rates across countries; 2) the unemployment rate (*Unemployment*), and the unemployment rate by gender (*Female Unemployment, Male Unemployment*); and 3) the three socio-cultural factors analyzed: rate of perceived entrepreneurial skills (*Skills*), rate of entrepreneurial *Role Models*, and the proportion of the population who state that the fear to business failure is an obstacle to engage in entrepreneurship (*Fear of Failure*).

According to Nickell (1981) and Judson and Owen (1999), the presence of the unobserved heterogeneity in panel data models with lagged dependent variables as an explanatory variable would tend to generate biased and inconsistent estimates if the time dimension of the panel is fixed and small. As a result, the Generalized Method of Moments (GMM) proposed by Arellano and Bond (1991) is used as econometric tool. This method treats regression models as a system of equations, one for each period, and the first differences are calculated from the equation so that observed individual heterogeneity is removed. Consequently, lagged levels of the series are used as instruments for the endogenous variables in first differences.

However, this estimator known as 'difference estimator' presents some shortcomings. Lagged levels of explanatory variables are weak instruments for estimating the parameters of the first-difference variables, leading to inconsistent model estimates. Arellano and Bover (1995), Blundell and Bond (1998) and Bond (2002) show that the GMM 'system estimator', which is based on asymptotic and small sample properties, works better. They suggest to instrument endogenous and non-strictly exogenous variables with lags of their own first differences, instead of using lagged values for the variables in levels. Thus, the system GMM model is used in the present paper. In the first-difference equations, lagged values of the explanatory variables are used as instruments (as in the GMM difference estimator). Since the instruments used in the GMM difference

approach are strict subsets of the instruments used in the GMM system estimation, a specific contrast of the additional instruments is reported. The Sargan test of autocorrelation is used to corroborate the presence of serial correlation and the Hansen test of over-identification (Hansen, 1982) is used to contrast the overall validity of the instruments used in the regression. The final models employ the two-step method, although the variances tend to be biased downwards. Therefore, to enhance estimation accuracy, the Windmeijer finite-sample correction method is used (Windmeijer, 2005).

2.4. Results

Tables 2.3 to 2.7 show the regression results based on equation (1). The result of the Hansen test confirms that instruments used in the model specifications are appropriate. Moreover, the results of the Arellano-Bond test for autocorrelation, i.e. AR(1) and AR(2), do not reject the null hypothesis of no first- and second-order autocorrelation. The results of these tests indicate that there is no serial correlation between the first-differenced variables used as instruments and the first differences of the residuals. This indicates that the coefficients and standard errors are not biased, thus confirming that the estimation approach is valid.

The coefficient of the lagged dependent variable is negative and significant in all model specifications. This means that the higher the level of entrepreneurial activity the lower its growth rate. The business exit rate appears are statistically significant in all model specifications (see tables 2.2 to 2.7), and the sign of the coefficients indicate that previous business exit rate is an influential variable for enhancing future entrepreneurial activity. Additionally, results show that previous exit rate is positively correlated to all the analyzed dimensions of entrepreneurial activity. This suggests that the learning process derived from business exit benefits the local economy through its application to subsequent businesses (McGrath, 1999). This finding is also consistent with that reported by Hessels *et al.* (2011), who also find a positive and significant

impact of business exits on future entrepreneurial activity levels. The authors remark that people who have recently experienced an entrepreneurial exit more often perceive good entrepreneurial opportunities than those who did not experience an exit.

Concerning the covariates, the results for the lagged GDP per capita are statistically weak, and they cannot confirm the relationship between economic development and entrepreneurial activity and entrepreneurial motivations. Yet, the result for the interaction term between the lagged GDP per capita and business exit rate suggests that the positive effect of business exit on future entrepreneurial activity dilutes in low-income countries (Table 2.3). A similar result is reported in Table 2.7. Here, previous business exits positively influence future necessity-driven entrepreneurship, but the negative coefficient linked to the term lagged GDP per capita´ business exit rate indicates that this effect is significantly lower in low-income countries.

Wealthier countries enjoy a greater market capacity and local demand, which increases business opportunities (Van Stel *et al.*, 2007; Minniti *et al.*, 2005). On the contrary, developing economies are faced with greater market and financial constraints, and necessity may become the main driver for entrepreneurial activity. The said market and financial constraints create a barrier which increases the opportunity cost of business exit (Kelley *et al.*, 2012). These results in Table 2.7 corroborate this intuition, and they are in accordance with the hypothesis stating that in developing and underdeveloped economies exit rates will have a negative impact on future business entry rates.

Table 2.3 Estimates of the Total Entrepreneurial Activity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total Entrepreneurial Activity$_{t-1}$	-1.439***	-1.195***	-0.805***	-1.133***	-1.230***	-0.948***	-1.278***
	(0.089)	(0.208)	(0.281)	(0.259)	(0.260)	(0.205)	(0.232)
Exits	3.216***	2.601***	2.672***	2.075***	2.954***	2.830***	3.185***
	(0.349)	(0.498)	(0.667)	(0.778)	(1.065)	(0.746)	(0.864)
Fear of Failure	-0.265***	-0.150**	-0.182*	-0.176	-0.354**	-0.213*	-0.352**
	(0.075)	(0.074)	(0.105)	(0.125)	(0.149)	(0.117)	(0.153)
lnGDP_pc$_{t-1}$	6.220*	1.023	-2.548	-2.037	6.160	5.507	9.484
	(3.272)	(4.198)	(5.264)	(4.424)	(9.165)	(6.772)	(8.371)
lnGDP_pc$_{t-1}$ X Exits		-0.081	-0.205**	-0.181**	-0.079	-0.129*	0.000
		(0.086)	(0.095)	(0.092)	(0.122)	(0.073)	(0.107)
Role Model			0.031	0.068	0.125	0.071	0.089
			(0.206)	(0.207)	(0.218)	(0.210)	(0.240)
Entrepreneurial Skills				0.202**	0.020	-0.017	-0.007
				(0.097)	(0.127)	(0.109)	(0.094)
Unemployment$_{t-1}$					1.390*		
					(0.813)		
Female Unemployment$_{t-1}$						1.094**	
						(0.491)	
Male Unemployment$_{t-1}$							1.807**
							(0.725)
Constant	-49.513	-1.491	35.048	23.730	-60.365	-54.894	-95.520
	(32.623)	(42.375)	(53.687)	(43.398)	(92.653)	(68.146)	(83.981)
Hansen Test (stat.)	11.51	10.94	6.60	3.62	1.70	2.59	1.95
Hansen Test (p-value)	0.40	0.28	0.58	0.82	0.95	0.86	0.92
Test AR(1) (z-stat.)	-2.08	-1.75	-1.86	-2.33	-0.96	0.14	-2.54
Test AR(1) (p-value)	0.04	0.08	0.06	0.02	0.34	0.89	0.01
Test AR(2) (z-stat.)	-0.78	-0.27	0.92	0.80	1.33	1.37	0.83
Test AR(2) (p-value)	0.43	0.79	0.36	0.42	0.18	0.17	0.41
Sample size	140.00	113.00	113.00	113.00	112.00	109.00	109.00
Number of countries	41.00	40.00	40.00	40.00	39.00	38.00	38.00

The endogenous variable is ΔTEA_{t-1}

Notes:

1. All models include dummy years
2. *** Significant at 1% , ** Significant at 5%, * Significant at 10%.
3. Numbers in parenthesis are the coefficient standard errors.

Table 2.4 Estimates of the Nascent Entrepreneurial Activity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$Nascent_{t-1}$	-1.193***	-1.016***	-1.016***	-1.085***	-1.407***	-1.262***	-1.321***
	(0.076)	(0.191)	(0.192)	(0.195)	(0.243)	(0.149)	(0.140)
Exits	1.979***	1.406***	1.373***	0.800*	1.985***	1.682***	2.027***
	(0.264)	(0.389)	(0.404)	(0.418)	(0.602)	(0.392)	(0.541)
Fear of Failure	-0.252***	-0.194***	-0.200***	-0.152**	-0.142**	-0.143**	-0.140**
	(0.074)	(0.065)	(0.067)	(0.072)	(0.065)	(0.063)	(0.064)
$lnGDP\_pc_{t-1}$	3.596*	1.419	0.877	-0.622	6.642	6.051	7.934*
	(2.162)	(2.288)	(2.412)	(2.450)	(4.265)	(3.709)	(4.376)
$lnGDP\_pc_{t-1}$ X Exits		-0.019	-0.015	-0.037	0.019	-0.002	0.031
		(0.048)	(0.050)	(0.052)	(0.065)	(0.045)	(0.047)
Role Model			0.074	0.121	0.066	0.185	0.143
			(0.110)	(0.129)	(0.145)	(0.136)	(0.160)
Entrepreneurial Skills				0.141***	-0.036	-0.017	-0.051
				(0.053)	(0.056)	(0.044)	(0.047)
$Unemployment_{t-1}$					1.099***		
					(0.284)		
Female $Unemployment_{t-1}$						0.759***	
						(0.181)	
Male $Unemployment_{t-1}$							1.281***
							(0.300)
Constant	-26.988	-6.565	-3.882	4.263	-69.484	-66.982*	-86.03**
	(22.417)	(24.171)	(24.834)	(25.754)	(42.436)	(37.531)	(43.025)
Hansen Test (stat.)	8.28	8.48	7.71	9.96	2.31	1.63	4.09
Hansen Test (p-value)	0.69	0.49	0.46	0.19	0.89	0.95	0.66
Test AR(1) (z-stat.)	-2.41	-2.43	-2.42	-1.97	-0.16	-0.90	-2.00
Test AR(1) (p-value)	0.02	0.02	0.02	0.05	0.87	0.37	0.05
Test AR(2) (z-stat.)	-0.85	-0.59	-0.27	0.58	-0.22	0.63	0.09
Test AR(2) (p-value)	0.40	0.55	0.79	0.56	0.83	0.53	0.93
Sample size	140.00	113.00	113.00	113.00	112.00	109.00	109.00
Number of countries	41.00	40.00	40.00	40.00	39.00	38.00	38.00

The endogenous variable is $\Delta Nascent_{t-1}$

Notes:

1. All models include dummy years
2. *** Significant at 1% , ** Significant at 5%, * Significant at 10%.
3. Numbers in parenthesis are the coefficient standard errors.

Table 2.5 Estimates of the New Business Activity

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
New Business$_{t-1}$	-1.574***	-0.975***	-0.884***	-0.954***	-0.948***	-0.895***	-0.971***
	(0.075)	(0.107)	(0.237)	(0.243)	(0.223)	(0.225)	(0.243)
Exits	1.638***	1.438***	1.691***	1.300***	1.399**	1.372***	1.542***
	(0.259)	(0.315)	(0.399)	(0.485)	(0.636)	(0.486)	(0.596)
Fear of Failure	-0.002	-0.025	-0.056	-0.061	-0.071	-0.058	-0.103
	(0.044)	(0.054)	(0.078)	(0.077)	(0.105)	(0.075)	(0.115)
lnGDP_pc$_{t-1}$	6.502*	-1.445	-0.602	-1.947	-0.801	-1.310	0.211
	(3.552)	(3.965)	(3.597)	(3.729)	(5.605)	(4.498)	(5.730)
lnGDP_pc$_{t-1}$ X Exits		-0.129***	-0.131***	-0.149***	-0.137**	-0.136***	-0.113*
		(0.026)	(0.048)	(0.050)	(0.065)	(0.044)	(0.068)
Role Model			-0.138	-0.084	-0.093	-0.127	-0.104
			(0.131)	(0.137)	(0.133)	(0.139)	(0.147)
Entrepreneurial Skills				0.076	0.058	0.055	0.038
				(0.054)	(0.102)	(0.083)	(0.083)
Unemployment$_{t-1}$					0.121		
					(0.619)		
Female Unemployment$_{t-1}$						0.104	
						(0.377)	
Male Unemployment$_{t-1}$							0.368
							(0.613)
Constant	-63.593*	18.379	15.570	25.914	15.028	20.808	4.714
	(36.009)	(40.454)	(35.497)	(36.187)	(56.460)	(46.071)	(58.596)
Hansen Test (stat.)	11.04	4.48	2.90	0.80	0.71	1.46	1.22
Hansen Test (p-value)	0.44	0.88	0.94	1.00	0.99	0.96	0.98
Test AR(1) (z-stat.)	0.50	-2.22	-1.21	-1.30	-0.81	-0.84	-0.58
Test AR(1) (p-value)	0.61	0.03	0.23	0.19	0.42	0.40	0.56
Test AR(2) (z-stat.)	-0.84	0.67	0.78	0.61	1.09	1.16	1.42
Test AR(2) (p-value)	0.40	0.50	0.44	0.54	0.28	0.25	0.16
Sample size	140.00	113.00	113.00	113.00	112.00	109.00	109.00
Number of countries	41.00	40.00	40.00	40.00	39.00	38.00	38.00

The endogenous variable is ΔNew Business$_{t-1}$
Notes:
1. All models include dummy years
2. *** Significant at 1% , ** Significant at 5%, * Significant at 10%.
3. Numbers in parenthesis are the coefficient standard errors.

The positive relationship between unemployment rates and country-level entrepreneurial activity found in Table 2.3 supports the 'push effect of unemployment' gives support to previous studies (Koellinger and Thurik, 2012; Thurik *et al.*, 2008; Audretsch and Vivarelli, 1996; Foti and Vivarelli, 1994; Storey and Jones, 1987; Gilad and Levine, 1986). Here, unemployment represents an undesirable and costly condition for individuals, and entrepreneurship is perceived as a mechanism that helps alleviate their situation by providing a solution to the lack of market opportunities.

Contrary to the results in Audretsch and Thurik (2000), Verheul, *et al.* (2002), and Wennekers *et al.* (2005), the findings do not support the positive relationship between unemployment rates and necessity-driven entrepreneurship. It should be said that this result could signal the excessive use of entrepreneurship in developed economies as a way to channel unemployed individuals to the labor market through new business initiatives. Also, this result might be consequence of the design of the study as the data captures a period of economic expansion.

Table 2.6 Estimates of the Opportunity Entrepreneurship

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Opportunity Entrepreneurship$_{t-1}$	-1.409***	-1.212***	-0.832***	-1.405***	-1.513***	-1.063***	-1.263***
	(0.089)	(0.213)	(0.316)	(0.307)	(0.318)	(0.299)	(0.316)
Exits	2.388***	2.133***	1.958***	1.781***	2.562***	2.295***	2.586***
	(0.282)	(0.410)	(0.486)	(0.567)	(0.818)	(0.619)	(0.728)
Fear of Failure	-0.181**	-0.142**	-0.185*	-0.143	-0.235**	-0.111	-0.179
	(0.071)	(0.068)	(0.100)	(0.111)	(0.093)	(0.107)	(0.119)
lnGDP_pc$_{t-1}$	7.492***	3.618	-1.070	1.857	11.199	7.941	10.823
	(2.400)	(3.547)	(4.433)	(3.578)	(7.620)	(5.465)	(7.112)
lnGDP_pc$_{t-1}$ X Exits		-0.041	-0.122*	-0.054	-0.001	-0.066	-0.013
		(0.041)	(0.070)	(0.067)	(0.078)	(0.059)	(0.070)
Role Model			-0.049	0.201	0.164	-0.024	0.004
			(0.178)	(0.171)	(0.184)	(0.209)	(0.226)
Entrepreneurial Skills				0.143*	-0.004	-0.014	0.008
				(0.081)	(0.063)	(0.076)	(0.072)
Unemployment$_{t-1}$					1.211***		
					(0.425)		
Female Unemployment$_{t-1}$						0.781**	
						(0.329)	
Male Unemployment$_{t-1}$							1.150**
							(0.497)
Constant	-66.319***	-29.663	21.912	-22.860	-116.276	-78.353	-108.882
	(23.854)	(36.323)	(46.489)	(35.893)	(75.754)	(54.622)	(71.971)
Hansen Test (stat.)	11.35	10.00	5.61	7.47	2.35	1.32	1.35
Hansen Test (p-value)	0.41	0.35	0.69	0.38	0.88	0.97	0.97
Test AR(1) (z-stat.)	-2.16	-1.54	-1.37	-1.74	-0.87	0.77	.
Test AR(1) (p-value)	0.03	0.12	0.17	0.08	0.38	0.44	.
Test AR(2) (z-stat.)	-0.73	0.26	0.49	1.37	1.13	1.46	0.89
Test AR(2) (p-value)	0.46	0.80	0.63	0.17	0.26	0.15	0.37
Sample size	140.00	113.00	113.00	113.00	112.00	109.00	109.00
Number of countries	41.00	40.00	40.00	40.00	39.00	38.00	38.00

The endogenous variable is ΔOpportunity Entrepreneurship$_{t-1}$
Notes:
1. All models include dummy years
2. *** Significant at 1% , ** Significant at 5%, * Significant at 10%.
3. Numbers in parenthesis are the coefficient standard errors.

