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The Evolution of Output in Transition Economies: Explaining the Differences

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Abstract

What are the relative roles of macroeconomic variables, structural policies, and initial conditions in explaining the time path of output in transition and the large observed differences in output performance across transition economies? Using a sample of 26 countries, this paper follows a general-to-specific modeling approach that allows for differential effects of policies and initial conditions on the private and state sectors and for time-dependent effects of initial conditions. While showing some fragility to model specification, the results point to the preeminence of structural reforms over both initial conditions and macroeconomic variables in explaining cross-country differences in performance and the timing of the recovery.

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I. Introduction

Following the universal collapse in measured output at the beginning of transition, the experience of the transition countries of Central and Eastern Europe (CEE) and the countries on the territory of the former Soviet Union has been quite varied. While the output paths of most countries are qualitatively similar — an asymmetric "U" or "V"-shape, with a sharp initial decline giving way to gradual recovery after a sometimes protracted "bottoming out" phase[1]—countries have differed greatly both in terms of the magnitude of the initial decline and the timing and strength of the recovery. In particular, transition countries in the Baltics, Russia and other countries of the former Soviet Union (BRO) have, on average, experienced sharper declines and slower recoveries than transition countries in Central and Eastern Europe, although there are large differences within these groups as well (Figures 1 and 2, Table 1).[2]

The objective of this paper is to account for both the common transition experience in the time dimension—i.e. the U-shaped output profile—and the considerable cross-country differences in output paths in terms of three main groups of explanatory factors: macroeconomic variables, structural reforms and initial conditions (including some other controls, such as wars and internal conflict). There is by now large literature on output and growth in transition,[3] which has typically emphasized one or two of these three groups, raising questions about the extent to which its results might be picking up the effects of omitted variables. In contrast, we hope to disentangle the relative contributions of factors that may have contributed to the U-shaped output profile and to cross-country differences in output performance by studying the main potential determinants *jointly*, in the context of a panel regression that uses data from 26 transition economies.

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[1] This characterization abstracts from the possibility of a "double dip"—i.e. a return to negative growth after a period of output stabilization—as was observed for some countries in 1997 and possibly on a wider scale in 1998. While for some countries (Bulgaria in 1996 and Albania, Bulgaria, and Romania in 1997), the double dip is probably related to structural and macroeconomic policies of the type that are studied in this paper, our regression analyses are based on a sample that ends in 1996.

[2] Throughout this paper, we use IMF estimates of real output which are mostly based on the official output data. For a brief discussion of the problems with this data and a justification why it is nevertheless used in this paper, see Section III below.

[3] In particular, de Melo, Denizer and Gelb (1996, 1997), who were the first to quantify and systematically study the role of structural reforms; Fischer, Sahay and Végh (1996 a,b; 1997), who introduced macroeconomic policies, and de Melo, Denizer, Gelb and Tenev (1997), who study the role of initial conditions in detail. Part of our data is taken from these papers (see below). Related papers include Sachs (1996), Sachs and Warner (1996), Åslund, Boone and Johnson (1996), Selowsky and Martin (1996), Hernández Catá (1997), Heybey and Murrell (1997) and Wolf (1997).

Figure 1. Output Paths in Calendar Time (1989 = 100)

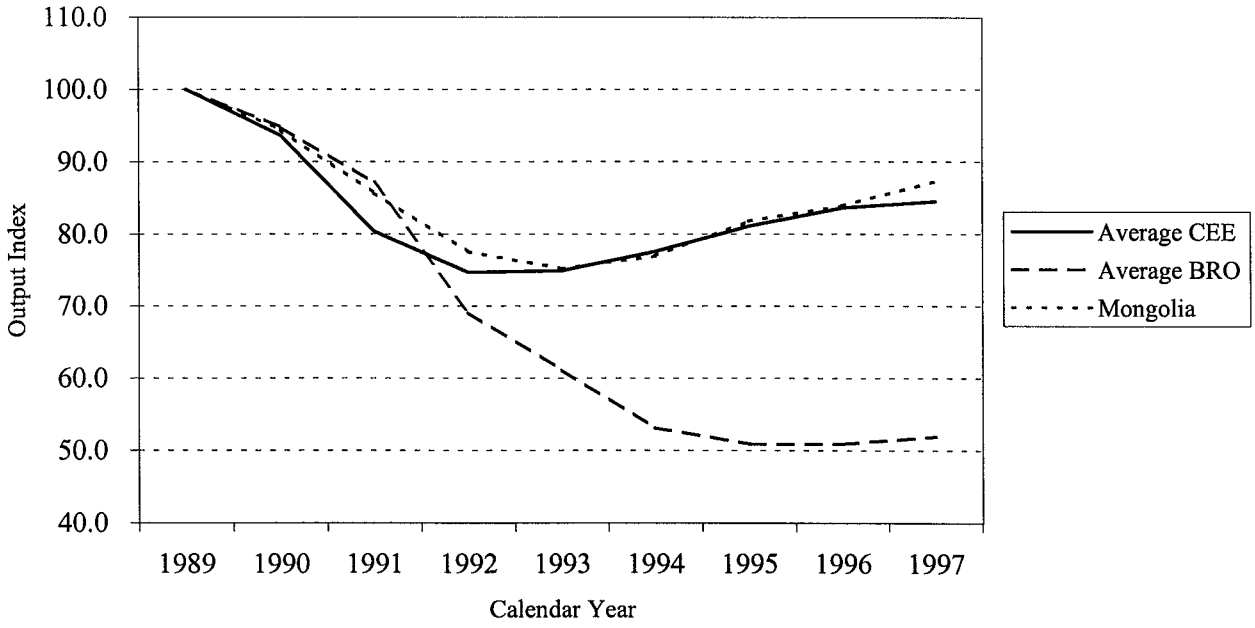
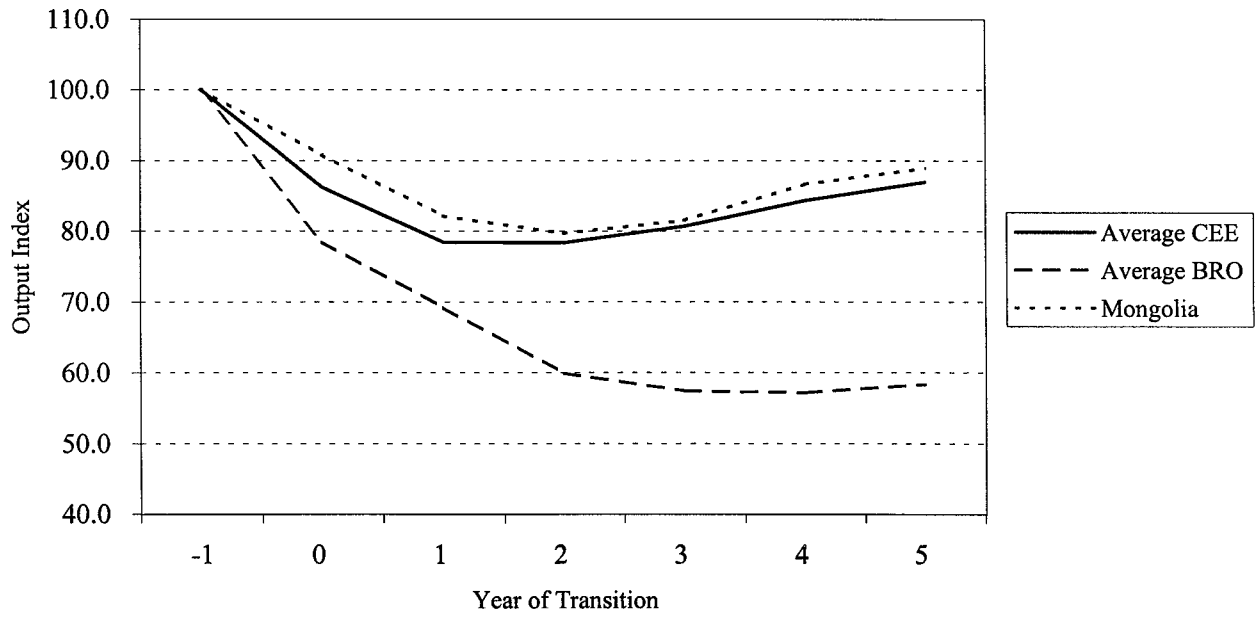


Figure 2. Output Paths in Transition Time (Pre-Transition Year = 100)



Notes: Transition year zero is defined as the year in which central planning was decisively abandoned. This is taken to be 1992 for the BRO countries, 1990 for Poland, Hungary and countries on the territory of the former Socialist Federated Republic of Yugoslavia and 1991 for the remaining Eastern European countries.

Table 1. Transition Economies: Growth of Real GDP, 1990-1997
(in percent per annum)

	Growth of Real GDP							
	1990	1991	1992	1993	1994	1995	1996	1997
CEE	-6.4	-14.2	-7.2	0.2	3.4	4.3	2.9	0.8
Albania	-10.0	-28.0	-7.2	9.6	9.4	8.9	9.1	-7.0
Bulgaria	-9.1	-11.7	-7.3	-1.5	1.8	2.1	-10.9	-7.4
Croatia	-7.5	-17.0	-11.7	-0.9	0.6	1.7	4.3	6.3
Czech Republic	-1.2	-11.5	-3.3	0.6	2.7	5.9	4.1	1.2
Hungary	-3.5	-11.9	-3.1	-0.6	2.9	1.5	1.3	4.0
FYR Macedonia	-7.5	-17.0	-21.1	-9.4	-2.7	-1.6	0.9	1.5
Poland	-11.6	-7.0	2.6	3.8	5.2	7.0	6.1	6.9
Romania	-5.6	-12.9	-8.8	1.5	3.9	6.9	3.9	-6.6
Slovak Republic	-0.4	-15.9	-6.7	-3.7	4.6	6.8	7.0	5.7
Slovenia	-7.5	-8.9	-5.5	2.8	5.3	4.1	3.2	3.7
Baltics	-2.3	-8.3	-25.5	-13.8	-3.6	2.3	4.0	5.7
Estonia	-2.3	-7.9	-21.6	-8.2	-1.8	4.3	4.0	5.0
Latvia	-2.3	-11.1	-35.2	-16.1	2.1	0.3	2.8	6.0
Lithuania	-2.3	-6.0	-19.6	-17.1	-11.2	2.3	5.1	6.0
Russia	-2.3	-5.0	-14.5	-8.7	-12.6	-4.0	-2.8	0.8
Other FSU	-6.3	-8.4	-21.2	-12.1	-15.2	-5.5	-1.9	1.4
Armenia	-2.2	-12.4	-52.6	-14.1	5.4	6.9	5.8	3.3
Azerbaijan	-11.7	-0.7	-22.1	-23.1	-18.1	-11.0	1.3	5.0
Belarus	-2.3	-1.2	-9.7	-7.6	-12.6	-10.4	2.8	10.0
Georgia	-12.4	-20.6	-44.8	-25.4	-11.4	2.4	10.5	10.0
Kazakhstan	-2.3	-11.0	-5.3	-10.6	-12.6	-8.2	0.5	2.1
Kyrgyz Republic	-2.3	-7.9	-13.9	-15.5	-20.1	-5.4	5.6	6.2
Moldova	-2.4	-17.5	-29.1	1.0	-31.0	-1.4	-7.8	1.3
Tajikistan	-32.6	-7.1	-28.9	-11.1	-21.4	-12.5	-28.3	2.2
Turkmenistan	-2.3	-4.7	-5.3	-10.0	-18.8	-8.2	-3.0	-24.0
Ukraine	-3.6	-8.7	-9.9	-14.2	-22.9	-12.2	-10.0	-3.4
Uzbekistan	4.3	-0.5	-11.1	-2.3	-4.2	-0.9	1.6	2.4
Mongolia	-5.6	-9.2	-9.5	-3.0	2.3	6.3	2.6	4.0

In the context of modeling output in transition, the attempt to avoid the standard omitted variables problem is complicated by a host of other methodological problems. In dealing with these problems, we extend previous studies in four respects. First, we try to incorporate the "structural change" aspect implicit in the transition process by parametrizing the model in a way that allows policies and initial conditions to have a differential impact on the "old" and the "new" productive sectors, and thus allows the effect of policies and initial conditions on *aggregate* output to change as the transition process unfolds. Second, we allow for a flexible dynamic structure and in particular do not impose constant effects of initial conditions across time. While these modeling strategies are, in our opinion, necessary to avoid implicitly imposing inappropriate restrictions, they also compound the potential omitted variables problem, as we now have many more potential right side variables (lags and interaction terms of our main variables of interest) to worry about. This motivates a third methodological extension, which is to use a general-to-specific approach to generate relatively parsimonious models after starting out with a fairly extensive set of potential growth determinants. Finally, we also try to address the policy endogeneity problem as far as the macroeconomic policies go, i.e. the fact that either policies themselves or the variables that are often used to proxy for them (such as the fiscal balance) might themselves depend on output or growth. We do this by using IMF program targets as instruments for the macroeconomic right-hand side variables that are most likely to be endogenous, as explained in Section II below.

Three recent papers by de Melo, Denizer, Gelb and Tenev (1997), Wolf (1997) and Havrylyshyn, Izvorski and van Rooden (1998) share our broad objective of studying the effects of relevant policy variables while controlling for the role of initial conditions.[4] None, however, addresses the full range of methodological problems that we consider. We explore much more systematically the robustness of results with respect to variations in model specification, while Wolf, de Melo et al. and Havrylyshyn et al. focus on a small set of regressions. In addition, our initial specification is substantially, and in our view appropriately, more flexible, particularly in its treatment of time-varying effects of initial conditions and differential effects of policy on the state and private sectors.[5]

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[4] In addition, in a recent paper, Christoffersen and Doyle, 1998, analyze the growth experience of a panel of transition economies paying particular attention to the role of inflation. Their basic specification is fairly restrictive—for example, they do not control for initial conditions. However, they study two issues we have largely neglected: the potential non-linearities in the relationship between inflation and growth, and the role of growth in export markets. We looked for and did not discover a non-linear effect of inflation in our more general specification. Whether growth in export markets would remain significant in the face of our fuller set of controls remains to be discovered.

[5] In terms of methodology, Havrylyshyn et al. are closer to our paper in that they undertake some sensitivity analysis by estimating their basic regression both with country fixed effects and initial conditions, and distinguish between a "decline period" and "recovery period" in their regression.

On the other hand, the first two papers go beyond ours in that they also analyze the effects of initial conditions on *policies*. While we recognize that this link is interesting, it is not examined in what follows. As such, it could be claimed that our findings on the relative importance of policies and initial conditions understate the overall importance of the latter, as they ignore any "indirect" effect of initial conditions on growth via their influence on policies. However, it is not clear whether a statistical or even behavioral dependence of policies on initial conditions implies that the former should no longer be viewed as government *choices*.[6] We take the view that they can, and are thus interested in initial conditions primarily as controls in a broad regression that includes policy variables, and in terms of their direct effects of output.[7]

We have two sets of results, depending on the degree to which a structure is imposed on the general-to-specific procedure adopted. First, we subject the policy variables (including lags and interaction terms) to a series of exclusion tests, conditioning on the presence of either a parsimonious set of initial conditions or dummies to control for country specific effects. The objective of this exercise is to give a sense of the range of model specifications that is consistent with the data. The main finding is that the data generally rejects the hypothesis that *no* structural reform variables and/or *no* macroeconomic variables belongs in the model, but beyond this it is not very informative—in the absence of additional prior information to guide the model selection process—in telling us what variables should be included. In other words, the same data set could be used to make contradictory claims about the significance or lack of significance of certain policies, an observation that reinforces our skepticism vis à vis ad hoc regression models of growth in transition.

