



Case-by-Case *Versus* Mass Privatization in Transition Economies: Initial Owner and Final Seller Effects on Performance of Firms in Slovenia

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Summary. — The paper develops a new approach for studying the key policy choice in transition economies between mass privatization and case-by-case privatization. We propose a new analytical approach which separates the initial owner and final seller effects on performance of firms by different privatization agents. By applying the production function approach to the dataset of Slovenian privatized firms, we find two important results. First, we find that mass privatization agents, receiving shares mainly for free, are better initial owners than the government and its institutions only when they are subject to a fully transparent and regulated economic and legal environment. Second, firms sold to foreign or domestic strategic owners by the government are performing better than firms sold by mass privatization agents. But here again, the superiority of the 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-run 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.

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Key words — Europe, Slovenia, transition economies, privatization, firm performance, selection bias, endogeneity

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1. INTRODUCTION

According to the World Bank comprehensive report¹ on lessons learned in the first 10 years of economic transition from planned to market economy, 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 during a short period, as 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 not 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, policymakers in transition economies decided to privatize the privatization process itself. Initial owners from mass privatization, privately managed privatization funds, insiders or citizens who mostly 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 mass privatization institutions are as initial temporary owners and how good they are as the final sellers of former state-owned firms. Not only is the speed in finding the appropriate strategic investors important, but the quality of this selection matters as well. Similarly, the overall efficiency of the standard case-by-case privatization depends on how efficient governmental privatization institutions are as initial temporary owners of firms before sale and how good they are in quickly finding the appropriate private buyer. To analyze the efficiency of transitional ownership effects in both programs, one should compare performance of firms before being sold by the government or by mass privatization institutions. We call these effects on

firm performance *initial owner effects of privatization*. On the other hand, the efficiency of both programs in selling firms to “true” (final) owners is to be found by comparing performance of firms after being sold to strategic investors directly by the government or indirectly by mass privatization agents. The performance of firms after the sale is mainly due to the quality of these new strategic owners, but the important policy issue is whether this selection is made by the government or by the initial owners from mass privatization. To stress that policymakers have to make a deliberate choice whether government or mass privatization institutions are the final selling agents in privatization, we call these effects of the ownership change on firm performance *final seller effects of privatization*.

To study the initial and final effects of privatization on performance of firms, we use the complete dataset of Slovenian firms that were privatized along with the privatization program of 1992 and launched by 1994. The dataset used contains firms that were privatized both by mass privatization method as well as by the case-by-case privatization method. We combine firms’ accounting data with the ownership data for the period 1994–2001. By applying the production function approach, we demonstrate that mass privatization institutions are better temporary owners only when they are subjected to a fully transparent and regulated economic and legal environment (i.e., in the firms that are listed on 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 institutions. Our analysis shows that government institutions are better sellers, that is, firms that were sold to strategic owners (foreign or domestic) by the government are performing better than firms sold by mass privatization participants. 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 firms that are listed on the stock exchange. 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 and Fernald (1995) and Levinsohn and Petrin (2000) approach as well as the system-GMM approach.

In Section 2, we develop the framework for studying initial owner and final seller effects of different privatization agents 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

In this section, we propose a new approach for studying the key policy choice in transition economies between mass privatization and case-by-case privatization. A new analytical approach is being introduced which separates the initial owner and final seller effects on performance of firms by different privatization agents. The key policy choice in privatization for countries in transition is schematically presented in Table 1 which shows hypothetical improvements in firm's performance as a consequence of different privatization methods. Suppose that privatization can improve firm performance by the magnitude of 0–3 in one or more steps. Case-by-case privatization requires that a special privatization program be prepared for each individual firm, based on the individual characteristics of the firm and after some preparatory restructuring the firm is sold in a com-

petitive way. 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 in the magnitude of 3), many stay in continued state ownership (with no initial owner effects on performance, that is, the magnitude is equal to 0). Alternatively, 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. Mass privatization transfers ownership in hundreds of companies quickly to new inefficient private owners (with at least some initial owner effects on performance in the magnitude of 1), while further improvements are expected only after secondary sales by mass privatization institutions take place.

It is expected that initial 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 representing the initial phase of privatization with transitional owner effects on performance of the order 0 *versus* 1.

