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**Case-by-case versus mass privatization in transition
economies: Owner and seller effects
on performance of firms in Slovenia**

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Case-by-case versus mass privatization in transition economies: Owner and seller effects on performance of firms in Slovenia

by

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Abstract

The paper develops a new approach for studying the key policy choice in transition economies between mass privatization and case-by-case privatization. We contribute to the literature by separating the owner and seller effects in order to study the impact of privatization agents on performance of firms. We use the data set of Slovenian firms that were privatized along with the privatization program launched by 1994. Firms' accounting data are combined with the ownership data for the period 1994 - 2001. By applying the marginal production function approach we demonstrate that mass privatization institutions are better temporary owners only when they are subject to a fully transparent and regulated economic and legal environment (i.e. firms that are listed at the stock exchange). When this institutional framework is lacking, private privatization funds and other participants in mass privatization are shown not to be any better temporary owners than government and its institutions. Our analysis shows that government institutions are better sellers, i.e. firms that have undergone substantial restructuring by the government and were subject to sales to strategic owners (foreign or domestic) are performing better than firms sold by private privatization funds. But it is the institutional framework that makes a difference,, since the superiority of government in selling firms is not confirmed in the case of well regulated mass privatization in listed firms. The results are quite robust to observing either long run or short effects of privatization. The results are also robust to different econometric techniques that serve to control for potential simultaneity between ownership and initial performance, but proved to be sensitive to econometric techniques controlling for the simultaneity between unobserved productivity shocks and input levels.

[JEL classification: G34; L33; P31]

1 Introduction

According to the recent World Bank comprehensive report¹ on lessons learned in the first ten years of economic transition from plan to market, the ideal privatization strategy is to transfer assets as rapidly as possible to concentrated owners through open, fair and transparent methods. However, the report admits that it is difficult to achieve it on a large scale in a short period as the privatization to diffused owners and insiders is appealing on equity grounds, and in several countries this was the only way to make private ownership politically acceptable. The main issue then is whether these intermediate ways of privatization accelerate or retard the eventual takeover of the enterprise by the “right” kind of investors. In other words, would it be preferable to keep the assets in state hands, waiting to identify and then to sell the enterprises to viable strategic investors? The World Bank report goes further by saying “Navigating between continued state ownership with eroding control rights and a transfer to inefficient new private owners with an inadequate institutional framework is possibly one of the most difficult challenges confronting policymakers in charge of privatization.”

By choosing the mass privatization route, policy makers in transition economies decided to privatize the privatization process itself. Initial owners from mass privatization, mostly privately managed privatization funds, insiders or citizens who received shares free of charge, hereafter mass privatization institutions, were expected to be only transitional owners, which would later sell firms to viable strategic investors. Therefore, the overall efficiency of mass privatization depends on how efficient are mass privatization institutions as temporary owners and how good are they as the final sellers of former state owned firms. Not only the speed in finding the appropriate strategic investors, but the quality matters as well. Similarly, the overall efficiency of the standard case-by-case privatization depends on how efficient are governmental privatization institutions as temporary owners in firms before sale and how good are they in finding quickly the appropriate private buyer. To analyze the relative efficiency of transitional ownership effects in both programs one should compare performance of firms that are still waiting to be sold by the government or by the mass privatization institutions. We call this owner effects of privatization. On the other side, key difference in relative efficiency of both programs in selling firms to “true” (final) owners is to be found by comparing performance of firms being sold to strategic investors directly by the government or indirectly by the mass privatization institutions. The performance of firms after the sale to strategic investors is mainly due to the quality of these new owners, but the important policy issue is whether they were selected by the government or by the initial

¹ Transition – The first ten years: analysis and lessons for Eastern Europe and former Soviet Union, The World Bank; 2002 (pages 72-73).

owners from mass privatization. To stress the policy-making aspects, we call these effects of the ownership change on firm performance seller effects.

In order to study the owner and seller effects of privatization on performance of firms we use the data set of Slovenian firms that were privatized along with the privatization program of 1992 and launched by 1994. Firms' accounting data are combined with the ownership data for the period 1994 - 2001. By applying the marginal production function approach we demonstrate that mass privatization institutions are better temporary owners only when they are subject to a fully transparent and regulated economic and legal environment (i.e. firms that are listed at the stock exchange). When this institutional framework is lacking, private privatization funds and other participants in mass privatization are shown not to be any better temporary owners than government and its institutions. Our analysis shows that government institutions are better sellers, i.e. firms that have undergone substantial restructuring by the government and were subject to sales to strategic owners (foreign or domestic) are performing better than firms sold by private privatization funds. But here again, the institutional framework does make a difference, as the superiority in selling firms of government over initial owners from mass privatization could not be confirmed in the case of well regulated mass privatization in listed firms. The results are quite robust to different time aggregation (long run and short run effects) as well as to different econometric techniques that serve to control for potential simultaneity between ownership and initial performance, but proved to be sensitive to econometric techniques controlling for the simultaneity between unobserved productivity shocks and input levels. Potential simultaneity between ownership and initial performance is being controlled for by using fixed effects and first differences transformation of data as well as by using initial performance variables and the Heckman two-stage procedure. We control for simultaneity between unobserved productivity shocks and input levels by applying the Basu-Fernald (1995) and Levinsohn-Petrin (2000) approach as well as the system GMM approach.

In Section 2 we develop the framework for studying owner versus seller effects of different privatization methods on firm performance. Section 3 analyzes performance of Slovenian firms undergoing different privatization methods. Section 4 discusses the empirical model and different econometric techniques of controlling for potential simultaneity biases. In Section 5 we provide our main empirical results, while Section 6 concludes.

2 Case-by-case versus mass privatization in transition countries

The key policy choice in privatization for countries in transition is schematically presented in Table 1,. Suppose that privatization can improve firm performance by the magnitude of 0 to 3 in one or more steps. Case-by-case privatization requires that a special privatization program is prepared for each individual firm, based on the individual characteristics of the firm and after some preparatory restructuring, the firm is sold in a competitive way. Mass

privatization treats a large number of firms simultaneously, all following one simplified privatization plan in which most of the shares are given for free or with discounts to privatization funds, insiders or citizens at large. Given the large number of firms to be privatized, a case-by-case approach is almost by definition gradual in transition economies. While some firms get privatized (with the final seller effects on performance by the magnitude of 3), many stay in continued state ownership (with zero transitional owner effects on performance). Alternatively, mass privatization transfers ownership in hundreds of companies quickly to new inefficient private owners (with the limited transitional owner effects on performance by the magnitude of 1), while further improvements are expected only after the secondary sales by mass privatization institutions take place (with the final seller effects on performance of the order 2).

<Insert Table 1>

It is expected that the transitional owner effects on performance are stronger in mass privatization than in case-by-case privatization (Hypothesis 1). One can argue that it is better to do some partial privatization via free distribution of shares than to do nothing and keep firms in the government's hands while waiting for privatization. This hypothesis is illustrated in Table 1 in the column with the transitional owner effects on performance of the order 0 versus 1.

It is expected that the seller effects on performance are stronger in case-by-case privatization than in mass privatization (Hypothesis 2). Before selling, government can prepare firms for sale and take into account the restructuring needs of an individual firm in selecting the appropriate new private owner, which are both expected to assure better post privatization performance. On the other side, mass privatization institutions are acting more narrowly, considering only the amount of money they can get out of selling the firms. This hypothesis is presented in Table 1 in the column with the final seller effects on performance of the order 3 versus 2.

Therefore, the advantage of mass privatization is to introduce at least some partial privatization for all firms in the first phase, resulting in positive owner effects, while the advantage of case-by-case privatization is the quality of the second phase, resulting in the stronger seller effects. The overall effects of private-sector-led mass privatization versus government-led case-by-case privatization then depends on the relative importance of the owner and seller effects. When the transitional owner effects are dominating, mass privatization should be better. When the final seller effects are dominating, case-by-case privatization should be better.

