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Divestitures, Privatization and Corporate Performance in Emerging Markets

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Abstract

We use new firm-level data to examine the effects of firm divestitures and privatization on corporate performance in a rapidly emerging market economy. Unlike the existing literature, we control for accompanying ownership changes and the fact that divestitures and ownership are potentially endogenous variables. We find that divestitures increase the firm's profitability but do not alter its scale of operations, while the effect of privatization depends on the resulting ownership structure – sometime improving performance and sometime bringing about decline. The effects of privatization are hence more nuanced than suggested in earlier studies. Methodologically, our study provides evidence that it is important to control for changes in ownership when analyzing divestitures and control for endogeneity, selection and data attrition when analyzing the effects of divestitures and privatization.

Keywords: Divestiture, breakups, privatization, corporate performance, emerging markets, endogeneity.

JEL Classification: D23, G32, G34, L20, M21, P47

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1. Introduction

Corporate divestitures (including asset sales, spinoffs, breakups, and carve-outs) play an important part in advanced market economies and they have been widely researched in the literature. In this paper, we use a new firm-level data set from a model transition economy (Czech Republic) to estimate the respective effects of divestitures and privatization on corporate performance. The dataset is unique in that we know the identity of firms and observe values of indicators of corporate performance for the divested units (representing all parts of the parent company) both before and after the divestiture by the parent firm. Since we have the corresponding data also for firms that did not experience any divestitures, we can carry out an analysis that has not been performed in either the advanced or emerging market context before. Moreover, since we have data for variables from the pre-transition period when central planners exogenously set the values of firm-level variables, we can construct relatively credible instrumental variables (IVs) to control for endogeneity of divestitures and changes in ownership. We thus provide evidence on the performance effect of divestitures and privatization that could not be carried out before. We find that divestitures increase the firm's profitability but do not alter its scale of operations, while the effect of privatization depends on the resulting ownership structure – sometime improving and sometime worsening the firm's performance.

The existing literature analyzes divestitures from a number of angles. Hausman, Tardiff, and Belinfante (1993) show in the US context that the breakup of a nationwide telephone company brought about opportunity for gains in economic efficiency, while Slade (1998) examines the efficiency effects of divestiture of a large number of breweries in the United Kingdom. There is evidence that parent companies experience positive cumulative abnormal excess returns at the announcement of a spinoff (e.g., Hite

and Owers, 1983; Miles and Rosenfeld, 1983; Schipper and Smith, 1983) and that both the spun-off units and parent firms have positive abnormal returns after the spinoff and experience significantly more takeovers than similar firms with no spinoffs (Cusatis, Miles, and Woolridge, 1993). Woo, Willard, and Daelenbach (1992) and Daley, Mehrotra, and Sivakumar (1997) show that spinoffs record improvements in operating performance, while John and Ofek (1995) show that divestiture driven improvement in operating performance occurs primarily in firms that increase their focus. Similarly, with respect to the corporate focus hypothesis, Dittmar and Shivdasani (2003) find that after divestiture parent companies improve internal allocation of capital and increase their rate of investment. Overall, the literature suggests that in the advanced economies divestitures increase value and improve performance, but also have important distributional effects.

From the methodological standpoint, the literature has limitations that represent a challenge for ongoing and future research. First, the existing studies treat divestitures as exogenous rather than using for example instrumental variable estimation to control for their potential endogeneity. Second, in many studies the data do not permit researchers to compare the performance of the divested units before and after the divestiture. Third, while Cusatis, Miles, and Woolridge (1993) provide evidence that changes in the structure of ownership after divestitures increase the firm's rate of return, the rest of the literature does not control for ownership changes that occur with divestitures. Since the aforementioned endogeneity and omitted variable issues may have produced biased estimates of the effects of divestitures, the next step in the literature is to tackle these problems. In the present study, we take on these methodological issues.

In addition to being consequential in advanced countries, divestures are also important in the transition and emerging market economies. Divestitures in emerging

markets are also frequently observed together with privatization and the two phenomena represent a key form of corporate restructuring as enterprises divest themselves of divisions or literally break up into two or more units. In this context, it may be hypothesized that divestitures and privatization improve corporate performance as the new firms strive to gain reputation and introduce superior governance. As the originally underdeveloped legal and institutional framework improves in emerging market economies, divestitures and certain types of corporate ownership may enhance performance by serving as a disciplining device for management. The theoretical model developed by Chemmanur and Yan (2004) is relevant in this setting because it shows how divestitures may increase the probability of a takeover by value-improving management that enhances operating performance after the divestiture. Similarly, Cusatis, Miles, and Woolridge's (1993) evidence from an advanced country context that ownership structure after divestiture affects positively the firm's rate of return suggests that the challenge is to estimate the respective effects of divestiture and ownership changes when assessing post-divestiture performance.

Although divestitures constitute important phenomena in the transition and emerging market economies, a lack of adequate data has prevented researchers from analyzing them. An exception is Lizal, Singer and Svejnar (2001), who use Czech data from the start of the transition to show that small and medium sized divestitures have positive effects on productive efficiency and profitability of both the parent companies and divested units in the year when the division occurs. These findings need to be interpreted with caution, however, given the limited data available at the time of this study. The authors for instance do not know the identity of firms and have to use indirect methods to identify divestitures and link the divested units to the parent firms. Moreover, the authors can follow the firms only during the year of the breakup (1991)

and the following year (1992). This hence prevents them from evaluating the medium- and long term effects of divestitures. It also does not allow them to estimate the effects of privatization since it had not yet taken place. Since we have richer data with a longer time span, we are able to overcome these shortcomings and credibly estimate the effects of post-divestiture restructuring and privatization.

The literature on the effects of privatization in the transition and emerging market economies is substantial (see e.g., Roland, 1994; and Boycko, Shleifer and Vishny, 1996, for theoretical treatments and Megginson and Netter, 2001; Djankov and Murrell, 2002; and Estrin et al. (2007), for empirical surveys). However, most studies do not control adequately for the fact that firms are unlikely to be assigned for privatization at random and the estimated effects may hence be biased (see Gupta, Ham and Svejnar, 2008). In particular, Djankov and Murrell (2002) point out that 47% of the studies surveyed in their paper do not control for endogeneity or selection problems at all. From this perspective, the Czech Republic constitutes a particularly useful laboratory for analyzing the effects of divestitures and privatization on financial and economic performance in emerging markets. During the late 1980s and early-to-mid 1990s the country had many features found in other emerging market economies, but the variation in the values of the relevant variables was much greater. Hence, while emerging market economies are usually characterized by a transition from significant to less pronounced state ownership, with divestitures being one of the mechanisms of corporate restructuring, in the Czech Republic these processes were much more pronounced than in most other economies. The country started in 1990 as an almost completely state-owned, controlled and trade-protected economy, with its corporate sector being dominated by large state-owned enterprise (SOE) conglomerates. It rapidly opened itself to trade, liberalized prices and privatized its SOEs, so that by 1995 it was an

overwhelmingly privately-owned market economy. In the process, most of the large SOE conglomerates were broken up and the number of the medium and large industrial firms more than tripled on account of numerous divestitures, as well as entry of newly created firms.

The structural and institutional features observed in the emerging market economies in general, and the Czech Republic in particular, lead us to test two competing hypotheses with respect to divestitures and privatization:

1. Divestitures and privatization have a positive effect on the performance of the resulting units by eliminating inefficiencies such as diseconomies of scale of large SOEs, weak managerial incentives and information asymmetries that existed prior to economic liberalization and reduction of state control;
2. Divestitures and privatization have a negative effect on the performance of the resulting units because of weak corporate governance, waning government coordination and regulation, unclear property rights, and underdeveloped legal and institutional framework that exist in emerging market economies.

With respect to privatization, we also test whether the nature of the effect depends on the type of the new ownership structure. In particular, we are able distinguish the extent to which each firm is owned by an industrial (i.e., non-financial) firm, financial company, individual owner, or state, and we can estimate the effect of different ownership patterns on corporate performance.

We find that divestitures and privatization have a number of significant but also some insignificant effects on corporate performance. The average divestiture increases the firm's profitability and scale of operations (sales), while the effect of privatization depends on the resulting ownership structure. The overall evidence for divestitures is consistent with our first hypothesis, namely that divestitures have a positive effect on

performance. Reducing state ownership is positive for some performance indicators but insignificant or even negative for others. Industrial firms as owners improve or do not hamper performance and in that sense they behave consistently with our first hypothesis. Financial companies and individuals as owners are mostly associated with no improvement and in some cases significant declines in performance, thus providing evidence that is consistent with the second hypothesis. The effects of privatization are hence found to be less positive and more nuanced than was suggested in many of the early studies. Methodologically, we show that it is important to control for changes in ownership when analyzing the effect of divestitures and control for endogeneity, selection and data attrition when analyzing the effects of divestitures and privatization.

The paper is structured as follows. In Section 2 we outline the institutional setting underlying our analysis, stylized model and our estimation strategy. In Section 3 we present our data, variables and the method for identifying divestitures. Section 4 we describe our estimating framework, including the instrumental variables that we use. We present our empirical results in Section 5 and conclude in Section 6.

