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Gender diversity and educational attainment in limited companies: Evidence from Slovakia

Running title: ***Gender diversity & education in firms***

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Gender diversity and educational attainment in private companies: Evidence from Slovakia[2].

Manuscript Type: Empirical

Research Question: The paper tests the impact of gender diversity and educational attainment of the owners and company agents on the performance of private firms in the Slovak economy. Several aspects of performance are assessed – efficiency, growth and survival.

Research Findings/Insights: The gender diversity both in owners and company agents within a company leads to higher total factor productivity. However, the companies with higher proportion of females in ownership structure or among company agents tend to grow less, and this result was confirmed along both turnover and total assets dimensions. Although there is evidence that more females self-select into lower risk sectors and occupations. Surprisingly, given higher risk aversion of females, the default of companies is affected by gender diversity only marginally. In terms of educational attainment, companies with the higher proportions of owners or company agents with university education are much more productive but there is no evidence that growth and default of companies are affected.

Theoretical/Academic Implications: Unlike extant literature, which looks mainly at large listed enterprises in developed economies we look at private, predominantly small and medium sized privately held companies in a transition economy. Moreover, besides gender composition we examine the impact of educational attainment of stakeholders. Lastly, our approach is multidimensional in that we assess company performance along multiple lines.

Practitioner/Policy Implications: From the viewpoint of policy implications, even though gender diversity may contribute to higher productivity of companies. The finding that a higher proportion of females may hamper firm-level growth needs to be investigated further in relation to industry sector before taking uniform approaches such as imposing gender quotas. Regarding the effect of university education, since it contributes to much higher productivity and at the same time does not hinder the

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growth, the owners and company agents are to be encouraged to increase their human capital by gaining an university education.

Keywords: Corporate Governance, Gender Diversity, Educational Attainment, Private Firms

INTRODUCTION

The issue of board level diversity and company level performance has attracted much interest conceptually, empirically and in relation to policy intervention[1]. Empirical studies have sought evidence on the governance-performance relationship predominantly from large and listed companies in developed economies. There is less evidence of the impact of board composition in emerging and transition economies and from the broader cross section of enterprise types. Indeed Kang et al. (2007) argue that the generalisability of extant findings from, predominantly, large US listed companies (e.g. Erhardt et al., 2003) "may not extend across national boundaries due to different regulatory and economic environments, cultural differences, the size of capital markets and the effectiveness of governance mechanisms" (Erhardt et al., 2003:194). The Slovak Republic is an economy that has experienced transition (post communist period) and convergence (after EU enlargement). Of course these economies have now also weathered the financial tsunami of 2008 and resulting real economy recession. Economies where the culture of entrepreneurship and firm level competition has been absent for decades are an interesting case. Indeed the impact of the transition process on productive efficiency, revenue and profitability growth and firm survival has been a feature of many empirical studies of such economies. This study adds a further dimension, corporate governance and diversity of management and ownership, in relation to the performance of Slovak enterprises.

In this paper, we focus on privately held predominantly small and medium size enterprises (SME), which are the engine of any market economy. In general, effective boards are influenced by their configuration of expertise, the ownership type, structure and sector of the firm and the life-cycle phase. The dimensions of director expertise include: gender and ethnic diversity; age and sector experience; networks and contacts; previous business and board experience and multiple board membership; prior successes and failures; and board stability versus replacement. Diverse boards are more likely to incorporate the range of expertise and networks highlighted above. We focus on two main dimensions of diversity that can be measured within our dataset: gender diversity and educational attainment that captures human and social capital.

Our analysis includes data from 2012-2014 which covers a more stable period post transition and recession and characterised by more steady economic growth, stable industry structure and high spill-over effects form foreign direct investment (driven by the automobile industry) but also by now the political, legal and fiscal conditions developed in line with other western economies. Although there are many studies of firm level performance post transition-enlargement (see Wilson et al., 2016) we are not aware of any that incorporate detail of the stakeholder characteristics (owners and agents) and their diversity. Moreover as ownership (concentrated, dispersed, family-owned, worker-owned, foreign-owned, mixed ownership) and governance structures have evolved in the new private sectors, the scope for analysing novel dimensions in the governance-performance relationship have become pertinent and possible.

We contribute to corporate governance literature in the following ways. Unlike extant literature, which looks mainly at large listed enterprises in developed economies we look at private, predominantly small and medium sized privately held companies in a transition economy. Moreover, besides gender composition we examine the impact of educational attainment of stakeholders. At the same time our approach is multidimensional in that we assess company performance along multiple lines. As it has been recognized that the impact of gender diversity is ambiguous (Carter et al., 2010; Simpson et al., 2010), multidimensional approach in a way reconciles the contradictions by providing a broader picture and elucidating how it affects various dimensions of company performance. The same holds for educational attainment.

In the next section we provide context with a discussion of the development of the Slovakian corporate sector. Following is a review the literature on the effects of board diversity and educational attainment on corporate performance and we suggest hypothesis in relation to Slovakian enterprises. We then discuss our data and variable construction. The next section outlines our empirical methodology in relation to the firm level performance dimensions and we conclude with a discussion of the main findings.

CONTEXT: THE SLOVAKIAN CORPORATE SECTOR

SME's now play a significant role in the development of post communist countries and like most developed countries SMEs are now considered to be the backbone of the economy in terms of job creation and technical and product innovation. One would expect that the SME ownership and governance would reflect the diversity of the population. In comparison to developed countries (e.g. the EU), where the SME private sector has grown over many years, the history-length of the private SMEs sector in transition economies, post communism, can be measured in decades. Entrepreneurial ventures in Slovakia have a relatively short history. One of the novelties and contributions of this paper is to focus on some specific founding and early governance characteristics of SMEs in Slovakia and the development and performance of the sector in these transformative years. In examining performance, unlike previous studies, we chose several dimensions including efficiency, growth and survival (exit via bankruptcy).

The transition process, especially privatisation, internalisation and restructuring in transition economies created corporate sectors with a wide range of ownership structures and origins encompassing the sale and break up of state owned enterprises or cooperatives through to new start-up ventures with both domestic and foreign participation. The changing political, institutional and economic environments created opportunities for new ventures within business services (e.g. consultancy, accounting, legal services) in order to respond to the new demand for advice in a rapidly changing landscape. In addition, there were opportunities to exploit new markets through cross-border sales. This opportunity, of course, opened further after Slovakia joined the EU and the Eurozone. Thus, during and after the transition and convergence period new ventures in Slovakia could exploit existing resources, technologies, social ties, distribution channels and organisational networks (created within central planning) or exploit gaps, create new resources, networks and service new demand and new markets. In parallel the development of legal and financial systems post-privatisation has a bearing on the speed and nature of the evolution of the SME sector. The scope for analysing novel dimensions in the governance-performance relationship has become possible as ownership (concentrated, dispersed, family-owned, worker-owned, foreign-owned, mixed ownership) and governance structures have evolved in the new private sectors.

The options for structuring business entities in Slovakia are, like elsewhere, either commercial companies or sole entrepreneur. The latter is a type of business owned and run by an individual person. The legal forms of commercial companies are a joint stock company, a limited liability company, a limited partnership and a general partnership. There is a special type of legal entity called a cooperative, however it is seldom used for business activities. A joint stock company[2] (JSC) is designed for larger businesses; the minimum required capital is 25,000 EUR. A JSC must establish a board of directors and a supervisory board for its governance. A supervisory board consists of no less than 3 members and the same holds for a board of directors. A limited liability company (LL) is a company based on a share capital minimum of 5,000 EUR. An LL can be founded by one or more shareholders (maximum 50). An executive, appointed by the general meeting of shareholders, assures the management. An executive can be the sole shareholder. A supervisory board can be appointed, but it is not mandatory.

The partners in a general partnership are equally liable for the company's debts up to the extent of their entire personal property. The partners take all the decisions equally. The limited partnership is not a frequent form of business organisation; it must have both general and limited partners. The former has no obligation of capital contribution but has unlimited liability. The latter should make a minimum contribution of 250 EUR to the share capital and is liable for the partnership's obligations only to that extent. General partners make all decisions and they act as statutory representatives.

There was a substantial growth in number of commercial companies in Slovakia since the economy changed into free market economy. In 1993 a total of 20,850 commercial companies have been registered, while in 2014 the number grew to 184,258. Limited liability companies form the highest proportion at 87.0% in 1993 gradually growing to 96.1% of all commercial companies in 2014. The proportion of joint stock companies decreased from 8.1% in 1993 to 3.2% in 2014 and the partnerships (both general and limited) decreased from 4.85% in 1993 to 0.7% in 2014. The number of limited liability companies has been growing much more also when compared to the growth of sole entrepreneurs. The number of limited companies grew more than nine times between 1993 (18,147 companies) and 2014 (177,110 companies), while the number of sole entrepreneurs has increased by 28% during the same period – 264,090 sole entrepreneurs in 1993 compared to 337,182 in

2014 (Statistical Office of Slovak Republic). The number of limited liabilities companies in Slovakia in the transition period is shown in Figure 1. Based on the Slovak Business Agency report (Slovak Business Agency, 2016) there were registered 531,729 active businesses in Slovakia (including sole traders). Of the total number of active business entities micro-enterprises represented 96.9% (515,236), small enterprises 2.4% (12,984) and medium-sized enterprises 0,5% (2,843). The share of large enterprises accounted for 0.1% (666). Of the total number of individuals-entrepreneurs registered in the Register of Organizations, at the end of 2011, 72.3% were men and 27.7% women. Representation of women in business in Slovakia is one of the lowest in the EU countries, although, as we will see the incidence of female owners/directors in limited liability companies varies by sector.