It is clearly illustrated in Table 1 that a relevant comparison of the two privatization methods can be done only by taking into account all firms initially included in both programs. The usual research approach, comparing performance of firms temporarily owned by mass privatization institutions (with performance of order 1) and firms sold by the government in case-by-case privatization (with performance of order 3) is not appropriate. The effects of case-by-case privatization are usually overvalued as non-privatized firms from these programs (with performance of order 0) are excluded, while the effects of mass privatization are undervalued as firms sold by mass privatization institutions to strategic investors (with performance of order 2) are excluded. This systematic bias in favor of case-by-case privatization effects is often further increased for practical and methodological reasons. There is often no reliable public data on which firms were initially chosen to be included in particular privatization program, while data on final or current ownership structures are readily available. In addition, it has become a standard approach in empirical literature to deal with the selection bias problem by using the final ownership structure in the performance equations². This approach is very questionable as all success stories (with the final seller effects on performance of order 2 and 3) are attributed to strategic ownership, with no distinction made whether the seller was the government or the initial owner from mass privatization. On the other side, only weak transitional ownership effects (with performance of order 1) are attributed to mass privatization programs.

In analyzing the policy choices in the large scale privatization programs in transition economies one should start from the initial ownership structures and then focus on how ownership is evolving through time and what are the effects on firm performance. Originally, mass privatization methods were adopted in transition countries as politically acceptable and convenient solutions for rapid and partial privatization of the entire enterprise sector. Initial ownership structures were intended as transitional, whereas optimal would be set up gradually and would result from secondary transactions. Thus, the recognition that today mass privatization institutions, such as private privatization funds, are not good owners should not be surprising, as ownership was not their intended role. It is more important whether privatization funds are good and fast sellers.³ Therefore, we propose a more appropriate strategy for studying policy choices made in the past in transition economies. We suggest to compare firms that are still owned by mass privatization institutions with non-privatized firms still owned by the government, and, on the other side, to compare firms

² For example, this approach was used by Walsh and Whelan (2001) in the comparative paper including Slovenian data.

³ In early days of transition this was rather obvious at least to privatization officials in the transition countries. Their first international conference on the topic, held in Prague in 1993 was titled: "Investment Funds as Intermediaries of Privatization". Proceeding were later published in a book under the same title (see Simoneti, Triška (Eds), CEEP, 1994).

privatized by the government in a standard way with firms sold by mass privatization institutions.

There are two additional important conditions illustrated in Table 1 that are necessary for a serious empirical analysis of the two policy choices. First, the initial performance of firms selected for case-by-case and mass privatization should be the same (with initial performance of order 0). In real life this is almost never the case and the issue of selection bias or simultaneity between firm performance and chosen privatization method should be explicitly dealt with in the empirical analysis of firm level data. Differences in initial conditions are also the main reasons why studies comparing macroeconomic performance of countries with mass privatization and case-by-case privatization can tell us so little about this difficult policy choice.

Second, selection of the time period is crucial for comparative analysis of the various effects of the two privatization methods on performance of firms. The time dimension is crucial not only to analyze the relative importance of the transitional owner effects in the first phase and final seller effects in the second phase within each method, but to compare overall effects on performance between the two methods as well. To put it simply, in the early years of transition mass privatization should be superior, while in the mature phase of transition, case-by-case privatization might well catch up and overcome the efficiency of mass privatization programs. This is particularly important where the institutional framework for secondary transactions by mass privatization institutions is relatively weak. On the other side, to study these differences one should choose the time period carefully, as it is expected that in the functioning market economy all privatized firms should eventually find the appropriate owners and they should be equally efficient irrespective of the initial privatization method (with performance of order 3 in the last column of Table 1).

It should be stressed that Hypothesis 1 and 2 are in fact consistent with mass or case-by-case privatization being more efficient in any particular time period. For example, if the case-by-case privatization is executed very quickly (as it was in Estonia, Hungary or East Germany), it can give better results, than slowly implemented mass privatization (as it was the case in Poland or Slovenia) even in the relatively short time period. The speed of implementation of the programs matters a lot, as the overall success of the program depends on what percentage of firms have already reached the second phase with strong seller effects and what percentage of firms are still in the first phase with weak or no transitional ownership effects. The importance of the speed of privatization is illustrated in Table 2, where distributions of firms are presented that would in the short run lead to better results of mass privatization (due to small immediate positive owner effects of order 1 in 100% of these firms prevailing) and in the long run to better results of case-by-case privatization (due to strong seller effects of order 3 in 50% of these firms prevailing). In addition, the case with

relatively rapid implementation of case-by-case privatization is presented that would lead to this privatization being more efficient even in the short run (due to strong seller effects of order 3 taking place in 50% of these firms very quickly).

<Insert Table 2>

Different institutional arrangements provide different incentives for governmental and mass privatization institutions as they perform their role as transitional owners and final sellers in the privatization process. The institutional framework critically affects the quality (illustrated in Table 1) and the speed (illustrated in Table 2) of every large privatization program in transition economies. Therefore, to learn from past experiences we should study separately the transitional ownership effects and the final seller effects in various privatization programs and measure how much they contributed to the overall success or failure in the particular time period. In the ex-post evaluation of these programs, we should not forget that mass privatization methods were originally introduced to get at least some positive short-term effects at the beginning of the transition and to make economic reforms politically acceptable, while their long-term effects, that are mostly critically evaluated today, were far less important for policymakers at the time.

3 Owner versus seller effects of privatization on firm performance in Slovenia

A traditional approach to examining the relation between ownership type and performance of firms prevails in the literature on economic transition. The recent extensive survey of empirical studies on corporate restructuring after privatization for most of the countries in transition can be found in Djankov and Murrel (2002) or Havrylyshyn and McGettingen (1999). Recently, Brown, Earle and Telegdy (2003) provide a careful comparative study on the impact of privatization on firm performance in Hungary, Romania, Russia and Ukraine. Using a common estimation approach they cast doubt on simple explanations for “when privatization works”. In this Section, we apply a new analytical approach for studying these policy issues by examining separately the owner and the seller effects on performance of firms in various non-traditional privatization and restructuring programs. In the rest of the paper we apply this new approach to Slovenia and empirically verify how efficiently initial owners from mass privatization (funds, insiders and small shareholders) perform the role of transitional owners in comparison to the government and its agencies. In addition, we analyze how efficient are initial owners from mass privatization in comparison to the government and its agencies in post-privatization period as direct sellers of firms to strategic investors.

3.1 Privatization policy in Slovenia

According to the privatization law from 1992, in Slovenia socially owned firms had a choice to participate in government-led restructuring program before privatization or enter directly into the mass privatization program. Initially, the restructuring program was managed through governmental restructuring agency (called Development Fund of Slovenia) that became a temporary owner of these firms with the mandate to first restructure and later privatize firms. The original idea was that restructuring efforts would be limited to short term financial restructuring and to external governmental support for dealing with excessive employment and debts in these firms. Later on, when additional troubled firms were taken over directly or indirectly by the government, its restructuring objectives became much broader and its direct or indirect ownership role lasted much longer than originally planned.

In both, government pre-privatization restructuring programs and mass privatization programs in Slovenia, we have in a way only temporary owners who are responsible to find the appropriate final owners for each firm in the next stage. In the first case, temporary owner and final seller is directly the government or governmental restructuring agency. In the second case, the initial owners and final sellers are funds, insiders and small shareholders, which obtained shares in exchange for vouchers. We can compare whether governmental or private institutional solutions are superior. In Slovenia, transitional ownership by the government and funds tends to be much longer than expected. Therefore, it is important to know how well do perform firms that are in »temporary« ownership of the government versus those that are in “temporary” ownership of initial owners from mass privatization.

Most of socially owned firms chose to enter directly into mass privatization program without any prior restructuring. Shares of these firms were distributed free of charge to insiders, privatization funds, two para-state funds and citizens at large⁴. In this study all mass privatized firms are divided into listed and non-listed firms. The ownership structure in these two groups of firms is rather similar, only that in listed firms the ownership share of insiders is smaller at the expense of the bigger share of small financial investors. On the other hand, the corporate governance regime and institutional framework for secondary transactions is very different. In Slovenia, mass privatization process in listed firms was well regulated, while in non-listed firms it was not. In listed firms there is much better information available and initial shareholders have the possibility for transparent exit on the market. In non-listed firms, consolidation of ownership in post-privatization period is taking place in a non-

⁴ More about different methods of privatization and restructuring in Slovenia could be found in Dubey and Vodopivec (1995), Prašnikar (1999, 2000), Smith et al (1997) and Simoneti et al (2003a, 2003b).

transparent way, while in listed firms these transactions are public, and takeovers had to be completed through competitive public bids.

