

Firm Survival in European Economies

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High business dynamics and turbulence of a particular sector manifested through frequent firm entrances and exits actualizes the question of their survival and the stability of the environment in which they operate. As it takes time before the effect of new firm entry influences economic growth and boosts self-employment and employment in the economy overall, it is important to track their post-entry performance and their survival. It seems that young firms never had poorer chances of survival than its established rivals. Small and medium-sized enterprises are particularly vulnerable. The aim of the paper is to empirically investigate the impact of certain variables on firm survival rate in the information and technology sector. IT sector is often characterized as strategic in most of the European economies but is, due to its service nature, continuous innovations and improvements, often considered as highly turbulent. The empirical model used in the paper consists of panel method where EU10 countries represent cross-sectional component, while the time component covers the period of economic crisis from 2008-2012, which is the last available data within the Eurostat database. Additionally, traditional methods of descriptive statistics are used to emphasize the business dynamics of IT sector and to present information about the newly born enterprises and their ability to survive up to four years after their creation.

Name of the track: Management (Business Dynamics)

1. Introduction

High unemployment rate as a consequence of latest economic crisis has once more brought to attention supply side of economics research. This paper explores the survival of small and medium enterprises (SME's) in European Union information and communication (ICT) industry in a time frame congruent with latest economic crisis. According to Nace Rev. 2 classification, ICT industry (J) includes: publishing activities (J58), motion picture, video and television programme production, sound recording and music publishing activities (J59), programming and broadcasting activities (J60), telecommunications (J61), computer programming, consultancy and related activities (J62) and information service activities (J63). ICT industry is characterized by high innovativeness and dependence on constant technological breakthroughs. Products and services resulting from activities of this industry cause significant changes in business processes of other industries by increasing efficiency and productivity. Within the observed industry (J) in EU27 in 2010. there were 873.000 firms, which employed 5,8 million people and generated 487,9 billion dollars of added value. Two of the six activities prevail within the ICT industry: Computer programming, consultancy and related activities (J62) and telecommunications (J61). These two activities have generated almost three quarters of industry value added and accounted for nearly two thirds of overall number of employed in industry. Among the EU member states, United Kingdom (UK) had the highest value added contribution and employment within the ICT industry in 2010. ICT industry has significant effects on economic growth in developed European economies where: a) it contributes with 8,5% of value added, and 3% of employed in entire business sector, b) investments in ICT improve the overall labor productivity, and c) ICT technologies usage increases firm's efficiency in production processes, making them more competitive (EPR, 2014). Main problems ICT industry faces are: changes and high business dynamics, need for continuous investments, and certain inertia in acceptance of new technologies, especially at the state level.

Previous research studies which have explored business dynamics were mainly based on manufacturing industry, adding an additional motive to explore the ICT firm's survival. Furthermore, ICT industry, as a relatively young industry which plays an important role in technological advancement, in many countries is designated as strategic industry. More so, especially vulnerable are the SME's which are usually characterized by high business dynamics. Acs (1992) stresses the importance of small firms and points out that through their entrepreneurial activities small firms act as agents of change. As a consequence of latest economic crisis and high unemployment rates, economic growth became a key challenge for the creators of economic policies and a topic which once more is in researchers focus. In accordance with theory, new firms should possess the innovativeness traits; therefore an increase in a number of new firms in economy should subsequently increase all firms' competitiveness, and force the existing firms to improve the levels of efficiency and productivity, since otherwise they would be forced to exit the market. Through increases of innovativeness and acceptance of new technologies in its processes, newly founded firms can have a positive impact on productivity and growth of economy as a whole. Firm's entries and exits are related processes. It is considered that the single owner would end ones business if ones business efficacy is less than the efficacy which a person would gain as an employed person working for other employee, or when one would become unemployed and leave the labor force. Of course it is possible that leaving an entrepreneurial venture is due to willingness for more leisure time or un-satisfaction with one's own project. Besides observing firm's entries, observing their life span is also of great importance. This is exactly where increased interests of academic community are noted, concerning the topics of firm's survival and post-entry performance. The concept of this paper is based on the question what happens to new firms in ICT industry after their entry and what affects their survival. The goal of this article is to explore determinants of SME's survival in ICT industry in 10 most developed European Union countries in time frame marked with economic crisis and to present the information on firms' birth and death rate in the subsequent time period. The remainder of article provides literature review, description of used methodology and model, overview of results and descriptive statistics, results discussion, summary and conclusion.