Our focus is on LL companies because of their predominance in the economy, our unique data, and the gap in the literature. Examining Figure 1 reveals that the growth of LL companies has been on an upward trajectory since 2004 and thus much of the growth has taken place in the last 10 years. These companies can, therefore be considered as relatively new incorporations. Indeed, studies of company survival find that new incorporations are at the highest risk of failure up to an 8-10 years threshold before being regarded as established (see for instance, Wilson and Altanlar, 2014). Our sample therefore presents an interesting test ground for examining diversity-performance relationships.

LITERATURE REVIEW AND HYPOTHESIS

Boards of directors have a dual role in governing the firm. On one hand, effective boards protect shareholders' wealth by ensuring managers' accountability. On the other hand, boards, also have a role in enhancing wealth creation. By providing knowledge, expertise, contacts and other resources they can enable executives and managers to assume the calculated risks that benefit shareholders through improved firm performance (efficiency, growth, survival). Boards of directors are central in both monitoring and advising corporate managers on behalf of shareholders. Existing analyses of the 'governance–performance' relationship focus on broad measures of board characteristics and are based upon established, large public-listed firms (Anderson et al., 2011) where classic agency problems could arise. So far, only a handful of studies (e.g. Wilson et al., 2014) have attempted to determine the role of directors on the performance of the corporate spectrum including small and medium-sized enterprises (SMEs) and family businesses (Wilson et al., 2013). In unravelling causal relationships it is acknowledged in extant studies of larger, established enterprises, that director selection, board characteristics and company performance are likely endogenous (Hermalin and Weisbach, 2003; Anderson et al., 2011). This, of course, confounds the problem of measuring the performance impacts of director heterogeneity and board diversity. Of course, in recently incorporated companies the ownership, board, and top management overlap to a great extent (Brunninge et al., 2007). Moreover, given that new companies have limited track record and it is the directors that found a new company, potential endogeneity issues do not hamper this study unlike the analysis of old established companies where better performing firms choose to select and maintain more heterogeneous boards (Anderson et al., 2011). However in investigating gender effects we are concerned to test whether the gender composition of owners/managers may be industry specific. For instance that female incidence is higher in lower risk, more stable sectors or that females are more likely to invest in 'life-style' businesses and avoid higher risk ventures.

Effective boards in SMEs are influenced by their configuration of expertise, the ownership type, structure and sector of the firm and the life-cycle phase of the SME. The dimensions of director expertise in SMEs include: gender and ethnic diversity; age and sector experience; networks and contacts; previous business and board experience and multiple board membership; prior successes and failures; and board stability versus replacement. Moreover, SMEs cover a range of ownership and governance configurations including start-ups, family firms, and buy-outs of existing firms. SMEs also face a number of life-cycle challenges as they move from start-up to professionalization, maturity, decline and potential reinvigoration that have implications for the nature and role of their boards that include both monitoring and adding value. Diverse boards are more likely to incorporate the range of expertise and networks highlighted above. We focus on two main dimensions of diversity that can be measured within our dataset: educational attainment that captures human and social capital and gender diversity.

Directors and active shareholders can bring human (expertise) and social (networks) capital to the enterprise. For small and young enterprises boards are likely to vary in the degree of their heterogeneity of expertise and networks. Educational attainment has been used as proxy for human capital but educational attainment is not only a proxy for knowledge, skills and intelligence but also for social connections which may be particularly important in economies where traditional business networks have not fully developed. These social connections may be with other business owners and/or connections with high level professionals in business services (accounting, legal services, finance), professional bodies, the banking sector and government. This may be particularly the case in Slovakia where firm stakeholders that have achieved a high level of educational attainment can add considerable value to firms that lack these networks and skills and at the same time complement the directors and stakeholders that have acquired more task related human capital based on experience rather than formal education. This is not to say that fast-growing and high-performing firms in post transition economies are all managed by people who are highly-educated but education brings both specific and general skills (human capital) that are relevant to successful businesses. Human capital comprises investments (education) and outcomes (professional skills). Human capital should increase a business founders' capability of identifying opportunities and assembling the resources to exploit these opportunities, and thus increasing firm survival (Unger et al., 2011). Task-related human capital has greatest importance in new business survival (Unger et al., 2011:4).

Our first hypothesis is that educational attainment of owners and company agents will positively affect the performance of companies. We expect that the educational attainment of owners and agents in our sample will have a positive impact on productive efficiency and growth. On the other hand, we expect the higher risk and innovative ventures would be found within the subsample of firms with a high level of educational attainment and therefore the association with survival probability is ambiguous.

A further feature of our database is the ability to identify the gender of owners and directors in the sample and thus construct measures of gender diversity. We explore the impact of diversity on performance outcomes based on results of previous studies and theoretical predictions. Gender diversity can add value to an enterprise by bringing extra dimensions of human and social capital, contributing to and changing group dynamics (Adams and Ferreira, 2009). A company with a balance of gender on the board will have access to a wider pool of human capital than male-only boards with more potential to create competitive advantages (Barney, 2001). Women provide information and insights unique to female experiences and their complementary networks (Brammer, Millington, and Pavelin, 2009). Female directors, because of their participation in certain consumer markets may have expertise in and unique knowledge of product markets that is helpful in product positioning and in gaining a wider customer base. Gender diverse boards are likely to be more cognisant with the range of customer needs.

Moreover female directors may have important knowledge of specific labour markets, skills and access to relevant task-related human capital. Jehn et al. (1999) finds that groups with more diversity generate more innovative and critical thinking in problem solving. Huse et al (2010) suggest that a higher ratio of women directors may contribute to reducing board level conflict, creating more time for strategic tasks and developmental activities. Having a range of viewpoints within a board may be especially beneficial during turbulent economic conditions that can contribute to firm survival (Hjul, 2009; Filatotchev and Toms, 2003). Adams and Funk (2010) provide evidence that women may be more risk aware and more astute in managing credit and cashflow. Of course, risk aversion may manifest as female run businesses choosing to set up in lower risk environments. This is one possible source of endogeneity within our sample in that there may be a higher incidence of females within certain industrial sectors that have both a lower failure rate and growth potential and is something that we address in our estimation/sensitivity analysis.

Empirical studies on gender diversity and performance outcomes do not produce clear-cut results. Carter et al. (2010), for instance, examine the impact of women and ethnic directors on the boards of large US companies. After reviewing extensively the literature from a range of theoretical lenses i.e. resource dependence theory, human capital theory, agency theory, and social psychology they conclude that "gender and ethnic diversity may have either a positive, negative, or neutral effect on the financial performance of the firm" (Carter et al., 2010:396). Their findings lend support to the neutral effect, sometimes a positive and sometimes a negative or no effect concluding that, "the effect of the gender and ethnic diversity of the board may be different under different circumstances at different times" (2010:396). Simpson et al. (2010) raise serious concerns about these mixed results and the appropriate methodology for testing such a relationship. Of course most empirical studies focus on large companies and clearly smaller companies are likely to have different and likely weaker governance practices. Thus gender diversity on the board of smaller companies may help to strengthen board effectiveness and performance outcomes.

The business case for board level diversity including gender diversity provides a clearer exposition of the potential outcomes. The business case approach is introduced by Robinson and Dechant (1997), in which they argue that board diversity can enhance business performance and growth through several channels. (1) Diverse boards can bring positive outcomes for the firm's market penetration. (2) Board diversity will improve creativity and innovation. (3) Board diversity will improve the decision-making process that leads to better problem solving and conflict resolution. (4) Board diversity will enhance effective leadership. (5) Board diversity promotes global relationships. The business case approach draws on ideas articulated in agency theory (Jensen and Meckling, 1976; Carter et al., 2003; Ahern and Dittmar, 2012; Bebchuk and Fried, 2005), resource dependency theories Pfeffer and Salancik (1978), (Hillman et al, 2000; Hillman et al, 2007, stakeholder theories and human capital theories. The proponents of the stakeholder theory argue that corporations should reflect their external environment, for instance society that is composed by different gender, race, and ethnic (see Rose, 2007). The human capital theory relates to directors characteristics such as education, experience, skills, which of course should be optimised within the board (see Singh et al., 2008; Sealy et al., 2007; Singh and Vinnicombe, 2004). Although Terjesen et al. (2009) suggest that females tend to be less experienced than men in term of business experience.

The literature review highlights that gender diversity may not have a clear relationship with performance outcomes. Specifically the impact is unlikely to be linear and that gender balance is more important that the proportion of male/female. We address this issue in our estimation strategy. Our second hypothesis is that female participation in ownership structure and company representation will impact the performance of companies. We want to test if gender balance positively contributes to firm performance and survival or if it is one of the polarized gender compositions and if observed effects vary by sector.

PERFORMANCE MEASURES AND MODELLING STRATEGY

The aim of this study is to explore links between the gender composition and education of owners and company agents on one side and the firm performance on the other side. We adopt multidimensional approach to analysing the impact of diversity and the modelling strategy involves the estimation of multivariate models determining firm level efficiency (productivity); firm level growth in value turnover and assets;

and firm level survival (default and bankruptcy). Details for each of the methods are given below.

