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Measuring the Causal Effect of Privatization on Firm Performance

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Abstract

Despite an apparent consensus in the literature that privatization leads to increased productivity and profitability of firms, the problem of endogeneity bias is profound and has been emphasized in a number of meta-analyses. We propose a new method to address the endogeneity bias and apply it to a universe of Polish medium and large firms over 1995-2009. Unlike some previous studies we find that improvement in firm performance is a rare phenomenon, which suggests that the endogeneity bias could have been indeed large.

Keywords:
privatization, firm performance, endogeneity bias

JEL:
P45, P52, C14, O16

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1 Introduction

There are strong grounds to dismiss a large part of the evidence on the grounds of endogeneity, which made estimators of the *causal* effect of privatization on firm performance overstated. If indeed privatization fosters output and productivity, it would be a recommendable and relatively universal policy tool. However, DeWenter and Malatesta (2001) show empirically that the profitability of state-owned firms increases already *before* privatization, Megginson and Netter (2001), while the majority of the research dates back to the mid 1990s, i.e. the first years of transition, when only few private firms could be used as comparison group. Moreover, Gupta et al. (2008) demonstrate the crucial role of privatization sequencing, which has not been accounted for in majority of empirical studies.

In the most cited meta-analyzes, both Djankov and Murrell (2002a) as well as Estrin et al. (2009) emphasize that adequate accounting for endogeneity is crucial and the attempts to address this problem have been only found in minority of analyzed studies. Moreover, Estrin et al. (2009) argue as well that privatization seems to improve performance mainly if foreign investor is involved. In fact, "profoundness" of FDI involvement (e.g. majority shareholding) have been found significant in majority of analyzed empirical studies, also for Poland - see Hagemejer and Tyrowicz (2011) - whose case is analyzed here. This finding is easy to be reconciled with a majority of the literature on FDI, but seems to provide little support to the claim that privatization *per se* helps economic efficiency.

To adequately measure the effect of privatization on firm performance one needs to control for two potentially strong effects. First, firms may strategically respond to the suggestion that they *will* be privatized. Second, both buyers/investors and SOEs *select* each other, while the unsuccessful privatizations (SOEs without an interested buyer) are not likely to be identified as such in the data. Both these facts may result in biased estimators, likely to overstate the effect of privatization on profitability, productivity, etc.

To address the bias, an identification restriction is needed. In this paper we propose such an identification method. We construct a counterfactual based on incumbent private enterprises and trace the relative performance of privatized firms prior and subsequent to the event privatization. To assure exogeneity, we instrument for the decision to privatize using fiscal needs indicators. The immediate budgetary needs have already been demonstrated to affect significantly the government willingness to privatize Bortolotti et al. (2004). We build on these findings since fiscal stance is surely exogenous to firm level performance. In fact our instrument shows strong correlation with the intensity of privatization. While it is only a time-varying variable, to account for industry variation we also include measures of "supply" and "demand" for privatized companies, which are both time and industry specific. These include the intensity of FDI presence in the sector as well as a breadth of the state ownership in the sector. The reference group of incumbent private firms is selected in order to maintain the policy relevance and maintain focus on the sources of output and productivity growth. We apply this approach to a universe of Polish medium and large firms over 1995-2009.

This paper finds no universal effect of privatization on firm performance, thus

corroborating the concerns about the endogeneity bias raised in earlier literature. More specifically, although in general the data show in the OLS specification that privatized firms are superior in terms of performance improvement, this effect seems to be mostly driven by the selection. When instrumented, privatization dummy looses statistical significance universally across the firms, with the exception of SOEs who need to compete globally. This last finding is consistent with the contention expressed by Estrin et al. (2009), but raises doubts whether the superiority in terms of performance comes from privatization or from foreign ownership.

The paper is structured as follows. The next section discusses the relevant literature. We briefly describe the data and move to specifying the idenfication strategy and instrument design in section 3. Results along with various robustness checks are described in section 4. In the last section we present conclusions.

2 Literature review

In addition to mostly firm-level studies for the industrialized countries, mass privatization of the state owned firms has received a lot of attention in the context of transition from centrally planned to market economies underwent by Central and Eastern European countries. While majority of these studies focused around the first years of transition and thus initial waves of privatization, the modes of these ownership changes differed substantially across the countries of the region, Grosfeld and Roland (1995). Recently the topic has received further attention due to undergoing privatization in other transitional economies - predominantly China. In this literature review we concentrate on theoretical premises and empirical studies from the CEE region.