Our second step is to put more structure on the general-to-specific model selection process (priors about the likely importance of variables and some simplification conventions) in ways that we believe will be transparent and acceptable to most readers. This helps us arrive at a small set of "final" specifications, which we discuss and analyze in terms of the main questions asked at the beginning. The main results are as follows. (1) The "U" shape in output is explained by the combination of (i) post-communist initial conditions that, by themselves, generate a contraction in output, and (ii) structural reforms, which are the driving force of the recovery. The effects of structural reforms themselves can typically be decomposed into a mostly positive effect on the private sector and mostly negative effects on the state sector; as the transition proceeds, the shifting relative size of these two sectors implies that the positive effect becomes stronger. (2) Even though structural reforms often affect private and state sectors in opposite ways, the net effect of structural reforms appears to be positive from the beginning, i.e. we find little evidence that reforms significantly exacerbate

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[6] This is ultimately a philosophical issue, that in Western civilization goes back to at least St. Augustine (*De Libero Arbitrio*).

[7] In Section V, we also address the possibility that the *effects* of policies might be modified by initial conditions—an issue raised in de Melo et al.—by testing for interactions between policies and initial conditions.

the output decline initially. (3) The impact of macroeconomic variables, while significant, is much smaller than that of either initial conditions and structural reforms. (4) The role of initial conditions in explaining *cross-sectional* variation in growth is surprisingly minor; in particular, the difference in performance between the CEE and the BRO countries is mostly explained by differences in structural reforms (even at the beginning of transition), rather than initial conditions.

Section II describes our estimation methodology in some detail. Section III presents and discusses the data, sensitivity analyses and estimation results. Using these results, Section IV interprets the transition experience—both over time and across countries—and answers the main questions that motivate the paper. Section V discusses some extensions, including whether the speed of reform matters, and whether the effects of policies are modified by initial conditions. Section VI concludes.

II. Specification Issues

Modeling the evolution of output in transition as a function of its many possible determinants gives rise to a number of methodological problems. In our view, four main issues need to be addressed. First, with little specific guidance from economic theory, there is a large potential for misspecifying the regression model by omitting relevant variables. This suggests a need to either "test down" from more general to more specific structures, or to explore the robustness of the estimated correlations in a systematic way, as has been done in the empirical literature on long-term growth (Levine and Renelt 1992, Sala-I-Martin 1997), or both. Second, we are faced with potential endogeneity problems, both through the presence of unaccounted country-specific effects and because some of the right-hand side determinants of output—in particular, macroeconomic variables such as the fiscal balance or inflation—could depend on output themselves. The question then arises as to what are the appropriate instruments to test for, and if necessary address, this potential endogeneity. Third, there is an issue regarding the stationarity of output during the transition, and therefore, whether the appropriate left-hand side variable should be output or growth. Finally, the way in which policy variables and initial conditions are to enter the regression model poses some questions. In particular, one would like a specification which allows for the possibility that the same policy change (as measured by, say, a given increase in some liberalization index) might have quite different effects depending on whether it occurs at the beginning of transition or

well into transition.[8] Similarly, one would not want to impose that initial conditions continue to play the same role throughout the transition process.

A. Basic Setup and Endogeneity Problems

Suppose the structural econometric model of aggregate output or output growth during transition is as follows:

$$Y_{t,i} = F(Y_{t-1,i}, ...; P_{t,i}, P_{t-1,i}, ...; S_{t,i}; X_I; Z_I) + \varepsilon_{t,i} \quad (1a)$$

$$P_{t,i} = G(Y_{t,i}, Y_{t-1,i}, ...; P_{t,i}, P_{t-1,i}, ...; S_{t,i}; X_I; Z_I) + \mu_{t,i} \quad (1b)$$

$$S_{t,i} = H(Y_{t,i}, Y_{t-1,i}, ...; P_{t,i}, P_{t-1,i}, ...; X_I; Z_I) + \eta_{t,i} \quad (1c)$$

$Y_{t,i}$ is our main dependent variable (either the level of output or growth), $P_{t,i}$ denotes a vector of policy variables (including macroeconomic policy variables and structural reform indices), X_I denotes observable country-specific effects (including initial conditions), and Z_I stands for unobservable country-specific effects. $S_{t,i}$, finally, denotes a state variable such as the extent of structural change since the beginning of transition; it is included to capture the possibility that the effect of policies or initial conditions on growth changes as the transition progresses. As always, t and I index the time period and the country. Our main interest is in estimating the first of these three equations.

As it stands, this system is not identified and the output/growth equation cannot be consistently estimated. In principle, this problem could be addressed in two ways. First, we might be able to find variables which are unrelated to growth, but are correlated with one or more policy or state variables. In system 1, these variables would show up on the right-hand sides of (1b) and/or (1c) but not (1a), and could thus be used to instrument for $P_{t,i}$ and/or $S_{t,i}$ on the right-hand side of (1a). For example, consider a stabilization proxy such as the fiscal deficit. While it can be argued that the deficit is a reasonable measure of a country's attempt to stabilize (Fischer, Sahay and Végh 1996 a) , deficits are clearly also susceptible to endogeneity problems as they may depend on current output via tax revenues. One way of resolving this inverse causality problem could be to use (I) deficits *targets* under IMF-supported programs and (ii) an indicator variable expressing whether the country is "on track" or not in the context

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[8] For example, the use of the "cumulative liberalization index" (de Melo, Denizer and Gelb (1996 a,b) is equivalent to including the non-cumulative index in each year since the beginning of reforms and restricting the coefficients to be identical. Thus, it implicitly assumes that it is irrelevant for growth *when* a given increment in the non-cumulative index occurred; it only matters *that* the increment occurred. We find this too strong: surely a given change might not have an immediate impact, or the effect of some change might fade after some time. Moreover, a given increment in the cumulative liberalization is assumed to have the same effects whether it occurs early or late in transition. This may also may be unduly restrictive, as we argue below.

of an IMF program as instruments for the actual deficit. These variables should be correlated with the actual deficit but, unlike actual deficits, they can be assumed to be independent of the contemporaneous error term in the output growth equation.[9]

Second, for some state variables and policy variables such as liberalization indices it might be reasonable to assume that *contemporaneous* growth does not determine policy decisions and the state of transition. In other words, suppose the true model was

$$Y_{i,t} = F(P_{i,t}, P_{i,t-1}, ...; S_{i,t}; X_I; Z_I) + \varepsilon_{t,i} \quad (2a)$$
$$P_{i,t} = G(Y_{i,t-1}, ...; S_{i,t}; X_I; Z_I) + \mu_{t,i} \quad (2b)$$
$$S_{i,t} = H(Y_{i,t-1}, ...; P_{i,t}, P_{i,t-1}, ...; X_I; Z_I) + \eta_{t,i} \quad (2c)$$

P and S are now weakly exogenous with respect to Y. The output/growth equation is identified and can in principle be consistently estimated–provided that we take care of potential fixed effects problems entering through the correlation of Z (the unobservable country effect) with the remaining right-hand side variables, bearing in mind that strong exogeneity of the right-hand side variables P and S is unlikely to hold.

In Section III below, we follow a combination of these two approaches. In the case of current macroeconomic variables, where weak exogeneity can clearly not be assumed, we use IMF program targets—which are widely available since almost all transition countries had an IMF-supported stabilization program at some point—as instruments. In the case of indices of structural reform, we assume weak but not necessarily strong exogeneity. In addition, we attempt to address the presence of fixed effects in two ways: first, by including a very large set of initial conditions and other country-specific controls—i.e. observable X_Is—in the model, which may lend sufficient plausibility to the idea that the remaining set of unaccounted Z_Is can be neglected; and alternatively, by explicitly estimating a model including country dummies.

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[9] The argument is as follows. Program targets are set ahead of time (or early in the year, when Fund staff and the authorities had no knowledge of *actual* annual output) as a function of *expected* output. Thus, they will be uncorrelated with the error in equation (1a) provided the targets only incorporate information which is controlled for by the right hand side of (1a). Since our right hand side specification includes lagged growth as well as information about other policies and initial conditions (see below), we can reasonably assume that this is the case. On the other hand, an indicator for whether a program is "off track" will constitute a valid instrument provided that the Fund's judgment of whether a country is "off track" is related only to the authorities' policy effort, not to the occurrence of a bad shock. Since the Fund can generally observe such a "bad shock," this can also be reasonably assumed.

B. Output versus Growth

Should the left-hand side variable be an index of real output or should it be real output growth? Clearly, the question can only be answered in relation to the right-hand side of the equation, particularly for the structural reform indices. Most of the literature has output growth on the left and levels of structural reform indices on the right (Fischer, Sahay and Végh (1996b, 1997), Sachs (1996), Selowsky and Martin (1997), and Wolf (1998)). This makes sense if one thinks that economic reforms leading to a permanent change in, for example, the degree of openness of the economy or the ownership structure of firms will have permanent effects on growth rates as opposed to just output levels. Based on, say, endogenous growth models, this is a natural assumption which has some backing in the empirical growth literature (e.g. Sachs and Warner (1995)). Alternatively, one could argue that in the context of transition economies reforms should be viewed as important primarily for the length and severity of the transitional recession and not for growth afterwards. This would argue for regressing the output level on transition indices, as in Hernández Catá (1997), which implicitly assumes that structural reforms have permanent effects on output levels, but not on how output continues to evolve after the transition. Finally, several papers in the early literature on growth in transition take the opposite view and regress *growth* on a *cumulative* liberalization index.[10] In a panel context, a positive coefficient in this regression would imply that a reform measure that increases the liberalization index by a given amount in year t will have *permanent* effects on growth even if the measure is reversed in the following year. This is hard to justify. It thus seems safe to exclude this last approach, but the choice between the former two is difficult based on a priori arguments only.

One way of approaching the problem is to attempt to get some help from the time-series properties of the data themselves. First, one can reasonably assume that the right-hand side policy variables are stationary, as they presumably evolve (or "revert") toward some international standard defined by market economies. Conditioning on this assumption, the problem of how to define the endogenous variable then boils down to deciding whether output is I(0) or I(1). If output is I(1), changes in stationary policy variables can only have permanent effects on growth, not output. In that case, we would be in the first of the settings discussed in the previous paragraph, and the endogenous variables should be defined in terms of growth. If, on the other hand, output is I(0), we are in the second setting and the endogenous variable should be the level of output.

Table 2 reports t-values from country-by-country Dickey-Fuller (DF) and augmented Dickey-Fuller (ADF) regressions. The first column gives the Dickey-Fuller statistic using the longest available sample for each transition economy (i.e., 1990-1997 for Hungary and Poland, 1992-1997 for the FSU countries and 1991-1997 for the remainder). The next two columns give the Dickey-Fuller and augmented Dickey-Fuller statistics using the maximum sample minus one observation. The final column of the table indicates which of these two

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[10] De Melo, Denizer and Gelb (1996) and Åslund, Boone and Johnson (1996) in a cross-section context; Fischer, Sahay and Végh (1996a) in a panel context.

regressions was given preference by the standard information criteria. Finally, the last row in the table computes the "t-bar" statistic corresponding to the panel unit root test proposed by Im, Pesaran, and Shin (1997), this statistic is just the average of the individual unit root statistics.

Table 2. Output Unit Root Tests

	Max Sample 1/	Max Sample - 1		Preferred
	DF	DF	ADF(1)	Specification
Albania	-1.93	-0.67	-2.66	ADF(1)
Armenia	-8.23	-0.94	-6.84	ADF(1)
Azerbaijan	-3.78	-4.56	-4.09	ADF(1)
Belarus	-1.96	-1.83	-1.67	ADF(1)
Bulgaria	-1.26	-0.23	-0.26	DF
Croatia	-3.99	-1.82	-1.05	ADF(1)
Czech Republic	-1.44	0.19	-1.88	ADF(1)
Estonia	-4.63	-0.98	-0.56	ADF(1)
Georgia	-6.24	-2.93	-1.43	ADF(1)
Hungary	-2.32	-3.31	-3.90	ADF(1)
Kazakhstan	-1.64	-2.86	-4.37	ADF(1)
Kyrgyz Republic	-2.36	-2.67	-2.39	ADF(1)
Latvia	-8.29	-3.59	-1.47	ADF(1)
Lithuania	-3.81	-3.25	-3.23	ADF(1)
FYR Macedonia	-4.91	-18.40	-13.89	ADF(1)
Moldova	-2.14	-1.12	-1.60	ADF(1)
Poland	-0.18	0.96	-0.77	ADF(1)
Romania	-2.55	-1.23	-3.65	ADF(1)
Russia	-4.28	-2.74	-1.80	DF
Slovak Republic	-1.73	0.14	-1.02	ADF(1)
Slovenia	-0.76	0.21	-1.57	ADF(1)
Tajikistan	-1.49	-0.71	-0.79	ADF(1)
Turkmenistan	0.52	0.07	0.10	DF
Ukraine	-1.10	-2.00	-1.81	DF
Uzbekistan	-5.86	-1.91	-1.03	DF
t-bar statistics 2/	-3.05	-2.25	-2.55	
excluding Macedonia	-2.98	-1.57	-2.07	

1/ Maximum Sample = Full Sample -1.
2/ See Im, Pesaran and Shin (1997).
Note: Critical Values for T=5, N=25:
at the 1 percent level: -2.51
at the 5 percent level: -2.11
at the 10 percent level: -1.96

The table shows that the individual unit root tests reject the unit root null at the five percent level in 9 out of 26 cases using the ADF(1) test and 13 cases based on the DF test performed on the maximum sample. The t-bar statistics suggest a rejection of the unit root null hypothesis at the five or even the one percent levels, depending on the type of test. However, this conclusion is somewhat sensitive to outliers; removing FYR Macedonia from the sample imply that the ADF(1) based test could no longer reject the unit root null at the five percent level for ADF(1), although we would still reject at the ten percent level.

In summary, there is sufficient evidence against the unit root null to justify defining the endogenous variable as the output level. However, the evidence is less than fully conclusive. In addition, the fact that, with only one exception, the literature so far models the output dynamics of transition in terms of growth rather than output argues in favor of also trying growth as endogenous variable to achieve some comparability of results. Finally, as we shall see in the next section, defining the endogenous variable as growth has some important advantages in enabling us to cleanly parametrize the model in a way that distinguishes between the private and public sector effects of policies and initial conditions, and also has some advantages when it comes to presenting the results. As a result, in what follows we go both routes, i.e. define the dependent variable alternatively in levels or growth rates.

C. The Role of Structural Change

Creation versus destruction effects of policies and initial conditions

In addition to systemic transformation—i.e. the emergence of market institutions to guide resource allocation—transition involves *structural adjustment*, i.e. the decline of certain sectors of the economy and the creation of new ones, with the latter eventually leading to long-term economic growth. Since policies during transition are likely to affect both destruction and creation, the dependence of aggregate growth on policies can be written as follows (ignoring country subscripts, lagged dependent variables and country-specific variables):[11]

$$Y_t = \lambda_t Y_N(P_t, P_{t-1,\ldots}) + (1-\lambda_t) Y_O(P_t, P_{t-1,\ldots}) \tag{3}$$

where $Y_N(P_t, P_{t-1,\ldots})$ and $Y_O(P_t, P_{t-1,\ldots})$ denotes the dependence of current growth in the newly emerging and declining sectors, respectively, on current and past policy, and λ_t denotes the share of the new sectors in GDP. Clearly, λ_t is time-variant. It will be small at the beginning of transition and increase with time, and its rate of increase will depend on Y_N and Y_O.

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[11] Equivalently, this decomposition could be written with log output on the left hand side and conditioning on past log output. If the true coefficient on past log output is close to one, the decomposition would hold approximately.

Assuming that the dependence of Y_N and Y_O on policies can be captured by a linear relationship, equation (3) can be written as

$$Y_t = \lambda_t \alpha(L) P_t + (1 - \lambda_t)\beta(L) P_t \tag{4}$$

where $\alpha(L)$ and $\beta(L)$ denote lag polynomials. In general, the coefficients of α and β will not the same; in many cases one would even expect them to be of opposite sign (for example, liberalization may hurt the old sectors but help the new ones).

Suppose that one runs a regression of growth on current and past levels of policies, as in Selowsky and Martin (1996) or de Melo, Denizer, Gelb and Tenev (1997). If (4) is the appropriate specification, such a regression amounts to an attempt to estimate a composite "coefficient" $\lambda_t \alpha(L) + (1 - \lambda_t)\beta(L)$, a weighted average of potentially offsetting effects with time-varying weights. In particular, if λ_t increases in time and the α coefficients are positive while the β coefficients are negative, the effect of, say, further liberalization on growth would always be underestimated.

