Privatisation Methods and Economic Growth in Transition Economies

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Summary

We investigate the impact of differences in privatisation method on national economic performance in transition economies. Our approach is to estimate, using dynamic panel data methods, a growth equation over 23 countries for the period 1990-2001. Among our results, we find that mass privatisation has significant positive effect on growth across a wide variety of definitions and specifications. This result holds with particular force after 1995, i.e., once the period of early transition and recession was over. Our analysis suggests that an advantage of mass privatisation was that it led spontaneously to development of the capital market, which is significantly correlated with economic growth.

Keywords: Privatization, Method, Economic Growth, Transition

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NON-TECHNICAL SYMMARY

John Bennett, Saul Estrin, James Maw and Giovanni Urga, 'Privatisation Methods and Economic Growth in Transition Economies.' Summary

This paper investigates the impact of different privatisation methods on national economic performance in transition economies. These can influence growth directly through differentiate effects on enterprise performance, and indirectly via the impact of privatisation revenues on the provision of infrastructure and networks. Our approach is to estimate a growth equation over 23 countries for the period 1990-2001. We find that GDP growth is significantly influenced by investment, employment growth and the growth of labour quality. Several institutional elements specific to the transition process, notably the private sector share and capital market development, are also found to be significant determinants.

While theory would suggest that 'full privatisation' (direct sale)s would generate the maximum direct enhancement of company performance and provide the greatest indirect effect via government revenue that may be spent on infrastructure, we are unable to identify either element in the growth process. There is also evidence in some specifications that 'mixed privatisation' (which includes MEBOs) not only fails to enhance growth, but may act as a hindrance. The most striking result, however, concerns mass privatisation, which is found to have a significant effect on growth across a wide variety of definitions and specifications. The result holds with particular force after 1995, i.e., once the period of early transition and recession was over. Our analysis suggests that, in addition to political factors, economic factors were at work favouring mass privatisation. An advantage of mass privatisation was that, unlike full privatisation, it led spontaneously to some development of the capital market, and this is significantly correlated with economic growth.

1. Introduction

From the outset of the transformation of Central and Eastern Europe and the former Soviet Union from socialism to capitalism, privatisation was identified as a central component of reform (Berg and Sachs, 1990; Estrin, 1994). It was intended to address the fundamental issues of enterprise inefficiency and lack of market orientation and innovation that characterised socialism (Ellman, 1989). However, transition economies suffered from a paucity of domestic savings and an underdeveloped institutional framework, particularly with respect to capital markets. It was therefore realised, soon after the arrival in power of reform governments from 1989 onward, that conventional methods of privatisation - by tender and through public offerings - would not always be appropriate (Blanchard *et al.*, 1991). Considerable effort was put into developing new methods, including widespread use of manager-employee buyouts (MEBOs) and mass privatisation – the 'sale' of firms at zero or nominal price, through the issue to the general population of vouchers or privatisation certificates.[3] In this paper we examine the impact that the alternative privatisation methods used in the transition have had on national economic performance.

An extensive literature exists that addresses how different privatisation methods may have influenced the structure of private ownership post-privatisation: whether it was outsider- or insider-dominated, and whether it was concentrated or dispersed (Nellis, 2000). Privatisation using traditional methods of sale to the highest bidder is found typically to have led to outsider ownership, in the cases of Hungary and Estonia with a high proportion of foreign participation. Privatisation through leased buyout or

[3] Mass privatisation schemes originated in the early 1990s in Czechoslovakia and Poland, were used in Russia in 1994, and were later imitated in various countries.

MEBO has led to insider ownership, often dominated by managers and sometimes with a large retained state ownership share (e.g., Romania and Slovenia). The consequences of mass privatisation for ownership have been more complex. In Russia and Ukraine, the way that the process operated led to widespread insider ownership (Estrin and Wright, 1999), while in the Czech Republic and Poland, mass privatisation was constructed to ensure primarily outsider ownership (Coffee, 1996).

The huge literature on the impact of privatisation on firm performance in transition economies,[4] which is summarised in Djankov and Murrell (2002), confirms that in the leading transition countries, privatisation resulted in the predicted improvements in financial performance and productivity (see also Megginson and Netter, 2001; EBRD, 2002). Outsider ownership has generally enhanced performance more than insider ownership has, but the institutional environment has also been relevant. Privatisation is typically found to have had a smaller impact on firm performance in Russia than in Central Europe, and Djankov and Murrell follow the literature in relating this to widespread insider ownership and underdeveloped capital markets (see also Nellis, 2002; Stiglitz, 2002).

Each of the studies noted above looked at firms in one or several countries. Our focus, however, is on the dispersion in national economic performance across (almost) all the economies in transition. This dispersion is relatively wide, even though most transition economies followed a similar cocktail of policies (the 'Washington consensus'): privatisation, liberalisation and stabilisation. The early league tables of the EBRD, for example, drew sharp distinctions in terms of qualitative indicators of 'progress in transition' between the successful economies of Central Europe, the more

[4] E.g., Earle and Estrin, 1997; Jones *et al.*, 1998; Claessens and Djankov, 1999; and Frydman *et al.*, 1999.

patchy performances in the Baltics and Balkans, and the generally dismal record of the rest of the former Soviet Union (EBRD, 1994). The variance in growth and inflation rates was established empirically by Gomulka (1995) and Aslund, Boone and Johnson (1996), while Blanchard and Kremer (1997) explained the dispersion in performance on the basis of 'disorganisation.' More recently, attempts have also been made to explain the dispersion by political factors (Aslund, 1999), policy errors (Stiglitz, 1999) and capital market differences (Berglof and Bolton, 2002).

Despite the central role attributed to privatisation in the transition literature - according to some, privatisation 'is' transition (see the discussion by Brada, 1996) - it has rarely been analysed as a source of the inter-country dispersion in national economic performance. Indeed, it has frequently been asserted that differences in privatisation methods have had little effect on aggregate performance (see Djankov and Murrell, 2002). The literature dealing with the macroeconomic aspects of privatisation at the theoretical or empirical level is sparse, an exception being Hansen (1997), who examines technology choices under different privatisation schemes and considers how these may bring about multiple equilibria at the macro level. Also, Schipke (2001) sketches some general macroeconomic themes related to privatisation, but does not develop a theoretical model or undertake econometric analysis, while Bennett, Estrin and Maw (2002) examine a government's optimal privatisation policy, taking into account the general equilibrium interactions between firms, but do not consider empirics.

Our analysis covers a variety of ways in which the method of privatisation may influence economic growth. The first is as a form of neutral technical progress, deriving primarily from the hypothesised improvement in efficiency at the firm level.

Different methods of privatisation may lead to different dominant ownership structures, with differentiated impacts on firm performance. Second, privatisation may result in network externalities. We therefore examine how the method of privatisation may have interacted with the share of the private sector in total output to produce economic growth. Third, privatisation may generate development of the capital market, and so we examine the interaction between privatisation method and capital market development as a further potential source of economic growth. Fourth, we allow for the fact that different privatisation methods also generate different amounts of revenue for the government, thereby impacting on its ability to spend on infrastructure, and so, potentially, to generate economic growth (Aghion and Schankerman, 1999).[5]

To identify the direct and indirect impacts of privatisation methods on national economic performance, we estimate an aggregate growth model for the 23 economies in transition for which consistent and reasonably reliable data are available from 1990 to 2001.[6] In addition to factor inputs, we control for the share of the private sector and capital market development, and other potential determinants of growth. Our regressions provide a robust description of the growth process, but, contrary to expectations from the microeconomics literature, we find that it is mass privatisation, rather than the other privatisation methods, that enhances growth under a wide variety of assumptions. Private sector shares and capital market development also interact to

[5] Around the world, raising revenues to support government expenditure has been a significant motivation for privatisation (Schipke, 2001) – 'selling the family silver.' This motivation has been particularly strong in the cash-strapped government offices of transition economies (Barr, 1993; World Bank, 1996).

[6] Our data set covers all the transition countries listed by EBRD (2002) except for Turkmenistan, Tajikistan and Yugoslavia; i.e., it covers Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Czech Republic, Estonia, FYR Macedonia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, Ukraine and Uzbekistan.

improve national economic performance. However, we fail to identify an impact of government capital expenditure on growth.

In Section 2 we outline briefly our conceptual framework, and in Section 3 we discuss the specification of the estimating equations and the data used. The results are reported in Section 4, while in Section 5, which concludes, we interpret our findings. The large variety of data sources that we use is reported in the Appendix.

2. Theoretical Framework

In this section we first define our classification of privatisation methods and then specify equations for real aggregate demand and supply, in each of which the method of privatisation is an argument. Combining these equations, we obtain an expression in which real GDP depends on the method of privatisation and a variety of other factors. In first-difference form, this expression will be the basis for our empirical work.

We distinguish three alternative privatisation methods.[7] The first is *full privatisation*, where the dominant form of privatisation in an economy is the sale of firms for a positive price. The second is *mass privatisation*, where the dominant form of privatisation is that firms are sold at a zero (or nominal) price. The third category is *mixed privatisation*, which covers all cases that are not adequately represented by either of the first two categories, and includes MEBOs and leased buyouts. Of the three methods, full privatisation typically yields the most revenue, at least in the short term, while mass privatisation yields the least. A dummy variable representing the three methods of privatisation is an argument in the growth equation that we estimate.