2. Literature Review

Economic literature is significantly more obscure in researching firm's survival determinants than in researching business dynamics, meaning the firms rates of entry and exits (e.g. Evans, 1987; Greene et al., 2004; Yasuda, 2005). Certain research of firms life span and survival rates in earlier phases were mainly based on US firms sample (e.g. Audretsch and Mahmood, 1995; Thompson, 2005) and later, but to a lesser degree in Europe (e.g. Wagner, 1994; Mata and Portugal, 1994). However, those studies have mainly focused on firm's entry barriers and firm's exits. A segment of academic literature is based on exploring the closure rates of firms as seen through a prism of labor market and managerial perspective. Such literature seeks to find answer to a question why some owners close their businesses or entrepreneurial ventures, and instead of self-employment opt for participating in labor market as employees, become unemployed, or in extreme cases leave the labor force, where the research was mainly focused on analyzing human capital of firms owners or co-founders (e.g. Gimeno et al., 1997; Taylor, 1999; Hamilton, 2000).

The probability of firm's failure is highest at the beginning and it decreases over time. The stated thesis was confirmed by Mata and Portugal (1994 and 1999) on a case of Portuguese manufacturing industry. Other studies (Wagner, 1994; Honjo, 2000) also state that the likelihood of survival is smallest at the beginning and reaches its zenith after a year or two and then decreases with time. Some authors analyzed the initial size of a firm and probability of their survival. Dunne et al. (1989) and Geroski (1995) found that the larger the firm's initial size, the higher the probability of their survival. Agarwal and Gort (1996) and Agarwal (1997, 1998) also stress the positive relationship between firm's size and probability of survival, especially in industries which are in their earlier development stages. Additionally, the larger the new firm is, the less time is needed to reach the minimum efficient scale of production. Size of a firm is usually measured by number of employees, sales revenues or initial capital. Dunne et. al (1989) likewise state that less than 50% of firms survive 5 years after their birth. In addition, already established firms exhibit lesser rates of industry exit, as opposed to new found firms, or in other words, the likelihood of survival increases with firm's age. Therefore, positive indicators in certain industry caused by increase in demand can lead to increase of profit margins and accordingly improve post entry performances of new found firms. Furthermore, it is possible to presume that already established firms shall not as aggressively oppose the entry of newly founded firms in such high growth industries (Bradburd and Caves, 1982) as opposed to stagnant industries. The studies have confirmed the positive influence of certain industry growth on firm's survival likelihood (e.g. Mata and Portugal, 1994 and 1999).

One of the more significant problems which firms are facing is the difficult access to finance, which can to insolvency and liquidity problems. In addition, smaller firms on average employ less highly skilled employees, which can influence the likelihood of their survival on market. It is the smaller likelihood of survival that differentiates small from the large firms. Such claim was confirmed through several studies (e.g. Audretsch and Mahmood, 1995; Mata and Portugal, 1994 and 1999; Segarra and Callejon, 2002). Acs and Audretsch (1990) state that initial firm's size reflects the ability of attracting financial resources, which can consequently influence the firm's likelihood of survival. However, other studies have refused such claim (see e.g. Wagner, 1994; Audretsch et al. 1999a and 1999b). Fotopoulos and Louri (2000) have analyzed the likelihood of newly found firms' survival and concluded that the lower debt level and higher initial amount of capital reduce the possibility of market failure.

From other factors influencing the rate of survival it is worth noting the location (cities, suburbs, rural areas) of new found firms (Renski, 2009) and certain industry characteristics such as changes in (un)employment, concentration of firms business in one industry, levels of expenditures for research and development and investments, as well as levels of new entrants to the industry (Madhoushi and Nasiri, 2011). Stearns et al. (1995) showed that firms with certain existing technological capital have higher chance for survival (e.g. Cefis and Masili, 2006; Calvo, 2006) and exhibit firm's innovativeness, accordingly have higher likelihood of market survival. Geroski et al. (2007) state that environmental conditions and strategic choices set at the foundation of a firm, form the determinants for survival. Also, business cycles, macroeconomic (in)stability, their combination and other macroeconomic variables can define firm's exit determinants (Bhattacharjee et al., 2009).