To estimate the effect of policy measures today on growth today and in the future, it is necessary to isolate the time invariant components of (4). Provided one has a measure of λ_t, this is straightforward. Ignoring country-specific variables, one needs to run a regression of the form:

$$Y_t = a_1(L) P_t + a_2(L) \lambda_t P_t + \varepsilon_t \tag{5}$$

Comparing the coefficients of (5) and (4), it is clear that $a_1(L)$will identify $\beta(L)$ while $a_2(L)$ will identify $\alpha(L) - \beta(L)$, so that an estimate of $\alpha(L)$ can be recovered by adding $a_1(L)$ and $a_2(L)$. Using measures of the private sector share in GDP as proxies for λ_t , we estimate a generalized version of this equation in Section III.

Time-varying effects of initial conditions

A related question is whether the effects of initial conditions can be assumed to continue with the same intensity over time. In a panel regression context, the existing literature tends to treat initial conditions as observable country-specific fixed effects (in practical terms, the same value of the initial condition is entered into the data set for each year of the sample). For a study on transition, this seems much too strong an assumption: the impact of inherited macroeconomic distortions, for example, would be expected to vanish as the economy is liberalized and stabilized, and would no longer have a notable influence on output thereafter.

To allow the regression model to account for this type of structure one would need to fit a time path for each initial condition allowing a decaying effect over time and encompassing a flat path as a special case. For example, one could fit an exponential function $ae^{(-b)x_i t} + c$,

where t stands for transition time, x_I is the initial condition for country I, and a, b, and c are parameters to be estimated. The problem is that this requires non-linear estimation of the entire model, which proved infeasible in practice given our large initial number of regressors and the large number of regressions required at the model specification stage (see next section). To retain linear estimation, one is forced to fit the time path of initial conditions as a time-polynomial, such as a cubic function of time. However, this is impractical as a basis for simplifying the time path and testing the hypotheses that interest us. For example, testing that the effect of the initial condition becomes zero and stays zero after some time is impossible on the basis of a cubic function.

As a result, we took the following two-step approach. In a first step, we estimated a cubic time path for each initial condition. In the second step, we approximated the estimated time path via a piecewise linearization (see Appendix for details). This involved estimating the following three-parameter functional form for each initial condition x_I:

$$ax_iD_\tau + bx_iD_\tau t + cx_I(1 - D_\tau) \tag{6}$$

where $D_\tau \equiv 1$ for $t \leq \tau$ and 0 else; t, as before, is transition time, and τ is a parameter we picked on the basis of the third order polynomial fitted first. In other words, for each initial condition, we fitted a piecewise linear function which allowed the data to choose (I) an initial effect (intersection with the y-axis, given by parameter a), (ii) the slope of a linearly increasing or decreasing time path, (iii) the level of a flat effect after $t = \tau$. We then went on to test hypotheses on this functional form to attempt further simplification, e.g. ruling out discontinuities between the linear segments of the function, or testing whether the initial condition becomes zero ($c = 0$). In the end, this enabled us to characterize most initial conditions using only one or two parameters.

D. Omitted Variables, Robustness, and Path Dependency

Since many of the policy variables and initial conditions are mutually correlated, it would clearly be incorrect to test their significance "one or two at a time". For example, a regression equation featuring only the policy variable of interest (plus, say, a few non-policy controls, as in DDG (1996), pp. 10-11) will be misspecified unless the omitted policy variables are either uncorrelated with those included or have no effect on output or growth. This cannot safely be assumed.

The alternative is to estimate a general model that includes all major policy variables and initial conditions which might have some bearing on growth. For this model, the absence of misspecification can be assumed, and as a result, valid inferences can be based on it. The obvious drawbacks of this approach is that we might not have sufficient data points to estimate such a model at all, or if we do, that the parameter estimates of interest might lack precision

and consequently the tests we want to conduct might have very low power. At worst, we might not be able to detect any significant policy effects at all.

It is important to realize that if the true coefficients on the variables in the general model are in fact non-negligible and mutually correlated, we cannot do any better than estimate the most general model possible. In this case, the information used to estimate the model parameters (including control variables which are themselves of little interest) is well spent—it prevents us from conducting a possibly erroneous inference based on a misspecified model—and the only way to improve our results is to get more data, or maybe more prior information that would enable us to restrict the model in good conscience. If, however, some of the true coefficients are in fact zero or negligible, then the information used on estimating them is wasted. Excluding the negligible variables would have led to more precise estimates of the parameters of interest without misspecifying the model.

To address this trade-off, we apply the following approach, which is a loose application of David Hendry's "General-to-Specific" methodology.[12] First, we estimate the model in the most general form that is feasible under the current data set. This includes a rich set of initial conditions, which are fitted assuming the flexible time structure described above. As an alternative, we also estimate the model using country-specific dummies (fixed effects) instead of initial conditions. At its most general level, this includes 26 country-dummies plus 26 interaction terms with the private sector share for each country dummy.[13]

Next, we apply a sequence of F-tests to reduce the models to more parsimonious specifications admissible under our data set. This leads to the problem of path-dependency. The order of elimination clearly matters: for example, it is typically the case that most policy variables we are interested in could be "legally" excluded early on from the model as individually or jointly not significant. Thus, it is possible to obtain parsimonious specifications where these variables play no role at all.

In order to obtain stronger results on the significance and quantitative importance of policy variables and initial conditions, one must move beyond an entirely agnostic position in

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[12] Ericsson, Campos and Tran (1990). For outside views, see Pagan (1987) and Hayo (1997).

[13] Using country dummies avoids the problems of selecting and appropriately measuring potentially relevant initial conditions, which may lead us to omit relevant country-specific effects. However, it also has substantial disadvantages: (1) the fact that we cannot say anything about the role of initial conditions in the context of a fixed effects model; (2) potential for misspecification due to the fact that the strong exogeneity assumption underlying fixed effects models is likely to be violated, even when instrumenting for the contemporaneous macro variables and even when there are no lagged dependent variables in the model; (3) restrictive timing assumptions that could misspecify the dynamics of the model (countries are "stuck" with their fixed effect through the length of the transition period). Note that fitting a more general time structure is not feasible, as this would at least double the country-specific parameters, from 52 to 104.

which all variables in the general model are assigned equal prior importance. To make this process as transparent as possible, i.e., give the reader a sense of how the priors influence our results and what the sensitivity of the results would be to the adoption of different sets of priors, we work in two broad steps. Reflecting our interest in the role of policies, we begin by adopting the following minimalist simplification convention: we *always* simplify first among time constants, then initial conditions (or country-dummy interaction terms, see Appendix), and finally policy variables. The justification for this is to give the set of policy variables a chance of being estimated with reasonable precision before we decide whether and which policies matter.

The remaining path-dependency problem—including dependence of the parsimonious specifications on how we simplify *within* the set of policy variables—is dealt with from two angles:

- We begin by showing the reader how broad the range of admissible specification would be if—conditional on the specification(s) achieved after simplifying among time dummies and country-specific variables—we attempted to eliminate the main sets policy variables (i.e. fiscal balance, inflation, and three structural reform indices: price and internal liberalization, external liberalization and private sector conditions). In other words, we show all admissible simplification paths that result from testing the statistical significance of policy variables as groups (i.e. including all lags and interaction terms). This is somewhat akin to sensitivity analyses by Leamer (1983) and Levine and Renelt (1992) in that we are trying to map out the sensitivity of the results to a range of "extreme priors", i.e. priors that contend that certain sets of variables should not matter at all.

- While the imposition of these extreme priors is useful in the context of a sensitivity analysis, neither we nor (we suspect) most readers would actually want to embrace any of them. Our second angle is thus to adopt a more mainstream set of priors and simplification rules which is sufficiently strong to yield a reasonably small set of parsimonious specifications, i.e. a set which can be characterized by showing the regression results for two or three "final" models. These rules include: (i) simplifying macroeconomic variables before simplifying structural reform variables (thus giving the latter an advantage in terms of estimation precision during the model reduction process);[14] (ii) moving sequentially from one variable group (e.g. internal liberalization with its lags and interaction terms) to the next; (iii) exploiting *within* group simplification possibilities—conditional on never deleting interior lags and testing lags "from the back"—rather than testing for the significance of the entire group first. In some of the models presented below, this latter rule was critical in avoiding the extreme outcomes traced out by the sensitivity analysis, i.e. the elimination of several variable groups altogether. The economic assumption

[14] This reflects the fact that, while stabilization could be important, structural reforms are the driving force of the transition process in most models of transition.

underlying this rule is that all three structural reform indices are potentially important, and should thus be given a chance to survive in the model by eliminating insignificant lags prior to the decision whether to eliminate the index entirely, i.e. with all lags and interaction terms.

All regression results reported in this paper obey these three rules in addition to the "minimalistic" hierarchy among variable groups established earlier. While they may be sensitive to relaxations or reversals of these rules (within bounds implied by the sensitivity analyses performed separately) the results are robust in the sense that variations *within* the guidelines described below will not affect our results beyond the ranges suggested in the tables. In addition, the coefficients reported are robust in the sense that *beginning* with any of the specifications reported below, the addition of other variables from our data set will not result in a statistically significant change in the remaining variables.[15]

III. Estimation

A. Data

The sample period spans the transition period for 10 CEE countries, the three Baltic Republics, 12 CIS countries, and Mongolia. It covers the period 1990 to 1996 for Hungary and Poland, 1991 to 1996 for the remaining CEE countries and Mongolia, and 1992 to 1996 for Baltics and the CIS countries. Our left-hand side variable is either the logarithm of an index of real Gross Domestic Product or the annual growth rate of real GDP. As stated in the introduction, we use official GDP numbers (or, in some cases, IMF estimates based on official GDP numbers) which suffer from considerable, well-known, measurement problems, and in particular are widely believed to overstate the initial output decline by inadequately capturing newly emerging activities and by using pre-transition relative prices, which tend to give low weight to new activities.[16] However, the only practical alternative—output estimates based on

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[15] The t-statistics resulting from our general-to-specific procedure have the unfortunate feature that they are biased upwards to the extent that they are themselves used to select the variable for inclusion in the regression. We report and use them in good conscience based on three considerations. First, this is a general problem with all investigations in which the final specification depends on the data; our procedure is much more transparent than typical ad hoc methods. Second, we systematically explore robustness to alternative model reduction paths, giving a sense of the range of confidence we can have about model specification. Finally, as argued in Hendry (1995), the reported t-statistics are correct to the extent that the general-to-specific procedure has in fact recovered the true model.

[16] See Dobozi and Pohl (1995), Kaufmann and Kaliberda (1996) and Bloem, Cotterell, and Gigantes (1996). In the context of specific countries, see Berg (1993), Gavrilenkov and Koen (1994), and de Broeck and Kostial (1998).

electricity consumption—seems even more problematic for the purposes of a panel regression, quite apart from the fact that these estimates are not available for all countries in our sample.[17]

Our right-hand side data falls into the following categories:

- Macroeconomic variables. This includes the fiscal balance as a percentage of GDP (*Fbal*), the natural log of one plus the CPI inflation rate (expressed as a decimal) (*Inf*) and a dummy for the exchange rate regime. Inflation is our main stabilization proxy. Controlling for inflation, the fiscal balance could be expected to have an effect on growth either through crowding out or through a short run aggregate demand stimulus. The rationale for including the exchange rate regime, finally, is the notion that the output costs of stabilization might depend on whether monetary or exchange rate targets are used. For all macro variables, IMF data was used.[18]
- Structural reform indices. These consist of an index of internal liberalization (*LII*), which scores price liberalization and the dismantling of trading monopolies in domestic markets; an index of external liberalization (*LIE*) which measures the removal of trade controls and quotas, moderation of tariff rates and foreign exchange restrictions; and an index of private sector conditions (*LIP*) which measures progress in privatization and financial sector reforms. These indices were constructed by de Melo, Denizer and Gelb (1996a, b); we updated them for 1996 using information on recent structural reforms from the 1996 EBRD Transition Report.[19]
- Initial conditions. We drew on a data set put together by de Melo, Denizer, Gelb and

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[17] Two problems of electricity consumption-based estimates stand out: (i) they assume constant output elasticities of electricity consumption along time; (ii) they involve somewhat arbitrary assumptions about the magnitude of this elasticity across countries. As Koen (1995) has pointed out, these are implausible assumptions for transition economies undergoing fundamental structural changes, including drastic changes in relative prices, a large potential for energy savings, and substantial shifts in the structure of production (e.g., strong growth in services sectors). In the context of a panel regression, these are particularly serious issues as the speed of these changes is likely to vary substantially across countries.

[18] We also made an attempt to include variables capturing credit to the private sector and the size of government (as a proxy for distortions through taxation and large public sectors). Unfortunately, the most desegregated credit variable that could be obtained for all 26 countries in our sample was total bank credit to the non-government sector; this includes state enterprises in most countries. In the case of data on the size of government (government consumption) the available data did not seem comparable across different sources and we could not find a source that supplied data on all or even most countries over our sample period.

[19] EBRD (1996). The indices are published in November of each year and reflect the EBRD's assessment of the level of reforms at about mid-year.

Tenev (1997). This includes data on initial (i.e. pre-transition) levels of per capita income in PPP terms (*ypc89*) and growth (*GrIni*); degree of urbanization (*Urban*), natural resource endowment (*NatRR*, a dummy variable for natural resource rich countries), initial macroeconomic distortions as measured by estimates of repressed inflation (*RepInf*) and/or actual fiscal imbalances and inflation just prior to the elimination of planning, initial economic structure including the share of agriculture (*AgSh89*), trade dependency (*Traddep*) and a measure of overindustrialization (*OverInd*), time under communism, and the state of pre-transition reforms, i.e. liberalization steps taken before the final collapse of central planning (*LIIni*). For precise definitions of these variables, see notes to Table 5.

- Other controls. This included average growth in the OECD, the terms of trade, and dummies for war or conflict episodes.
- Private sector share estimates. These were only used for the purposes of creating interactions with other variables (see Section II above). We constructed these estimates by combining information provided in the EBRD's Transition Reports, the World Bank's 1996 World Development Report, country data on shares of employment in the non-state sectors compiled by the World Bank, and, in some cases, estimates from IMF economists working on these countries (for details, see Appendix). The notation used for these interaction terms is to precede the variable name with the letter "*l*" (i.e., "*lInf*" stands for the private sector share times year on year inflation). We recognize that private sector shares are only a crude approximation to the "new" sector share, in particular, because the private sector may include privatized "old" industries which are not necessarily restructured (see Aghion and Carlin (1996)). However, there is no superior measure available at this point.

The most obvious absentee from our list of right-hand side variables is a measure of property rights and the quality of the legal framework. Several sources have recently constructed related indices,[20] but they are only available for the last few years of our sample period (typically from 1994 or 1995 onwards), and do not exist for all countries.

At the most general level, we included first and second lags of the macroeconomic variables and first, second and third lags of the structural indices in the model, in addition to the contemporaneous variables. However, we also took the view that these lags should not be allowed to extend into the pre-transition period, as the collapse of the central planning system implied a drastic structural break in most countries. Furthermore, pre-transition information is already being independently captured through initial conditions (which include information on pre-transition liberalization). Thus, zeros were substituted for the pre-transition values of lagged output and the policy variables; these truncated lagged variables were then used in conjunction with time dummies for the early transition years for which these truncations were

[20] The EBRD (beginning with the 1995 *Transition Report*) and the Heritage Foundation's *Index of Economic Freedom*, amongst others.

relevant. In the tables, the use of a truncated series is indicated in the tables by the letter "*s*" (for "sample") following the lag number.

B. Results

We start with two general regressions involving all the variables described above: one with growth on the left hand side and one with output in levels. Neither is satisfactory: with such a large number of regressors, the data are not sufficient to pin down the coefficient values.[21] We thus conduct a first round of model simplifications, in which time dummies and initial conditions are tested and, if possible, eliminated following a general-to-specific approach. As it turns out, this does not lead to a unique outcome for the class of models with growth on the left hand side, even with some prior assumptions on the relative importance of the various initial conditions.[22] However, the extent of remaining path dependency can be well summarized by *two* outcomes. As a result, for the models with growth on the left hand side, the analysis that follows is based on two alternative ways of modeling the effect of initial conditions; there is one specification with output as the dependant variable.