[7] For other schemes of classification see Estrin (1994) and Roland (2000).

In the empirical literature on growth it is common to employ a Cobb-Douglas production function and assume that each economy is close to its steady-state growth path (e.g., Barro, 1991). This simplifies analysis considerably. Yet, by definition, transition economies are significantly out of steady state. It may take many more years than the decade or so that transition has been underway for the assumption of steady-state growth to be an adequate approximation for empirical analysis. We therefore use a general formulation of the determinants of real GDP, and thus economic growth, with minimal restrictions on functional form, but in which a wide range of independent variables is specified.

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

$$(1) \qquad y^d = Y^d(\overset{-}{p}, M, \overset{+}{L}).$$

In addition to depending negatively on the real price level p, y^d is assumed to depend on the method of privatisation M and employment L. If there is mass privatisation, the recipients of shares may feel richer, and this real wealth effect may raise their demand for goods.[8] Given imperfect capital markets, the expenditure involved with the other methods of privatisation may leave the buyers of firms short of liquidity, which will have a negative effect on demand, at least in the short term. However, this effect may be rather small for full privatisation because the number of buyers is relatively small. The employment term L appears in equation (1) because it is assumed that firms employ surplus labour. We therefore expect employment to

affect real aggregate demand positively, but to be of little consequence for real aggregate supply.

We assume that real aggregate supply depends positively on the real price level and is related to a variety of other factors:

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

Here, P is the share of the private sector in national income; S is a measure of capital market development; K is the private sector capital stock; A is the human capital stock and G is the public sector infrastructure capital stock. We assume without comment that K and A affect y^s positively, and focus our discussion on the other variables.

Consider first the role of M. It may be expected that full privatisation, being associated with relatively concentrated ownership, will lead to the most effective corporate governance of our three types of privatisation. However, MEBOs and leased buyouts, which we include in our mixed privatisation category, may lead to managerial and worker entrenchment, and therefore be least effective with respect to corporate governance. Assuming that more effective corporate governance raises real aggregate supply, this suggests that direct sale has the strongest, and mixed privatisation the weakest, effect on y^s [9].

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

[9] The method of privatisation may also affect incentives within the firm and the amount of investment in restructuring it undertakes. However, apart from the relatively uncommon case of the sale of a firm to a foreign investor, the literature finds that such microeconomic differences are relatively small initially (see Carlin, Van Reenan and Wolfe, 1995; Djankov and Murrell, 2002).

Private sector output has two sources - privatised firms and *de novo* firms. An increase in the output of either, as a proportion of national income, may raise y^s. We noted above the well-documented positive effect of privatisation on productivity at the microeconomic level. The sources of this gain 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 (Kornai, 1992; Vickers and Yarrow, 1998; Roland and Sekkat, 2001). The major contribution made by small and medium-sized *de novo* firms stems from their ability to fill the gaps left under communism by biases towards high capital intensity and against the provision of services (EBRD, 1999). Also, private sector development may generate network externalities, with repeated market transactions creating a climate of trust, raising business confidence (Roland and Verdier, 1994; Sacco and Scarpa, 2000).

The development of capital markets, as represented by S, is in principle associated with more widespread and cheaper finance, reducing the need for firms to rely on internally-generated funds for investment, thereby raising y^s. There is now a large body of empirical evidence supporting this view (see, e.g., Demirguc-Kunt and Maksimovic, 1998). Moreover, the larger proportion of output that comes from the private sector, the greater is the scope for taking advantage of capital market development. Thus, we expect that:

(3) $\partial^2 y^s / \partial P \partial S > 0.$

The public sector infrastructure capital stock, G, includes physical infrastructure, such as roads and telecommunications, and institutional infrastructure, such as the framework for the enforcement of laws to protect property rights. Outside the

transition context, it is recognised in the literature on economic growth that there is a trade-off between government expenditure, if it is productive, and the raising of distortionary taxes to finance the government expenditure (Barro, 1990; Barro and Sala i Martin, 1995). Thus, 'productive' government expenditure raises (lowers) the growth rate if it is at less (more) than the optimal level. The empirical literature provides mixed results (see, e.g., Kneller, Bleaney and Gemmell, 1999). In transitional economies, privatisation programmes are a non-distortionary source of revenue, so 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, in particular, by highly distortionary taxation. Also, the transition economies' past performance in infrastructure investment - from the communist era - exhibited extreme inefficiency (see World Bank, 1996). Hence, we may expect at best a weak positive relationship between public sector investment and real aggregate supply.

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

(4) $\quad p = r(M, L, P, S, K, A, G)$.

Substituting (4) into (2) and writing $y = y^s$, we obtain

(5) $\quad y = Y^s\left[r(M, L, P, S, K, A, G), M, P, S, K, A, G\right] \equiv Y(M, L, P, S, K, A, G)$,

which is increasing in (L, P, S, K, A), and may be increasing in G. Putting together our comments concerning the effect on Y^d and Y^s of each privatisation method suggests that, compared to the other methods of privatisation, the direct effect of

mixed privatisation will be a low level of y, but the ranking of the other two methods in this respect is unclear.

3. Specification and Data

In this section we first outline how our model is developed for the purposes of estimation and discuss our estimation methods. We then discuss the data used in the regressions, and present summary statistics and definitions. Details of the various sources for our data are given in the Appendix.

Equation (5) is the basis for our empirical work. Our approach is to estimate a cross-country growth model along the lines of e.g. Barro (1991), Mankiw, Romer and Weil (1992) and Levine and Zervos (1993). However, we supplement the standard model relating GDP growth to factor inputs with indicators of private sector development, privatisation method, capital market development and government capital expenditure. Similar methodology has been applied to privatisation in developing countries (Barnett, 2000; Cook and Uchida, 2002) and capital market development (Edison *et al*., 2002; Bekaert and Harvey, 2000, Bekaert, Harvey and Lundblad, 2000, Henry, 2000, Reyes and Urga 2002).

We therefore estimate a model of the form:

$$(6)\quad dGDP_{it} = a_1 + a_2 dINV_{it} + a_3 dEMP_{it} + a_4 dIHC_{it} + a_5 STOCKMC_{it} + a_6 PRIV_{it} + a_7 GIS + a_8 FULL_{it} + a_9 MASS_{it} + a_{10} MIXED_{it} + E_{it}$$

where d is the difference operator, t denotes time and *i* country, GDP represents the log of gross domestic product (y), EMP is the log of employment (L), INV is the log change in the capital stock (gross fixed capital formation, K), HP (log of investment

in human capital, A) is our indicator of labour quality (gross enrolment in tertiary education) and STOCKMC is the measure of stock market development (stock market capitalisation as a percentage of GDP, S). The three methods of privatisation (M) are Full, Mass and Mixed, and government expenditure on infrastructure (G) is measured by the share of investment in total government expenditure (GIS). The estimation period is the twelve years 1990 – 2001 and we use data from all the transition countries listed by EBRD (2002) except for Turkmenistan, Tajikistan and Yugoslavia, for which data were not available in most years.

We use panel data analysis (within-groups estimators) to exploit both time-series and cross-section variation in data, and in particular in the relationship between growth and privatisation method. We also compare the performance of model (6) with its dynamic counterpart. As indicated in equation (6), we have estimated equation (5) in first-difference form, thus taking out country-specific fixed effects. We test for time-specific as well as country-specific fixed effects in each regression.

The average values for the economic variables used in the estimations – the growth of GDP capital stock, employment, IHC and government capital expenditure as a share of GDP – are reported in Table 1. Over the entire period, the unweighted mean of GDP growth was negative, at -1.5%, with negative average growth concentrated in the countries of the former Soviet Union. GDP growth was highest on average in Estonia, closely followed by Poland, and lowest in Moldova. Though investment declined on average by more than GDP in the majority of countries, the variance was high and it grew quite rapidly in a few countries like Georgia, though from a very low base. Employment also declined on average over the region, by slightly more than the decline in GDP, though with less variance. Employment actually grew on average in

only one country – the Kyrgyz Republic – and fell quite steeply on average in Bulgaria and Macedonia. This gradual decline over a long period in employment in almost every country, and the implied decline in GDP per capita in most, confirms that there must have been significant over-employment everywhere at the start of transition, and that this may not have been fully eradicated even by the end of our sample period. This suggests that economies may not be operating on the technical frontier of their aggregate production function, so that the estimated coefficients on employment might be lower than would predict in market economics. The index of human capital (IHC) shows a modest increase on average in most countries, with the unweighted mean rising by 4.7%, and a slightly smaller standard deviation. Human capital improvements were particularly marked in Hungary and Poland and in two countries of the former Soviet Union – the Kyrgyz Republic and Latvia. The proportion of the population enrolled in tertiary education actually declined on average in two countries, Armenia and Uzbekistan. Finally, we see that the share of government capital expenditure in GDP tended to rise on average over the period. This masks considerable variation across countries. In 10 countries, the share fell, most markedly in Moldova, but it also increased sharply in some countries, most notably Bulgaria and Croatia.