3. The Methodology and Model

Model observed the effects of GDP changes, unemployment rates, rates of firm's birth, changes in value added and investments per person employed in relation with rate of survival of firm's within the ICT industry, in accordance with Nace Rev. 2 classification in EU10 countries in time periods of one, two and three years from birth. Even though the research tendency was to conduct analysis within the EU10 countries, Greece was left out from the analysis due to absence of data. In analysis we have used Eurostat's database for latest available time series from years 2008-2012. Eurostat indicators of business demography (birth rates, death rates, survival rates etc.) provided information on business dynamics within certain industry in accordance with specific criteria. Survival rate is the ratio of new found firms in a year t-1 (t-2, t-3, t-4, t-5) which are still active in a year t. Birth rate represents the ratio of a number of newly founded firms in a year t and entire number of active firms in the same year. Change in GDP measures the change in GDP in year t in comparison to year t-1. Unemployment rate is observed in the entire economy. Model also analyzed the influence of investments per person employed on the firm's survival rate. Changes in value added represent the changes in added values with respect to activities in a year t in comparison with a year t-1.

Considering that the observed data has data panel characteristics, which combines the cross-section and time series, hence in empirical research data panel method was used. Baltagi (2001) stated that the choice of using panel model with fixed or random effects depends on a nature of data. Greene (2003) noted that in a case of using ordinary least squares (OLS) model, estimators would be biased and inconsistent. If a sample is randomly chosen from the population, use of panel model with random effects is preferred. However, on case when observations relate to specific industry or specific country (which is the case in our model) fixed effects are used. In order to provide additional model validity, as dependent variables, one, two and three years firm's survival rates were used. Each model consisted of 45 observations, where N=9, and T=5. Accordingly, three models with various survival rates as dependent variables are showed in Table 1.

**Table: 1 Determinants of Firm Survival in EU10 Economies (Except Greece)
(Standard Errors in Parentheses)**

Variable	1-year survival rate	2-year survival rate	3-year survival rate
GDP change	0.438 (0.688)	0.917 (0.788)	1.513** (0.375)
Unemployment rate	-0.919** (0.211)	-0.714** (0.244)	-0.386* (0.161)
Birth rate	-0.819** (0.245)	-1.732** (0.519)	-2.180** (0.208)
Value added change	-0.564** (0.143)	-0.692** (0.235)	-0.766** (0.110)
Investments per person employed	0.187* (0.082)	0.321* (0.129)	0.502** (0.093)
Cons.	97.345	87.619	75.700

	(3.780)	(5.430)	(3.345)
N	45	45	45
R ²	0.551	0.440	0.744
Adjusted R ²	0.435	0.296	0.678
Prob (F-statistic)	0.000	0.008	0.000

Source: Authors analysis

Note: Coefficients statistically significant at the (*) 5% and (**) 1% level.

Change in GDP has not proved to be statistically significant in models with 1 year and 2 year annual rate of survival as dependent variable, while it has displayed positive direction and statistical significance at the 1% significance level in model with a 3 year annual survival rate as a dependent variable. In other words, the effects of the state of economy become evident after the firm had to a certain degree established itself on the market. Until then, the prevalent effects are individual, firm specific effects. Unemployment rate has proved to be statistically significant at the 1% level (5% in a model with a 3 year survival rate) and it suggests that increase in rate of unemployment will decrease firm's survival rates. The stated implies that negative economic trends will considerably more negatively affect firm survival on the market than certain positive indicators. Birth rate is also statistically significant at the 1% level in all models and it suggests that the higher birth rate will negatively affect firm's survival. It implies that the prevailing effect in which new innovative firms create additional competition and cause pressure through process of adjustment to new market conditions. Change in ICT industry value added is also a significant variable at the 1% level of significance in all three models; however its influence is negative. Such result can be interpreted in a way that by entering the markets, new and innovative firms begin to create additional value added and that in spite of entire industry growth, some firms are squeezed out of market. Investments per person employed represent positive influence on survival rate at the 5% level of significance (1% in a model with 3 year survival rate) and it is possible to conclude that higher investment levels will contribute to higher likelihood of firm's survival on the market. This variable reiterates and confirms the importance of investments and implementation of new technologies, especially in industry such as the ICT.

4. Business Dynamics Facts in Europe

The following section provides key business dynamics indicators for ICT industries in analyzed countries. Birth rates and survival rates were previously defined. Death rate presents a ratio of closed firms in year t and entire number of firms in the same year. Churn rate represents the sum of birth rate and death rate. Table 2 displays the stated indicators.

