Firm Performance and Selection in an Emerging Economy:

Micro Evidence from Slovenia

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1. Introduction

The collapse in output in the early transition period from plan to market in Central and Eastern Europe and the subsequent growth performance has been the topic of substantial theoretical and empirical work in recent years (for an excellent survey see Djankov and Murrell,2002). Three of the main institutional changes – privatization of the state sector, opening to trade and hardening of budget constraints - that characterized the transition from plan to market have been considered as some of the key elements in explaining the economic performance of emerging economies[1]. Empirically, however, there is still no consensus about the effects these factors have had on firm performance in transition economies (for an overview see Estrin, 2002). This paper analyzes these issues for one of the most successful transition economies, Slovenia. Slovenia is a small open economy and a former republic of the Yugoslav Federation, from which it became independent in 1991. Slovenia's macroeconomic stabilization program started in 1992 and as the other transition economies it also experienced a sharp decline in its GDP in the early transition years. However, its recovery started early on and it is one of the few countries that have now reached a level of GDP, which is higher than its pre-transition level. GDP per capita is more than 60% of the EU average, which puts the Slovenian economy of all transition economies closest to the EU. Privatization of state owned enterprises started mostly in 1995 after a new law on privatization was adopted in November 1994 (EBRD, 1999). In 1995 the EU Association Agreements and EFTA Agreements were also signed. In December 2002 Slovenia was accepted as a future member of the EU whose membership is due to start in May 2004.

We believe this paper makes a number of new contributions relative to other work investigating firm performance in emerging economies. Previous studies mostly had to rely on

[1] Theoretical contributions include Boycko, Schleifer and Vishny (1996), Dewatripont and Roland (1995) among others. Roland (2000) provides a rather complete overview of theoretical contributions in this area.

small samples of firms - usually of a few hundreds - collected through surveys (e.g. Hersch et al., 1993; Frydman et al. 1999; Konings, 1997; Walsh and Whelan, 2001). An important problem of these studies is the potential survivorship bias present in these data. Yet, in emerging economies we would expect the least efficient firms to exit the market first. In contrast, this paper contains virtually the entire population of firms in Slovenia between 1994-98. This has the advantage of increased reliability of our results, moreover, the data allow us to identify firm survival and exit[2]. This enables us to study the effects of private ownership, competitive pressure and financial discipline on firm performance and selection. We believe that these three factors should be treated together as the mechanisms causing these factors to have an effect on firm performance are very similar: they tend to discipline managerial behavior and give incentives to improve performance. Most papers, however, have concentrated on one or two of these aspects, the focus being mostly on the effects of privatization (e.g. Kocenda and Svenjar, 2002 for a recent contribution). However, as Nickell and Nicolitsas (1999) have pointed out, financial constraints may act as a substitute for increased competitive pressure and improved corporate governance. We will take up these issues when we discuss our results. A final contribution of this study is that we are able to provide a better interpretation to the role small and private firms play in the growth performance in transition economies, taking into account potential selection effects. We are able to assess whether selection matters for a typical firm performance analysis and what factors drive firm selection. To our knowledge this is the first time that such an analysis is done.

Our main results are as follows: First, we find that survivorship bias in a typical firm performance (growth) equation is not statistically significant, which suggests that the results from existing work investigating firm performance of surviving firms only is unlikely to be biased. Second, small firms are more likely to exit than large firms, but once they survive they have higher growth performance. Third, Financially constrained firms and firms with a larger

[2] This paper belongs to a second generation of work using representative micro data sets to analyze transition issues as in Claessens and Djankov (2001), Kocenda and Svejnar (2002), Sabrianova, Svejnar and Terrell (2003), Konings, Van

share of their sales in international markets are also more likely to exit, but given they survive, financial constraints do not matter for performance, while firms that are more active in international markets have higher growth performance. Finally, we find that private firms have the highest survival rates and also the highest growth rates. Most of these private firms in our data are likely "de novo" private firms, although we cannot assess this given that we have no information on which firms are privatized and which ones are "de novo".

The paper is organized as follows. In the next section we discuss the data set, the framework that we use and the hypotheses that we want to test. Section 3 gives the results and section 4 concludes the paper.

2. Data, Framework and Hypotheses

Data

The data that we use are the company accounts of virtually all the manufacturing firms available at the Slovenian Central Statistical Office[3] in 1994 and which we could trace through to 1998. The data set includes a large number of very small and small firms with many firms employing less than 10 workers. A number of these firms do not however report complete information on employment and sales and thus are excluded from the analysis. Consequently, in 1994 we have information for 2742 firms (around 1000 with more than 10 workers), 237 of which did not survive till 1998.[4] Table 1 compares total employment in our data set for the year 1998, with total employment reported in the Slovenian statistical yearbook for the manufacturing sector and at each 2-digit sector for the total sample and for the sample of survivors only. It can be seen that we cover around 80% of the employment in manufacturing as a whole and more than that percentage in several 2-digit sectors[5]. In table 2 we show the number of firms that

Cayseele and Warzynski (2003).

[3] We thank Joze Damijan who kindly made this data set available for this research.

[4] Note that the use of all the explanatory variables decreases the sample to 2656 firms.