It is expected that the final seller effects on performance are stronger in case-by-case privatization than in mass privatization (Hypothesis 2). Before selling, the 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 hand, mass privatization institutions are acting more narrowly, considering only the amount of money they can get by selling the firms. Underperformance of mass privatization institutions is even more likely when the institutional framework for secondary transactions is relatively weak. This hypothesis is shown in Table

Table 1. *Hypothesized quality of privatization in the transformation matrix: expected firm performance in the relative order from 0 to 3*

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

1 in the column representing the final phase of privatization, with additional seller effects increasing performance from the order 0–3 in case-by-case privatization and from the order 1–2 in mass privatization.

Therefore, the advantage of mass privatization is to introduce at least some partial privatization for all firms in the initial phase, bringing at least some positive owner effects, while the advantage of case-by-case privatization is the quality of the final phase, resulting in the stronger seller effects. The overall cumulative effects of private-sector-led mass privatization *versus* government-sector-led case-by-case privatization then depends on the relative importance of owner and seller effects in the population of all firms included in both programs. When initial owner effects are dominating, mass privatization should be better. When 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 standard research approach, comparing performance of firms temporarily owned by mass privatization institutions (with performance of the order 1) and firms sold by the government in case-by-case privatization (with performance of the order 3) is not appropriate. The effects of case-by-case privatization are overvalued, as nonprivatized firms from these programs (with performance of the 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 the order 2) are excluded. This systematic bias in favor of case-by-case privatization 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 a 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 equations.² This approach is very questionable in our framework as all success stories (with the final seller effects on performance of the orders 2 and 3) are attributed to strategic ownership, with no distinction made as to whether the investor was chosen by the government or by mass privatization institutions. On the other hand, only weak ini-

tial ownership effects (with performance of the order 1) are attributed to mass privatization programs.

In analyzing the two policy choices in 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 cumulative 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 nonprivatized firms still owned by the government, and, conversely, to compare firms 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 relevant empirical analysis of the two policy choices. First, the starting point performance of firms selected for case-by-case and mass privatization should be the same (with performance of the order 0 in the starting period). 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 starting conditions are also the main reasons why studies comparing macroeconomic performance of countries with mass privatization or case-by-case privatization programs can tell us so little about this difficult privatization 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. It is expected that in a functioning market economy, all privatized firms should eventually find the appropriate owners and,

after cumulative effects of all these transactions, they should be equally efficient irrespective of the initial privatization method (with performance of the order 3 in the last column of Table 1). Therefore, to study these differences in a meaningful way one should choose the time period carefully. 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 is expected to be superior, while later case-by-case privatization might well catch up and overcome the efficiency of mass privatization programs. However, it should be stressed that Hypotheses 1 and 2 are in principle consistent with mass or case-by-case privatization being more efficient in any particular time period and they can cover well the diversity of real life implementation problems common in large-scale privatizations. For example, if 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 was the case in Poland or Slovenia) even in a relatively short time period. The speed of implementation of the programs matters much, as the overall success of the program depends on what percentage of firms have already reached the final phase with strong seller effects and what percentage of firms are still in the initial phase with weak or no transitional ownership effects. The importance of the speed of privatization is illustrated in Table 2, where the distributions of

firms are presented that would in the short run lead to the expected better results of mass privatization (due to small but immediate positive owner effects of the order 1 in 100% of these firms prevailing) and in the long run to the expected better results of case-by-case privatization (due to strong seller effects of the order 3 in 50% of these firms prevailing). In addition, the case with relatively rapid implementation of case-by-case privatization is presented, which would lead to the unexpected outcome of this privatization method being more efficient even in the short run (due to strong seller effects of the order 3 taking place in 50% of these firms very quickly).

Different institutional arrangements provide different incentives for government 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 experience, 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, which are mostly critically evaluated today, were far less important for policymakers at the time.

