Privatization Methods and Economic Growth*

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Abstract

In low-income countries privatization, if implemented appropriately, may play an important role in generating growth. Using data recently available from Central and Eastern Europe, we therefore investigate the impact of alternative methods of privatization on economic growth. Our analysis suggests that the use of conventional privatization methods to match owners with firms can be inefficient in economies with underdeveloped capital markets, particularly if wealth is poorly correlated with managerial and entrepreneurial ability. In these circumstances mass privatization, with firms being given away or sold at a nominal price, may be the appropriate policy choice.

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Privatization has become a world-wide phenomenon. During the 1990s, it generated government revenues of more than $700b according to the OECD Privatization Database. Since 1989 more than 70,000 enterprises have been privatized in Central and Eastern Europe, and privatization is currently a major item on the policy agenda in China, India, and many other developing economies. Although the impact of privatization on the performance of firms has been studied extensively (see William L. Megginson and Jeffry M. Netter, 2001), literature addressing its effects on growth and other macroeconomic implications is sparse.[1] Yet many of the countries with nascent privatization programs, such as those in Sub-Saharan Africa, are suffering from economic stagnation, and the choice of an appropriate method of privatization could play an important role in jump-starting growth. For the testing of hypotheses about the consequences for growth of different privatization strategies, the transition process in Central and Eastern Europe provides a unique sample, for extensive privatization programs were undertaken in that region over a relatively short period of time using a variety of methods. In this paper we therefore use data from a sample of 23 transition economies over the period 1990 to 2001 inclusive to estimate an aggregate growth model in which we include methods of privatization, as well as capital market and private sector growth, as exogenous variables.

Our framework allows us to test empirically a number of competing hypothe-

[1]Two exceptions are Nico Hansen (1997), who analyzes technology choices under different privatization schemes, and Alfred Schipke (2001), who sketches general macroeconomic themes related to privatization.

ses. First, if the positive effects of privatization on the financial performance and productivity of firms that are predicted by microeconomic theory obtain, we would expect these effects to have a macroeconomic analog, raising growth. Second, as Simeon Djankov and Peter Murrell (2002) have stressed, the type of owner post-privatization may matter and this is related to both the method of privatization and the extent of capital market development. For example, some ownership types will, for a given level of capital market development, lead to more efficient matching of buyers with firms and better corporate governance. Third, methods of privatization may affect aggregate demand. The greater is the expenditure of private agents on the purchase of shares from the government, the more tightly will the spending ability of the private sector be constrained, leading to different levels of investment spending by privatized firms and consumption spending by households. However, greater revenue for the government may also raise its willingness to spend on infrastructure, with a potential positive feedback on aggregate productivity (Philippe Aghion and Mark Schankerman, 1999). Finally, if economic growth is positively associated with capital market development (Asli Demirguc-Kunt and Vojislav Maksimovic, 1998), and if different privatization methods have different effects on capital market development, this suggests another channel through which the privatization method may affect growth.

Our results have important implications for current privatization policy in developing economies. We find that the conventional sale of state assets ('full

privatization') has no significant impact on growth, whereas mass privatization, with firms being given away or sold at nominal prices, has a significant positive effect. Stock market development also enhances growth. Our analysis suggests that the use of full privatization to match owners with firms can be inefficient in economies with underdeveloped capital markets, particularly if wealth is poorly correlated with managerial and entrepreneurial ability. In these circumstances mass privatization may be the appropriate policy choice.

In Section 1 we outline our theoretical framework, and in Section 2 we discuss the specification of the estimating equations and the data used. The results are reported in Section 3, while in Section 4, which concludes, we interpret our findings. The data sources are reported in the Appendix.

1 Theoretical Framework

In this section we present the simple theoretical framework for our empirical contribution. We take the method of privatization to be an exogenous policy choice. First we classify privatization methods and then we specify equations for real aggregate demand and supply, in each of which the method of privatization is an argument. Combining these equations, an expression is obtained in which real GDP depends on the method of privatization and a variety of other factors.[2]

[2]The empirical literature on growth commonly adopts a Cobb-Douglas production function and is based on the assumption that each economy is close to its steady-state growth path (for example, Robert J. Barro, 1991). However, by definition, transition economies are significantly out of steady state. Instead, we use a general formulation of the determinants of real GDP,

The impacts on growth of private sector and capital market development are also explored.

We distinguish three alternative privatization methods.[3] 'Mass privatization' is defined to occur when the dominant form of privatization in an economy is that firms are sold at a zero (or nominal) price. 'Full privatization' occurs when the dominant form of privatization is the sale of firms to outsiders for positive prices. 'Mixed privatization' covers all cases that are not adequately represented by either of the first two categories, and includes manager-employee buyouts (MEBOs) and leased buyouts. In practice, the choice of privatization methods appears to have been driven primarily by political and ideological factors, and does not appear to correlate with economic performance pre-transition.

For a given country and time, we denote real aggregate demand by y^d and real aggregate supply by y^s. Our formulation of real aggregate demand, where the sign above a variable is that of the relevant partial derivative, is

$$y^d = Y^d\left(\bar{p}, \bar{M}\right). \tag{1}$$

Thus, in addition to being negatively related to the price level p, y^d is assumed to depend on the method of privatization M. Let $M = 1$ denote mass privatization,

and thus economic growth, incorporating a range of independent variables.