2. The Institutional Setting and Estimation Strategy

In this section we outline the main features of the institutional setting underlying the wave of divestitures and privatization in the Czech Republic and present our strategy for estimation.

2.1 The Institutional Setting

The divestitures took place mostly during the privatization program that was carried out in the first half of the 1990s under three different schemes: restitution, small-scale privatization and large-scale privatization. The first two schemes started in 1990 and were most important during the early years of the transition. Large-scale privatization,

by far the most important scheme, began in 1991 and was completed in early 1995.¹ Small firms were usually auctioned or sold in tenders. Many medium businesses were sold in tenders or to predetermined buyers in direct sales. Most large and many medium firms were transformed into joint stock companies and their shares were distributed through voucher privatization (almost one-half of the total number of all shares of all joint stock companies was privatized in the voucher scheme), sold in public auctions or to strategic partners, or transferred to municipalities. The voucher scheme was part of the large-scale privatization process and two waves of voucher privatization took place in 1992-93 and 1993-94, respectively. The early post-privatization ownership structure emerged as shares from the first and second wave were distributed in 1993 and early 1995, respectively. There was also significant post-privatization share trading (often off the official stock market) among large shareholders during this period.

Privatization of each enterprise was based on an officially accepted privatization project. The management of each enterprise was obliged by law to submit a privatization proposal, but any domestic or foreign firm, institution or individual could present a competing privatization project. In reality, there was more than one privatization proposal submitted for numerous enterprises. All proposals were to be considered on an equal footing by the privatization authorities, which worked with the investors to ensure that the final submitted proposals reflected at least in part government objectives in terms of ownership structure and other characteristics.

The decisions on divestitures were taken by the relevant government ministries in conjunction with the government privatization authority. The decision for each firm was based on the winning privatization project that outlined the proposed framework for the divestiture(s). On average almost 9 projects were submitted per firm (the median was

¹ The privatization process has been extensively described and analyzed. See e.g., Kočenda (1999), and Filer and Hanousek (2001). For development of ownership structures in voucher-privatized firms, see Kočenda and Valachy (2002).

5); the projects were approved at an average rate of close to 3 per firm (the median was 2), reflecting the divestitures as well as government objectives (see Kotrba and Svejnar, 1994). Tables 1 summarizes information about the privatization projects and shows that the interest to privatize originated from management as well as other parties.² Since management was required to submit a privatization proposal, it comes as no surprise that 25% of all projects came from this source. Independent bidders that wanted to privatize by purchasing (a part of) a firm submitted two fifth (39%) of all projects.

2.2 The Estimation Strategy

Before presenting our formal model, we note that initial conditions, the nature of the divestiture, and the change in ownership may all affect subsequent corporate performance. Moreover, initial conditions are also likely to influence the nature of the divestiture and privatization. Therefore, in analyzing the effects of divestitures, we benefit from the fact that we can identify the parent company and the (to be) divested units within it (i.e., all the operating units of the parent company).

In view of the institutional setting, we model corporate performance as a function of the presence or absence of a divestiture and the type of ownership structure. Since the explanatory variables related to divestitures and ownership structure may be endogenous, we use instrumental variables in estimation. In particular, we use a logit equation to model the divestiture of a company and subsequent changes in its ownership structure, with the explanatory variables being predetermined and exogenous with respect to the divestiture and privatization. We then use the predicted values from the

² Privatization of each state owned firm was decided on the basis of an officially accepted privatization project. According to the law, all state owned enterprises were selected either for the first or the second privatization wave, or they were temporarily exempted. Each selected firm had to submit an official privatization proposal that was usually crafted by the firm's management under the tutelage (and responsibility) of its sectoral ministry. Any domestic or foreign corporate body or individual was allowed to present a competing project that was to be considered on an equal footing to the official one.

logit as instruments in our model of corporate performance.³ The task of finding legitimate explanatory variables for the logit regression is not simple because divestitures and ownership changes may be systematically related to unobserved firm characteristics. In Section 4 we introduce our explanatory variables and show that they are likely to satisfy the formal requirements. To address selection bias arising from data attrition over time, we use a Heckman (1979) procedure to estimate a selection equation and insert the resulting Mills' ratio as a regressor in the corporate performance equation.

3. Data, Identification of Divestitures, and Definitions of Variables

The data were compiled by the authors from Aspekt, a commercial database, and from the archives of the Ministry of Privatization and the National Property Fund of the Czech Republic. Table 2 summarizes all variables available along with the periods, source, and accounting standards (for financial variables). The data allow us to identify unambiguously the parent enterprises and all new units related to a surge of divestitures that occurred in 1991-1992. Prior to voucher privatization, 44 firms were broken up into 131 new firms that subsequently entered the first wave of the voucher scheme; these new firms received new tax identification numbers and had the same rights to use the brand and/or trade name of the former parent enterprise. Thus, out of the 988 firms that entered the first wave of voucher privatization, we use these 131 newly created firms as a result of numerous divestitures, plus 780 firms that did not experience division and constitute our control group. This means that there are only 77 firms (8% of the total) for

³ The main specification models corporate performance where endogenous variables are divestiture and ownership structure. In a classic case one could estimate the main model with an appropriate set of instruments (to instrument for endogeneity of divestiture and ownership). Alternatively, we know that this approach is equivalent to a two-stage least squares. This means that in a first stage one would estimate separate models for divestiture and ownership structure, and use predicted values as instruments for the main specification in the second stage. Both approaches are identical when the least-square method is employed. However, since divestiture and ownership are 0/1 variables we prefer to use a limited dependent variables technique in the first stage.

which the data are dubious due to legal problems associated with privatization, and we do not include them in our sample. Finally, the set of firms that were divested from large industrial conglomerates is a subset of the privatized firms. The decision to privatize the divested units was taken at the same time as that of their divestment. Hence, privatization is not nested with respect to divestiture in our sample and our estimation is not constrained in any way.

Based on the identified ownership structure available from our data, we assign firm ownership corresponding to the following categories of owners: the state, industrial firm, individual owner, or financial company. We can clearly link parent firms with divested units and have performance data and firm characteristics of all the units both after the division and before, when they were still parts of the original parent enterprise.⁴ We use this information in constructing variables measuring the size of the divestiture and in carrying out a difference-in-differences (DID) analysis as a robust check of the baseline model.

For each firm in our data set, we have detailed information derived from all the proposed privatization projects that were submitted to the government before privatization. This includes the relevant information about the divestiture, the links between the parent company and divested units, the privatization scheme, and information on assets, liabilities, profit, sales, and number of employees in 1990. The number of privatization projects submitted for any given firm is *per se* an important factor for our analysis. For many SOEs there were several privatization projects submitted and their number was directly and primarily related to number of divisions within each firm or the number of units into which a firm could be naturally divided.

⁴ Under the US accounting rules, data related to sales, assets, operating profit, and number of employees are available for subsidiaries and operating units before and after the divestitures for operating units representing at least 5% of a firm's business. It seems that the availability of these data has not been fully exploited in the literature, perhaps because of the absence of data related to costs.

Each privatization project reflected the structure of the firm, manager's motives, degree of investor interest, and expected future performance of the firm. For many firms, however, a number of proposals were submitted to privatize a particular small asset that was not connected with the firm's production activity but that was in the firm's possession (e.g., a recreational facility). In order to avoid mixing these privatization projects with those covering principal productive activities, we only consider projects aiming at privatizing 5% or more of the enterprise's assets. Table 3 displays pre-divestiture 1990 economic indicators for the new units, parent firms and firms in the control group.

We also have data on the structure of share ownership among various domestic and foreign parties as proposed in the winning privatization projects. The share ownership variables include the share that the government intended to keep for the short vs. long term. Short-term government ownership reflects the expectation that the government would be able to sell appreciated shares shortly after privatization, while long-term government ownership indicates an expectation of slower appreciation of the value of the privatized firm and/or its strategic character in the economy. Parts of the shares retained by the government were also classified as intended for restitution or future sale through an intermediary (see Table 4 for data on the allocation of shares for other purposes than voucher privatization).⁵

The sectoral distribution of firms is summarized in Table 5. The frequency of firms in the various sectors reveals that most firms belong to the sector of heavy machinery, reflecting the structure of the Czech economy under the command system. The firms in this sector were also most in need of restructuring and the divisions of large conglomerates were the start of this process. Thus, the distribution of the firms that

⁵ Mean proportion of shares allocated to various owners (other than through voucher scheme) sum-up to 15.7% for spun-off units and 15.5% for the control group of firms.

underwent divisions is not uniform across sectors and we account for this in our estimation by including industry-specific dummy variables and dummy variables for size differences in particular sectors. We also exclude firms from the forestry sector since they represent rather atypical examples of privatization, often linked to political pressures due to various restitution claims.