Efficiency

To examine differences in productive efficiency we specify a production function model using firm level data. In this model we relate total output (value added) to labour and capital inputs, and then isolate productivity differentials for company types. The production function specification is Cobb-Douglas, frequently used in academic empirical studies of ownership-governance-performance linkages. In equation (1) the dependent variable, output, is real value added (deflated using GDP deflator). The control variables used for the production function models were number of employees (labour) and real fixed assets (capital). The following estimation equation was used:

$$\log(Y_{i,t}) = \beta_0 + \beta_1 \log(L_{i,t}) + \beta_2 \log(K_{i,t}) + \beta_3 E_{i,t} + u_{i,t} \qquad (1)$$

where Y stands for real value added, L for number of employees, K for real fixed assets and E for experimental variables reflecting dimensions of board characteristics. The experimental variables essentially explain firm level differences in total factor productivity (TFP). The residual from the basic production function isolates the efficiency differences in firms attributed to technological progress, knowledge and know-how, management practices and other factors that increase efficiency. The variables used for the model are described in Table 1.

Growth

We studied the companies' growth along two dimensions – turnover and total assets. The basic model is presented in equation (2). The dependent variable is compound annual growth rate from 2012 to 2014. In order to exclude the impact of price level the growth was calculated using deflated variables (GDP deflator was used). This analysis is cross-sectional – using the information from 2012 we aim to explain the average annual growth rate that occurred between 2012 and 2014. The control variables for the growth models were size (either turnover or total assets), total debt to total assets, age, competition (measured by Hirsch-Herfindahl index of turnover within the industry sector), location (indicator of Bratislava region), and industry of diversification. Thus the estimation equations were as follows:

$$Growth_i = \beta_0 + \beta_1 C_i + \beta_2 E_i + u_i \qquad (2)$$

where *Growth* stands either for turnover or total assets, C for the vector of control variables and E for experimental variables. The variables used for the model are described in Table 1.

Survival/Bankruptcy

Finally we estimate models determining survival/failure. In this analysis we develop the logit model of default prediction. The literature aimed at default prediction using the financial ratios is rich and the notable milestones are Beaver (1966), Altman (1968), Ohlson (1980), Zmijewski (1984) and Shumway (2001). Beaver (1966) tested the predictive ability of selected financial ratios but his analysis was univariate in its nature. Altman (1968) suggested employing the multivariate approach and used the multivariate discrimination analysis (MDA). Ohlson (1980) pointed out to the issues related to the use of MDA and favoured the logistic regression. Zmijewski (1984) also contributed to the debate related to the default-prediction methodology and in terms of modelling approach used a probit model. Shumway (2001) introduced the hazard models and at the same time demonstrated that in order to arrive at the unbiased estimates of the coefficients, the sample must have the time dimension, as well, so that there are observations also prior to the year of default. This method is similar to the survival analysis and represents another, arguably more flexible approach to default modelling. However, Beck et al. (1998) showed that if certain conditions are fulfilled, the logistic regression is almost identical to survival analysis approach.

Our dependent variable is binary and represents the event of default (Equation 3). In order to construct the variable, we checked the legal documents attached to the companies marked as defaulted in our database. We used the date when the company filed for bankruptcy as a date (year) of default. In order to build the predictive model and at the same time to avoid the issue of endogeneity because of simultaneity we marked last financial statements before the company filed for bankruptcy as 'defaulted'. The use of financial variables as predictors for default in developed economies has a long history and dates back to thirties (Altman, 1968: 590). Usually the ratios used for default prediction are the measures of liquidity, solvency and profitability. Every study used slightly different set of financial default predictors, depending on the country and time-period. The non-financial information often offers additional information to the financial ratios and that is why they are used for default modelling, as well (Altman et al., 2010). There are not many academic studies related to the default prediction for the Slovakian companies using larger samples. We are aware of two published papers on this topic – Fidrmuc and Hainz (2010) and Wilson et al. (2016). In our study the initial set was similar to Wilson et al. (2016), however, our final set of control variables is slightly different, possibly due to the differences of the sample in terms of the number and size of the companies and the sample period. Hence the set of control variables include the following financial ratios: Cash to Total assets, Trade creditors to Total liabilities, Pre-tax profit to Total assets and Net worth to Total assets. Besides financial ratios we included Size in terms of Total assets (used in logarithm), and also some of the non-financial information, as well. We use age of the company and the indicators of manufacturing and construction sectors, too. The model specification used for the default prediction was as follows:

$$P(d_{i,t+1} = 1|\Omega_t) = 1/\{1 + \exp\left[-\left(\beta_0 + \beta_1 F_{i,t} + \beta_2 N_{i,t} + \beta_3 E_{i,t} + u_{i,t}\right)\right]\} \quad (3)$$

where F stands for financial variables, N for non-financial variables and E means experimental variables. The variables used for the model are described in Table 1. We construct a range of variables reflecting firm level characteristics and performance measures including financial ratios. Since accounting ratios are often subject to outlying and extreme values that can potentially bias our multivariate estimates, particularly for private companies, we apply a consistent strategy for dealing with outliers (winsorization).

DATASET DESCRIPTION AND CONSTRUCTION OF EXPERIMENTAL VARIABLES

Dataset Description

The sample used in this study originates from one of the largest corporate credit reference databases of Slovakian companies (database Albertina from Bisnode). Firstly data about all limited liabilities companies were extracted, including financial statements covering financial years 2012, 2013 and 2014, company characteristics and information about owners and company agents (as of March 2013). The process of elimination was as follows. A company was excluded if the gender of at least one owner or company agent was unknown. Also, we removed companies with no owners or no company agents. The final criterion for keeping a company-year observation in the estimation sample was that there are non-missing values for all variables needed to estimate at least one model (i.e. either productivity, growth or default model). In case of multiple statements for a given company and year only the last updated version was used. The final estimation sample used for estimations in this study contains 272,538 company-year observations on 112,639 Slovakian limited liability companies and therefore represents a substantial proportion of the Slovakian corporate population. The descriptive statistics of the dependant and control variables for the three estimation samples (productivity, growth and default approach) are reported in Table 2.

Construction of Experimental Variables

The main purpose of this study is to explore the links between aspects of diversity i.e. education and gender diversity and enterprise performance. In general the experimental variables used in this study are constructed as proportions of persons with characteristic of interest. Since there are two types of specific positions of responsibility related to limited liability companies – owners and company agents, our experimental variables relate to gender and educational attainment of stakeholders and agents.

Firstly we construct four variables: 1) proportion of females among company owners, 2) proportion of females among company agents, 3) proportion of owners with university education and 4) proportion of company agents with university education[3]. However, these variables are not going to be used directly in estimations. We expect non-linear relationships and at the same time are interested in the impact of specific values of proportions (roughly speaking what happens if the proportion is 0, 0.5 or 1). That is why for each of these four variables two indicators are constructed – the first one is equal to one if the given proportion is higher or equal to 0.34 and lower or equal to 0.66, zero otherwise; and the second is equal to one if the given proportion is greater than 0.66, zero otherwise. Such construction of experimental variables enables easy interpretation – the estimated parameters will be interpreted as difference from the reference category, i.e. the proportion is smaller than 0.34. Altogether there are eight experimental variables and their definitions are given in Table 1. The descriptive statistics of the experimental variables used for each modelling strategy are reported in Table 3.

Given the limitations of our sample (we knew the details about the people associated with the companies as of March 2013) the details about the stakeholders and company agents is constructed as time-invariant and we use this information in models for each year in the estimation sample, i.e. 2012, 2013 and 2014. However, as the great majority of the companies are micro-entities with owners and company agents being the actual founders of the companies, we assume their turnover rate to be negligible and thus this limitation does not affect the obtained results (this issue is addressed later in sensitivity analysis).

ESTIMATION AND RESULTS

Production Function Approach

The results of the estimations are displayed in Table 4. The first model in Table 4 contains only the control variables and is included in the table for the sake of comparison and to confirm that the Cobb-Douglas specification generates reliable total factor productivity residuals. The results show that the estimated coefficients have expected sign and are highly statistically significant. Moreover, they are within the expected interval[4] and their sum is nearly exactly equal to 1, so the returns to scales are approximately constant.

The model 2 contains the experimental variables representing the participation of females among the company owners. The estimated parameter of the indicator of gender diversified ownership is highly statistically significant with positive sign signifying that companies with owners both male and female in approximately balanced proportion are on average more productive than those with predominantly male owners. The real effect is also non-negligible – all else equal these companies are nearly 8% more productive than companies owned by males[5]. The indicator of female dominated ownership structure is not statistically significant and hence it seems that there are no differences between the productivity of companies owned mainly by males and those owned by mainly females.

The model 3 contains indicators of proportions of females among the company agents. Similar to model 2, the companies with gender diversified company agents are significantly more productive than companies with predominantly male representatives. This effect is highly statistically and economically significant – the difference in productivity is more than 10%. The second experimental variable attracted a significantly positive sign, as well. Companies run mostly by females are on average 4% more productive than those run for the most part by males.

The model 4 contains the experimental variables related to the proportion of owners with university education. Both variables are highly statistically significant and the coefficient of the second one is larger, i.e. we can say that the higher the proportion of owners with university education, the higher the company productivity. The effect is rather strong, as well – when compared to the companies owned mostly by owners without university degree, if the ownership is approximately balanced in terms of university education, the companies are on average more productive by 20% and the average difference in productivity is nearly 36% if a company is owned mainly by university graduates.

Finally, the experimental variables included in model 5 relate to the proportions of company agents with university education. Here, the conclusions are very similar to those of model 4 – the higher the proportion of company agents with university education, the company is on average more productive. The real impact is very similar to the previous model, too. The company with about half of company agents with university education is on average 22% more productive than the company run by people without university education. If the proportion of company agents with university education is over two thirds, the difference in productivity is nearly 36%.