[5] Note that for the Chemical sector our coverage is more than 100%. This is because we include firms with less than 10 workers, while the official statistical yearbook only includes firms with more than 10 workers.

survived through 1998 and the number of firms that exited between 1994 and 1998. We can note that the exit rates vary between 0% (Tobacco products) and 19% (Apparel). The overall exit rate is 7.6%, which is comparable to exit rates reported for some market economies. In table 3 we show summary statistics of surviving and non-surviving firms. The average growth rate of surviving firms between 1994 and 1998 is 5%, but there is a substantial heterogeneity between firms in terms of their growth rate, given the high standard deviation of 20%. The average firm size in terms of employment is larger for surviving firms (66 workers) than for non-surviving firms (14.7 workers). We can also note that the profitability, measured as the ratio of net profits over sales or the profit margin, is much lower in non-surviving firms, -26%, than in surviving firms, -1.8%. We will discuss the remainder of table 3 as we introduce our hypotheses below.

Framework and Hypotheses

The framework that we adopt here is based on the growth of firms literature (Sutton, 1997), which explains firm performance (growth) on the basis of a passive learning process as modeled in Jovanovic (1982) and empirically validated by Evans (1987), Dunne, Roberts and Samuelson (1989) for the US and Hart and Oulton (1996) for the UK. The theoretical argument is based on a process of Bayesian updating of initial beliefs of individual firms' efficiency levels. The exact efficiency level a firm has is not known, but firms know the distribution of costs from which they got a draw. As time progresses they find out about their true cost parameters through a process of Bayesian updating of their initial beliefs. Efficient firms grow and survive, while inefficient firms shrink and exit the market. This may also be expected in an emerging market economy. If restructuring and reallocation of resources in an economy moving from plan to market occurs efficiently, we would expect that the existing pre-transition firms, large and potentially the least efficient, producing low quality and low demand commodities, will shrink and production will be replaced by new small and more efficient firms with more "fashionable"

goods which if they succeed are expected to grow with time. In terms of survival, the intuition of the Jovanovic's model (1982) is that firms enter with a size smaller than the industry's minimum efficiency scale and thus their survival is more difficult. Also, due to pre-entry uncertainty and ignorance towards their ability, firms only learn this after entering and they grow and continually revised their expectations. Thus, those that grow bigger are more likely to be efficient and survive. The empirical literature typically analyzes the relationship between firm growth and firm size in this context. We will also analyze such a relationship, but in addition we are interested how the typical transition features have had an impact on firm performance, measured as firm growth (i.e. firm level employment growth or sales growth).

Our modeling strategy starts from Evans (1987), where firm *i*'s size, *S*, in period *t'* is the following function of its size and age, *a*, in period *t*

$$S_{it'} = [G(S_{it}, a_{it})]^{d} S_{it} e_{it} \qquad (1)$$

which taking logs and applying a first order logarithmic approximation becomes

$$\frac{\ln S_{it'} - S_{it}}{d} = \ln G(S_{it}, a_{it}) + u_{it} \quad \text{with} \quad \ln G(S_{it}, a_{it}) = \alpha_0 + \alpha_1 \ln S_{it} + \alpha_2 \ln a_{it} + \varepsilon_{it} \qquad (2)$$

where subscript *i* stands for firm *i*, subscript *t* refers to the initial year (1994) and *t'* to the last year (1998) of the observations and *d* is the difference between the end and the first year of the analysis[6]. *Avrgremp*, the dependent variable, therefore stands for the four-year average employment growth of a firm. *S* stands for firm size and ε is a white noise error term. However, our main wish is to go a step further and, departing from this initial framework, explore which factors related to transition and the transition reforms and apart from initial firm size may determine the growth trajectory of the firm in the transition world and which factors determine its survival. We are particularly interested in studying if and in which matter the *ownership* of the firm, its *financial constraints* and the *competitive pressure* it faces impacted on the growth of firms in transition. Thus, we seek to estimate a more general equation (an augmented version of

equation 2 above) considering a number of variables that may capture firm growth in a transition economy such as Slovenia. Following *e.g.* Konings (1997) and Weiss (1999) type of augmented specification:

$$avrgremp = \frac{\ln S_{it'} - \ln S_{it}}{d} = \alpha_0 + \alpha_1 \ln S_{it} + \alpha_2 Own_{it} + \alpha_3 Fin_{it} + \alpha_4 Comp_{it} + \sum_{k=1}^{n} \beta_k Z_{kit} + \varepsilon_{it} \quad (3)$$

Own stands for firm ownership, *Fin* for firm level financial constraints and *Comp* for measures of competitive pressure. *Z* is a vector of control variables including firm level capital intensity and sector level (3-digit NACE industry classification) dummies (see below and the appendix for details on measurement and definitions of data). Note also that in (3) we do not control for the age of the firm as our data do not provide information on that firm characteristic. However, our size variable is likely to be highly correlated with firm age as newly established private firms are typically also small firms. Furthermore, many of our private firms are likely to be "de novo" private firms, which also is correlated with age.