To summarize, in analyzing corporate performance after the wave of divestitures and privatization, we use economic and financial indicators for the period 1995-1996. The divestitures occurred in 1991-92, the accompanying privatization in 1992-93, and the distribution of shares of the privatized firms and the major post-privatization swaps of shares in 1993-94. Since for some of the firms the transfer of ownership rights ended in 1994 or very early 1995, we take 1995 to be the first year after divestitures and privatization that truly reflects the new corporate and ownership structure. Moreover, by 1995 the quality of the reported accounting and economic data by and large reflected the international standards. Finally, using data for both 1995 and 1996 allows us to test for time-varying effects of divestitures and privatization. Hence, in our estimation we use data on early corporate performance in 1990, firm divestitures in 1991-2 and post-divestiture, post-privatization performance in 1995 and 1996.

Our data permit us to use three indicators of corporate performance in our main model: unit labor cost measured by labor costs over sales (labor costs/sales), operating profit over labor costs (profit/labor costs), and operating profit per share (profit/equity). Our main analysis is hence based on a measure of (labor) cost effectiveness and two direct measures of profitability. Finally, in our DID analysis, which we perform as an extension reflecting a robustness check, we are able to use sales as a measure of scale of operation.

4. The Estimating Framework

We exploit the structure of our data to model the post-divestiture and post-privatization corporate performance in 1995-96 as a function of the presence or absence of a divestiture and (subsequent) change in the ownership structure, controlling for possible endogeneity of these explanatory variables. Second, as a robust check to our baseline model, we construct a DID estimator, using the fact that we can exactly match divested units in 1995-96 with their predecessor enterprise operating units in 1991 and have comparable data on one performance indicator (sales) for both of these periods. In other words, for sales we look at the difference in performance between 1995-96 and 1991 as a function of a divestiture and ownership change, controlling for possible endogeneity of the explanatory variables.

4.1 The Main specification

We identify the percentage shares of pre-divestiture capital and labor that each new unit appropriates from the parent (broken up) firm at the time of its division. These are our indicators of the extent of each divestiture and we interact them with the occurrence of a firm's division (divestiture dummy). We hence use the 1990 ratio of capital in each divested firm to total capital in the former parent enterprise, dK_i , and the 1990 ratio of the number of employees in each divested firm to the total number of employees in the former parent enterprise, dL_i , as explanatory variables capturing the size of the divestiture. Both shares are to a large extent given by the organizational structure of the parent firm before the split. In addition to these key indicators of the extent of divestiture, we use a set of variables to characterize the economic situation in the parent company before the divestiture. Post-divestiture and post-privatization economic performance and ownership structure are the other types of information that we take into account in our analysis.

Formally, we estimate the following model of corporate performance:

$$\pi_i = \alpha_0 X_i + \alpha_1 DIV_i + \beta OWN_{(DIV)}_i + \gamma OWN_{(NoDIV)}_i + \chi dL_i + \delta dK_i + \varepsilon_i \quad (1)$$

where index i denotes firms, π_i is a measure of corporate performance of firm i after both divestiture and privatization occurred (i.e., in 1995-96), X_i captures the pre-divestiture, pre-privatization (1990) economic situation in the parent firm measured by assets, liabilities, sales, profit, and number of employees, and DIV_i is a dummy variable coded 1 if the enterprise is a divested unit and 0 if it is a firm that did not experience division. Variables $OWN_{(DIV)}_i$ and $OWN_{(NoDIV)}_i$ measure the post-privatization (1995-96) ownership structure in companies that experienced divestitures and those that did not, respectively, while β and γ are the associated coefficients. Finally, ε_i is the error term.

Endogeneity of Divestitures and Ownership

Since divestitures and changes in ownership structure may be correlated with firms' unobserved characteristics, we treat the explanatory variables related to divestitures and ownership as endogenous and apply IV estimation. The advantage of the IV procedure over the more efficient maximum likelihood estimation is that it is more robust and does not require numerical integration in the presence of the dummy variable for divestitures and share variable for ownership. We use a logit model to estimate the predicted values of the explanatory variables (divestitures and ownership) and we employ standard nonlinear two stage least squares (Wooldridge 2002, pp. 427-430)⁶ in that we use the

⁶ Conditions for consistency in the non-linear two stage least squares are same as in the linear version and require exogeneity of the instrumental variables employed. To summarize our estimation method, we begin with modeling corporate performance as a function of the presence or absence of a divestiture and the type of ownership. Due to the potential endogeneity of explanatory variables, we use a logit equation to model the divestiture of a company and subsequent changes in its ownership structure. We then use the predicted values from the logit as instruments in our model of corporate performance. Hence, instead of using a linear projection of the endogenous variables onto the space of exogenous variables, we use logit-model-based predicted values constructed from exogenous variables that pass the tests as legitimate instruments.

predicted values from the logit as instruments in the main model (1) to obtain consistent estimates.⁷ In particular, for the first stage regression we use the following logit model to estimate the probability of a divestiture occurring:

$$DIV_i = f\left(NP_i, \sum_{j=1}^3 (DE_i)^j, POWN_i, \sum_{j=1}^2 (PP_i)^j, \sum_{j=1}^3 (PTNS_i)^j\right) + v_i \quad (2)$$

where DIV_i equals 1 if company i is a divested unit and 0 otherwise, NP_i refers to the number of privatization projects submitted to the government in 1991 (more discussion below), DE_i captures how much the size of each firm deviates in 1990 from the standard in the OECD economies (discussed below), $POWN_i$ stands for the ownership structure proposed in 1991 in the winning privatization project (expressed in percentage intended for ownership type defined by categories listed in Table 4), PP_i measures the profitability of the parent firm in 1990 (Table 3), and $PTNS_i$ represents the total number of shares per parent firm in 1990. The effects of variables such as the firm's distance from the mean OECD size, profitability, and total number of shares may be nonlinear and we hence use a Taylor series expansion of the second and third order to formulate a specification that takes into account potential nonlinearities (the order of expansion is denoted by j in equation (2)).

Finding valid IVs is always a challenge and our case is no exception. Nevertheless, the fact that we are able to use as IVs firm-specific variables whose values were set by planners centrally and independently of what firms would subsequently do in a market setting, makes our IVs more likely to satisfy the orthogonality assumption in the second stage of estimation than would the use of similar IVs in both more and less developed market economies. For example, the planners tended to establish and

⁷ We have also carried out a sensitivity analysis in which we have adopted a linear probability model instead of the logit specification. In this case we estimate a standard two stage least squares model. The estimates from the two approaches are not materially different.

maintain very large firms, both because it was easier to control few large (rather than many small) firms and because of the prevailing political philosophy to build large firms under communism. Econometrically, we find that all the IVs described above pass the formal Sargan-Wu, Hansen J and Bassman tests of overidentifying restrictions at the 1% test level and in this sense they qualify as valid instruments.

From the first stage regression results on the divestiture occurrence, we detect that the IVs are strongly pre-determined through time and have the intuitively expected effects (see Table A1 in the Appendix). For example, the number of privatization projects submitted in 1991 (NP_i) is naturally a good instrument since it is unlikely to be correlated with potential omitted variables affecting performance in 1996. There are two reasons for this lack of correlation. First, the number of submitted projects is highly correlated with the number of separable divisions (units) that the parent firms had in 1990-91 and that could be easily divested. Hence it is the number of divisions established by planners rather than inherently superior performance in a market economy that was the key determinant of the number of privatization projects submitted per firm. Furthermore, given that privatization projects were submitted under the old, pre-transition regime in 1991 and performance is measured in a market economy five years later, it is unlikely that the 1995-96 performance of a private firm and its management is related to the number of privatization projects submitted to the state five years earlier.

Another instrument that we use is the variable DE_i , measuring the number of employees in a firm in 1990 minus the number of employees in a (weighted) average firm belonging to the same industrial sector in the OECD economies at the same period

(see Kumar, Rajan and Zingales, 1999).⁸ We take the mean OECD firm size as a benchmark because the transition countries declared their commitment to move towards a standard market economy and many, including the Czech Republic, succeeded in joining OECD soon after the start of the transition. One of the determining factors for a divestiture is therefore likely to be the size of the firms that emerged from the centrally planned system, relative to the size of firms in established market (OECD) economies. Since the socialist planners preferred large firms, the variable DE_i captures well the excessive size of enterprises under central planning relative to firm size in market economies and serves as a good instrument.

Overall, the predictive power of the first-stage regressions is very high. Specifically, in terms of the fraction of correct predictions for the divestment and non-divestment categories, the fraction is 97 %, and this value passed the standard Chi-square test for significance of predictions at the 2 % level.

We use the following regression to instrument the ownership structure observed in 1995 and 1996 (OWN_i):

$$OWN_i = f(NP_i, POWN_i, IND_i, \sum_{j=1}^3 (PTNS_i)^j, \sum_{j=1}^3 (AP_i)^j, \sum_{j=1}^3 (PIFh_i, IIh_i)^j) + \zeta_i, \quad (3)$$

where IND_i is a set of one-digit industry dummies and AP_i is the average price per share of company i in the voucher privatization scheme. $PIFh_i$ and IIh_i are the shares of company i allocated to privatization investment funds and individual investors, respectively, during the large-scale privatization in 1992. The effects of variables such as the firm's total number of shares ($PTNS_i$) and shares allocated to the institutional

⁸ We have used both the mean and median firm size and the results are similar. The mean and median numbers of employees by industrial sector in OECD countries are given in of Kumar et al. (1999; Table 2).