From the theoretical perspective, privatization is believed to raise efficiency due to improvement in the alignment of decision rights,Vickers and Yarrow (1988); Graham and Prosser (1991); Boycko et al. (1996). In fact, much of the literature views privatization from the perspective of agency theory, cfr. Dharwadkar et al. (2000). However, a more refined view of this process recognizes that many of the changes in management could be enforced already before the privatization. For example, Megginson and Netter (2001) provide a theoretical framework that frames the relevance of internal processes in the companies foreseeing privatization. They show that already in the expectation of future change in the ownership structure the management of the firm may introduce some pro-efficiency policies.

The political economy context of the privatization processes has also been widely discussed. The focus of the early literature in the context of transition lied in the so-called soft budget constraint, Roland (2000) On the other hand, the literature theorizing about privatization in the context of industrialized countries emphasized the problem of commitment and voting, e.g. Perotti (1995); Biais and Perotti (2002).

While all these conceptualizations are intuitive and appealing, the implementation of privatization may in practice yield effects inconsistent with the premises from the theoretical models. Namely, there is a number of microeconomic and macroeconomic factors that can largely drive the privatization decisions outside the context imposed by the models. The microeconomic factors include the rule

of law, Winiecki (1994) and institutional quality, Anderson et al. (2000), whereas from the macroeconomic perspective the budgetary situation seems particularly important. In addition, some researchers shed light on the role of matching between the (state owned) firm to be sold and the investor interested in purchasing, Chen (2012).

Cross-country comparisons facilitated by the access to data on privatizations around the world seem to corroborate empirically these ideas. Klein and Luu (2003) argue that the success of privatization (as measured by the improvement in technical efficiency) is affected by the perception of market participants and outside investors about stable macroeconomic policies and the confidence these policies will remain in place. Bortolotti et al. (2004) show that fiscal pressure may be more important than the political stance, while privatization takes place typically in wealthy and democratic countries, endowed with deep and liquid stock markets, and is affected by the governing political majority. In addition, extent of privatization in terms of revenues and stakes sold appears more limited in civil law countries, where shareholders are poorly protected, banks powerful, and capital markets less developed.

Taking the microeconomic perspective, majority of the empirical literature seems to suggest that firm performance improves subsequent to the privatization. On one hand, performance indicators are higher after privatization than before, e.g. Megginson et al. (1994) for UK; Lopez-de Silanes et al. (1997) for US; Lízal and Svejnar (2002) and Harper (2002) for Czech Republic; Smith et al. (1997) for Slovenia, Barberis et al. (1996) for Russia among others. On the other hand, privatized firms tend to outperform the state-owned enterprises (SOEs), e.g. Anderson et al. (1997); Konings et al. (2005). In addition, privatized firms also catch up with the global production frontier faster, Sabirianova Peter et al. (2012).

Based on these premises, it has been frequently argued that privatization - through restructuring - has contributed to increased output and productivity in transition countries. However, the multiplicity of studies in the field has urged also a critical review of how these analyzes are typically performed. In fact, as Djankov and Murrell (2002b) demonstrate, majority of the studies do not account for endogeneity, which implies that the reported coefficients on "privatization dummy", are likely to be upward biased. As further discussed by Estrin et al. (2009), point estimates on variables other than productivity are largely heterogeneous and depend on both period of analysis, but also country, method and type of data.

From the perspective of the literature, the main contribution of this paper is to suggest a method of analysis that would be immune to endogeneity issues and at the same time utilize a fairly easily available indicators to facilitate future studies of the effects of privatization. In the next sections we move to describing briefly the data, the method and eventually the results.

3 Data and method

The data set used in this study comes from financial reports and balance sheets of *all* Polish enterprises employing more than 49 employees and covers the period of 1995-2009. Typically in this strand of literature dedicated survey based data sets

are employed, among which Business Environment Enterprise Survey and Amadeus are the most popular. This practice is well justified because not many firm-level data from early transition are available, while international standardized databases permit cross-country comparisons. Country level studies usually employ a selection of firms: e.g. stock-listed in Grosfeld and Hashi (2005) or largest in Filatotchev et al. (2007). Microeconomic data sets for developing countries are rarely available, which explains the scarcity of representative survey studies[1].