Table 2. Hypothesized speed of privatization in the transformation matrix: illustrative distribution of firms included in privatization according to the first phase (with initial owner effects) and to the second phase (with final seller effects)

	Initial phase owner effects	Final phase seller effects
<i>Short run with mass privatization superior</i>		
Case-by-case privatization (%)	80	20
Mass privatization (%)	100	0
<i>Long run with case-by-case privatization superior</i>		
Case-by-case privatization (%)	50	50
Mass privatization (%)	80	20
<i>Short-run with rapid case-by-case privatization superior</i>		
Case-by-case privatization (%)	50	50
Mass privatization (%)	100	0

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 Murrell (2002) or Havrylyshyn and McGettingan (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 owner and seller effects on performance of firms in various non-traditional privatization and restructuring programs. In the rest of this 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 initial owners from mass privatization are in comparison to the government and its agencies in the postprivatization period as final sellers of firms to strategic investors.

(a) *Privatization policy in Slovenia*

While the Slovenian Law on Ownership Transformation, adopted in November 2002, introduced an immediate transformation of all enterprises into companies with known owners, the real privatization was only gradual and does not seem to reach an end. Slovenia’s privatization law provided a combination of four methods of ownership transformation:

- Transfer of 40% of shares to para-state funds: 10% to the Compensation/Restitution fund, 10% to the Pension fund, and 20% to the Development fund.
- Internal distribution of shares to employees in exchange for vouchers (this was limited to 20% of company’s shares).
- Internal buy-out of shares (at 50% discount), which was limited to 40% of company’s shares.

—Public offerings of company’s shares, which mainly took place in companies too large for being privatized by internal buy-outs.

Companies were free to opt for any combination of these methods, given that the Privatization Agency has approved the transformation and that 40% of shares were transferred to the relevant para-state funds. This ownership transformation became operational in 1994. One should note, however, that the privatization law (of 1992) did not touch privatization of firms in the so called strategic sectors (such as banks, insurance companies, telecommunications, steel factories, etc.) which are yet to be privatized in the future.

This process of “privatization” in Slovenia, however, can be merely described as transformation of ownership with the real privatization postponed. The socially owned firms had a choice to participate in a government-led restructuring program before privatization or enter directly into the mass privatization program. Initially, the restructuring program was managed through a governmental restructuring agency (the Development fund of Slovenia) that became a temporary owner of these firms with the mandate to first restructure and later to 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 preprivatization restructuring programs and mass privatization programs in Slovenia, we have in a way only temporary owners who are responsible for finding the appropriate final owners for each firm in the next phase. In the first case, the 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, who 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 even more important to know how well firms that are in “temporary” ownership of the government per-

form *versus* those that are in “temporary” ownership of initial owners from mass privatization.

Most socially owned firms chose to enter directly into a 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 large.⁴ 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 citizens at large. The major reason for that is that the listed firms were initially too large for being privatized mainly to the insiders. As a consequence, the shares of these firms have been offered publicly to the broad audience and the shares were listed on the Ljubljana stock exchange. On the other hand, the corporate governance regime and institutional framework for secondary transactions among both groups of privatized firms is very different. While the mass privatization process in listed firms was well regulated, this was not the case in nonlisted firms. In listed firms, there is much better information available, and initial shareholders have the possibility for transparent exit on the market. In nonlisted firms, consolidation of ownership in the postprivatization period is taking place in a nontransparent way, while in listed firms, these transactions are public and takeovers had to be completed through competitive public bids.

(b) *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 1,350 firms in these programs) for which data on initial and final ownership are available. The data were available for the period 1994–2001, which is suitable for our analysis since the privatization program started in 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 the Agency of Payments. Accounting data have 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 the aggregate CPI (consumer price index). The data on ownership are obtained from different sources. Data on initial ownership structure, that is, on the type of privatization method chosen by an individual firm in 1994, are 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 during 1998–2001 are obtained from the Central Securities Clearing Corporation.

To study and present the quality and speed of ownership transformation after privatization, we use a concept of the transformation matrix.⁵ The transformation matrix is constructed by taking into account the initial and final ownership categorization of firms. In this paper, we initially group firms into those that were mass privatized as listed (L) or nonlisted (N) and those that were taken over by governmental institutions for preprivatization restructuring (G). The transformation matrix provides information on transition of these firms into firms that remained in the same category (LL, NN, GG) and into firms that were subject to secondary transactions, or even more narrowly, subject to 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). Similar is the intensity of 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.