Even with this simplification of the specification of time dummies and initial conditions, there are still too few degrees of freedom to draw confident inferences about the effects of policy and macroeconomic variables. For each of the three basic models, we thus carry out two sorts of analysis, as described at the end of Section II. First, we show the extent to which the main policy variables can be legally eliminated from the model. Second, we present the results from a final set of "parsimonious" specifications at which we arrive after continuing to simplify following the guidelines discussed in Section II

Sensitivity Analysis of Policy Variables

Figures 3 and 4 show the scope for elimination of policy variables when testing for the significance of each policy variable as a group that includes all lagged terms and interaction terms. Figure 3 shows two trees, 3a and 3b, one for each of the two variants with growth on the left hand side. Figure 4 shows the exclusion possibilities with output as the dependent variable.

Below the long box at the top of each figure, we show the results of all exclusion tests on the five main groups of policy variables: Fiscal Balance (*Fbal*) and Inflation (*Inf*) (referred to below as the "macroeconomic variables") and the three structural reform indices *LII*, *LIE* and *LIP*, each with lags and interaction terms. The model is then simplified by eliminating groups of variables for which exclusion from the model could not be rejected

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[21] For an alternative set of results from regressions involving country dummies instead of initial conditions, see the Appendix.

[22] The Appendix explains fully the different assumptions involved; the differences in the resulting specifications for initial conditions are described below.

Figure 3a: Exclusion Possibilities from Model with Growth on LHS (Variant A)

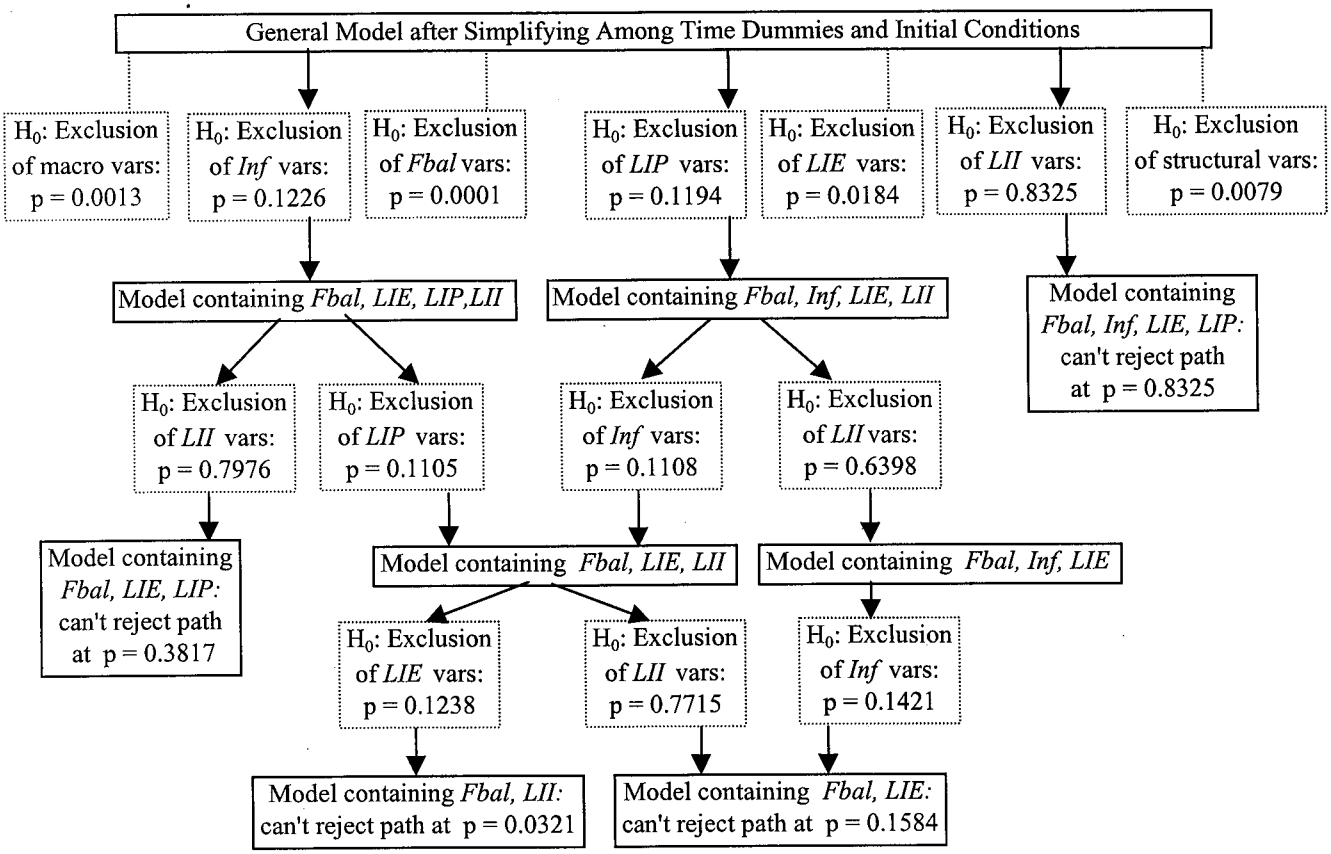


Figure 3b: Exclusion Possibilities from Model with Growth on LHS (Variant B)

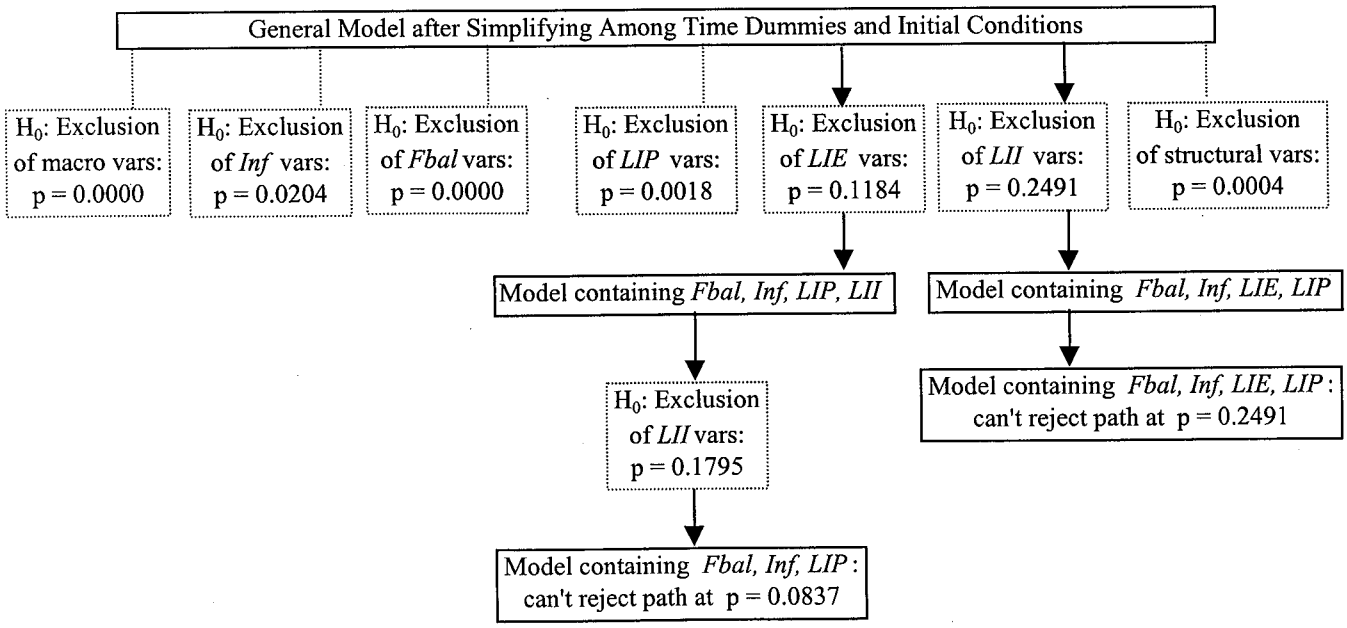
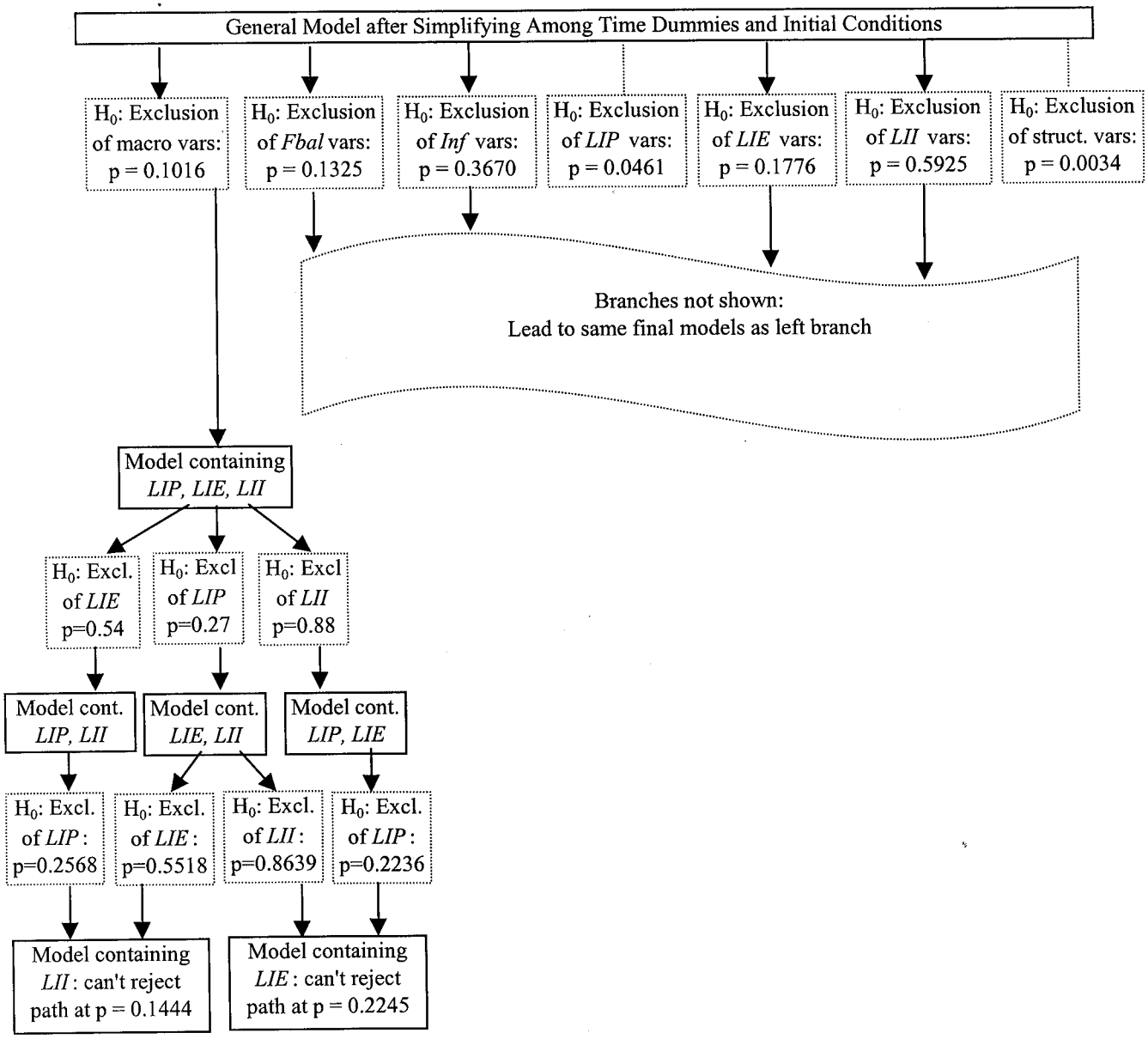


Figure 4: Exclusion Possibilities from Model with Output on Left Hand Side



at the 0.1 level. At the next level, exclusion tests are repeated for the remaining groups of variables (however, only the test results for variable groups with $p > 0.1$ are shown). The process is repeated until all groupwise elimination possibilities are exhausted. The boxes at the end of each tree state the policy variables remaining and in addition give the p-value associated with testing whether the exclusion restrictions imposed along the path leading to the specific model can be *jointly* rejected or not.

The main results are as follows:

- The hypotheses that *none* of the macroeconomic policy variables matters and/or that *none* of the structural policy variables matter are strongly rejected in both figures 3a and 3b, i.e. in all tests with growth on the left hand side.
- Within the group of structural variables, *LIE* is impossible to eliminate at the most general level in Figure 3a while *LII* (conditioning on the presence of *LIE*) is easiest to eliminate. Note that stepwise elimination in Figure 3a suggests at first that the elimination of *LIE* is possible provided that *LII* remains in the model, but the path that leads to the elimination of *LIE* turns out to be inadmissible at the five percent level when the restrictions embodied in it are tested as a group ($p=0.03$). In addition, fiscal balance can never be eliminated.
- Figure 3b, while agreeing with Figure 3a that *some* macroeconomic and *some* structural policy variable matters, shows *LIP* rather than *LIE* or *LII* as the most robust structural policy variable. Regarding the macroeconomic variables, it now turns out that *neither* fiscal balance nor inflation can be eliminated in any of the final branches of the tree.
- Finally, it is much easier to eliminate policy variables from the "levels specification" of the model (output on the left-hand side) than from the "growth specification" (Figure 4). The surviving variables are structural policy variables (either *LIE* or *LII*), while macroeconomic variables do not survive.

In summary, based on the above, it is only possible to say that *some* structural variable and (in the context of the regressions with growth rates on the left-hand sides) *some* macroeconomic variables are important, but not *which*.

An analogous sensitivity analysis based on country dummy regressions (see Appendix) concurs with the above results. Both some macroeconomic and some structural variables are robust in the models with growth on the left hand side, but weaker results obtain in the model with output on the left-hand side. However, in the latter class it is now the structural variables which can be eliminated, while the macroeconomic variables survive. The previous finding that *some* structural reform index is important without being able to say *which* reappears in the context of the models with growth on the left hand side. Given the correlation of the three

structural reform indices, the inability of the data to discriminate within this group is perhaps not surprising.

Regression Results

We now move to the regression results which follow from the stronger but still reasonable set of priors discussed at the end of Section II. Most critically, we test macroeconomic before structural variables. We also simplify among lags and interaction terms for a variable (for example LIP) before moving on to test the significance of the next variable. Finally, we test the variables in a sequence that reflects prior beliefs about the relative importance of the variables (we test the least likely variables first). Although there are still several admissible variations of the final model after adopting these rules (depending on whether one begins by simplifying *LII*, *LIE* or *LIP* among the structural variables), the resulting variable sets and coefficient are quite similar and do not lead to qualitatively different conclusions. For each of the three basic specifications that follow from the simplification of initial conditions and time dummies, we thus concentrate on one of these admissible variations in discussing the results (Table 3).

In the case of the growth specification (growth of output on the left-hand side), this leads to two final models ("gA" and "gB"), one for each of the two variants of initial conditions specifications discussed above, while in the class of models with output on the left hand side there is just one final model ("y"). All three models were estimated in two variants: OLS (i.e. ignoring the potential endogeneity problems discussed above) and IV (using Fund program targets as instruments for the contemporaneous macroeconomic right-hand side variables). As it turns out, somewhat surprisingly, the use of IV makes little difference to the results. To keep the presentation manageable, we only show and discuss the OLS results below (Table 3). The IV versions are reproduced in the Appendix.