The data for this paper comes from the Central Statistical Office of Poland and covers manufacturing sector (sections C, D and E) as well as market services (sections G, H, I and K), yielding in total almost 30 000 different enterprises over on average 7 years. Apart from the financial information, the data set allows to determine the form of ownership. In particular, the data set shows whether a firm is state owned, private or has a share of foreign ownership. This is a rich and representative data set. The firms covered by our sample constitute a significant part of the economy - they account for about 70% of employment in the enterprise sector and contribute about 70% of the value added created in the enterprise sector.

3.1 Method

Literature on firm-level heterogeneity in productivity is massive. Bloom and Van Reenen (2010) provide an excellent review of the empirical findings. In the context of multinational enterprises and international trade literature receives tribute in Wagner (2011). Equally numerous are the ways to adequately estimate the production function itself - recent developments have been reviewed in de Loecker (2011) and Van Beveren (2012). In this paper our specific objective is to analyze the causal effect of privatization on firm performance. We adopt a *before-after* framework and estimate a (differenced) standard production function to inquire the causal effect of privatization on productivity. We follow the standard simplified framework, estimating the production function with firm fixed effects. There are two main innovation in measuring the effects of privatization introduced in this paper. The first one concerns the construction of the counterfactual. The other one involves the choice of the instruments. We discuss them in detail below.

Counterfactual In order to apply a before-after approach a time anchor is needed. For privatized SOEs such anchor is naturally provided by the event of privatization. Such analyzes typically demonstrate an improvement of performance subsequent to privatization, Harper (2002). However, such approach does not allow to conclude that performance of the privatized firms improved *more* than for private incumbents or non-privatized SOEs, because such benchmark is typically missing in before-after studies[2].

[1]It seems that Czech Republic is a notable exception, with Harper (2002) as well as Gupta et al. (2008) using a panel of firm-level data on employment, production and other relevant information.

[2]Harper (2002) explores a natural anchor of so-called "wave" privatizations, as followed by the Czech Republic. Such policy was relatively rare among the European transition countries, though.

Theoretically, there could be two solutions to this problem. In the first one, firms that should be privatized at the same time but were not for exogenous reasons could be used as reference group. Unfortunately, such data are usually unavailable, whereas the reference group would also be relatively small, given the exogeneity requirement. In the second one, one could randomly allocate such time anchors among private incumbents (counterfactual reference events). Such approach is custom in evaluation studies, Boockmann et al. (2012). It is the second approach that we follow in this paper.

The sample of *all* Polish medium and large enterprises contains about 1600 cases of privatization. However, for some of these cases relevant data is missing, reducing the number of analyzed privatizations to 1278. Random assignment of counterfactual reference event years yields a comparison group of approximately 6184 firms, with again some relevant data missing[3].

Instrumenting We instrument for the actual privatization decision using fiscal needs and complement it with a variety of time-and-industry specific indicators. The idea to use fiscal needs as instrument for the probability of the firm to be privatized is in line with the findings of Bortolotti et al. (2004). Fiscal needs variable is clearly exogenous to the firm performance, but depending on the definition of this variable may be contemporaneously correlated with firm performance indicators because of cyclical properties. In order to avoid this problem we chose the percentage of budget deficit realization in June each year. This measure is independent of the actual budget deficit but tells well whether the assumed revenues and costs of the central government proceed according to the plan. In fact our instrument is relatively strongly correlated with the intensity of privatizations - the correlation coefficient is 0.63 with the p-value of 0.027 with just 13 annual observations, cfr. Figure 1. This variable takes values between 13% and 98% with a mean of 58%.

Industry specific and time-variant indicators too were chosen to assure maximum possible exogeneity. Following Djankov and Murrell (2002a) and Estrin et al. (2009) we include FDI intensity in a sector with the rationale that this may well measure the "demand" from the foreign investors to establish any production in Poland. This indicator is measured by the share of foreign affiliates in all firms active in this sector - it takes an average value of 4% and ranges between 0 and 50% over the sectors and analyzed years. In the similar spirit, we also include the number of SOEs in a sector in each year - this "supply" measure suggests how many firms in this sector are in general available for privatization. Over the analyzed 15 years this variable takes an average value of 597 with a minimum of 1 and a maximum o 3281. In the case of both indicators, industry is measured at 3-digit level, yielding about 160 sectors[4].