[3]In practice, each country has privatized in a variety of ways. Nonetheless, we have taken care to determine where the dominant mode can be identified in each country, and that is the 'privatization method' specified in our analysis (see the working paper version of this paper, available from the authors).

$M = 2$ full privatization, and $M = 3$ mixed privatization. With mass privatization, the recipients of shares may feel richer, at least in the short term, and this can be expected to a have a positive, though perhaps relatively small, real wealth effect on the demand for goods.[4] The other two methods of privatization involve the transfer of funds from private agents to the government and so the net effect on aggregate demand depends on relative marginal propensities to spend. Given imperfect capital markets, the expenditure associated with these methods may leave buyers of firms short of liquidity, which may have a negative short-term effect on real consumption and investment demand. However this effect may be small for full privatization if the number of buyers is relatively small or if firms are purchased by foreigners. Hence we expect that real aggregate demand will be greatest for $M = 1$ and smallest for $M = 3$.

Real aggregate supply is specified by

$$y^s = Y^s(\overset{+}{p}, \overset{?}{M}, \overset{+}{K}, \overset{+}{L}, \overset{+}{A}, \overset{+}{S}, \overset{+}{P}, \overset{+}{G}), \tag{2}$$

where K is the private sector capital stock; L is employment; A is the human capital stock; S is a measure of capital market development; P is the share of the private sector in national income, and G is the public sector capital stock. We assume without comment that y^s is positively related to p, K and A. We

[4]Insofar as the other methods of privatization underprice shares, we may expect similar effects on demand, though generally less than for mass privatization.

also assume that y^s is increasing in L, though, because of labor hoarding, the relationship may be weaker than in Western economies. We focus our discussion on the variables M, P, S and G.

Different methods of privatization may lead to different majority ownership structures, with differentiated impacts on firm performance, as represented by M in equation (2). Assuming that full privatization is associated with relatively efficient matching of owners to firms, it may be expected to lead to the most effective corporate governance of our three types of privatization. In contrast, MEBOs and leased buyouts may lead to managerial and worker entrenchment, while mass privatization may lead to diffuse ownership structures and long agency chains.[5] Assuming that more effective corporate governance raises real aggregate supply, this suggests that the effect on y^s may be strongest for full privatization ($M = 2$), but we cannot rank, *a priori*, the expected effects of mass and mixed privatization ($M = 1$ and 3).

Private sector development is the consequence of output growth by both privatized and *de novo* firms. We assume that an increase in the output of either,

[5] An extensive literature addresses how different privatization methods may have influenced the structure of private ownership post-privatization (see Djankov and Murrell, 2002). Full privatization is found typically to have led to outsider ownership, with, in Hungary and Estonia, a high proportion of foreign participation. Mixed privatization has led to insider ownership, often dominated by managers, and sometimes with a large retained state ownership share (for example, Romania and Slovenia). The consequences of mass privatization for ownership have been more complex. In Russia and Ukraine, widespread insider ownership resulted, while in the Czech Republic and Poland, mass privatization was constructed to ensure primarily outsider ownership. The impact of privatization method and ownership form also depends on capital market development; for example, on whether insiders choose to sell their mass privatization vouchers.

as a proportion of national income, will tend to raise y^s, and we treat this effect as a form of neutral technical progress. The sources of the positive effect of privatization on productivity at the level of the firm include the better definition of corporate goals by private firms and some resolution of the incentive problems associated with the softer budget constraints of state-owned enterprises. Also, privatization may generate network externalities, with more extensive market transactions creating a climate of trust, raising business confidence. A major contribution to productivity growth is made by small and medium-sized *de novo* firms through their ability to fill the gaps left under communism by biases towards high capital intensity and against the provision of services. Private sector development is not correlated in the data with the method of privatization, though it is likely to be associated with other policy measures with respect to the private sector, for example towards small-scale privatization.

The development of capital markets may be associated with more widespread and cheaper corporate finance, reducing the need for firms to rely on internally-generated funds for investment, and thus raising y^s. More mature capital market structures can also be an important element in improved corporate governance (Megginson and Netter, 2002). Privatization itself may generate development of the capital market, and the larger the proportion of output that comes from the private sector, the greater is the scope for benefiting from capital market

development. Thus, we expect that

$$\partial^2 y^s / \partial P \partial S > 0. \tag{3}$$

Additionally, there is a potential interaction between privatization method and capital market development. For example, implementation of mass privatization policies in Poland was explicitly associated with plans for capital market development (Leszek Balcerovic,1995), whereas extensive use of MEBOs may restrict the expansion of the capital market.