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 firms in the sample grouped into ownership categories G, L, and N. 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) are 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

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

Firm type	Government	Nonlisted	Listed	Strategic	Total
Government (G)	39 (GG)	11	5	16 (GSt)	71
Nonlisted (N)	8	260 (NN)	11	62 (NSt)	341
Listed (L)	1	0	57 (LL)	9 (LSt)	67
Total	48	271	73	87	479
<i>in %, n = 479</i>					
Government (G)	54.93 (GG)	15.49	7.04	22.54 (GSt)	100
Nonlisted (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 nonlisted (N) in 1994

Ownership group	Sales ^a	Employees	Assets ^a	Value added/ employee ^a	Assets/ employee ^a	Equity/ assets	EBITDA/ sales	Exports/ sales
G								
Mean	2.5E+06	255	4.2E+06	2,530	15,823	0.587	0.058	0.283
N	71	71	71	71	71	71	71	71
Min.	2.9E+05	22	2.5E+05	258	2,713	-0.161	-0.186	0
Max.	2.3E+07	1,357	3.5E+07	7,313	111,664	0.965	0.575	0.998
L								
Mean	7.8E+06	509	1.2E+07	3,159	38,349	0.727	0.082	0.321
N	67	67	67	67	67	67	67	67
Min.	3.0E+05	29	7.6E+05	463	3,353	0.053	-0.220	0
Max.	1.1E+08	3,547	1.0E+08	8,363	568,355	0.972	0.435	0.919
N								
Mean	2.4E+06	241	2.5E+06	2,927	13,389	0.628	0.047	0.236
N	341	341	341	341	341	341	341	341
Min.	2.8E+05	10	1.5E+05	-6,653	911	-0.040	-0.455	0
Max.	4.3E+07	6,076	5.8E+07	16,421	300,332	0.993	0.299	0.943
Total								
Mean	3.2E+06	281	4.0E+06	2,900	17,241	0.636	0.053	0.255
N	479	479	479	479	479	479	479	479
Min.	2.8E+05	10	1.5E+05	-6,653	911	-0.161	-0.455	0
Max.	1.1E+08	6,076	1.0E+08	16,421	568,355	0.993	0.575	0.998

Source: Authors' calculations.

^a In thousands of SIT.

indicators (EBITDA⁶ to sales), the best firms were listed on the stock exchange, and the worst were selected for a 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 during the preprivatization period.

Table 5 summarizes overall changes in performance of firms undergoing different privatization programs. Changes in performance serve as a measure of the efficiency of individual pro-

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

Ownership group	N	Sales	Value added	TFP ^a	Assets	Labor
<i>Firms according to initial owners, 1995–2001</i>						
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
<i>Firms staying with initial owners, 1995–2001</i>						
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
<i>Firms sold to strategic owners, 1999–2001</i>						
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

Source: Authors' calculations.

^a TFP (total factor productivity) was calculated as a Solow residual by estimating Eqn. (1) without ownership variables (see Section 4).

grams. 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 initial owner and final 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 to 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 the governmental restructuring program (G firms) and in regulated mass privatization (L firms) outperforming firms in the nonregulated mass privatization program (N firms). On the other side, firms are restructured in a very different way. G firms were subject to 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% in value added), while N firms are more or less stagnating. All three groups reduced employment during the period, with the most dramatic fall of 32.5% being realized in G firms in comparison to the fall of about 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.

The change in performance of LL, NN, and GG firms (diagonal firms) reflect primarily the initial owner effects. Therefore, to find out who is the better temporary owner—governmental institutions or participants 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 preprivatization period (compare LL with GG firms), while contrary to Hypothesis 1, non-regulated mass privatization seems to provide smaller transitional owner effects (compare NN with GG firms). At the same time, it should be noted 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) experienced the highest growth in assets (+14.2%). Data indicate that initial owners from mass privatization are simply not capable and willing to invest as much as the government in firms they temporarily own in the transition process.

To find out who is a better final seller in privatization—governmental institutions or initial owners from mass privatization—one should

compare the performance of off-diagonal firms. We can also observe who is the better final seller to strategic investors by comparing performance of firms that were initially grouped as listed, nonlisted, or governmental, but were subsequently sold to strategic buyers (LSt, NSt, GSt). 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 during 1994–98. In accordance with Hypothesis 2, positive TFP growth (+5.2%) is shown only by firms sold by the government (GSt), while firms sold by mass privatization institutions experience negative TFP growth. Strategic investors chosen by the government or by 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 the previous section reveals somehow an expected result, with the important qualification that regulated and nonregulated 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 firms 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 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.