[3]To the best of our knowledge this is the largest number of privatization cases analyzed so far in the literature, despite the missing observations. Notably, to compute value added revenues lagged by one year are needed, whereas some of the analyzed firms are present in the sample, but with gaps.

[4]Hencefort $i-th$ firm in $k-th$ sector at time t.

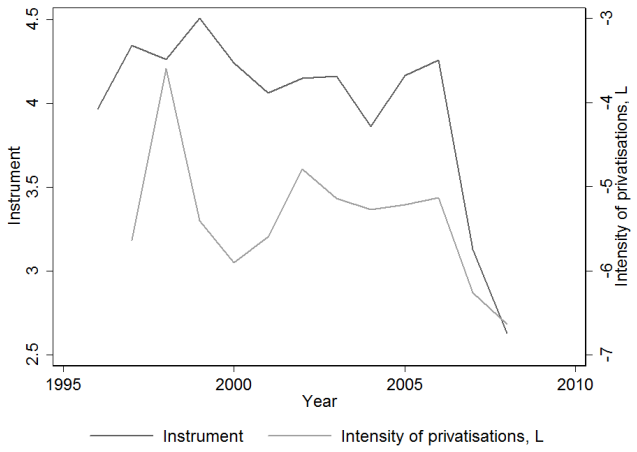

Figure 1: Time correlation between the instrument and the privatization intensity

3.2 Identification strategy

We first merge the annual datasets into a panel and obtain aggregate privatization probabilities for SOEs in each year[5]. This distribution is then used to randomly assign a counterfactual reference event to private firms[6]. Having established time anchors for all true and counterfactual reference events we use this timing to compute the before-after changes in outputs and inputs. Finally, we instrument for the actual privatization decision using fiscal needs and complement it with a variety of time-and-industry specific indicators, as described earlier.

We estimate a standard production function for privatized and private firms using the before-after changes with a two-stage least squares method to account for the role of privatization.

$$\begin{aligned} \Delta \ln(VA)_i &= \beta_0 + \beta_1 \Delta \ln(K)_i + \beta_2 \Delta \ln(L)_i + \delta_3 \hat{privatization}_i + \epsilon_i \\ privatization_{i,t} &= \gamma_0 + \gamma_1 Fiscal_t + \gamma_2 FDI_{k,t} + \gamma_3 SOE_{k,t} + \varepsilon_{i,t}, \end{aligned} \tag{1}$$

where Δ denotes a percentage change between $t-1$ and $t+1$ for each of the privatization and the counterfactual reference events i, which have "happened" at time t in sector k. Given the model specification, ϵ_i and $\varepsilon_{i,t}$ are uncorrelated. The likely source of bias in (1) remains the potential response to productivity shocks by the profit-maximizing firms, as discussed by Olley and Pakes (1996) and Levinsohn and Petrin (2003). However, given the before-after framing of our model this problem is not likely to affect the estimators. We compute value added based on the accounting data reported by the firms[7]. Capital is proxied by fixed assets plus intangible assets. Labor is measured by employment, full-time equivalents.

[5]Majority of privatizations has happened in 1997 and in 2001 - nearly 50% of all analyzed 1600 cases.

[6]Uniform distribution was chosen with values in each year corresponding to the actual privatization intensity. Random assignment concerned only those firms whose state involvement throughout the whole analyzed period was strictly zero.

[7]Value added = Gross profit +(Wages+ Non-wage employment costs)+Interest+ Income tax + Taxes + Depreciation.

Table 1: Descriptive statistics - sample means

	Privatized SOEs	Private Incumbents	p-value
No of firms	1278	6184	
FDI intensity	5.73%	3.99%	0.00***
K/L ratio (PLN/worker)	112.36	46.58	0.00***
ROA	-2.47%	3.54%	0.00***
Before-after changes (in %)			
Output (value added)	15.39%	19.66%	0.03***
K	12.32%	20.96%	0.00***
L	-24.27%	-4.80%	0.00***

Note: Before-after change in a three year growth rate between $t-1$ and $t+1$. Welch (1947) mean's equality test between privatized and private incumbents "randomized" for the analysis, *** represent difference significant at 1%, 5% and 10% levels, respectively. Before-after changes correspond to a three year compound change (a year before event to a year after event).