($PIFh_i$) and individual (Iih_i) investors may be nonlinear, and we hence use a Taylor series expansion of the third order to take into account potential nonlinearities.⁹

As in the case of the divestiture equation (2), all the instruments used in specification (3) pass the formal Sargan-Wu, Hansen and Bassman tests at 1% test level and thus qualify as valid instruments. They are strongly pre-determined through time with intuitively expected effects and the predictive power of the first-stage regressions is very high. The fraction of correct predictions for the observed ownership structure ranges from 93.5 to 97.3 %, depending on the type of ownership, and these values passed the standard Chi-square test for significance of predictions at the 1 % level.

The first stage regression results on ownership structure are reported in the Appendix, Table A2. These results are of independent interest. Specifically, the role of the state in privatized firms can be detected from the variables of the temporary and permanent presence of the state in firms (the variable is coded as *Fund of National Property*). The temporary effect of the state is positive for banks, portfolio companies, and undistinguished foreign owners, where the presence of the state has attracted these types of owners. The negative effect in the case of investment funds and foreign investment companies may be viewed as if the presence of the state repelled investment funds and foreign owners for not being able to effectively control a firm. These effects are in line with the prolonged control of the state (via share holdings) in numerous firms long after their privatization (see Hanousek and Kočenda, 2007).

Selection Bias Due to Attrition

⁹ The logit specification in equation (2) resulted from standard Heckman correction procedure. In specification (3) we can use either probit or logit. We prefer logit, since it is less sensitive to the actual distribution of the error term. For the sake of consistency we employed both methods and found them to yield similar results. The goodness of fit, measured by an adjusted R^2 , ranges from 0.09 to 0.1. Note that goodness of fit is not an issue here because specification (3) is a correction equation. In this case poor fit could be interpreted as resulting from the fact that missing observations in equation (1) are randomly distributed.

In estimating equation (1), we may experience a selection bias because about 24% of firms observed in 1990 do not report data for 1995-96. The bias may be present despite the fact that attrition occurred similarly in the groups of firms that experienced divestitures and those that did not. We therefore use the Heckman (1979) procedure to correct for this bias by estimating a selection equation and inserting the resulting inverse Mills' ratio into equation (1). The selection probit equation is specified as

$$M_i = g(AP_i, \sum_{j=1}^3 (PTNS_i)^j, PIFh_i, V_i, IND_i) + \eta_i, \quad (4)$$

where M_i equals zero if company i has missing performance data in 1995-1996 and V_i refers to the percentage of company shares sold in voucher scheme. The estimated coefficients from this auxiliary probit regression are available upon request.

4.2 Robustness Check: Difference-in-Differences (DID)

As a robustness check to our baseline model, we carry out a DID estimation for the one variable – sales revenue – for which we have comparable data in both 1990 and 1995-96. In particular, for sales -- a key variable capturing the scale of operations and hence both performance and restructuring – we have comparable 1990 and 1995-96 data on the divested units within the parent firms and on the firms that did not experience divestitures. The problem that we face with respect to the other dependent variables used in our baseline model is that the (command system) variable definitions in 1990 differ dramatically from the (international) definitions used by firms in 1995-96.¹⁰ For sales, however, the definitions are similar and we can employ the DID method as a robustness

¹⁰ For example, unsold inventories were included as part of a firm's profit in 1990 but not in 1995-96, and artificial invoicing was common in 1990 as invoiced products were included in profit and improved the firm's image. Thus, using profit in the DID estimation would most likely yield distorted results. In the period after privatization (from the end of 1994 on) accounting rules conforming to the international (IAP) standard were already in place. They are different from those used prior to 1991 when majority of divestitures took place.

check to equation (1), taking the divestiture and privatization as the *treatment* variables that may alter the performance of the firm.¹¹

Taking into account other potentially relevant variables, our specification of the DID model is

$$\Delta\pi_i = \alpha\Delta DIV_i + \beta\Delta OWN_{(DIV)_i} + \gamma\Delta OWN_{(NoDIV)_i} + \chi dL_i + \delta dK_i + \phi MR_i + \varepsilon_i \quad (5)$$

where $\Delta\pi_i$ is a measure of the difference in sales between 1990 and 1995-96, ΔDIV_i is a divestiture dummy coded 1 if the firm is a divested unit and zero otherwise, and $\Delta OWN_{(DIV)_i}$ and $\Delta OWN_{(NoDIV)_i}$ capture the change in ownership structure between 1990 and 1995-96 for firms that experienced divestiture and those that did not, respectively. In this context, the pre-divestiture, pre-privatization ownership is 100% state ownership.¹² Since we use the DID approach, ΔOWN_i captures the diminished share of state ownership and increase in private ownership as compared to the pre-privatization stage. Thus, in the case of state ownership, a value of the variable of -0.30 stands for a 30% decrease in state ownership (e.g. from 100% to 70%). A negative coefficient on the change in state ownership variable thus implies an improvement in performance with declining state ownership. For private types of ownership the interpretation is analogous, with a positive coefficient implying that performance improves with an increase in private ownership. In this context, coefficient β captures the interaction effect of the split and subsequent change in ownership, while coefficient γ gives the effect of ownership change in a firm without a divestiture. Finally, MR_i is the

¹¹ In equation (1) we control for the 1990 values of key performance variables by including them as regressors X_i , but we do not constrain the dependent variable to be in the form of a difference between the 1995-96 and 1990 values.

¹² We use the pre-divestiture, pre-privatization ownership structure in 1990 and the post-divestiture, post-privatization one in 1995 and 1996. Privatization of firms within the first wave of the voucher scheme was concluded in 1993 and 1994, but it was not until 1995 that new owners could affect ownership structure or execute sovereign corporate governance in privatized and spun-off firms. See Hanousek et al. (2007) for the post-1996 developments in privatized firms.

Mills' ratio from the Heckman correction (equation 3) and dK_i and dL_i are as in specification (1).

The validity of the DID estimates may be affected by the potential endogeneity of the treatment variables, in our case divestitures and privatization. To overcome this problem, we use the approach and variables as defined in equations (2) and (3), respectively. Since shares of labor and capital interact with the process of firm's division, we also instrument the capital and labor ratios. The instrumental variables that we use are industry-specific average dK and dL for groups of firms that did not experience divestitures. Due to the absence of divestiture, the size of these firms can be considered as being appropriate with respect to ratios of labor and capital in a particular sector. Most importantly, the computed average is not correlated with the error term in equation (5) that considers only firms where divestiture occurred. Furthermore, we use the series of average dK and dL for groups of all firms across various industry sectors. This average ratio is computed for all firms within a sector, with each firm experiencing division being consecutively omitted one at a time so that a large set of averages is available. Omitting a firm that experienced division eliminates potential correlation with the error term and an average constructed this way is by definition a valid instrument. Finally, we also use one-digit industry dummy variables as instruments.

The standard errors of the DID estimates may also be biased as a result of serial correlation. Fortunately, in our case this is not a concern because the time dimension of our panel data is very short and the cross-section dimension quite large. Nevertheless, to check the sensitivity of our results, we have also generated estimates based on data that were aggregated into one observation before and one after the treatment. The results are not materially different.

5. Empirical Results

The estimated coefficients of equation (1) are reported in Table 7. We start by estimating the effect of the extent of a divestiture by interacting the share of labor dL as well as the share of capital dK in the divested unit with annual dummy variables for 1995 and 1996, respectively. This time-varying coefficient specification generated similar 1995 and 1996 point estimates of the corresponding coefficients. We have therefore performed F -tests to verify whether the separate effects for 1995 and 1996 could be constrained into a single coefficient for each variable. In all cases, we have been able to accept the restricted model. In Table 7, we hence report estimates from this more parsimonious specification.

As mentioned earlier, there is an important discrepancy in the divestiture literature between the specification of Cusatis, Miles, and Woolridge (1993), who control for ownership changes in analyzing divestitures, and the rest of the literature that does not. In order to check the validity of the maintained assumption in the rest of the literature, namely that one can ignore ownership effects, we have tested whether our data permit us to exclude the ownership variables from the estimating equations. The relevant F -tests indicate that specifications that exclude the ownership variables are misspecified. Our results hence suggest that analyses of divestitures ought to take into account the accompanying changes in the ownership structure.

Finally, the Hausman (1978) tests for endogeneity of divestitures and ownership indicate that the IV method is superior to OLS in all regressions. In Tables 7 and 8 we hence report the IV estimates, noting that we do not have an excessive number of instruments and that our regressions pass the test of over-identifying restrictions. These tests suggest that the literature on divestitures needs to take into account the fact that

divestitures and ownership changes may be endogenously determined rather than brought about by a random assignment.