Our study is focused on the impact of different privatisation methods on growth. We employ three dummy variables to explore this relationship: full privatisation, mixed privatisation and mass privatisation.[10] These dummies have both a cross-section and

[10] There are various that we might identify the dominant method of privatisation chosen in each country. We have explored the effects of using three different approaches. The first was based on searches through the government websites to read the official reports in each country of privatisation method. The second was to draw on external documentary sources, e.g., Earle, Frydman, Rapacyzynski, Turkewitz (1994), Bohm (1995) and World Bank (1996). The third was to use the EBRD's classification of country. Of the 23 countries considered, 5 shifted category when the approach was changed. For this paper, we decided to report the regressions using the third approach because it derives from a single source and does not rely on the subjective judgements of our research

time-series dimension. We specify the chosen method of privatisation in each country as belonging to one these three categories, and then identify the date in which this privatisation method was introduced. This allows us to create three dummy variables, one for each method of privatisation. In each case the dummy variable equals zero in the years before the relevant method of privatisation was introduced and unity thereafter.

The classification of privatisation method by year and country is presented in Table 2. The two columns on the right report the EBRD's classification of primary and secondary privatisation methods. We have transformed this into our categories as follows. When the EBRD primary method is voucher, we classify privatisation as 'mass.' When it is direct sales, we classify privatisation as 'full.' In all other cases we classify privatisation as 'mixed.' In Table 3, we report the main time line of privatisation activities (the 'privatisation chronicle') for each of our sample countries. In the right-hand column, we report the primary privatisation method. The year in which the main privatisation method and activity concur is represented in bold, and is reported as the 'year of privatisation' in Table 2.

Finally, we include in equation (6) both the private sector share in GDP, to control for the impact of private sector development including *de novo* growth on GDP, and stock market capitalisation, as a share of GDP, to indicate the level of development of the capital market. Other studies (see Bekaert and Harvey, 2000, Bekaert, Harvey and Lundblad, 2000, Henry, 2000, Reyes and Urga, 2002) have stressed the role of capital market development on economic growth, especially in the transition context (see

team. However, all the equations were estimated using all three definitions, and none of the results were significantly affected if either of the other two approaches was used instead. This considerably increases our confidence in the robustness of our findings. The regressions are available from the authors on request.

Berglof and Bolton, 2002; EBRD, 1996). We predict both to have a positive effect on national economic development. However, since the effectiveness of private ownership in improving managerial performance depends to a considerable extent on the depth, liquidity and efficiency of the capital market, we also interact the two measures in some of empirical analysis.

4. Results

We first estimate equation (6) across the whole data set for our basic results. We then address issues of dynamics and endogeneity using GMM methods. Finally, we undertake a number of tests for sensitivity of the results. In Table 4 we report the basic equation with interaction effects. The equations fit well with the adjusted R^2 in excess of 0.6 and a joint Wald test of 130. The country- and time-dummy Wald tests confirm the relevance of fixed effects in the equation, and indicate that autocorrelation is not present. The country-fixed effects are a particularly important element in the explanation ($c^2 = 2703$).

Despite the very strong impact of country- and time-specific factors in the transition growth process, the equation provides a sensible and conventional explanation of national economic performance in terms of factor inputs, including labour quality. The coefficient on investment is highly significant ad values are estimated to be within the normal range. The coefficient on employment is also significant, but, as expected, the considerable labour hoarding and excess employment of the socialist era results in estimated coefficients that are lower than would typically pertain in Western economies. There is a modest but significant impact of labour quality on GDP and a significant impact from the development of the stock market on GDP growth. The negative coefficient on the interactive term suggests that the growth-enhancing effects

of capital sector development tail off as the economy approaches a more conventional Western ownership and capital market structure.

The most striking results in Table 4 concern the dummy variables for method of privatisation. Full privatisation is not found to have any independent influence on growth. This suggests that neither the direct impact, nor the indirect macro-economic externality through increased infrastructure expenditure, is operating in the transition economies in this period. The latter inference is strengthened when we take into account that the coefficient on the share of the government capital expenditure growth is not significant. In fact, correlation coefficients confirm that there is almost no relationship between full privatisation and government capital expenditure ($r<0.05$). This suggests that transition governments did not choose to spend incremental revenues from privatisation on capital goods. The lack of significance of government capital expenditure in the growth process suggests that the reform governments in the region have been unable to solve the problems of capital allocation that had bedevilled their socialist predecessors (see Barr, 1990; Ellman 1989). This may have been because of low administrative competence in the state sector (see EBRD, 2000).

However, Table 4 reveals that mass privatisation has a positive and significant independent effect on the growth process. A clue to the interpretation can be gleaned from the modest correlation between mass privatisation and the private sector share (the correlation coefficient is around 0.3). The private sector share is not correlated with either of the other two privatisation methods (the correlation coefficient is less than 0.1). This suggests that mass privatisation schemes played an important role in kick starting or encouraging the broader growth of the private sector, thereby

enhancing the growth process. Mixed privatisation, like full privatisation, is found not to have independent effects on economic development.

Before we can have confidence in these results, we must address issues of dynamics and endogeneity. We therefore estimate a dynamic version of the model with a lagged dependent variable. The presence of the lagged dependent variable induces *per se* correlation between this regressor and the error term. Thus, we used the generalised-method-of-moments (GMM) estimation developed for dynamic panel data by Arellano and Bond (1991), addressing potential problems of endogeneity of the explanatory variables by instrumenting on lagged values. GMM also allows us to address the correlation between the error term and the lagged endogenous variable (see Edison *et al*., 2002). The results, which are presented in Table 5, are not greatly different from those reported in Table 4. The lagged dependent variable is significant in OLS but not in GMM. Despite its presence, and instrumentation of all the economic variables (investment, employment, labour quality and government expenditure), the pattern of the results is more or less unchanged, though there is some evidence for endogeneity of employment. The dynamic specification and the control for potential endogeneity bring out even more sharply the results with respect to private sector share, capital market development and method of privatisation. In particular, we find that the positive impact of mass privatisation on growth is significant at the 99% level in both columns (1) and (2) of Table 5, and mixed privatisation is also significant in column (2). However, neither full privatisation nor government expenditure is statistically significant in either formulation.

A second important line of enquiry is to undertake sensitivity tests as a check for robustness. In Table 6, we explore the time patterns of the growth process, re-

estimating the basic equation of Table 4 with and without interactions between the private sector share and stock market development on each of the two sub-periods 1990-1995 and 1996-2001. The validity of the selected period is supported by the $c^2(10) = 109.129$, though the explanation has less economic content with so many fewer degrees of freedom. The equation for the early period fits rather less well than for the later, and the explanation of the growth process relies rather more on the country- and time-fixed effects. Given the recession in most countries in this sub-period, it is unsurprising that the coefficient on employment growth is not statistically significant, suggesting that economies were operating within the aggregate technology frontier with respect to employment. The equations suggest, however, that growth was influenced by investment and by the quality of the labour force, even in the 1990-1995 period, though not by government investment. The results on privatisation method, stock market development and private sector share are disappointing but perhaps not surprising. None of the coefficients are significant, probably reflecting the fact that most values were zero in most countries in those early years.

The contrast with the two equations for the second sub-period is striking. The fit is comparable to that for the whole period, though the time fixed effects are not significant and are excluded. The main economic variables are significant despite the loss of degrees of freedom, and the private sector share and stock market development are significant, with or without interactions. The coefficient on the mass privatisation method dummy is statistically significant at the 99% level, but full privatisation is still not found to have any significant effect on economic growth. Mixed privatisation has a negative effect, and this is actually significant in the interactive specification. These regressions have to be treated with caution however, because of the sample size, but they suggest that capital market development, private sector growth and privatisation

only began to influence the growth process in transition economies in the second half of the 1990s.

A second check for robustness concerns whether the privatisation method dummies proxy for other unidentified variables of significance in the transition growth process. The framework of equation (5) suggests that we should examine carefully the role of capital market development and government investment in infrastructure in our sensitivity analysis. We therefore estimated equations in which alternative measures of both capital market development and government capital expenditure were used. For the former, we replace stock market capitalisation by the EBRD (1996, 2002) indices for Banking Reform and Non-Banking Reform.[11] For the latter, we replaced government capital expenditure by the EBRD (1996, 2002) index of Infrastructure Reform.

The results are reported in Table 7. It can be seen that the change has little effect on the underlying structure of the estimated equations. The fit remains similar, as does the central role in the explanation of country- and time-fixed effects. The coefficients and standard errors on the factor inputs, including labour quality, are also not affected greatly by either change. In column (1) we report the equation that uses EBRD indices on capital market development. These prove not to be significant.[12] The coefficient on mass privatisation method is robust to the change in specification. In column (2), we report the equation using the EBRD Infrastructure Index. As in Table 4, the coefficient on the variable proxying for government provision of infrastructure and capital goods is not significant. This strengthens the interpretation that the quality of public sector decision-making and management in transition economies may have

[11] For the two years prior to the start of the EBRD series, we applied the values for 1992.

been poor in this period. However, the coefficient remains insignificant, and is not correlated with full privatisation (or either of the other privatisation-method dummies). Once again, the result on mass privatisation is found to be robust to this change of specification.