Table 2.7 Estimates of the Necessity Entrepreneurship

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Necessity Entrepreneurship$_{t-1}$	-1.074***	-0.681***	-0.674***	-0.733***	-0.659***	-0.730***	-0.841***
	(0.052)	(0.139)	(0.140)	(0.146)	(0.138)	(0.110)	(0.152)
Exits	0.613***	0.567***	0.556***	0.460***	0.322	0.487***	0.610***
	(0.066)	(0.131)	(0.147)	(0.163)	(0.230)	(0.170)	(0.218)
Fear of Failure	-0.059***	-0.025	-0.026	-0.037	-0.005	-0.043	-0.069
	(0.015)	(0.037)	(0.036)	(0.036)	(0.035)	(0.046)	(0.063)
lnGDP_pc$_{t-1}$	-0.947	-1.549	-1.691	-2.105*	-3.203**	-1.877	-0.966
	(0.826)	(0.958)	(1.051)	(1.094)	(1.550)	(1.491)	(1.897)
lnGDP_pc$_{t-1}$ X Exits		-0.056***	-0.059***	-0.065***	-0.081***	-0.059***	-0.043
		(0.014)	(0.015)	(0.015)	(0.020)	(0.021)	(0.029)
Role Model			0.024	0.016	-0.025	0.020	0.039
			(0.041)	(0.042)	(0.046)	(0.053)	(0.048)
Entrepreneurial Skills				0.032	0.060*	0.019	0.002
				(0.024)	(0.034)	(0.038)	(0.040)
Unemployment$_{t-1}$					-0.151		
					(0.166)		
Female Unemployment$_{t-1}$						0.042	
						(0.139)	
Male Unemployment$_{t-1}$							0.214
							(0.277)
Constant	11.741	17.623*	18.291*	22.370**	34.514**	20.021	9.829
	(8.530)	(9.972)	(10.807)	(11.221)	(15.779)	(15.829)	(20.131)
Hansen Test (stat.)	11.56	4.01	3.45	1.54	0.94	2.59	2.47
Hansen Test (p-value)	0.40	0.91	0.90	0.98	0.99	0.86	0.87
Test AR(1) (z-stat.)	-1.44	-2.26	-2.25	-2.36	-1.78	-1.79	-1.44
Test AR(1) (p-value)	0.15	0.02	0.02	0.02	0.08	0.07	0.15
Test AR(2) (z-stat.)	-0.88	0.58	0.68	0.62	0.23	0.73	0.78
Test AR(2) (p-value)	0.38	0.56	0.50	0.54	0.82	0.46	0.44
Sample size	140.00	113.00	113.00	113.00	112.00	109.00	109.00
Number of countries	41.00	40.00	40.00	40.00	39.00	38.00	38.00

The endogenous variable is ΔOpportunity Entrepreneurship$_{t-1}$
Notes:
1. All models include dummy years
2. *** Significant at 1% , ** Significant at 5%, * Significant at 10%.
3. Numbers in parenthesis are the coefficient standard errors.

Concerning the socio-cultural factors, the results for all the model specifications presented in Tables 2.3 to 2.7 suggest a negative connection between the social fear to business failure and future entrepreneurial activity rates. This result is consistent with previous studies by Driga *et al.*, (2009); Vaillant and Lafuente, (2007) and Arenius and Minniti (2005). Regardless the analyzed entrepreneurial dimension, these results show that this factor is an important constraint for entrepreneurship.

2.5. Conclusions

The potentially value-creating effect of the knowledge and experience linked to previous business exits for future entrepreneurial activity and economic development has received increased attention; however, the bulk of research has focused on individual-level variables that may not effectively capture country-level effects. Using an international sample of 41 countries for the period 2002-2007, this paper aimed at assessing whether business exits impact future dimensions of entrepreneurial activity at the country level.

The results show a positive and significant effect of business exit rates on future entrepreneurial activity. This confirms that exit rates represent a change in the configuration of the local industrial fabric, thus providing value to competing rivals (Akhigbe *et al.*, 2003). Also, this finding gives support to the presence of a powerful Schumpeterian 'churn', which helps revitalize the entrepreneurship pool in a territory through turnover and replacement dynamics (Sutaria and Hicks, 2004). The results are consistent to different entrepreneurship dimensions, and to different entrepreneurial motivations (opportunity and necessity), thus revealing that the local economy may obtain important gains from the revitalization of the stock of entrepreneurial firms, regardless of the underlying motivations to engage in entrepreneurship (Burke and Van Stel, 2014).

The results of this study have important implications. From an academic perspective, the findings provide support in favor of a greater use of a territorial approach to the study of entrepreneurship, and this becomes especially relevant when examining the relationship between previous exit rates and future levels of entrepreneurial activity at the territorial level.

From a policy-making point of view, the results suggest that entrepreneurship support policies should take into consideration the individuals' motivations to engage in entrepreneurship (Acs and Varga, 2005). For example, opportunity entrepreneurship might be encouraged through the development of programs oriented to connect potential opportunity-driven entrepreneurs to suppliers of finance seeking to invest in new business projects. To the contrary, policy-makers might be interested in increasing the quality and economic impact of businesses created by necessity-driven entrepreneurs. To do this so, support agents and policies might target special needs of necessity-driven entrepreneurs, and help increase the entrepreneur's level of human capital. Additionally, government agents designing entrepreneurship support policies should design specific policies that help maximize the knowledge and experience derived from previous business experience and market exit. Local economies can obtain important gains from the appropriate channeling of this market-specific knowledge in the form of future businesses. These new firms created by experienced entrepreneurs would benefit from the entrepreneurs' accumulated knowledge and this can contribute to not only revitalize the territorial entrepreneurial pool, but also to create high-impact businesses. Finally, policy-makers can use business exit rates as a relevant indicator to examine the quality of the local entrepreneurial firms, and this information can be used to a more effective promotion of different types of entrepreneurship.

This study has some limitations that in turn represent potential avenues for future research. First, the results can be affected by other covariates not included in the analysis, such as some technological factors. Therefore, future research should include a

greater number of covariates in the analysis, as well as a longer time span so that a more long-term analysis that includes expansion and recession periods can be conducted. Finally, future studies should analyze the potentially differentiating effect of the various types of business exit on future entrepreneurial activity.

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Appendix 1. Tables

Table 2.8 Correlation matrix

	TEA	Nascent	New Business	Opportunity Entrepreneurship	Necessity Entrepreneurship	Exits	Fear of Failure	lnGDP_pc
TEA	1							
Nascent	0.9005*	1						
New Business	0.9414*	0.7050*	1					
Opportunity Entrepreneurship	0.9441*	0.8995*	0.8576*	1				
Necessity Entrepreneurship	0.8392*	0.6723	0.8462*	0.6185*	1			
Exits	0.6747*	0.6523*	0.6083*	0.5193*	0.7681*	1		
Fear of Failure	-0.0318	-0.0792	0.0052	-0.0794	0.0359	-0.0343	1	
lnGDP_pc	-0.5753*	-0.4251*	-0.5985*	-0.3388*	-0.8329*	-0.6832*	-0.0341	1
lnGDP_ pc X Exits	0.7173*	0.6877*	0.6346*	0.5851*	0.7577*	0.8270*	-0.0531	-0.6779*
Role Model	0.3743*	0.4670*	0.2527*	0.3784*	0.2653*	0.3449*	0.0776	-0.1551
Entrepreneurial Skills	0.6917*	0.7294*	0.5648*	0.6597*	0.5747*	0.5003*	-0.0169	-0.3719*
Unemployment	-0.1101	-0.0361	0.1559	0.2289*	0.1253	0.0441	0.0160	-0.3267*
Female Unemployment	-0.0580	-0.0093	0.1096	0.1763	0.1594	0.0571	0.0796	-0.3320*
Male Unemployment	-0.1585	-0.0843	0.1941*	-0.2718	0.0832	0.0295	-0.0412	-0.3053*

Source: Self-device from GEM and WDB database.
Note: * Significant at 10%

	lnGDP_ pc X Exits	Role Model	Entrepreneurial Skills	Unemployment	Female Unemployment	Male Unemployment
lnGDP_ pc X Exits	1					
Role Model	0.3038*	1				
Entrepreneurial Skills	0.6101*	0.4439*	1			
Unemployment	0.0744	-0.1388	0.0583	1		
Female Unemployment	0.1152	-0.1505	0.1279	0.9698*	1	
Male Unemployment	0.0298	-0.1223	-0.0177	0.9674*	0.8770*	1

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Chapter 3

Is Entrepreneurship a Way to Escape from Skill Mismatches?

3.1. Introduction

With global competition increasing, demographic change unfolding and rapid technological change intensifying, skill mismatches have come to the forefront of Europe's policy debate (Cedefop, 2010). Skill mismatches have important negative consequences for labor activity. For instance, skill mismatches have a negative impact on salaries, employment, competitiveness and economic growth, as well as on psychological aspects such as job satisfaction. Berlingieri and Erdsiek (2012) argue that being mismatched, from employees' perspective, could reduce their motivation and effort, leading to a lower level of productivity. This affects social interaction and generates significant economic and social costs (Allen et al., 2001). Hence, matching skills and available jobs through better labor market information and efficient job placement services should be a priority for policy-makers.

Most research regarding skill mismatches focuses on analyzing their determinants and their negative effects on society and more specifically on individuals. However, given that skill mismatches are one of the main challenges faced by governments, it is necessary to focus on how to overcome them. Keeping this in mind and given that most individuals who report being skill-mismatched are salaried employees (Allen et al., 2001; Vieira, 2005; Millán et al., 2013), we find it plausible that employees may overcome this problem by making the transition to self-employment. To the best of our knowledge, an analysis of the impact of the transition from

salaried employment to self-employment on the probability of reporting being skill-mismatched does not exist.

Given the relevance of matching skills and jobs and of promoting self-employment, the aim of this paper is to determine whether those individuals who transit from salaried employment to self-employment report being less skill-mismatched, both in the short and in the medium term. To this end, we resort to the European Community Household Panel (ECHP). This survey provides comparable micro data for a number of EU countries during the period 1994–2001. The panel nature of the data allows us to track individuals over time and measure their self-reported skill mismatch before and after the transition. Our results indicate that making the transition from salaried employment to self-employment significantly reduces the probability of reporting being skill-mismatched. This finding is robust to all our alternative models and specifications.

The remainder of the paper is structured as follows. Section 2 revises the findings in the literature. Section 3 describes the data and presents the descriptive statistics. Section 4 introduces the model and the econometric framework. Section 5 explains the main results and, finally, Section 6 draws conclusions from the analysis and offers some policy implications.

3.2. Literature review

A large part of the empirical literature gives support to the fact that self-employees are more satisfied than employees[6] (Thompson et al., 1992; Blanchflower and Oswald, 1998; Blanchflower, 2000;

[6] These results have been subject to some criticism. For instance, Blanchflower and Oswald (1998) state that job satisfaction levels might be subject to biases since self-employed people may be intrinsically more optimistic and cheerful than others. However, Frey and Benz's (2003) results show that job satisfaction increases when employees become self-employed even when they control for unobserved individual differences, such as the extent of cheerfulness or optimism.

Blanchflower et al., 2001; Hundley, 2001; Parasuraman and Simmers, 2001; Benz and Frey, 2004, 2008; Bradley and Roberts, 2004; Noorderhaven et al., 2004). From a theoretical point of view, self-employment transitions based on rational agent-based models assume that individuals will become self-employed if their expected utility from this option exceeds that associated with wage employment. Hence, the expected improvements in earnings from self-employment in comparison with wages are one of the factors pointed out in the literature to explain the transition from salaried employment to self-employment (Rees and Shah, 1986; Fujii and Hawley, 1991; Taylor, 1996). However, other factors have attracted the attention of the empirical literature, while the role of earnings as a proxy for utility has been relaxed. According to some authors (Taylor, 1996; Blanchflower, 2000, 2004; Hamilton, 2000; Guerra and Patuelli, 2012), the non-pecuniary benefits of becoming self-employed justify the fact that individuals become and remain self-employed in spite of the fact that they may have lower initial earnings, lower earnings growth and higher income volatility with respect to salaried employment.

Different non-pecuniary determinants affect job satisfaction and may push individuals to become self-employed. In fact, it has been found that job satisfaction can be interpreted as an "excess" reward discounting future potential flows of utility deriving from a change in working conditions with respect to the current situation. Another simpler way of defining this would be that job satisfaction picks up the difference between the expected utility and the experienced utility in the workplace (Diaz-Serrano, 2009). The factors affecting job satisfaction are the following. First, the independence offered by self-employment may explain the transition from employment to self-employment (Evans and Leighton, 1989; Taylor, 1996; Hyytinen and Ruuskanen, 2006; van Praag and Versloot, 2007). In other words, self-employees may shape their own future (Hundley, 2001). Second, supervision and limited opportunities for promotion also arise as major determinants of job transition (Brockhaus, 1982). Third, emotional factors, such as feeling inappropriate or displaced,

may push individuals to become self-employed (Shapero and Sokol, 1982). Furthermore, other feelings, such as feeling bored or angered, positively affect self-employment choices (Wennekers et al., 2001; Hofstede et al., 2004). For instance, van Praag and Versloot (2007) point out that self-employees may be more satisfied because they enjoy more interesting jobs. This feeling may be more pronounced for individuals with higher education since they have more demanding jobs and have to meet higher expectations. Fourth, the risk of becoming unemployed may finally encourage potential self-employees to create their own company. Hence, all these factors increase the dissatisfaction of employees. Of course, the more dissatisfied employees are the ones who are expected to be more prone to enter self-employment (Brockhaus, 1980; Taylor, 1996; Blanchflower, 2000, 2004; Millán et al., 2013).[7]

Furthermore, there is a robust finding that skill mismatches are correlated with lower earnings (e.g. Borghans and de Grip, 2000; Groot and Maassen van den Brink, 2000; Chevalier, 2003; Cedefop, 2010). Consequently, skill mismatches appear as one of the most crucial factors affecting job satisfaction (Moshavi and Terborg, 2002; Cabral, 2005; Bender and Heywood, 2006; Lindley and McIntosh, 2008; McGuinness and Wooden, 2009; Verhaest and Omey, 2009; Mavromaras et al., 2010; Bender and Heywood, 2011; Mavromaras and McGuinness, 2012). For instance, Battu et al. (1997) concluded that job satisfaction is significantly adversely affected by mismatches. Belfield and Harris (2002) find only limited support for the argument that job matching explains greater job satisfaction. Johnson and Johnson (2002) report a negative relation between job satisfaction and perceived over-qualification in a longitudinal analysis. In fact, Allen and Velden (2001) and Allen and de Weert (2007) also point out that while educational mismatches may affect wages, skill mismatches are good predictors of job satisfaction and the on-the-job search.

[7] Furthermore, previous evidence shows that switchers to entrepreneurship gain more satisfaction than switchers in the opposite direction (Frey and Benz, 2003).

One significant result in the literature is that skill mismatches are positively correlated with quitting and job turnover (e.g. Allen and Velden, 2001; Wolbers, 2003; Lee et al., 2011). For instance, Allen and Velden (2001) show that skill mismatches, in particular for employees declaring underutilization of skills, have a positive impact on on-the-job search behavior. However, their study focuses on data from tertiary education in eleven European countries and Japan belonging to two different cohorts, those who graduated in the academic year 1990–91 and those who graduated in the academic year 1994–95. In a more recent study, Lee et al. (2011) analyze the determinants affecting intentions to become self-employed. Their results show that self-employment becomes desirable when there is a mismatch between the employees' innovation orientation and the characteristics of the organizations for which they work. Although they focus on the innovation orientation, their results highlight that the existence of a mismatch between the skills of an individual and those required in the work affects the intention to become self-employed positively. Conversely, some results show that individuals do not decide to become self-employed if they have skill shortages. For instance, Brixiova et al. (2009) develop a simple model of labor reallocation with transaction costs and show how skill shortages can inhibit firm creation and increase income inequality.

However, the literature also indicates other factors that may mitigate the advantages of self-employment, one of which is job security. It is argued that self-employees have more limited employment protection than employees. In that sense, employees face a smaller gap between expected and actual job security. Self-employees may have more difficulties in predicting the extent of job security beforehand since the specific circumstances and challenges that they encounter in their business may change every year. As a consequence, self-employees experience much higher income volatility throughout their working lives, which in turn has a negative impact on the probability of becoming a homeowner (Diaz-Serrano, 2005). Furthermore, the pressure of work is higher among self-employees due to the inherent risk of businesses. In that sense,

self-employees report that they find their work stressful, but they also state that they have control over their lives as well as being highly satisfied with their lives (Blanchflower, 2004; Guerra and Patuelli, 2012).