Turnover Growth

The results of the estimations are displayed in Table 5. The first model in Table 5 contains only the control variables and is included in the table for the sake of comparison. The control variables attract expected signs. On average, the bigger, more leveraged and older companies grow less. Neither market concentration nor region of capital city seems to impact the turnover growth in relevant manner. On the other hand, companies operating in several industrial sectors enjoy on average about two percentage points higher annual growth in turnover. However, the percentage of explained variability in turnover growth is rather low and amounts to slightly over six per cents.

The results of model 2 suggest that the gender composition of ownership structure impacts the turnover growth in a significant way. Both coefficients of experimental variables are negative and statistically significant. The pattern seems to be rather simple – the higher the proportion of females among the company owners, the smaller the average growth in turnover. The size of this effect is not negligible, either. The companies with approximately balanced ownership structure in terms of gender diversity grow by about two percentage points less, if the proportion of females among company owners is higher than two thirds, the growth is smaller by nearly four percentage points (both cases in comparison with the companies owned predominantly by males).

The results of model 3 offer similar picture in relation to gender composition of company agents. Both coefficients of experimental variables are negative and statistically significant, as well. Companies represented by males and females in approximately balanced way achieve on average one percentage point lower annual growth in turnover, when compared to companies run mainly by males. The statistical significance of this result is somewhat smaller – it is significant just on 5% level. If the proportion of females among company agents is higher than two thirds, the annual growth in turnover is lower by nearly four percentage points (again compare to predominantly male owners).

The impact of university education of company owners on turnover growth is tested in model 4. The results suggest that the balanced mix of owners lead to about 1.5 percentage point higher growth in turnover compared to companies owned by owners without university education. On the other hand, if over two thirds of owners have university degree, the growth in turnover is similar to the companies owned by the owned mainly by owners without university education.

The results of model 5 show that very similar conclusion can be drawn in relation to the university education of company agents. Companies with balanced mix of company agents have on average about two percentage points higher turnover growth compared to companies with representatives without university education. The coefficient of indicator of high proportion of university educated company agents is just marginally statistically significant with real impact on turnover growth below one percentage point compared to reference category.

Total Assets Growth

The estimation results of the models explaining the growth in total assets are reported in Table 6. The first model in Table 6 contains only the control variables. Most of them attract expected signs. On average, the bigger and older companies grow less. Unlike the former models, growth in total assets does not seem to be influenced by leverage. The market concentration does not seem to have impact either. On the other hand, companies in Bratislava region grow slightly more when compared to the rest of the country and so do the companies operating in multiple industrial sectors. The proportion of explained variability in dependent variable is over nine per cents – it is still rather small but somewhat higher than in turnover growth models.

The experimental variables included in model 2 relate to the proportion of female owners. Both coefficients are statistically significant and negative and the overall pattern is very similar to the turnover growth. The companies with higher representation of females among the company owners achieve lower growth in total assets. In comparison with mainly male ownership, companies with balanced ownership structure (in terms of gender) grow on average by about three percentage points less whereas those owned mainly by females grow less by nearly five percentage points. The model 3 looks at relation between the gender composition of company representation and growth in total assets and the results are nearly identical to the former model.

Model 4 and model 5 are aimed at testing the impact of university education on growth in total assets. However, both models fail to offer evidence in favour of the association between the university education of owners or company agents on one hand and the growth in total assets on the other.

Bankruptcy /Defaults Models

The estimation results for the default models are displayed in Table 7. The first model contains just control variables. All of them are statistically significant with expected sign. The discriminating performance of the model is also very good – the area under ROC curve is 0.866.

Model 2 and model 3 include experimental variables aimed at testing the relation between the gender composition of the ownership structure and company representation. Both experimental variables in model 2 have negative signs and seem to suggest that females are associated with somewhat lower probability of default. However, they are statistically insignificant. The results of model 3 offer evidence in favour of gender diversity. The coefficient for the indicator of balanced company representation in terms of gender is statistically significant at 5% level and suggests that such companies are less prone to default compared to those represented mainly by males.

The model 4 and model 5 test whether the university education of either owners or company agents makes any difference in relation to default probability.

However, none of them seem to provide compelling evidence since none of them is statistically significant.

SENSITIVITY ANALYSIS

In order to check the stability of results two sensitivity checks were performed. Firstly we estimated the models separately for clusters of industry sectors based on the proportions of female owners and company agents. The rationale behind this procedure was to control for possible industry effects. Namely, the observed significant effect of variation in proportion of females in ownership and representation of company on productivity and growth could be a consequence of specific features of a given industry sector, e.g. sectors with higher participation of women such as education or health and social work activities may achieve in general lower productivity or growth. In order to rule out possibility that uncontrolled industry effects drive our results, we ranked the industry sectors based on the proportion of females in company ownership structure and on the basis of this ranking four clusters of industry sectors were formed[6]. The industry sectors in the same cluster are homogenous in terms of gender composition and at the same time the clusters have approximately similar number of company-year observations (see Table 13 for details).

Secondly we re-ran the models using the biggest possible common sample. In the main analysis we used as much information/ observations as possible for each modelling approach. Given the pattern of missing values this resulted in different sample for each modelling strategy. That is why as a part of sensitivity analysis we wanted to compare the results with those obtained using the common sample. In addition, this allowed us to estimate the production function and default models for cross-sections, as well, which given the limitation of our sample[7], may provide further assurance of robustness of results.

Production Function Models

The results of the production function models used in the main analysis provided evidence in favour of gender diversity argument in that the companies with the mixed profile of company ownership and representation structure were more productive by

8-10%. Moreover, companies represented predominantly by females were more productive than mainly male company agents. The relevant results of sensitivity analysis related to this approach are reported in condensed form in Table 8. The robustness checks supported these findings for the most part. In all models the diversified pools of owners or company agents in terms of gender performed better (or not worse) than polarized ones. The evidence was conflicting in relation to whether the "male" or "female" companies are more productive. The results were clearly industry specific. On the other hand, the results of cross-sectional models for the common sample supported the results of the original models that gender diversity leads to higher productivity and predominantly female owners/ company agents are more productive than male ones.

In terms of education the results from main models were confirmed and all models supported the notion that the higher proportion of owners and/or company agents with university education lead to higher productivity.

Turnover Growth

In case turnover growth models the results of the main models were confirmed only partially (see Table 9 for details). The finding that the companies with diversified ownership and company representation in terms of gender achieve on average smaller growth of turnover was supported just in three model specifications out of ten. On the other hand, the result that if the proportion of owners or company agents is over two thirds the companies' turnover grows annually by less than four percentage points when compared with predominantly "male" companies was supported rather consistently – both in terms of statistical significance and effect size.

The preliminary notion that companies with mixed ownership and company representation in terms of education grow more than those with polarized structures was not supported in general. This result seems to be driven by the first cluster of industry sectors.

Total Assets Growth

The results of models concerning the growth of total assets were confirmed by sensitivity analysis, as well. The details can be found in Table 10. On average the growth of total assets decreases with the increasing proportion of females both among the owners and company agents. On the other hand, university education does not seem to play role in this regard. Unexpectedly, the results of the models estimated for the (smaller) common sample seem to suggest that the companies with over one third of owners or company agents with university education grow less than those owned or run by people without it.

Default Models

The results of models estimated as a part of sensitivity analysis related to default models are reported in Table 11. Unlike former models, the weak result of the default models in that the companies with diversified owners and company agents in terms of gender grow less were supported only marginally in a couple of models. Regarding the effect of education, the result of main models that university education of stakeholders does not impact the default probability was confirmed.

SUMMARY AND DISCUSSION

The paper tests the impact of educational and gender diversity on the performance of private firms in the Slovak economy. The data sample represents a substantial proportion of the private company population and uniquely undertakes test across multiple performance dimensions: efficiency, growth and survival. Our experimental variables for gender and education are constructed to test whether impacts are non-linear. The sample size permits sensitivity analyses for observed effects across industry and relevant subsamples. Specifically we are interested in whether gender effects are industry specific.

The productivity models support gender diversity hypothesis both on the level of company owners and company agents. The companies with balanced proportion of females in ownership structure or among the company agents have on average higher total factor productivity. The growth models, on the other hand, did not provide support for gender diversity hypothesis. The results either show that the proportion of females does not play any role, at all, or has adverse effect on growth in that the companies with higher proportion of females, either in ownership structure or among company agents, have (all else equal) on average lower rate of growth. We study dimensions of the companies' performance that have not been subject to much research; nevertheless, we can refer to somewhat similar studies. Adams and Ferreira (2009) in their study of listed US companies find that gender diversity has a positive impact on performance in firms that otherwise have weak governance, however it has negative impact on companies with strong governance. Our results suggest higher performance (in terms of productivity) of gender balanced ownership and company representation. Study of Matsa and Miller (2013) on the impact of introducing gender quotas in Norway connects the higher proportion of women on boards with the short-term decrease of firm's profits. Similarly in our case the higher proportion of women among owners and company agents leads to lower firm's growth.

The default probability models offered partially arguments for gender diversity. The diversity in owners and agents within one company leads to smaller probability of default. Recent study of Sila at al. (2016) finds that the gender diversity in the boardroom has no impact on risk taking or risk aversion of a company, although they measure risk differently.