The estimated coefficient on the occurrence of divestiture (*DIV*) in Table 7 indicates that the base effect of divestitures is insignificant for labor cost/sales, but positive and statistically significant for profit/labor costs and profit/equity. Holding the relative factor intensity of the divestitures constant, the base performance effect of divestitures is hence positive for the two measures of profitability, but insignificant for the unit labor cost.

The effect of divestitures on profit/equity varies significantly with both dL and dK , the effect on labor cost/sales varies with dK only and the effect on profit/labor cost is invariant with respect to the labor and capital intensity of the divested unit. In particular, the effect of dL is positive and significant on profit/equity and insignificant on labor costs/sales and profit/labor cost. The effect of increasing the divestiture in terms of the labor share of the original parent firm is hence to increase or leave unaffected the divested unit's profitability and leave unchanged its unit labor cost.

The effect of dK on labor costs/sales is negative, suggesting that larger divestitures in terms of the share of capital appropriated from the parent firm are more efficient in that they decrease the unit labor cost of the divested firm. As was the case with dL , the effect of dK on profit/labor cost is insignificant. However, its effect on profit/equity is negative and significant. The effect of increasing a divestiture's share of parent firm's capital is hence to enlarge the newly emerged firms' (labor) cost efficiency and decrease or leave unaffected its profitability.

Given that the effects of divestitures vary in terms of the base effect and the size of the divestiture in terms of dL and dK , it is informative to calculate the mean effect of divestitures on each indicator of performance. When we take into account the effect of

the base (*DIV*) and evaluate the performance effects of divestitures at the mean values of dL and dK , using the estimated variance-covariance matrix, we find that the mean effects (and corresponding standard errors) are -0.010 (0.029) for labor cost/sales, 1.011 (0.505) for profit/labor cost, and 0.170 (0.066) for profit/equity. The three effects point in the direction of divestitures reducing costs and increasing profitability. However, only the two average effects on the profitability indicators are statistically significant. This is because the statistical significance of the base effect (*DIV*) dominates in the calculation of the statistical significance the average effect. The average divestiture therefore has a positive and statistically significant effect on both measures of profitability, and a statistically insignificant negative effect on the unit labor cost. Given that the average value of profit/labor cost and profit/equity equal to 0.317 and 0.132, respectively, the mean effect of divestitures on profitability of firms is large.

The effects of ownership changes on performance vary with the type of owner and whether or not the firm is the result of a divestiture. With the ownership coefficients and standard errors in Table 7 being multiplied by a factor of 100 for ease of interpretation, and with dispersed ownership serving as the base with its effect contained in the constant term, one can see that the extent of state ownership does not much affect performance in either type of firm. The only effects of state ownership that are statistically significant or somewhat close to being significant are the negative effects on the two measures of profitability in firms that did not experience divestiture. Reducing state ownership during large scale privatization hence brings limited positive effects on the profitability of firms that did not experience divestitures, while the effect on newly emerged units is insignificant.

Ownership of firms by an industrial (i.e., non financial) company has positive or insignificant effects on performance, relative to dispersed ownership. Greater ownership

by an industrial company decreases labor costs/sales in both the divested units and firms that do not experience divestitures, and it also increases profit/equity in firms that were not divided. With other effects being insignificant, industrial firms as new owners hence improve cost efficiency and leave unchanged or improve profitability.

Financial companies and individuals, on the other hand, appear to be owners that do not improve and in several aspects reduce efficiency. Financial companies have a negative effect on both measures of profitability in the divested firms and also a positive effect on unit labor cost in firms without divestment. Greater ownership by individuals has a similarly non-positive effect, with the coefficients being mostly insignificant, the effect on profit/labor cost being negative for divestitures and the effect on unit labor cost being positive for firms without divestitures.

The above results, based on the IV estimation, can be contrasted with those obtained from the standard OLS. For the sake of the completeness of our analysis, we present these results in Table A3 in the Appendix, despite their inaccuracy. The effects of the share of labor force and capital are reasonably similar to those reported in Table 7 because the two variables are more or less exogenous by their nature and are used only as control variables. The effects of divestitures and ownership type vary greatly from those obtained by the IV estimation and demonstrate the urgent need to account for endogeneity of divestment and privatization.

In Table 8 we report the DID estimates that capture the effect of divestitures and privatization on (growth of) sales. The base effect of divestitures is large (18%), positive and statistically significant at a 7% two-tail test level. The coefficients on dL and dK are insignificant, indicating that the strong positive effect of divestitures on the scale of operations (proxied by the logarithm of sales) does not vary with the size of the

divestiture. This finding broadens the support for our conclusions based on the estimates of equation (1) that divestitures have a positive effect on corporate performance.

The DID effects of changes in ownership structure are varied. A greater reduction of state ownership results in higher sales in divested units but lower sales in firms without divestitures. In the case of divestitures, the effect of reducing state ownership stands out against the positive and uniform effect across of all other types of ownership. In firms without divestitures, there is no significant sales effect associated with ownership by an industrial company, but there is a negative sales effect associated with ownership by financial companies and individuals, and a positive effect associated with state ownership.

6. Conclusions

Our study, based on new data from a rapidly emerging market economy (Czech Republic), suggests that divestitures and changes in ownership have a number of significant but also some insignificant effects on the performance of firms. We show that divestitures increase the firms' indicators of profitability and scale of operations (sales), but do not reduce in a significant way their unit labor cost. The performance effects of privatization depend on the resulting ownership structure and on whether or not a firm experienced a divestiture. In particular, smaller state ownership does not result in uniform and widespread improvements in performance. It has a weakly significant positive effect on profitability of firms without divestitures, relative to other types of ownership, but other effects are insignificant or mixed. Industrial (non financial) firms as owners reduce unit labor cost and leave unchanged or increase profitability. Greater ownership by financial companies or individuals reduces profitability in divested firms and increases unit labor cost and reduces sales in firms without divestment.

The overall evidence for divestitures is hence consistent with our first hypothesis, namely that divestitures have a positive effect on performance. A positive effect of divestiture on profitability without reducing costs can be credited to the increased market power of the divested firms. Since the socialist planners preferred large firms, the sizes of the firms that emerged from the centrally planned system were considerably larger relative to the size of firms in the established-market economies (OECD). The divestitures of the large SOEs into smaller units combined with their privatization eliminated prior inefficiencies such as diseconomies of scale of large state conglomerates, weak managerial incentives, and information asymmetries. Divestitures also enabled firms to become more specialized and focused on their core competence.

The effect of privatization is more nuanced. Reducing state ownership *per se* is positive for some performance indicators in the case of firms without divestitures, but it is less so in the divested units. Industrial firms as owners improve or do not hamper performance and in that sense they behave consistently with our first hypothesis. Financial companies and individuals as owners are mostly associated with no improvement and in some cases significant declines in performance, thus providing evidence that is consistent with our second hypothesis related to waning government controls, unclear corporate governance, and weak market-oriented legal framework. The effects of privatization are hence more nuanced than was suggested in many of the early studies.

Methodologically, our study provides evidence that it is important to (a) take into account changes in ownership when analyzing the effect of divestitures, and (b) control for endogeneity, selection and data attrition when analyzing the effects of divestitures and privatization.

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Table 1
Proposers of Privatization Projects in the Czech Republic

| Project Submitted by | Total | Percentage |
|-----------------------------------|-------|------------|
| Management of Company | 2813 | 25 |
| Management of Plants | 450 | 4 |
| Bidders for Purchase of Company | 4388 | 39 |
| District Privatization Commission | 788 | 7 |
| Restitution Claimants | 450 | 4 |
| Local Government | 450 | 4 |
| Consulting Firms | 338 | 3 |
| Others | 1575 | 14 |
| Total | 11252 | 100 |

Source: Kotrba and Svejnar (1994). Total number of firms equals to 2,404.

1. Bidders for purchase of company are proposers of competing projects who wish to purchase the company.
2. Consulting firms submit projects proposing sales to other entities or applying to get a contract for organizing a tender or auction.