Equation (3) constitutes our basic specification that we use in our estimations, although we also experimented using a logarithmic specification of the all explanatory variables (except for ownership) and a specification in which firm size is entered in a non-linear fashion, including its second and third powers. However, these extra robustness checks did not alter our basic results. It is important to note that estimating equation (3), that is, the average growth of firms between 1998 and 1994, using simple OLS estimation captures only the growth of those firms that survived up to 1998. This may pose a selection bias problem to the analysis that may potentially affect the results. Hence, we estimate (3) correcting for survivorship bias using Heckman's selection model. This allows us to investigate not only the determinants of firm growth, but also the determinants of firm survival in a transition context.

[6] We also experimented with a log specification of the other of all the variables, but this did not alter our basic results.

We proxy *size* by the log employment level in the firm - *Lemp94*. Previous work (*e.g.* Hart and Oulton, 1996) shows that employment is widely used and that sales, assets, and employment follow similar distributions. We also used the log sales to check the robustness of the results as in Hart and Oulton (1996), but our results were unaffected.

As mentioned, we are particularly interested in a number of transition-related variables, which may affect average firm growth, after controlling for size and potential selection bias. We thus focus on the following variables and hypotheses:

Ownership: It was generally believed that privatization would enhance economic performance as firms would move to profit maximizing / cost minimizing strategies while being cut off from political influence and subsidies. Boycko *et al.* (1996) and Frydman *et al.* (1999) for instance use firm level survey data to show that privatization of state owned enterprises (SOEs) has contributed to better firm performance, while Konings (1997), Richter and Schaffer (1997) among others demonstrates that "*de novo*" private firms, after controlling for size and age effects, have the highest growth rates. We include two ownership categories in our analysis: first, we consider a dummy equal to 1 if the firm is a private domestic firm and 0 else (*Private*); second, we include a dummy equal to 1 if the firm is a majority foreign owned one and 0 else (*Foreign*). The benchmark category refers to the state owned enterprises (*SOEs*). The information on foreign ownership allows us to test whether foreign firms perform better than their domestic counterparts. It has been argued that foreign firms possess some superior technology and expertise, which allows them to outperform domestic firms (Teece, 1977; Djankov and Hoekman, 1998). Furthermore, foreign owned firms operate in international competitive product markets, which may induce higher efficiency. Note that the ownership status of the firm refers to the year 1996, the first year for which we have consistent information. By construction, in our data set a firm that was privatized during the period under study kept the same id number while changing the ownership category. Note that we are unable to distinguish

between "de novo" and privatized firms for the year 1996 due to lack of information for 1994 and 1995 and hence cannot accurately detect the performance of each of the two groups (i.e. whether de novo performed better than privatized). However, we believe that most are "de novo" firms for two reasons: 1) 75%, 90%, 95% and 99% of the private firms in 1996 have respectively an average employment of 7, 12, 23 and 99 workers, pointing to a vast majority of very small firms (thus "de novo"); and 2) the privatization process of SOEs was slow and started later in Slovenia (in 1995 and 1996) so that it is likely that most ownership changes took place after 1996 (from 1996 to 1997 8% of the firms became private domestic and 3% became foreign firms).

Competitive Pressure: As suggested in the work on export led growth and in the work on trade orientation in transition economies of Repkine and Walsh (1999), firm activity in international markets may be a determining factor explaining firm performance. The argument is that firms that are active in export markets must have viable products in accordance to world standards and have potentially more growth opportunities given the market expansion they can achieve by selling abroad. Furthermore, firms operating in international markets face tougher international competition, which may enhance their performance. Other studies looking at the relationship between firm performance and competitive pressure (*e.g.* Aghion and Schankerman, 1999; Carlin *et al.*, 2001; Grosfeld and Tressel, 2001; Brown and Earle, 2001) argued that stronger competition may increase firm productivity and/or growth, the rationale being that competition increases the incentives for innovation and cost minimization/profit maximization practices.

We have information at the firm level on the fraction of the production of each firm that is sold in foreign markets[7] versus the fraction that is sold in their domestic market. We use this fraction as an indicator of the degree of trade a particular firm is doing in the initial stages of

[7] Although we do not have information on the destination of exports, it is however generally accepted that in 1994 Slovenia's most important trading partner was the EU area.

transition, 1994 (*Forsh94*). This variable enables us to understand whether firms used to competitive markets through foreign trade grew faster (and/or survived) than those used only to the domestic market during the period of the analysis. A second, complementary, measure to control for competitive pressure is the impact of import competition on firm growth. We measure this as the ratio of total sector imports to the sum of total sector sales plus imports at the three-digit NACE sector level for the initial year (1994), *Impenet94*. With the transition process also trade barriers were reduced, which led to increased imports. It can be expected that increased international competition can potentially have an effect on firm growth and survival. Finally, we also consider the 3-digit NACE Herfindahl index of market concentration (sum of the squares of the market shares), *Herf94*, as a proxy for domestic market competition.

Financial Constraints of firms: In recent years a growing literature on the role of financial constraints on firm performance has emerged (*e.g.* Nickell and Nicolitsas, 1999) showing that financial constraints have a positive impact on firm performance. Tighter financial constraints increase the threat of bankruptcy and therefore give incentives to managers to increase their effort to improve firm performance. In the context of transition countries, however, soft budget constraints often persisted as documented by the EBRD (1999) and Lizal and Svejnar (2001). In the presence of soft budget constraints (SBCs) we would therefore expect that financial constraints have no or the opposite effect on firm performance. We proxy the financial constraints faced by the firm using the ratio of long-term debt over total assets in 1994 - *Finance94*.