(i) Policy Variables. Focusing first on the two growth specifications and the **macroeconomic variables**, note that there are no important contradictions between specifications gA and gB. In particular, increases in **inflation** have a strong adverse effect on private sector growth (sum of the coefficients on *DInf* and *DlInf*)[23] and a positive effect on state sector growth. However (and unlike the regression model involving country dummies, see Appendix), we do not see a contemporaneous effect of inflation *levels* on growth. However, we do find such a contemporaneous effect of the **fiscal balance** on growth. The signs of the private and public sector effects are somewhat paradoxical (recall that a positive fiscal balance means a surplus), as they suggest that tight fiscal policy, i.e. small deficits or large surpluses, sustain production/growth in the state sectors but negatively impact the private

[23] Recall from Section II that the coefficient on the interaction term measures the *difference* between the growth effects of the variable on the public and private sectors. A significant coefficient indicates that the hypothesis of an identical effect on the two sectors is rejected. To obtain the effect on the private sector, one needs to add both coefficients

Table 3. Regressions including Initial Conditions:
Coefficients on Lagged Endogenous Variables and Policy Variables

Variable	Dependent Variable: Growth				Dep.Variable: Output	
	Model gA (OLS)		Model gB (OLS)		Model y (OLS)	
	Coefficient	(t-value)	Coefficient	(t-value)	Coefficient	(t-value)
Output-1s					0.821	(14.87)
Output-2s					0.116	(2.1)
Output-3s					0.014	(3.25)
lInf-2s					-0.014	(-0.75)
DInf	3.426	(2.03)	5.807	(3.90)		
DlInf	-15.636	(-2.89)	-18.488	(-3.90)		
Fbal	0.588	(3.49)	0.910	(6.90)		
lFbal	-1.356	(-2.86)	-2.275	(-5.69)		
Fbal-1s			-0.232	(-3.59)		
lFbal-1s					-0.008	(-2.81)
Fbal-2s					0.002	(2.14)
DFbal-1s	-0.235	(-3.69)				
LII	-16.438	(-1.62)				
lLII	55.924	(2.13)				
DLII-1s			9.421	(2.68)		
LII-2s					0.109	(1.94)
LIE	28.308	(2.47)	8.502	(2.10)	-0.616	(-5.40)
lLIE	-50.508	(-1.61)			1.769	(4.86)
LIE-1s	12.336	(1.41)	0.771	(0.18)	0.582	(4.55)
lLIE-1s	-22.068	(-0.80)			-1.730	(-4.30)
DLIE-2s	-33.190	(-2.98)	-33.916	(-3.15)		
DlLIE-2s	64.723	(2.56)	85.984	(3.63)		
LIP			-14.313	(-1.83)	-0.282	(-1.88)
lLIP			102.300	(5.93)	1.612	(3.11)
LIP-1s			-25.259	(-3.89)		
lLIP-1s					-0.728	(-2.73)
DLIP-1s	-49.831	(-2.90)				
DlLIP-1s	108.780	(2.76)				
Memorandum Items						
k	34		27		38	
R^2	0.86		0.85		0.96	

Variable Definitions: Output is natural log of an index of real output; Growth is annual average output growth (in percent), Inf is natural log of (1+p), where p denotes average annual inflation expressed as a fraction; Fbal is the fiscal balance (in percent of GDP); LII, LIE and LIP are de Melo, Denizer and Gelb's (1996) indices of internal liberalization, external liberalization, and private sector entry conditions, respectively (see text). Notation: the prefix "l" denotes an interaction (multiplication) with the estimated private sector share; "D" denotes the first difference operator. The suffix "s" denotes that the series only contains observations corresponding to the transition sample, i.e. pre-transition lags are truncated (replaced by zero entries), see text. Estimation sample: N = 143

sector. Since this is a contemporaneous effect, one might suspect that it is driven by reverse causality, however, the effect shows even in the instrumented regressions (see Appendix). We are thus left with something of a puzzle: while the negative effect of a contraction on the private sector could consistent with an aggregate demand effect (in particular, since we are already controlling for inflation in this regression), the positive effect on the state sector is hard to interpret. Finally, note that the effects of macroeconomic variables appear very weak in the levels version of the model, consistent with the sensitivity analyses above. In particular, we see no effect of inflation and no contemporaneous effect of fiscal balances. There is, however, a lagged effect of *Fbal* along the same lines as the contemporaneous growth effect (positive on state sector, negative on private sector).[24]

Turning to the **structural variables**, note the effect of **internal liberalization** in specification gA, namely a contemporaneous positive impact on private sector growth but *destructive* impact on the state sector. This is in line with standard theory on the creative and destructive effects of structural reforms. Unfortunately, the effect does not seem robust: in model gB we merely find a positive lagged effect of the increase in the internal liberalization index on growth, i.e. without distinction between private and public sector effects. For the case of the **external liberalization** index (*LIE*), an interesting pattern emerges. On impact, and perhaps contrary to expectations, the effect of external liberalization on the *state* sector is *positive* while in specification gA the private sector effect appears negative (although it is borderline insignificant). As is clear from adding the two contemporaneous coefficients, the positive state sector effect (coefficient on *LIE*) outweighs the negative private sector effect (sum of coefficients on *LIE* and *lLIE*). As time passes, however, the two effects reverse sign. At two lags, the effect on the state sector is negative and on the private sector positive in both specifications. At one lag, both effects are positive and a significant difference between the effects cannot be detected. Finally, for the index reflecting privatization and **private sector conditions**, we find insignificant contemporaneous effects on growth in Model gA, but significant effects of *changes* in *LIP* after one lag, in the direction which theory would predict (destructive on the state sector, creative on the private sector). In contrast, for models gB and "y" we see the same qualitative contemporaneous effect of *LIP* that we found for *LII* in the case of model gA, namely a destructive effect of *LIP* (in levels) on the state sector and a much stronger creative effect on the private sector.

Of these findings, those referring to *LIE* are clearly the hardest to interpret. One might have expected external opening to be associated with an immediate destructive effect on the state sector and creative effect on the private sector, as we find after two years. However, the fact that the direction of these two effects is reversed is not as implausible as it may seem at first. In particular, at the beginning of transition a country's exportables, which should benefit from external opening, are probably concentrated in the state sector (energy, manufacturing).

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[24] The fiscal balance may be particularly poorly measured. For example, quasi-fiscal deficits in the banking system are measured only when they are brought on budget, which may happen more rapidly in advanced reformers. Moreover, inflation interacts with the budget deficit insofar as nominal interest payments are included in expenditures.

While consumer goods, which are especially vulnerable to import competition, were initially produced in both the state and the (small) private sector, they are likely to constitute a larger share of the latter. In addition, state sector production is likely to be initially less vulnerable to import competition than the private sector as it enjoys greater state support (via credit and direct subsidies). After a few years, however, one would expect this support to taper off as budget constraints are increasingly enforced, while the easing of import constraints benefits newly emerging private firms.

Given the fairly complicated dynamics implied by the coefficients on the three policy indices and the partly contradictory effects on the state and private sectors, the discussion so far makes the overall **effects of structural reforms over time** (say, from the beginning of transition) difficult to gauge. To clarify these effects, Table 4 combines the coefficients on all three structural reform indices from both versions of the growth model of Table 3 to show how a 0.1 increase in *LII*, *LIE* and *LIP* at t = 0 would have affected growth during transition. The top two lines of each panel reflect the separate effects on the state and private sectors. The rest of each panel contains weighted averages of these two lines using a set of actual paths of the private sector share. In addition to the average BRO and non-BRO private sector shares over time, we pick three countries as examples within each of these groups. The idea is to show countries who differed widely in terms of their (estimated) initial share of the private sector and subsequent paths: thus, Albania started out with a very low share (an estimated 0.05) but privatized quickly, Turkmenistan started out with a low share (0.1) that remained low, Bulgaria stated out with a low but somewhat higher share (about 0.17) that grew rather slowly, and the Czech Republic and Estonia started out with shares in the 0.2 to 0.25 range that grew quickly, reaching about 0.7 by the fifth year of transition. Russia represent an intermediate case, it started out at a little around 0.25 in 1992 and is estimated to have reached 0.6 in 1996. The growth effects shown in Table 4 for each country condition on these realized paths of the private sector share; thus, the table shows what would have happened to growth at the margin in reaction to an increase in reforms. Since models gA and gB do not contain lagged endogenous variables (they were found to be insignificant and eliminated in the course of the model simplification process), the paths of Table 4 are essentially impulse responses with respect to a change in structural policies at the beginning of transition policy variable, treating the private sector share as exogenous.

The main robust finding of Table 4 is that structural reforms in aggregate help all countries in the later transition years and helps most of them even in the early transition years, with only one exception. Thus, while reform tends to hurt the state sector, our findings offer little support for the widespread view that structural reforms have an aggregate "destruction effect" at the beginning of transition, which importantly contributes to the initial output decline. [25] The main exception is Turkmenistan, which kept its private sector share so low

[25] For example, see Havrylyshyn et al. (1998).

throughout the transition that the opposite effects of structural reform on the private and state sector in model gB continue to imply a negative aggregate effect even in the later years.[26]

Table 4. Growth Effects of a Permanent 0.1 Increase in Structural Reform Indices at t = 0 (Initial Conditions Models)

		Transition Time					
Model	Sector or Country	0	1	2	3	4	5
gA	state sector effect	1.19	-2.56	-0.90	2.42	2.42	2.42
	private sector effect	1.73	6.65	3.91	0.76	0.76	0.76
	non-BRO average	1.29	-0.08	0.73	1.68	1.61	1.49
	Albania	1.21	-1.56	0.94	1.59	1.42	1.17
	Bulgaria	1.28	-0.15	0.36	1.87	1.82	1.77
	Czech Republic	1.31	0.54	0.69	1.35	1.25	1.17
	BRO average	1.28	-0.47	0.56	1.82	1.70	
	Estonia	1.32	1.11	1.75	1.39	1.29	
	Russia	1.31	0.47	1.51	1.45	1.42	
	Turkmenistan	1.25	-1.43	-0.18	2.17	2.09	
gB	state sector effect	-0.58	-2.09	-6.42	-3.03	-3.03	-3.03
	private sector effect	9.65	8.14	12.41	7.20	7.20	7.20
	non-BRO average	1.43	0.67	-0.06	1.51	1.94	2.72
	Albania	-0.07	-0.98	0.80	2.09	3.11	4.64
	Bulgaria	1.24	0.59	-1.49	0.35	0.65	0.96
	Czech Republic	1.80	1.36	-0.19	3.55	4.13	4.64
	BRO average	1.23	0.24	-0.70	0.66	1.38	
	Estonia	1.97	1.99	3.93	3.31	3.93	
	Russia	1.82	1.28	2.99	2.90	3.11	
	Turkmenistan	0.53	-0.83	-3.60	-1.50	-0.98	

[26] Of course, this does *not* imply that structural reforms "would not have worked" in Turkmenistan, since the estimated reaction to a 0.1 increase in structural reforms at the beginning of transition conditions on the actual private sector share, which in fact resulted *inter alia* from absent or very slow reforms over the transition period. Put differently, a lesson from model gB is that structural reforms at the beginning will only help if they are continued with a minimum consistency in the outer years, in a way that allows some rise in the private sector share.

A number of differences between models gA and gB underline the sensitivity of some of our findings to model specification. In model gA, contractionary effects of reforms on the state sector are registered only temporarily, particularly at $t = 1$, i.e. with a one year lag after the beginning of the reform experiment. This is driven by the negative lagged effect of *changes* in *LIP* on the state sector (see variable *DLIP-1s* in Table 3), and is consistent with results from the regression models using country dummies (see Appendix). In contrast, in model gB the contractionary effect on the state sector is permanent, driven by the negative coefficient on the *level* of *LIP*. In the aggregate, this effect is more than offset by a large positive private sector effect of the same variable.

(ii) Initial Conditions. As described in Section II, the initial conditions were parametrized in a way that allowed us to model and test time-varying effects, namely by approximating generally non-linear time paths by piecewise linear functions of time which were subsequently simplified by testing various exclusion and equality restrictions. The disadvantage of this procedure is that it yields estimation coefficients on piecewise linear time paths which require some extra notation and are hard to interpret without actually plotting them. Rather than discussing the coefficients, in Table 5 we show the time paths implied by these coefficients, for each initial condition surviving in the final model models. The coefficients themselves are tabulated in the Appendix.

The thought experiment underlying Table 5 is analogous to that of Table 6: what would be the change in the growth rate (or, in the case of model y, in the output level) in each transition year if *before* the beginning of transition the initial condition variable had been larger by one unit, everything else equal? "Everything else equal" implies that we ignore any dynamics via lagged dependent variables; thus, the time paths can be interpreted as impulse response functions only in the case of models gA and gB, which have no lagged dependent variable in the model . For the case of model y, however, there are several lagged dependent variables (see Table 5). In this case, the time paths of Table 5 are really no more than a way of representing the coefficients on the initial conditions terms.

In interpreting Table 5, note that the magnitude of the effects *across* initial conditions can obviously only be compared when the units are the same, i.e. only for the cases where initial conditions are being measured in percent. Observe also that whenever we found a significant difference in the effects of a particular variable on the state and private sectors (i.e. an interaction term with the private sector share that insignificantly different from zero), we show both effects; if only one line is shown (as in the case of *Traddep*) this means that the hypothesis of identical effects on both sectors could not be rejected.

The overall impression from Table 5 is that the effects of individual initial conditions are fairly similar across the three specifications shown. The robust effects are as follows:

- higher **trade dependency** has an adverse aggregate effect on the initial output decline

Table 5. Effects of Initial Conditions in Transition Time

Variable	Units	Effect by sector	Model gA (OLS) Transition Time 0	1	2	3	4	5	Model gB (OLS) Transition Time 0	1	2	3	4	5	Model y Transition Time 0	1	2	3	4	5
			(change in the growth rate, in percentage points, from a unit change in the initial conditions variable)												(perc. effect on output level of unit change)					
GrIni	percent		-2.3	0.0	0.0	0.0	0.0	0.0	...	...	...	...	...	...	-7.3	0.0	0.0	0.0	0.0	0.0
ypc89	ln of $ per capita	private	...	...	...	...	...	...	...	...	...	...	...	...	27.9	-2.9	-5.8	-5.8	-5.8	-5.8
		state	...	...	...	...	...	...	...	...	...	...	...	...	27.9	-2.9	-5.8	-5.8	-5.8	-5.8
dInf-1	ln(1+π)		-10.4	0.0	0.0	0.0	0.0	0.0	-17.7	0.0	0.0	0.0	0.0	0.0	-0.5	0.0	0.0	0.0	0.0	0.0
dFbal-1	percent of GDP	private	-6.2	0.0	0.0	0.0	0.0	0.0	...	...	...	...	...	...	...	...	...	...	...	...
		state	1.3	0.0	0.0	0.0	0.0	0.0	...	...	...	...	...	...	...	...	...	...	...	...
RepInf	percent	private	0.6	0.3	0.0	0.0	0.0	0.0	0.8	0.5	0.1	0.1	0.1	0.1	-16.5	0.6	0.6	0.6	0.6	0.6
		state	0.6	0.3	0.0	0.0	0.0	0.0	0.8	0.5	0.1	0.1	0.1	0.1	5.8	0.0	0.0	0.0	0.0	0.0
NatRR	dummy (0 or 1)	private	-5.9	-5.9	0.0	0.0	0.0	0.0	-10.7	-8.0	-5.3	-2.7	0.0	0.0	-4.8	-4.8	-4.8	-4.8	-4.8	-4.8
		state	-5.9	-5.9	0.0	0.0	0.0	0.0	-10.7	-8.0	-5.3	-2.7	0.0	0.0	-4.8	-4.8	-4.8	-4.8	-4.8	-4.8
Urban	percent of population	private	0.8	0.2	-0.5	-0.5	-0.5	-0.5	0.9	0.2	-0.6	-1.0	-1.0	-1.0	16.0	4.0	-0.9	-0.9	-0.9	-0.9
		state	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.4	-0.4	-0.4	0.0	0.0	0.0	-2.5	-1.3	0.0	0.0	0.0	0.0
AgSh89	percent of GDP	private	-7.0	-3.9	-0.8	-0.8	-0.8	-0.8	-5.7	-3.8	-1.9	-0.6	-0.6	-0.6	-26.0	-13.4	-0.8	-0.8	-0.8	-0.8
		state	0.1	-0.4	-0.8	-0.8	-0.8	-0.8	0.0	0.0	0.0	-0.6	-0.6	-0.6	8.8	4.0	-0.8	-0.8	-0.8	-0.8
OverInd	percent	private	-2.4	-1.2	0.0	0.0	0.0	0.0	-3.3	-1.5	0.2	0.0	0.0	0.0	-7.7	-3.5	0.0	0.0	0.0	0.0
		state	...	...	...	...	...	...	0.2	0.2	0.2	0.0	0.0	0.0	2.2	1.4	0.0	0.0	0.0	0.0
LIIini	index betw. 0 and 100	private	0.0	-0.3	0.2	0.2	0.2	0.2	...	...	...	...	...	...	2.2	0.4	0.0	0.0	0.0	0.0
		state	0.0	-0.3	-0.5	-0.5	-0.5	-0.5	...	...	...	...	...	...	2.2	0.4	0.0	0.0	0.0	0.0
Traddep	percent		-0.1	0.0	0.1	0.2	0.3	0.3	-0.4	-0.2	-0.1	0.0	0.0	0.0	-0.9	-0.5	0.0	0.0	0.0	0.0
Memorandum Item																				
Sum of Fitted Values of Initial Conditons (incl. Constant):			-21.2	-16.2	-15.4	-13.0	-10.8	-10.2	-24.1	-14.8	-16.3	-14.6	-17.5	-21.1	...	...	...	...	...	...