3.3. Econometric model

3.3.1. Random effects vs. pooled probit model

One of the most interesting features of our analysis is the use of longitudinal data. It allows us to study observed mobility from salaried employment to self-employment, rather than intentions to move, and its impact on the probability of reporting a skill mismatch. Our main outcome variable is SM_{it}, a dummy that takes the value one if individual i declares him- or herself to be skill-mismatched in period t and zero otherwise. Hence, the econometric specification can be written as

$$SM_{it} = I(SM^*_{it} > 0) = I(\lambda Trans_{it} + Z'_{it}\gamma + v_{it} > 0), \quad (i = 1, \dots., N; t = 1, \dots, T) \qquad (3.1)$$

where *I(.)* is a binary indicator function that takes the value one if the argument is true and zero otherwise, $Trans_{it}$ is an indicator picking up the transition from salaried employment to self-employment, Z_{it} is a vector of explanatory variables, λ and γ are a set of coefficients to be estimated and v_{it} is the error term. λ is our parameter of interest since it shows the impact of the transition to self-employment on the skill mismatch.

Equation (3.1) represents the standard pooled probit model, which ignores the heterogeneity across individuals. If v_{it} is independent of Z'_{it}, the estimates produced by this model are consistent but might not be asymptotically efficient. However, the following clustering correction allows us to estimate the standard errors efficiently (Greene, 2004):

$$\hat{V}(\hat{\delta}, \hat{\gamma}) = \left(\frac{N}{N-1}\right)(-H^{-1})\left(\sum_{i=1}^{n} g_i g_i'\right)(-H^{-1}) \qquad (3.2)$$

where g_{it} and H are the gradient and the Hessian of the corresponding likelihood function of Equation (3.1), respectively, and $g_i = \sum_{t=1}^{T} g_{it}$.

If we assume that the error term in Equation (3.1) can be additively decomposed into an unobservable individual-specific component, δ_i, which is constant over time and normally distributed with zero mean and variance σ_δ^2, and time-varying white noise, e_{it}, independent of both δ_i and Z_{it}, then Equation (3.1) becomes:

$$SM_{it} = I(SM^*_{it} > 0) = I(\lambda Trans_{it} + Z'_{it}\gamma + \delta_i + e_{it} > 0), \quad (i = 1, \dots, N; t = 1, \dots, T) \quad (3.3)$$

Equation (3.3) corresponds to the standard random-effects probit model for which maximum likelihood estimates are generally consistent and asymptotically efficient (see e.g. Greene, 2000). We can also obtain an estimate of ρ defined as:

$$\rho = corr(\delta_i + e_{it}, \delta_i + e_{is}) = \frac{\sigma_\delta^2}{\sigma_\delta^2 + \delta_e^2}, \forall t \neq s \quad (3.4)$$

This term is the correlation between the composite latent errors, $\delta_i + e_{it}$, across any two time periods and it also measures the relative importance of the individual's unobserved effect, δ_i.

So far, we know that both the pooled and the random-effects model provide consistent estimates under given circumstances. Moreover, after applying the correction expressed in Equation (3.2), the pooled probit model also turns out to be efficient. The estimated parameters of the correlated random-effects probit model will converge to the estimated parameters of the pooled probit model as ρ tends to zero. In this setting, given the binary and panel nature of our data, a natural candidate to model skill mismatches is the random-effects probit model. As pointed out, a pooled bivariate probit model is also a feasible alternative.

3.3.2. Endogeneity

In the context of our research, one potential source of endogeneity stems from the fact that a number of unobserved factors might affect both the probability of being skill-mismatched and the probability of being salaried and the transition to self-employment. If we do not account for this endogeneity, the estimates will be inconsistent, thus generating an identification problem for the parameters in Equation (3.1). Given that both variables are binary and the pooled model is feasible in this setting, the pooled bivariate probit model, which simultaneously estimates Equation (3.1) and the transition equation defined below, is a good solution to account for endogeneity:

$$Trans_{it} = I(Trans^{*}{}_{it} > 0) = I(X'_{it}\pi + \varepsilon_{it} > 0), \ \ (i = 1, \dots., N; t = 1, \dots, T) \qquad (3.5)$$

In Equation (3.5), $Trans_{it}$ stands as defined in Equation (3.1), X_{it} is a vector of explanatory variables, π is a set of coefficients to be estimated and ε_{it} is the error term. In this equation system, now $\rho^{*} = cov(\varepsilon_{it}, v_{it})$ is the correlation of the error terms in Equations (3.1) and (3.5). Endogeneity will exist if ρ^{*} is sufficiently large. As we have already discussed in subsection 3.1, unbiased and asymptotically efficient estimates of the simultaneous equation model composed by Equations (3.1) and (3.5) can be obtained by means of the maximum likelihood estimation of a pooled bivariate probit model. Recall that since we estimate a pooled model, we do not account for individual-specific effects. However, as we explained in subsection 3.1, this should not be a problem after using the clustering correction defined in Equation (3.2).[8]

[8] See Diaz-Serrano and Stoyanova (2010) for further discussion.

3.4. Data and variables

3.4.1. Data and restricted samples

The data used in this paper come from the European Household Panel (ECHP). The main advantage of this survey is that the questionnaires are standardized. Each year, all the surveyed individuals in the participating countries are asked the same questions; consequently, the information is directly comparable. Furthermore, it contains not only information at the household level, but also very detailed data at the individual level. These interviews cover a wide range of topics concerning living conditions. For instance, they include detailed information about the surveyed individuals' income, financial situation in a wider sense, working life, housing, social relations, health and sociodemographic information.

The data collection started in 1994 and was conducted over eight consecutive years. We make use of all the waves of the ECHP, thus covering the 1994–2001 period[9] for eleven of the EU-15 countries (Denmark, the Netherlands, Belgium, France, Ireland, Italy, Greece, Spain, Portugal, Austria and Finland). For Austria and Finland, the available files only cover the periods 1995–2001 and 1996–2001, respectively.[10]

The purpose of this paper is to test whether self-employment is a way to escape from skill mismatches and whether workers perceive their job context differently when they become self-employed. Therefore, the panel structure of the ECHP allows us to track individuals who participate in the survey in consecutive years and change their job status from salaried employment to self-employment during the sample period.

[9] EU-15 refers to the fifteen member states of the European Union before the 1 May 2004 enlargement.
[10] See Peracchi (2002) for a review of the organization of the survey.

We restrict our sample to those individuals who are self-employees or salaried employees, aged 18–65, either males or females and working part-time or full-time. Individuals who do not participate in consecutive waves are excluded from our sample. Workers are counted as self-employees if they answer "yes" to a direct question on self-employment[11] and salaried employees if they answer "yes" to a direct question on private employment[12]. Since we are interested in analyzing transitions from salaried employment to self-employment, individuals who remain in self-employment during the whole sample period are also excluded from the analysis.

Our final sample consists of a pool sample of countries containing 172,174 observations belonging to 46,830 individuals. This large sample is what we call the "full sample." In this sample, those individuals who remain salaried employees throughout the whole sample period are used as a control group for those who experience transitions from salaried employment to self-employment. Alternatively, from this "full sample," we create a subsample consisting of those individuals who switch only once from salaried employment to self-employment and remain in this employment regime until the end of the sample period. In this sample, we only consider individuals who experience the transition, so individuals are compared with themselves before and after the transition. We refer to this as the "restricted sample" and it consists of 4,414 observations belonging to 922 individuals.

[11] Individuals are forced to choose only one main occupation, either working for an employer in paid employment or working in self-employment. Since no information is collected on secondary activities, it is not possible to determine whether some individuals combine both self-employment and paid employment.

[12] We exclude workers in the public sector from the analysis because the determinants of occupational choice and job satisfaction among public sector workers deviate from those of private (salaried employment) sector workers. This difference is related to several factors, such as a relatively smaller workload for public sector workers and a motivation to serve the community (Francois, 2000; Glazer, 2004; Besley and Ghatak, 2005; Prendergast, 2007; Delfgaauw and Dur, 2008, 2009; Millán et al., 2013).

3.4.2. Variables

Table 3.5 in the appendix contains the description of the variables used in this analysis. The variable *Job Satisfaction* originally ranged from one to six, with one referring to individuals who are not satisfied with their job and six referring to those who are completely satisfied with their work. This variable is collapsed into a dummy variable that takes a value equal to one when the variable is equal to five or six and zero for values equal to four or less.[13]

Our main outcome variable, that is, self-reported *Skill Mismatch*, is a dummy variable obtained from the elicited responses to the following question: "Do you feel that you have the skills or qualifications to do a more demanding job than the one you now have?" Those individuals who respond affirmatively to this question are considered to be skill-mismatched.

To test our hypothesis, we create different transition variables. The consideration of different transition variables will help us to determine the robustness of our analysis. From the "full sample," we construct two transition variables named Transition 1 and Transition 2. *Transition 1* is a dummy variable that takes the value one when individual *i* is in salaried employment in period *t-1* and in self-employment in periods *t*, *t+1* and so on until the end of the sample period and zero if the individual is in salaried employment at *t-1* and *t*. Those individuals who become self-employed only temporarily are considered as missing values. *Transition 2* is a dummy variable that takes the value one if individual *i* transits from salaried employment to self-employment between period *t-1* and period *t*, regardless of whether he or she is self-employed temporarily or until the end of the period, and zero if the individual is working in salaried employment. Note that the main difference between these two last transition variables is that in the first one, *Transition 1*, we compare those individuals who switch only once

[13] We choose this procedure because, in most cases, there are only a few observations for some of the satisfaction scales.

with those individuals working in salaried employment and in the second one, *Transition 2*, we compare all the individuals who switch at least once from salaried employment to self-employment with those individuals working in salaried employment.

From the "restricted sample," we construct the following transition variables: *Transition Long Term*, which is a dummy variable that takes the value one since the individual becomes self-employed until the end of the period in our sample and zero in the previous periods. This variable captures the long-term effect of the job transition on the skill mismatch. We also create a variable named *Transition Short-Term 1*, which is a dummy variable that takes the value one if individual *i* switches to self-employment between period *t-1* and period *t* and zero otherwise. This variable is equal to one only in the period in which the individual make the transition and zero afterwards. This variable captures the short-term effect. Analogously, we also create two more transition variables, one named *Transition Short-Term 2*, which is a dummy variable that takes the value one only in the second year after the transition, and another named *Transition Short-Term 3–7*, which takes the value one from the third to the last year of the sample period after the transition and zero otherwise. These three variables allow us to capture the potential existence of adaptation effects, in terms of skills, on self-employment.

Our vector of explanatory variables accounts for various determinants: a set of individual-specific variables, such as demographic indicators (*Age* and *Female*), educational attainment (*Educ2* and *Educ3*), family aspects (*Family Size*) and employment characteristics (*Tenure*, *Log Hours Worked* and *Permanent Contract*).

Table 3.5 reports some of the descriptive information of the variables in the model. The summary statistics are reported separately for the "full" and the "restricted sample," and for the latter, we report the summary statistics for those in salaried employment "before switching" and those in self-employment "after switching." Column

(1) reports the descriptive statistics for the "full sample." Here, we have all the individuals who switch from salaried employment to self-employment, both those who switch only once and those who switch at least once. The percentage of individuals who switch once in comparison with those in salaried employment is 0.52%, while the percentage of individuals who make the transition at least once in comparison with those individuals in salaried employment is 1.46%. Here, the numbers indicate that our sample is formed mostly by individuals who perform more than one transition. As dependent variables, we have *Job Satisfaction* and *Skill Mismatch*. Recall that our satisfaction variable is a binary indicator. We observe that 48.43% of individuals report being satisfied with their current job status. The percentage of individuals who report being skill-mismatched is 52.76%. We observe that the average age is almost 37 years and most of the individuals are males. Furthermore, the percentage of individuals with tertiary education is 16.50%, while individuals with secondary education account for more than 35%. The average family size is 3 members. Regarding the employment characteristics variables, the average number of years in employment is 7 and the logarithm of the hours worked is more than 3. Concerning firm-specific indicators, the occupation with the highest value is *craft and trade workers* and the highest value of the main activity is recorded for the *service sector*, with 20.43% and 51.26%, respectively.

Column (2) reports the descriptive statistics for the "restricted sample." As we mentioned before, of the 46,830 individuals participating in the "full sample," only 922 make the transition from salaried employment to self-employment and remain there until the end of the sample period. The average percentage of individuals who report being skill-mismatched, accounting for those individuals who switch to self-employment, is 47.12%. In general, these switchers seem to be similar in terms of age and education relative to those in the "full sample," though the share of females is lower. The average number of years in the current job is 6, almost 1 year less than in the "full sample." The natural logarithm of the hours worked per

week is slightly higher, 3.84. Almost 33% of the switchers declare that they had a permanent contract in the previous year. The *craft and trade workers* occupation accounts for the highest value, while around 36.66% of the main activity is accounted for by the *industry sector*. Column (3) and Column (4) report the descriptive statistics separately for the periods before switching (salaried employment) and the periods after switching (self-employment). As one would expect, the average age after making the transition is higher than before, 39 years old. The percentage of females and the individuals with tertiary education have decreased to 15.68% and 15.47%, respectively. We also find that on average, the total number of members of the household is 3. However, the percentage of individuals with secondary education has increased to 35.29%. *Employment characteristics* are on the same line as those before switching to self-employment. Concerning firm-specific indicators, *craft and trade workers* and *service sector* continue to account for the higher values.

It is worth noting the interesting pattern of our key variable, Skill Mismatch. The summary statistics reveal differences among the individuals in the "full sample" and those in the "restricted sample." In particular, 52.76% of individuals declare themselves to be skill-mismatched in the "full sample," while this percentage decreases to 47.12% in the "restricted sample." The decrease in this percentage once individuals make the transition should be highlighted. The percentage of individuals who report being skill-mismatched decreases significantly from 54.08% before the switch to 43.38% after the switch. Moreover, in Column (4), we observe that this value decreases through time. These results represent an interesting snapshot of the skill-mismatched individuals in the European Union and gives us the opportunity to see the variability among the individuals who switch at least once from salaried to self-employment and those who are in salaried employment.

Table 3.1 Descriptive statistics of the model

	Full sample	*Restricted sample*		
		All	Before switching	After switching
Sample				
Number of observations	172174	4414	1544	2870
Number of individuals	46830	922	922	922
Dependent variables				
Job Satisfaction	48.43			
Skill Mismatch	52.76	47.12	54.08	43.38
Explanatory variables				
Restricted sample				
Transition long term		65.02		
Transition short term 1		20.00		30.76
Transition short term 2		15.06		23.17
Transition short term3_7		29.95		46.06
Full sample				
Transition 1	0.52			
Transition 2	1.46			
Demographic characteristics				
Age	36.96	37.72	35.26	39.04
Female	37.49	16.45	17.87	15.68
Education				
Educ2	35.54	34.89	34.13	35.29
Educ3	16.50	15.72	16.19	15.47
Family aspects				
Family Size	3.48	3.59	3.56	3.56
Employment characteristics				
Selfemp	1.47	65.02		
Tenure	7.39	6.07	7.58	7.12
Log Hours Worked	3.67	3.84	3.75	3.76
Lagged Permanent Contract		32.98	60.75	60.15
Firm specific indicators				
Occupations				
Services	5.71	15.52	7.57	7.68
Professionals	6.89	8.09	7.44	7.88
Technicians	12.58	11.17	12.43	12.14
Clerks	14.71	3.42	7.19	7.27
Service_workers_and_salers	13.08	12.57	14.89	15.11
Agricultural_and_fishery_workers	1.81	8.27	3.49	3.57
Craft_and_trade_workers	20.43	26.55	26.16	25.91
Plant_and_machine_operators	11.91	7.41	9.58	9.34
Elementary_occupations	11.20	5.89	9.71	9.70
Main Activity				
Agricultural Sector	3.45	10.04	5.69	6.25
Manufacturing Sector	41.14	36.66	44.62	43.95
Service Sector	51.26	5.08	47.86	47.93

Source: Own elaboration from the ECHP

Table 3.2 reports the share of individuals reporting being skill-mismatched before and after switching to self-employment by country. The base category consists of individuals working in salaried employment. At first glance, this figure reveals that our key variable is quite heterogeneous across the board, which allows us to look for the effects on both before and after switching. Before switching, the highest value is recorded for Finland, for which the percentage of individuals is 67.42%, while in the Netherlands it is around 38%. After switching, Belgium is the country with the highest presence of individuals reporting being skill-mismatched, more than 59%, while Greece reports the lowest percentage. Furthermore, we observe that on average, for all the EU countries in our sample, the percentage of individuals who report being skill-mismatched is lower after making the transition to self-employment than when they were in salaried employment. This supports the idea that self-employees report lower levels of skill mismatch in all countries in comparison with individuals working in salaried employment.