3.2 Data, transformation matrix, and firm performance

We gathered accounting and ownership data for a sample of 479 Slovenian firms included in all of the three programs (out of 1350 firms in these programs) for which data on initial and final ownership is available. The data was available for the period 1994-2001, which is suitable for our analysis since the privatization program started by 1994. We can, hence, observe changes in ownership structure and their impact on firm performance from the start of the privatization process.

Firm accounting data (balance sheets and income statements) are obtained from Agency of Payments. Accounting data has been deflated to the 1994 price level using NACE-2 digit PPI (producer prices indices), except assets that have been deflated according to Slovenian accounting standards using aggregate CPI (consumer price index). The data on ownership is obtained from different sources. Data on initial ownership structure, i.e. on the type of the privatization method chosen by individual firm in 1994, is obtained from the Privatization agency, which has had to approve the selected individual firm's privatization program. The data on firm ownership after the officially completed first phase of privatization (by 1998) and the data on subsequent changes in ownership structure between 1998 and 2001, are obtained from the Central Securities Clearing Corporation.

In order to study and present the quality and speed of ownership transformation after privatization we use a concept of transformation matrix⁵. Transformation matrix is constructed by taking into account the initial and final ownership categorization of firms. In this paper we group initially the firms into those that were mass privatized as listed (L) or non-listed (N) and those that were taken over by the governmental institutions for pre-privatization restructuring (G). The transformation matrix provides information on transition of these firms into the firms that remained in the same category (LL, NN, GG) and into the firms that were subject of secondary transactions, or even more narrowly subject of the sale to strategic investors (LSt, NSt, GSt).

Table 3 reveals that the most intensive changes in ownership structure occurred in G firms (54,9% of firms stay in the same ownership) and the least intensive changes are visible in L firms (85,1% of firms stay in the same ownership). Similarly is the intensity of the sales to strategic investors: 22,5% of G firms, 18,2% of N firms and only 13,4% of L firms were sold to strategic investors until the end of 1999.

<Insert Table 3>

The data on initial performance of firms confirm significant differences among firms included in various privatization/restructuring programs in Slovenia. Table 4 presents the initial characteristics of the firms in the sample grouped into *G*, *L* and *N* ownership categories. Listed firms are by far the largest in terms of employment, assets and sales. Capital intensity (assets per employee) and labor productivity (value added per employee) is also the highest in listed firms. The highest indebtedness (the inverse of the equity to assets ratio) is in government-owned firms and the lowest in listed firms. Export propensity is the highest in listed firms, followed by government-owned firms. According to the financial performance indicators (EBITDA to sales), the best firms were listed on the stock-exchange and the worst were selected for governmental restructuring program, which is the expected outcome. Differences in initial characteristics among the three groups are convincing and seem to have influenced the selection of different privatization methods by firms. In the next Section we control for the obvious endogeneity of the privatization method selection by referring to individual performance of firms in the pre-privatization period.

<Insert Table 4>

Table 5 summarizes overall changes in performance of firms undergoing different privatization programs. Changes in performance serve as measure of the efficiency of individual programs. The above part of Table 5 summarizes performance of firms according to their initially chosen privatization program (i.e. firms *L*, *N* and *G*). Note that both, owner and seller effects, are present here simultaneously as we do not distinguish between firms that stayed in the same group (hereafter, diagonal firms) and those that were subject of secondary transactions (hereafter, off-diagonal firms). One can observe that firms included in all three programs have experienced positive growth of total factor productivity (TFP) in the period 1995-2001, with firms in governmental restructuring program (*G* firms) and in regulated mass privatization (*L* firms) outperforming firms in non-regulated mass privatization program (*N* firms). On the other side, firms are restructured in a very different way. *G* firms were subject of defensive restructuring, reducing their sales and value added by 3,4% and 11,7%, respectively. *L* firms expanded in terms of output (by 8,5% in sales and by 5,

5 More details on transformation matrix for firms from mass privatization in Slovenia can be found in Simoneti et al (2003a).

5% in value added), while N firms are more or less stagnating. All three groups reduced employment in the period, with the most dramatic fall of 32,5% being realized in G firms in comparison to the fall of around 18 % in mass privatized firms (L and N firms). Mass privatized firms are expanding in terms of assets, with the highest growth in N firms (+ 11,2%), followed by L firms (+5,1%) and practically no growth in G firms. These differences in performance as well as adjustments in employment and assets are to be expected, given the differences in initial conditions of G, L and N firms. In the rest of the paper we further analyze these data by correcting for initial differences and by decomposing the effects on performance into the owner and seller effects.

<Insert Table 5>

The change in performance of LL, NN and GG firms (diagonal firms) reflect primarily the owner effects. Therefore, to find out who is better owner, governmental institutions or initial owners from mass privatization, we should compare the change in performance of LL, NN and GG firms. Data from Table 5 indicate the highest TFP growth in LL firms, followed by GG firms and NN firms. In accordance with Hypothesis 1, regulated mass privatization seems to provide stronger transitional owner effects than direct ownership of the government in the pre-privatization period (compare LL versus GG firms), while contrary to Hypothesis 1, non-regulated mass privatization seems to provide smaller transitional owner effects (compare NN versus GG firms). At the same time, it should be noticed that governmental restructuring in Slovenia was not limited only to short-term financial restructuring as initially planned. In fact, firms owned by the government and its agencies (GG firms) experience the highest growth in assets (+14,2%). Data indicates that initial owners from mass privatization are simply not capable and willing to invest as much as the government in firms they temporary own in transition process.

To find out who is better privatization agent, governmental institutions or initial owner from mass privatization, one should compare the performance of off-diagonal firms. We can observe also who is better final seller to strategic investors by comparing performance of firms, that were initially grouped as listed, non-listed or governmental (LSt, NSt, GSt), but were subsequently sold to strategic buyers. Data on performance of firms sold to strategic investors are presented in the lower part of Table 5. We present here only data for the period 1999-2001, since we do not have information on ownership changes between 1994 and 1998. In accordance with Hypothesis 2, positive TFP growth (+ 5,2%) is shown only by firms sold by the government (GSt), while the firms sold by the mass privatization institutions experience negative TFP growth. Strategic investors chosen by the government or by the mass privatization institutions behave differently as well. Buyers chosen by the government

provide for additional sales (+ 3%) and sell some of the assets, while strategic buyers entering mass privatized firms are reducing sales (by 13,8% in LSt firms and by 8,5% in NSt firms) and invest in additional assets.

4 Estimating impact of ownership on firm performance

Performance evolution of Slovenian firms undergoing different privatization methods as presented in previous Section reveals somehow expected outcome, with the important qualification that regulated and non-regulated mass privatization lead to different outcomes. In this Section we aim at studying the impact of ownership and ownership changes on post-privatization performance of Slovenian by using more thorough empirical methods. We first present our basic empirical model and then discuss two potential sources of simultaneity biases that may arise in estimating the impact of ownership structure on firm performance in the production function approach. These biases arise due to the potential simultaneity between firm's performance and ownership structure as well as potential simultaneity between unobserved productivity shocks and the input levels. We discuss the variety of econometric procedures to deal with both of them.

4.1 Simultaneity of privatization methods

In analyzing the performance of firms after privatization/restructuring it has to be taken into account that the selection of privatization method is not exogenous but it most likely depends on initial operational characteristics of firms. One can argue that, at the time of privatization, the performance of firms influences the selection of ownership structure. For example, large firms with sound performance are more likely to select a mass privatization method, while badly performing firms are likely to be included into a governmental restructuring scheme. This is particularly true for Slovenia, where a strong bias in selection of privatization methods might likely occur due to the principle of autonomy of firms in choosing among the available privatization methods (see Vodopivec and Dubey (1995), Smith, Vodopivec, Boeh-Cheol Cin (1997), Simoneti et al (2003)). Any evaluation of individual model of privatization is therefore biased, if the endogenous selection mechanism among different privatization models is not explicitly taken into account. Similar simultaneity bias was found in the Czech mass privatization by Marcineien and Wijnbergen (1997) and taken into account in empirical studies by Weiss and Nikitin (1998) and Kočenda and Valachy (2003). The simultaneity bias was also confirmed for Polish privatization (see Claessens and Djankov (1998)). Djankov and Murrell (2002) in their quantitative survey on privatization in transition countries offer good overview how different researchers dealt with the privatization simultaneity bias problem.