Privatization methods may have a direct impact on the macro-economy through the effects on government revenue, and hence on its ability to invest in infrastructure, thereby enhancing growth. Full privatization would be expected to yield the most revenue for the government, and mass privatization the least. With mixed privatization, firms are usually sold at a positive, but preferential, price. Insofar as privatization programs in transition economies are a non-distortionary source of revenue, productive investment financed by this revenue will have a positive impact on growth. However, a large proportion of public investment is financed in other ways, particularly by distortionary taxation, and so the effect of government expenditure on economic growth may be of either sign (Barro, 1991). Furthermore, the transition economies' investment performance during the communist era exhibited extreme inefficiency. Hence, we expect at best a weak positive relationship between public sector investment and real aggregate

supply.

Let y denote real GDP. Setting $y^d = y^s = y$, we can solve (1) and (2) for p:

$$p = P\left(M, K, L, A, S, P, G\right) \tag{4}$$

Substituting (4) into (2), we obtain

$$\begin{aligned} y &= Y^s\left[P\left(M, K, L, A, S, P, G\right), M, K, L, A, S, P, G\right] \\ &\equiv Y(\overset{?}{M}, \overset{+}{K}, \overset{+}{L}, \overset{+}{A}, \overset{+}{S}, \overset{+}{P}, \overset{+}{G}) \end{aligned} \tag{5}$$

Real GDP is increasing in K,L, A, S, and P, and may be increasing in G. Putting together our comments concerning the effects on y^d and y^s of each privatization method suggests that, compared to the other methods of privatization, the direct effect of mixed privatization will be a relatively low level of y, but the ranking of the other two methods in this respect is unclear. However, given that with mass privatization the positive effect on demand may be relatively small, we expect that full privatization, because of its relatively efficient matching, will have the greatest effect on real GDP, at least in economies with more developed capital markets.

2 Specification and Data

We estimate a cross-country growth model along the lines of, for example, Barro (1991) and Gregory Mankiw, Davis Romer and David Weil (1992). However, equation (5) leads us to supplement the model with the method of privatization, government investment, and indicators of private sector and capital market development. We also explore potential complementarities between privatization method, private sector development and capital market development. For emerging markets, similar methodology has been applied to capital market development by, for example, Gert Bekaert and Campbell R. Harvey (2000) and Peter B. Henry (2000). The basic model is therefore

$$
\begin{aligned}
(6) \qquad GDP_{it} &= a_1 + a_2 INV_{it} + a_3 EMP_{it} + a_4 IHC_{it} + \\
&\quad a_5 STOCKM_{it} + a_6 PRIV_{it} * a_7 GIS_{it} + \\
&\quad a_8 FULL_{it} + a_9 MASS_{it} + a_{10} MIXED_{it} + \varepsilon_{it}
\end{aligned}
$$

where all variables are re-labelled for a more immediate interpretation of the estimates. i denotes country and t time; GDP is the first difference of the log of real gross domestic product y; INV is the first difference of the log change in the real capital stock K; EMP is the first difference of the log of employment L; IHC is the first difference of the log of investment in human capital A, which is measured by gross enrolment in tertiary education; $STOCKM$ is stock market

capitalization as a proportion of GDP, which is our measure of stock market development S; $PRIV$ is the share of private sector output in GDP, corresponding to P in equation (2); and GIS is the share of government expenditure devoted to investment, corresponding to the variable G.[6] The three methods of privatization, M, are denoted by $FULL$, $MIXED$ and $MASS$; and ε_{it} is an i.i.d. error term. The estimation period is the twelve years 1990-2001 and covers 23 transition countries.[7]

We use panel-data analysis (within-groups estimators) to exploit both time-series and cross-section variation in data, in particular in the relationship between growth and privatization method. We test for time-specific as well as country-specific fixed effects in each regression, and compare the performance of model (6) with its dynamic counterpart. For the dynamic version of the model, with lagged dependent variables, we use generalized-method-of-moments (GMM) estimation, dealing with potential problems of endogeneity of the explanatory variables by instrumenting on lagged values. GMM estimation also allows us to address the

[6]Equation (6) is estimated in first-difference form to take out country-specific fixed effects. Since we are addressing the impact of privatization method, and capital market and private sector development on growth, the variables are included in the estimating equations in levels form. This is clearly appropriate for privatization methods, since it is constructed as a dummy variable. However, since the others are continuous variables, we also estimated the equations including these in first differences. The principal findings with respect to INV, EMP, IHC, G and methods of privatization are not affected by the change in specification. However, neither $PRIV$ nor $STOCKM$, nor their interaction is significant in the OLS estimation. $STOCKM$ and its interaction with $PRIV$ are significant in the GMM estimation, with the same signs as in Table 4.

[7]Our data set covers all the transition countries listed by EBRD (2002), except for Bosnia and Herzegovina, FR Yugoslavia, Tajikistan and Turkmenistan for which relevant data are not available. We cover Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Czech Republic, Estonia, FYR Macedonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Ukraine and Uzbekistan.

correlation between the error term and lagged endogenous variables,.