(a) *Simultaneity of privatization methods*

In analyzing the performance of firms after privatization/restructuring, it has to be taken

into account that the selection of a privatization method is not exogenous but 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 in 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 Dubey & Vodopivec, 1995; Simoneti, Rojec & Gregorčič, 2003; Smith *et al.*, 1997).⁷ Any evaluation of a particular 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 Marcinein and van Wijnbergen (1997) and taken into account in empirical studies by Kočenda and Valachy (2003). The simultaneity bias was also confirmed for Polish privatization (see Claessens & Djankov, 1998; Grosfeld & Hashi, 2003). Djankov & Murrel (2002), in their quantitative survey on privatization in transition countries, offer a good overview on 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 performance and ownership structure. In order to check for the robustness of our results, we use different methods to account for this simultaneity.

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 TFP growth-accounting model:

$$y_{it} = \alpha k_{it} + \beta l_{it} + \delta_t + \eta_i + \gamma \mathbf{a}_{it} + e_{it},$$

where $\alpha + \beta \neq 1$, (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 which serves as a control for common economic policy shocks. 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:

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

where elements of \mathbf{a}_{it} are the elements of the transformation matrix; that is, L, N, and G stand for listed, nonlisted, 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 evidence 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, that is, $E(\mathbf{a}_{it}e_{it}) \neq 0$, 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 the Hausman (1978) test of endogeneity, we first regress the endogenous ownership structure on the set of inputs:

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

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

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

Combining Eqns. (1) and (4), we get the complete regression model:

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

where v_{it} in fact denotes the OLS residuals from the reduced form regression (3). 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 of dealing with the endogeneity bias is to estimate model (1) by 2SLS.⁸ Interestingly, this method

has been widely neglected in previous research on the impact of ownership on firm performance. A 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 preprivatization performance indicators are used as instruments for endogenous ownership variables.⁹

The third, and most widely used, method in related empirical work so far has been to treat the impact of simultaneity between ownership and performance implicitly as an omitted variable in the sense of unobserved individual firm-specific effects (i.e., η_i) or group-specific effects (κ_j , where j denotes ownership group).¹⁰ 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 κ_j . However, we do not solve the problem when the impact of ownership on firm performance behaves according to a 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 preprivatization period. The data on initial performance of Slovenian firms in the preprivatization year 1994 in fact confirm significant differences among firms with different ownership structures. Table 4 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, nonregulated mass privatization with no listing and preprivatization restructuring by the government) is being estimated. The probability of firms to choose one of the three possible ownership forms is conditional on their operational characteristics in the preprivatization year 1994. We estimate the probability of p_{it} [0, 1] using the following multinomial logit model:

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

where \mathbf{M}_{it} is a matrix of operational characteristics of firms. We assume that errors are IID distributed and have an independent

extreme-value distribution. The control variables contained in 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 Table 6 confirm that the above differences are essential in our case. Significant differences between listed and nonlisted firms are found in terms of 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.¹¹

In the second step, following Amemiya (1984), we use the predicted values based on an estimated coefficient from the multinomial logit model in order to calculate a vector of the so-called inverse Mills' ratios¹² for individual firms. The latter then enters as a control variable into our basic model (1) in order to control for the endogeneity between firm performance and the privatization selection method.

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

(b) *Modeling impact of ownership on performance in a panel setup*

Present applications to estimate production functions have revealed significant problems of potential correlation between input levels

Table 6. Evaluation of the privatization method selection^a and of secondary transactions mechanism^b using multinomial logit model