We undertook several other experiments. First, we divided the data set into the CIS and non-CIS countries, a division that was found to be statistically significant ($c^2(10) = 59.01$). The results of this regression are reported in Table 8, and the same broad pattern of results as in Table 4 hold with respect to many of the long-run supply factors and institutional development. Moreover, full and mixed privatisation were not significant. However, mass privatisation was found to have a significant strong positive effect in the CIS countries, but a weak negative one in the non- CIS countries. Though the result is suggestive, and consistent with the interpretation of Djankov and Murrell (2002), we do not attach great significance to it because the degrees of freedom are relatively small (71 and 109) and in these equations, some of key economic variables – employment and labour quality – are not significant. Since the status of Belarus has also been questioned as a transition economy – for example the level of privatisation is very low – we also re-estimated the equations with Belaus excluded. The results are reported in Table 9 and are virtually the same as in Table 4.

Finally, to address the question of the impact of demand-side variables in the growth process, we re-estimated the basic equation of Table 4 to include both the exchange rate (annual average in US dollars) and oil price[13]. The former has clearly played an important role in growth process of many transition process of many transition

[12] When the period is divided into two sub-periods, the non-banking sector index along with the private sector share index became statistically significant at the 95% level. These equations are not reported.
[13] It is worth noticing that in our previous estimated equations those effects were captured, though indistinguishable, by the time dummies.

economies (see World Bank, (1996) and the latter is likely to be a significant factor in the growth performance of several CIS countries. The results are reported in Table 10, and confirm that higher dollar exchange rates have acted significantly to reduce growth rates while higher oil prices have increased them. However, these variables seem more or less orthogonal to the other determinants of growth, and their inclusion does not affect our conclusions on the impact of different privatisation methods. Each was weakly significant but did not greatly affect the other coefficients or standard errors.

5. Conclusions

This paper has investigated the impact of differences in privatisation method on national economic performance in transition economies. Our approach has been to estimate, using panel data methods, a growth equation over 23 countries for the period 1990-2001. We find that growth is driven primarily by country- and time-specific factors, but is also significantly influenced by investment, employment growth and the growth of labour quality. Several institutional elements specific to the transition process, notably the private sector share and capital market development, are also found to be significant determinants of economic development in our sample.

Our findings concerning privatisation methods may at first be found surprising. While theory would suggest that full privatisation would generate the maximum direct enhancement of company performance and provide the greatest indirect effect via government revenue that may be spent on infrastructure, we are unable to identify either element in the growth process. Our interpretation is that the direct impact through improved corporate governance is in fact being picked up in our factor inputs, especially investment. Thus, direct sale might be having its main effect through

access to financial resources, enabling firms to invest, rather than via increased technical efficiency.

While full privatisation is found not to have the predicted effects on growth, there is evidence in some specifications that mixed privatisation not only fails to enhance growth, but may act as a hindrance. The most striking result, however, concerns mass privatisation, which is found to have a significant effect on growth across a wide variety of definitions and specifications. The result holds with particular force after 1995, i.e., once the period of early transition and recession was over

A positive effect of mass privatisation on economic growth can be explained by political factors, but our results suggest that economic factors have also been at work.[14] Boycko, Shleifer and Vishny (1995) make the political argument that the free distribution of shares to agents such as managers and workers, who might try to block privatisation, can be an effective way of buying off their opposition. A similar argument can be applied after mass privatisation, when the ownership stakes of managers and workers can be effective in maintaining their support. Our analysis also suggests an economic case for mass privatisation.[15] It is frequently argued that an advantage of full privatisation is that it leads to concentrated ownership and short agency chains, whereas mass privatisation has the converse effects (see, e.g., Coffee, 1996; Stiglitz, 1999). However, in any economy the ability to purchase a firm, or at least a substantial ownership share, is imperfectly correlated with the skills required to

[14] Concerns that have been expressed about the ownership structures (Estrin and Wright, 1999), corporate governance (Coffee, 1996) and supporting institutions (see Stiglitz, 1999) may still be appropriate, but such factors are, on average, insufficient to counteract the benefits of mass privatisation across our 23 transition economies.

[15] Related arguments about mass privatisation as a positive force appeared in the the early literature on transition (see Blanchard *et al*., 1991). These views fell into disrepute because of the many excesses associated with mass privatisation, particularly in Russia (see Nellis, 2000). However, our paper

run the firm efficiently. In an economy with an extremely underdeveloped capital market, 'wrong' owners will tend to persist for longer. An advantage of mass privatisation is that, unlike full privatisation, it leads spontaneously to some development of the capital market, which, as we have seen, is significantly correlated with economic growth. [16] In the Czech Republic, for example, the distribution of shares at nominal cost to the general public led to shares being placed in the hands of privatisation funds, which exerted pressure on managers to be relatively efficient. This argument does not apply to full privatisation to foreign investors, but, as we have already noted, the amount of such privatisation has been relatively small, especially in countries with weak infrastructure, severe asymmetric information problems or political instability (see Bevan and Estrin, 2001).

There is also a macroeconomic case for mass privatisation. It is argued by Roland (2000) that mass privatisation, because it yields no government revenue, may contribute to macroeconomic instability and does not enable the supply of public goods to be expanded. However, an alternative point of view is that when shares are distributed free, there is no need for buyers to access funds such as bank credit. Consequently, inflationary pressure is not generated and the interest rate is not driven up, i.e., the cost of borrowing for real investment is unaffected. [17] Hence, mass privatisation can have beneficial macroeconomic effects. Furthermore, our analysis indicates that the argument with respect to public goods is a weak one: governments do not use revenue effectively. This is a general point. Support for privatisation

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suggests that, if one considers all transition countries together over the period since the start of reform, the more positive initial view of mass privatisation was correct.

[16] This argument is strengthened if the income distribution inherited from the communist era was especially misaligned with the ability to run firms.

[17] This argument is reinforced by the existence of a macroeconomic stock-flow constraint (see Sinn and Sinn, 1991; Bolton and Roland, 1992), whereby the total savings in a country are too small to enable the government to realise through full privatisation an amount of revenue that it is at all commensurate with the value of firms.

programmes is linked to the need to remove political interference and bureaucratic inefficiency as far as possible from firms' operations. But it should also be taken into account that similar political and bureaucratic considerations play a role in the allocation of government expenditure.[18] Thus, although full privatisation is more successful than mass privatisation in terms of the objective of raising more (immediate) government revenue, the extent to which this is translated into faster economic growth may be disappointing.

Our analysis has significant implications for countries, particularly developing economies that have still to undertake large-scale privatisation programmes. In India, capital markets are relatively developed and macroeconomic problems are not as severe as in much of the developing world and so direct sale may be the appropriate form of privatisation. A similar conclusion may apply to China. In Africa, however, wealth is generally concentrated in the form of rent earned from natural resource ownership and primary production. Capital markets are generally underdeveloped and, inflation rates and the real cost of borrowing tend to be high. These are precisely the conditions that favour reliance on mass privatisation.

[18] See World Bank (1997) for an extended discussion of the effectiveness of the state, which is typically found to be particularly low in poor countries.

Table 1:

Average Values of Macroeconomic Series, 1990-2001

Country	GDPg	INV	EMPLg	IHCg	GISg
Albania	1.50	11.74	-1.80	3.11	6.76
Armenia	-1.84	-1.66	-1.37	-1.44	4.76
Azerbaijan	-3.68	7.13	-0.87	1.60	-4.77
Belarus	-0.71	-5.14	-1.65	2.81	1.02
Bulgaria	-2.32	-3.70	-3.69	2.62	16.34
Croatia	-1.07	3.75	-2.11	3.26	10.53
Czech Rep.	0.22	2.49	-1.41	4.52	-1.61
Estonia	2.71	7.22	-2.53	5.14	-2.75
FYR Macedonia	-2.67	-1.45	-3.99	1.30	3.29
Georgia	-1.70	35.34	0.72	3.58	2.67
Hungary	0.78	3.06	-3.10	10.52	-1.63
Kazakhstan	-1.74	-4.42	-1.22	3.59	-2.49
Kyrgyz Rep.	-2.43	-3.96	0.49	10.86	-0.31
Latvia	-1.88	7.56	-2.51	11.79	11.94
Lithuania	-2.43	-4.62	-2.11	6.06	-2.73
Moldova	-9.92	-10.96	-3.62	4.14	-13.23
Poland	2.23	5.24	-1.50	11.45	1.09
Romania	-1.54	-2.81	-1.87	8.80	-0.35
Russia	-3.16	-11.16	-1.40	3.55	-0.10
Slovak Rep.	0.68	1.70	-1.97	4.33	0.03
Slovenia	1.48	5.14	-0.37	8.10	0.45
Ukraine	-5.95	-12.37	-0.50	3.78	-1.51
Uzbekistan	-0.99	-8.35	-1.28	-5.42	7.30
Mean	**-1.50**	**0.86**	**-1.72**	**4.70**	**1.51**
Std. Dvt.	**2.75**	**9.98**	**1.20**	**4.14**	**6.17**

All figures are annual average rate of growth per cent.
In the last two rows mean and average of these rates of growth are provided.