The three privatization dummies have both a cross-section and a time-series dimension. We identify the chosen method of privatization in each country and then identify the date at which this privatization method was introduced.[8] In each case the dummy variable is zero in the years before the relevant method of privatization was introduced and unity thereafter. The classification of privatization method by year and country is presented in Table 1. When the primary method is identified by the European Bank for Reconstruction and Development (EBRD) as voucher, we classify privatization as 'mass.' When the EBRD primary method is direct sales, we classify privatization as 'full.' In other cases we classify privatization as 'mixed.'[9]

[Table 1 about here]

[8]In preparing the paper, we explored the effects of using three different ways of classifying privatization methods (see our working paper). The first was based on official reports available on government websites. The second used external documentary sources. The third was based on EBRD classifications. In this paper we report regressions based on the third approach because it derives from a single source and does not rely on our subjective judgements. However, all the equations were estimated using all three approaches. When the approach was changed, five countries shifted category, but none of the conclusions with respect to method of privatization were affected. (The regressions are available from the authors on request.) Thus, our findings are not dependent on how we categorize the few countries for which the dominant privatization method is somewhat unclear, and which may shift between Mass and Mixed. Our results are driven by the performance of countries about which there is little debate as to the dominant method of privatization.

[9]For countries, such as Ukraine, in which privatization has been relatively slow, the year specified in Table 1 may be contentious. However, our main findings are found not to be sensitive to adjustment of the assumed privatization dates.

3 Results

We first estimate versions of equation (6), before addressing issues of dynamics using GMM methods and undertaking sensitivity tests. In all equations we use White's correction for robust standard errors. In Table 2, we report four versions of equation (6). Column (1) represents the simplest formulation, with no interactions, while in column (2) we include a term for the interaction between capital market development and private sector development. We have also calculated regressions interacting each method of privatization with stock market development and with private sector development. None of these interactions with the method of privatization are significant, but, as a 'representative' example, in column (3) we report a regression that includes an interaction term between stock market development and mass privatization. Column (4) includes both interaction terms.

[Table 2 about here]

All four formulations in Table 2 yield good fits, with $R^2 > 0.6$ and joint Wald tests ranging from 130.7 in column (1) to 179 in column (3). The Wald tests for country (dummy) and time confirm the strong significance of fixed- and time-specific effects in the growth process, while the AR tests indicate that autocorrelation is not present. Country fixed effects represent a particularly important element in the explanation, with the value of the χ^2 in the Wald tests ranging from 2703 in column (1) to 7108 in column (4), all with probability [0.00].

The coefficients on factor inputs are stable and significant across the four formulations. The findings are consistent with the type of growth process identified by Barro (1991) and many others, with the coefficient on investment estimated to be around .08. The coefficient on the change in employment is also highly significant, but lower than typically obtains in the West, perhaps because of labor hoarding in the immediate post-transition period. Additionally, we identify a relatively small, but significant, impact of labor-quality change on GDP growth.

Private sector and stock market development are not found to be independently significant (column (1)). However, once their interaction term is included (column (2)), we identify a significant positive impact of stock market development on GDP growth, together with a small negative interaction effect. This suggests that the growth-enhancing effects of capital market development relied on private sector development, but tailed off as an economy approached a Western ownership and capital market structure. As noted above, the interaction of stock market development with mass privatization (column (3)) is not significant.

Turning to the impact of privatization methods on growth, the findings are consistent across the four specifications. Neither full nor mixed privatization is found to exert a significant independent influence on GDP growth, but the coefficient on mass privatization is always positive and at least weakly significant. Moreover, the coefficient on government investment expenditure is insignificant in each specification, and so we conclude that full privatization influences growth neither directly, through productivity enhancement, nor indirectly, through the

potential macro-economic externality that could derive from spending the increased government revenues on infrastructure.[10] To check the robustness of the finding with respect to government investment expenditure, we re-estimated columns (1)-(4) of Table 2 replacing GIS by the EBRD (1996, 2003) index of infrastructure reform. The coefficients and standard errors on the other independent variables in Table 2 were hardly affected by the change and the index was not significant in any regression (see our working paper).

Since the results could be sensitive to the absence of dynamics in the specification, we re-estimated the OLS regressions with the inclusion of a lagged endogenous variable. The results, which are reported in Table 3, indicate that a dynamic specification is appropriate: the lagged endogenous variable is significant in all three columns, and its inclusion widens the standard error around the contemporaneous change in employment variable, which is no longer significant. However, our conclusions about the impact of capital market development and privatization method on growth are the same as in our original specification. The coefficients on stock market development and its interaction term with private sector development are significant in columns (2) and (4), and the coefficient on mass privatization is positive and significant in each column. The coefficients on mixed privatization, full privatization and government investment expenditure

[10]The data suggest that, even though the choice of full privatization must have relaxed the government's budget constraint, the authorities did not choose to use this incremental revenue on capital expenditure. The correlation coefficient between full privatization and government investment expenditure is only .05.

are not significant in any column.

[Table 3 about here]

The results in Table 3 may be biased by correlation between the error term and the lagged endogenous variable, so we also undertook GMM estimation. The GMM estimates for the four specifications, with factor inputs (investment and the changes in employment and labor quality) and government investment expenditure all instrumented on lagged values, are reported in Table 4. This replicates the main results from the other two tables. The lagged endogenous variable is always significant, as are the coefficients on investment and the change in employment. However the measure of the change in human capital is not quite significant in any specification using GMM estimation methods. As in the previous tables, government investment expenditure is found to be insignificant in all the four specifications, as are the coefficients on full and mixed privatization. The conclusions from Table 2 concerning private sector and capital market development are confirmed by Table 4, as are the findings concerning mass privatization.