In this subsection, we discuss the econometric procedures to deal with the possible bias arising from potential simultaneity between firm's performance and ownership structure. In order to check for the robustness of our results, we use different methods to account for this simultaneity.

In order to study the impact of ownership on economic performance of firms and to deal with the problem of the privatization simultaneity bias effectively let us consider the following total factor productivity (TFP) growth accounting model:

$$(1) \quad y_{it} = \alpha k_{it} + \beta l_{it} + \delta_t + \eta_i + \gamma \mathbf{a}_{it} + e_{it}, \quad r = \alpha + \beta \neq 1$$

where y_{it} is log value added, k_{it} and l_{it} are log capital stock and log labor inputs (there is no restriction on constant returns to scale), and δ_t is a year specific intercept. Of the error components, η_i is a time-invariant unobserved firm-specific effect and e_{it} is the usual error term. \mathbf{a}_{it} is an identified productivity (TFP) shock that is time-varying and is determined by the impact of the ownership structure and changes in ownership structure:

$$(2) \quad \mathbf{a}_{it} \equiv (L_{it}, N_{it}, G_{it}, LL_{it}, NN_{it}, GG_{it}, LSt_{it}, NSt_{it}, GSt_{it})$$

where elements of \mathbf{a}_{it} are the elements of the transformation matrix; i.e. L , N and G stand for listed, non-listed and government owned firms in each time period, respectively; LL , NN and GG indicate firms that remained in the same category, and LSt , NSt and GSt indicate firms that were the subject of sale to strategic investors.

For the sake of simplicity of the exposition, let us denote \mathbf{z}_{it} as a matrix of inputs k_{it} and l_{it} . We assume exogeneity between inputs and the error term ($E(\mathbf{z}_{it}' e_{it}) = 0$). On the other hand, as discussed above, there is evident that the initial performance of firms at the time of privatization may be correlated with selection of the ownership structure. Thus we can argue that \mathbf{a}_{it} is correlated with the error term, i.e. $E(\mathbf{a}_{it}' e_{it}) \neq 0$, which means that the ownership structure is endogenous. There is a simple formal test of endogeneity of the ownership structure that we shall apply subsequently. Based on Hausman (1978) test of endogeneity, we first regress the endogenous ownership structure on the set of inputs:

$$(3) \quad \mathbf{a}_{it} = \pi \mathbf{z}_{it} + v_{it}, \quad \text{where } E(\mathbf{z}_{it}' v_{it}) = 0$$

and then test whether the structural error e_{it} is correlated with the reduced form error v_{it} :

$$(4) \quad e_{it} = \sigma v_{it} + \varepsilon_{it}, \quad \text{where } E(v_{it}' \varepsilon_{it}) = 0 \text{ and } E(\mathbf{z}_{it}' \varepsilon_{it}) = 0.$$

Combining equation (1) and (4) we get the complete regression model:

$$(5) \quad y_{it} = \phi \mathbf{z}_{it} + \delta_t + \eta_i + \gamma \mathbf{a}_{it} + \sigma v_{it} + \varepsilon_{it},$$

where v_{it} in fact denotes the OLS residuals from the reduced form regression (4). All of the coefficients, ϕ , γ and σ can be consistently estimated by OLS and the usual t statistic (or heteroskedasticity-robust t statistic) is a valid test of the null hypothesis that $\sigma = 0$. Thus, \mathbf{a}_{it} is exogenous only if $\sigma = 0$. Rejecting it, however, requires that one seriously takes care of the simultaneity bias using one of the available methods.

The most straightforward method to take care of the endogeneity bias is to estimate model (1) by 2SLS.⁶ Interestingly, this method has been widely neglected in previous research on the impact of ownership on firm performance.

Related method to the above 2SLS, which has been widely used in related empirical work, is to use a kind of instrumental variable (IV) approach, where pre-privatization performance indicators are used as instruments for endogenous ownership variables.

Third, and most widely used, method in related empirical work so far is to treat the impact of simultaneity between ownership and performance implicitly as omitted variable in the sense of unobserved individual firm specific effects (i.e. similar to η_i) or group specific effects (η_j , where j denotes ownership group).⁷ In the panel data framework, one can effectively deal with this problem by using the fixed effects (FE) or first difference (FD) estimator. Time-demeaning or first-differencing equation (1), however, helps only to wipe out the time invariant unobserved firm and group specific effects η_i and η_j . However, we do not solve the problem when the impact of ownership on firm performance behave in the sense of distributed lag model, where productivity shocks stemming from ownership change are not constant over time.

Yet another method suitable to control for the endogeneity of the privatization method selection is to use the Heckman (1979) two step method by referring to observed individual performance of firms in the pre-privatization period. The data on initial performance of Slovenian firms in the pre-privatization year 1994 in fact confirm significant differences among firms with different ownership structure. Table 4 above demonstrates significant initial differences among firms in the sample grouped into G , L and N ownership categories.

Using the Heckman procedure, in the first step the probability of firms to choose one of the three possible ownership forms (regulated mass privatization with listing, non-regulated mass privatization with no listing and pre-privatization restructuring by the government) is

⁶ See Wooldridge (2002) for more details.

⁷ Brown, Earle and Telegdy (2003) use the latter approach, where they assume that firms that will become private at some point share a common productivity difference that is fixed over time. Therefore, they include a group fixed effects for firms that are being ever privatized into their estimation model.

being estimated. The probability p_{it} $[0, 1]$ of firms to choose one of the three possible ownership forms is conditional on their operational characteristics in the pre-privatization year 1994. The probability p_{it} is being estimated using the following multinomial logit model:

$$(6) \quad \Pr(p_{it} = 1 | \mathbf{M}_{it}) = G(\omega \mathbf{M}_{it}),$$

where \mathbf{M}_{it} is a matrix of operational characteristics of firms. We assume that errors are IID distributed and have independent extreme-value distribution. The controlling variables contained in \mathbf{M}_{it} are sales and labor (which control for the size of firms), assets to sales ratio (which controls for capital intensity), value added to labor ratio (which controls for differences in labor productivity across firms) as well as financial performance (EBITDA to sales ratio) and export propensity (exports to sales ratio). Indeed, the results from the multinomial estimations in the Table 6 confirm that the above differences are essential in our case. Significant differences between listed and non-listed firms are found in terms of the size, capital intensity, labor productivity, financial performance and export propensity. On the other hand, significant differences between listed and firms restructured by the government are found only in terms of capital intensity.

<Insert Table 6>

In the second step, following Amemiya (1984), the predicted values based on estimated coefficient from the multinomial logit model are used in order to calculate a vector of so called inverse Mills' ratios⁸ for individual firms. The latter then enters as a controlling variable into our basic model (1) in order to control for the endogeneity between firm performance and the privatization method selection.

We apply above discussed methods when estimating our basic model (1) in order to check for the robustness of the results.

4.2 Modeling impact of ownership on performance in a panel setup

Present applications to estimating production functions have revealed significant problems of potential correlation between input levels and the unobserved firm-specific shocks. The idea is that firms that experience a large positive productivity shock may respond

⁸ Inverse Mills' ratios are calculated as the ratios between the normal density and its cumulative density function. Note that calculation of the inverse Mills' ratios is different for treated and nontreated observations.

by using more inputs, which violates the OLS assumption of strict exogeneity of inputs and the error term. Let us show this by rewriting our basic model (1) in order to capture possible endogeneity between inputs and performance. Consider modified TFP growth accounting model:⁹

$$(7) \quad y_{it} = \gamma \mathbf{a}_{it} + \alpha k_{it} + \beta l_{it} + \delta_{it} + (\eta_i + u_{it} + m_{it}), \quad r = \alpha + \beta \neq 1$$

$$(8) \quad u_{it} = \rho u_{i,t-1} + o_{it} \quad |\rho| < 1$$

$$o_{it}, m_{it} \sim \text{MA}(0)$$

where of the error components, η_i is an unobserved firm-specific effect, u_{it} is an autoregressive (productivity) shock, and m_{it} represents serially uncorrelated measurement errors. Note that both labor (l_{it}) and capital (k_{it}) are potentially correlated with firm-specific effects (η_i) as well as with both productivity shocks (\mathbf{a}_{it}) and measurement errors (m_{it}).