Additional control variables in our analysis include the *firm level capital intensity and sector characteristics.* Including the capital intensity of the firm allows us to control for differences in the technology use across firms. Firms that are more capital intensive may have different growth rates than firms that are labor intensive, simply because of their technological features. We compute initial capital intensity - *Kinten94* - as the ratio of total capital assets to

sales revenues. We control for differences across sectors using sectoral dummies (at the 3-digit level of NACE industry classification). Sectors may differ in terms of production technology and consumer demand for example. We believe that these differences can be accounted for by inserting dummies in the estimated regression.

Concerning the Heckman selection equation (where the dependent variable is firm survival, that is, a binary variable equal to 1 if the firm is still in activity in 1998 and 0 otherwise), we include the above variables and add, based on existing evidence, a set of other variables not included in the growth model. A number of studies show that firm survival increases with firm initial size (*e.g.* Jovanovic, 1982; Mata *et al.*, 1995) the reason being that firms enter with a size smaller than the industry's minimum efficiency scale and the incumbents and thus their survival is more difficult. Also, due to pre-entry uncertainty and ignorance towards their ability, firms only learn this after entering and they grow and continually revised their expectations. Thus, those that grow bigger are more likely to be efficient and survive.

Moreover, as shown by Mansfield (1962) and Gibson and Harris (1996) among others, survival appears to be positively associated with initial firm profitability but negatively related to input costs. Hence, we compute: initial production costs (materials and labor costs) normalized by sales revenues in 1994- *Totcost94* - and initial profitability in 1994- *Profit94* - measured as the ratio of net profits to sales revenues, and introduced them both in the survival equation. Along the same line of reasoning, firm financial constraints can also be expected to have an impact on firm survival, depending on the presence of soft budget constraints or not.

Previous work (e.g. Audretsch and Mahmood, 1995) also shows that Western firms' survival increases with market concentration because firms in concentrated markets face less competition. Moreover, as mentioned above firms operating in international markets face tougher international competition and this may impact on their likelihood of surviving. We therefore include the Herfindahl index of concentration, account for the potential effect of import

(foreign) competition on survival, and consider the firm's involvement in international trade using the proportion of foreign sales in total sales of the firm.

We further compute a variable that measures sunk costs of the industry as previous evidence (*e.g.* Audretsch, 1995) suggests that firm survival is positively associated with sunk costs in that these constitute a barrier to exit. For a measure of exogenous sunk costs we use the logged values of the median tangible fixed assets of the industry in 1994 (*Lsunk94*), defined at the three digit NACE level. This can be interpreted as a measure of minimum efficient scale (MES) and a high minimum efficient scale is expected to be associated with a higher probability of firm survival.

Finally, we may expect that the ownership structure and the associated incentives may bear an association with firm survival (e.g. if private firms are more efficient than SOEs, so they are more likely to survive). Again we control for firm capital intensity: survival rates may be different between labor and capital intensive firms as a result for instance of the transition process and the closing down of the heavy industry firms and/or changes in demand patterns.

Table 3 shows summary statistics of the variables that we use in our estimations. In our sample in 1996 around 74% of all the firms were private and 10,6% were foreign owned firms so that 15,4% of the firms were state owned**.** The average fraction of production that is sold in foreign markets is almost 20%. About 50% of the firms reported trade shares different from 0. In other words, half of the firms in our sample were involved in some international trade. This suggests that Slovenia is an open economy trading quite considerably in world markets. There is also quite a wide variation in terms of firm profitability, total costs, and financial health. Note that, on average, firms reported to be loss making.

3. Estimation and Results

Table 4 shows the results for the firm growth and survival equations estimated for various model specifications and correcting for selection bias, that is, applying the Heckman's

simple selection model, which estimates the survival and the growth equation jointly using maximum likelihood (Heckman, 1976, 1979).[8] We also estimate the growth equation using OLS alone and taking the potential heteroskedasticity into account by conducting robust regression analysis, that is, applying the White variance-covariance matrix correction (White, 1980). Results were very similar and thus are not presented. Table 4 presents what we consider are our best four model specifications. Version (1) considers firm characteristics and market competition, version (2) adds sector level (3-digit NACE) dummies, version (3) considers interactions between size and ownership, and version (4) considers a non-linear relationship between growth and size. Other versions produced similar results and did not add information to the models shown (*i.e.* the set of significant variables and their sign do not change). These included a) the interaction between domestic and foreign competition, b) the interactions between market competition and ownership, c) the interactions between ownership and firm financial constraints, and d) non-linear use of the measures of competition.