Table 2
Variables and Data Sources

| Variable | Data available in the period | | Period and Source |
|---|------------------------------|----------------------|---|
| | Before Divestiture | After Divestiture | |
| <i>Performance indicators</i> | | | |
| <i>Baseline model:</i> Labor costs/ sales, profit/labor costs, profit/equity | -- | yes | 1995-1996, IAS |
| <i>Difference-in-difference model:</i> Sales | yes | yes | 1989-1991, Ministry of Privatization (MoP), LAS, 1995-1996, Aspekt, IAS |
| <i>Ownership data</i> | | | |
| State, Individual owner, Financial co., Industrial co. (in percentage of the total) | -- | yes | 1995-1996, Aspekt |
| <i>Instrumental and control variables</i> | | | |
| Share of labor and capital (divestiture units on parental company) | yes | | 1989-1991, Ministry of Privatization (MoP), LAS |
| Capital, Profit, Sales, Total liabilities, No. of employees | yes | yes | 1989-1991, (MoP), LAS |
| Number of privatization projects | yes | n.a. | 1989-1991, MoP |
| Proposed ownership structure (winning project): Foreign, domestic | yes | n.a. | 1989-1991, MoP |
| Identification of the split | yes | yes | 1989-1991, MoP |
| Shares offered and distributed in the Voucher Privatization | yes | yes | 1992, MoP |
| Company shares (percent) held by privatization funds and individuals | yes | yes | 1992, MoP |
| Industrial dummies | yes | yes | 1989-1991, MoP, 1995-1996, Aspekt |
| Identification of the split | yes | yes | 1989-1991, MoP |
| | | | |

Notes: IAS stands for international accounting standards, LAS stands for local accounting standards

Table 3
Summary Statistics of Pre-Divestiture Indicators in 1990

| | Mean | Std. Dev. | Min | Max | Median | No. of Firms |
|-----------------------------------|--------|-----------|--------|----------|--------|--------------|
| <i>Parent Enterprises</i> | | | | | | <i>44</i> |
| Profit | 171.1 | 385 | -271.8 | 2050.2 | 20.2 | 44 |
| Sales | 1847.8 | 2698 | 60.0 | 14500.0 | 686.1 | 44 |
| Employment | 2434.7 | 3729 | 175.0 | 23138.0 | 1334.0 | 44 |
| Assets | 1930.0 | 8633 | 47.2 | 57600.0 | 331.1 | 44 |
| Liabilities | 431.9 | 907 | 2.9 | 5787.4 | 140.8 | 44 |
| No. of Divestitures | 2.98 | 1.5 | 2 | 9 | 2 | 44 |
| No. of Projects ¹ | 8.98 | 12.2 | 1 | 77 | 5 | 44 |
| <i>Firms without Divestitures</i> | | | | | | <i>780</i> |
| Profit | 73.7 | 658 | -612.8 | 16,700.0 | 5.6 | 778 |
| Sales | 828.4 | 2840 | 1.5 | 50,800.0 | 213.5 | 779 |
| Employment | 1,156 | 3049 | 3 | 49,701 | 402 | 780 |
| Assets | 313.4 | 779 | 2.2 | 9,391.4 | 105.5 | 780 |
| Liabilities | 232.1 | 821 | 0.1 | 14,400.0 | 53.6 | 717 |
| No. of Projects [*] | 2.96 | 4.4 | 1 | 41 | 1 | 780 |
| <i>Divested Units</i> | | | | | | <i>131</i> |
| Profit | 57.9 | 212 | -267.2 | 1,874.4 | 4.7 | 130 |
| Sales | 620.6 | 1501 | 6.2 | 13,100.0 | 133.9 | 131 |
| Employment | 818 | 1901 | 23 | 17,880 | 294 | 131 |
| Assets | 648.2 | 4311 | 15.8 | 49,200.0 | 78.1 | 131 |
| Liabilities | 157.0 | 517 | 0.1 | 5,295.1 | 27.7 | 121 |

* Original projects were assigned only to the master firms and to control group. Hence no information on number of projects is available for divested units.

All financial indicators are expressed in million CZK. The average exchange rate in the period studied was \$1=30CZK.

Table 4
Proposed Allocation of Shares Among Privatizing Parties in the Winning Projects (in %)

| | | Mean | Std. Dev. | Min | Max |
|-----------------------------------|---------------------------------------|------|-----------|-----|-----|
| <i>Divested Units</i> | Foreign Owner | 1.15 | 6.75 | 0 | 51 |
| | Domestic Owner | 2.15 | 9.52 | 0 | 52 |
| | Restitution | 0.46 | 2.44 | 0 | 18 |
| | Fund of National Property (Temporary) | 8.30 | 14.74 | 0 | 57 |
| | Fund of National Property (Permanent) | 0.12 | 0.51 | 0 | 3 |
| | Sale throughout Intermediary | 0.34 | 2.34 | 0 | 20 |
| | Municipality Transfer | 3.21 | 8.20 | 0 | 67 |
| | Other | 0.00 | 0.00 | 0 | 0 |
| <i>Firms without Divestitures</i> | Foreign Owner | 1.74 | 9.08 | 0 | 75 |
| | Domestic Owner | 4.28 | 14.42 | 0 | 84 |
| | Restitution | 0.41 | 2.70 | 0 | 58 |
| | Fund of National Property (Temporary) | 5.98 | 13.19 | 0 | 82 |
| | Fund of National Property (Permanent) | 0.28 | 3.07 | 0 | 45 |
| | Sale throughout Intermediary | 1.83 | 7.66 | 0 | 72 |
| | Municipality Transfer | 0.88 | 2.34 | 0 | 20 |
| | Other | 0.07 | 0.94 | 0 | 16 |
| <i>Full Sample</i> | Foreign Owner | 1.66 | 8.78 | 0 | 75 |
| | Domestic Owner | 3.97 | 13.84 | 0 | 84 |
| | Restitution | 0.42 | 2.66 | 0 | 58 |
| | Fund of National Property (Temporary) | 6.31 | 13.44 | 0 | 82 |
| | Fund of National Property (Permanent) | 0.26 | 2.85 | 0 | 45 |
| | Sale throughout Intermediary | 1.62 | 7.16 | 0 | 72 |
| | Municipality Transfer | 1.22 | 3.87 | 0 | 67 |
| | Other | 0.06 | 0.87 | 0 | 16 |

Note: The number of observation is equal to 131 for divested snits, 780 for control group and 911 for the full sample.

Table 5
Sector Distribution of Firms

| Sector | Divested Units | Control Group | Full Sample |
|--------------------------|----------------|---------------|-------------|
| Agriculture | 1.5% | 1.4% | 1.4% |
| Heavy Machinery | 48.9% | 34.6% | 36.7% |
| Light Machinery | 13.0% | 19.6% | 18.7% |
| Construction | 12.2% | 21.5% | 20.2% |
| Transportation | 2.3% | 2.4% | 2.4% |
| Trade | 3.1% | 12.1% | 10.8% |
| Research and Development | 1.5% | 1.9% | 1.9% |
| Services | 13.0% | 4.0% | 5.3% |
| Financial | 4.6% | 2.4% | 2.7% |

Note: The number of observations is equal to 131 for divested units, 780 for firms without divestitures and 911 for the full sample.

Table 6
Summary Statistics of Performance Indicators: 1995-1996

| | | Mean | Std. Dev. | Min | Max | Num. Firms |
|-----------------------------------|---------------------|---------|-----------|-------|--------|------------|
| 1995 | | | | | | |
| <i>Divested Units</i> | Labor Costs | 96.4 | 0.27 | 1.12 | 2,405 | 91 |
| | Sales | 1,067.5 | 5.35 | 1.59 | 50,570 | 91 |
| | Profit/ Labor Costs | 0.5 | 1.20 | -2.70 | 7 | 91 |
| | Profit / Equity | 0.1 | 0.2 | -0.3 | 0.9 | 91 |
| <i>Firms without Divestitures</i> | Labor Costs | 82.6 | 0.14 | 0.90 | 2,229 | 538 |
| | Sales | 558.8 | 1.72 | 0.27 | 29,872 | 538 |
| | Profit/ Labor Costs | 0.3 | 0.89 | -2.89 | 7 | 538 |
| | Profit / Equity | 0.1 | 0.2 | -0.3 | 0.9 | 538 |
| <i>Full Sample</i> | Labor Costs | 84.6 | 0.17 | 0.90 | 2,405 | 629 |
| | Sales | 632.4 | 2.58 | 0.27 | 50,570 | 629 |
| | Profit/ Labor Costs | 0.3 | 0.95 | -2.89 | 7 | 629 |
| | Profit / Equity | 0.1 | 0.2 | -0.3 | 0.9 | 629 |
| 1996 | | | | | | |
| <i>Divested Units</i> | Labor Costs | 112.5 | 0.32 | 4.73 | 2,818 | 86 |
| | Sales | 1,210.9 | 6.03 | 2.08 | 55,495 | 86 |
| | Profit/ Labor Costs | 0.4 | 1.01 | -2.36 | 6 | 86 |
| | Profit / Equity | 0.1 | 0.2 | -0.3 | 0.9 | 86 |
| <i>Firms without Divestitures</i> | Labor Costs | 91.4 | 0.16 | 0.60 | 2,415 | 522 |
| | Sales | 536.4 | 1.20 | 0.16 | 17,423 | 522 |
| | Profit/ Labor Costs | 0.3 | 0.76 | -2.38 | 6 | 522 |
| | Profit / Equity | 0.1 | 0.2 | -0.3 | 0.9 | 522 |
| <i>Full Sample</i> | Labor Costs | 94.3 | 0.19 | 0.60 | 2,818 | 608 |
| | Sales | 631.8 | 2.53 | 0.16 | 55,495 | 608 |
| | Profit/ Labor Costs | 0.3 | 0.80 | -2.38 | 6 | 608 |
| | Profit / Equity | 0.1 | 0.2 | -0.3 | 0.9 | 608 |

Labor Costs and Sales are expressed in million CZK. Exchange rates at the end of 1995 and 1996 were \$1=26.6 CZK and \$1=27.3 CZK, respectively.