[Table 4 about here]

We sought to understand these results further by breaking the data set into sub-samples geographically (Conference of Independent States (CIS) versus non-CIS) and over time (1990-1995 and 1996-2001), but the decline in degrees of freedom made the estimated coefficients much less precise. Since the equations are

less reliable, we exclude them here (they are reported in full in our working paper). What these experiments suggest is that our main results with respect to stock market development, private sector development and method of privatization hold in particular in the CIS, and in the period after 1995. This is unsurprizing given the data Table 1, which indicate the concentration of mass privatization in CIS countries and in the post-1995 period.

However, these findings suggest that the mass privatization dummy might be proxying for improved demand and cost conditions in the CIS countries between 1996-2001. Sources of these improved conditions might include oil prices, which were increasing in this period to the benefit of several oil-supplying CIS countries, and exchange rate depreciations. We therefore re-estimated our equations to control for this issue. A sample of the results is reported in Table 5, which is based on column (2) of Table 2, but includes first the exchange rate (column (1)) and then the exchange rate and the oil price (column (2)). It can be seen that the new coefficients are significant in both columns (1), suggesting that oil (and perhaps other commodity) price increases and exchange rate depreciation both had a positive effect on growth. However, as in the other tables, the coefficient on mass privatization in Table 5 is positive and significant. Thus, although mass privatization was the dominant method in CIS countries, the variable $MASS$ is not proxying for demand or costs factors in this region. This suggests that the correct interpretation of our previous findings is that the countries in the CIS that introduced mass privatization were in a better position to exploit the improved

market conditions in the late 1990's than those countries that employed other privatization methods.

[Table 5 about here]

4 Conclusions

Our empirical analysis shows that the method of privatization plays an important role in economic growth. A finding that full privatization had a significant growth effect would have verified the hypothesis that efficient corporate governance and the matching of buyers with firms are critical. An advantage of full privatization is that it leads to concentrated ownership, whereas mass privatization has the converse effects. However, we find that it is mass privatization that has the positive effect, suggesting that the matching argument is relatively weak for transition economies. This may because in any economy the ability to purchase a firm, or at least a substantial ownership share, is imperfectly correlated with the skills required to run the firm efficiently. In an economy with an extremely underdeveloped capital market, 'wrong' owners will tend to persist for longer.[11] The positive effect of mass privatization has been justified on political economy

[11]This argument is strengthened insofar as the income distribution inherited from the communist era was misaligned with the ability to run firms. In contrast, in the Czech Republic, the distribution of shares at nominal cost to the general public led to shares being placed in the hands of privatization funds, which may have exerted pressure on managers to be relatively efficient. The argument does not apply to full privatization to foreign investors, but, as we have already noted, the amount of such privatization has been relatively small across all transition economies, amounting to less than 2% of world foreign direct investment in 1999 (United Nations Conference on Tariffs and Development, 2003).

grounds (Maxim Boycko, Andrei Shleifer and Robert W. Vishny, 1995), but it is also consistent with the hypothesis that the method of privatization may foster growth through the effects on the demand for consumption or investment goods and by separating the management of firms from state ownership (see Djankov and Murrell, 2002).

We hypothesized that government capital investment might have played a significant role in generating growth through the provision of public goods, in which case full privatization could have yielded benefits through the greater revenue it generates for the government. However, we are unable to identify such an effect in our empirical work, presumably because transition governments did not use incremental revenue in this way. Thus, although full privatization raises more (immediate) government revenue than mass privatization does, the extent to which this is translated into faster economic growth may be disappointing.

Our analysis has significant implications for developing countries that have still to undertake large-scale privatization programs, for example China, India and Vietnam. It suggests that the method of privatization is an important policy choice, and that, despite the great criticism it has received in recent years, mass privatization may be the appropriate choice in situations where capital markets are highly imperfect and the distribution of wealth is not well correlated with the distribution of managerial ability.

Data Appendix

The data used in this paper describe 23 of the 27 transition economies covered in the EBRD *Transition Reports* (various years), which provide complete information for 1990-2001 on macroeconomic variables including GDP, employment and gross fixed capital formation, and the indicators of institutional investment used in the paper. Bosnia and Herzegovina, FR Yugoslavia, Tajikistan and Turkmenistan were excluded from the analysis because complete data on these countries were unavailable.

Gross Domestic Product. The base year for the GDP series was sourced from the *World Bank's Historically Planned Economies: A Guide to the Data*, taking the 1988 figure, measured in constant 1987 market prices. Figures were converted into US dollars using the 1987 exchange rate.[12] For each country that later disintegrated (Czechoslovakia, Yugoslavia and the USSR), we broke the total GDP into constituent parts using information provided by UN, World Bank and national sources on the constituent countries' share in total GDP. The total USSR figure was divided into Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Ukraine and Uzbekistan. The total figure for Yugoslavia was divided into separate data for Slovenia, Macedonia and Croatia. The total figure for Czechoslovakia was divided to obtain separate data on Slovakia and the Czech Republic. To extend

[12]In the case of Albania, 1988 GDP is provided in constant 1986 market prices, and was converted into US dollars using the 1986 exchange rate.

the series from 1988 real GDP growth data provided by the EBRD were used.