The results are quite consistent (similar) across all model specifications. Looking at table 4 it can be seen that models (1) to (3) show that *size* is negatively and significantly related to growth (-0.03 and -0.02 with P-value=0.00) in a similar way to that found in studies for the West (*e.g.* Evans, 1987). Konings (1997) and Walsh and Whelan (2001) albeit using a different estimation procedure also find a negative association between firms' growth rate and size for Bulgaria, Hungary, and Romania. According to version (4) firm growth is associated with the initial size of the firm in a non-linear fashion. Evidence suggests that the relationship between growth -*Avgremp* - and size follows an inverse U-shaped pattern so that small firms grow faster than medium size firms but also very big enterprises grow faster than medium size ones (although the coefficient is rather small). The coefficient estimates for *Lemp94*, *Lemp94sq*, and *Lemp94cb* are around -0.086, 0.016 and -0.001 and are statistically significant (P-value=0.00,

[8] We also computed the Heckman two-step efficient estimator procedure, which consists of first estimating the survival equation and then estimating the growth equation using the inverse Mill's ratio, computed using the first

0.00 and 0.015). Evans (1987) finds a similar non-linear relationship although with higher magnitudes indicating perhaps that the growth of US firms is more strongly associated with size than is the growth of Slovenian firms.

The results also suggest that the average growth rate of Slovenian firms, *Avgremp*, is positively related to *Private* and *Foreign ownership* of firms. The coefficient estimates are respectively about 0.03 and 0.04 in specification (1) and (2) and 0.06 and 0.02 in specification (4). However, only the association between private ownership and growth is statistically significant (P-value=0.03 in (1), 0.015 in (2) and 0.00 in (4)) suggesting that foreign firms did not perform differently from SOEs. This may relate to the fact that, in 1996, only a very small proportion of firms was foreign owned (10%) or mirror the difficulties faced by foreign firms in adjusting to the transition environment. Version (3), which considers the interaction between size and ownership, shows us that private ownership contributes positive and significantly to firm growth (with a coefficient estimate of 0.11 and P-value=0.00) but large private firms grow less than their smaller counterparts, as can be seen in the negative and statistically significant coefficient estimate of -0.021 (P-value=0.00). The estimates thus show that Slovenian firms that were private in 1996 grew faster than did SOEs confirming that privatization seen in a broad sense (including Greenfield privatization) is having the desirable effect on firm performance.

In terms of competitive pressure we find that firm export orientation (*Forsh94)* bears a positive and significant coefficient of about 0.03 (P-value=0.07 in model (1), 0.02 in (2) and 0.03 in (3) and 0.09 in (4)) – meaning that firms whose activity involves trading abroad register a larger growth rate than those trading only in the domestic market. This confirms the hypothesis put forward by Walsh and Whelan (2001) that trade orientation may be an important factor in explaining firm growth as firms produced more viable higher quality goods. Unexpectedly perhaps, firm growth is not related to the other two measures of competition: import penetration

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equation, as a extra regressor. Results were very similar.

and market concentration. This may mean that in Slovenia market competition is still not having the desired / expected effect on firm performance and indicate that a stronger role should be given to competition policy and the competition authority, as well as trade and trade policy. Also firm financial constraints do not appear to be associated with firm growth.

When considering the interaction between import penetration and market concentration, not reported here for brevity, we find a positive sign associated with the former and a negative sign associated with the interaction term, hinting that foreign competition may improve firm performance in general and specifically in highly concentrated markets. The estimates are however not statistically significant. Moreover, when taking into account the interaction between financial constraints and firm ownership no statistically significant behavior is found between types of firms, which may indicate that soft budget constraints are a reduced problem in Slovenia. By introducing the second power of the competition measures we find that import penetration bears the expected sign (positively related to growth in a decreasing way) but estimates are not significant. The same holds in the context where firm ownership interacts with competitive pressure.

In terms of firm *Survival* we find that the probability of survival, in Slovenia, increases with the size of the firm (as hypothesized). The coefficient estimate for *Lemp94* is positive - about 0.14 - and statistically significant (P-value=0.00).

Moreover, firms that were privately owned in 1996 are more likely to survive compared to those that were owned by the state as indicated by the positive (0.35) and statistically significant (P-value0.075 in (1), (2) and (3) and 0.00 in (4)) coefficient estimate associated with *Private*. This result may reflect the closing down of non-efficient SOEs in Slovenia. Foreign firms do not appear to have a different likelihood of survival than SOEs.

As in previous work, initial firm profitability is found to increase the probability of survival of a Slovenian firm: the estimated coefficient of *Profit94* is positive - about 0.12 - and

significant (P-value=0.03).[9] Input costs, *Totcos94*, are negatively and significantly related to survival (as expected): the coefficient estimate is around -0.16 (P-value<0.05).

Interestingly, but as one could expect, we find a negative and significant sign of the coefficient associated with firm financial constraints, *Financ94*: about -0.55 (P-value<0.012), while this variable is not related to firm growth. The sign is in line with the financial literature and has the expected sign for the context where budget constraints are hard. Hence, one can say that in Slovenia, the firms with a financially ill health are more prone to exit the market just as in most market economies. The presence of soft budget constraints, common to socialist economies, appears to be reduced in the Slovenian transition.

Also, the firm survival probability decreases with foreign trade involvement, whereas the latter is positively related to firm growth. The coefficient estimate for *Forsh94* is negative in the survival equation - around -0.44 - and statistically significant (P-value≤0.01) but positive in the growth equation. A rationale is that the involvement in foreign trade by Slovenian firms makes them more prone to external and harder competition decreasing their probability of surviving. However, if they succeed, the fact that they trade abroad leads to a higher growth rate, perhaps a result of foreign competition being found to increase efficiency (Estrin *et al.*, 2001).