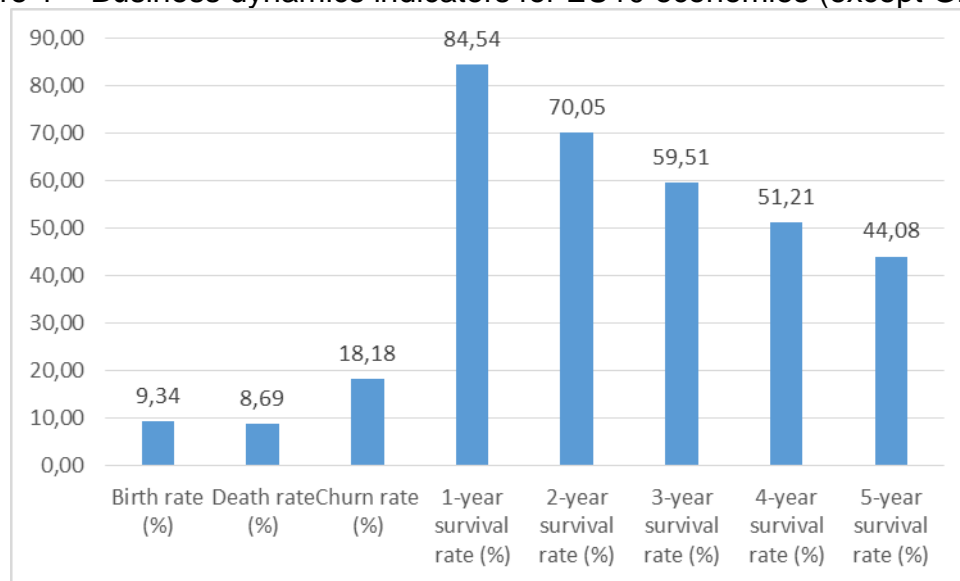
Table: 2 Business dynamics indicators for EU10 economies (except Greece)

Business dynamics indicator	2008	2009	2010	2011	2012	Avg
Birth rate (%)	10,10	9,32	9,21	9,36	8,72	9,34
Death rate (%)	8,78	8,82	8,51	8,63	-	8,69
Churn rate (%)	18,88	18,14	17,72	17,99	-	18,18
1-year survival rate (%)	86,29	85,85	83,52	83,38	83,65	84,54
2-year survival rate (%)	69,17	70,41	71,05	69,51	70,10	70,05
3-year survival rate (%)	59,79	57,85	59,61	60,83	59,45	59,51
4-year survival rate (%)	49,57	49,98	50,18	52,14	54,18	51,21
5-year survival rate (%)	-	43,05	43,27	43,85	46,15	44,08

Source: Eurostat (authors analysis)

Averages of the stated indicators are displayed in Figure 1.

Figure 1 – Business dynamics indicators for EU10 economies (except Greece)



Source: Eurostat (authors analysis)

In the observed time period from 2008-2012 in ICT industry average birth rate was 9,34%, while average death rate in the same time period was 9,69%. The results indicate that in spite of the difficult period which was marked by economic crisis, there was a net increase in total number of firms. Average churn rate was 18,18%, which indicates that yearly in the stated period in ICT industry, almost one fifth of firms change, indicating large turbulence within the ICT industry. Highest average birth rates in the analyzed period were observed in Portugal (12,69%) and UK (11,39%), while the lowest noted birth rates were in Belgium (5,10%) and Italy (6,91%). Highest observed death rates in a time period from 2008-2012 were also noted in Portugal (16,41%) and UK (11,79%), while the smallest observed death rates were in Belgium (3,25%) and Italy (6,88%). Death rates were analyzed in a time period from 2008-2011, due to unavailable data for 2012. From the data it is possible to conclude that firms in ICT industry in Portugal and UK conduct their business in extremely turbulent environment.

On average, in EU10 countries (except Greece) first year after the firm's birth survive 85,54% of firms, second year 70,05%, third year 59,51%, fourth year 51,21% and fifth year only 44,08%. We can therefore say that every 6,5 firm does not survive the first year since birth, every second firm does not survive until the fourth year in the market, while less than half of the firms does not live up to the fifth year. First and second year since firm's birth most firms survive in UK (94,75% and 79,85%) and the least in Portugal (75,21% and 55,75%). However, after the fourth and fifth year survival rates significantly decrease, especially in UK. Furthermore, among EU10 countries there are significant differences in entrepreneurial environment and business stability. In Portugal only 30,09% of firms survive up to fifth year since birth, while in Belgium and France 60,09% and 54,5% of firms survive up to fifth year. It is worth to note that for calculating the average 5 years survival rate for Belgium, only the last two years were used, while for other countries all observed years of the analyzed time period were used, except for 2008, for which there was no data available.