Table 3.2 Sample statistics of skill mismatched switchers (full sample)

			% of individuals reporting being skill mismatched	
	Obs.	Individuals	Before switch	After switch
Denmark	10,033	2,463	62.87	45.00
Netherlands	20,840	5,331	38.33	29.63
Belgium	8,244	2,413	64.97	59.15
France	22,325	5,589	53.02	21.82
Ireland	12,442	4,085	53.35	49.09
Italy	21,144	5,479	50.11	43.90
Greece	11,034	3,257	58.94	05.00
Spain	22,540	6,622	55.32	46.02
Portugal	23,148	5,506	44.17	42.48
Austria	11,508	3,115	61.78	52.75
Finland	8,916	2,970	67.42	56.15

Source: Own elaboration from the ECHP

3.5. Empirical results

Table 3.3 contains the results of two alternative specifications. Model (1) presents the results of the univariate probit model regarding the probability of reporting job satisfaction. Model (2) shows the results of the univariate probit model regarding the probability of reporting being skill-mismatched. This model is merely used as an initial approach to determine the factors affecting self-reported skill mismatches and to detect potential differences between the workers in salaried employment and the self-employed.

Our findings indicate that the probability of reporting job satisfaction for those individuals reporting being skill-mismatched in their current workplace is 4.4 percentage points lower than that for their skill-matched counterparts. It is important to remark that among all the individual characteristics variables considered in the equation, the skill-mismatch indicator is found to be the variable with the largest negative estimated marginal effects. Hence, skill mismatches appear to be one of the most crucial factors affecting job satisfaction. When distinguishing by employment status, self-employees are 6.1 percentage points more likely to report being satisfied and 8.7 percentage points less likely to report being skill-mismatched than salaried employees. Age is U-shaped for the probability of reporting job satisfaction and inverted U-shaped for the probability of reporting being skill-mismatched. Females are less satisfied than males, but they are less likely to report being skill-mismatched in their current work. As one might expect, more educated workers are more likely to report job satisfaction and to report being skill-mismatched. The *logarithm of working hours per week* has a statistical and positive effect on job satisfaction and *family size* has a statistical and negative effect on the skill-mismatch probability. Individuals who work in their current job as *legislators, senior officials or managers* are 6.2 percentage points more likely to report being satisfied and 3.9 percentage points less likely to report being skill-mismatched. Those in *elementary occupations* are less likely to report being job satisfied, while those

who are *skilled agricultural and fishery workers* are less likely to report being skill-mismatched.

Table 3.3 Estimates of job satisfaction and the skill mismatch equation

	Model (1) Probit Job Satisfaction	Model (2) Probit Skill Mismatch
Skill Mismatch$_t$	-0.044***	
	(0.005)	
Self-employment$_t$	0.061***	-0.087***
	(0.015)	(0.015)
Age$_t$	-0.011***	0.009***
	(0.002)	(0.002)
Age2$_t$	0.000***	-0.000***
	(0.000)	(0.000)
Female$_t$	-0.030***	-0.082***
	(0.007)	(0.007)
Educ3$_t$	0.051***	0.184***
	(0.009)	(0.009)
Educ2$_t$	0.033***	0.122***
	(0.006)	(0.007)
Tenure$_t$	-0.000	-0.000
	(0.001)	(0.002)
Tenure2$_t$	0.000	-0.000*
	(0.000)	(0.000)
Log Hours Worked$_t$	0.021**	-0.014
	(0.013)	(0.013)
Family Size$_t$	-0.002	-0.006***
	(0.002)	(0.002)
Permanent Contract$_{t-1}$		
Services	0.062***	-0.039**
	(0.018)	(0.018)
Professionals	0.058***	-0.018
	(0.018)	(0.019)
Technicians	0.035**	-0.006
	(0.017)	(0.017)
Clerks	-0.012	0.024
	(0.017)	(0.017)
Service_workers_and_salers	-0.030*	0.017
	(0.018)	(0.018)
Agricultural_and_fishery_workers	-0.053*	-0.087***

	(0.030)	(0.030)
Craft_and_related_trade_workers	-0.070***	-0.071***
	(0.016)	(0.017)
Plant_and_machine_operators	-0.076***	-0.050***
	(0.017)	(0.017)
Elementary_occupations	-0.125***	-0.026
	(0.017)	(0.018)
Agricultural Sector	-0.013	-0.034
	(0.023)	(0.024)
Manufacturing Sector	-0.016	0.006
	(0.012)	(0.014)
Service Sector	0.012	0.025*
	(0.012)	(0.013)
Constant		
Sample size	81754	82998

Notes:
1. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.
2. All models include dummy for years and countries.
3. Numbers in parenthesis are the coefficient standard errors.

Table 3.4 reports the marginal effects of the estimation of our empirical models relating to the determinants of the probability of reporting being skill-mismatched. To allow for comparisons, we report the marginal effects instead of the estimated coefficients. In these models, we use the same controls as in Model (2) in Table 3.3. The results regarding the determinants of the probability of self-reported skill mismatches are qualitatively the same as in Model (2) in Table 3.3. Therefore, in Table 3.4, we just focus on the estimated marginal effects for our variables of interest, that is, transitions from salaried to self-employment.[14] In Models (3) to (6), we report the estimates of the single-equation models using the "full sample." In these models, we estimate the impact of the transition for those individuals who switch only once (Models (3) and (5)) and for those individuals who switch more than once (Models (4) and (6)).

[14] The estimated coefficients of the control variables included in the models shown in Table 4.4, which are not reported, provide the same qualitative results as the coefficients reported in Table 4.3 in terms of the direction and the size of the effect. Full estimates of the models in the table are available from the authors upon request.

According to the estimates from the pooled probit model (Models (3) and (4)), on average, individuals who switch only once to self-employment are almost 10 percentage points less likely to report being skill-mismatched, while for those switching more than once, the marginal effect is of 8 percentage points. When we resort to the random probit model (Models (5) and (6)), we find that the corresponding decrease in the probability of being skill-mismatched is of 14 and 10 percentage points, respectively. We obtain large estimated marginal effects in both models, though it seems that in the pooled probit model the marginal effects are biased downwards.

Models (7) to (10) report the results for the "restricted sample," that is, for those individuals who switch from salaried to self-employment and remain self-employed until the end of our sample period. In this sample, the individuals experiencing this transition are compared with themselves before and after the transition. As in the previous models, we observe that the pooled and the random-effects model both provide the same qualitative results. We consider this to be proof of robustness, since the two samples differ significantly in terms of size and composition. Our comments will focus on the marginal effects obtained from the random-effects model. As a general remark, we can say that the estimated effects from this "restricted sample" are slightly augmented with respect to the ones from the "full sample." In Model (9), we test for the long-term impact of switching from salaried to self-employment on the probability of being skill-mismatched. The variable labeled *Transition Long Term* takes the value 1 from the period of the transition until the end of the sample period. Our estimates indicate that, on average, individuals are 15 percentage points less likely to report being skill-mismatched after experiencing the transition to self-employment. The impact of our variables picking up the short-term effect of the transitions (*Transition Short Term 1 and Transition Short Term 2*) is provided in Model (10). The estimated marginal effects for these variables are the same as in Model (9). That is, 1 year after the transition, the probability of reporting being skill-mismatched is about 15 percentage points smaller than in the years prior to the

transition. This holds for the second, third and so on years after the transition. We find that both the short-term and the long-term impact of the transition are the same, which is quite an interesting result.

Finally, Model (11) estimates a bivariate probit model of the determinants of both the probability of reporting being skill-mismatched and the probability of experiencing the transition from salaried to self-employment for the "restricted sample." This model is intended to control for the potential endogeneity of the variable picking up the transition in the skill-mismatch equation. In the bivariate model, we use a variable that indicates whether the individual holds a permanent labor contract as an exclusion restriction. This variable is included in the transition equation but not in the skill-mismatch equation. The Wald statistics reported in Table 3.4 do not allow us to reject the null hypothesis that the error terms of the two equations are uncorrelated. Therefore, the presence of endogeneity is discarded. This indicates that the estimates from the single-equation models are consistent. In addition, since in the pooled models we apply the clustering correction proposed in Equation (3.2), these models are efficient.

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Table 3.4 Estimates of the skill mismatch equation

	Full sample				Restricted sample				Bivariate probit
	Pooled probit		Random effects probit		Pooled probit		Random effects probit		Restricted sample
	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)	Model (8)	Model (9)	Model (10)	Model (11)
	Skill Mismatch	Skill Mismatch	Skill Mismatch	Skill Mismatch	Skill Mismatch	Skill Mismatch	Skill Mismatch	Skill Mismatch	Transition long term
Transition long term$_t$					-0.118***		-0.152***	-0.081*	
					(0.029)		(0.032)	(0.131)	
Transition short term 1$_t$						-0.115***	-0.149***		
						(0.028)	(0.033)		
Transition short term 2$_t$						-0.115***	-0.148***		
						(0.031)	(0.037)		
Transition short term 3_7$_t$						-0.119***	-0.151***		
						(0.037)	(0.043)		
Transition 1 $_t$	-0.098***		-0.144***			-0.144***			
	(0.017)		(0.024)			(0.024)			
Transition 2 $_t$		-0.081***		-0.107***					
		(0.011)		(0.015)					
Rho			0.661	0.659			0.544	0.544	-0.068
LR-test of $\rho = 0$			$3.6 \cdot 10^4$	$3.7 \cdot 10^4$			650.31	650.29	
(p-value)			0.000	0.000			0.000	0.000	
Pseudo-R^2 (pooled)	0.058	0.058			0.074	0.074			
Wald chi^2	5292	5368			201.71	202.24			
Prob>chi2	0.000	0.000			0.000	0.000			
Wald test of $\rho = 0$)									0.918
(p-value)									0.337
Sample size	170536	172174	170536	172174	4414	4414	4414	4414	4414

Notes: 1. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. 2. All models include dummy for years and countries. 3. Numbers in parenthesis are the coefficient standard errors. 4. Model (1) and (2) contain those individuals who switch only once from the salaried to the self-employment and remain there during the whole sample period in comparison with all the individuals in the salaried employment. Model (3) contains those individuals who switch at least once in comparison with those working in the salaried employment. Model (4) contains those individuals who switch only once in comparison with those in the salaried employment.

3.6. Summary and concluding remarks

The recent increase in skill mismatches in Europe has attracted the attention of the academic community due to the effects on labor activity (salaries, employment and productivity), competitiveness and growth as well as on psychological aspects such as job satisfaction. Skill mismatches also affect social inclusion and generate significant economic and social costs (Allen and Velden, 2001). Hence, matching skills and available jobs through better labor market information and efficient job placement services should be a priority for policy-makers. In contrast to Lazear's (2005) assumptions, however, self-employees need more basic and specialized skills than salaried employees. In a more recent study, Lechmann and Schnabel (2014) find that self-employees perform more tasks than salaried employees and their work requires more skills. Moreover, there is a strong belief that self-employment fosters innovation and competitiveness. Recent studies suggest that self-employment has tangible positive economic impacts not only on salaried employment but also on per capita income growth and poverty reduction (Goetz et al., 2012). In this framework, it is important to investigate whether self-employment is a way to escape from skill mismatches.

Using panel data from eleven European countries covering the period 1994–2001, in this article, we have investigated the relationship between the transition from salaried to self-employment and the probability of reporting being skill-mismatched. This is one of the few studies based on panel data; therefore, we could observe whether individuals feel skill-mismatched before and after the transition. Our results indicate that switching from salaried to self-employment significantly reduces the probability of reporting being skill-mismatched in the short and the long term. To test the sensitiveness of this effect, we construct alternative transition variables and samples. We find that the negative impact of the transition to self-employment remains robust across alternative samples, specifications and models. We

think this is proof of the robustness of our results, which suggest that self-employment is a way to escape from skill mismatches, and believe this to be a crucial policy issue, not only for policy-makers but also for social partners and trade unions. As a result, policies aimed at promoting self-employment might be effective in reducing skill mismatches in the workforce, which in turn will have a positive impact on job satisfaction. Our finding supports the idea that mechanisms such as specific start-up programs should be emphasized. We think that an improved distribution of skills among the labor market through an increase in self-employment should raise the economic performance in Europe through the gains of competitiveness and productivity.

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Appendix 2. Tables

Table 3.5 Definition of the variables used in the econometric estimates

Variable	Description
Dependent variables	
Job Satisfaction	Dummy that takes the value 1 if the individual is satisfied with its work or main activity and 0 for unsatisfied individuals.
Skill Mismatch	Dummy that takes the value 1 if the individual reports being skill mismatched and 0 otherwise.
Explanatory variables	
Restricted sample	
Transition long term	Dummy that takes the value 1 since the period in which the individual changes the job status and 0 for the previous periods.
Transition short term 1	Dummy that takes the value 1 in the period in which the individual changes job status and 0 otherwise.
Transition short term 2	Dummy that takes the value 1 in the second period in which the individual has changed job status and 0 otherwise.
Transition short term 3-7	Dummy that takes the value 1 from the third period to the seventh in which the individual has changed job status.
Full sample	
Transition 1	Dummy that takes the value 1 in the period in which the individual changes job status and 0 for those working in the salaried employment. Those individuals that become self-employees temporally are not considered, hence, the variable is a missing.
Transition 2	Dummy that takes the value 1 in the period in which the individual becomes a self-employee and 0 for those working in the salaried employment, regardless the number of periods they stay as a self-employees.
Demographic characteristics	
Age	Age of the individual.
Age2	Age of the individual squared.
Female	Dummy that takes the value 1 if the individual is a woman.
Education	
Educ2	Dummy that takes the value 1 if the highest educational level of the individual is secondary education.
Educ3	Dummy that takes the value 1 if the highest educational level of the individual is tertiary education.
Family aspects	
Family size	Number of persons in the household.
Employment characteristics	
Self-employment	Dummy that takes the value 1 if the individual works as self-employee and 0 for those working in the salaried employment.
Tenure	Total of years in the current job.

Tenure2	Total of years in the current job squared.
Log Hours Worked	Natural logarithm of hours working per week.
Permanent contract	Dummy that takes the value 1 if the individual had a permanent contract in the previous year.
Firm specific indicators	
Occupations	
Services	Dummy that takes the value 1 if the occupation in current job is legislators, senior officials and managers.
Professionals	Dummy that takes the value 1 if the occupation in current job is professionals.
Technicians	Dummy that takes the value 1 if the occupation in current job is technicians and associate professionals.
Clerks	Dummy that takes the value 1 if the occupation in current job is clerks.
Service_workers_and_salers	Dummy that takes the value 1 if the occupation in current job is service workers and shop and market sales workers.
Agricultural_and_fishery_workers	Dummy that takes the value 1 if the occupation in current job is skilled agricultural and fishery workers.
Craft_and_trade_workers	Dummy that takes the value 1 if the occupation in current job is craft and related trades workers.
Plant_and_machine_operators	Dummy that takes the value 1 if the occupation in current job is plant and machine operators and assemblers.
Elementary_occupations	Dummy that takes the value 1 if the main occupation in current job is elementary occupations.
Main activity	
Agricultural Sector	Dummy that takes the value 1 if the main activity in the current job is agriculture.
Manufacturing Sector	Dummy that takes the value 1 if the main activity in the current job is manufacturing sectors..
Service Sector	Dummy that takes the value 1 if the main activity in the current job is service sectors.
Country dummies	
Dummies equal 1 for individuals living in the named country, and 0 otherwise. The following countries are included: Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal and Spain.	

Source: Own elaboration from the ECHP

Chapter 4

Investigating the impact of small versus large firms on economic performance of countries and industries

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4.1. Introduction

Building an economy based on knowledge and innovation is a key target of the European 2020 strategy (European Commission, 2010a). Typically, entrepreneurship is regarded as an essential component of a knowledge-based economy where people start firms to pursue new but uncertain ideas (Audretsch and Thurik, 2001). Although a multi-faceted concept, entrepreneurship is most often understood as the establishment and operation of new and small firms. Since it became apparent that the comparative advantages of the EU in global competition lie in the exploitation of its knowledge base, politicians in many countries try to increase the number of new and small firms in their territory. At the end of the 20th century, researchers started to investigate the changing role of small and new firms in industrial economies (Brock and Evans, 1989; Acs and Audretsch, 1993). Globalization and an increasing importance of knowledge in the production process caused many developed countries to move from a more 'managed' to a more 'entrepreneurial' economy (Audretsch and Thurik, 2000, Thurik et al., 2013). In the former type of economy, large and incumbent firms play a dominant role, exploiting economies of scale in production and R&D in a relatively stable economic environment. In the latter type, small and new firms play an increasingly important role, introducing new products and services in highly insecure economic environments

while quickly adapting to rapidly changing consumer preferences (Audretsch and Thurik, 2001).