	Initial selection		Secondary selection	
	Coefficient		Coefficient	Coefficient
				<i>Lst</i>
Sales				-6.8E-09
Employment				1.5E-04
Assets/employee				-4.2E-05
VA/employee				-3.8E-04
EBITDA/sales				1.952
Exports/sales				-3.155
Constant				-0.127
		<i>N</i>	<i>NN</i>	<i>NSI</i>
Sales		-1.1E-07***	-1.9E-07***	-1.1E-07
Employment		2.6E-04	6.9E-04	-8.8E-04
Assets/employee		-2.2E-05***	-0.0000233***	-8.3E-05***
VA/employee		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
		<i>G</i>	<i>GG</i>	<i>GSt</i>
Sales		-4.5E-08	-8.0E-09	-6.6E-08
Employment		-3.8E-04	-1.1E-03	5.2E-04
Assets/employee		-1.8E-05**	-3.6E-05***	-6.3E-06
VA/employee		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 observations		479	443	
Pseudo- R^2		0.210	0.244	

^a Initial privatization method selection: base group = listed firms in mass privatization, data for 1994.

^b Secondary transactions mechanism: base group = listed firms (LL), data for 1994.

***, **, and * indicate statistical significance of coefficients at 1%, 5%, and 10%, respectively.

and the unobserved firm-specific shocks. The idea is that firms that experience a large positive productivity shock may respond 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 a modified TFP growth-accounting model:¹³

$$y_{it} = \gamma a_{it} + \alpha k_{it} + \beta l_{it} + \delta_{it} + (\eta_i + u_{it} + m_{it}),$$

where $\alpha + \beta \neq 1$,

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

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

where of the error components, η_{it} 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 (a_{it}) and measurement errors (m_{it}).

Given the AR(1) process in u_{it} according to model (8), a firm's response to a 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 ($E(z_{it}u_{it}) \neq 0$).¹⁴ 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 the 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.¹⁵ Tests of serial correlation, however, reveal 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 capital and labor shares.

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

Table 7. Properties of estimated production functions, period 1994–2001

Transformation	1 OLS	2 Within (FE)	3 OLS	4 OLS	5 First differences
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 × ownership effects	No	No	No	Yes	Yes
No. of observations	3,818	3,818	3,818	3,818	3,332
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

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%, respectively.

as long as we have to deal with serious measurement problems in the stock of capital (see Griliches & Mairesse, 1995). The most simple methods are the application of fixed effects or first-difference transformation in order to wipe out the firm-specific unobserved effects η_i . However, the drawback of both methods 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-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 the 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, three more sophisticated methods applied to estimating a production function in a dynamic panel data context were developed 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, which is fully transmitted to the investment equation. In other words, OP assume that if capital input has already adjusted to the anticipated part of the productivity process ($\rho u_{i,t-1}$ in (8)), the investment proxy will only account for the “news,” that is, the unanticipated part of the technology shock (o_{it}). As a consequence, some correlation between the 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 the 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 material costs into the model, we observe reduction both in the capital as well as the labor parameter, but the capital parameter seems to be affected to a larger extent. At the same time, serial correlation remains sizeable. It is (initial) ownership cross-effects with individual production inputs that improve the parameters of capital and labor, and move them closer 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 the 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):

$$\begin{aligned}
 y_{it} = & \rho y_{i,t-1} + \alpha k_{it} - \rho \alpha k_{i,t-1} \\
 & + \beta l_{it} - \rho \beta l_{i,t-1} + (\delta_i - \rho \delta_{i,t-1}) \\
 & + (\gamma a_{it} - \rho \gamma a_{i,t-1} + \eta_i(1 - \rho)) \\
 & + o_{it} + m_{it} - \rho m_{i,t-1}.
 \end{aligned} \tag{9}$$

In model (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 model (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 u_{it} and m_{it} in model (7) are not serially correlated. This holds also whether the individual effects are considered fixed or random (see Baltagi, 1995; Hsiao, 1986; 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 model (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 the difference-GMM approach are shown to be weak instruments for first-differenced equation (see Arellano & Bover, 1995; Blundell & Bond, 1998, 1999), we apply the system-GMM approach, which in addition to lagged levels uses also lagged first differences as instruments for equations in levels. As the model is estimated in first differences, corresponding instruments for $\Delta x_{i,t-3}$ 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) point 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 suffer from the same drawback as that of the within estimator; valid instruments are usually weak instruments—that is 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 the above methods can be efficient only when we are dealing with accurately measured datasets. When

this precondition is violated, no existing econometric technique can help in controlling for the unobserved productivity shocks and simultaneity bias. In the 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, thereby exacerbating other problems and misspecifications. 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 have 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's performance response to changes in ownership might well take the pattern of a distributed lag model. We therefore first estimate model (7) on a set of cumulative differences in firm variables over the period 1995–2001.¹⁶ In the second step, we proceed with 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, that is, 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, that is, the TFP growth model (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 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 crossownership—inputs effects), the input parameters are reduced significantly. Of course, explanatory power of the model estimated in first differences drops significantly as a 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 the 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.