The education of owners or company agents does not seem to influence the probability of default, however, it does influence the total factor productivity in that the companies with more educated owners or company agents are more productive. Our results are supported by similar findings for listed companies. According to Hitt et al. (2001) students from the top-ranking universities have the opportunity to acquire the highest degree of codified knowledge, they have the potential to learn and accumulate tacit knowledge and thus the company should benefit from them the most, particularly if the managers are well educated. Audretsch and Lehmann (2006) find that the directors with academic background can contribute to a company by facilitating access to external knowledge spillovers and their absorption in the company, since they are experts in their particular fields. King et al. (2016) report that management education enables bank CEOs achieve superior performance when compared to their peers.

In terms of growth, only the turnover growth is influenced by education, but the pattern is surprising in a way – the companies with 'balanced' ownership structure or company representatives' group. Similarly, Barney (1991) and Galunic and Rjordan (1998) suggest that the diversity in company's workforce contributes to its business results; the human capital diversity provides a source for competitive advantage as it combines specific expertise and social skills.

CONCLUSION

The paper tests the impact of gender diversity and educational attainment of the owners and company agents on the performance of private firms. The sample of mainly small and medium sized companies from transitional economy of Slovakia covering the period 2012-2014 is utilized. The topic is approached from several aspects – the efficiency is assessed using the production function approach, growth is explored along two dimensions of turnover and total assets and finally the impact of the gender and education diversity on companies' survival is evaluated.

Our findings support those from earlier studies that the impact of the education and gender depends on the broader context. The gender diversity both in owners and company agents within a company leads to higher total factor productivity. However, the companies with higher proportion of females in ownership structure or among company agents tend to grow less, and this result was confirmed along both turnover and total assets dimensions. Surprisingly, given higher risk aversion of females, the default of companies is affected by gender diversity only marginally. In terms of educational attainment, companies with the higher proportions of owners or company agents with university education are much more productive when compared to the companies led or owned by people without any university degree. On the contrary, we do not find evidence that growth or the default of companies are affected.

From the wider viewpoint, our results suggest that even though gender diversity may contribute to higher productivity of companies, higher proportion of females may hamper their growth. These issues have to be taken into account when tailoring the economic policy, e.g. imposing gender quotas. Regarding the effect of university education, since it contributes to much higher productivity and at the same time does not hinder the growth, the owners and company agents are to be encouraged to increase their human capital by gaining an university education.

FIGURE 1
Number of Limited Liabilities Companies in Slovakia

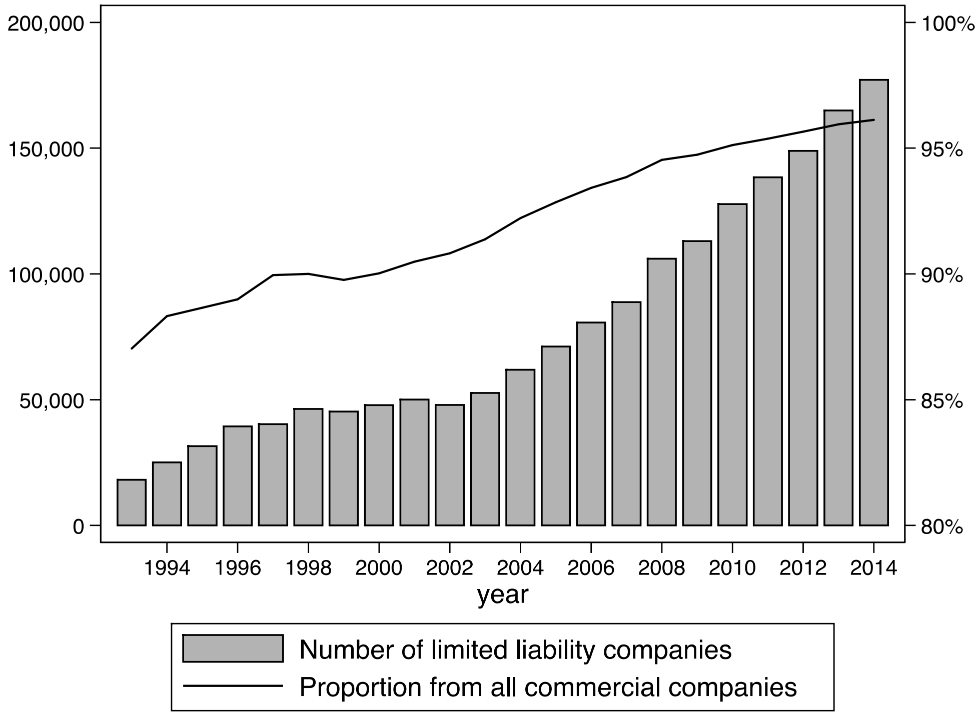

TABLE 1
Definition of Variables

Variable	Definition
Productivity model – control variables	
Real value added (log)	Natural logarithm of value added deflated to 2012 prices (GDP deflator) – dependent variable
Labour (number of employees, log)	Natural logarithm of number of employees
Capital (real fixed assets, log)	Natural logarithm of fixed assets deflated to 2012 prices (GDP deflator)
Growth models – control variables	
Real turnover growth	Compound annual growth rate of turnover deflated to 2012 prices (GDP deflator) – dependent variable
Real total assets growth	Compound annual growth rate of total assets deflated to 2012 prices (GDP deflator) – dependent variable
Size (Turnover, log)	Natural logarithm of turnover
Size (Total assets, log)	Natural logarithm of total assets
Total debt/ Total assets (w)	Total debt divided by total assets, winsorized at 5% and 95%
Age (in years)	Age of the company – difference between the year of financial statements and the year when the company was founded
HHI (turnover)	Hirschman-Herfindahl index calculated for each year and industry sector (21 sectors based on two-digit NACE codes, see TABLE 12)
Bratislava region indicator	Indicator equal to one if the company has its registered address in Bratislava region, zero otherwise
Diversification indicator	Indicator of activities in more industrial sectors (21 sectors based on two-digit NACE codes, see TABLE 12), equal to one if the company is active in more than one sector, zero otherwise
Default model – control variables	
Default indicator	Indicator of default, equal to one if the company defaulted in the year following the submission of financial statement
Financial variables	
Cash/ Total Assets (w)	Cash and bank accounts divided by total assets, winsorized at 5% and 95%
Trade Creditors/ Total Liabilities (w)	Accounts payable divided by total liabilities, winsorized at 5% and 95%
Pre-tax profit/ Total Assets (w)	Pre-tax profit divided by total assets, winsorized at 5% and 95%
Net Worth/ Total Assets (w)	Net worth (equity) divided by total assets, winsorized at 5% and 95%
Size (Total assets, log)	Natural logarithm of total assets
Non-financial variables	
Age (in years)	Age of the company – difference between the year of financial statements and the year when the company was founded
Manufacturing sector indicator	Indicator of manufacturing industry sector, equal to one if two-digit NACE code ranged from 10 to 33, zero otherwise
Construction sector indicator	Indicator of construction industry sector, equal to one if two-digit NACE code ranged from 41 to 43, zero otherwise
Experimental variables	
Female – owners	Proportion of females among company owners, equal to number of female company owners divided by number of all owners
Female – owners (0.34 – 0.66)	Equal to one if proportion of females among company owners is between 0.34 and 0.66, zero otherwise
Female – owners (over 0.66)	Equal to one if proportion of females among company owners is higher than 0.66, zero otherwise
Female – company agents	Proportion of females among company agents, equal to number of female company agents divided by number of all company agents
Female – company agents (0.34 – 0.66)	Equal to one if proportion of females among company agents is between 0.34 and 0.66, zero otherwise
Female – company agents (over 0.66)	Equal to one if proportion of females among company agents is higher than 0.66, zero otherwise
Education – owners	Proportion of company owners with university education, equal to number of company owners with university education divided by number of all owners
Education – owners (0.34 – 0.66)	Equal to one if proportion of company owners with university education is between 0.34 and 0.66, zero otherwise
Education – owners (over 0.66)	Equal to one if proportion of company owners with university education is higher than 0.66, zero otherwise
Education – company agents	Proportion of company agents with university education, equal to number of company agents with university education divided by number of all company agents
Education – company agents (0.34 – 0.66)	Equal to one if proportion of company agents with university education is between 0.34 and 0.66, zero otherwise
Education – company agents (over 0.66)	Equal to one if proportion of company agents with university education is higher than 0.66, zero otherwise

TABLE 2
Descriptive statistics of dependent and control variables

Panel A: Production function model (N = 148,989)

Variable	Mean	S.D.	1st quartile	median	3rd quartile
Real value added (log)	10.419	1.689	9.417	10.473	11.480
Labour (number of employees, log)	0.967	1.246	0.000	0.000	2.079
Capital (real fixed assets, log)	10.318	1.984	9.019	10.135	11.621

Panel B: Growth models (N = 81,844)

Variable	Mean	S.D.	1st quartile	median	3rd quartile
Real turnover growth	0.070	0.560	-0.184	0.009	0.219
Real total assets growth	0.152	0.460	-0.100	0.038	0.269
Size1 (Turnover, log)	11.076	1.997	9.932	11.078	12.348
Size2 (Total assets, log)	11.011	1.790	9.745	10.881	12.185
Total debt/ Total assets (w)	0.841	0.792	0.333	0.719	0.983
Age (in years)	6.482	5.360	2.000	5.000	9.000
HHI (turnover)	111.434	163.450	18.996	58.173	101.898
Bratislava region indicator	0.303	0.459	-	-	-
Diversification indicator	0.899	0.301	-	-	-

Panel C: Default model (N = 237,956)

Variable	Mean	S.D.	1st quartile	median	3rd quartile
Default indicator	0.002	0.040	-	-	-
Cash/ Total Assets (w)	0.337	0.328	0.053	0.215	0.573
Trade Creditors/ Total Liabilities (w)	0.291	0.322	0.016	0.151	0.510
Pre-tax profit/ Total Assets (w)	-0.016	0.307	-0.066	0.012	0.121
Net Worth/ Total Assets (w)	0.128	0.840	0.004	0.272	0.673
Size (Total assets, log)	11.004	1.932	9.678	10.898	12.285
Age (in years)	6.875	5.513	3.000	5.000	9.000
Manufacturing sector indicator	0.053	0.225	-	-	-
Construction sector indicator	0.038	0.190	-	-	-

Note:
The table shows descriptive statistics of control variables used in the employed model approaches – production function, growth and default models. The variables are defined in Table 1. The second and third column display mean and standard deviation. The last three columns show quartiles for a given model/ sample.