Fixed Capital Investment. Fixed capital investment figures were obtained from the EBRD (1999, 2000, 2001, 2002) by taking the real gross fixed investment rate, measured in annual percentage change. For the few cases in which such information was unavailable, alternative measures were used. The main alternative source was data on investment share in GDP provided by the IMF and EBRD. This ratio was applied to our GDP levels data to obtain fixed capital investment levels figures. An annual percentage change in fixed capital investment was calculated from the levels figures. We also used GDP level figures to calculate fixed capital investment growth in the early 1990s in the few cases when information on annual percentage change in investment was not available. We calculated fixed capital investment figures by applying fixed capital investment to GDP ratios, provided by IMF and National Statistics sources, to our GDP levels figures.

Employment. Information on employment growth was obtained from EBRD employment time series, measured in annual percentage change, for 1989-2001.

Investment in Human Capital. The measure chosen for investment in human capital was gross enrolment in tertiary education, defined as the total number of students who had attained a certain level of education as a percentage of the total population in the age group. The data were obtained using the *TransMonee Database*, produced by UNICEF, by taking 5-year period averages. These series were preferred to UNESCO data, which are inconsistent with the World Bank source and show unconvincingly high growth of enrolment rates for

several countries.

Government Investment Share in GDP. Data were derived from the measurement of government investment expenditure provided by IMF Country Reports. For CIS countries, information on the early years of transition was unavailable from this source, so we used the CIS national databases. For the Baltic countries, the Baltic International Centre for Economic Policy Studies provided additional data for Estonia (1991 and 1995); for Latvia (1994 and 1995); and for Lithuania (1991, 1993, 1994 and 1995.)

Private Sector Share in GDP. Data were taken from EBRD (1999, 2002).

Stock Market Capitalization as a Proportion of GDP. Data were taken from EBRD (2002) and the *Emerging Stock Market Facts Book*. Since in many transition countries the stock market did not exist in the early 1990s, a zero value was assigned for those years.

Indices of Reform. The EBRD Infrastructure Reform Index was sourced from EBRD (2002).

Privatization Data and Mode. Information on privatization mode was sourced from the EBRD (1995, 2002), which classifies privatization methods into voucher, direct sale, and MEBO, and identifies the first year in which the primary type of privatization was implemented.

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Table 1: Country Privatization Table

	(1)	(2)	(3)	(4)
Country	**Classification of privatization**	**Year of privatization**	**Primary method**	**Secondary method**
Albania	Mixed	1995	MEBO	vouchers
Armenia	Mass	1994	vouchers	direct sales
Azerbaijan	Mass	1997	vouchers	direct sales
Belarus	Mixed	1994	MEBO	vouchers
Bulgaria	Full	1993	direct sales	vouchers
Croatia	Mixed	1992	MEBO	vouchers
Czech Republic	Mass	1992	vouchers	direct sales
Estonia	Full	1993	direct sales	vouchers
FYR Macedonia	Mixed	1993	MEBO	direct sales
Georgia	Mass	1995	vouchers	direct sales
Hungary	Full	1990	direct sales	MEBO
Kazakhstan	Full	1994	direct sales	vouchers
Kyrgyzstan	Mass	1996	vouchers	MEBO
Latvia	Full	1992	direct sales	vouchers
Lithuania	Mass	1991	vouchers	direct sales
Moldova	Mass	1995	vouchers	direct sales
Poland	Full	1990	direct sales	MEBO
Romania	Mixed	1992	MEBO	direct sales
Russia	Mass	1993	vouchers	direct sales
Slovakia	Full	1995	direct sales	vouchers
Slovenia	Mixed	1998	MEBO	vouchers
Ukraine	Mass	1995	vouchers	MEBO
Uzbekistan	Mixed	1995	MEBO	direct sales

Table 2: Growth Equations, 1991-2001, Interacting Private Sector Share and Mass Privatisation with Stock Market Capitalization