Market concentration and import competition carry the expected signs, implying that higher competition leads to stronger market selection, but they are not statistically significant.

Finally, although bearing the expected positive sign (as suggested by previous studies) the coefficient estimate for sunk costs, *Lsunk94*, measuring the MES of the sector, is only significant (P-value=0.09) in version (1) of the models, providing some albeit limited information that technological exit barriers may be observed in Slovenia. Firm capital intensity, *Kinten94*, does not influence the probability of firm survival.

[9] Due to the potential problem of firms under reporting profits, a dummy variable equal to one if profits were greater or equal to zero and zero otherwise was used instead of the continuous profit variable. Results are unchanged.

The Heckman selection models estimate several measures of the correlation between the residuals of the two equations. As can be seen at the bottom of table 4, the estimated *rho* (measuring the correlation between the two equations when in the context of the simple selection model) is not statistically different from zero as also indicated by the likelihood ratio test provided in the same table. Note also that, although not shown, the inverse Mill's ratio in the Heckman two-step estimation has an associated coefficient estimate that is not statistically significant confirming that selection bias does not appear to be a problem in our analysis.

To check on the robustness of the results we estimated the above specifications but using the log form of the explanatory variables. These provide similar associations between the dependent and independent variables. Note also that the results obtained when using sales in the place of employment as a measure of size were very similar (in magnitude and significance) to the ones just listed.

Summarizing, evidence presented suggests that in Slovenia and for these four years of transition, privately owned firms, using capital more intensively, and whose activity involved foreign trade, grew the fastest. The growth rate was the highest for both small and large firms with the medium size firms growing the least. Finally, large firms and those with initial positive profitability were more likely to remain in activity whilst firms with ill financial health, higher costs or involved in foreign trade were more likely to close down.

4. Summary and Conclusions

This paper is a first contribution to the study of firm growth and survival in a transition economy. Using unique firm level data, covering virtually the whole population of Slovenian manufacturing firms, we analyzed firm growth and selection as a function of a set of variables relevant to economies in transition. We therefore tested whether, apart from *size*, the *ownership* structure of firms, firm *financial constraints* and *competitive pressure* played an important role in explaining firm behavior, while controlling for firm capital intensity and sectoral differences.

We used both OLS (accounting for potential heteroskedasticity) and Heckman's (1976, 1979) sample selection correction models (that control for potential selection bias) and considered a number of model specifications including various interactions between variables.

In Slovenia average exit rate for the period was 7.6% although exit rates varied substantially across sectors: while wearing apparel registered the highest rate of exit (19%) and other five sectors registered an exit rate of 10% and more, tobacco products and coke, refined petroleum and nuclear fuel witnessed a zero exit rate. On average the growth rate of employment was 5%, although there were substantial differences between firms. In our sample, in 1996, around 74% of all the firms were private and 10.6% were foreign owned firms so that 15.4% of the firms were SOEs**.** About 50% of the firms reported positive international trade shares and the average fraction of production sold in foreign markets was almost 20%, which suggests that Slovenia is quite an open economy with a considerable international trade. A wide variation in terms of firm size, profitability, total costs, and financial health could also be observed. The average size of the firms in 1994 was 65 workers but 50% of the firms had less than 5 workers. Also, on average, firms were making losses.

The evidence concerning the regression analysis was consistent with predictions for market economies. Our main findings can be summarized as follows. Firm growth was negatively related to firm size and in a non-linear way following an inverted U-pattern. Firm survival, on the contrary, was positively related to size in line with the theory that firms enter with a size smaller than the market MES and/or in line with the learning hypothesis of Jovanovic (1982). Also, privately owned firms had higher growth rates than did state and foreign owned firms and were also more likely to survive in Slovenia. This may indicate that privatization in a broad sense (including greenfield privatization) is having the desirable/expected effect.

We further found that firms that are financially constrained have lower chances of survival, suggesting that firms in Slovenia face hard budget constraints, but no association could

be observed between firm financial health and its growth. Firms with higher initial profitability and lower costs appeared to have higher chances of surviving as previous literature suggested, while capital intensive firms registered higher growth rates on average.

Results further confirmed what has been previously argued: trade orientation (exports) of firms can be an important determinant of firm growth in transition countries. Using a firm level proxy for the trade intensity of a firm we found that the higher the export intensity the higher the growth rate of the firm on average. In contrast, firm survival was negatively related to trade orientation. This suggests that firms trading internationally are exposed to more competitive pressure and therefore are more likely to fail, although once they survive they will also have a superior growth performance.

Market concentration and import penetration were not found to be associated with firm survival or growth although bearing the expected positive and negative sign when considering survival, that is, competition may lead to stronger market selection as predicted by theory (i.e. more efficient firms replace less efficient ones). It may therefore be concluded that in Slovenia market competition is not having the desired effect on firm performance. A stronger role should be given to competition policy and the competition authority, as well as trade and trade policy.