TABLE 3
Descriptive statistics of experimental variables

Panel A: Production function model

Variable	N	Mean	S.D.	Less than 0.34	0.34 to 0.66	Over 0.66
Female – owners	148,989	0.271	0.376	95,652	27,679	25,658
Female – company agents	148,989	0.252	0.375	99,477	24,940	24,572
Education – owners	137,655	0.460	0.460	66,992	14,758	55,905
Education – company agents	137,655	0.468	0.467	66,268	13,688	57,699

Panel B: Growth models

Variable		Mean	S.D.	Less than 0.34	0.34 to 0.66	Over 0.66
Female – owners	81,844	0.276	0.384	52,563	14,235	15,046
Female – company agents	81,844	0.259	0.385	54,690	12,545	14,609
Education – owners	74,773	0.445	0.461	37,634	7,710	29,429
Education – company agents	74,773	0.452	0.468	37,448	7,003	30,322

Panel C: Default model

Variable		Mean	S.D.	Less than 0.34	0.34 to 0.66	Over 0.66
Female – owners	237,956	0.269	0.383	155,481	39,312	43,163
Female – company agents	237,956	0.253	0.383	161,271	34,631	42,054
Education – owners	213,002	0.443	0.461	107,741	21,717	83,544
Education – company agents	213,002	0.450	0.468	107,190	19,738	86,074

Note:
The table shows descriptive statistics of experimental variables. The experimental variables are described in table 1. The second and third column display mean and standard deviation. The last three columns show frequencies of company-year observations with values of experimental variables from given interval.

TABLE 4
Production function models

Sample:	All companies			Inland owned companies	
	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Real value added (log)	Real value added (log)	Real value added (log)	Real value added (log)	Real value added (log)
Labour (number of employees, log)	0.714***	0.714***	0.715***	0.708***	0.707***
	(184.51)	(183.99)	(184.02)	(177.39)	(177.17)
Capital (real fixed assets, log)	0.236***	0.236***	0.236***	0.234***	0.233***
	(86.99)	(86.95)	(87.07)	(83.68)	(83.44)
Female – owners (0.34 – 0.66)		0.0777***			
		(6.93)			
Female – owners (over 0.66)		0.0150			
		(1.23)			
Female – company agents (0.34 – 0.66)			0.104***		
			(8.90)		
Female – company agents (over 0.66)			0.0406***		
			(3.31)		
Education – owners (0.34 – 0.66)				0.200***	
				(13.29)	
Education – owners (over 0.66)				0.356***	
				(37.52)	
Education – company agents (0.34 – 0.66)					0.220***
					(14.21)
Education – company agents (over 0.66)					0.355***
					(37.66)
Constant	7.296***	7.276***	7.263***	7.141***	7.144***
	(275.45)	(270.20)	(269.38)	(260.55)	(260.81)
Observations	148,989	148,989	148,989	137,655	137,655
Companies	64,077	64,077	64,077	58,965	58,965
R^2	0.473	0.473	0.473	0.475	0.475
Standard errors	Clustered	Clustered	Clustered	Clustered	Clustered

Notes:
The table displays the estimated parameters of micro-production functions. The dependent variable is the logarithm of value added in constant prices. The description of variables is in Table 1. The parameters are estimated using OLS (ordinary least squares) method. ***,**,* indicate coefficients are significant at the 1%, 5% and 10% levels respectively (two-tailed tests, t-statistics in parentheses, calculated using clustered standard errors).

TABLE 5
Growth models (turnover)

Sample:	All companies			Inland owned companies	
	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Real turnover growth	Real turnover growth	Real turnover growth	Real turnover growth	Real turnover growth
Size (Turnover, log)	-0.0651***	-0.0658***	-0.0658***	-0.0677***	-0.0677***
	(-47.58)	(-47.73)	(-47.72)	(-46.59)	(-46.60)
Total debt/ Total assets (w)	-0.0114***	-0.0116***	-0.0117***	-0.0107***	-0.0106***
	(-3.83)	(-3.92)	(-3.93)	(-3.47)	(-3.43)
Age (in years)	-0.00449***	-0.00457***	-0.00460***	-0.00466***	-0.00467***
	(-12.55)	(-12.75)	(-12.84)	(-12.47)	(-12.50)
HHI (turnover)	0.0000182	0.0000141	0.0000148	0.0000107	0.0000107
	(1.56)	(1.22)	(1.27)	(0.87)	(0.87)
Bratislava region indicator	0.00181	0.00233	0.00280	0.00224	0.00214
	(0.42)	(0.54)	(0.65)	(0.50)	(0.48)
Diversification indicator	0.0212***	0.0206***	0.0204***	0.0158***	0.0158***
	(3.67)	(3.57)	(3.53)	(2.63)	(2.62)
Female – owners (0.34 – 0.66)		-0.0189***			
		(-3.98)			
Female – owners (over 0.66)		-0.0389***			
		(-7.77)			
Female – company agents (0.34 – 0.66)			-0.0110**		
			(-2.25)		
Female – company agents (over 0.66)			-0.0394***		
			(-7.81)		
Education – owners (0.34 – 0.66)				0.0153**	
				(2.38)	
Education – owners (over 0.66)				0.00611	
				(1.46)	
Education – company agents (0.34 – 0.66)					0.0192***
					(2.88)
Education – company agents (over 0.66)					0.00776*
					(1.87)
Constant	0.808***	0.828***	0.827***	0.842***	0.842***
	(48.06)	(48.03)	(47.94)	(46.91)	(46.91)
Observations/ companies	81,844	81,844	81,844	74,773	74,773
R^2	0.0618	0.0625	0.0624	0.0666	0.0666
Standard errors	Robust	Robust	Robust	Robust	Robust

Note:
The table displays the estimated parameters of growth (turnover) models. The dependent variable is the cumulated average growth rate of real turnover over two years. The description of variables is in Table 1. The parameters are estimated using OLS (ordinary least squares) method. ***,**,* indicate coefficients are significant at the 1%, 5% and 10% levels respectively (two-tailed tests, t-statistics in parentheses, calculated using robust standard errors).

TABLE 6
Growth models (total assets)

Sample:	All companies			Inland owned companies	
	(1)	(2)	(3)	(4)	(5)
Dependent variable:	Real total assets growth	Real total assets growth	Real total assets growth	Real total assets growth	Real total assets growth
Size (Total assets, log)	-0.0684***	-0.0697***	-0.0698***	-0.0686***	-0.0686***
	(-65.29)	(-65.84)	(-65.88)	(-62.07)	(-62.01)
Total debt/ Total assets (w)	-0.00272	-0.00337	-0.00349	-0.000922	-0.000839
	(-1.02)	(-1.26)	(-1.30)	(-0.33)	(-0.30)
Age (in years)	-0.00723***	-0.00724***	-0.00728***	-0.00701***	-0.00702***
	(-24.98)	(-24.98)	(-25.14)	(-23.00)	(-23.04)
HHI (turnover)	0.00000597	0.000000668	0.000000902	0.00000629	0.00000624
	(0.65)	(0.07)	(0.10)	(0.64)	(0.64)
Bratislava region indicator	0.00785**	0.00841**	0.00889***	0.00692*	0.00681*
	(2.27)	(2.44)	(2.58)	(1.92)	(1.89)
Diversification indicator	0.0181***	0.0177***	0.0176***	0.0183***	0.0184***
	(3.93)	(3.85)	(3.82)	(3.78)	(3.79)
Female – owners (0.34 – 0.66)		-0.0312***			
		(-8.04)			
Female – owners (over 0.66)		-0.0476***			
		(-11.53)			
Female – company agents (0.34 – 0.66)			-0.0326***		
			(-8.11)		
Female – company agents (over 0.66)			-0.0494***		
			(-11.82)		
Education – owners (0.34 – 0.66)				0.000630	
				(0.12)	
Education – owners (over 0.66)				0.000438	
				(0.13)	
Education – company agents (0.34 – 0.66)					-0.000758
					(-0.14)
Education – company agents (over 0.66)					0.00184
					(0.55)
Constant	0.935***	0.964***	0.965***	0.930***	0.930***
	(75.13)	(75.20)	(75.29)	(70.97)	(70.94)
Observations/ companies	81,844	81,844	81,844	74,773	74,773
R^2	0.0944	0.0961	0.0962	0.0939	0.0939
Standard errors	Robust	Robust	Robust	Robust	Robust

Note:
The table displays the estimated parameters of growth (total assets) models. The dependent variable is the cumulated average growth rate of real total assets over two years. The description of variables is in Table 1. The parameters are estimated using OLS (ordinary least squares) method. ***,**,* indicate coefficients are significant at the 1%, 5% and 10% levels respectively (two-tailed tests, t-statistics in parentheses, calculated using robust standard errors).