Given the AR(1) process in u_{it} according to (8), a firm's respond to positive productivity shock in the past ($u_{i,t-1} > 0$) by using more inputs in the period t clearly violates the OLS assumption on strict exogeneity between inputs and the error term ($E(\mathbf{z}_{it}' u_{it}) \neq 0$).¹⁰ This endogeneity usually shows up in OLS estimations in the form of persistent serial correlation and yields biased parameter estimates. Levinsohn and Petrin (2000) demonstrate that in the case where capital and labor are positively correlated, and both are also correlated with the productivity shock, the parameter for labor input will tend to be overestimated and the parameter for capital will tend to be underestimated. Given the usual quality of firm level datasets, this is the most likely case. Unfortunately, biased parameter estimates for capital and labor inevitably lead to biased estimates of productivity.

We can demonstrate above concern by comparing results obtained through estimations of different specifications of production function (7) using our sample of 479 firms. Let us first consider our basic estimation model that includes value added as a dependent variable, and capital and labor as main inputs (refer to model 1 in Table 7). Applying OLS to the (panel) data in levels gives quite reasonable estimates of capital (0.275) and labor shares (0.716), which are in accordance with the theory. The sum of capital and labor shares indicates constant returns to scale (0.992) across industries.¹¹ Tests of serial correlation, however, reveal

⁹ We use the Blundell and Bond (1999) notations.

¹⁰ Where, again, \mathbf{z}_{it} is a matrix of inputs k_{it} and l_{it} .

¹¹ Note that we include industry dummies at the NACE-2 digit level to capture cross industry variation in production technology as well as year dummies in order to control for common policy shocks in the observed period.

strong AR(1) and AR(2) processes in the error term indicating either simultaneity between input levels and unobserved productivity shocks or measurement problems, which may both yield biased estimates of the capital and labor shares.

<Insert Table 7>

There is a need, hence, to find suitable methods to account for this correlation between inputs and the error term. Any such method, however, will inevitably prove to be inefficient as long as we have to deal with serious measurement problems in the stock of capital (see Griliches and Mairesse, 1995). Most simple methods are to apply fixed effects or first difference transformation in order to wipe out the firm specific unobserved effects η_i . However, the drawback of both of them is to require that a component of the productivity shock is fixed over time, which gives little hope that we have dealt with the problem efficiently. This is apparent also in our case. Applying within transformation (model 2) to our data, which wipes out firm's specific (fixed) effects), does not help much in reducing the bias since serial correlation remains substantial. On the other hand, capital and labor shares seem to yield overestimated parameters.

Another alternative is to apply instrumental variables approach, but valid instruments are required that are correlated with firm-level input choices and orthogonal to the productivity shock. The problem is that, usually, there are simply no valid instruments.

Recently, there were developed three more sophisticated methods applied to estimating production function in a dynamic panel data context that claim to solve the problem of endogeneity between input levels and the unobserved firm specific shocks in a satisfactory way. Olley and Pakes (OP, 1996) propose to use investment expenditure as a proxy for unobservable technological shocks. The advantage of this method is that we do not assume that unobserved productivity is fixed over time, and since there is no need for differencing, it leaves more variance in capital and labor. The drawback of the OP approach, however, is in their assumption that there is only one single component of unobservable heterogeneity in the system, and which is fully transmitted to the investment equation. In other words, OP assume that if the capital input has already adjusted to the anticipated part of productivity process ($\rho u_{i,t-1}$ in (8)), the investment proxy will only account for the "news", i.e. the unanticipated part of the technology shock (o_{it}). As a consequence, some correlation between unobserved technological shock and capital, and therefore some bias, would remain in the estimated production function coefficients.

Instead, Levinsohn and Petrin (LP, 2000) propose to use materials (energy consumption or material costs) as a proxy for unobserved technological shocks. Material costs respond to the entire productivity shock u_{it} and not just to unanticipated part of it. In addition, Basu and Fernald (BF, 1995) also suggest using material cost in the production function with value added as a dependent variable in order to control for unobserved demand shocks.

Including material costs directly into the model as suggested by Basu and Fernald or applying the LP instrumentalization does not necessarily reduce the bias. In model 3 (see Table 7) by including the material costs into the model we observe reduction both in the capital as well as labor parameter, but capital parameter seem to be affected in a larger effect. At the same time, serial correlation remains sizeable. It is (initial) ownership cross effects with individual production inputs that improves the parameters of capital and labor, and moves them close to OLS estimates (compare models 1 and 4). But, again, serial correlation in the error term remains unaltered.

An alternative approach to control for the seemingly persistent simultaneity bias is to model production function as a dynamic process since present firm growth is inevitably correlated with the past performance of the firm. Arellano and Bond (1991, 1998), Arellano and Bover (1995), and Blundell and Bond (1998, 1999) propose related econometric techniques to deal with the simultaneity bias in a dynamic panel data context. Consider a dynamic version of the growth model (7):

$$(9) \quad y_{it} = \rho y_{i,t-1} + \alpha k_{it} - \rho \alpha k_{i,t-1} + \beta l_{it} - \rho \beta l_{i,t-1} + (\delta_t - \rho \delta_{t-1}) + (\gamma \mathbf{a}_{it} - \rho \gamma \mathbf{a}_{i,t-1} + \eta_i(1 - \rho) + o_{it} + m_{it} - \rho m_{i,t-1}).$$

In (9) one can show that the OLS estimator will be seriously biased due to correlation of the lagged dependent variable with the individual specific effects as well as with the independent variables. This is due to the fact that y_{it} is a function of η_i in (7), and then $y_{i,t-1}$ is also a function of η_i . As a consequence, $y_{i,t-1}$ is correlated with the error term, which renders the OLS estimator biased and inconsistent, even if the u_{it} and m_{it} in (7) are not serially correlated. This holds also whether the individual effects are considered fixed or random (see Hsiao 1986, Baltagi 1995, Wooldridge 2002). One way of controlling for this unobserved heterogeneity and simultaneity is to include exogenous variables into the first-order autoregressive process. This, in turn, reduces the bias in the OLS estimator, but its magnitude still remains positive. Another way of controlling for the simultaneity is to apply the Anderson-Hsiao instrumental variable approach. We may first-differentiate our model (9) in order to eliminate η_i , which is the source of the bias in the OLS estimator. Then we may take the second lag of the level ($y_{i,t-2}$) and the first difference of this second lag ($\Delta y_{i,t-2}$) as possible instruments for $\Delta y_{i,t-1}$, since both are correlated with it ($\Delta y_{i,t-1} = y_{i,t-1} - y_{i,t-2}$) but

uncorrelated with the error term Δu_{it} ($= u_{it} - u_{i,t-1}$). This approach, though consistent, is not efficient since it does not take into account all the available moment conditions (i.e. restrictions on the covariances between regressors and the error term).

Hence, a natural choice of approach that allows for controlling for the unobserved simultaneity in (9) is the application of GMM (general method of moments) estimators. Our model will be estimated in first differences in order to obtain estimates of differences in growth performance of privatized firms as well as to eliminate unobserved firm-specific effects. Since lagged level instruments used in difference-GMM approach are shown to be weak instruments for first-differenced equation (see Arellano and Bover (1995), Blundell and Bond (1998, 1999)), we apply system-GMM approach, which in addition to lagged levels uses also lagged first differences as instruments for equations in levels. As model is estimated in first differences, corresponding instruments for Δx_{it} are $x_{i,t-1}$ and $\Delta x_{i,t-1}$ (where x stands generally for all included variables), and so on for higher time periods. This allows for a larger set of lagged levels and first differences instruments and therefore to exploit fully all of the available moment conditions. Hence, the system GMM approach, in principle, maximizes both the consistency as well as the efficiency of the applied estimator. However, this is not necessarily true in every case. Levinsohn and Petrin (2000) points out that "...lagged values of inputs will not generally be valid instruments because chosen input levels may depend upon past values of the (potentially correlated) shock. Frequently, instrumental variables suffers from the same drawback as that of the within estimator; valid instruments are usually weak instruments - that's generally what makes the exclusion restriction believable - and weak instruments significantly weaken the signal, exacerbating other imperfections in the data."