	(1)		(2)		(3)		(4)	
Variable	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
INV	0.082	0.022***	0.077	0.020***	0.082	0.022***	0.076	0.020***
EMP	0.152	0.073**	0.151	0.074**	0.151	0.073**	0.149	0.074**
IHC	0.066	0.026**	0.059	0.025**	0.066	0.026**	0.059	0.025**
GIS	0.004	0.006	0.004	0.006	0.004	0.006	0.004	0.006
$PRIV$	0.078	0.082	0.105	0.085	0.080	0.083	0.110	0.087
$STOCKM$	-0.042	0.054	1.230	0.424***	-0.032	0.066	1.262	0.420***
$PRIV * STOCKM$	-	-	-0.017	0.006***	-	-	-0.018	0.006***
$MASS * STOCKM$	-	-	-	-	-0.021	0.114	-0.043	0.112
$MASS$	6.588	3.272**	6.401	3.387*	6.649	3.456*	6.522	3.537*
$FULL$	-0.127	1.961	-0.313	1.948	-0.159	1.943	-0.380	1.950
$MIXED$	2.502	1.696	1.894	1.768	2.485	1.672	1.854	1.772
Constant	-2.631	2.785	-2.629	2.808	-2.645	2.780	-2.659	2.803
Time Dum	Yes***		Yes***		Yes***		Yes***	
Group Dum	Yes***		Yes***		Yes***		Yes***	
Σ	5.824		5.751		5.838		5.764	
R^2	0.629		0.640		0.629		0.640	
$T \times N$	244		244		244		244	
N	23		23		23		23	
k	43		44		44		45	
W(joint)	$\chi^2(9)[0.00]$		$\chi^2(10)[0.00]$		$\chi^2(10)[0.00]$		$\chi^2(11)[0.00]$	
W(dummy)	$\chi^2(34)[0.00]$		$\chi^2(34)[0.00]$		$\chi^2(34)[0.00]$		$\chi^2(34)[0.00]$	
W(time)	$\chi^2(11)[0.00]$		$\chi^2(11)[0.00]$		$\chi^2(11)[0.00]$		$\chi^2(11)[0.00]$	
$AR(1)$	$N(0,1)[0.31]$		$N(0,1)[0.33]$		$N(0,1)[0.31]$		$N(0,1)[0.33]$	
$AR(2)$	$N(0,1)[0.68]$		$N(0,1)[0.81]$		$N(0,1)[0.68]$		$N(0,1)[0.83]$	

Notes: (a) Significance levels: ***: 1% or less; **: less than 5%; *: less than 10%; **(b)** Time Dum and Group Dum=time and group dummies, respectively; Σ= equation standard error, R^2= determination coefficient; total $T \times N$=number of observations, N=number of countries and k=number of parameters; **(c)** W(joint) = Wald tests the significance on all regressors except the dummies;W(dummy) = Wald tests the significance of all dummies; and W(time) = Wald tests the significance of the time dummies and the constant. All these statistics are asymptotically distributed as $\chi^2_{(n)}$under the null of no relationship, where n represents the degree of freedom; **(d)** $AR(1)$ and $AR(2)$ statistics test for the first- and second-order serial correlation respectively in the residuals. The statistics are asymptotically distributed as standard normal under the null of no serial correlation.

Table 3: Growth Equations, 1991-2001, OLS Dynamic Models, Interacting Private Sector Share and Mass Privatization with Stock Market Capitalization

	(1)		(2)		(3)		(4)	
Variable	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E
$GDP(-1)$	0.207	0.089**	0.191	0.088**	0.207	0.089**	0.192	0.089**
INV	0.075	0.022***	0.070	0.020***	0.075	0.022***	0.070	0.020***
EMP	0.113	0.073	0.116	0.074	0.115	0.072	0.117	0.073
IHC	0.059	0.024**	0.054	0.023**	0.059	0.024**	0.054	0.023**
GIS	0.003	0.006	0.003	0.006	0.003	0.006	0.003	0.005
$PRIV$	0.053	0.082	0.075	0.084	0.050	0.082	0.074	0.085
$STOCKM$	-0.014	0.042	1.002	0.347***	-0.029	0.054	0.989	0.358***
$PRIV * STOCKM$	-	-	-0.014	0.005***	-	-	-0.014	0.005***
$MASS * STOCKM$	-	-	-	-	0.035	0.099	0.017	0.101
$MASS$	7.792	2.691***	7.626	2.812***	7.708	2.839***	7.585	2.937**
$FULL$	0.119	1.698	-0.046	1.599	0.184	1.658	-0.013	1.581
$MIXED$	2.313	1.705	1.775	1.763	2.346	1.661	1.794	1.738
Constant	-6.209	3.285*	-6.280	3.342*	-6.152	3.295*	-6.251	3.350*
Time Dum	Yes***		Yes***		Yes***		Yes***	
Group Dum	Yes ***		Yes***		Yes***		Yes***	
Σ	5.564		5.519		5.577		5.433	
R^2	0.674		0.681		0.674		0.681	
$T \times N$	233		233		233		233	
N	43		44		44		45	
k	23		23		23		23	
W(joint)	$\chi^2(10)[0.00]$		$\chi^2(11)[0.00]$		$\chi^2(12)[0.00]$		$\chi^2(12)[0.00]$	
W(dummy)	$\chi^2(33)[0.00]$		$\chi^2(13)[0.00]$		$\chi^2(33)[0.00]$		$\chi^2(33)[0.00]$	
W(time)	$\chi^2(10)[0.00]$		$\chi^2(10)[0.00]$		$\chi^2(10)[0.00]$		$\chi^2(10)[0.00]$	
$AR(1)$	$N(0,1)[0.11]$		$N(0,1)[0.13]$		$N(0,1)[0.11]$		$N(0,1)[0.13]$	
$AR(2)$	$N(0,1)[0.68]$		$N(0,1)[0.75]$		$N(0,1)[0.67]$		$N(0,1)[0.75]$	

Notes: For explanation see notes to Table 2.