TABLE 7
Default models

Sample:	All companies			Inland owned companies	
	(1)	(2)	(3)	(4)	(5)
Dependent variable:	default	default	default	default	default
Cash/ Total Assets (w)	-1.227***	-1.233***	-1.231***	-1.421***	-1.407***
	(-3.39)	(-3.41)	(-3.41)	(-3.44)	(-3.41)
Trade Creditors/ Total Liabilities (w)	1.500***	1.491***	1.479***	1.613***	1.610***
	(10.66)	(10.62)	(10.53)	(10.39)	(10.34)
Pre-tax profit/ Total Assets (w)	-2.022***	-2.020***	-2.018***	-2.080***	-2.077***
	(-7.86)	(-7.87)	(-7.87)	(-7.28)	(-7.28)
Net Worth/ Total Assets (w)	-0.732***	-0.729***	-0.727***	-0.750***	-0.749***
	(-9.49)	(-9.47)	(-9.45)	(-8.71)	(-8.72)
Size (Total assets, log)	0.510***	0.507***	0.506***	0.544***	0.545***
	(12.04)	(11.90)	(11.91)	(10.90)	(10.86)
Age (in years)	0.0388***	0.0389***	0.0391***	0.0290***	0.0297***
	(4.77)	(4.81)	(4.82)	(3.20)	(3.29)
Manufacturing sector	0.712***	0.710***	0.709***	0.773***	0.770***
	(4.55)	(4.54)	(4.53)	(4.60)	(4.58)
Construction sector	1.023***	1.008***	1.002***	0.959***	0.952***
	(6.47)	(6.38)	(6.33)	(5.70)	(5.67)
Female – owners (0.34 – 0.66)		-0.201			
		(-1.28)			
Female – owners (over 0.66)		-0.123			
		(-0.77)			
Female – company agents (0.34 – 0.66)			-0.426**		
			(-2.31)		
Female – company agents (over 0.66)			-0.0815		
			(-0.51)		
Education – owners (0.34 – 0.66)				-0.184	
				(-0.93)	
Education – owners (over 0.66)				0.127	
				(1.05)	
Education – company agents (0.34 – 0.66)					-0.0507
					(-0.26)
Education – company agents (over 0.66)					0.0418
					(0.35)
Constant	-13.68***	-13.58***	-13.56***	-14.07***	-14.07***
	(-24.62)	(-24.19)	(-24.21)	(-21.63)	(-21.65)
Observations	237,956	237,956	237,956	213,002	213,002
Companies	108,821	108,821	108,821	96,810	96,810
Log-likelihood	-2,430.4	-2,429.3	-2,427.4	-2,072.7	-2,074.0
Defaulted	390	390	390	334	334
Area under ROC curve	0.866	0.867	0.867	0.871	0.871
Standard errors	Clustered	Clustered	Clustered	Clustered	Clustered

Notes:
The table displays the estimated parameters of default models. The dependent variable is binary, equal to one if the company defaulted, zero otherwise. The description of variables is in Table 1. The parameters are estimated using logistic regression. ***,**,* indicate coefficients are significant at the 1%, 5% and 10% levels respectively (two-tailed tests, z-statistics in parentheses, calculated using clustered standard errors).

TABLE 8
Sensitivity analysis - production function

	Original models	Industry cluster 1	Industry cluster 2	Industry cluster 3	Industry cluster 4	Common sample
Models (2)						
Female – owners (0.34 – 0.66)	0.0777***	0.0293	0.0785***	-0.0344	0.111***	0.0814***
	(6.93)	(1.46)	(3.75)	(-1.13)	(5.26)	(5.31)
Female – owners (over 0.66)	0.0150	-0.168***	-0.0472**	-0.0567*	0.0529***	0.0352**
	(1.23)	(-5.95)	(-1.99)	(-1.91)	(2.60)	(2.10)
Models (3)						
Female – company agents (0.34 – 0.66)	0.104***	0.0319	0.0944***	-0.00849	0.151***	0.0950***
	(8.90)	(1.45)	(4.28)	(-0.27)	(7.08)	(5.94)
Female – company agents (over 0.66)	0.0406***	-0.110***	-0.00466	-0.0676**	0.0578***	0.0483***
	(3.31)	(-3.79)	(-0.19)	(-2.24)	(2.84)	(2.84)
Models (4)						
Education – owners (0.34 – 0.66)	0.200***	0.140***	0.236***	0.0343	0.355***	0.222***
	(13.29)	(5.61)	(8.60)	(0.86)	(11.02)	(10.78)
Education – owners (over 0.66)	0.356***	0.206***	0.308***	0.153***	0.521***	0.384***
	(37.52)	(11.60)	(16.38)	(5.89)	(25.49)	(29.18)
Models (5)						
Education – company agents (0.34 – 0.66)	0.220***	0.161***	0.278***	0.0230	0.360***	0.237***
	(14.21)	(6.30)	(9.98)	(0.55)	(10.73)	(11.17)
Education – company agents (over 0.66)	0.355***	0.203***	0.310***	0.149***	0.526***	0.384***
	(37.66)	(11.56)	(16.58)	(5.82)	(25.68)	(29.30)

The table shows the estimated coefficients for the experimental variables for the production function models. The variables are described in Table 1. The specification of the models is the same as in TABLE 4. The coefficients for control variables and summary model statistics are not reported (they are available from authors upon request). The second column displays the coefficients of experimental variables from the models in TABLE 4 for the sake of comparison. The third, fourth, fifth and sixth column show estimated parameters for the models for clusters of industry sectors with similar proportions of female owners and company agents (the details of the clusters are reported in TABLE 13). Finally, in the last column there are estimated parameters for the sample in common to all the models (production function, growth and default models); unlike the models before this sample is cross-sectional. In all models, ***,**,* indicate that coefficients are significant at the 1%, 5% and 10% levels respectively (two-tailed tests) and t-statistics in parentheses are calculated using cluster robust standard errors (robust errors in cross-sectional models from last column).

TABLE 9
Sensitivity analysis – growth (turnover)

	Original models	Industry cluster 1	Industry cluster 2	Industry cluster 3	Industry cluster 4	Common sample
Models (2)						
Female – owners (0.34 – 0.66)	-0.0189***	-0.0166*	-0.0130	-0.0162	-0.0225**	-0.00593
	(-3.69)	(-1.65)	(-1.32)	(-1.25)	(-2.46)	(-1.15)
Female – owners (over 0.66)	-0.0389***	-0.0369***	-0.0217**	-0.0460***	-0.0439***	-0.0332***
	(-7.70)	(-3.08)	(-2.16)	(-3.70)	(-5.38)	(-6.10)
Models (3)						
Female – company agents (0.34 – 0.66)	-0.0110**	-0.0166	0.00445	-0.0114	-0.0140	-0.0106**
	(-2.04)	(-1.55)	(0.43)	(-0.83)	(-1.49)	(-1.99)
Female – company agents (over 0.66)	-0.0394***	-0.0153	-0.0317***	-0.0529***	-0.0424***	-0.0330***
	(-7.73)	(-1.23)	(-3.11)	(-4.24)	(-5.22)	(-5.99)
Models (4)						
Education – owners (0.34 – 0.66)	0.0153**	0.0346***	0.0233*	-0.00756	0.0175	0.00919
	(2.29)	(2.78)	(1.81)	(-0.47)	(1.35)	(1.35)
Education – owners (over 0.66)	0.00611	0.0265***	0.0119	-0.00239	0.0142*	-0.000185
	(1.46)	(3.17)	(1.40)	(-0.22)	(1.80)	(-0.04)
Models (5)						
Education – company agents (0.34 – 0.66)	0.0192***	0.0396***	0.0241*	-0.0255	0.0377***	0.0112
	(2.77)	(3.06)	(1.82)	(-1.49)	(2.80)	(1.60)
Education – company agents (over 0.66)	0.00776*	0.0290***	0.0133	0.00576	0.0121	0.000379
	(1.86)	(3.51)	(1.57)	(0.54)	(1.54)	(0.09)

The table shows the estimated coefficients for the experimental variables for the production function models. The variables are described in Table 1. The specification of the models is the same as in TABLE 5. The coefficients for control variables and summary model statistics are not reported (they are available from authors upon request). The second column displays the coefficients of experimental variables from the models in TABLE 5 for the sake of comparison. The third, fourth, fifth and sixth column show estimated parameters for the models for clusters of industry sectors with similar proportions of female owners and company agents (the details of the clusters are reported in TABLE 13). Finally, in the last column there are estimated parameters for the sample in common to all the models (production function, growth and default models). In all models, ***,**,* indicate that coefficients are significant at the 1%, 5% and 10% levels respectively (two-tailed tests) and t-statistics in parentheses are calculated using robust standard errors.