Following the early stream of research documenting the changing role of small and new firms in industrial economies, a considerable amount of research has now emerged studying the consequences of this change toward smallness for macro-economic performance (Van Stel, 2006; Carree and Thurik, 2010). In particular, several studies have found a positive link between measures of entrepreneurship (e.g. start-ups, small firm presence, number of self-employed, number of entrepreneurs in young businesses) and measures of macro-economic performance (e.g. productivity, GDP growth), e.g. Audretsch and Keilbach (2004) and Van Stel and Suddle (2008). In line with these findings, economists and policy makers are increasingly becoming aware of the importance of entrepreneurship for achieving higher levels of competitiveness and economic growth. Entrepreneurs introduce innovations into the economy thereby challenging incumbent firms to perform better as well (Schumpeter, 1934). A lack of entrepreneurs is harmful for economic growth because it implies a lack of competition, and hence a lack of incentives to innovate.

However, although it is clear that a lack of entrepreneurs is harmful for economic growth, in general less attention is paid to the question whether an economy can also have more entrepreneurs than is good for economic prosperity (Blanchflower, 2004). For instance, when there are many self-employed or very small firms in an economy, it is likely that a considerable proportion of these small firms operates below the minimum efficient scale, and that many of their business owners could be more productive as employees (Carree et al., 2002). The notion that an economy can also have too many entrepreneurs (self-employed) or small firms is important, because in many countries policy measures have been installed based on the (often implicit) assumption that higher self-employment or small firm rates always induce macro-economic performance (European Commission, 2009, Chapter 3). However, it is possible that such measures have an adverse effect in the sense that individuals

without the required entrepreneurial skills are attracted into self-employment (Johnson, 2005; Parker, 2007; Shane, 2009; Storey, 2003).

We have seen that economies can have less but also more entrepreneurs than is good for macro-economic performance (Carree et al., 2002). This clearly implies the existence of an *optimal* rate of entrepreneurship. However, to our knowledge, only a few studies have attempted to actually measure what the level of this optimal rate might be, and which factors may determine this level. Carree et al. (2002, 2007) model the equilibrium rate of business ownership (the number of business owners per labour force) as a function of economic development (per capita income), while Van Praag and Van Stel (2013) model the optimal business ownership rate as a function of a country's participation rate in tertiary education. Audretsch et al. (2002) use a completely different measure of entrepreneurship, viz. small firm presence operationalized as the share of small firms in a country's total turnover (i.e., sales). Although they do not explicitly measure the optimal rate of small firm presence, they do show that such an optimal rate exists and moreover, that most countries in their sample of European countries had a level of small firm presence below the optimum in the early 1990s.

The present paper is based on Audretsch et al. (2002) and extends and refines their analysis. In particular, we investigate whether changes in size-class structure affects macro-economic performance of industries and countries in the European Union (EU-27). The underlying assumption is that there exists an optimal size-class structure, where (newer and) smaller firms are strong in flexibility and in *exploration* of innovative ideas (Audretsch, 1995; Geroski, 1995; Caves, 1998), and where larger firms are strong in producing with higher efficiency through scale economies and in *exploitation* of

innovative ideas.[15] A well-functioning economy requires a good balance between these core competences of firms of different firm size but can this perfect balance be quantified? We make use of a unique and rich database prepared in part by Panteia/EIM on behalf of the European Commission (see European Commission, 2010b). The database provides information on employment, value added, sales and other variables for all 27 countries of the European Union over the period 2002-2008. The information is also disaggregated by sector and size-class.

We distinguish between 27 EU-countries, five broad sectors of economic activity and four size-classes: micro, small, medium-sized and large. At the country-sector level we first approximate the net growth rate of the share of SMEs as the annual percentage growth of real sales by SMEs minus the annual percentage growth of real sales by large firms. We then approximate the net growth rate of the share of micro firms as the annual percentage growth of real sales by micro firms (as a size-class) minus the annual percentage growth of real sales by all firms (i.e. the industry total). We similarly define net growth of the share of small, medium and large firms. Note that these variables relate to the *distribution* of economic activity over size-classes but not to the *magnitude* of total economic activity.[16] We then estimate two equations where GNP growth of the sector is explained by changes in size-class structure as estimated by (1) the net growth rate of the share of SMEs and (2) the net growth rates of the four separate size-classes. A positive impact of a change in the share of (for instance) small firms on sector growth would imply that the share of small firms is below optimum as an increase of the share in the economy of small firms apparently stimulates macro-economic performance. Such an outcome would imply that

[15] Of course, not all firms are involved in innovation. Moreover, the extent to which small and large firms explore and exploit innovative ideas will differ by sector.
[16] For instance, a positive net growth rate of the share of SMEs may go together with positive but also with negative growth of GNP.

apparently, there is not enough flexibility and exploration of innovative activities (by small firms) present in the economy.

As the importance of small versus large firms for an economy depends on the stage of economic development (Thurik et al., 2013), we also estimate our equation separately for countries within the EU with relatively lower and higher levels of economic development. Our main findings are as follows. We find that increases in the share of real sales by medium-sized firms has a significantly positive influence on sector growth (i.e., growth of value added at the sector level), particularly for higher income EU countries, whereas we find the opposite for micro and large firms, particularly for lower income EU countries. These results suggest that on average, EU-countries have too much economic activity by micro and large firms, but not enough economic activity by medium-sized firms. An explanation for the important role of medium-sized firms for macro-economic growth as implied by our analysis, may be that medium-sized firms are flexible enough to adjust fast to changing economic circumstances while at the same time they have a large enough scale to compete with large firms, thereby also challenging the latter to perform better. Our results suggest that the transformation from a 'managed' (where large firms are relatively more important) to an 'entrepreneurial' economy (where SMEs are relatively more important) has not been completed yet in all EU-countries, at least in 2008, i.e., just prior to the current economic crisis.

4.2. Models

4.2.1 Base model

In this section we present a model which enables to test the hypothesis that changes in size-class structure affect macro-economic performance of industries and countries in the European Union (EU-27). We capture changes in industry structure by changes in the relative importance (share of economic activity) of

four firm size-classes (micro, small, medium and large) for five broad sectors of economy.

The model of Audretsch et al. (2002) assumes that a country's growth can be decomposed into two components: (1) growth that would have occurred with an optimal industry structure, and (2) the impact on growth occurring from any actual deviations from that optimal industry structure. Audretsch et al. (2002) provide a mathematical derivation of their estimation equation starting from this assumption. For this derivation we refer to Appendix 1, but here we continue directly with their estimation equation:

$$\Delta GNP_{ct} = \Delta GNP_{ct-1} + \sum_{t=1}^{T} \beta_t D_t + k\Delta SFP_{ct-1} + e_{ct} \quad (1)$$

where ΔGNP_{ct} denotes the rate of economic growth in country c and year t, D_t denote dummy variables for periods $t=1, \ldots, T$, capturing business cycle effects and ΔSFP represents the change in small firm presence, as approximated by the difference in growth rates of SMEs and large firms in terms of real sales:

$$\Delta SFP_t = \left[\ln\left(\frac{sal_{SME}}{dfl_{SME}*PLI}\right)_t - \ln\left(\frac{sal_{SME}}{dfl_{SME}*PLI}\right)_{t-1}\right] - \left[\ln\left(\frac{sal_{large}}{dfl_{large}*PLI}\right)_t - \ln\left(\frac{sal_{large}}{dfl_{large}*PLI}\right)_{t-1}\right] \quad (2)$$

where *sal* indicates nominal sales, *dfl* indicates a size-class specific deflator, and *PLI* represents a price level index correcting for price level differences across countries. A positive value of this variable reflects a change in size-class structure towards a higher share in industry sales of SMEs and a correspondingly lower share of large firms (as SME sales grow faster than large firm sales).

In equation (1), the effect of changes in size-class structure on economic growth is reflected by k. A positive estimate for parameter k indicates that a relative shift in economic activity towards SMEs (at the expense of large firms) benefits macro-economic growth. Accordingly, a positive (negative) k implies that the share of

economic activity of SMEs is below (above) optimum. A non-significant k would indicate that the share of SMEs is around the optimum, indicating that there is good balance between the core competences of large firms (such as exploitation of economies of scale) and those of smaller firms (such as flexibility and exploration of new ideas).

We extend the Audretsch et al. (2002) model in three directions, all of which make the model more flexible. First, instead of estimating the model at country level, we estimate the model at country-sector level. Second, instead of including lagged GNP growth on the right hand side, implicitly fixing its parameter to 1, we allow the impact of lagged growth to be freely estimated. Third, instead of assuming a one year lag between the change in industry structure and economic growth, we also add a contemporaneous term, allowing for the possibility that (part of) the impact is immediate. These three extensions result in the following model:

$$\Delta GNP_{cst} = \alpha\, \Delta GNP_{cst-1} + \sum_{t=1}^{T} \beta_t D_t + k_1 \Delta SFP_{cst} + k_2 \Delta SFP_{cst-1} + e_{cst} \qquad (3)$$

where indicator s reflects sector. The use of both a lag operator and a difference operator in equation (3) implies that two years of data are lost. Hence, although our data base covers the period 2002-2008, our estimation sample covers the period 2004-2008.

4.2.2 Refinement

In a second exercise we refine the model further by splitting the SME size-class in four separate size-classes: micro, small, medium-sized and large. In this second exercise we approximate the net growth of the share of micro firms as the annual percentage growth of real sales by micro firms (as a size-class) minus the annual percentage growth of real sales by all firms (i.e. the industry total):

$$\Delta SFP_{micro\,t} = \left[\ln\left(\frac{sal_{micro}}{dfl_{micro}*PLI}\right)_t - \ln\left(\frac{sal_{micro}}{dfl_{micro}*PLI}\right)_{t-1}\right] - \left[\ln\left(\frac{sal_{total}}{dfl_{total}*PLI}\right)_t - \ln\left(\frac{sal_{total}}{dfl_{total}*PLI}\right)_{t-1}\right] \qquad (4)$$

We similarly define net growth of the share of small, medium-sized and large firms (i.e., real sales growth of the respective size-classes in deviation from the real sales growth for the industry total).

We then have

$$\Delta GNP_{cst} = \alpha\, \Delta GNP_{cst-1} + \sum_{t=1}^{T} \beta_t D_t + k_1 \Delta SFPmicro_{cst} + k_2 \Delta SFPsmall_{cst} + k_3 \Delta SFPmedium_{cst} + \quad (5)$$

$$k_4 \Delta SFPlarge_{cst} + k_5 \Delta SFPmicro_{cst-1} + k_6 \Delta SFPsmall_{cst-1} + k_7 \Delta SFPmedium_{cst-1} + k_8 \Delta SFPlarge_{cst-1} + e_{cst}$$

A positive impact of a change in the share of (for instance) small firms on sector growth would imply that the share of small firms is below optimum as an increase of the share in the economy of small firms apparently stimulates macro-economic performance. Such an outcome would imply that possibly, there is not enough flexibility and exploration of innovative activities present in the economy (as these are typical qualities of small firms).

4.3. Database and descriptive statistics

We make use of a unique and rich database prepared in part by Panteia on behalf of the European Commission (see European Commission, 2010b). The database provides information on employment, value added, sales and other variables for all 27 countries of the European Union. The information is also disaggregated by sector and size-class[17]. This enables us to compute sales and value added growth rates by sector and size-class.

[17] The data for a more recent version of the data base are publicly available from the following link: http://ec.europa.eu/enterprise/policies/sme/facts-figures-analysis/performance-review/index_en.htm (under 'Database for the Annual report'). However, crucially, for these more recent data it is not possible to construct deflator series at the level of sector times size-class, which hampers correct approximation of changes in size-class structure.

4.3.1 Definitions of sectors, size-classes and variables

We will make use of data for the period 2002-2008.[18] We use data for the following sectors[19] and size-classes:

Sectors[20]:

- Manufacturing (sector D)
- Construction (F)
- Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods (G)
- Hotels and restaurants (H)
- Transport, storage and communication (I)
- Non-financial private sector: the aggregate of these sectors

Size-classes:

- Micro: 1-9 occupied persons
- Small: 10-49 occupied persons
- Medium-sized: 50-249 occupied persons
- SMEs: 1-249 occupied persons (aggregate of micro, small and medium-sized)
- Large: 250 or more occupied persons
- Total: the aggregate of these size-classes

We use the following operationalisations for the model variables introduced in section 2.1 (see equations 1 and 2). All variables are available at the sector and size-class level defined above. The main data source of the variables is the above-mentioned data base which was prepared for the Annual Report on SMEs in the EU (see European Commission, 2010b).

[18] For more recent years the data required to construct deflator series at the level of sector times size-class are not available.
[19] In the other parts of economy (e.g., mining; electricity), interplay between small and large firms is less likely to occur.
[20] Sector classification is based on Nace Revision 1.1.

ΔGNP: growth of real gross national product (also available by sector)

Sal: real sales, in Euros

dfl: deflator

PLI: price level index (purchasing power parities)

In our empirical application we correct nominal sales (*Sal*) for inflation and country differences in purchasing power. Data on purchasing power parities (with EU-27=100) are taken from Eurostat for the year 2005 (the middle year of our estimation sample). Deflator series by sector and size-class are constructed using data of additional variables from the Annual Report database, as well as price indices data from Eurostat. For the methodology to construct these deflator series we refer to Van Stel, De Vries and De Kok (2014).

4.3.2 Descriptive statistics

Table 4.1 presents some summary statistics for the relative importance of the different size-classes in the 27-EU countries in 2005 (in terms of sales). The importance of firm-size in the economy is measured by each firm-size share: micro, small, medium, SME (as the sum of the last three), and large. The share of micro firms in the economy[21] is defined as the total volume of sales by micro firms in 2005 divided by total sales in 2005 (in all size-classes). Column 1 reports the share of micro firms in total sales. The lowest value is recorded for Germany, where the share of micro firms accounts only for 9.1% of total sales, while in Greece around 40% of the overall sales is accounted for by micro firms. The average sales share

[21] In this paper, 'the economy' refers to the non-financial private sector, i.e., the aggregate of sectors D, F, G, H and I, as listed in Section 3.1.

accounted for by micro firms in that year is 19.5%. Column 2 reports the sales share of small firms in the industry. Here, the numbers indicate that the lowest and the highest value are recorded for two neighbour countries, Finland and Estonia, with 14.8% and 30% respectively. However not for medium-sized firms as column 3 shows. Around 16% of overall industry is accounted for by medium-sized firms in Malta, while more than 30% is accounted for by medium-sized firms in Latvia. Column 4 reports the aggregate sales share of the micro, small and medium firms (SMEs) in overall industry. Cyprus is the country with the highest presence of SMEs, more than 85%, while Germany reports the lowest share of economic activity by Small and Medium Enterprises. Furthermore, on average for the EU-27, total sales is formed in most part by small and medium-sized firms. In this sense, the industry structure of Germany is dominated by large firms, while Cyprus, belonging to 12-EU newcomer countries, is the country with the lowest share of this firm-size class. Almost all the 27-EU countries report higher sales shares of SMEs than large firms; Finland, Germany and the United Kingdom are the exceptions to this size-class structure. This suggests that (at least some) higher developed economies are dominated by large firms. Moreover, this table represents an interesting snapshot of the industry structure in 2005 where the 27-EU economies are mostly formed by SMEs (62.8%).