Variable Definitions: *GrIni* denotes average percentage growth 1985-89, *ypc89* is income per capita in 1989, measured at PPP exchange rates; *dInf-1* and *dFbal-1* are Inflation and Fiscal Balance, respectively, in year prior to beginning of transition; *RepInf* is average repressed inflation 1987-1990, measured as percent change in real wage less the precent change in real GDP; *NatRR* is a dummy for resource rich countries, it takes the value 1 for Azerbaijan, Kazakhstan, Russia and Turkmenistan and 0 for the remainder; *Urban* is the percentage of population living in urban areas; *AgSh89* is the share of agriculture in GDP in 1989; *OverInd* is the degree of "overindustrialization" measured as the percentage difference between actual and predicted share of industry in 1989, where the latter is based on a paper by Syrquin and Chenery (1986); *LIIni* is the value of the de Melo, Denizer and Gelb (1996) index of liberalization for 1989 (multiplied times 100 for easier comparability of units); *Traddep* denotes total trade in 1989 as a percentage of GDP.

- **over-industrialization** also makes the initial output decline worse; paradoxically, this seems to be driven by an adverse effect on private sector growth, rather than a faster collapse of the state sector
- higher **urbanization** is associated with initial faster growth of the private sector, but only at the beginning of transition, and there appears to be a reversion in later years when it affects growth adversely;
- **natural resource** exporters (Russia, Azerbaijan, Kazakhstan and Turkmenistan) tend to suffer larger output declines, at least at the beginning
- a higher **share of agriculture** is associated with lower private sector growth
- open **macroeconomic imbalances** in the year preceding the end of central planning aggravate the output decline; however, average **repressed inflation** in the 1987-1990 period is generally positively associated with growth.

While many of these effects—which generally appeared robust not just in these three specifications but also in other regressions we do not show—are intuitive and have standard interpretations,[27] others are clearly not, such as the positive effect of repressed inflation. In these cases, while one can sometimes rationalize the findings (for example, that repressed inflation went along with pent-up demand for unavailable or shortage goods that had a positive impact on private sector growth) we would not put much stock in the results, particularly in view of the somewhat crude way in which some of the initial conditions are measured.[28]

The joint effect of the initial conditions does not always conform to the expected time pattern of a strong initial output decline that later disappears. The memorandum item at the bottom of the table shows the *overall* implications of the initial conditions for the fitted growth path for the average transition economy, i.e. the joint effect weighted with the actual values for each variable. For model gA, the aggregate effect of initial conditions is to generate sharply negative growth in the first year, followed by diminishing but still negative effects on growth over time. This supports the notion of a strongly adverse effect of initial conditions that slowly vanishes over time (with a "half life" of about 5 years). In model gB, in contrast, an initially upward sloping profile, that is gradually receding negative effects of initial conditions on growth, reverses direction in the last two years. While the mechanics

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[27] The fiunding that higher share of agriculture goes along with lower private sector growth contrasts with the common argument that a high share of agriculture was a factor in the absence of output collapse in East Asian economies transition economies. It may be that Asian agriculture is characterized by more institutional flexibility than the highly industrialized sort practiced in most countries in our sample.

[28] See notes to Table 4. "Repressed inflation", for example, is defined as the average difference between percentage change in the real wage minus percentage change in real GDP in the 1987-1990 period.

of this effect is not very interesting in this particular model,[29] it is important to note that the nicely upward sloping path of model gA is not a robust finding. As will become clearer below, this has implications for our overall conclusions when interpreting the time path of growth in transition.

IV. Accounting for the Path of Output in Transition

We now attempt to answer the basic motivating questions of this paper: what factors account for the decline and recovery in output, and what explains the considerable cross-country differences in performance? To answer these questions, we decompose output growth into the contributions of the major groups of explanatory variables. This is feasible in models gA and gB because neither contain any lagged dependent variables; thus, the fitted values can be written as a linear combination of the independent variables alone. For this reason, we concentrate on these two growth specifications in what follows.

We work from two angles. First, we focus on the time dimension of the transitional recession and recovery by decomposing the fitted growth path in transition time, both for the average economy and for two major country blocks, "BRO" and "non-BRO". This will also show whether our models have greater difficulty fitting the BRO experience than the experience of the Central and Eastern European countries. Second, we focus on the cross-sectional dimension by decomposing fitted growth by country for two major time blocks, the "early years" (transition time 0,1 and 2) and the "later years" (transition time 3 and 4). This gives a sense of what drives the differences in the growth experience across countries and whether the driving factors are different in the early transition period, when most countries experienced varying degrees of output decline, and in the later period, when some countries began to recover while others continued to slide. It also reveals countries that may be considered outliers in the sense that our models do not adequately fit their experience.

A. Accounting for the Transition in the Time Dimension

Tables 6 and 7 show actual and fitted growth for models gA and gB and three groups of countries: the (unweighted) average of all transition economies, the BRO countries and the non-BRO countries including Mongolia. Below the "fitted growth" line, we show the decomposition of fitted values into the major groups of variables (macroeconomic, structural, initial conditions including the regression constant, and the effect of wars). For each time period, the contribution of each group is calculated by summing the product of each right-hand side coefficient and the corresponding data within each group of variables, and then averaging either over all countries (upper panel) or over the BRO/non-BRO groups (lower two panels). The tables thus show how the actual paths of explanatory variables combine with the

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[29] It is driven by the variable "*Urban*", whose negative effect on the private sector in the outer transition years swamps the effect of the remaining variables as the private sector grows relative to the state sector.

Table 6. Accounting for Growth in Transition (Model gA)
(in percent per year)

	Transition Time					
	0	1	2	3	4	5
	Average of All Transition Economies					
Growth (actual)	-20.8	-12.1	-9.6	-1.5	1.5	...
Growth (fitted)	-20.7	-12.4	-9.5	-1.7	1.6	...
Macroeconomic Variables	-2.7	0.5	-0.6	0.7	1.0	...
Fiscal balance	-3.7	0.0	-1.1	-0.8	-0.2	...
Inflation	1.0	0.5	0.5	1.6	1.2	...
Structural Reforms	5.0	5.7	7.7	11.2	11.5	...
state sector effect	3.4	-0.1	0.1	7.9	14.5	...
private sector effect	12.1	21.8	22.1	16.8	10.5	...
Initial Conditions (including constant)	-21.2	-16.2	-15.4	-13.0	-10.8	...
of which:						
Trade Dependency	-7.7	-5.7	-3.8	-1.9	0.0	...
Overindustrialization	-9.8	-6.0	0.0	0.0	0.0	...
War Dummy	-1.8	-2.4	-1.2	-0.7	-0.1	...
	Average of non-BRO countries (CEE+Mongolia)					
Growth (actual)	-13.4	-10.5	-5.4	1.6	3.9	2.6
Growth (fitted)	-14.3	-10.3	-5.0	1.5	3.6	3.4
Macroeconomic Variables	-2.8	-0.2	-0.3	1.4	1.3	0.3
Fiscal balance	-2.7	-0.1	-0.2	0.2	0.3	-0.1
Inflation	-0.1	-0.1	-0.1	1.2	1.1	0.4
Structural Reforms	8.0	8.4	11.2	13.7	13.2	13.3
state sector effect	6.8	1.6	2.6	11.6	17.4	20.3
private sector effect	12.3	25.0	23.8	15.9	10.3	6.7
Initial Conditions (including constant)	-19.6	-16.6	-14.1	-12.2	-10.9	-10.2
of which:						
Trade Dependency	-6.9	-5.9	-5.0	-4.2	-3.3	-3.3
Overindustrialization	-13.8	-7.2	0.0	0.0	0.0	0.0
War Dummy	0.0	-1.9	-1.9	-1.4	0.0	0.0
	Average of BRO countries					
Growth (actual)	-24.8	-13.3	-12.7	-3.8	-0.2	...
Growth (fitted)	-24.0	-14.0	-12.7	-4.1	0.1	...
Macroeconomic Variables	-2.7	0.9	-0.9	0.3	0.7	...
Fiscal balance	-4.3	0.0	-1.7	-1.5	-0.5	...
Inflation	1.6	0.9	0.9	1.8	1.3	...
Structural Reforms	3.5	3.7	5.2	9.3	10.3	...
state sector effect	1.5	-1.4	-1.8	5.2	12.5	...
private sector effect	11.9	19.4	20.9	17.5	10.7	...
Initial Conditions (including constant)	-22.1	-15.9	-16.4	-13.6	-10.7	...
of which:						
Trade Dependency	-8.2	-5.5	-2.9	-0.2	2.4	...
Overindustrialization	-7.7	-5.1	0.0	0.0	0.0	...
War Dummy	-2.8	-2.8	-0.7	-0.2	-0.2	...

Table 7. Accounting for Growth in Transition (Model gB)
(in percent per year)

	Transition Time					
	0	1	2	3	4	5
	Average of All Transition Economies					
Growth (actual)	-20.8	-12.1	-9.6	-1.5	1.5	...
Growth (fitted)	-20.8	-12.5	-9.3	-0.9	0.6	...
Macroeconomic Variables	-1.0	-0.6	1.7	2.2	2.3	...
Fiscal balance	-5.4	-0.9	1.1	1.8	1.7	...
Inflation	4.4	0.3	0.7	0.4	0.5	...
Structural Reforms	6.2	5.4	6.6	12.3	15.8	...
state sector effect	-0.7	-8.4	-20.6	-16.9	-15.7	...
private sector effect	31.3	40.9	55.1	48.7	47.6	...
Initial Conditions (including constant)	-24.1	-14.8	-16.3	-14.6	-17.5	...
of which:						
Trade Dependency	-8.2	-5.0	-2.5	0.0	0.0	...
Overindustrialization	-10.5	-5.0	3.8	0.0	0.0	...
War Dummy	-1.9	-2.6	-1.3	-0.8	-0.1	...
	Average of non-BRO countries (CEE+Mongolia)					
Growth (actual)	-13.4	-10.5	-5.4	1.6	3.9	2.6
Growth (fitted)	-14.7	-9.3	-6.0	2.4	2.7	3.3
Macroeconomic Variables	-2.7	-1.4	2.0	3.1	2.7	2.3
Fiscal balance	-3.9	-0.5	1.2	2.5	2.1	2.1
Inflation	1.2	-0.8	0.8	0.6	0.6	0.3
Structural Reforms	9.9	7.1	6.9	15.2	16.7	22.1
state sector effect	-0.9	-10.2	-26.5	-20.8	-18.5	-19.4
private sector effect	43.8	50.0	67.5	57.8	52.6	52.9
Initial Conditions (including constant)	-21.9	-13.0	-12.8	-14.4	-16.8	-21.1
of which:						
Trade Dependency	-4.0	-2.3	-1.2	0.0	0.0	0.0
Overindustrialization	-14.6	-5.7	4.9	0.0	0.0	0.0
War Dummy	0.0	-2.0	-2.0	-1.5	0.0	0.0
	Average of BRO countries					
Growth (actual)	-24.8	-13.3	-12.7	-3.8	-0.2	...
Growth (fitted)	-24.1	-14.9	-11.7	-3.3	-1.0	...
Macroeconomic Variables	-0.1	0.0	1.5	1.5	2.0	...
Fiscal balance	-6.1	-1.2	0.9	1.2	1.5	...
Inflation	6.1	1.2	0.6	0.3	0.5	...
Structural Reforms	4.3	4.2	6.3	10.2	15.2	...
state sector effect	-0.6	-7.1	-16.3	-14.1	-13.6	...
private sector effect	24.6	34.2	46.0	42.1	44.0	...
Initial Conditions (including constant)	-25.3	-16.1	-18.8	-14.8	-17.9	...
of which:						
Trade Dependency	-10.5	-7.0	-3.5	0.0	0.0	...
Overindustrialization	-8.3	-4.5	3.1	0.0	0.0	...
War Dummy	-3.0	-3.0	-0.7	-0.2	-0.2	...

regression coefficients to explain the transition experience and the main differences between the BRO and non-BRO groups. Figures A3, A4 and A5 in the Appendix plot the actual paths of explanatory variables along with their main growth effects.

Focusing first on the pure time dimension, i.e. on the upper panel that accounts for the average transition experience, we first note that the key conclusions are consistent across both models. The major results are as follows.

- The "fit" of the average growth path over time is near perfect. This may not be very surprising given the data-driven way in which the regression models were derived and also the fact that we are averaging fitted values over 26 countries. However, it is worth noting that the unexplained residuals are tiny in *all* of the five time periods without any obvious pattern. This clears the way for the exercise that follows, namely to "account" for growth by decomposing the fitted path.
- The output decline (transition years 0, 1 and 2) is overwhelmingly attributed to initial conditions and (to a much lesser extent) macroeconomic imbalances. Among the adverse initial conditions, trade dependency and overindustrialization play a prominent role in the initial output decline, accounting for more than three quarters of the impact of initial conditions on the output decline in year 0.
- the small initial negative impact of macroeconomic variables is due to offsetting effects of inflation and the fiscal balance. Notably, the net initial effect of inflation appears positive; this in turn is attributable to a positive effect on the state sector (see previous section) that more than offsets the adverse affect on the private sector at a time when the state sector is still large.
- We find no evidence that, controlling for the other factors, structural reforms initially aggravated the output decline. In one of the two models (gB) we do find a substantial negative impact of structural reforms on the state sector (particularly after two years), but this is more than offset by its positive impact on the private sector.
- The driving force behind the recovery is the impact of structural reforms and—to a lesser extent, and primarily in Model gA—the tapering off of the effect of initial conditions.

Next, we consider what the tables have to say about the differences in performance between the BRO and non-BRO group. As stated in the introduction, two facts require explanation: (i) why was the initial output decline steeper in the BRO; (ii) why did the BRO take longer to recover? Again, the two models gA and gB largely agree on the answers. These are as follows:

- the larger initial output decline is attributed to some extent to more adverse initial conditions (particularly in Model gB), but to a greater extent to the fact that structural

reforms got off to a slower start in the BRO.

- the poorer growth performance in the BRO in the later transition years is overwhelmingly attributed to less advanced structural reforms.