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Tables

Table 1: *Sample representativeness in terms of employment using Slovenia Statistical Yearbook as means of comparison for 1998*

Sector 2-digit NACE	Statistical Yearbook Employment	Sample Employment all firms in 1998	Sample Representation %	Sample Employment survivors	Sample Representation %
15 and 16. Food Beverages and Tobacco	20688	15859	77%	15859	77%
17. Textiles	15492	12743	82%	12332	80%
18. Wearing apparel	18502	13562	73%	13177	71%
19. Tanning and dressing of leather, luggage	8240	6595	80%	5787	70%
20. Wood and wood products	10940	7549	69%	7040	64%
21. Pulp and paper	6687	5105	76%	3884	58%
22. Publishing, printing	7649	7188	94%	6604	86%
23. Coke, refined petroleum and nuclear fuel	330	87	26%	85	26%
24. Chemicals	12192	13524	111%	13327	109%
25. Rubber and plastic	10812	7949	74%	7226	67%
26. Other non-metallic mineral products	11097	9309	84%	8925	80%
27. Basic metals	8614	7093	82%	5812	67%
28. Fabricated metal products	23219	16152	70%	14440	62%
29. Machinery and equipment	23292	16217	70%	14504	62%
30. Office machinery and computers	796	653	82%	574	72%
31. Electrical machinery and apparatus	11445	11223	98%	10915	95%
32. Radio, TV and communication equipment	6020	5054	84%	4484	74%
33. Medical, precision and optical instruments	7242	6406	88%	6224	86%
34. Motor vehicles, trailers	7592	6696	88%	6165	81%
35. Other transport equipment	2701	2560	95%	1327	49%
36. Furniture	13095	9445	72%	8699	66%
37. Recycling	714	400	56%	385	54%
Total (and average rate)	227359	181369	80%	167775	71%

Table 2: *Distribution of Firms and Exit Rates*

Sector 2-digit Nace	Firms that survived	Firms that Exited	Exit rate (%)
15. Food and beverages	181	11	6%
16. Tobacco products	1	0	0%
17. Textiles	105	7	6%
18. Wearing apparel	144	28	19%
19. Tanning and dressing of leather luggage	34	5	14%
20. Wood and wood products	170	16	9%
21. Pulp and paper	44	3	7%
22. Publishing, printing	303	30	10%
23. Coke, refined petroleum and nuclea fuel	3	0	0%
24. Chemicals	79	8	10%
25. Rubber and plastic	176	10	5%
26. Other non-metallic mineral products	97	10	10%
27. Basic metals	32	2	6%
28. Fabricated metal products	488	40	8%
29. Machinery and equipment	216	22	10%
30. Office machinery and computers	44	4	9%
31. Electrical machinery and apparatus	152	12	7%
32. Radio, TV and communicatio equipment	76	10	13%
33. Medical, precision and optica instruments	120	4	3%
34. Motor vehicles, trailers	40	2	5%
35. Other transport equipment	17	1	5%
36. Furniture	198	11	5%
37. Recycling	22	1	4%
Total (and average rate)	2742	237	7.6%

Table 3: *Descriptive Statistics*

	Survivors					Exitors				
Variables	**Observs**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Observs**	**Mean**	**Std. Dev.**	**Min**	**Max**
Avgremp	2742	0.051	0.201	-1.492	1.163					
Emp94	2742	66.760	236.588	1	6076	237	14.781	40.517	1	275
Private96	2715	0.737	0.440	0	1	223	0.848	0.360	0	1
Foreign96	2715	0.106	0.308	0	1	223	0.040	0.197	0	1
Kinten94	2706	0.753	7.578	0	379	220	1.030	2.533	0	20.322
Financ94	2713	0.064	0.147	0	2.845	223	0.093	0.358	0	4.824
Profit94	2706	-0.018	0.874	-36.2	20.184	220	-0.263	1.237	-10.874	1.352
Totcos94	2706	1.130	8.716	0.068	453.400	220	1.324	2.836	0.104	39.950
Forsh94	2594	0.197	0.294	0	1	220	0.192	0.319	0	1
Herf394	2715	0.136	0.145	0.029	1	223	0.122	0.119	0.029	0.763
Impenet394	2715	0.309	0.203	0	0.988	223	0.335	0.206	0	0.982

Table 4: *Regression results for the estimation of average firm growth (**avgremp**) and firm survival (**survival**) in Slovenia using the Heckman simple selection model (simultaneous maximum likelihood estimation).*