Table 7
Effects of Divestitures and Changes in Ownership Structure on Performance
(Instrumental Variable (IV) Estimates; Standard Errors in Parentheses)

| Dependent Variable: | Labor Costs/ Sales | Profit/ Labor Costs | Profit/Equity |
|---|--------------------------------|---------------------------------|---------------------------------|
| <i>Effects of Divestitures</i> | | | |
| <i>DIV (Base Effect)</i> | -0.009 (0.028) | 0.991 ⁵ (0.460) | 0.174 ¹ (0.066) |
| <i>dL (Share of Original Labor Force)</i> | 0.018 (0.033) | 0.153 (0.164) | 0.073 ⁵ (0.039) |
| <i>dK (Share of Original Capital)</i> | -0.529 ⁵ (0.027) | 0.026 (0.247) | -0.074 (0.042) |
| <i>Effects of Ownership Structure: Divested Units</i> | | | |
| <i>Industrial firm</i> | -0.693 ¹ (0.264) | -2.302 (2.408) | -0.603 (0.442) |
| <i>Financial company</i> | 0.332 (0.301) | -8.248 ⁵ (3.808) | -1.310 (0.573) |
| <i>Individual owner</i> | 0.111 (0.669) | -18.628 ⁵ (9.518) | -1.878 (1.471) |
| <i>State</i> | 0.303 (0.558) | -8.631 (6.596) | -1.297 (1.227) |
| <i>Effect of Ownership Structure: Control Group of Firms with No Divestitures</i> | | | |
| <i>Industrial firm</i> | -0.45 ¹ (0.109) | 0.853 (0.600) | 0.731 ⁵ (0.235) |
| <i>Financial company</i> | 0.277 ⁵ (0.121) | 0.096 (0.722) | -0.098 (0.321) |
| <i>Individual owner</i> | 0.445 ¹⁰ (0.263) | -1.794 (1.680) | 0.016 (0.756) |
| <i>State</i> | 0.233 (0.234) | -2.638 ¹⁰ (1.507) | -1.388 ¹⁰ (0.861) |
| <i>Constant</i> | 0.241 ¹ (0.021) | 1.201 ¹ (0.270) | 0.290 (0.129) |
| <i>Mills' Ratio</i> | 0.033 (0.028) | -1.225 (0.282) | -0.270 ¹ (0.129) |
| <i>Pre-split performance indicators</i> | <i>Yes</i> | <i>Yes</i> | <i>Yes</i> |
| <i>R-square</i> | 0.061 | 0.072 | 0.153 |
| <i>Adjusted R-square</i> | 0.047 | 0.058 | 0.140 |
| <i>Number of Observations</i> | 1280 | 1279 | 1234 |
| <i>Hausman test (degree of freedom)</i> | 102.3 (6) | 48.9 (8) | 422.9 (7) |
| <i>Upper tail area</i> | < 0.01 | < 0.01 | < 0.01 |

Notes: Since after a divestiture and subsequent privatization the state reduces its share, the coefficients associated with state ownership refer to a reduction of state ownership.

The category financial company includes ownership by banks, privatization investment funds and financial intermediaries/brokerages.

Ownership coefficients and associated standard errors (in parentheses) are multiplied by a factor of 100 for ease of interpretation.

1, 5, and 10 denote significant at 1%, 5%, 10% statistical test level, respectively.

Table 8
Effect of Divestiture-Related Characteristics on Performance:
Difference in Difference Instrumental Variable (IV) Estimates
(Standard Errors in Parentheses)

| | <i>In Sales</i> |
|--|----------------------------------|
| | IV |
| <i>Effects of Divestitures</i> | |
| <i>DIV (Base Effect)</i> | 18.213 ¹⁰ (9.828) |
| <i>dL (Share of Original Labor Force)</i> | 0.022 (0.168) |
| <i>dK (Share of Original Capital)</i> | -0.092 (0.082) |
| <i>Effects of Ownership Structure: Divested Units</i> | |
| <i>Industrial firm</i> | 7.251 (4.731) |
| <i>Financial company</i> | 1.313 (5.372) |
| <i>Individual owner</i> | 8.741 (11.416) |
| <i>State</i> | -17.099 ¹⁰ (9.849) |
| <i>Effect of Ownership Structure: Control Group of Firms with No Divestitures</i> | |
| <i>Industrial firm</i> | 0.270 (1.533) |
| <i>Financial company</i> | -5.688 ¹ (1.454) |
| <i>Individual owner</i> | -5.902 ¹⁰ (3.507) |
| <i>State</i> | 2.299 ¹ (0.291) |
| <i>Mills' Ratio</i> | -5.211 ¹ (0.431) |
| <i>R-square</i> | 0.130 |
| <i>Adjusted R-square</i> | 0.122 |
| <i>Number of Observations</i> | 1347 |
| <i>Hausman test (degree of freedom)</i> | 22.238 |
| <i>Upper tail area</i> | < 0.01 |

Notes: Since we define all ownership categories in terms of a change in ownership between 1990 and 1995-96, the state ownership variable refers to the reduction of the state's share while for the remaining categories this difference reflects an increase.

The category financial company includes ownership by banks, privatization investment funds, and financial intermediaries/brokerages.

Ownership coefficients and associated standard errors (in parentheses) are multiplied by a factor of 100 for ease of interpretation.

1, 5, and 10 denote significant at 1%, 5%, 10% statistical test level, respectively.

Appendix

Table A1

First Stage Regression Results on the Occurrence of Divestiture (Equation 2)

| Variable | Coeff. | Sign. | dP/dx |
|---|--------------------|-------|----------|
| Total Number of Privatization Projects | 0.201 (0.047) | 1 | 0.014 |
| (Total Number of Privatization Projects) ² | -0.006 (0.002) | 1 | -0.00003 |
| <i>DE_i</i> average | 0.001 (0.0006) | 1 | 0.0001 |
| (<i>DE_i</i> average) ² | -1e-8 (2e-7) | | -4e-9 |
| (<i>DE_i</i> average) ³ | 3e-10 (1e-10) | 5 | 2e-12 |
| <i>DE_i</i> median | -0.001 (0.0005) | 5 | -8e-5 |
| (<i>DE_i</i> median) ² | 4e-6 (2e-6) | | 3e-9 |
| (<i>DE_i</i> median) ³ | -3e-9 (1e-10) | 5 | -2e-12 |
| Foreign Owner | -0.007 (0.014) | | -4e-4 |
| Domestic Owner | -0.0002 (0.007) | | -1e-5 |
| Restitution | -4e-4 (0.040) | | -3e-5 |
| Fund of National Property (Temporary) | 0.009 (0.006) | | 6e-4 |
| Fund of National Property (Permanent) | -0.029 (0.043) | | -0.002 |
| Municipality Transfer | 0.018 (0.030) | | 0.001 |
| Profit (parent) | 0.248 (0.178) | | 0.017 |
| [Profit (parent)] ² | -0.018 (0.028) | | -0.001 |
| Sales (Parent) | 0.082 (0.039) | 5 | 0.006 |
| [Sales (Parent)] ² | -0.002 (0.001) | 5 | -0.0001 |
| Total Number of Shares (in billion) | 1.020 (0.412) | 1 | 0.071 |
| [Total Number of Shares (in billion)] ² | -0.205 (0.102) | 5 | -0.014 |
| [Total Number of Shares (in billion)] ³ | 0.003 (0.001) | 5 | 2e-4 |
| Industrial Dummies | | Yes | |
| R-square | | 0.286 | |

Table A2
First Stage Regression Results on the Ownership Structure (Equation 3)