(a) *Overall cumulative impact of privatization programs*

We first examine the impact of initially chosen privatization programs on firm performance, which captures both owner and seller effects simultaneously. The 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 performing 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 the TFP growth pattern between firms that have undergone nonregulated mass privatization (N) or have been restructured by government institutions (G). These results remain robust also after correcting for initial differences in performance (with the exception of the Heckman correction procedure in model 2). Results of our model estimated using the year-by-year growth rates data (compare models 4–8) demonstrate 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 patterns 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.¹⁷

Hence, overall effects of privatization on performance of firms that have initially selected either nonregulated 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 owners—government or nonregulated 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.

(b) *Initial owner effects*

The owner effects are examined only in firms that stayed in the same ownership group throughout the period 1994–2001, that is, firms at the diagonal of the transformation matrix. Here, we study only the overall ownership effect on the performance of firms that have 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).¹⁸ Table 3 has revealed only minor ownership changes over the period, as until 1999, more than 75% of nonregulated mass privatized firms and 85% of listed firms remained in the same ownership category, which they had chosen in 1994. Ownership changes occurred more intensively in firms restructured by the government, since only 55% of G firms still remained under the 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 nonregulated mass privatization, taking place in nonlisted firms in Slovenia, we could not find any empirical support for diffused private owners from mass privatization being better owners than the government in nonprivatized firms (coefficients for the NN variable in Table 9 are not significantly different from the GG firms that serve as a comparison group).

One should note, however, that the above results are less robust than was the case with overall cumulative privatization effects using the initial ownership structure. The above re-

Table 8. Cumulative owner and seller effects in firms mass privatized as listed (*L*) and nonlisted (*N*) in comparison to nationalized firms (*G*)

Transformation used	Model 1 OLS Cumulative differences 1995–2001	Model 2 OLS Cumulative differences 1995–2001	Model 3 OLS Cumulative differences 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
Selection control	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,l]	Significant	–	–	Significant	–	–	–	–
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies				Yes	Yes	Yes	Yes	Yes
Inputs × ownership effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	475	475	475	3,353	3,832	2,874	2,874	2,874
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**	1,223**	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%, respectively; Reference group = G firms.

Table 9. *Owner effects in listed (LL) and nonlisted firms (NN) in comparison to government controlled firms (GG)*

Transformation used	Model 1 OLS Cumulative differences 1995–2001	Model 2 OLS Cumulative differences 1995–2001	Model 3 OLS Cumulative differences 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
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 × ownership effects	No	No	No	No	No	No	No	No
No. of observations	352	352	352	2,492	2,848	2,136	2,136	2,136
Adj. R ²	0.532	0.542	0.536	0.430	0.578	0.492	0.493	0.504
Wald χ^2 (joint)				489.6***	1,054***	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%, respectively; Reference group = GG firms.

sults, interestingly, do not show up when estimating the empirical models on a dataset of cumulative changes over the period 1995–2001 (see Table 9, models 1–3), but they do so when using data on year-by-year changes (Table 9, models 4–8). 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.

(c) *Final seller effects*

If conventional wisdom holds, one may expect government institutions to be better sellers 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 hand, 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 participants in mass privatization—have done a better job of selling firms to strategic investors?

Results contained in Table 10 are very conclusive in demonstrating that in the case of privatization in Slovenia, the government has done its job of selling firms much better than nonregulated 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 better after transaction in terms of TFP growth than firms sold by the nonregulated private mass privatization institutions. On the other hand, for regulated mass privatization, the results are not conclusive (coefficients for the LSt variable in Table 10 are negative but not significant). As in the case of owner effects, the quality of regulation in mass privatization has a decisive impact on seller effects. Transparency of takeover rules for listed companies and, consequently, open competition among strategic buyers made these transactions almost as efficient as those completed by the government in 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 initial participants in mass privatization are not good owners should not be surprising, as long-term ownership is not their intended role. It is equally important whether privatization funds and other initial owners from free distribution of shares 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 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 a more relevant comparison between various mass privatization programs and traditional approaches to privatization. Firms still owned by participants in mass privatization should be compared with nonprivatized 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 nonlisted firms with a government-led preprivatization 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). 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 hand, 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.