Overall, this would seem to put most of the blame for the BRO's poorer performance on policies, rather than initial conditions per se.[30]

B. A Cross-Sectional View

Consider now Tables 8 and 9, in which the emphasis is on explaining cross-country differences in the transition experience. The "raw material" of these tables is the same as that of Tables 6 and 7, i.e. the product of right-hand side coefficients and data values, summed over groups of related explanatory variables. However, rather than averaging these fitted values over countries as in Tables 6 and 7, we average over time, distinguishing only between two broad "time-phases"—earlier and later transition years. For each phase, we show the fitted values for each individual country. In addition, the last lines of the tables show the cross-sectional correlation, within each time phase, between the fitted values corresponding to a given group of explanatory variables and actual growth.[31] This is introduced as a summary measure of the extent to which each of the major groups of right-hand side variables contribute to explaining the observed cross-country differences in growth performance, within each phase.[32]

Turning to the left panels of the two tables, the main, and rather surprising result for both models is that the growth impact of initial conditions appears fairly uncorrelated with actual growth across countries during the output decline phase. In other words, a number of countries with "bad" initial conditions (such as the Baltic countries or Poland, with high degrees of initial trade dependency and overindustrialization) made up for them by reforming faster or having smaller macroeconomic imbalances; while other countries with relatively good initial conditions often reformed more slowly or suffered wars, partly or wholly offsetting the effect of initial conditions. In model gA, this finding is exacerbated by a

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[30] Different private sector shares in the two regions interact with the differing degrees of reform undertaken to generate this result. However, as Figures A5a and A5b show, the non-BRO countries did in fact undertake much less structural reform.

[31] Thus, this is the correlation between growth and a weighted sum of the individual right hand variables that make up each group, where the weights are given by the coefficient estimates.

[32] When we checked at the end of the previous section what was driving the difference in growth performance between the BRO and non-BRO groups, we identified families of explanatory variables that differed in terms of the contribution to growth across the two country groups in the same direction as growth itself. The correlations shown in Tables 10 and 11 merely extend this idea to the simultaneous comparison between many countries.

Table 8. Accounting for Growth in Transition: Cross-Sectional Perspective (Model gA)
(in percent per year)

	Average across Transition Years 0,1 and 2						Average across Transition Years 3 and 4					
	Growth	Accounted for by ...					Growth	Accounted for by ...				
		Macro	StructurallCs+const		War	Residual		Macro	StructurallCs+const		War	Residual
CEE	-10.5	-1.0	9.2	-16.5	-2.1	-0.1	2.6	0.9	13.8	-11.8	-0.8	0.5
Albania	-8.5	-5.8	6.2	-10.0	0.0	1.1	9.2	0.7	13.5	-8.5	0.0	3.5
Bulgaria	-6.8	-2.0	11.1	-18.5	0.0	2.6	2.2	-1.6	14.3	-12.2	0.0	1.7
Croatia	-25.5	-2.0	9.1	-16.7	-10.3	-5.6	-1.5	3.4	13.9	-17.5	-2.6	1.3
Czech Republic	-7.2	0.6	9.5	-16.2	0.0	-1.1	3.7	1.0	12.8	-6.8	0.0	-3.3
Hungary	-6.2	0.0	10.6	-17.7	0.0	0.9	1.2	1.5	14.7	-13.1	0.0	-2.0
FYR Macedonia	-19.1	-1.5	8.7	-20.9	-10.3	5.0	-8.3	3.1	15.1	-17.4	-5.2	-3.9
Poland	-5.3	0.8	12.3	-22.2	0.0	3.8	4.9	0.1	14.4	-14.2	0.0	4.7
Romania	-6.8	-0.2	5.9	-12.9	0.0	0.4	5.4	0.7	11.7	-7.2	0.0	0.2
Slovak Republic	-8.8	-0.5	10.1	-15.5	0.0	-2.9	6.2	-0.8	13.0	-5.3	0.0	-0.7
Slovenia	-11.2	-0.1	8.6	-14.7	0.0	-5.1	3.1	0.9	14.1	-15.9	0.0	4.0
Baltics	-17.1	2.0	11.6	-30.8	0.0	0.1	2.3	1.1	14.5	-14.7	0.0	1.4
Estonia	-10.0	1.8	12.8	-29.1	0.0	4.4	3.2	0.8	15.4	-15.3	0.0	2.2
Latvia	-16.4	1.7	11.0	-27.9	0.0	-1.1	1.3	0.7	15.4	-12.3	0.0	-2.5
Lithuania	-25.0	2.5	10.9	-35.5	0.0	-3.0	2.4	1.6	12.7	-16.4	0.0	4.4
Russia	-11.9	0.1	7.6	-17.6	0.0	-2.0	-3.2	4.0	10.8	-17.0	0.0	-1.0
Other CIS	-17.3	-1.7	1.8	-14.7	-2.8	0.1	-3.1	0.0	8.4	-11.0	-0.2	-0.5
Armenia	-20.4	-2.0	5.6	-20.4	-7.8	4.2	6.8	2.5	11.6	-7.3	0.0	-0.1
Azerbaijan	-21.1	-0.2	-1.0	-13.8	-7.8	1.6	-4.9	-1.2	7.4	-10.0	0.0	-1.0
Belarus	-10.8	0.7	2.4	-16.4	0.0	2.4	-6.6	-2.5	6.4	-12.4	0.0	1.9
Georgia	-27.2	-5.8	0.8	-14.5	-6.9	-0.9	6.5	1.3	9.6	-10.8	0.0	6.4
Kazakhstan	-17.0	0.0	3.6	-17.9	0.0	-2.8	-4.0	1.2	12.1	-18.3	0.0	1.0
Kyrgyz Republic	-16.5	-1.7	5.1	-18.4	0.0	-1.5	2.4	1.4	13.5	-10.2	0.0	-2.3
Moldova	-20.5	-3.8	4.4	-17.8	0.0	-3.3	-5.5	-0.1	12.3	-13.7	0.0	-3.9
Tajikistan	-20.5	-4.9	-2.6	-3.2	-8.6	-1.1	-9.8	-3.8	0.6	-2.1	-2.6	-1.9
Turkmenistan	-11.8	3.3	0.0	-13.5	0.0	-1.7	-7.2	-0.8	1.9	-9.7	0.0	1.4
Ukraine	-18.9	-2.3	1.2	-14.8	0.0	-3.1	-10.0	1.4	9.8	-15.8	0.0	-5.4
Uzbekistan	-5.9	-2.6	-0.2	-10.8	0.0	7.8	-1.4	1.1	7.3	-10.8	0.0	1.0
Mongolia	-7.2	0.2	10.0	-16.7	0.0	-0.8	4.3	5.8	10.6	-8.8	0.0	-3.3
Cross-sectional Correlation with Growth		0.29	0.34	0.15	0.65	0.37		0.26	0.54	0.25	0.43	0.46
Memorandum Item: Cross-sectional Correlation with Growth excl. Tajikistan		0.24	0.30	0.27	0.63	0.37		0.11	0.43	0.51	0.34	0.45

Table 9. Accounting for Growth in Transition: Cross-Sectional Perspective (Model gB)
(in percent per year)

	Average across Transition Years 0,1 and 2						Average across Transition Years 3 and 4					
	Growth	Accounted for by ...					Growth	Accounted for by ...				
		Macro	StructurallCs	+const	War	Residual		Macro	StructurallCs	+const	War	Residual
CEE	-10.5	-0.9	5.3	-12.5	-2.2	-0.2	2.6	2.1	15.7	-14.6	-0.8	0.3
Albania	-8.5	-7.1	5.7	-6.2	0.0	-0.9	9.2	5.2	20.6	-16.7	0.0	0.0
Bulgaria	-6.8	-2.0	7.2	-12.9	0.0	0.9	2.2	1.3	6.5	-9.0	0.0	3.3
Croatia	-25.5	0.0	1.7	-8.2	-11.2	-7.8	-1.5	2.1	7.8	-7.8	-2.8	-0.7
Czech Republic	-7.2	0.6	10.0	-20.1	0.0	2.4	3.7	1.4	36.1	-30.8	0.0	-3.0
Hungary	-6.2	0.1	9.1	-19.7	0.0	4.4	1.2	3.8	24.3	-25.0	0.0	-2.0
FYR Macedonia	-19.1	-1.6	-8.1	-2.6	-11.2	4.4	-8.3	3.1	8.9	-8.3	-5.6	-6.4
Poland	-5.3	1.1	14.6	-21.8	0.0	0.7	4.9	2.1	19.4	-18.5	0.0	1.8
Romania	-6.8	0.4	4.8	-11.3	0.0	-0.6	5.4	0.7	9.3	-7.3	0.0	2.7
Slovak Republic	-8.8	0.0	11.7	-19.7	0.0	-0.7	6.2	1.5	23.5	-23.0	0.0	4.2
Slovenia	-11.2	-0.3	-4.0	-2.4	0.0	-4.4	3.1	-0.5	0.6	0.2	0.0	2.9
Baltics	-17.1	2.7	18.1	-37.2	0.0	-0.7	2.3	1.9	33.4	-34.8	0.0	1.8
Estonia	-10.0	2.3	20.7	-35.0	0.0	1.9	3.2	1.1	37.7	-36.9	0.0	1.2
Latvia	-16.4	2.4	16.7	-33.4	0.0	-2.1	1.3	1.3	31.2	-32.7	0.0	1.5
Lithuania	-25.0	3.4	16.8	-43.2	0.0	-2.0	2.4	3.2	31.3	-34.9	0.0	2.8
Russia	-11.9	2.3	12.6	-24.2	0.0	-2.6	-3.2	7.2	22.6	-32.1	0.0	-0.8
Other CIS	-17.3	-0.3	0.6	-15.0	-3.1	0.4	-3.1	1.2	6.1	-9.9	-0.3	-0.3
Armenia	-20.4	2.9	6.6	-24.4	-8.4	2.9	6.8	10.1	14.6	-16.8	0.0	-1.1
Azerbaijan	-21.1	0.3	1.5	-16.5	-8.4	2.0	-4.9	-1.0	2.3	-5.6	0.0	-0.6
Belarus	-10.8	2.4	-2.3	-13.5	0.0	2.5	-6.6	-4.7	-3.0	-0.6	0.0	1.7
Georgia	-27.2	-3.9	-0.5	-12.0	-7.5	-3.4	6.5	3.0	11.9	-13.3	0.0	4.8
Kazakhstan	-17.0	1.7	-1.0	-18.2	0.0	0.4	-4.0	0.0	10.2	-14.8	0.0	0.6
Kyrgyz Republic	-16.5	-1.1	4.2	-16.8	0.0	-2.8	2.4	4.0	13.8	-14.4	0.0	-1.0
Moldova	-20.5	-3.4	0.9	-14.9	0.0	-3.1	-5.5	0.9	6.8	-13.1	0.0	0.0
Tajikistan	-20.5	-5.5	-1.8	-3.5	-9.3	-0.4	-9.8	-1.7	-4.4	0.9	-2.8	-1.7
Turkmenistan	-11.8	5.2	-0.4	-17.1	0.0	0.5	-7.2	-1.3	-0.7	-4.0	0.0	-1.2
Ukraine	-18.9	-0.4	0.6	-17.1	0.0	-2.0	-10.0	2.7	10.9	-16.6	0.0	-7.0
Uzbekistan	-5.9	-1.5	-0.8	-11.1	0.0	7.6	-1.4	1.3	5.0	-10.4	0.0	2.7
Mongolia	-7.2	3.2	21.5	-32.2	0.0	0.2	4.3	11.2	18.8	-25.5	0.0	-0.2
Cross-sectional Correlation with Growth		0.12	0.32	-0.02	0.65	0.47		0.45	0.54	-0.40	0.43	0.56
Memorandum Item: Cross-sectional Correlation with Growth excl. Tajikistan		0.05	0.29	0.04	0.63	0.47		0.41	0.48	-0.32	0.34	0.56

clear outlier, Tajikistan,[33] but even after removing this outlier the correlation does not appear very large (see memorandum item in Table 9). Note, on the other hand, the high correlation of the output decline with the occurrence of war during the initial years.

For the later phase of transition, specifications gA and gB agree on an important role for structural reforms in explaining cross-sectional variation in growth. They completely disagree, however, on the role of initial conditions. In model gA, surprisingly, the correlation between the growth effects of initial conditions and the overall growth outcome is stronger in the later years than in the early years (especially if Tajikistan is removed from the sample). The opposite is true for model gB, where the correlation becomes *negative* in the later phase. That is, countries that would continue to suffer particularly large output declines in the outer transition years based on their initial conditions alone tend to *more than offset* their adverse initial conditions through fast reforms. While this is an interesting idea, it is not robust given the finding in model gA. These differences between the explanatory role of initial conditions in the outer transition years mirror the different time profiles of initial conditions across the two models which was noted at the end of Section III above.

Finally, Tables 8 and 9 allow us to identify countries whose experience is poorly accounted for by our two models, as reflected in the columns showing the residuals for the two time period. For the early years, Croatia and to a lesser extent Slovenia stand out as cases in which the measured output decline was substantially larger than predicted by the model; while in the case of Uzbekistan it was much smaller than predicted. In the later years, the main case of a larger than predicted rebound is Georgia; while FYR Macedonia and Ukraine did substantially worse than predicted. Since Croatia, Slovenia, Georgia and FYR Macedonia are all countries with war or internal strife, there is a sense that our war dummy might have been less than adequate in capturing the effects of conflict. For Uzbekistan and Ukraine, war was not an issue and a puzzle remains, especially for Uzbekistan which has exceptionally large positive residuals in the early transition phase according to both versions of the model.[34]

V. Extensions and Implications

A. Is there an intrinsic dynamic of transition?

One of the main objectives of the previous sections was to account for the "U-shape" of growth in transition in terms of economically interpretable variables. This leaves the

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[33] The small adverse impact of initial conditions for Tajikistan (excluding Wars) is driven by two factors: low initial industrialization and urbanization, and the fact that the adverse inital impact of a relatively high share of agriculture on private sector growth (see Table 4) has little effect in the aggregate because of a very low initial share of the private sector.

[34] The case of Uzbekistan is examined in detail in Zettelmeyer (1998) using the methods developed in this paper.

question of whether—and if so, to what extent—there is an "intrinsic dynamic" of transition, which might imply a pattern of output decline and eventually recovery, *irrespective* of the initial conditions and policies characterizing a particular country. While at their most general level the models discussed contained a full set of time dummies and lagged endogenous variables that could pick up an intrinsic dynamic, these variables were eliminated early in the simplification process in the models presented above. Since this outcome may have been sensitive to the order of testing, it makes sense to re-introduce time dummies and lagged endogenous variable into the final models to see whether they are now significant and also whether the economically interpretable variables carrying the dynamics of output remain significant in their presence. In addition, we test one specific hypothesis about intrinsic growth dynamics of transition, which is that the speed of recovery is positively related to the size of the initial output decline. In other words, we test for the presence of a "rebound effect" (Table 10).

Table 10: Testing for an "Intrinsic Dynamic" of Growth in Transition

	Adding time and lagged dep. vars.				Testing for a "rebound effect			
	... to model gA		... to model gB		... in model gA		... in model gB	
Variables	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
Growth-1s	0.01	0.14	-0.06	-0.94				
Growth-2s	-0.03	-0.45	0.10	1.64				
t0	7.06	0.47	3.89	0.47				
t1	7.28	0.76	3.01	0.38				
t2	-0.56	-0.13	2.60	0.33				
t3	-0.15	-0.04	0.53	0.18				
t4	-0.86	-0.25	2.53	0.93				
t5	-1.58	-0.49	0.11	0.04				
Declt2					-0.08	-1.56	0.04	0.71
Declt2-1					-0.08	-1.75	-0.01	-0.22
Declt2-2					-0.05	-0.99	-0.05	-1.07
Test 1 *p*	0.982		0.650					
Test 2 *p*	0.936		0.827					
Test 3 *p*					0.280		0.570	
R^2	0.87		0.86		0.87		0.86	
k	42		35		37		30	
N	143		143		143		143	

Notes:
"gA controls": regression controls for variables in specification gA, see Section III
"gB controls": regression controls for variables in specification gB, see Section III
Test 1 is test for joint significance of time dummies and lagged endogenous variables.
Test 2 is test for joint significance of time dummies. Test 3 is test for joint significance of recovery terms (*Declt2, Declt2-1, Declt2-2*).