Table 4.1 Sales share by firm size-class for the 27 European Union countries in 2005

Country	*Share micro*	*Share small*	*Share medium*	*Share SME*	*Share large*
Austria	0.158	0.226	0.222	0.606	0.394
Belgium	0.204	0.218	0.194	0.616	0.384
Bulgaria	0.221	0.242	0.235	0.698	0.302
Cyprus	0.309	0.276	0.271	0.855	0.145
Czech Republic	0.167	0.185	0.250	0.603	0.397
Denmark	0.180	0.243	0.219	0.641	0.359
Estonia	0.238	0.301	0.282	0.821	0.179
Finland	0.136	0.148	0.178	0.461	0.539
France	0.168	0.202	0.174	0.545	0.455
Germany	0.091	0.158	0.196	0.445	0.555
Greece	0.405	0.200	0.175	0.780	0.220
Hungary	0.184	0.197	0.188	0.569	0.431
Ireland	0.108	0.171	0.256	0.535	0.465
Italy	0.275	0.247	0.197	0.720	0.280
Latvia	0.204	0.282	0.311	0.796	0.204
Lithuania	0.111	0.245	0.266	0.622	0.378
Luxembourg	0.162	0.205	0.187	0.554	0.446
Malta	0.327	0.229	0.161	0.718	0.282
Netherlands	0.145	0.216	0.249	0.610	0.390
Poland	0.239	0.150	0.232	0.621	0.379
Portugal	0.250	0.236	0.232	0.717	0.283
Romania	0.162	0.223	0.231	0.616	0.384
Slovakia	0.131	0.173	0.217	0.522	0.478
Slovenia	0.182	0.190	0.235	0.607	0.393
Spain	0.227	0.247	0.200	0.674	0.326
Sweden	0.161	0.181	0.190	0.533	0.467
United Kingdom	0.124	0.167	0.184	0.475	0.525
Average	0.195	0.213	0.220	0.628	0.372

Source: Self-device from Panteia/EIM database (Database for the Annual Report). See European Commission (2010b).

Correlation matrixes between the dependent and independent variables used in the different models can be found in Appendix 7.

4.4. Results

In order to analyze whether changes in size-class structure affect macroeconomic performance of industries, we estimate equations (3) and (5) using a pooled data set for five broad sectors of economic activity for the EU-27 countries for the period 2004-2008. However, as the importance of small versus large firms for an economy depends on the stage of economic development (Thurik et al., 2013), we also estimate our equations separately for countries with relatively lower and higher levels of economic development (within a EU context).[22]

As the presence of outliers may distort our empirical strategy, the analysis is performed using Ordinary Least Squares robust regression method which performs an initial screening based on Cook's distance > 1 to eliminate gross outliers before calculating starting values and then performs Huber iterations (Huber, 1964) followed by biweight iterations, as suggested by Li (1985). For a detailed description of the method see Hamilton (1991, 1992).[23]

Estimation results for the 27-EU countries over the period 2002-2008 for the five broad sectors of economic activity are presented in Table 4.2.[24] Our first specification includes the general variable

[22] Classifications by economic development level are in Appendix 4. For the 'lower' developed countries estimation sample we use the 'relatively lower developed countries' and 'medium developed countries' from Table 4.3. For the 'higher' developed countries estimation sample we use the 'relatively higher developed countries' and 'medium developed countries' from Table 4.3. As there is no obvious reason to (exclusively) include the medium developed countries with either the lower developed country sample or the higher developed country sample, we include this middle group in both estimation samples.
[23] Standard errors are calculated using the pseudo values approach described in Street *et al.* (1988).
[24] Estimation results for each separate sector are available from the authors upon request.

indicating the net growth of the share of Small and Medium-sized Enterprises approximated by the annual percentage growth of real sales by SMEs minus the annual percentage growth of real sales by large firms (see equation (2)). Both lagged and unlagged terms are included (see equation (3)). Our second specification then adds the net growth rates of the shares of micro, small, medium and large firms (see equation (4)) and also the lagged versions of these variables. The variables included in the second specification allow deeper examination of the effect of changes in size-class structure on macro-economic performance (see equation (5)). Our findings are as follows. For the general sample, i.e., when combining all EU countries in one pooled sample, we find a positive and statistically significant effect (at the 10% significance level) for our first indicator of changes in size-class structure on sector growth. Hence, recent increases in the share of real sales by SMEs relative to large firms has a significantly positive influence on sector growth. However, we find a negative and statistically significant effect (at the 1% significance level) for the lag of our first indicator of changes in size-class structure on sector growth. This last effect is slightly bigger.

Table 4.2 Regression results for equations (3) and (5): Relating growth to industry structure[1,2,3]

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.250***	0.254***	0.233***	0.236***	0.305***	0.297***
	(0.044)	(0.048)	(0.036)	(0.037)	(0.028)	(0.029)
ΔSFP	0.025		0.035**		0.031*	
	(0.026)		(0.017)		(0.017)	
ΔSFP_{cp-1}	-0.046*		-0.037**		-0.051***	
	(0.024)		(0.015)		(0.015)	
ΔSFP_{micro}		-0.061*		0.019**		0.011
		(0.035)		(0.009)		(0.011)
ΔSFP_{small}		-0.045		0.005		-0.015
		(0.061)		(0.042)		(0.038)
ΔSFP_{medium}		0.034		0.094***		0.099***
		(0.052)		(0.027)		(0.028)
ΔSFP_{large}		-0.109***		-0.054**		-0.059**
		(0.039)		(0.025)		(0.025)
$\Delta SFP_{micro_{cp-1}}$		-0.091***		-0.013		-0.017
		(0.030)		(0.009)		(0.011)
$\Delta SFP_{small_{cp-1}}$		0.017		-0.039		0.005
		(0.029)		(0.031)		(0.019)
$\Delta SFP_{medium_{cp-1}}$		-0.086*		0.084***		0.018
		(0.050)		(0.025)		(0.026)
$\Delta SFP_{large_{cp-1}}$		0.002		0.051**		0.048**
		(0.035)		(0.023)		(0.022)
Constant	0.056***	0.057***	0.025***	0.025***	0.039***	0.039***
	(0.010)	(0.010)	(0.005)	(0.005)	(0.005)	(0.005)
R-squared	0.197	0.240	0.168	0.233	0.251	0.266
Sample size	280	280	336	336	521	521

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1%, ** Significant at 5%, * Significant at 10%.

Looking at the second specification, we find that recent increases in the share of real sales by medium-sized firms has a significantly positive influence (at the 1% significance level) on sector growth (i.e.,

growth of value added at the sector level), whereas the lagged impact of medium-sized firms is non-significant. Hence, combining the lagged and unlagged effects, the net-effect of increases of the share of medium-sized firms on sector growth is positive. This may be because medium-sized firms combine a certain level of scale with a certain level of flexibility, allowing them to be very competitive (Van Stel, De Vries and De Kok, 2014). As regards large firms, we find a negative unlagged effect and a positive lagged effect which more or less cancel each other out. Results for micro and small firms are not significant. Overall, these results suggest that on average, EU-countries do not have enough economic activity by medium-sized firms.

By and large, results for the higher developed countries are in line with these findings. We find a positive and statistically significant effect (at the 5% significance level) of recent increases in the share of real sales by SMEs on sector growth. And a negative and statistically significant effect (at the 5% significance level) of lagged increases in the share of SMEs on economic growth. Looking at results per size-class, we again find a positive influence of medium-sized firms, and for large firms a net-effect over time of approximately zero. We also find a small positive impact for micro firms.

When estimating for lower developed countries within the European Union, we find that increases in the share of real sales by large-sized firms has a significantly negative effect (at the 1% significance levels) on sector growth. We also find negative effects for micro firms and medium-sized firms, albeit for the latter only at the 10% significance level. This pattern might indicate that in (former) transition countries, there is still a category of larger firms not operating efficiently. On the other side of the spectrum, there seem to be many micro firms which may also not be as productive as would be desirable. Possibly, entrepreneurs in some of these firms could be more productive as an employee in a somewhat bigger firm (e.g. in the small-scaled size-class).

We conclude, based on the empirical findings, that on average for the (particularly higher income) EU-countries, medium-sized firm presence is below optimum during the period 2002-2008. One has to be careful interpreting the estimation results for different countries. The estimated positive sign found for medium-sized firms must be seen as an average value. So, there may be countries in the sample where the share of medium-sized firms (such as Ireland) is relatively high and consequently, medium-sized firm share might exceed optimum, despite the positive regression coefficient. On the other hand, for countries with low share (such as France), medium-sized firm presence may be expected to be below the optimum, given the positive coefficient.

4.4.1. Robustness test

Since we include not only lags of our independent variables but also contemporaneous variables, it is conceivable that there is reversed causality, i.e. that high GNP growth may benefit small firms more than large firms (or vice versa). To correct for this possibility, we estimate a version of the model where the variables reflecting the change in size-class structure are 'cleared' for business cycle (reversed causality) effects. We apply the following procedure, similar to Audretsch et al. (2002, footnote 12).

We first estimate the following equation using the same sample as in equation (3) but with one extra year (period 2003-2008):

$$\Delta SFP_{cst} = \pi + \mu \Delta GNP_{cst} + \varepsilon_{cst} \qquad (6)$$

The estimated residual of this equation, $\hat{\varepsilon}_{cst}$, can be seen as the variable ΔSFP_{cst}, corrected for business cycle effects.

Related to equation (5), we similarly estimate the net growth of the share of micro, small, medium and large firms:

$$\Delta SFP_{micro\,cst} = \pi + \mu \Delta GNP_{cst} + \varepsilon_{cst} \qquad (7)$$

$$\Delta SFP_{small_{cst}} = \pi + \mu \Delta GNP_{cst} + \varepsilon_{cst} \quad (8)$$

$$\Delta SFP_{medium_{cst}} = \pi + \mu \Delta GNP_{cst} + \varepsilon_{cst} \quad (9)$$

$$\Delta SFP_{large_{cst}} = \pi + \mu \Delta GNP_{cst} + \varepsilon_{cst} \quad (10)$$

where the estimated residuals of these equations, $\hat{\varepsilon}_{micro_{cst}}$, $\hat{\varepsilon}_{small_{cst}}$, $\hat{\varepsilon}_{medium_{cst}}$ and $\hat{\varepsilon}_{large_{cst}}$, are the variables $\Delta SFP_{micro_{cst}}$, $\Delta SFP_{small_{cst}}$, $\Delta SFP_{medium_{cst}}$ and $\Delta SFP_{large_{cst}}$ respectively, corrected for business cycle effects.

Second, we estimate equations (3) and (5), with ΔSFP_{cst}, $\Delta SFP_{micro_{cst}}$, $\Delta SFP_{small_{cst}}$, $\Delta SFP_{medium_{cst}}$ and $\Delta SFP_{large_{cst}}$ replaced by $\hat{\varepsilon}_{cst}$, $\hat{\varepsilon}_{micro_{cst}}$, $\hat{\varepsilon}_{small_{cst}}$, $\hat{\varepsilon}_{medium_{cst}}$ and $\hat{\varepsilon}_{large_{cst}}$, respectively, for the period 2004-2008. These ΔSFP variables are then "cleared" for possible reversed causality effects.

Results are reported in Appendix 6. After correcting for reversed causality, the results remain similar to those in Table 4.2. Hence, we conclude that omission of the option of reversed causality hardly influences the size and sign of the effects as represented in Table 4.2. Nevertheless, one notable difference is that in Table 4.4, the effect for small firms for higher income countries is negative. As the effect for medium-sized firms is positive, this suggests that sector growth could be enhanced if more small firms would grow further to become a medium-sized firm.

4.5. Conclusions

It is deeply embedded in the current European policy approach that the creativity and independence of the self-employed contribute to higher levels of economic activity (Carree *et al.*, 2002). Moreover, as Audretsch *et al.* (2002) pointed out, an extensive literature has linked the structure of industries to performance. However, little is known about whether changes in size-class structure affect macro-

economic performance of industries and countries in the European Union (EU-27).

Our empirical analysis shows that there may be too much economic activity by micro and large firms, particularly for the relatively lower developed countries, including the EU-12 newcomer countries. On the other hand, we also find that there is not enough economic activity by medium-sized firms for member countries of the European Union in the period 2002 to 2008.

An explanation for the important role of medium-sized firms for macro-economic growth as implied by our analysis, may be that medium-sized firms are flexible enough to adjust fast to changing economic circumstances while at the same time they have a large enough scale to compete with large firms, thereby also challenging the latter to perform better. Our results suggest that the transformation from a 'managed' (where large firms are relatively more important) to an 'entrepreneurial' economy (where SMEs are relatively more important) has not been completed yet in all EU-countries, at least not in 2008, i.e., just prior to the current economic crisis. This imbalance may have consequences for economic growth.

Future research may focus on estimating the model at more detailed levels of sectoral aggregation, and on extending the model with a distinction between different types of economic activity within a sector, e.g. R&D versus production.

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Appendix 3. The Audretsch et al. (2002) model

In this appendix we show the derivation of the Audretsch et al. (2002) model. The derivation is taken directly from their article (Audretsch et al. 2002, pp. 88-90):

"We test the hypothesis that the extent of the gap between the actual industry structure and the optimal industry structure influences subsequent growth. We start with the assumption that a country's growth can be decomposed into two components: (i) growth that would have occurred with an optimal industry structure, and (ii) the impact on growth occurring from any actual deviations from that optimal industry structure. This can be represented by

$$\text{(A1)} \qquad \Delta GNP_{cp} = \Delta GNP^{*}_{cp} - \gamma \left| SFP_{cp-1} - SFP^{*}_{c} \right|,$$

where the dependent variable is the actual rate of economic growth. ΔGNP^{*}_{cp} is the rate of economic growth in country c in the case where the actual industry structure, summarized by small firm presence (SFP_{cp}), is at the optimal level at the start of the period p. For ease of exposition we assume that the optimal industry structure in a country remains constant for the total period under investigation. This is not vital to our analysis. Since we are considering only short-term periods, this may be a reasonable assumption.

Industry structure is multidimensional and spans a broad array of characteristics that defy measurement by a single statistic. However, as explained elsewhere (Audretsch and Thurik, 2000 and 2001), the most salient characteristic driving the shift in industry structure from the managed to the entrepreneurial economy is that the relative role of small and entrepreneurial firms has increased. Thus, we capture changes in industry structures by changes in the relative importance of small firms.

In equation (1) the parameter γ is positive. Deviations of the actual industry structure from the optimal industry structure negatively

affect economic growth, both when the industry structure consists of too few or too many small firms. In either case there is a deviation from the optimal industry structure and number of small firms. Taking the first difference of equation (1) we obtain

(A2)

$$\Delta GNP_{cp} = \Delta GNP_{cp-1} + \Delta\Delta GNP^{*}_{cp} - \gamma\left(\left|SFP_{cp-1} - SFP^{*}_{c}\right| - \left|SFP_{cp-2} - SFP^{*}_{c}\right|\right)$$

In case both SFP_{cp-1} and SFP_{cp-2} are above the optimal small-firm share, the expression between brackets reduces to ΔSFP_{cp-1}. Indeed, in case the small-firm share is too high, adding small firms to the industry structure reduces economic growth. In case both SFP_{cp-1} and SFP_{cp-2} are below the optimal small-firm share, the expression between brackets reduces to $-\Delta SFP_{cp-1}$. An increase in the small firm share when this presence is below optimal enhances economic performance. Therefore, the sign of the parameter of ΔSFP_{cp-1} reflects whether the small firm presence is below or above the optimal levels for the countries under consideration. In case the parameter is negative, the industry structure consists of too many small firms. In case the parameter is positive, the reverse holds and the industry structure consists of too few small firms.

We will denote the parameter of ΔSFP_{cp-1} as κ. Note that this is not the same parameter as γ, since the sign of κ is dependent on whether the actual small-firm share is above or below the optimal one. So, κ can be both positive and negative whereas γ is necessarily positive.

We make some further assumptions to transform equation (2) into an equation that can be estimated using the data at hand. First, we approximate ΔSFP_{cp-1} by $\Delta SF_{cp-1} - \Delta LF_{cp-1}$, the difference between the growth of small firms and large firms in terms of value-of-

shipments. Second, we assume that ΔGNP^{*}_{cp} is idiosyncratic with respect to time and country. Therefore country dummies and time dummies (the last to correct for European wide business cycle effects) are included. Thus, $\Delta\Delta GNP^{*}_{cp}$ is approximated by time dummies only because the country dummies drop out when taking first differences. Third, we add an error term e_{cp}. Summarizing we have

$$\text{(A3)} \qquad \Delta GNP_{cp} = \Delta GNP_{cp-1} + \sum_{p=1}^{P} \beta_p D_p + \kappa(\Delta SF_{cp-1} - \Delta LF_{cp-1}) + e_{cp},$$

where D_p denote dummy variables for periods $p = 1,...,P$. Factors specific to each time period are reflected by β_p. A high value of this parameter indicates an unexplained increase in the extent of economic growth. In case of a low β_p the reverse holds. The contribution of the shift in the size class distribution of firms to the percentage growth of GNP is represented by κ."

Note that in the present paper we also have data at sector level. Accordingly, we assume that ΔGNP^{*}_{cp} is idiosyncratic with respect to time, country *and* sector. However, similar to the country dummies, sectoral dummies drop out when taking first differences of equation (1), hence $\Delta\Delta GNP^{*}_{cp}$ is approximated by time dummies only.

Appendix 4. Classification by economic development level

In this appendix we provide a classification of countries based on their GNI per capita in 2005.