5. Summary and Conclusions

By observing business dynamics indicators, it is possible to track the adjustment processes in EU economy, its industries and adjustment effects concerning turbulence and volatile market conditions. There are plenty of determinants which can be related to the probability of firm's survival. Business cycles, macroeconomic environment stability, entrepreneurial environment, business conditions, approach to financing, firm's age, industry life cycle and various other micro and macro variables which this paper explored. Positive trends in economy, such as GDP growth, are to be favorably felt after the third year of firm's birth, after the firm has stabilized on the market to a certain degree. Until then, firm specific effects are prevailing. On the other hand, negative trends in economy are felt significantly earlier and therefore along the unemployment increase in entire economy, reduced survival rates were noted in the ICT industry. Birth rates indicate the existence of effect in which new innovative firms create added competition and exert pressure on already established firm's adjustment processes to new market conditions. The firms which are unable to adjust exit the market. By entering the markets, new and innovative firms begin to create additional value added, however in spite of the industry growth, some firms are squeezed out of the market. Correspondingly, it is possible to conclude that higher investments shall contribute to a higher possibility of firm survival on the market. This variable just confirms the importance of investments and implementation of new technologies, especially in the industry such as the ICT. Survival of the firms plays a significant role in achieving economic growth and preservation of working places which. Firm's survival poses key questions for the creators of economic policy and actualization of the theme in economic research. It is considered that the newly founded firms are innovative and lead to increase in competitiveness, which presents an important determinant of economic growth. However, small number of newly founded firms survives and grows. The most dynamic ICT industries are in Portugal and UK, and are characterized by high birth and death rates, and high churn rates overall. The least dynamic ICT industries are in Belgium and Italy. Dynamic interrelatedness of firm's birth and death plays one of the key roles in economic development through creation of new work places by formation of new firms and loss of work places due to firms leaving the market. Depending on which elements of business dynamics prevail, they determine the performance of entire economy. Accordingly, it is the common reason why institutional support for entrepreneurs is

stressed as important. Special attention should be given to firms in their first five years since birth in a time when they are most vulnerable, especially through institutional support for reducing the business barriers which they are facing. The recommendations for a future research are that the research should expand to analyzing business dynamics, determinants of birth and death of firms and their survival in various industries, countries and different entrepreneurial and macroeconomic environments in order to enable comparison of post-entry firm's performance in various conditions.

References

- Acs, Z. J. (1992) Small Business Economics: A Global Perspective, *Challenge*, 35, November/December, pp. 38-44
- Acs, Z., Audretsch, D. (1990) *Innovation and Small Firms*, USA: Massachusetts Institute of Technology
- Agarwal, R., Gort, M. (1996) The Evolution of Markets and Entry, Exit and Survival of Firms, *The Review of Economics and Statistics*, 78 (3), pp. 489-498
- Agarwal, R. (1997) Survival of Firms over the Product Life Cycle, *Southern Economic Journal*, 63 (3), pp. 571-584
- Agarwal, R. (1998) Evolutionary Trend of Industry Variables, *International Journal of Industrial Organization*, 16 (4), pp. 511-526
- Audretsch, D. B., Mahmood, T. (1995) New Firms Survival: New Results Using a Hazard Function, *The Review of Economics and Statistics*, 77 (1), pp. 97-103
- Audretsch, D. B., Santarelli, E., Vivarelli, M. (1999a) Start Up Size and Industrial Dynamics: Some Evidence from Italian Manufacturing, *International Journal of Industrial Organization*, Vol. 17, pp. 965-983
- Audretsch, D. B., Santarelli, E., Vivarelli, M. (1999b) Does the Startup Size Influence the Likelihood of Survival?, in B. David Audretsch and A. Roy Thurik (eds.), *Innovation, Industry Evolution, and Employment*, Cambridge University Press, Cambridge, UK, pp. 280-296
- Baltagi, B. H. (2001) *Econometric Analysis of Panel Data*, 2nd edition, Chichester: John Wiley and Sons
- Bhattacharjee, A., Higson, C., Holly, S., Kattuman, P. (2009) Macroeconomic instability and business exit: determinants of failures and acquisitions of UK firms, *Economica*, 76, pp. 108-131.
- Bradburd, R., Caves, R. E. (1982) A Closer Look at the Effect of Market Growth on Industries' Profits, *The Review of Economics and Statistics*, 64 (4), pp. 635-645
- Calvo J. L. (2006) Testing Gibrat's law for small, young and innovating firms, *Small Business Economics*, 26 (2), pp. 103-116
- Cefis E., Marsili O. (2006) Survivor: the role of innovation in firms' survival, *Research Policy*, 35 (5), pp. 626-641
- Dunne, T.; Roberts, M. J. & Samuelson, L. (1989). The Growth and Failure of U. S. Manufacturing Plants, *The Quarterly Journal of Economics*, 104 (4), pp. 671-698
- European Platform for Rehabilitation-EPR (2014) Cooperation mechanisms between the providers of vocational education and training and employers in the field of ICT, analytical paper, November 2014
- Evans, D. S. (1987) The Relationship Between Firm Growth, Size, and Age: Estimates for 100 Manufacturing Industries, *The Journal of Industrial Economics*, 35 (4), pp. 567-581