Table 2:
Country Privatisation Table

Country	Classification of Privatisation	Year of Privatisation	Primary Method	Secondary Method
Albania	Mixed	1995	MEBO	vouchers
Armenia	Mass	1994	vouchers	MEBO
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
Slovak Republic	Full	1995	direct sales	vouchers
Slovenia	Mixed	1998	MEBO	vouchers
Ukraine	Mass	1994	vouchers	MEBO
Uzbekistan	Mixed	1996	MEBO	direct sales

Note: Year of privatisation was established based on EBRD information on Primary Method of privatisation and its privatisation chronicle. Date of privatisation is consistent with primary method of privatisation.

Table 3

Country	Year[1]	Privatisation chronicle	Main method of privatisation [2]
Albania	1989		
Albania	1990		
Albania	1991	Small scale privatisation	
Albania	1992		
Albania	1993	Privatisation agency established	
Albania	1994		
Albania	**1995**	Voucher privatisation begins	**MEBO**
Albania	1996		
Albania	1997		
Albania	1998		
Albania	1999		
Albania	2000		
Albania	2001		
Bulgaria	1989		
Bulgaria	1990		
Bulgaria	1991		
Bulgaria	1992	Privatisation law introduced	
Bulgaria	**1993**	Large scale privatisation	**direct sales**
Bulgaria	1994		
Bulgaria	1995		
Bulgaria	1996	Voucher privatisation	
Bulgaria	1997		
Bulgaria	1998		
Bulgaria	1999		
Bulgaria	2000		
Bulgaria	2001		
Czech Republic	1989		
Czech Republic	1990		
Czech Republic	1991	Small scale privatisation and restitution	
Czech Republic	**1992**	Voucher privatisation	**vouchers**
Czech Republic	1993		
Czech Republic	1994	Voucher privatisation (2nd wave)	
Czech Republic	1995		
Czech Republic	1996		
Czech Republic	1997		
Czech Republic	1998		
Czech Republic	1999		
Czech Republic	2000		
Czech Republic	2001		

Slovakia	1989		
Slovakia	1990		
Slovakia	1991	Small scale privatisation	
Slovakia	1992	Voucher privatisation	
Slovakia	1993		
Slovakia	1994		
Slovakia	**1995**	Direct sales	**direct sales**
Slovakia	1996		
Slovakia	1997		
Slovakia	1998		
Slovakia	1999		
Slovakia	2000		
Slovakia	2001		
Hungary	1989		
Hungary	**1990**	Large scale privatisation	**direct sales**
Hungary	1991	Small scale privatisation	
Hungary	1992		
Hungary	1993		
Hungary	1994		
Hungary	1995		
Hungary	1996		
Hungary	1997		
Hungary	1998		
Hungary	1999		
Hungary	2000		
Hungary	2001		
Poland	1989		
Poland	**1990**	Small scale privatisation & privatisation law introduced	**direct sales**
Poland	1991		
Poland	1992		
Poland	1993	Mass privatisation begins	
Poland	1994	National Investment Funds (NIF) established	
Poland	1995	State enterprises allocated to NIFs	
Poland	1996		
Poland	1997	NIFs listed	
Poland	1998		
Poland	1999		
Poland	2000		
Poland	2001		
Romania	1989		
Romania	1990		
Romania	1991	Voucher privatisation	
Romania	**1992**	Small scale privatisation & MEBO	**MEBO**
Romania	1993		

Romania	1994		
Romania	1995	Voucher privatisation (2nd wave) & new privatisation law adopted	
Romania	1996		
Romania	1997	Large scale privatisation	
Romania	1998		
Romania	1999		
Romania	2000		
Romania	2001		
Armenia	1989		
Armenia	1990		
Armenia	1991	Small scale privatisation	
Armenia	1992	Privatisation law introduced	
Armenia	1993		
Armenia	**1994**	Voucher privatisation	**vouchers**
Armenia	1995	Large scale privatisation	
Armenia	1996		
Armenia	1997		
Armenia	1998		
Armenia	1999		
Armenia	2000		
Armenia	2001		
Azerbaijan	1989		
Azerbaijan	1990		
Azerbaijan	1991		
Azerbaijan	1992		
Azerbaijan	1993		
Azerbaijan	1994		
Azerbaijan	1995	Large scale privatisation & privatisation law (on large scale privatisation) adopted	
Azerbaijan	1996	Small scale privatisation	
Azerbaijan	**1997**	Voucher privatisation	**vouchers**
Azerbaijan	1998		
Azerbaijan	1999		
Azerbaijan	2000		
Azerbaijan	2001		
Belarus	1989		
Belarus	1990		
Belarus	1991		
Belarus	1992		
Belarus	1993	Privatisation law adopted	
Belarus	**1994**	Voucher privatisation	**MEBO**
Belarus	1995		
Belarus	1996		
Belarus	1997		
Belarus	1998		

Belarus	1999		
Belarus	2000		
Belarus	2001		
Estonia	1989		
Estonia	1990		
Estonia	1991	Small scale privatisation	
Estonia	1992	Large scale (tender) privatisation	
Estonia	**1993**	Privatisation agency law & privatisation act adopted	**direct sales**
Estonia	1994		
Estonia	1995		
Estonia	1996		
Estonia	1997		
Estonia	1998		
Estonia	1999		
Estonia	2000		
Estonia	2001		
Georgia	1989		
Georgia	1990		
Georgia	1991		
Georgia	1992		
Georgia	1993	Small scale privatisation	
Georgia	1994		
Georgia	**1995**	Voucher privatisation	**vouchers**
Georgia	1996		
Georgia	1997		
Georgia	1998		
Georgia	1999		
Georgia	2000		
Georgia	2001		
Kazakstan	1989		
Kazakstan	1990		
Kazakstan	1991		
Kazakstan	1992		
Kazakstan	1993		
Kazakstan	1994	Voucher privatisation	
Kazakstan	1995	Privatisation law adopted	
Kazakstan	**1996**	Cash sales privatisation	**direct sales**
Kazakstan	1997		
Kazakstan	1998		
Kazakstan	1999		
Kazakstan	2000		
Kazakstan	2001		
Kyrgyzstan	1989		
Kyrgyzstan	1990		

Kyrgyzstan	1991	Small scale privatisation	
Kyrgyzstan	1992	Corporatisation of enterprises	
Kyrgyzstan	1993	Corporatisation of enterprises	
Kyrgyzstan	1994		
Kyrgyzstan	1995		
Kyrgyzstan	**1996**	Voucher privatisation	**vouchers**
Kyrgyzstan	1997		
Kyrgyzstan	1998		
Kyrgyzstan	1999		
Kyrgyzstan	2000		
Kyrgyzstan	2001		
Latvia	1989		
Latvia	1990		
Latvia	1991	Small scale privatisation	
Latvia	**1992**	Large scale privatisation & privatisation law adopted	**direct sales**
Latvia	1993		
Latvia	1994		
Latvia	1995		
Latvia	1996		
Latvia	1997		
Latvia	1998		
Latvia	1999		
Latvia	2000		
Latvia	2001		
Lithuania	1989		
Lithuania	1990		
Lithuania	**1991**	Voucher privatisation & privatisation law adopted	**vouchers**
Lithuania	1992		
Lithuania	1993		
Lithuania	1994		
Lithuania	1995	Cash privatisation	
Lithuania	1996		
Lithuania	1997		
Lithuania	1998		
Lithuania	1999		
Lithuania	2000		
Lithuania	2001		
Moldova	1989		
Moldova	1990		
Moldova	1991		
Moldova	1992		
Moldova	1993	Cash privatisation	
Moldova	1994		
Moldova	**1995**	Voucher privatisation	**vouchers**

Moldova	1996		
Moldova	1997		
Moldova	1998		
Moldova	1999		
Moldova	2000		
Moldova	2001		
Russia	1989		
Russia	1990		
Russia	1991		
Russia	1992	Voucher privatisation (takes place in October)	
Russia	**1993**		**vouchers**
Russia	1994	Cash privatisation	
Russia	1995	Loans-for-shares privatisation	
Russia	1996		
Russia	1997		
Russia	1998		
Russia	1999		
Russia	2000		
Russia	2001		
Ukraine	1989		
Ukraine	1990		
Ukraine	1991		
Ukraine	1992	Small scale privatisation	
Ukraine	1993		
Ukraine	**1994**	Voucher privatisation	**vouchers**
Ukraine	1995		
Ukraine	1996		
Ukraine	1997		
Ukraine	1998		
Ukraine	1999		
Ukraine	2000		
Ukraine	2001		
Uzbekistan	1989		
Uzbekistan	1990		
Uzbekistan	1991		
Uzbekistan	1992		
Uzbekistan	1993		
Uzbekistan	1994		
Uzbekistan	1995		
Uzbekistan	**1996**	Privatisation programme adopted	**MEBO**
Uzbekistan	1997		
Uzbekistan	1998		
Uzbekistan	1999		
Uzbekistan	2000		
Uzbekistan	2001		