Table 4.3 EU-27 countries, by economic development level, 2005

Relatively lower developed countries	*Gross national income (GNI) per capita in purchasing power parities (current international $), 2005*
Romania	9280
Bulgaria	9840
Latvia	12880
Poland	13470
Lithuania	14050
Slovak Republic	15720
Estonia	15920
Hungary	16060
Medium developed countries	*GNI per capita*
Malta	20070
Czech Republic	20370
Portugal	21050
Slovenia	23280
Cyprus	23400
Greece	23990
Relatively higher developed countries	*GNI per capita*
Spain	27000
Italy	28290
France	29910
Finland	30850
Germany	31470
Belgium	32400
Sweden	32940
Austria	33300
Ireland	33450
United Kingdom	33490
Denmark	33660
Netherlands	35270
Luxembourg	58640

Source: World Bank, World Development Indicators

Appendix 5. Regression results by sector

In this appendix we provide the results of the main model by sector.

Table 4.4 Regression Results for Equations (2), (7): Relating Growth to Industry Structure[1,2,3] (Manufacturing Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.443***	-0.515***	0.733***	0.552***	0.502***	-0.495***
	(0.154)	(0.163)	(0.111)	(0.127)	(0.094)	(0.095)
$\Delta SFP_{micro\,cp-1}$		-0.079		-0.144*		0.012
		(0.075)		(0.075)		(0.025)
$\Delta SFP_{small\,cp-1}$		-0.196		-0.256*		-0.273***
		(0.201)		(0.129)		(0.097)
$\Delta SFP_{medium\,cp-1}$		0.136		-0.035		0.251**
		(0.233)		(0.176)		(0.096)
$\Delta SFP_{large\,cp-1}$		-0.106		-0.169		0.029
		(0.182)		(0.159)		(0.117)
ΔSFP_{micro}		0.050		-0.007		-0.021
		(0.082)		(0.029)		(0.025)
ΔSFP_{small}		-0.441*		-0.036		-0.103
		(0.224)		(0.124)		(0.105)
ΔSFP_{medium}		-0.183		-0.036		-0.107
		(0.241)		(0.166)		(0.142)
ΔSFP_{large}		-0.203		-0.143		-0.197
		(0.185)		(0.123)		(0.137)
ΔSFP_{cp-1}	-0.044		-0.072**		-0.049	
	(0.069)		(0.029)		(0.037)	
ΔSFP	-0.002		0.066**		0.039	
	(0.070)		(0.030)		(0.037)	
Constant	0.038	0.019	0.028***	0.031**	0.037***	0.034***
	(0.023)	(0.025)	(0.010)	(0.012)	(0.012)	(0.012)
R-squared	0.200	0.398	0.465	0.435	0.270	0.407
Sample size	57	57	65	63	103	102

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Table 4.5 Regression Results for Equations (2), (7): Relating Growth to Industry Structure[1,2,3] (Construction Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.244**	0.427***	0.123	0.258**	0.317***	-0.626***
	(0.110)	(0.150)	(0.101)	(0.111)	(0.078)	(0.071)
$\Delta SFP_{micro\,cp-1}$		-0.025		-0.011		-0.109
		(0.143)		(0.113)		(0.068)
$\Delta SFP_{small\,cp-1}$		-0.154		0.013		-0.135
		(0.222)		(0.135)		(0.109)
$\Delta SFP_{medium\,cp-1}$		-0.024		0.158		0.070
		(0.258)		(0.115)		(0.102)
$\Delta SFP_{large\,cp-1}$		0.026		0.057		-0.007
		(0.117)		(0.098)		(0.058)
ΔSFP_{micro}		0.392***		0.249**		0.099
		(0.117)		(0.121)		(0.065)
ΔSFP_{small}		0.592**		0.325		0.640***
		(0.243)		(0.202)		(0.116)
ΔSFP_{medium}		0.767***		0.292**		0.214**
		(0.243)		(0.131)		(0.106)
ΔSFP_{large}		0.268**		0.091		-0.057
		(0.117)		(0.108)		(0.059)
ΔSFP_{cp-1}	0.017		0.071*		0.052	
	(0.056)		(0.043)		(0.040)	
ΔSFP	0.038		0.006		0.063	
	(0.073)		(0.069)		(0.052)	
Constant	0.039*	0.006	0.023*	0.019	0.034**	0.020*
	(0.023)	(0.028)	(0.013)	(0.012)	(0.014)	(0.012)
R-squared	0.492	0.564	0.238	0.374	0.335	0.725
Sample size	56	57	67	66	105	106

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Table 4.6 Regression Results for Equations (2), (7): Relating Growth to Industry Structure[1,2,3] (Household goods Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.053	0.082	-0.125	-0.075	0.248***	0.157**
	(0.087)	(0.095)	(0.092)	(0.099)	(0.062)	(0.069)
$\Delta SFP_{micro\,cp-1}$		-0.245		-0.268*		-0.071
		(0.221)		(0.158)		(0.134)
$\Delta SFP_{small_{cp-1}}$		0.006		-0.434**		-0.179
		(0.213)		(0.164)		(0.152)
$\Delta SFP_{medium_{cp-1}}$		-0.092		0.016		0.099
		(0.184)		(0.149)		(0.115)
$\Delta SFP_{large\,cp-1}$		-0.032		-0.095		0.027
		(0.091)		(0.104)		(0.071)
ΔSFP_{micro}		0.107		0.342		-0.207
		(0.331)		(0.226)		(0.194)
ΔSFP_{small}		-0.220		0.370		-0.378**
		(0.257)		(0.250)		(0.182)
ΔSFP_{medium}		0.346		0.424**		0.216
		(0.220)		(0.192)		(0.134)
ΔSFP_{large}		0.023		0.107		-0.222***
		(0.101)		(0.170)		(0.077)
ΔSFP_{cp-1}	-0.082		-0.008		-0.115***	
	(0.058)		(0.045)		(0.043)	
ΔSFP	-0.126**		0.081*		0.015	
	(0.059)		(0.045)		(0.046)	
Constant	0.093***	0.079***	0.048***	0.052***	0.061***	0.058***
	(0.022)	(0.023)	(0.011)	(0.013)	(0.013)	(0.015)
R-squared	0.342	0.465	0.253	0.413	0.334	0.464
Sample size	57	57	68	67	106	106

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Table 4.7 Regression Results for Equations (2), (7): Relating Growth to Industry Structure[1,2,3] (Hotels and Restaurants Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.225***	0.225*	0.147	-0.848***	0.267***	0.228***
	(0.071)	(0.122)	(0.093)	(0.109)	(0.043)	(0.062)
$\Delta SFP_{micro\,cp-1}$		-0.097		-0.004		0.009
		(0.084)		(0.017)		(0.015)
$\Delta SFP_{small\,cp-1}$		0.006		0.012		0.045
		(0.046)		(0.100)		(0.059)
$\Delta SFP_{medium\,cp-1}$		0.049		-0.000		0.015
		(0.112)		(0.050)		(0.041)
$\Delta SFP_{large\,cp-1}$		-0.082		0.039		0.023
		(0.086)		(0.054)		(0.035)
ΔSFP_{micro}		-0.212**		0.005		0.003
		(0.093)		(0.018)		(0.016)
ΔSFP_{small}		-0.125		-0.063		-0.215***
		(0.132)		(0.116)		(0.069)
ΔSFP_{medium}		-0.294**		0.040		-0.016
		(0.124)		(0.059)		(0.046)
ΔSFP_{large}		0.010		-0.040		-0.011
		(0.080)		(0.064)		(0.039)
ΔSFP_{cp-1}	-0.026		-0.032		-0.021	
	(0.041)		(0.034)		(0.024)	
ΔSFP	0.026		0.016		0.018	
	(0.043)		(0.038)		(0.025)	
Constant	0.052**	0.052**	-0.010	-0.008	0.007	0.004
	(0.021)	(0.025)	(0.010)	(0.012)	(0.010)	(0.011)
R-squared	0.308	0.431	0.100	0.615	0.326	0.331
Sample size	52	52	68	68	101	100

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Table 4. 8 Regression Results for Equations (2), (7): Relating Growth to Industry Structure[1,2,3] (Transport, storage and communication Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	-0.079	0.129	0.170*	0.164	0.111	-0.889***
	(0.162)	(0.202)	(0.085)	(0.129)	(0.109)	(0.091)
$\Delta SFP_{micro\,cp-1}$		-0.127		-0.128		-0.038
		(0.085)		(0.089)		(0.053)
$\Delta SFP_{small_{cp-1}}$		0.026		-0.401***		0.027
		(0.152)		(0.133)		(0.096)
$\Delta SFP_{medium_{cp-1}}$		-0.284*		-0.056		-0.034
		(0.168)		(0.112)		(0.089)
$\Delta SFP_{large\,cp-1}$		-0.217		-0.767		-0.044
		(0.373)		(0.458)		(0.251)
ΔSFP_{micro}		0.009		0.236*		-0.033
		(0.127)		(0.129)		(0.076)
ΔSFP_{small}		-0.194		0.193		-0.231**
		(0.170)		(0.166)		(0.107)
ΔSFP_{medium}		0.074		0.404***		0.036
		(0.167)		(0.151)		(0.101)
ΔSFP_{large}		-0.191		1.469***		-0.137
		(0.436)		(0.524)		(0.281)
ΔSFP_{cp-1}	-0.241**		0.027		-0.044	
	(0.102)		(0.036)		(0.058)	
ΔSFP	0.066		-0.140**		0.009	
	(0.125)		(0.055)		(0.081)	
Constant	0.073***	0.080**	0.045***	0.040***	0.053***	0.055***
	(0.023)	(0.030)	(0.009)	(0.012)	(0.013)	(0.015)
R-squared	0.135	0.215	0.230	0.255	0.077	0.657
Sample size	57	57	66	65	104	104

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Appendix 6. Robustness test: correcting for (the possibility of) reversed causality

This appendix presents the results of the robustness test described in Section 4.1. Independent variables are cleared from (contemporaneous) business cycle influences.

Table 4.9 Regression results equations (3) and (5), correcting for reversed causality[1,2,3]

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.285***	0.275***	0.217***	0.214***	0.311***	0.327***
	(0.049)	(0.049)	(0.043)	(0.043)	(0.029)	(0.032)
$\Delta SFP_{micro_{cp-1}}$		-0.096***		-0.016*		-0.019*
		(0.031)		(0.009)		(0.011)
$\Delta SFP_{small_{cp-1}}$		-0.005		-0.080**		-0.028
		(0.055)		(0.038)		(0.035)
$\Delta SFP_{medium_{cp-}}$		-0.090*		0.094***		0.020
		(0.050)		(0.025)		(0.026)
$\Delta SFP_{large_{cp-1}}$		0.001		0.051*		0.039
		(0.038)		(0.026)		(0.024)
ΔSFP_{micro}		-0.061*		0.020**		0.010
		(0.035)		(0.009)		(0.012)
ΔSFP_{small}		0.010		0.027		0.007
		(0.061)		(0.044)		(0.039)
ΔSFP_{medium}		-0.005		0.087***		0.068**
		(0.052)		(0.030)		(0.029)
ΔSFP_{large}		-0.106***		-0.068**		-0.071***
		(0.039)		(0.028)		(0.025)
ΔSFP_{cp-1}	0.046*		-0.040**		-0.049***	
	(0.026)		(0.017)		(0.016)	
ΔSFP	-0.044*		0.048**		0.047***	
	(0.025)		(0.019)		(0.017)	
Constant	0.055***	0.059***	0.024***	0.024***	0.038***	0.039***
	(0.010)	(0.010)	(0.005)	(0.005)	(0.005)	(0.005)
R-squared	0.203	0.243	0.152	0.212	0.254	0.262
Sample size	279	279	332	332	520	518

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Table 4.10 Regression results equations (3) and (5), correcting for reversed causality[1,2,3] (Manufacturing Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.469***	0.543***	0.725***	0.611***	0.521***	0.550***
	(0.148)	(0.167)	(0.110)	(0.117)	(0.093)	(0.095)
$\Delta SFP_{micro\,cp-1}$		-0.067		-0.075		-0.028
		(0.080)		(0.057)		(0.019)
$\Delta SFP_{small\,cp-1}$		-0.155		-0.185		-0.202**
		(0.213)		(0.112)		(0.093)
$\Delta SFP_{medium\,cp-}$		0.133		0.194**		0.174**
		(0.246)		(0.093)		(0.087)
$\Delta SFP_{large\,cp-1}$		-0.082		-0.024		0.010
		(0.191)		(0.114)		(0.117)
ΔSFP_{micro}		-0.012		0.030*		0.019
		(0.087)		(0.018)		(0.020)
ΔSFP_{small}		-0.195		0.033		-0.045
		(0.245)		(0.113)		(0.104)
ΔSFP_{medium}		-0.047		0.134		0.144
		(0.255)		(0.109)		(0.104)
ΔSFP_{large}		-0.226		-0.064		-0.093
		(0.194)		(0.104)		(0.122)
ΔSFP_{cp-1}	-0.029		-0.069**		-0.047	
	(0.067)		(0.029)		(0.036)	
ΔSFP	0.046		0.070**		0.057	
	(0.068)		(0.029)		(0.037)	
Constant	0.036	0.029	0.028***	0.031***	0.037***	0.036***
	(0.023)	(0.026)	(0.010)	(0.011)	(0.012)	(0.012)
R-squared	0.210	0.294	0.465	0.484	0.287	0.358
Sample size	57.00	57.00	65.00	64.00	103.00	103.00

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Table 4.11 Regression results equations (3) and (5), correcting for reversed causality[1,2,3] (Construction Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.292**	0.331**	0.291***	0.217**	0.416***	0.399***
	(0.126)	(0.137)	(0.109)	(0.102)	(0.080)	(0.079)
$\Delta SFP_{micro_{cp-1}}$		-0.052		-0.037		-0.093
		(0.138)		(0.102)		(0.076)
$\Delta SFP_{small_{cp-1}}$		-0.110		0.134		-0.105
		(0.204)		(0.158)		(0.117)
$\Delta SFP_{medium_{cp-}}$		-0.072		0.103		0.044
		(0.235)		(0.107)		(0.111)
$\Delta SFP_{large_{cp-1}}$		0.001		0.009		0.024
		(0.123)		(0.090)		(0.073)
ΔSFP_{micro}		0.208		0.320***		0.127
		(0.138)		(0.108)		(0.085)
ΔSFP_{small}		0.594**		0.629***		0.633***
		(0.229)		(0.188)		(0.139)
ΔSFP_{medium}		0.281		0.244**		0.162
		(0.261)		(0.120)		(0.129)
ΔSFP_{large}		0.185		0.227**		0.059
		(0.146)		(0.099)		(0.087)
ΔSFP_{cp-1}	-0.017		-0.045		-0.005	
	(0.066)		(0.060)		(0.045)	
ΔSFP	-0.039		-0.033		-0.052	
	(0.073)		(0.065)		(0.050)	
Constant	0.035	0.015	0.025**	0.019*	0.035**	0.022*
	(0.023)	(0.025)	(0.012)	(0.011)	(0.013)	(0.013)
R-squared	0.497	0.577	0.266	0.450	0.373	0.537
Sample size	55.00	55.00	66.00	65.00	104.00	104.00

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Table 4.12 Regression results equations (3) and (5), correcting for reversed causality[1,2,3] (Household goods Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.261**	0.575***	-0.138	0.040	0.282***	0.159**
	(0.101)	(0.102)	(0.091)	(0.092)	(0.066)	(0.074)
$\Delta SFP_{micro\,cp-1}$		-0.033		-0.296*		-0.151
		(0.241)		(0.156)		(0.140)
$\Delta SFP_{small\,cp-1}$		0.429*		-0.592***		-0.186
		(0.237)		(0.186)		(0.166)
$\Delta SFP_{medium\,cp-}$		-0.237		0.121		0.066
		(0.201)		(0.153)		(0.119)
$\Delta SFP_{large\,cp-1}$		0.142		-0.122		-0.015
		(0.106)		(0.127)		(0.082)
ΔSFP_{micro}		0.159		0.501**		0.199
		(0.383)		(0.224)		(0.203)
ΔSFP_{small}		0.026		0.187		-0.200
		(0.312)		(0.236)		(0.204)
ΔSFP_{medium}		0.058		0.418**		0.296**
		(0.258)		(0.195)		(0.141)
ΔSFP_{large}		0.455***		0.024		0.191**
		(0.123)		(0.201)		(0.095)
ΔSFP_{cp-1}	-0.057		-0.032		-0.101**	
	(0.063)		(0.047)		(0.046)	
ΔSFP	-0.223**		0.177**		0.030	
	(0.084)		(0.080)		(0.059)	
Constant	0.082***	0.067***	0.052***	0.056***	0.062***	0.058***
	(0.023)	(0.024)	(0.011)	(0.011)	(0.013)	(0.015)
R-squared	0.364	0.608	0.232	0.511	0.344	0.331
Sample size	55.00	55.00	66.00	66.00	104.00	104.00