- Fotopoulos, G., Louri, H. (2000) Determinants of Hazard Confronting New Entry: Does Financial Structure Matter?, *Review of Industrial Organization*, 17 (3), pp. 285-300
- Geroski, P. A. (1995) What Do We Know about Entry?, *International Journal of Industrial Organization*, Vol. 13, pp. 421-440
- Geroski, P. A., Mata, J., Portugal, P. (2007) Founding Conditions and the Survival of New Firms, *DRUID Working Papers 07-11*, DRUID, Copenhagen Business School, Department of Industrial Economics and Strategy/Aalborg University, Department of Business Studies.
- Gimeno J., Folta T. B., Cooper A. C., Woo C. (1997) Survival of the Fittest? Capital and the persistence of underperforming firms, *Administrative Science Quarterly*, 42 (4), pp. 750-783
- Greene, W. H. (2003) *Econometric Analysis*, 5th ed., Prentice Hall, New Jersey
- Greene F., Mole K., Storey D. J. (2004) Does more mean worse? Three decades of enterprise policy in the tees valley, *Urban Studies*, 41 (7), pp. 1207-1228
- Hamilton, B. H. (2000) Does entrepreneurship pay? An empirical analysis of the returns to selfemployment, *Journal of Political Economy*, 108 (3), pp. 604-631
- Honjo, Y. (2000) Business Failure of New Firms: An Empirical Analysis Using a Multiplicative Hazards Model, *International Journal of Industrial Organization*, Vol. 18, pp. 557-574
- Madhoushi, M., Nasiri, A. (2011) The Influence of Industry Characteristics on New Firms' Survival: Iranian Study, *Australian Journal of Basic and Applied Sciences*, 5 (3), pp. 653-661,
- Mata, J., Portugal, P. (1994) Life Duration of New Firms, *Journal of Industrial Economics*, Vol. 42, pp. 227-246
- Mata, J., Portugal, P. (1999) Technology Intensity, Demand Conditions, and the Longevity of Firms, in D.B. Audretsch and A.R. Thurik (eds.), *Innovation, Industry Evolution and Employment*, Cambridge, UK: Cambridge University Press, pp. 265-279
- Renski, H.C. (2009) New firm entry, survival and growth in the United States: A comparison of urban, suburban and rural areas, *Journal of the American Planning Association*, 75 (1), pp. 60-77
- Segarra, A., Callejon, M. (2002) New Firms' Survival and Market Turbulence: New Evidence from Spain, *Review of Industrial Organization*, Vol. 20, pp. 1-14.
- Stearns, T., Carter, N., Reynolds, P., Williams, M. (1995) New firm survival: industry, strategy and location, *Journal of Business Venturing*, Vol. 10, pp. 23-42
- Taylor, M. (1999) Survival of the Fittest? An analysis of self-employment duration in Britain, *The Economic Journal*, 109 (454), pp. C140-C155
- Thompson, P. (2005) Selection and firm survival: evidence from the shipbuilding industry, 1825–1914, *Review of Economics and Statistics*, 87 (1), pp. 26-36
- Wagner, J. (1994) The Post-Entry Performance of New Small Firms in Manufacturing Industries, *Journal of Industrial Economics*, 42 (2), pp. 141-154
- Yasuda T. (2005) Firm growth, size, age and behaviour in Japanese manufacturing, *Small Business Economics*, Vol. 24, pp. 1-15