Hence, we should notice again, that above methods can be efficient only in case we are dealing with accurately measured data sets. When this precondition is violated, no sophisticated econometric technique can help in controlling for the unobserved productivity shocks and simultaneity bias. In words of Griliches and Mairesse (1995) "...we find that researchers, in trying to evade the simultaneity problem, have shifted to the use of thinner and thinner slices of data, exacerbating thereby other problems and miss specifications. We describe the need for better data..."

5 Empirical results

In this section we present results on the impact of ownership on performance of Slovenian firms that undergone different privatization methods. Our estimation strategy is as follows. First, we try to uncover long run ownership effects for we believe that changes in ownership may not take effect immediately. Firm performance' respond to changes in ownership might well take a pattern of a distributed lag model. We therefore first estimate model (7) on a set of

cumulative differences in firm variables over the period 1995-2001.¹² In the second step we proceed at estimating year-by-year changes in firm performance in order to reveal any consistent short run effects of different privatization methods. Here, one may expect somehow weaker results than in the case of long run effects. In all of the exercises, i.e. different estimations of the long run as well as short run privatization effects, we basically estimate model (1) or (7), which differ only in the assumptions on the structure of the error term. Where relevant, we then try to control for different empirical caveats as described above in order to identify, at least approximately, the true pattern of ownership effects on performance of privatized firms in Slovenia.

We estimate marginal production functions, i.e. the TFP growth models (1) or (7) using cumulative differences or first-differenced data. This is due to the need to obtain estimates of the impact of ownership and ownership changes on TFP growth (not levels) of firms as this is only relevant from the policy perspective. Another advantage of this method is to wipe out firm specific effects, which may per se serve as a source of simultaneity bias. When estimating marginal production functions, however, one should take into account that the input coefficients' estimates no longer preserve the nice pattern that we observe when estimating production functions in levels. As shown in Table 7 (see model 9, which will be our preferred model that includes material costs and cross ownership - inputs effects), the input parameters reduce significantly. Of course, explanatory power of the model estimated in first differences drops significantly as firm's TFP growth in period t does not necessarily respond only to changes in inputs in the same period, but might be related to firm's investment into capital and labor in previous periods (according to the distributed lag model). This, again, speaks in favor of observing the long run effects of privatization instead of year-by-year changes.

Overall impact of privatization programs

We first examine impact of initially chosen privatization programs on firm performance, which captures both owner and seller effects simultaneously. First three columns in Table 8 present results obtained by estimating cumulative changes in firm performance over the period 1995-2001. It is revealed that the initially best mass privatized firms that are listed on the stock exchange (L) have grown significantly faster in terms of TFP than firms under government restructuring program (G), while there are no significant differences in TFP growth pattern between firms that undergone non-regulated mass privatization (N) or have been restructured by the government institutions (G). These results remain robust also after correcting for initial differences in performance (with the exception of the Heckman

¹² Note that initial year 1994 is excluded from estimation period as we use this year's data as instruments to control for simultaneity between ownership structure and initial firm performance.

correction procedure in model 2). Results of our model estimated using the year-by-year growth rates data (compare models 4 through 8) demonstrates that listed firms have grown on average by 3 – 5 % p.a. faster in terms of TFP over the period than G firms, while there is no significant evidence on different TFP growth pattern between N and G firms. Results are very robust to different correction methods applied in order to deal with the initial ownership – performance simultaneity bias, as well as to the static and dynamic specifications of the models.¹³

<Insert Table 8>

Hence, overall effects of privatization on performance of firms that have initially selected either non-regulated mass privatization (N) or governmental restructuring program (G) are not conclusive. There is no indication of either group being better off in the observed period. One should note, however, that this test does not differentiate between ownership and seller effects in both programs. One can therefore hardly make any inference on which type of the owners, government or non-regulated mass privatization institutions, is a better owner and which of the two is better in terms of restructuring and selling firms to appropriate, strategic partners. We should hence proceed further to disentangle these two effects.

Owner effects

The owner effects are examined only in firms that stayed in the same ownership group throughout the period 1994-2001, i.e. firms at the diagonal of the transformation matrix. Here, we study only the overall ownership effect on firm performance that undergone different privatization methods and do not enter into a more complex issue of the impact of different ownership structures within each group (i.e. impact of concentration and/or identity of individual owners).¹⁴ Table 3 above has revealed only minor ownership changes over the period, as until 1999 more than 75 per cent of non-regulated mass privatized firms and 85 per cent of listed firms remained in the same ownership category, which they have chosen in 1994. Ownership changes occurred more intensively in firms restructured by the government,

¹³ As already shown in the previous section, the simultaneity between performance and inputs remains a curse in all cases as we were not successful in finding suitable proxies for inputs in order to reduce the bias and, hence, serial correlation. Both the LP as well as the GMM instrumentalization methods proved to be inefficient.

¹⁴ In previous version of the paper we did also study this issue, but it turned out that ownership concentration and identity of individual owners do not seem to affect economic performance (TFP growth) of privatized firms. In a related study, but using different data set, Damijan, Gregorčič and Prašnikar (2004), similarly, find no impact of ownership concentration on economic performance of Slovenian firms, while there is a significant impact on their financial performance (EBITDA per sales).

since 55 per cent of G firms still remained under control of government institutions after 1998. It is straightforward to expect, therefore, that differences in performance according to initial ownership structure (as shown in table 8) are to be preserved also among diagonal firms. Our empirical results for the subset of diagonal firms indeed reveal that listed firms have a performance advantage over firms that still remained under government supervision. In accordance with the conventional wisdom, ownership effects are found to be stronger in mass privatization, but only if it is well regulated. For non-regulated mass privatization, taking place in non-listed firms in Slovenia, we could not find any empirical support for diffused private owners from mass privatization being better owners than the government in non-privatized firms (coefficients for NN variable in Table 9 are not significantly different from the GG firms which serve as a comparison group).

<Insert Table 9>

One should note, however, that above results are less robust than it was the case with the initial ownership structure. Above results, interestingly, do not show up when estimating the empirical models on a data set of cumulative changes over the period 1995-2001 (see Table 9, models 1 through 3), but they do when using data on year-by-year changes (Table 9, models 4 through 8). The latter are quite robust to corrections for the initial performance – ownership simultaneity bias, but again, there is nothing we could do regarding the serial correlation problem.

Seller effects

If the conventional wisdom holds, one may expect government institutions to be better seller of privatized firms. After initial restructuring, firms sold to carefully selected strategic owners (foreign or domestic) should perform better than they did before and than firms sold by mass privatization institutions. On the other side, given the lack of motivation and skills, initial diffused owners from mass privatization are less likely to implement any restructuring before sale. They are, instead, expected, to get rid of the bad companies as soon as possible, where new owners, however, are not carefully selected. Hence our question of major empirical interest here is, which of the two actors, government institutions or private mass privatization institutions, has done better its role in selling firms to strategic investors.

<Insert Table 10>

Results contained in Table 10 are very conclusive in demonstrating that in case of privatization in Slovenia government has done its role in selling firms much better than non-regulated private temporary owners. All of the empirical models estimated (except models 4 and 8) reveal that firms sold to strategic investors by the government perform after transaction better in terms of TFP growth than firms sold by the non-regulated private mass privatization institutions. On the other side, for regulated mass privatization the results are not conclusive (coefficients for LSt variable in Table 10 are negative but not significant). Like in the case of owner effects, the quality of regulation in mass privatization has a decisive impact on seller effects. Transparency of take over rules for listed companies and, consequently, open competition among strategic buyers made these transactions almost as efficient as the ones completed by the government in the case-by-case programs. Again, results are quite robust to the usual corrections for the initial performance - ownership simultaneity bias, but not robust regarding the serial correlation problem.

6 Conclusions

After a large scale privatization based on free distribution of shares it is expected that many initial owners will sell their shares to “true” owners in the next phase. Thus, the recognition that privatization funds are not good owners should not be surprising, as long-term ownership was not their intended role. It is more important whether privatization funds and other initial owners from mass privatization are good and fast sellers. Positive effects of mass privatization are thus not shown only by firms remaining in control of initial owners (the owner effects of mass privatization) but also by the firms that have already been sold by initial owners (the seller effects of mass privatization).