Table 1 shows the basic descriptive statistics of our data. Clearly, former SOEs were larger than private firms, but on average much less profitable. In addition, more frequently they operated in industries with presence of foreign investors. The before-after change in output has been larger among the private firms, though, with larger increase in capital and smaller reduction in employment.

4 Results

Simple OLS estimation demonstrates a statistically significant and positive coefficient on privatization. However, as argued before, this estimator is likely to be biased, which we address by instrumenting for privatization. Table 2 reports the results. In fact, if causal effect is analyzed the significance disappears. The only exception may be observed with the exporting firms, where foreign involvement has been found to be largely selective and conducive to raising global competitiveness. While in the case of counterfactual reference events productivity improves slower according to the OLS, in fact nothing has happened in those firms in the anchor year, so no "extra" change in the productivity should be expected *a priori*.

As emphasized earlier, majority of privatizations have occurred in 1997 and 2001 - both of which were characteristic moments in the business cycle. To address this problem we include $\Delta ln(VA)_{k,t}$ in model specification to account for general industry growth as a control factor for the firm level growth. This variable exhibits similar size of the estimator, irrespectively of the model specification. Including this variable raises a little the OLS coefficient on privatization, but has no effect on the privatization estimator in the 2SLS specification.

An interesting finding concerns the sub-population of exporters. In order to survive in the global markets, these firms need to foster productivity. On the other hand, some form of soft budget constraint could have facilitated it for the inefficient firms to avoid necessary changes in organization and production structures. If that indeed was the case, privatization implied not that much the changes related to ownership structure, but the removal of the soft budget constraint. Indeed, as presented in Table 3 the positive effect of privatization is not characteristic for firms in general privatized to a foreign investor and/or service sector companies. If anything, the result is significant for smaller firms (negative) , for whom potentially

Table 2: Output function estimation, value added as predicted variable

	OLS		IV			
Privatization	0.0520***	0.0620***	-0.0142	-0.0248	0.027	0.441***
	(0.0194)	(0.0195)	(0.1059)	(0.0891)	(0.0891)	(0.113)
$\Delta \ln(K)$	0.137***	0.0972***	0.137***	0.101***	0.0902***	0.0436*
	(0.0179)	(0.0194)	(0.0179)	(0.0199)	(0.0198)	(0.0279)
$\Delta \ln(L)$	0.467***	0.642***	0.456***	0.610***	0.704***	0.771***
	(0.0445)	(0.0548)	(0.0479)	(0.0658)	(0.0648)	(0.102)
$\Delta ln(VA)(k,t)$		0.0994***		0.0994***	0.0994***	0.102***
		(0.0197)		(0.0196)	(0.0201)	(0.0286)
Fiscal (t)			0.0048***	0.0034***	0.00107**	0.00121*
			(0.00091)	(0.00054)	(0.00107)	(0.00102)
% FDI (k,t)			0.799***	0.813***	0.790***	0.265*
			(0.1626)	(0.1769)	(0.1771)	(0.2306)
# SOEs (k,t)			-0.00006***	-0.00007***	-0.00008***	-0.0001***
			(0.00001)	(0.00001)	(0.00001)	(0.00003)
# SOEs (t)					0.2645***	0.461***
					(0.0453)	(0.0612)
Observations	4,461	3,484	4,461	3,484	3,484	1,746
R^2	0.206	0.200	0.204	0.195	0.181	0.407
$Pr(\text{-}D\vert-)$			79.80%	79.80%	79.91%	73.13%
$Pr(D\vert+)$			68.42%	68.42%	65.71%	54.67%
Sample	All	All	All	All	All	Exporter

Note: Robust standard errors in parentheses, first-stage estimators for constant, capital and employment not reported. A firm is considered to be an exporter if at least 2% of its sales comes from export. Given that the proposed instruments may be week, LIML estimations were performed, as suggested by Angrist and Krueger (2001), results are virtually identical, so for the purpose of paper brevity were skipped.

the soft budget constraint could have played the most important role. The fit of the standard model is the weakest among small firms, suggesting that heterogeneity may indeed be significant. Manufacturers observe large and positive effects of privatization.