Croatia	1989		
Croatia	1990		
Croatia	1991		
Croatia	**1992**	Large scale privatisation	**MEBO**
Croatia	1993		
Croatia	1994		
Croatia	1995		
Croatia	1996		
Croatia	1997		
Croatia	1998	Voucher privatisation	
Croatia	1999		
Croatia	2000		
Croatia	2001		
Macedonia	1989		
Macedonia	1990		
Macedonia	1991		
Macedonia	1992		
Macedonia	**1993**	Privatisation law adopted	**MEBO**
Macedonia	1994		
Macedonia	1995		
Macedonia	1996		
Macedonia	1997		
Macedonia	1998		
Macedonia	1999		
Macedonia	2000		
Macedonia	2001		
Slovenia	1989		
Slovenia	1990		
Slovenia	1991		
Slovenia	1992	Privatisation law adopted	
Slovenia	1993	Privatisation law amended	
Slovenia	1994	New privatisation law adopted	
Slovenia	1995	Privatisation agency established	
Slovenia	1996	Approve privatisation plans	
Slovenia	1997		
Slovenia	**1998**	Privatisation law amended and Slovene Development Corporation adopted	**MEBO**
Slovenia	1999		
Slovenia	2000		
Slovenia	2001		

Source: EBRD

Notes:

MEBO refers to Management and Employee Buy Out

1. The year that appears in bold is the year of privatisation, chosen on the basis of the date when privatisation of the dominant mode was conducted. If no such year exists, establishment of the Privatisation Agency and passing of privatisation laws is taken as an indicator of the privatisation year.
2. Main method of privatisation is provided by EBRD and refers to the dominant privatisation (MEBO, direct stales or voucher) in the particular country.

Table 4:

Growth equations, on 1990-2001

Variable	**Coeff.**	**Std. Errs**
INVg	0.077	0.020***
EMPLg	0.151	0.074**
IHCg	0.059	0.025**
GISg	0.004	0.006
PrivSS	0.105	0.085
Stock MC	1.230	0.424***
PrivSS*StockMC	-0.017	0.006***
Mass	6.401	3.387*
Full	0.313	1.948
Mixed	1.894	1.768
Constant	-2.629	2.808
Dummies	**Yes/No**	**Significance**
Time Dummies	Yes	***
Group Dummies	Yes	***
Indicators	**Value**	
Sigma	5.751	
Sigma^2	33.078	
R^2	0.640	
RSS	6615.548	
TSS	18393.524	
No. of observations	244	
No. of parameters	44	
No. of individuals	23	

Tests	**Stat.**	**Value**	**P-value**
Wald (joint):	Chi^2(10)	169.300	[0.000]
Wald (dummy):	Chi^2(34)	4075.000	[0.000]
Wald (time):	Chi^2(11)	46.750	[0.000]
AR(1) test:	N(0,1)	0.977	[0.339]
AR(2) test	N(0,1)	-0.243	[0.808]

The regression includes fixed effect, time effect, and White's correction for robust standard errors.

Significance levels:
*** : 1% or less
** : less than 5%
* : less than 10%

Table 5:
Growth equations on 1990-2001:
OLS and GMM dynamic models

Regression	(1)			(2)		
Variable[19]	**Coeff.**		**Std. Errs**	Coeff.		**Std. Errs**
GDPg(-1)	0.191		0.880**	-0.055		0.129
INVg	0.070		0.020***	0.090		0.036**
EMPLg	0.116		0.074	0.281		0.080***
IHCg	0.054		0.023**	0.044		0.026*
GISg	0.003		0.006	-0.001		0.009
PrivSS	0.076		0.084	-0.150		0.146
Stock MC	1.002		0.347***	2.624		1.500*
PrivSS*StockMC	-0.014		0.005***	-0.037		0.020*
Mass	7.626		2.812***	24.157		4.738***
Full	-0.046		1.599	-5.008		8.316
Mixed	1.775		1.763	14.827		5.770**
Constant	-6.280		3.342*	-0.880		3.923
Dummies	**Yes/No**		**Significance**	**Yes/No**		**Significance**
Time Dummies	Yes		***	Yes		***
Group Dummies	Yes		***	Yes		***
Indicators	**Value**			**Value**		
Sigma	5.519			8.777		
Sigma^2	30.457			77.034		
R^2	0.681			-		
Sigma levels	-			6.206		
RSS	5756.313			12864.701		
TSS	18043.836			10871.371		
No. observations	233			210		
No. parameters	44			43		
No. Individuals	23			23		
Tests	**Stat.**	**Value**	**P-value**	**Stat.**	**Value**	**P-value**
Wald (joint):	Chi^2(11)	180.400	[0.000]	Chi^2(11)	166.200	[0.000]
Wald (dummy):	Chi^2(33)	7574.000	[0.000]	Chi^2(32)	189.500	[0.000]
Wald (time):	Chi^2(10)	32.710	[0.000]	Chi^2(10)	23.830	[0.008]
Sargan test	-	-	-	Chi^2(89)	73.910	[0.875]
AR(1) test:	N(0,1)	-1.499	[0.134]	N(0,1)	-2.691	[0.007]
AR(2) test	N(0,1)	0.313	[0.754]	N(0,1)	0.827	[0.408]

All the regressions: Fixed effect, time effect, and White's correction for robust standard errors.

(1): OLS model including lagged dependent variable.

(2): GMM model instrumenting GDPg, INVg, EMPLg, IHCg and GISg
Transformation used: First differences
Level instruments: Dummies, Gmm(GDPg,1,2), Gmm(INVg,1,2), Gmm(EMPLg,1,2), Gmm(IHCg,1,2), Gmm(GISg,1,2)

Significance levels:

*** : 1% or less

** : less than 5%

* : less than 10%

[19] In the GDP model the coefficients refer to level variables; in the GMM model the coefficients refer to first differences (dINVg, dEMPLg, etc.)

Table 6:
Growth equations on sub-samples, 1990-1995 and 1996-2001
Interacting Private Sector Share and Stock Mkt Capitalisation

Regression	(1) – 1990-1995		(1) – 1996-2001		(2) – 1990-1995		(2) – 1996-2001	
Variable	**Coeff.**	**Std. Errs**	**Coeff.**	**Std. Errs**	**Coeff.**	**Std. Errs**	**Coeff.**	**Std. Errs**
INVg	0.071	0.025***	0.101	0.029***	0.071	0.026***	0.094	0.029***
EMPLg	0.193	0.156	0.277	0.068***	0.166	0.161	0.292	0.067***
IHCg	0.085	0.036**	-0.040	0.015***	0.064	0.035*	-0.038	0.015***
GISg	-0.020	0.016	0.002	0.004	-0.021	0.016	0.002	0.004
PrivSS	0.170	0.163	0.241	0.089***	0.176	0.166	0.281	0.086***
Stock MC	0.049	0.206	0.091	0.040**	5.333	2.131**	1.064	0.443**
PrivS*StockMC	-	-	-	-	-0.076	0.030**	-0.013	0.006**
Mass	1.001	5.231	12.467	2.826***	1.080	5.271	10.947	2.915***
Full	1.075	2.599	0.000	-	1.543	2.662	0.000	-
Mixed	4.245	3.292	-0.886	0.460*	4.574	3.051	-1.628	0.540***
Constant	-4.188	3.085	-10.404	6.329*	-3.446	3.129	-13.600	6.056**
Dummies	**Yes/no**	**Significance**	**Yes/no**	**Significance**	**Yes/no**	**Significance**	**Yes/no**	**Significance**
Time Dummies	Yes	***	No	-	Yes	***	No	-
Group Dummies	Yes	***	Yes	***	Yes	***	Yes	***
Indicators	**Value**		**Value**		**Value**		**Value**	
Sigma	7.681		3.072		7.577		3.021	
Sigma^2	59.085		9.440		57.405		9.129	
R^2	0.545		0.644		0.563		0.659	
RSS	4660.860		906.242		4477.606		867.290	
TSS	10237.700		2543.732		10237.700		2543.732	
No. observations	116		128		116		128	
No. parameters	37		32		38		33	
No. Individuals	23		23		23		23	

Tests	Stat.	Value	P-value	Stat.	Value	P-value	Stat.	Value	P-value	Stat.	Value	P-value
Wald (joint):	Chi^2(9)	65.430	[0.000]	Chi^2(9)	106.600	[0.000]	Chi^2(10)	70.560	[0.000]	Chi^2(10)	202.900	[0.000]
Wald (dummy):	Chi^2(28)	404.500	[0.000]	Chi^2(23)	386.000	[0.000]	Chi^2(28)	894.000	[0.000]	Chi^2(23)	420.700	[0.000]
Wald (time):	Chi^2(5)	16.030	[0.007]	-		-	Chi^2(5)	17.770	[0.003]	-		-
AR(1) test:	N(0,1)	-0.952	[0.341]	N(0,1)	0.079	[0.937]	N(0,1)	-1.119	[0.263]	N(0,1)	-0.501	[0.960]
AR(2) test	N(0,1)	-0.891	[0.373]	N(0,1)	-1.189	[0.235]	N(0,1)	-1.036	[0.300]	N(0,1)	-1.376	[0.169]

All the regressions: Fixed effect, White's correction for robust errors, Time effect when significant
(1): Interaction variable excluded
(2): Interaction variable included