	Heckman (1)		Heckman (2)		Heckman (3)		Heckman (4)	
Survival	**Coef.**	**St. dev.**	**Coef.**	**st. dev.**	**Coef.**	**st. dev.**	**Coef.**	**st. dev.**
Lemp94	**0.139**[a]	0.045	**0.143**[a]	0.045	**0.143**[a]	0.045	**0.143**[a]	0.045
Private96	**0.354**[c]	0.199	**0.356**[c]	0.199	**0.353**[c]	0.198	**0.355**[c]	0.198
Foreign96	**0.354**	0.243	**0.367**	0.243	**-0.366**	0.243	**0.363**	0.243
Profit94	**0.117c**	0.063	**0.116**[c]	0.065	**0.118**[c]	0.065	**0.119**[c]	0.064
Totcos94	**-0.161**[b]	0.722	**-0.155**[b]	0.074	**-0.156**[b]	0.074	**-0.158**[b]	0.073
Financ94	**-0.550**[b]	0.218	**-0.547**[b]	0.216	**-0.548**[b]	0.217	**-0.549**[b]	0.217
Forsh94	**-0.431**[a]	0.167	**-0.440**[a]	0.166	**-0.439**[a]	0.166	**-0.437**[a]	0.166
Herf94	**0.054**	0.366	**0.077**	0.366	**0.071**	0.367	**0.065**	0.367
Impenet94	**-0.269**	0.243	**-0.281**	0.241	**-0.278**	0.243	**-0.274**	0.243
Lsunk94	**0.164**[c]	0.099	**0.155**	0.099	**0.153**	0.099	**0.153**	0.099
Kinten94	**0.014**	0.029	**0.012**	0.027	**0.012**	0.027	**0.013**	0.028
Cons	**0.337**	0.813	**0.400**	0.817	**0.415**	0.820	**0.420**	0.817
Avgremp	**Coef.**	**St. dev.**	**Coef.**	**st. dev.**	**Coef.**	**st. dev.**	**Coef.**	**st. dev.**
Lemp94	**-0.034**[a]	0.003	**-0.035**[a]	0.003	**-0.021**[a]	0.007	**-0.086**[a]	0.011
Lemp94sq							**0.016**[a]	0.004
Lemp94cb							**-0.001**[b]	0.000
Private96	**0.032**[b]	0.015	**0.037**[b]	0.015	**0.110**[a]	0.033	**0.056**[a]	0.016
Foreign96	**0.011**	0.014	**0.018**	0.014	**-0.013**	0.047	**0.019**	0.014
Private96xlemp94					**-0.023**[a]	0.008		
Foreign96xlemp9					**0.007**	0.010		
Financ94	**0.021**	0.027	**0.015**	0.028	**0.020**	0.027	**0.031**	0.027
Forsh94	**0.027**[c]	0.015	**0.034**[b]	0.015	**0.032**[b]	0.015	**0.025**[c]	0.015
Herf94	**0.042**	0.026	**0.023**	0.064	**0.003**	0.064	**-0.006**	0.064
Impenet94	**-0.022**	0.018	**-0.002**	0.063	**0.006**	0.063	**-0.003**	0.063
Kinten94	**0.003**[c]	0.002	**0.003**[c]	0.002	**0.003**[c]	0.002	**0.003**[c]	0.002
Nace3 dummies	**No**		**Yes**		**Yes**		**Yes**	
_cons	**0.088**[a]	0.018	**0.105**[b]	0.045	**0.037**	0.054	**0.421**	0.817
Rho	**-0.192**	0.245	**-0.046**	0.315	**-0.108**	0.267	**-0.126**	0.291
No observations	**2656**		**2656**		**2656**		**2656**	
Wald test For joint signific.	**Chi2(8)=392.04 P>chi2=0.000**		**Chi2(106)=506.88 P>chi2=0.000**		**chi2(108)=542.63 P>chi2=0.000**		**chi2(108)=551.38 P>chi2=0.000**	
LR for Independence of eqs.	**Chi2(1)=0.33 P>chi2=0.565**		**Chi2(1)=0.02 P>chi2=0.875**		**chi2(1)=0.16 P>chi2=0.693**		**chi2(1)=0.16 P>chi2=0.688**	
Log-likelihood	**334.220**		**387.765**		**400.247**		**404.478**	

Notes: Coefficient estimates are in bold and are the first column of each estimation procedure. [a] denotes confidence level = 99% ($p \leq 0.010$); [b] denotes confidence level = 95% ($p \leq 0.050$); [c] denotes confidence level = 90% .($0.050 < p < 0.100$). Benchmark of industry dummies is NACE 151.

Appendix

The Heckman selection model assumes that there is an underlying regression equation (in our case explaining the average growth of the firm) of the type:

$$y_j = x_j\beta + u_{1j} \qquad \text{regression. eq.} \qquad \text{(A1)}$$

where the dependent variable is not always observed. Indeed, the dependent variable for observation *j* is only observed if

$$z_j\gamma + u_{2j} > 0 \qquad \text{selection eq.} \qquad \text{(A2)}$$

that in our case means that firm growth is observed only if the firm is still is business. It is further assumed that u_{1j} and u_{2j} are normally distributed with mean zero and variance σ and 1, respectively. However, they may be potentially correlated, with correlation ρ. If this is the case, $\rho \neq 0$, standard regression techniques (e.g. OLS) applied to equation (A1) yield biased results.

One way around it consists of estimating jointly, using maximum likelihood techniques, both the probability of survival and the growth equation. A measure of the correlation of the residuals from the two equations is then computed as a way of identifying the presence of selection bias. This measure can be ρ as defined above (and the one presented on the tables) or $\lambda=\rho\sigma$. A similar method, the Heckman's two-step estimator, consists of first estimating the probability of survival using all the firms in the sample, and then estimating the growth equation using as an additional regressor the inverse Mill's ratio (the Mill's lambda on the tables). This is computed using the survival equation and all the sample firms as $m_j = \frac{\phi(z_j\hat{\gamma})}{\Phi(z_j\hat{\gamma})}$. This procedure yields consistent estimates. A statistically significant coefficient estimate of the inverse Mill's ratio confirms the existence of selection bias.