TABLE 10
Sensitivity analysis – growth (total assets)

	Original models	Industry cluster 1	Industry cluster 2	Industry cluster 3	Industry cluster 4	Common sample
Models (2)						
Female – owners (0.34 – 0.66)	-0.0312***	-0.0246***	-0.0393***	-0.0165	-0.0339***	-0.0233***
	(-7.55)	(-3.05)	(-5.12)	(-1.59)	(-4.30)	(-5.28)
Female – owners (over 0.66)	-0.0476***	-0.0236**	-0.0420***	-0.0386***	-0.0628***	-0.0344***
	(-11.67)	(-2.47)	(-5.35)	(-3.89)	(-8.92)	(-7.36)
Models (3)						
Female – company agents (0.34 – 0.66)	-0.0326***	-0.0288***	-0.0404***	-0.0166	-0.0332***	-0.0214***
	(-7.52)	(-3.36)	(-5.00)	(-1.52)	(-4.12)	(-4.68)
Female – company agents (over 0.66)	-0.0494***	-0.0202**	-0.0430***	-0.0463***	-0.0630***	-0.0340***
	(-12.01)	(-2.04)	(-5.39)	(-4.63)	(-8.98)	(-7.17)
Models (4)						
Education – owners (0.34 – 0.66)	0.000630	-0.00357	-0.00286	0.0171	0.00951	-0.0133**
	(0.12)	(-0.36)	(-0.28)	(1.31)	(0.85)	(-2.25)
Education – owners (over 0.66)	0.000438	0.00847	0.0129*	0.00868	0.00404	-0.00674*
	(0.13)	(1.26)	(1.93)	(0.99)	(0.59)	(-1.79)
Models (5)						
Education – company agents (0.34 – 0.66)	-0.000758	-0.0103	0.00481	0.0106	0.00750	-0.0167***
	(-0.13)	(-0.99)	(0.46)	(0.77)	(0.65)	(-2.74)
Education – company agents (over 0.66)	0.00184	0.0128*	0.0112*	0.0119	0.00396	-0.00766**
	(0.54)	(1.93)	(1.69)	(1.38)	(0.58)	(-2.04)

The table shows the estimated coefficients for the experimental variables for the production function models. The variables are described in Table 1. The specification of the models is the same as in TABLE 6. The coefficients for control variables and summary model statistics are not reported (they are available from authors upon request). The second column displays the coefficients of experimental variables from the models in TABLE 6 for the sake of comparison. The third, fourth, fifth and sixth column show estimated parameters for the models for clusters of industry sectors with similar proportions of female owners and company agents (the details of the clusters are reported in TABLE 13). Finally, in the last column there are estimated parameters for the sample in common to all the models (production function, growth and default models). In all models, ***,**,* indicate that coefficients are significant at the 1%, 5% and 10% levels respectively (two-tailed tests) and t-statistics in parentheses are calculated using robust standard errors.

TABLE 11
Sensitivity analysis – default models

	Original models	Industry cluster 1	Industry cluster 2	Industry cluster 3	Industry cluster 4	Common sample
Models (2)						
Female – owners (0.34 – 0.66)	-0.201	0.0303	-0.279	-0.472	-0.836	-0.0565
	(-1.28)	(0.14)	(-0.96)	(-1.08)	(-1.12)	(-0.25)
Female – owners (over 0.66)	-0.123	-0.115	-0.114	-0.258	0.196	0.191
	(-0.78)	(-0.44)	(-0.40)	(-0.66)	(0.46)	(0.77)
Models (3)						
Female – company agents (0.34 – 0.66)	-0.426**	-0.0839	-0.701*	-1.069*	-0.259	-0.140
	(-2.31)	(-0.34)	(-1.89)	(-1.79)	(-0.41)	(-0.56)
Female – company agents (over 0.66)	-0.0815	-0.0885	-0.159	-0.0885	0.362	-0.119
	(-0.51)	(-0.32)	(-0.54)	(-0.24)	(0.84)	(-0.41)
Models (4)						
Education – owners (0.34 – 0.66)	-0.184	0.00990	-0.716	0.165	-0.1000	-0.126
	(-0.93)	(0.04)	(-1.51)	(0.32)	(-0.16)	(-0.50)
Education – owners (over 0.66)	0.127	0.242	0.178	0.386	-0.515	-0.561***
	(1.05)	(1.39)	(0.80)	(1.17)	(-1.21)	(-2.83)
Models (5)						
Education – company agents (0.34 – 0.66)	-0.0507	-0.0324	-0.241	-0.00705	0.414	-0.0962
	(-0.26)	(-0.12)	(-0.62)	(-0.01)	(0.72)	(-0.38)
Education – company agents (over 0.66)	0.0418	0.188	0.0452	0.168	-0.451	-0.601***
	(0.35)	(1.08)	(0.20)	(0.51)	(-1.05)	(-3.04)

The table shows the estimated coefficients for the experimental variables for the production function models. The variables are described in Table 1. The specification of the models is the same as in TABLE 7 (with exception of models for clusters 2, 3 and 4 where the indicators of manufacturing and construction sectors were omitted). The coefficients for control variables and summary model statistics are not reported (they are available from authors upon request). The second column displays the coefficients of experimental variables from the models in TABLE 7 for the sake of comparison. The third, fourth, fifth and sixth column show estimated parameters for the models for clusters of industry sectors with similar proportions of female owners and company agents (the details of the clusters are reported in TABLE 13). Finally, in the last column there are estimated parameters for the sample in common to all the models (production function, growth and default models); hence the sample is cross-sectional in this case. In all models, ***,**,* indicate that coefficients are significant at the 1%, 5% and 10% levels respectively (two-tailed tests) and z-statistics in parentheses are calculated using cluster robust standard errors (robust errors in cross-sectional models from last column).

TABLE 12
Industry sector classification

Industry sector	NACE two-digit code	Observations
A - Agriculture, Forestry And Fishing	01-03	4,874
B - Mining And Quarrying	05-09	220
C - Manufacturing	10-33	22,762
D - Electricity, Gas, Steam And Air Conditioning Supply	35	487
E - Water Supply; Sewerage, Waste Management And Remediation Activities	36-39	1,013
F - Construction	41-43	23,580
G - Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles	45-47	75,466
H - Transportation And Storage	49-53	11,079
I - Accommodation And Food Service Activities	55, 56	9,544
J - Information And Communication	58-63	14,445
K - Financial And Insurance Activities	64-66	961
L - Real Estate Activities	68	15,341
M - Professional, Scientific And Technical Activities	69-75	47,879
N - Administrative And Support Service Activities	77-82	21,603
O - Public Administration And Defence; Compulsory Social Security	84	9
P - Education	85	3,354
Q - Human Health And Social Work Activities	86-88	13,561
R - Arts, Entertainment And Recreation	90-93	3,249
S - Other Service Activities	94-96	3,036
T - Activities Of Households As Employers; Undifferentiated Goods	97-98	0
U - Activities Of Extraterritorial Organisations And Bodies	99	0

Note:
This classification is based on classification of economic activities used in European Community (EC, 2008:57). In this classification, industry sector corresponds to *section* and NACE two-digit code to *division*.

TABLE 13
Clustering of industry sectors for sensitivity analysis

Cluster	Industry sector	Observations	Proportion of females in owners	Proportion of females in comp. agents
1	O - Public Administration And Defence; Compulsory Social Security	9	0.00	0.00
1	F - Construction	23,580	0.14	0.11
1	B - Mining And Quarrying	220	0.14	0.11
1	D - Electricity, Gas, Steam And Air Conditioning Supply	487	0.15	0.14
1	E - Water Supply; Sewerage, Waste Management And Remediation Activities	1,013	0.18	0.15
1	J - Information And Communication	14,445	0.18	0.17
1	C - Manufacturing	22,762	0.19	0.17
1	A - Agriculture, Forestry And Fishing	4,874	0.20	0.17
1	H - Transportation And Storage	11,079	0.21	0.19
2	G - Wholesale And Retail Trade; Repair Of Motor Vehicles And Motorcycles	75,466	0.26	0.24
3	K - Financial And Insurance Activities	961	0.27	0.29
3	L - Real Estate Activities	15,341	0.28	0.26
3	R - Arts, Entertainment And Recreation	3,249	0.29	0.27
3	N - Administrative And Support Service Activities	21,603	0.29	0.27
3	I - Accommodation And Food Service Activities	9,544	0.29	0.28
4	M - Professional, Scientific And Technical Activities	47,879	0.33	0.31
4	P - Education	3,354	0.41	0.40
4	S - Other Service Activities	3,036	0.43	0.42
4	Q - Human Health And Social Work Activities	13,561	0.58	0.57

Note:
The table reports the clustering of the industry sectors for the purpose of sensitivity analysis. The first column shows the number of cluster, the second column shows the description of industry sector, the third column shows the number of company-year observations for companies having it as principal sector of economic activities, the fourth column shows the average proportion of female owners and the last one the proportion of female company agents. The sectors are sorted and clustered based on average proportion of female owners and the number of company-year observations.

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[1] Indeed several countries have legislated or recommended a minimum number of female directors on the boards of companies

[2] There are two types: a public joint stock company with shares listed on a stock market and freely transferable and a private joint stock company with stocks not publicly traded.

[3] The information about the educational attainment of the the owners and company agents was obtained indirectly from the academic titles before and after the names. This information is reliable for people of Slovakian origin because of the widespread practice of using these titles in Slovakia.

However, as we are aware that it is much less practiced outside of Slovakia, in models using the experimental variables related to education the sample is limited to companies with inland ownership where the probability of owners or company agents outside Slovakia is greatly reduced.

[4] The neoclassical theory of production function assumes that the marginal product of labour and capital are positive (hence the coefficient should be positive) and subject to law of diminishing returns (hence the coefficient should be smaller than one).

[5] Since the dependent variable is in the form of logarithm and the corresponding explanatory variable is binary, if the coefficient is multiplied by 100, it may be interpreted as percentage increase in dependent variable if the explanatory variable changes its value from zero to one.

[6] As it turned out, the clustering based on proportions of females among company agents would yield exactly same results, see TABLE 13 for details.

[7] We knew the information about the company owners and company agents only at the beginning of the sample period (as of March 2013) and even though the limited liability companies do not change the owners and company agents very often, these changes were not captured and in theory could bias the results, as well.