On the other side, the same type of initial owners from mass privatization are acting quite differently from owners and sellers in listed and nonlisted firms in Slovenia. This is in accordance with the view (see Sachs, Zinnes, & Eilat,

Table 10. *Seller effects in firms sold to strategic investors from listed (LSt) and nonlisted (NSt) firms in comparison to firms sold by the government to strategic investors (GST)*

Transformation used	Model 1 OLS Cumulative differences 1999–2001	Model 2 OLS Cumulative differences 1999–2001	Model 3 OLS Cumulative differences 1999–2001	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
Selection control	No	Heckman	Initial values	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,l]	Significant	–	–	Significant	–	–	–	–
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies				Yes	Yes	Yes	Yes	Yes
Inputs × 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)				1,183.0***	1,315.0***	1,248.0***	1,549.0***	1,546.0***
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%, respectively; Reference group = GST firms.

2001) that a well-defined institutional framework is the key to success or failure of privatization programs in transition economies. 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 takeover rules for listed firms.

Taking together owner and seller effects on firm 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 nonregulated mass privatization and in

the government restructuring program. The policy implications of our results for Slovenia are rather straightforward. Better regulation of corporate governance and consolidation of ownership is the key for better performance of nonlisted firms. On the other hand, speeding up privatization of firms taken over by the government for preprivatization restructuring (close to 55% of them were still owned by the government in 1999), should improve firm performance in this program, as the government was actually found to be relatively good at selling firms to appropriate strategic investors and not so good at holding them.

NOTES

1. The World Bank, *Transition—The First Ten Years: Analysis and Lessons for Eastern Europe and Former Soviet Union*, 2002, pp. 72–73.

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

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

4. More about different methods of privatization and restructuring in Slovenia can be found in Dubey and Vodopivec (1995), Prašnikar (1999, 2000), Smith *et al.* (1997), Simoneti *et al.* (2003), and Simoneti, Rojce & Gregorčič (2003).

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

6. EBITDA = earnings before interest and tax plus depreciation (cash flow from operations).

7. One should note that prior to privatization, Slovenian firms were formally not owned by the state (this was true only in exceptional cases, such as natural state monopolies) but were socially owned, that is, owned by workers. This difference in the ownership status with regard to other ex-communist countries ensured Slovenian firms *de facto* a kind of autonomy. Hence, firms

were free to choose any privatization method, where badly performing firms have autonomously chosen the governmental restructuring scheme.

8. See Wooldridge (2002) for more details.

9. See Djankov and Murrell (2002) for a good overview on studies that used either simple 2SLS or 2SLS with preprivatization firm performance to deal with the privatization simultaneity bias problem.

10. Brown *et al.* (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 group-fixed effects for firms that are eventually privatized into their estimation model.

11. Note that choice of a particular privatization method by each firm has been made upon its operational characteristics in the preprivatization year 1994, and that each particular privatization plan by each firm that was submitted to the Agency of Privatization should have relied on 1994 performance. This means that firm performance for 1994 was deterministic for selection of one of the three privatization methods.

12. Inverse Mills’ ratios are calculated as the ratios between the normal density and its cumulative density function. Note that calculation of inverse Mills’ ratios is different for treated (i.e., firms observed throughout the sample) and nontreated observations (i.e., firms observed in the initial year but then dropped due to bankruptcy, statutory changes, etc.).

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

14. Where, again, \mathbf{z}_{it} is a matrix of inputs k_{it} and l_{it} .
15. Note that we include industry dummies at the NACE-2 digit level to capture crossindustry variation in production technology as well as year dummies in order to control for common policy shocks in the observed period.
16. Note that initial year 1994 is excluded from the estimation period as we use this year's data as instruments to control for simultaneity between ownership structure and initial firm performance.
17. 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.
18. In a previous version of the paper, we 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 a different dataset, 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).

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