Significance levels:
*** : 1% or less
** : less than 5%
* : less than 10%

Testing joint significance of 1996-2001 variables in a regressions including 1990-1995 and 1996-2001 specific regressors:

LinRes Chi^2(10) = 109.129 [0.0000] **

Table 7:
Growth Equations on 1990-2001:
Replacing GISg and Stock Market Capitalisation with EBRD Indices
(Alternative definitions for the dates of privatisation)

Regression	(1)			(2)		
Variable	**Coeff.**		**Std. Errs**	Coeff.		**Std. Errs**
INVg	0.081		0.022***	0.084		0.022***
EMPLg	0.156		0.075**	0.154		0.073**
IHCg	0.061		0.027**	0.066		0.025***
GISg	0.003		0.006	-		-
Infrastructure R. Index	-		-	0.275		2.146
PrivSS	0.066		0.085	0.077		0.083
Stock MC	-		-	-0.043		0.055
Banking R. Index	1.015		1.274	-		-
Non-Banking R. Index	-0.181		1.367	-		-
Mass	6.783		3.281**	6.712		3.340**
Full	0.242		1.936	-0.108		1.970
Mixed	2.645		1.758	2.500		1.737
Constant	-3.384		2.908	-2.751		2.863
Dummies	**Yes/No**	**Significance**		**Yes/No**	**Significance**	
Time Dummies	Yes	***		Yes	***	
Group Dummies	Yes	***		Yes	***	
Indicators	**Value**			**Value**		
Sigma	5.835			5.826		
Sigma^2	34.043			33.942		
R^2	0.630			0.629		
RSS	6808.573			6822.418		
TSS	18393.524			18393.524		
No. observations	244			244		
No. parameters	44			43		
No. Individuals	23			23		
Tests	**Stat.**	**Value**	**P-value**	**Stat.**	**Value**	**P-value**
Wald (joint):	Chi^2(10)	125.600	[0.000]	Chi^2(9)	130.2	[0.000]
Wald (dummy):	Chi^2(34)	3100.000	[0.000]	Chi^2(34)	1576.0	[0.000]
Wald (time):	Chi^2(11)	56.000	[0.000]	Chi^2(11)	51.220	[0.000]
AR(1) test:	N(0,1)	1.077	[0.281]	N(0,1)	1.051	[0.293]
AR(2) test	N(0,1)	0.470	[0.639]	N(0,1)	0.396	[0.692]

All the regressions: Fixed effect, time effect, and White's correction for robust standard errors.
(1): Replacing Stock Mkt Capitalisation with Banking Reform and Non-Banking-financial-institution Reform Indices
(2): Replacing GISg with Infrastructure Reform Index

Significance levels:
*** : 1% or less
** : less than 5%
* : less than 10%

Table 8:

Growth equations, on 1990-2001, for CIS and non-CIS countries

Regression	**CIS countries**			**Non-CIS countries**		
Variable	**Coeff.**	**Std. Errs**		**Coeff.**	**Std. Errs**	
INVg	0.046	0.020**		0.082	0.033**	
EMPLg	0.194	0.140		0.116	0.044***	
IHCg	-0.061	0.022***		0.007	0.026	
GISg	0.006	0.006		0.002	0.014	
PrivSS	-0.176	0.101*		0.148	0.074**	
Stock MC	0.040	0.629		0.943	0.277***	
PrivSS*StockMC	-0.001	0.009		-0.012	0.004***	
Mass	9.171	2.832***		-5.672	2.669**	
Full	5.424	2.686**		-0.680	0.956	
Mixed	-0.341	1.458		0.672	1.146	
Constant	3.547	3.013		-6.989	2.513	
Dummies	**Yes/No**	**Significance**		**Yes/No**	**Significance**	
Time Dummies	Yes	***		Yes	***	
Group Dummies	Yes	***		Yes	***	
Indicators	**Value**			**Value**		
Sigma	5.876			4.139		
Sigma^2	34.524			17.131		
R^2	0.776			0.734		
RSS	2416.694			1867.280		
TSS	10794.785			7019.627		
No. of observations	101			143		
No. of parameters	31			34		
No. of individuals	10			13		
Tests	**Stat.**	**Value**	**P-value**	**Stat.**	**Value**	**P-value**
Wald (joint):	Chi^2(10)	1280.000	[0.000]	Chi^2(10)	1400.000	[0.000]
Wald (dummy):	Chi^2(21)	265.900	[0.000]	Chi^2(24)	175.000	[0.000]
Wald (time):	Chi^2(11)	185.100	[0.000]	Chi^2(11)	51.390	[0.000]
AR(1) test:	N(0,1)	-0.268	[0.789]	N(0,1)	-0.111	[0.912]
AR(2) test	N(0,1)	-0.248	[0.804]	N(0,1)	-1.612	[0.107]

All the regressions: Fixed effect, time effect, and White's correction for robust standard errors.

Significance levels:
*** : 1% or less
** : less than 5%
* : less than 10%

Testing joint significance of CIS variables in a regressions including CIS and non-CIS specific regressors:

LinRes Chi^2(10) = 59.0053 [0.0000] **

Table 9:
Growth equations, on 1990-2001
Excluding Belarus

Variable	**Coeff.**	**Std. Errs**
INVg	0.073	0.019***
EMPLg	0.151	0.073**
IHCg	0.057	0.025**
GISg	0.004	0.006
PrivSS	0.109	0.102
Stock MC	1.062	0.392***
PrivSS*StockMC	-0.015	0.005***
Mass	6.545	3.445*
Full	-0.263	1.940
Mixed	2.301	2.039
Constant	-2.863	2.904
Dummies	**Yes/No**	**Significance**
Time Dummies	Yes	***
Group Dummies	Yes	***
Indicators	**Value**	
Sigma	5.816	
Sigma^2	33.831	
R^2	0.637	
RSS	6427.936	
TSS	17704.482	
No. of observations	233	
No. of parameters	43	
No. of individuals	22	
Tests	**Stat.**	**Value**	**P-value**
Wald (joint):	Chi^2(10)	177.300	[0.000]
Wald (dummy):	Chi^2(33)	3917.000	[0.000]
Wald (time):	Chi^2(11)	44.980	[0.000]
AR(1) test:	N(0,1)	0.911	[0.362]
AR(2) test	N(0,1)	0.365	[0.715]

The regression includes Fixed effect, Time effect and White's correction for robust standard errors.

Significance levels:
*** : 1% or less
** : less than 5%
* : less than 10%

Table 10:
Growth equations, on 1990-2001
Including Exchange rates and oil price

Regression	(1)			(2)		
Variable	**Coeff.**	**Std. Errs**		**Coeff.**	**Std. Errs**	
INVg	0.078	0.020***		0.078	0.023***	
EMPLg	0.188	0.087**		0.218	0.092**	
IHCg	0.050	0.025**		-0.011	0.018	
GISg	0.000	0.006		-0.001	0.006	
PrivSS	0.096	0.084		0.125	0.048***	
Stock MC	1.077	0.412***		1.130	0.434***	
PrivSS*StockMC	-0.015	0.006***		-0.015	0.006**	
Exchange Rates	-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	1.878		2.570	1.862	
Constant	-2.065	2.750		-6.792	2.037***	
Dummies	**Yes/No**	**Significance**		**Yes/No**	**Significance**	
Time Dummies	Yes	***		No	-	
Group Dummies	Yes	***		Yes	***	
Indicators	**Value**			**Value**		
Sigma	5.719			5.796		
Sigma^2	32.711			33.597		
R^2	0.647			0.619		
RSS	6476.840			6988.228		
TSS	18357.644			18357.644		
No. of observations	243			243		
No. of parameters	45			35		
No. of individuals	23			23		
Tests	**Stat.**	**Value**	**P-value**	**Stat.**	**Value**	**Pvalue**
Wald (joint):	Chi^2(11)	271.500	[0.000]	Chi^2(12)	811.300	[0.000]
Wald (dummy):	Chi^2(34)	8761.000	[0.000]	Chi^2(23)	1369.000	[0.000]
Wald (time):	Chi^2(11)	31.110	[0.001]	-	-	-
AR(1) test:	N(0,1)	0.827	[0.408]	N(0,1)	0.457	[0.647]
AR(2) test	N(0,1)	-0.070	[0.944]	N(0,1)	0.334	[0.739]

All the regressions: Fixed effect, and White's correction for robust standard errors.
(1) Exchange rates and time effect
(2) Exchange rates and oil price (substituting time effect)

Significance levels:
*** : 1% or less
** : less than 5%
* : less than 10%

Appendix:
List of variables

GDPg: Gross Domestic Product rate of growth;
INVg: Fixed Capital Investment rate of growth;
EMPLg: Employment rate of growth;
IHCg: Investment in Human Capital rate of growth
GISg: Government Investment Share rate of growth
PrivSS: Privatisation Sector Share
StockMC: Stock Market Capitalization
Mass Priv. D.: Mass Privatisation Dummy
Full Priv. D.: Full Privatisation Dummy
Mixed Priv. D.: Mixed Privatisation Dummy
Mass1: Mass Privatisation Dummy with alternative definitions
Full1: Full Privatisation Dummy with alternative definitions
Mixed1: Mixed Privatisation Dummy with alternative definitions
Mass2: Mass Privatisation Dummy with alternative date setting
Full2: Full Privatisation Dummy with alternative date setting
Mixed2: Mixed Privatisation Dummy with alternative date setting
Infrastructure R. Index: EBRD Index of Infrastructure Reform
Banking R. Index: EBRD Index of Banking Sector Reform
Non-Banking R. Index: EBRD Index of Reform of Non-Banking Financial Instit.