Table 3: Robustness checks, value added as predicted variable

	FDI		Manufacturing		Services		Large firms		Small firms	
	2SLS	LIML	2SLS	LIML	2SLS	LIML	2SLS	LIML	2SLS	LIML
Privatization	0.0302	0.0357	0.182**	0.186**	0.167	6.722	-0.00150	-0.00486	-0.547***	-0.893**
	(0.314)	(0.359)	(0.0752)	(0.0771)	(0.315)	(149.9)	(0.122)	(0.130)	(0.206)	(0.359)
Business cycle k at t	0.115**	0.115**	0.0842***	0.0842***	0.0351	-0.0197	0.194***	0.194***	0.0140	0.00699
	(0.0511)	(0.0514)	(0.0311)	(0.0311)	(0.0229)	(1.275)	(0.0484)	(0.0483)	(0.0234)	(0.0274)
$\Delta \ln(capital)$	0.0383	0.0371	0.0647**	0.0646**	0.0733***	-0.127	0.124**	0.125**	0.0859***	0.0926***
	(0.0863)	(0.0931)	(0.0282)	(0.0283)	(0.0250)	(4.564)	(0.0548)	(0.0549)	(0.0203)	(0.0226)
$\Delta \ln(employment)$	0.680***	0.683***	0.736***	0.738***	0.727***	2.262	0.555***	0.554***	0.571***	0.484***
	(0.213)	(0.234)	(0.0945)	(0.0949)	(0.0920)	(35.09)	(0.140)	(0.142)	(0.0699)	(0.102)
Constant	0.0949	0.0935	-0.0115	-0.0127	0.0757*	-0.842	0.0659	0.0675	0.137***	0.184***
	(0.0814)	(0.0919)	(0.0214)	(0.0218)	(0.0440)	(20.98)	(0.0609)	(0.0649)	(0.0285)	(0.0479)
Observations	528	528	2,028	2,028	1,344	1,344	988	988	2,496	2,496
R-squared	0.160	0.160	0.183	0.182	0.243	0.243	0.232	0.232	0.028	0.028

Note: Robust standard errors in parentheses, first-stage estimators for constant, capital and employment not reported. A firm is considered to be an exporter if at least 2% of its sales comes from export. Given that the proposed instruments may be week, LIML estimations were performed, as suggested by Angrist and Krueger (2001).

Summarizing, we propose an approach similar to a difference-in-difference framework, with the main distinction, that it is not the differencing but the instrumentation that is used to demonstrate the causal effect of privatization on performance. We compare privatized SOEs to incumbent private firms and instrument the privatization decision with a measure of fiscal needs coupled with time and industry variant controls. Privatized firms tend to be bigger than private firms, but on average much less profitable. Capital grows more and employment drops less among private incumbents when compared to the privatized SOEs. Despite these differences, productivity does not differ between privatized SOEs and private incumbents in general. The statistical difference of the privatization dummy disappears in the 2SLS estimations. These findings may be interpreted against the contention that privatization *per se* improves performance.

5 Conclusions

A typical policy recommendation for a country with relatively large public sector and fiscal imbalances is to encourage privatization. Such policy is expected to relieve budget stringency and yield productivity improvement among privatized firms. These recommendations rely on theoretical presumptions from institutional and managerial economics as well as a wide selection of empirical studies. Some of these studies explored natural experiments or other conditions favorable from the econometric point of view and this literature usually suggests relatively smaller benefits from the privatization. Unfortunately, as pointed by the meta-analyses, substantial part of this literature does not account for the endogeneity bias. Using 15 years of census firm-level data for Poland, we provide an estimate of a causal effect of privatization on firm performance. We find that productivity improvement is relatively rare if endogeneity is accounted for.

These results seem robust across specifications. However, the Polish case is to some extent specific, with very high state involvement at the beginning of transition and relatively small private sector. The more firms there are to be privatized, the more likely it is that some of them fail, while *de novo* private firms may find it relatively easier to compete successfully against inefficient SOEs. This implies that part of the identified phenomena may be an aftermath of massive restructuring and reallocation from less efficient to more efficient uses. To critically evaluate the generality of our assertions, the study could be repeated on a similar data from from a mature market economy. Thus, the results should be interpreted with caution. ning of transition and relatively small private sector. The more firms there are to be privatized, the more likely it is that some of them fail, while *de novo* private firms may find it relatively easier to compete successfully against inefficient SOEs. This implies that part of the identified phenomena may be an aftermath of massive restructuring and reallocation from less efficient to more efficient uses. To critically evaluate the generality of our assertions, the study could be repeated on a similar data from from a mature market economy. Thus, the results should be interpreted with caution.

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