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**PROBABILITY OF BANKRUPTCY IN SMALL FIRMS AND  
COST EFFICIENCY – THE CASE OF SLOVENIA**

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**Principal Topic**

Recent entrepreneurship praxis as well as entrepreneurship research have concentrated on one of the fundamental issues: business failures. Existing research has focused on investigating determinants of the mortality of firms (Beaver, 1966, Altman, 1968, Zmijewsky, 1984, Frydman et al., 1985, Gentry et al., 1987) in two samples of firms, namely firms that survive in a particular year and firms that went bankrupt in this particular year. They aim to classify a sample of firms on the basis of balance sheet data (financial data) and nonfinancial data. Despite different opinions expressed by authors, these research activities argue that financial data alone could not explain the failure or nonfailure of the firm (Zavgren, 1987, Keasey and Watson, 1987). As one of the determinants of bankruptcy risk Becchetti and Sierra (2003) have investigated productive efficiency by adopting stochastic frontier approach (Battese and Coelli, 1995). Their findings indicate that a firm's productive efficiency has significant explanatory power in predicting bankruptcy.

In this perspective, the authors try to answer three questions: (1) whether the probability of bankruptcy could be explained by cost efficiency, measured by data envelopment analysis (DEA), (2) with what time lag cost efficiency effects bankruptcy, and (3) in what way cost efficiency must be analyzed to be able to estimate its predictive power on the probability of bankruptcy. According to the opinion of the authors, the inclusion of cost efficiency as the determinant of bankruptcy risk enables the analysis of the determinants, which arise from inside of firms (the combinations of factors of production, the scale of their use for producing a unit of production and their prices) and determinants arising from the market (output level and sales market prices), as cost efficiency indicates technical as well as allocative efficiency, both being the result of business process inside of firms.

In this perspective, by analyzing the probability of bankruptcy among small firms on the basis of cost efficiency authors determine the fault of bankruptcy as the consequence of business process inefficiency inside the firms and bad business performance on the sales markets. On the basis of financial ratios, we consider the following indices as determinants of business performance on the sales markets: liquidity, profitability, turnover, export, sales/industry sales rate and break-even point. The research is limited to a sample of small firms in Slovenia.

**Methodology/Key Propositions**

The paper investigates the probability of bankruptcy in a sample of Slovenian small firms in 2004. To estimate the probability of bankruptcy we adopt a multinomial logit model and to estimate cost efficiency we use data envelopment analysis (DEA). Multinomial logit model is applied in two steps: first, we analyze the effect of financial data, indicating market circumstances,

on the probability of bankruptcy of small firms in Slovenia, and second, we extend the model by analyzing the predictive power of cost efficiency on the probability of bankruptcy.

According to the availability of data we took into consideration only financial data, calculated on the basis of balance sheet data of Slovenian small firms as published by the official agency AIPES. Sample is numerically unbalanced, but generated randomly, which affects intercept but not the regressors' coefficients (Maddala, 1992). The data are calculated as a three-year trend for the period 2001-2004. In this perspective, the predictive power of determinants of probability of bankruptcy is measured by coefficients (Betas). This is not the case of cost efficiency data, which are collected in four different ways, as data for particular year in the period from 2001 to 2004 and as trend data for the period 2001-2004. For trend data we generate dummy variables with a value of one if the trend is an up-trend and down-trend and zero in all other cases. Data on cost efficiency were calculated in two steps: first, we calculated cost efficiency by data envelopment analysis for the whole population of small firms in Slovenia in observed years, and second, we calculated the distance of cost efficiency ratio for a particular firm from the average cost efficiency ratio of the industry. In this perspective, authors eliminated the influence of industry specific technology on cost efficiency ratio of the particular firm.

### **Results and Implications**

The paper investigates the probability of bankruptcy in particular historical circumstances of the country in transition – Slovenia, where the share of small firms in the size structure of firms was not substantial up to the end of 1980s. In Slovenia, small firms began to emerge at the beginning of the transition process in early 1990s. This beginning was impetuous; for example, the rate of growth of the number of small firms was 800 percent in 1992 (Tajnikar, 1994). The boom in the number of small business lasted up to the middle of 1990s. In this period, the mortality rate of small firms was very low as modest competition enabled high rate of the survival of small firms. The (non-)survival of small firms, therefore, became a problem and consequently a relevant research phenomenon in Slovenia at the end of 1990s, when the number of small firms stopped increasing and the size structure of Slovenian firms became similar to the firm size structure of developed economies. Nevertheless, there has been no research addressing the issue in Slovenia so far (Tajnikar, 2001).

Authors are convinced that the findings of the paper are not relevant only for Slovenia. The results of the research could add an important contribution to the understanding of the behavior of bankruptcy firms in transition countries for at least two reasons. First, most transition countries are faced with similar conditions as Slovenia. Second, the research on bankruptcy risk and survival of firms has so far been limited to developed countries. A relevant difference of our research when compared with other studies is also its focus on the analysis of small firms, which face a higher bankruptcy risk rate than other firms.

The contribution of our paper to the ongoing debate on bankruptcy risk lies also in the new approach to the measurement of efficiency of firms. In our paper, the efficiency is not measured by the stochastic frontier approach but by cost efficiency, measured by the DEA indicators. The main hypothesis of our paper is that cost efficiency, measured by the DEA indicators, adds additional

explanatory power to predicting business failure. Econometric findings support the hypothesis and could provide an answer to the question, to what extent the fault for the failure of small firms is the result of inefficient business decisions inside the firms and to what extent the result of bad business decisions on the market. The findings could, along with the similar research of cost efficiency of medium-sized and large firms, also indicate the differences in threats posed to firms because of their size.

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