Table 4: Growth Equation, 1991-2001,GMM Dynamic Models, Interacting Private Sector Share and Mass Privatization with Stock Market Capitalization

	(1)		(2)		(3)		(4)	
Variable	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.	Coef.	S.E.
$GDP(-1)$	-0.328	0.103***	-0.336	-6.855	-0.336	0.102***	-0.352	0.105***
INV	0.062	0.019***	0.059	0.019***	0.0627	0.019***	0.059	0.019***
EMP	0.186	0.082**	0.184	0.087**	0.192	0.083**	0.194	0.088**
IHC	0.027	0.017	0.023	0.018	0.028	0.018	0.025	0.020
GIS	-0.007	0.007	-0.009	0.008	-0.009	0.007	-0.012	0.000
$PRIV$	0.117	0.187	0.098	0.188	0.102	0.194	0.067	0.201
$STOCKM$	-0.060	0.093	3.425	1.744*	-0.255	0.227	3.791	1.955*
$PRIV * STOCKM$	-	-	-0.050	0.025**	-	-	-0.061	0.031**
$MASS * STOCKM$	-	-	-	-	0.284	0.227	0.518	0.448
$MASS$	8.539	2.880***	7.089	2.567***	8.375	2.962***	6.490	2.619**
$FULL$	-0.587	5.168	-1.926	5.253	-0.692	5.204	-2.397	5.148
$MIXED$	2.426	4.314	1.639	4.564	2.005	4.370	0.709	4.657
Constant	-6.095	3.910	-6.855	3.841*	-5.971	3.937	-6.787	3.820*
Time Dum	Yes***		Yes***		Yes***		Yes***	
Group Dum	Yes***		Yes***		Yes***		Yes***	
Σ	6.830		7.066		6.905		7.449	
R^2	-		-		-		-	
$T \times N$	220		220		220		220	
N	23		23		23		23	
k	43		44		44		45	
W(joint)	$\chi^2(10)[0.00]$		$\chi^2(11)[0.00]$		$\chi^2(12)[0.00]$		$\chi^2(12)[0.00]$	
W(dummy)	$\chi^2(33)[0.00]$		$\chi^2(13)[0.00]$		$\chi^2(33)[0.00]$		$\chi^2(33)[0.00]$	
W(time)	$\chi^2(10)[0.00]$		$\chi^2(10)[0.00]$		$\chi^2(10)[0.00]$		$\chi^2(10)[0.00]$	
Sargan test	$\chi^2(95)[0.11]$		$\chi^2(94)[0.32]$		$\chi^2(94)[0.14]$		$\chi^2(93)[0.63]$	
$AR(1)$	$N(0,1)[0.86]$		$N(0,1)[0.74]$		$N(0,1)[0.80]$		$N(0,1)[0.52]$	
$AR(2)$	$N(0,1)[0.99]$		$N(0,1)[0.76]$		$N(0,1)[0.96]$		$N(0,1)[0.79]$	

Notes: For explanation see notes to Table 2. In addition: **(a)** GMM model instrumenting GDP, INV, EMP, IHC and GIS. **(b)** Transformation used: first differences. **(c)** Level instruments: dummies, GMM (GDP,1,2), GMM (INV,1,2), GMM (EMP,1,2), GMM (IHC,1,2), GMM (GIS,1,2). **(d)** The Sargan statistic is a test for the over-identifying restrictions (k), asymptotically distributed as $\chi^2(k)$ under the null of instruments validity..

Table 5: Growth Equations, 1991-2001, Including Exchange Rates and Oil Price.

	(1)		(2)	
Variable	Coef.	S.E.	Coef.	S.E.
INV	0.078	0.020***	0.078	0.023***
EMP	0.188	0.087**	0.218	0.092**
IHC	0.050	0.025**	-0.011	0.018
GIS	0.000	0.006	-0.001	0.006
$PRIV$	0.096	0.084	0.125	0.048***
$STOCKM$	1.077	0.412***	1.130	0.434***
$PRIV * STOCKM$	-0.015	0.006***	-0.015	0.006**
Exchange Rate	-0.003	0.002*	-0.005	0.002***
Oil Price	-	-	0.020	0.010*
$MASS$	6.564	3.444*	6.971	3.863*
$FULL$	0.297	2.061	0.550	2.094
$MIXED$	1.959	2.061	2.570	1.862
Constant	-2.065	2.750	-6.792	2.037***
Time Dum	Yes***		No	
Group Dum	Yes***		Yes***	
Σ	5.719		5.796	
R^2	0.647		0.619	
$T \times N$	243		243	
N	23		23	
k	45		35	
W(joint)	$\chi^2(11)[0.00]$		$\chi^2(12)[0.00]$	
W(dummy)	$\chi^2(34)[0.00]$		$\chi^2(23)[0.00]$	
W(time)	$\chi^2(11)[0.00]$		$-$	
$AR(1)$	$N(0,1)[0.41]$		$N(0,1)[0.65]$	
$AR(2)$	N(0,1)[0.94]		$N(0,1)[0.74]$	

Notes: For explanation see notes to Table 2. In addition: in columns (1): model with exchange rates and time dummies; in column (2): model with exchange rates and oil prices (no time dummies).