| Variable | Domestic owners | | | | | | | | | | Foreign owners | | | | | |
|---|--------------------|-------|-------------------|-------------|--------------------|--------------|---------------------|--------|-------------------|------------------|---------------------|------------|--------------------|-------------|---|--|
| | Industrial Co. | | Bank | | Investment Fund | | Individual | | Portfolio Co. | | Industrial Co. | | Others | | | |
| | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | | |
| Constant | -2.201 (1.564) | -0.43 | -15.28 (6.273) | 5 -0.206 | -3.120 (2.084) | -0.432 | -2.049 (3.063) | -0.131 | -4.521 (3.583) | - 0.164 | 3.193 (3.061) | 0.175 | -17.51 (6.461) | 1 0.289 | - | |
| Total Number of Shares (in millions) | 0.448 -0.376 | 0.09 | 3.956 (1.650) | 5 0.0533 | 1.195 (1.19) | 0.1656 | 5.696 (3.98) | 0.3653 | -3.919 (4.41) | - 0.142 | -3.923 (1.76) | 5 -0.21 | 8.497 (3.39) | 5 0.14 | | |
| [Total Number of Shares (in millions)] ² | -0.013 (0.021) | 0.00 | -0.403 (0.028) | -0.005 | -0.607 (0.019) | 1 -0.084 | -1.948 (2.00) | -0.125 | -0.917 (0.086) | - 0.033 | -0.770 (0.062) | -0.04 | -0.835 (0.047) | 10 0.014 | - | |
| Shares in the Voucher Scheme (in millions) | -0.243 (2.27) | -0.05 | -12.449 (9.96) | -0.168 | -0.010 (3.34) | -0.001 | 1.701 (7.31) | 0.1091 | -12.350 (13.1) | - 0.448 | 0.908 (6.5) | 0.05 | -31.065 (16.6) | 10 0.512 | - | |
| Sold Shares (in millions) | -0.126 (2.16) | -0.02 | 9.999 (9.37) | 0.1348 | 1.424 (3.04) | 0.1973 | -10.177 (6.53) | -0.653 | 20.107 (12.7) | 0.73 | 5.716 (6.28) | 0.312 | 24.416 (14.8) | 10 0.402 | | |
| Sold Points (in millions) | 0.000 (0.012) | 0.00 | 0.043 (0.029) | 0.5829 | 0.000 (0.019) | 5 -0.005 | -0.005 (0.0479) | -0.302 | 0.000 (0.062) | 10 - 0.004 | 0.000 (0.025) | 5 0.003 | 0.131 (0.040) | 0.216 | | |
| | | | (0.0279) | | (0.0102) | | (0.0267) | | (0.0779) | | (0.0265) | | (0.875) | | | |
| Foreign Owner | -0.055 (0.0208) | -0.01 | | 0 | -0.033 (0.0254) | -0.005 | | 0 | | 0 | | 0 | | 0 | | |
| Domestic Owner | 0.022 (0.009) | 0.00 | 0.132 (0.0378) | 1 0.002 | -0.028 (0.0166) | 10 -0.004 | 0.00361 (0.0179) | 0 | 0.021 (0.0197) | 0.001 | -0.0802 (0.0185) | 1 -0 | 0.0123 (0.0349) | 0 | | |
| Restitution | 0.073 (0.052) | 0.01 | 0.275 (0.198) | 0.004 | -0.013 (0.0628) | -0.002 | -0.142 (0.175) | -0.009 | -0.389 (0.328) | 0.014 | 0.0723 (0.068) | 0.004 | | 0 | | |

Table A2
First Stage Regression Results on the Ownership Structure (Equation 3) (continued)

| Variable | Domestic owners | | | | | | | | | | Foreign owners | | | | | |
|--|---------------------|-------|-----------------------|------------|---------------------|--------------|------------------------|-------------|-----------------------|-------------|------------------------|------------|------------------------|------------|--|--|
| | Industrial Co. | | Bank | | Investment Fund | | Individual | | Portfolio Co. | | Industrial Co. | | Others | | | |
| | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | Coeff. | dP/dx | | |
| Fund of National Property (Temporary) | -0.011 (0.009) | 0.00 | 0.0706 (0.0293) | 5 0.001 | -0.025 (0.0148) | 10 -0.003 | -0.0105 (0.019) | -0.001 | 0.0306 (0.0162) | 10 0.001 | -0.028 (0.0127) | 5 -0 | 0.0574 (0.0246) | 5 0.001 | | |
| Fund of National Property (Permanent) | 0.011 (0.073) | 0.00 | | 0 | -0.061 (0.143) | -0.008 | -0.0798 (0.139) | -0.005 | 0.109 (0.0843) | 0.004 | | 0 | | 0 | | |
| Sale Through Intermediary | 0.008 (0.011) | 0.00 | -0.0061 (0.0667) | 0 | 0.025 (0.0147) | 10 0.003 | 0.00773 (0.0227) | 0 | | 0 | -0.0498 (0.0149) | 1 -0 | 0.0338 (0.0474) | 0.001 | | |
| Municipality Transfer | -0.126 (0.035) | -0.03 | -0.0073 (0.123) | 0 | -0.011 (0.02) | -0.002 | -0.0835 (0.0705) | -0.005 | 0.0006 (0.0406) | 0 | -0.0427 (0.019) | 5 -0 | 0.0838 (0.0383) | 5 0.001 | | |
| Other | 0.041 (0.014) | 0.01 | | 0 | -0.048 (0.0342) | -0.007 | -0.165 (0.0692) | 5 -0.011 | 0.0193 (0.0471) | 0.001 | -0.0684 (0.0232) | 1 -0 | -0.171 (0.187) | - 0.003 | | |
| Privatized in Voucher Scheme | 0.002 (0.009) | 0.00 | 0.091 (0.0324) | 1 0.001 | 0.032 (0.0143) | 5 0.004 | 0.0178 (0.02) | 0.001 | 0.0274 (0.0206) | 0.001 | -0.0948 (0.0153) | 1 -0.01 | 0.123 (0.0437) | 1 0.002 | | |
| Share Average Price in Voucher Scheme | -0.001 (0.00445) | 0.00 | 0.00965 (0.0142) | 0 | 0.017 (0.00842) | 5 0.002 | -0.0117 (0.0119) | -0.001 | 0.0402 (0.0222) | 10 0.001 | 0.00588 (0.0104) | 0 | 0.0261 (0.0179) | 0 | | |
| [Share Average Price in Voucher Scheme] ² | 0.000 (1.23E-05) | 0.00 | 8.9E-06 (3.15E-05) | 0 | 0.000 (3.56E-05) | 0 | 4.39E-06 (4.46E-05) | 0 | -0.0002 (0.000129) | 10 0 | -2.9E-05 (3.16E-05) | 0 | 2.95E-06 (3.81E-05) | 0 | | |
| Total Number of Privatization Projects | 0.026 (0.0102) | 0.01 | 0.0844 (0.0279) | 1 0.001 | 0.016 (0.0102) | 0.002 | -0.0137 (0.0267) | -0.001 | -0.0786 (0.0779) | - 0.003 | -0.0126 (0.0265) | -0 | -1.247 (0.875) | - 0.021 | | |
| Pre-privatization Characteristics | yes | | yes | | yes | | yes | | yes | | yes | | yes | | | |
| R-square (scaled) | 0.175 | | 0.464 | | 0.219 | | 0.157 | | 0.142 | | 0.386 | | 0.325 | | | |

Table A3
Inaccurate Effects of Divestitures and Changes in Ownership Structure on Performance
(Ordinary Least Squares (OLS) Estimates; Standard Errors in Parentheses)

| Dependent Variable: | Labor Costs/ Sales | Profit/ Labor Costs | Profit/Equity |
|---|--------------------------------|--------------------------------|--------------------------------|
| <i>Effects of Divestitures</i> | | | |
| <i>DIV (Base Effect)</i> | -0.011 (0.012) | -0.002 (0.325) | -0.055 ¹ (0.054) |
| <i>dL (Share of Original Labor Force)</i> | 0.022 (0.037) | 0.216 (0.495) | 0.076 ⁵ (0.079) |
| <i>dK (Share of Original Capital)</i> | -0.522 ⁵ (0.031) | 0.324 (0.580) | 0.153 (0.146) |
| <i>Effects of Ownership Structure: Divested Units</i> | | | |
| <i>Industrial firm</i> | -0.215 ¹ (0.082) | 0.033 (1.080) | -0.068 (0.101) |
| <i>Financial company</i> | 0.088 (0.172) | 7.574 ¹ (2.531) | 0.530 ¹ (0.146) |
| <i>Individual owner</i> | 0.018 (0.103) | -0.743 (1.020) | -0.034 (0.106) |
| <i>State</i> | 0.089 (0.173) | -1.599 (3.142) | 0.299 (201) |
| <i>Effect of Ownership Structure: Control Group of Firms with No Divestitures</i> | | | |
| <i>Industrial firm</i> | -0.081 ¹ (0.019) | 1.600 (1.247) | 0.059 (0.061) |
| <i>Financial company</i> | 0.018 (0.025) | 0.127 (1.476) | 0.002 (0.042) |
| <i>Individual owner</i> | 0.011 (0.052) | -10.024 (10.770) | 0.104 (0.161) |
| <i>State</i> | 0.154 (0.126) | -22.172 (24.587) | 0.142 (0.170) |
| <i>Constant</i> | 0.232 ¹ (0.012) | 1.597 ¹⁰ (0.904) | 0.207 ¹ (0.077) |
| <i>Mills' Ratio</i> | 0.033 (0.028) | -2.204 ⁵ (1.113) | -0.213 ¹ (0.092) |
| <i>Pre-split performance indicators</i> | <i>Yes</i> | <i>Yes</i> | <i>Yes</i> |
| <i>Adjusted R-square</i> | 0.053 | 0.064 | 0.151 |
| <i>Number of Observations</i> | 1280 | 1279 | 1234 |

Notes: Since after a divestiture and subsequent privatization the state reduces its share, the coefficients associated with state ownership refer to a reduction of state ownership.

The category financial company includes ownership by banks, privatization investment funds and financial intermediaries/brokerages.

Ownership coefficients and associated standard errors (in parentheses) are multiplied by a factor of 100 for ease of interpretation.

1, 5, and 10 denote significant at 1%, 5%, 10% statistical test level, respectively.