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Table 4.13 Regression results equations (3) and (5), correcting for reversed causality[1,2,3] (Hotels and Restaurants Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	0.278**	0.250*	0.114	0.092	0.293***	0.310***
	(0.109)	(0.135)	(0.090)	(0.099)	(0.065)	(0.058)
$\Delta SFP_{micro\,cp-1}$		-0.075		-0.006		-0.008
		(0.094)		(0.017)		(0.014)
$\Delta SFP_{small\,cp-1}$		0.013		-0.004		0.055
		(0.135)		(0.097)		(0.054)
$\Delta SFP_{medium\,cp-}$		0.043		-0.020		0.030
		(0.124)		(0.048)		(0.037)
$\Delta SFP_{large\,cp-1}$		-0.041		0.045		-0.013
		(0.096)		(0.053)		(0.032)
ΔSFP_{micro}		-0.136		-0.013		0.033**
		(0.113)		(0.017)		(0.014)
ΔSFP_{small}		0.004		-0.072		0.257***
		(0.148)		(0.114)		(0.062)
ΔSFP_{medium}		-0.197		-0.073		0.153***
		(0.143)		(0.055)		(0.041)
ΔSFP_{large}		0.031		0.091		-0.148***
		(0.089)		(0.059)		(0.035)
ΔSFP_{cp-1}	-0.026		-0.029		-0.021	
	(0.043)		(0.033)		(0.026)	
ΔSFP	0.053		-0.028		0.039	
	(0.048)		(0.036)		(0.028)	
Constant	0.051**	0.054*	-0.010	-0.006	0.011	0.015
	(0.021)	(0.027)	(0.010)	(0.011)	(0.011)	(0.010)
R-squared	0.249	0.301	0.111	0.137	0.222	0.482
Sample size	51.00	51.00	68.00	68.00	100.00	100.00

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Table 4.14 Regression results equations (3) and (5), correcting for reversed causality[1,2,3] (Transport, storage and comunication Sector)

	Lower developed		*Higher developed*		*General*	
	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}	ΔGNP_{cp}
ΔGNP_{cp-1}	-0.028	0.143	0.165*	0.134	0.078	0.160
	(0.169)	(0.196)	(0.084)	(0.130)	(0.107)	(0.109)
$\Delta SFP_{micro\,cp-1}$		-0.121		0.029		-0.058
		(0.083)		(0.097)		(0.049)
$\Delta SFP_{small\,cp-1}$		0.056		-0.092		0.066
		(0.151)		(0.151)		(0.093)
$\Delta SFP_{medium\,cp-}$		-0.292*		0.028		-0.060
		(0.165)		(0.115)		(0.085)
$\Delta SFP_{large\,cp-1}$		-0.211		0.147		-0.191
		(0.369)		(0.480)		(0.247)
ΔSFP_{micro}		0.035		-0.287**		-0.170**
		(0.125)		(0.133)		(0.076)
ΔSFP_{small}		-0.178		-0.246		-0.294***
		(0.168)		(0.171)		(0.107)
ΔSFP_{medium}		0.053		-0.247		-0.209**
		(0.166)		(0.173)		(0.100)
ΔSFP_{large}		-0.320		-1.165**		-0.754***
		(0.429)		(0.577)		(0.265)
ΔSFP_{cp-1}	-0.252**		0.022		-0.072	
	(0.106)		(0.037)		(0.058)	
ΔSFP	0.169		-0.068		0.131	
	(0.130)		(0.059)		(0.083)	
Constant	0.073***	0.083***	0.045***	0.028**	0.051***	0.054***
	(0.024)	(0.029)	(0.009)	(0.013)	(0.014)	(0.014)
R-squared	0.156	0.237	0.156	0.233	0.098	0.194
Sample size	57.00	57.00	65.00	65.00	103.00	103.00

Notes: [1] Regression for 27 European countries over the period 2002-2008. [2] All specifications include Year dummies. [3] Standard errors in parentheses. ***Significant at 1% , ** Significant at 5%, * Significant at 10%.

Appendix 7. Correlation matrixes by economic development level

In this appendix we provide the correlation matrixes by economic development.

Table 4.15 Correlation matrix for lower developed countries

	ΔGNP_{cp}	ΔGNP_{cp-1}	ΔSFP	ΔSFP_{cp-1}	$\Delta SFP_{micro\,cp-1}$	$\Delta SFP_{small\,cp-1}$
ΔGNP_{cp}	1					
ΔGNP_{cp-1}	0.3125*	1				
ΔSFP	-0.0338	-0.0608	1			
ΔSFP_{cp-1}	-0.0103	0.0748	-0.0848	1		
$\Delta SFP_{micro\,cp-1}$	-0.0644	-0.0337	-0.0413	0.5218*	1	
$\Delta SFP_{small\,cp-1}$	-0.0708	-0.3773*	-0.0722	-0.0488	-0.1020	1
$\Delta SFP_{medium\,cp-1}$	-0.0797	0.0393	0.0142	-0.2886*	-0.5669*	0.1756*
$\Delta SFP_{large\,cp-1}$	-0.0048	-0.0545	0.0960	-0.9820*	-0.4577*	0.0139
ΔSFP_{micro}	-0.0163	0.0170	0.5617*	-0.0227	-0.0763	-0.0434
ΔSFP_{small}	-0.0782	-0.0845	0.2616*	0.1256*	0.0808	-0.1079
ΔSFP_{medium}	0.1099	0.0157	-0.2834*	-0.0348	0.0400	0.0510
ΔSFP_{large}	0.0365	0.0705	-0.9841*	0.0927	0.0416	0.0624

Source: Self-device from Panteia database.
Note: * Significant at 5%

	$\Delta SFP_{medium\,cp-1}$	$\Delta SFP_{large\,cp-1}$	ΔSFP_{micro}	ΔSFP_{small}	ΔSFP_{medium}	ΔSFP_{large}
$\Delta SFP_{medium\,cp-1}$	1					
$\Delta SFP_{large\,cp-1}$	0.3212*	1				
ΔSFP_{micro}	0.0467	0.0269	1			
ΔSFP_{small}	-0.0550	-0.1244*	-0.1225*	1		
ΔSFP_{medium}	-0.0950	0.0317	-0.5915*	0.1217*	1	
ΔSFP_{large}	-0.0126	-0.1036	-0.4980*	-0.2365*	0.3239*	1

Table 4.16 Correlation matrix for higher developed countries.

	ΔGNP_{cp}	ΔGNP_{cp-1}	ΔSFP	ΔSFP_{cp-1}	$\Delta SFP_{micro\,cp-1}$	$\Delta SFP_{small_{cp-1}}$
ΔGNP_{cp}	1					
ΔGNP_{cp-1}	-0.1517*	1				
ΔSFP	0.1221*	-0.4419*	1			
ΔSFP_{cp-1}	-0.0027	0.1396*	-0.1637*	1		
$\Delta SFP_{micro\,cp-1}$	-0.0577	-0.0046	0.0506	0.4096*	1	
$\Delta SFP_{small_{cp-1}}$	-0.0089	0.2636*	-0.2177*	0.3800*	-0.2428*	1
$\Delta SFP_{medium_{cp-1}}$	0.1119*	0.1234*	-0.1265*	0.1984*	-0.2017*	0.4561*
$\Delta SFP_{large_{cp-1}}$	0.0022	-0.0844	0.1354*	-0.9057*	-0.1814*	-0.2379*
ΔSFP_{micro}	-0.0040	-0.1080*	0.4039*	-0.0170	0.0173	-0.0914
ΔSFP_{small}	0.2736*	-0.4572*	0.3999*	0.0005	0.1626*	-0.1735*
ΔSFP_{medium}	0.1130*	-0.2592*	0.2053*	-0.1333*	0.2092*	-0.3034*
ΔSFP_{large}	-0.0587	0.3200*	-0.9025*	0.1613*	0.0445	0.0730

Source: Self-device from Panteia database.
Note: * Significant at 5%

	$\Delta SFP_{medium_{cp-1}}$	$\Delta SFP_{large_{cp-1}}$	ΔSFP_{micro}	ΔSFP_{small}	ΔSFP_{medium}	ΔSFP_{large}
$\Delta SFP_{medium_{cp-1}}$	1					
$\Delta SFP_{large_{cp-1}}$	-0.0158	1				
ΔSFP_{micro}	-0.1022	-0.0081	1			
ΔSFP_{small}	-0.0193	-0.0198	-0.2465*	1		
ΔSFP_{medium}	-0.2579*	0.0998	-0.2014*	0.5119*	1	
ΔSFP_{large}	0.0496	-0.1580*	-0.1716*	-0.2493*	-0.0085	1

Table 4.17 Correlation matrix for the general sample

	ΔGNP_{cp}	ΔGNP_{cp-1}	ΔSFP	ΔSFP_{cp-1}	$\Delta SFP_{micro\,cp-1}$	$\Delta SFP_{small\,cp-1}$
ΔGNP_{cp}	1					
ΔGNP_{cp-1}	0.1643*	1				
ΔSFP	0.0563	-0.2292*	1			
ΔSFP_{cp-1}	0.0075	0.1286*	-0.0962*	1		
$\Delta SFP_{micro\,cp-1}$	-0.0442	-0.0060	0.0268	0.4273*	1	
$\Delta SFP_{small\,cp-1}$	-0.0433	-0.1642*	-0.1371*	0.0887*	-0.1477*	1
$\Delta SFP_{medium\,cp-1}$	0.0463	0.0576	-0.0650	-0.0078	-0.3223*	0.2722*
$\Delta SFP_{large\,cp-1}$	-0.0047	-0.0830	0.0796	-0.9383*	-0.2639*	-0.0548
ΔSFP_{micro}	-0.0018	-0.0565	0.4376*	-0.0058	-0.0062	-0.0582
ΔSFP_{small}	0.1423*	-0.2362*	0.3575*	0.0581	0.1413*	-0.1428*
ΔSFP_{medium}	0.0887*	-0.1089*	0.0001	-0.0928*	0.1630*	-0.0852
ΔSFP_{large}	-0.0138	0.1613*	-0.9345*	0.0928*	0.0356	0.0781

Source: Self-device from Panteia database.
Note: * Significant at 5%

	$\Delta SFP_{medium\,cp-1}$	$\Delta SFP_{large\,cp-1}$	ΔSFP_{micro}	ΔSFP_{small}	ΔSFP_{medium}	ΔSFP_{large}
$\Delta SFP_{medium\,cp-1}$	1					
$\Delta SFP_{large\,cp-1}$	0.1400*	1				
ΔSFP_{micro}	-0.0612	-0.0102	1			
ΔSFP_{small}	-0.0094	-0.0666	-0.2128*	1		
ΔSFP_{medium}	-0.1927*	0.0692	-0.3231*	0.3476*	1	
ΔSFP_{large}	0.0162	-0.0910*	-0.2662*	-0.2566*	0.1467*	1

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Chapter 5

Conclusions

5.1. Introduction

This doctoral thesis consists of three essays focused on analysing the entrepreneurship phenomena. These empirical studies represent new contributions to the empirical research, by applying different methodology techniques, both at macroeconomic and at microeconomic levels.

The research questions addressed in each chapter of the present book are the following:

1. In which direction are associated business exits with future territorial entry rates? Is this impact equal for developing and underdeveloped economies? And for different entrepreneurship dimensions? And to different entrepreneurial motivations (opportunity and necessity)?

2. Can an individual overcome skill mismatches – one of the main challenges faced by governments – through the transition from salaried employment to self-employment? Is this effect equal in the short and in the long term?

3. Assuming that there exists an optimal size-class structure, do changes in size-class structure affect macro-economic performance of industries and countries in the European Union? Is this impact equal for countries within the EU with relatively lower and higher levels of economic development?

This last chapter summarises the main results and conclusions emerged from the last chapters, policy implications and the possible future research lines. It is organised into three sections: in the first, the research questions addressed in each essay are presented; in the second, each chapter of the present study is summarised with the main empirical findings of each essay while, in the third section, future research lines are discussed.

5.2. Summary, Concluding Remarks and Policy Implications

This section presents a summary of each chapter with its main empirical findings and policy implications[25].

5.2.1. Data and Econometric Methodologies

Chapter 1 presents and describes the data and the econometric methodologies used in the empirical development of the thesis. At the country level we use Global Entrepreneurship Monitor, World Data Bank and Panteia/EIM data. At the individual level we use the European Community Household Panel. The econometric techniques used are the Generalised Method of Moments, the Random Effects Probit, Ordered Probit, Bivariate Probit and the robust Ordinary Least Squares.

The fact of having used different databases and different econometric methodologies allowed us to analyse and address the concept of entrepreneurship from different perspectives at different levels of analysis. This gives a remarkable and outstanding value to the study.

5.2.2. The Relevance of Business Exit for Future Entrepreneurial Activity

Chapter 2 is aimed at assessing whether business exits impact future dimensions of entrepreneurial activity at the country level. To enhance estimation accuracy, the Total Entrepreneurial Activity (TEA) rate and its two components – nascent and new business

[25] For a deeper conclusion and comments, go to the last section of each chapter.

activity rates – have been analysed. Given that entrepreneurs are heterogeneous in their entry motivations (Ardagna and Lusardi, 2009; Reynolds et al., 2005), the analysis distinguishes between opportunity-driven and necessity-driven entrepreneurial activity.

The results show a positive and significant effect of business exit rates on future entrepreneurial activity and are consistent to different entrepreneurship dimensions, and to different entrepreneurial motivations (opportunity and necessity).

The results of this study have important implications. From an academic perspective, the findings provide support in favour of a greater use of a territorial approach to the study of entrepreneurship, and this becomes especially relevant when examining the relationship between previous exit rates and future levels of entrepreneurial activity at the territorial level.

From a policy-making point of view, the results suggest that government agents designing entrepreneurship support policies should design specific policies that help maximise the knowledge and experience derived from previous business experience and market exit. Finally, policy-makers can use business exit rates as a relevant indicator to examine the quality of the local entrepreneurial firms, and this information can be used to a more effective promotion of different types of entrepreneurship.

5.2.3. Is Self-Employment a Way to Escape from Skill Mismatches?

Goetz et al. (2012) suggest that self-employment has tangible positive economic impacts not only on salaried employment but also on per capita income growth and poverty reduction. In a more recent study, Lechmann and Schnabel (2014) find that self-employees perform more tasks than salaried employees and their work requires more skills. Moreover, there is a strong belief that self-employment fosters innovation and competitiveness. In this framework, *Chapter 3* investigates the relationship between the transition from salaried to self-employment and the probability of reporting being skill-mismatched.

The results indicate that switching from salaried to self-employment significantly reduces the probability of reporting being skill-mismatched in the short and the long term. To test the sensitiveness of this effect, we construct alternative transition variables and samples. We find that the negative impact of the transition to self-employment remains robust across alternative samples, specifications and models.

Our findings suggest that policies aimed at promoting self-employment might be effective in reducing skill mismatches in the workforce. We think that an improved distribution of skills among the labour market through an increase in self-employment should raise the economic performance in Europe through the gains of competitiveness and productivity.

5.2.4. Investigating the Impact of Small versus Large Firms on Economic Performance of Countries and Industries.

Chapter 4 studies whether changes in size-class structure affect macro-economic performance of industries and countries in the European Union (EU-27).

The empirical analysis shows that there may be too much economic activity by micro and large firms, particularly for the relatively lower developed countries, including the EU-12 newcomer countries. On the other hand, it is also found that there is not enough economic activity by medium-sized firms for member countries of the European Union in the period 2002 to 2008.

Overall, the results suggest that the transformation from a 'managed' (where large firms are relatively more important) to an 'entrepreneurial' economy (where SMEs are relatively more important) has not been completed yet in all EU-countries, at least not in 2008; i.e., just prior to the current economic crisis. This imbalance may have consequences for economic growth.

European policy makers might give more relevance to SMEs identifying the specific barriers that could exist, particularly in the relatively lower and higher developed countries.

5.3. Limitations and Future research lines

This thesis has some limitations that are worth recognising and which, in turn, represent potential avenues for future research.

First, the results can be affected by other covariates not included in the analysis. Second, a longer time-span should improve the analyses. Third, the different models can be estimated with different data allowing for studies at different levels. Therefore, future research should include a greater number of covariates in the analysis, as well as a longer time span so that a more long-term analysis that includes expansion and recession periods can be conducted, among others. Finally, replicating our study with different datasets would be useful to confirm the generality of our findings.

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