By empirically separating the owner from seller effects on performance in mass privatized firms we can get more relevant comparison between various mass privatization programs and traditional approaches to privatization. Firms still owned by mass privatization institutions should be compared with non-privatized firms still owned by the government, and firms privatized by the government in a standard case-by-case approach should be compared with firms sold by mass privatization institutions.

For Slovenia, we compared mass privatization programs for listed and non-listed firms with government led pre-privatization restructuring program. We find that initial owners from mass privatization are better temporary owners than the government and its institutions, but only if they are subject to a fully transparent and regulated economic and legal environment (i.e. firms that are listed on the stock-exchange). On the other side, we find that the government and its institutions in a case-by-case program are better sellers of firms to strategic investors than initial owners from mass privatization. Our analysis using the TFP

growth approach subject to a number of robustness checks clearly demonstrates that firms that have undergone substantial restructuring by the government and were subject to sales to carefully selected strategic owners (foreign or domestic) are performing better than firms sold by the initial owners in mass privatization. On the other side, this advantage of the government in selling firms could not be confirmed in the case of well regulated mass privatization, taking place in listed firms.

Practically the same type of initial owners from mass privatization are acting quite differently as owners and sellers in listed and non-listed firms in Slovenia. It is, hence, confirmed that well defined institutional framework is the key for the success or failure of the mass privatization. The expected positive owner effects in the first phase, are realized only in the regulated environment of listed firms, while the expected weak seller effects in the second phase are to a great extent overcome by well defined public take over rules for listed firms.

Taking together owner and seller effects on firms performance in all three programs for the period 1995-2001, we find that firms included initially in regulated mass privatization performed better than firms initially included in non-regulated mass privatization and in the government restructuring program. Policy implications of our results for Slovenia are rather straightforward. Better regulation of corporate governance and consolidation of ownership is a key for better performance of non-listed firms. On the other side, speeding up privatization of firms taken over by the government for pre-privatization restructuring (close to 55% of them are still owned by the government in 1999), should improve the overall results of this programs, as the government was actually found to be relatively good in selling firms to appropriate strategic investors and not so good in holding them.

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APPENDIX

Table 1: Quality of privatization in the transformation matrix: Firm performance in the relative order from 0 to 3

	Initial period	Transitional owner effects	Final seller effects	End of economic transition
Case-by-case privatization	0	0	3	3
Mass privatization	0	1	2	3

Table 2: Speed of privatization in the transformation matrix: Distribution of firms included in privatization according to the first phase (with owner effects) and to the second phase (with seller effects)

	First phase owner effects	Second phase seller effects
Short run with mass privatization superior		
Case-by-case privatization	80%	20%
Mass privatization	100%	0%
Long run with case-by-case privatization superior		
Case-by-case privatization	50%	50%
Mass privatization	80%	20%
Short-run with rapid case-by-case privatization superior		
Case-by-case privatization	50%	50%
Mass privatization	100%	0%

Table 3: Transformation matrix since completed mass privatization until the end of 1999 and distribution of firms in the ownership groups

	Government	Non-Listed	Listed	Strategic	Total
Government (G)	39 (GG)	11	5	16 (GSt)	71
Non-Listed (N)	8	260 (NN)	11	62 (NSt)	341
Listed (L)	1	0	57 (LL)	9 (LSt)	67
Total	48	271	73	87	479

in %, n = 479

	Government	Non-Listed	Listed	Strategic	Total
Government (G)	54,93 (GG)	15,49	7,04	22,54 (GSt)	100
Non-Listed (N)	2,34	76,25 (NN)	3,23	18,18 (NSt)	100
Listed (L)	1,49	0	85,07 (LL)	13,44 (LSt)	100
Total	10,02	56,58	15,24	18,16	100

Source: Authors' calculations.

Table 4: Summary statistics of firms initially grouped as government (G), listed (L) and non-listed (N) in 1994

Own.		Sales*	Empl.	Assets*	Value added/ Empl.*	Assets/ Empl.*	Equity/ Assets**	EBITDA/ Sales**	Exports/ Sales**
G	mean	2.5E+06	255	4.2E+06	2530	15823	0.587	0.058	0.283
	N	71	71	71	71	71	71	71	71
	min	2.9E+05	22	2.5E+05	258	2713	-0.161	-0.186	0
	max	2.3E+07	1357	3.5E+07	7313	111664	0.965	0.575	0.998
L	mean	7.8E+06	509	1.2E+07	3159	38349	0.727	0.082	0.321
	N	67	67	67	67	67	67	67	67
	min	3.0E+05	29	7.6E+05	463	3353	0.053	-0.220	0
	max	1.1E+08	3547	1.0E+08	8363	568355	0.972	0.435	0.919
N	mean	2.4E+06	241	2.5E+06	2927	13389	0.628	0.047	0.236
	N	341	341	341	341	341	341	341	341
	min	2.8E+05	10	1.5E+05	-6653	911	-0.040	-0.455	0
	max	4.3E+07	6076	5.8E+07	16421	300332	0.993	0.299	0.943
Total	mean	3.2E+06	281	4.0E+06	2900	17241	0.636	0.053	0.255
	N	479	479	479	479	479	479	479	479
	min	2.8E+05	10	1.5E+05	-6653	911	-0.161	-0.455	0
	max	1.1E+08	6076	1.0E+08	16421	568355	0.993	0.575	0.998

Notes: * in thousand of SIT
** in per cent

Source: Authors' calculations.

Table 5: Performance of firms in different ownership groups (cumulative change over the indicated period, 1994 prices)

Own. group	N	Sales	Value added	TFP*	Assets	Labor
Firms according to initial owners, 1995-2001						
G	71	-0.0342	-0.1167	0.0316	0.0171	-0.3252
L	67	0.0848	0.0545	0.0450	0.0506	-0.1819
N	341	0.0489	-0.0438	0.0120	0.1120	-0.1873
Firms staying with initial owners, 1995-2001						
GG	39	0.1002	0.0403	0.0300	0.1420	-0.2737
LL	57	0.0981	0.0797	0.0541	0.0377	-0.1903
NN	260	0.0665	-0.0359	0.0154	0.0701	-0.1791
Firms sold to strategic owners, 1999-2001						
GSt	16	0.0303	0.1525	0.0521	-0.0563	-0.1554
LSt	9	-0.1383	0.1440	-0.0215	0.0797	-0.1412
NSt	62	-0.0847	-0.1585	-0.0310	0.1087	-0.1189

Note: * TFP was calculated as a Solow residual by estimating equation (1) without ownership variables (see Section 4).

Source: Authors' calculations.

Table 6: Evaluation of the privatization method selection¹ and of secondary transactions mechanism² using multinomial logit model

	Initial selection		Secondary transactions		
	Coef.		Coef.	Coef.	
				LSt	
Sales				-6.8E-09	
Employment				1.5E-04	
Assets/Empl.				-4.2E-05	
VA/Empl.				-3.8E-04	
EBITDA/Sales				1.952	
Exports/Sales				-3.155	
Constant				-0.127	
		N		NN	NSt
Sales		-1.1E-07 ***		-1.9E-07 ***	-1.1E-07
Employment		2.6E-04		6.9E-04	-8.8E-04
Assets/Empl.		-2.2E-05 ***		-0.0000233 ***	-8.3E-05 ***
VA/Empl.		5.0E-04 ***		6.3E-04 ***	5.1E-04 **
EBITDA/Sales		-6.875 ***		-8.202 ***	-7.211 **
Exports/Sales		-1.572 **		-1.822 **	-0.284
Constant		-0.426		-1.005	-0.354
		G		GG	GSt
Sales		-4.5E-08		-8.0E-09	-6.6E-08
Employment		-3.8E-04		-1.1E-03	5.2E-04
Assets/Empl.		-1.8E-05 **		-3.6E-05 ***	-6.3E-06
VA/Empl.		2.0E-04		1.1E-04	-4.3E-05
EBITDA/Sales		-2.852		-3.766	-1.612
Exports/Sales		0.089		0.665	-0.646
Constant		-0.612		-1.433	-1.603
No. of obs		479		443	
Pseudo R2		0.210		0.244	

Notes: ¹ initial privatization method selection: base group=listed firms in mass privatization, data for 1994

² secondary transactions mechanism: base group=listed firms (LL), data for 1994
 ***, ** and * indicate statistical significance of coefficients at 1, 5 and 10 per cent, respectively

Table 7: Properties of estimated production functions, period 1994-2001

Transformation	1 OLS	2 Within (FE)	3 OLS	4 OLS	5 First diff.
Assets	***0.275	***0.320	***0.281	***0.290	***0.225
Labor	***0.716	***0.775	***0.598	***0.695	***0.358
Materials	-	-	***0.127	***0.048	***0.216
Constant	***5.285	-	***4.245	***4.649	***0.016
Scale returns	0.992	1.095	1.005	1.033	0.799
Time dummies	Yes	Yes	Yes	Yes	Yes
Industry dummies	Yes	Yes	Yes	Yes	Yes
Inputs x owner. effects	No	No	No	Yes	Yes
No of obs	3818	3818	3818	3818	3332
Adj R ²	0.878	0.818	0.883	0.885	0.216
AR(1) N [0,1]	***10.385	***5.347	***10.842	***10.731	***-3.329
AR(2) N [0,1]	***9.314	** -2.554	***9.846	***9.691	-1.013

Notes: Dependent variable: value added.