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Data Appendix

The paper uses data from every transition economy identified by the EBRD on GDP, fixed capital investment, private sector share in GDP, mode and date of privatisation, employment, tertiary education, government capital expenditure, stock market capitalisation and reform indices. The basic criteria in collection of data and its processing has been comparability over time and across countries. In the analysis, Bosnia and Herzegovina, Serbia and Montenegro, Tajikistan and Turkmenistan were excluded because the data was either of dubious quality or unavailable in most years.

To provide a point of comparison for all the countries which are being analysed, a common source for the base year had to be used. The most comprehensive and methodologically consistent source for 1989 is the World Bank's "*Historically Planned Economies: A Guide to the Data*". Its 1989 figures therefore served as a basis for series on GDP, Fixed Capital Investment and Investment as a share of GDP, which were extended using EBRD times series. Other data series were obtained from various sources, including National Statistical Offices and Central Banks, IMF, EBRD and other international organisation. A detailed description of the methodology follows below.

GDP

GDP growth rates for all the 23 countries was obtained from EBRD *Transition Reports* 1995, 1998, 1999 and 2002, taking the most recent information on annual GDP percentage changes the period 1989-2001.

GDP level figures had to be used to obtain data on fixed capital investment growth at least in the early years of the 1990s because the annual percentage change in investment was not available. These GDP data were used to calculate a fixed capital investment figures by taking fixed capital investment to GDP ratios, provided by IMF and National Statistics sources. The details of GDP level calculations are presented below.

GDP level

(Former) Soviet Union – annual GDP figures were sourced from the World Bank's "*Historically Planned Economies: A Guide to the Data*" for 1988, using data in constant 1987 market prices. To allow for comparison, these figures were converted into US dollars using the 1987 exchange rate. To obtain information on GDP growth in all thirteen constituent countries, the total USSR figure was divided into Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Ukraine and Uzbekistan by using UN, World Bank and national sources. Data for 1989-2000 were obtained by extending the series from 1988 using EBRD real GDP growth rates covering 1989-2001 and taking the 1988 figure as the base for the extension.

(Former) Yugoslavia – annual GDP figures were sourced from the World Bank's "*Historically Planned Economies: A Guide to the Data*" for 1988, using data in constant 1987 market prices. To allow for comparison, these figures were converted into US dollars using the 1987 exchange rate. Country data for Slovenia, Macedonia and Croatia were obtained by dividing the total Yugoslavia figures, using UN, World Bank and national sources. Data for 1989-2000 were obtained by extending the series from 1988 using EBRD real GDP growth rates covering 1989-2001 and taking the 1988 figure as the base for the extension.

Czech Republic and Slovakia – annual GDP figures were sourced from the World Bank's "*Historically Planned Economies: A Guide to the Data*" for 1988, using data in constant 1987 market prices. To allow for comparison, these figures were converted into US dollars using the 1987 exchange rate. The total figure was divided according to information obtained from UN, World Bank and national sources. Data for 1989-2000 were obtained by extending the series from 1988 using EBRD real GDP growth rates covering 1989-2001 and taking the 1988 figure as the base for the extension.

Bulgaria, Romania, Hungary and Poland - annual GDP figures were sourced from the World Bank's "*Historically Planned Economies: A Guide to the Data*" for 1988, using data in constant 1987 prices. To allow for comparison, these figures were converted into US dollars using the 1987 exchange rate. Data for 1989-2001 were obtained by extending the series from 1988 using EBRD real GDP growth rates covering 1989-2001 and taking the 1988 figure as the base for the extension.

Albania - annual GDP figures were sourced from the World Bank's "*Historically Planned Economies: A Guide to the Data*" for 1988, using data in constant 1986 market prices. To allow for comparison, these figures were converted into US dollars using the 1986 exchange rate. Data for 1989-2001 were obtained by extending the series from 1988 using EBRD real GDP growth rates covering 1989-2001 and taking the 1988 figure as the base for the extension.

GROSS FIXED CAPITAL INVESTMENT

Fixed capital investment figures were obtained from the EBRD *Transition Report* 1999, 2000, 2001 and 2002 by taking the real gross fixed investment (GFI) rate, measured in annual percentage change. For years where such information was unavailable, alternative measures were used.

The most common alternative source of information was the data on investment share in GDP provided by IMF and EBRD. For consistency across countries and over time, investment levels were obtained from the same source as the GDP level data. Thus, for 1989, investment data were obtained from the World Bank's "*Historically Planned Economies: A Guide to the Data*". For this purpose, gross domestic investment in 1987 local prices was converted into US dollars using the 1987 exchange rate. The main additional sources were *UN Economic Surveys of Europe*, IMF (for Former Soviet Union) and *Yugoslavia Statistical Yearbooks*. It was then supplemented by using information on the fixed capital investment to GDP ratio.

To extend the series to the 1993-2001 period, EBRD real gross fixed investment rate was used, taking the 1992 figure as the base in most cases. National sources and IMF or EBRD were used for the 1990 and 1991 data.

EMPLOYMENT

Information on employment growth was obtained from EBRD employment time series, measured in annual percentage change. This data cover the 1989-2001 period.

INVESTMENT IN HUMAN CAPITAL

The measure chosen for investment in human capital was gross enrolment in tertiary education. The enrolment ratio is defined as the total number of students in a certain level of education as a percentage of the total population in the age group considered to be most common at this education level.

The data were obtained using TransMonee Database, produced by UNICEF, by taking 5 year period averages. These series were preferred to the UNESCO data, which is largely inconsistent with the World Bank data and also shows unconvincingly high growth of enrolment rates for several countries.

The definition of tertiary education and the relevant group ages vary somewhat from country to country.

GOVERNMENT INVESTMENT SHARE IN GDP

This data were derived from the measurement of government capital expenditure provided by the *IMF Country Reports*. For CIS countries, information on early years of transition was unavailable from this source, so we relied on the CIS National databases.

For Baltic countries, Baltic International Centre for Economic Policy Studies (located in Riga) has provided additional data:

- for Estonia: data for 1991 and 1995;
- for Latvia: data for 1994 and 1995;
- for Lithuania: data for 1991, 1993, 1994 and 1995.

In the years for which information was unavailable, in CIS countries in the 1990s, the data were extrapolated by taking the average of the following three years.

PRIVATE SECTOR SHARE IN GDP

The information on private sector share as percentage of GDP was taken from the EBRD *Transition Report* 1999 and 2002.

STOCK MARKET CAPITALISATION AS A SHARE IN GDP

Data were collected from the EBRD *Transition Report* 2002, and is consistent with *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.

INDICES OF REFORM

Three indices were used in the regressions: EBRD Infrastructure Reform Index, EBRD Banking Sector Reform Index and EBRD Index for Reform of Non-Banking Financial Institutions. Data were sourced from the EBRD *Transition Report* 2002.

PRIVATISATION DATE AND MODE

Information on privatisation mode was sourced from EBRD *Transition Report* 1995 and 2002. This classified privatisation methods into voucher privatisation, manager and employee buyouts (MEBO), or direct sales. The date of privatisation was chosen based on the year in which the dominant type of privatisation took place.

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(lix) This paper was presented at the ENGIME Workshop on “Mapping Diversity”, Leuven, May 16-17, 2002
(lx) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications”, organised by the Fondazione Eni Enrico Mattei, Milan, September 26-28, 2002
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(lxv) This paper was presented at the EuroConference on “Auctions and Market Design: Theory, Evidence and Applications” organised by Fondazione Eni Enrico Mattei and sponsored by the EU, Milan, September 25-27, 2003
(lxvi) This paper has been presented at the 4th BioEcon Workshop on “Economic Analysis of Policies for Biodiversity Conservation” organised on behalf of the BIOECON Network by Fondazione Eni Enrico Mattei, Venice International University (VIU) and University College London (UCL) , Venice, August 28-29, 2003
(lxvii) This paper has been presented at the international conference on “Tourism and Sustainable Economic Development – Macro and Micro Economic Issues” jointly organised by CRENoS (Università di Cagliari e Sassari, Italy) and Fondazione Eni Enrico Mattei, and supported by the World Bank, Sardinia, September 19-20, 2003
(lxviii) This paper was presented at the ENGIME Workshop on “Governance and Policies in Multicultural Cities”, Rome, June 5-6, 2003
(lxix) This paper was presented at the Fourth EEP Plenary Workshop and EEP Conference “The Future of Climate Policy”, Cagliari, Italy, 27-28 March 2003
(lxx) This paper was presented at the 9th Coalition Theory Workshop on "Collective Decisions and Institutional Design" organised by the Universitat Autònoma de Barcelona and held in Barcelona, Spain, January 30-31, 2004

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