Robust standard errors are applied, but are omitted from the table in order to save space. ***, ** and * indicate coefficients significant at 1, 5 and 10 per cent, respectively.

Table 8: Cumulative owner and seller effects in firms mass privatized as listed (L) and non-listed (N) in comparison to nationalized firms (G)

	Model 1 OLS Cumulative diff. 1995-2001	Model 2 OLS Cumulative diff. 1995-2001	Model 3 OLS Cumulative diff. 1995-2001	Model 4 OLS First differences	Model 5 Static FEM Fixed effects	Model 6 Dynamic OLS First differences	Model 7 Dynamic OLS First differences	Model 8 Dynamic OLS First differences
Transformation used	No	Heckman	Initial values	No	Fixed effects	No	Heckman	Initial values
Output (-1)						-0.115***	-0.115***	-0.139***
Assets	0.312**	0.294**	0.383***	0.277***	0.293***	0.269***	0.269***	0.291***
Assets (-1)						0.125***	0.125***	0.160***
Labor	0.572***	0.591***	0.510***	0.256**	0.416***	0.292**	0.299**	0.281**
Labor (-1)						0.056**	0.055**	0.056**
L	0.243**	-0.998	0.207**	0.046***	0.037***	0.048***	0.048***	0.034**
N	0.058	-1.669*	0.090	0.017	0.005	0.013	0.012	0.021**
Constant	0.066	1.968*	-0.767**	-0.011	None	0.029**	0.029**	0.006
Endogeneity [L,N k.I]	Significant	-	-	Significant	-	-	-	-
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies				Yes	Yes	Yes	Yes	Yes
Inputs x ownership effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	475	475	475	3353	3832	2874	2874	2874
Adj. R ²	0.454	0.456	0.458	0.394	0.561	0.437	0.438	0.452
Wald χ^2 (joint)				621.5**	1223**	799.8**	776.2**	866.8**
Wald χ^2 (dummy)				106.9**	108.3**	101.5**	102.1**	100.5**
Wald χ^2 (time)				106.9**	108.3**	101.5**	102.1**	100.5**
AR(1) N [0,1]				-3.571**	7.096**	-2.174*	-2.173*	-2.957**
AR(2) N [0,1]				-1.939	0.652	-2.090*	-2.172*	-2.975**

Note: Robust standard errors are applied, but are omitted from the table in order to save space. *, ** and *** indicate coefficients significant at 10, 5 and 1 percent, respectively; Reference group = G firms

Table 9: Owner effects in listed (LL) and non-listed firms (NN) in comparison to government controlled firms (GG)

	Model 1 OLS Cumulative diff. 1995-2001	Model 2 OLS Cumulative diff. 1995-2001 Heckman	Model 3 OLS Cumulative diff. 1995-2001 Initial values	Model 4 OLS First differences	Model 5 Static FEM Fixed effects	Model 6 Dynamic OLS First differences	Model 7 Dynamic OLS First differences	Model 8 Dynamic OLS First differences
Transformation used								
Selection Control	No	Heckman	Initial values	No	Fixed effects	No	Heckman	Initial values
Output (-1)						-0.102***	-0.102***	-0.122***
Assets	0.209***	0.186***	0.242***	0.182***	0.168*	0.169***	0.185***	0.190***
Assets (-1)						0.118***	0.118***	0.150***
Labor	0.782***	0.790***	0.752***	0.407*	0.611**	0.708***	0.692***	0.677***
Labor (-1)						0.034	0.034	0.029
LL	0.099	1.097*	0.043	0.042*	0.028	0.045**	0.045**	0.025
NN	-0.061	-0.277	-0.052	0.007	-0.004	0.003	0.004	0.008
Constant	0.209*	0.210	-0.573	-0.004		0.045**	0.045**	-0.044
Endogeneity [L,N k.l]	Significant	-	-	Significant	-	-	-	-
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies				Yes	Yes	Yes	Yes	Yes
Inputs x ownership effects	No	No	No	No	No	No	No	No
No of observations	352	352	352	2492	2848	2136	2136	2136
Adj. R²	0.532	0.542	0.536	0.430	0.578	0.492	0.493	0.504
Wald χ^2 (joint)				489.6***	1054***	801.3***	783.5***	937.7***
Wald χ^2 (dummy)				107.4***	109.5***	107.2***	103.7***	111.1***
Wald χ^2 (time)				107.4***	109.5***	107.2***	103.7***	111.1***
AR(1) N [0,1]				-2.645***	6.041**	-2.794**	-2.796**	-3.162**
AR(2) N [0,1]				-1.398	0.601	-0.628	-0.613	-1.688

Note: Robust standard errors are applied, but are omitted from the table in order to save space. *, ** and *** indicate coefficients significant at 10, 5 and 1 percent, respectively; Reference group = GG firms

Table 10: Seller effects in firms sold to strategic investors from listed (LSt) and non-listed (NSt) firms in comparison to firms sold by the government to strategic investors (GSt)

	Model 1 OLS Cumulative diff. 1999-2001	Model 2 OLS Cumulative diff. 1999-2001 Heckman	Model 3 OLS Cumulative diff. 1999-2001 Initial values	Model 4 OLS First differences	Model 5 Static FEM Fixed effects	Model 6 Dynamic OLS First differences	Model 7 Dynamic OLS First differences	Model 8 Dynamic OLS First differences
Transformation used	No	No	No	No	Fixed effects	No	Heckman	Initial values
Output (-1)						-0.088	-0.094	-0.105
Assets	0.404***	0.412***	0.449***	0.056	0.110	-0.013	0.044	0.042
Assets (-1)						0.071	0.083	0.073
Labor	0.511***	0.496***	0.465***	0.829***	0.877***	0.757***	0.701***	0.774***
Labor (-1)						0.327***	0.335***	0.356***
LSt	-0.178	-0.195	-0.125	-0.004	-0.005	-0.023	-0.021	-0.010
NSt	-0.331**	-0.357**	-0.265*	-0.017	-0.034*	-0.038*	-0.039*	-0.003
Constant	0.084	0.154	-1,26	0.055	None	-0.004	-0.006	0.175
Endogeneity [L,N k.I]	Significant	-	-	Significant	-	-	-	-
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies				Yes	Yes	Yes	Yes	Yes
Inputs x ownership effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No of observations	83	83	83	261	348	261	261	261
Adj. R ²	0.410	0.404	0.419	0.451	0.616	0.476	0.481	0.488
Wald χ^2 (joint)				1183.0***	1315.0***	1248.0***	1549.0***	1546.0***
Wald χ^2 (dummy)				6.19*	10.44**	11.95***	11.10**	7.392*
Wald χ^2 (time)				6.19*	10.44**	11.95***	11.10**	7.392
AR(1) N [0,1]				-2.155**	-1.638	-2.006**	-2.060**	-2.133**
AR(2) N [0,1]				-0.846	-2.033**	-0.956	-0.948	-1.022

Note: Robust standard errors are applied, but are omitted from the table in order to save space. *, ** and *** indicate coefficients significant at 10, 5 and 1 percent, respectively; Reference group = GSt firms