As can be seen from the upper panel of Table 10, none of the lagged endogenous variables and time dummies that were added back into the final "growth" specifications are individually significant. Moreover, the added variables can be collectively eliminated from the model at very high significance levels (see lines "Test 1 p-value" and "Test 2 p-value"). In order to directly test for a "recovery effect", we constructed a measure of the initial output decline by adding up growth in the first two years of transition (*t0* and *t1*), and included this variable in the model after interacting it with time dummies for years *t2* and lagging this once or twice (lower panel of Table 10). Thus, a significantly negative coefficient on "*Declt2* " means that, everything else equal, a larger initial output decline helped growth in year *t2*, while "*Declt2-1* " means it helped growth for year *t3*, etc. As can be seen, in models gA and gB these terms are generally negative but individually insignificant (with *Declt2-1* constituting a borderline exception), and they are collectively insignificant in both cases (see line "Test 3 p-value"). We conclude that in the category of models with (time-varying) initial conditions we find no significant growth dynamics beyond that already captured in the models presented in Section III.[35]

B. Are the BRO countries unaccountably different?

We now evaluate the question of whether the difference in growth performance between the BRO and non-BRO country groups goes beyond what one would expect based on the differences in initial conditions and policies across these two groups. A straightforward test is to add a BRO dummy to the regression. Based on Tables 6 and 7, in which we saw that the growth paths for both BRO and non-BRO groups could be fitted reasonably closely in models gA and gB, one would not expect this dummy to matter much.

This is confirmed in Table 11, which shows that the simple (i.e. time-invariant) BRO dummy is insignificant when added to the growth models gA and gB and the "levels specification" y. For the two growth models, the same is true when the BRO dummy is split into two, reflecting the earlier and later transition years as distinguished in Tables 8 and 9. Only if the dummy is split into year-specific BRO effects does it become at least marginally significant: while the year-specific dummies continue to be insignificant as a group, the first of these dummies (corresponding to $t = 0$) is always negative and numerically larger than the remaining dummies, and becomes significant at the 5 or 10 percent level once the other dummies are deleted. Thus, there appears to be a residual "BRO-effect" for the first year of transition, in which the output collapse in the BRO seems to have been substantially larger (by 3.5 to 8 percentage points) than what would have been expected based on initial conditions and policies alone. This results is foreshadowed in the growth decomposition discussed in

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[35] This is not true in the category of models with country dummies, for which regression results are presented in the appendix; in particular, these models exhibit a peculiar dynamic of lagged endogenous variables and time dummies (including, *negative* coefficients on lagged growth). We view this as a reflection of inadequate dynamic specification of the remaining right-hand side variables—in particular, the imposed "flat" effects of country dummies.

the previous section (Tables 6 and 7), where at $t = 0$ the extent of the output decline is somewhat underpredicted for the BRO average while for the non-BRO average the decline is overpredicted.

Table 11: Adding BRO dummies to Final Models with Initial Conditions

	(1)		(2)		(3)		(4)	
Variable	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
				Model gA				
BRO	0.027	0.012						
BRO012			0.017	0.006				
BRO34			0.034	0.014				
BRO0					-8.378	-1.424	-8.443	-1.942
BRO1					0.580	0.146		
BRO2					1.547	0.516		
BRO3					1.641	0.600		
BRO4					0.179	0.061		
				Model gB				
BRO	0.349	0.155						
BRO012			-0.071	-0.026				
BRO34			0.714	0.274				
BRO0					-3.584	-0.657	-7.527	-1.821
BRO1					2.964	0.911		
BRO2					-1.463	-0.459		
BRO3					0.144	0.049		
BRO4					1.458	0.524		
				Model y				
BRO	0.077	1.478						
BRO012			0.039	0.718				
BRO34			0.104	1.985				
BRO0					-0.241	-2.328	-0.301	-2.927
BRO1					0.140	2.173		
BRO2					0.048	0.809		
BRO3					0.115	2.080		
BRO4					0.108	1.992		

Notation: "BRO" is a dummy that takes on the value 1 for BRO countries and zero otherwise. "BRO012" takes on the value 1 for BRO countries in years 0,1 and 2 of transition and zero otherwise. The remaining dummy variables in the table are defined analogously.

C. Does the speed of reform matter?

A central question in the literature on transition has been the question of how the speed of reform matters for growth. In this section we look at this question in three different ways. First, and most directly, we have already found that (i) structural reforms are the driving for force of the recovery and (ii) the effects of structural reforms are mostly positive from the beginning, i.e. we found little evidence for an initial adverse effect of structural reforms on growth. From the perspective of minimizing the cumulative output loss associated with the transition process, this would argue in favor of fast structural reforms; i.e. a gradualist approach to reforms does not appear to be supported by our results.

This said, questions remain. First, one wonders how our results relate to a more direct test of the effect of the speed of reforms presented in a recent paper by Heybey and Murrell (1997), in which they find that while faster-growing countries tend to reform faster, the effect of faster reforms on growth has, on average, been *negative* since the beginning of transition. Finally and most importantly, we have so far not distinguished whether faster reforms are good for growth merely because liberalized economies tend to grow faster, or whether there is a beneficial or detrimental effect of the speed with which liberalization measures are carried out *over and above* the direct effect of these measures, as expressed by the level of the liberalization indices. In other words, our results might yet be consistent with a true model in which a more liberal *state* of the economy is good, but *adjusting* towards this more liberal state is costly; in this case, gradual adjustment would generally be superior to one-shot adjustment (for example, if adjustment costs are convex). The question is whether this distinction can be made based on our results so far, and whether there is a direct way of testing it.

Consider first the Heybey and Murrell growth regression, with a slight change from their notation:

$$y_i = \beta_0 + \beta_1(L_{4,i} - L_{-1,i}) + \beta_2 L_{-1,i} + \beta_3 CMEA_i + \beta_4 PREGDP_i + \epsilon_i \qquad (7)$$

This is a cross-sectional regression in which y_i stands for average annual real GDP growth over the first four transition years, $L_{-1,i}$ stands for the initial (pre-transition) level of liberalization in country i, measured as an average of the three indices LIE, LII and LIP, and $CMEA_i$ and $PREGDP_i$ denote two initial conditions—reliance on CMEA trade and initial (pre-transition) growth. The term $(L_{4,i} - L_{-1,i})$ denotes the difference between the level of liberalization in the fourth year of post-communist reform and in the pre-transition year. This is interpreted as capturing the "speed" of reforms. Heybey and Murrell's main result from this regression is that, after attempting to address the endogeneity of $(L_{4,i} - L_{-1,i})$ by, in effect, instrumenting using the initial share of industry and an index of political freedom, the coefficient β_1 comes out insignificant, suggesting that the speed of reforms does not matter. This is quite a strong result, since Heybey and Murrell's cross-sectional regression does not

distinguish between the two aspects of "speed" (effect of the state of liberalization versus effects of the adjustment path). Rewriting (7), one obtains:

$$y_i = \beta_0 + \beta_1 L_{4,i} + bL_{-1,i} + \beta_3 CMEA_i + \beta_4 PREGDP_i + \epsilon_i \quad (8)$$

where $b = \beta_2 - \beta_1$. Thus, the Heybey-Murrell finding is just that post-communist structural reforms were irrelevant for output performance in transition, which directly contradicts not only the claim of de Melo, Denizer and Gelb (1996), Sachs (1996) and other authors based on cross-sectional correlations but also our panel-based findings from the previous section.

To see what could drive the difference in findings, it is instructive to recreate the Heybey-Murrell "test" in the context of our panel regression. A straightforward panel version of equation (8) is as follows:[36]

$$y_{t,i} = \beta_0 + \beta_1 L_{t,i} + bL_{-1,i} + \beta_3 CMEA_i + \beta_4 PREGDP_i + \epsilon_{t,i} \quad (9)$$

The upper half of Table 12 shows the estimated coefficients β_1 and b in the context of five different specifications. The first literally runs model (9) , i.e., uses the same variables as Heybey and Murrell (except that $L_{t,i}$ is time varying). The remaining formulations are the same except that they use richer sets of controls, namely the macro policy and initial conditions controls from models gA and gB and the macro policy and country dummy controls from the country dummy model presented in the appendix (CD).[37] In addition, we use a version of model gA in which the initial conditions related to the initial state of liberalization have been deleted to avoid controlling for the same basic variable twice, i.e. in addition to $L_{-1,i}$ (this model is denoted gA').

As is apparent from Table 12, we find a positive and strongly significant coefficient on $L_{t,i}$, and thus "speed" in the Heybey-Murrell definition, across all specifications. This sharply contrasts with Heybey and Murrell's cross-sectional result. Since this difference in findings, as shown in Table 12, is clearly not driven by differences in the sets of controls, we are left with two possible explanations. First, we use a panel which not only enables much more precise estimation but includes one year beyond the sample used by Heybey and Murrell. Since this is the year in which many transition economies began to recover, it might

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[36] While most closely analogous to the cross-sectional formulation, this formulation is more restrictive in the time dimension since it assumes that the estimated coefficients are time invariant (see the discussion in Section II of this paper). However, all conclusions below are unchanged if we interact the right hand side variables with time or the private sector share.

[37] These models are thus identical to those of Section III and the country dummy model in the appendix except that the variables capturing structural reforms have been deleted and replaced by $L_{t,i}$ and $L_{-1,i}$.

Table 12: Direct Tests of the Effects of the "Speed" of Reforms

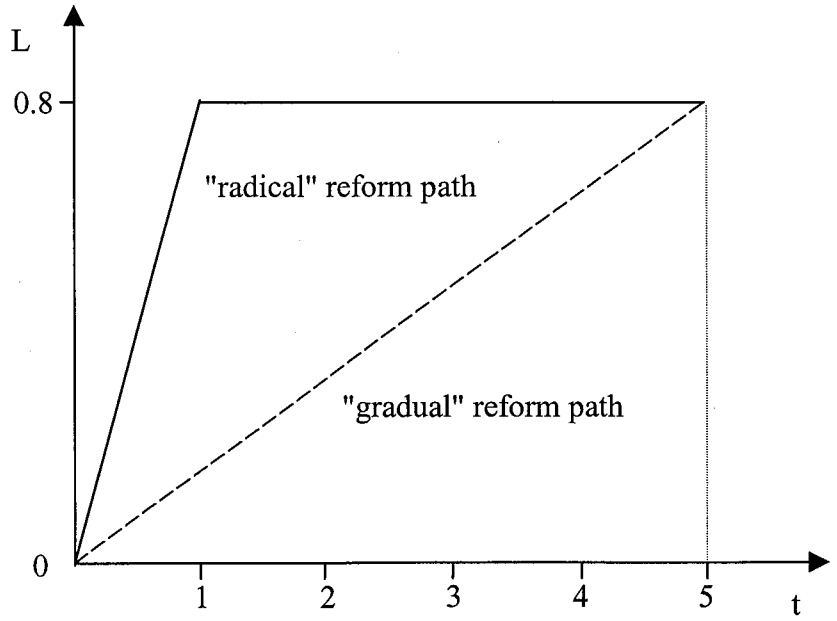
	Alternative Sets of Controls									
	(HM)		(CD)		(gA)		(gA')		(gB)	
Variables	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
					(a) Heybey-Murrell Type Regressions					
$L_{i,t}$	39.79	8.26	51.90	6.87	14.42	3.43	18.40	4.53	13.27	2.45
L_{-1}	-38.31	-4.38	3.27	0.03	6.95	0.71	-13.14	-2.11	-16.24	-2.50
R^2	0.38		0.86		0.83		0.80		0.79	
k	6		42		27		24		22	
N	143		143		143		143		143	
					(b) Extended Heybey-Murrell Type Regressions					
$L_{i,t}$	20.00	2.92	32.70	4.13	11.91	2.04	13.48	2.23	11.60	1.78
L_{-1}	-65.62	-6.02	-97.35	-0.89	2.85	0.24	-19.21	-2.31	-19.21	-2.10
$1/t\ \Sigma_{j=0}^{t-1} L_{i,j}$	34.59	3.89	32.60	4.83	4.99	0.62	9.09	1.10	3.90	0.46
R^2	0.44		0.88		0.83		0.80		0.79	
k	6		42		27		24		22	
N	143		143		143		143		143	

Notes:
HM: Heybey-Murrell controls (initial share of CMEA trade in GDP, initial (pre-transition) growth).
CD: controls = non-structural reform variables in country dummy specification, see Appendix.
gA: controls = non-structural reform variables in specification gA, see Section III and Appendix.
gA': controls = as gA, but without variables relating to initial liberalization.
gB: controls = non-structural reform variables of specification gB, see Section III and Appendix.

be particularly informative in estimating the relationship between strucutral reforms and growth. Second, as Heybey and Murrell themselves point out, their results are driven by their attempt to address the obvious potential endogeneity of $L_{4,i}$ (i.e. the level of liberalization at the *end* of the sample period) in the cross-section, namely by instrumenting using the initial share of industry and an index of political freedom. In contrast, we do not instrument but instead assume that $L_{t,i}$ is predetermined *for each given t*, i.e. on a year-by-year basis. Given policy implementation lags and the fact that the policy indices reflect the state at mid-year, we view this as a reasonable assumption—in other words, $L_{t,i}$ might well depend on $y_{t-1,i}$, but is very unlikely to depend on $y_{t,i}$ contemporaneously. In contrast, and although we agree with Heybey and Murrell that $L_{4,i}$ must be instrumented in the context of a cross-sectional regression, we are not persuaded by their choice of instruments—particularly the initial share of industry, which in our view clearly belongs in the growth equation and was indeed shown to have large effects on growth in the previous two sections.

On the basis of our version of the Heybey-Murrell test, "speed" thus clearly matters—and positively—for growth. However, this may not be saying much because the Heybey-Murrell concept of "speed", as we have seen, is indistinguishable from the statement that post-communist structural reforms are good for growth, which merely confirms the findings of the previous section. A more interesting question is as follows: conditioning on initial liberalization and today's level of the structural indices, does it matter for *today's* growth whether structural reforms were carried out quickly or slowly? For example, consider a situation in which two structural reform paths set out and end up at the same levels, but where in once case reforms were undertaken in one step at the beginning, while in the second case they occurred gradually over time (Figure 5). While indistinguishable in the Heybey-Murrell definition, the former could be viewed as an example for fast, or "radical" reforms while the latter represents a slower, or more gradual, approach. Defined in this way, does "speed" matter, and if so, is it detrimental or beneficial for reforms today?

Figure 5: Example for "Gradual" versus "Radical" Reform Path



One way of answering this question is to estimate a growth model which includes a sufficiently large number of lags of structural reform indices, as in the main sections of this paper. If the sum of coefficients on lagged reform indices—controlling for both the current state of liberalization and initial liberalization—is positive, then the answer to the previous question would be that "speed" in the narrow definition proposed above is beneficial. Table 4 suggests that this is indeed the case. Alternatively, a simpler and more direct—although clearly more restrictive[38]—way of testing "speed" in the narrow definition is to extend the Heybey-Murrell equation by a term that measures the average level of the liberalization index in the past. In terms of Figure 5, this is just a measure of the average distance between the two curves. In other words, one can run:

$$y_{t,i} = \alpha_0 + \alpha_1 L_{t,i} + \alpha_2 L_{-1,i} + \alpha_3 \frac{1}{t} \sum_{j=0}^{t-1} L_{j,i} + controls + \epsilon_{t,i} \qquad (10)$$

In this formulation, the coefficient α_3 rather than α_1 is viewed as measuring "speed", while α_1 measures the "level" effect of liberalization. Estimates of α_1, α_2 and α_3, using the same sets of controls as before, are given in the lower panel of Table 12.

The main result is that the coefficient α_3 is always positive, significantly so in the presence of two out of the five sets of controls used. In addition, α_1 remains positive and significant in all cases (at at least the five percent level in four instances and at the ten percent level in one). These results thus support fast liberalization policies in two respects. First, more liberalized economies grow faster, thus, the quicker one achieves a more liberalized *state* of the economy, the better. Second, chosing a faster *path* to this more liberalized state does not imply an offsetting cost; if anything provides an *additional* impulse to growth. Thus, this set of tests strenghtens the conclusion of the previous section that faster liberalization is better for growth.

D. Are the effects of policies modified by initial conditions?

It is sometimes argued that some countries "could not" engage in radical reforms because their initial conditions were too adverse (for example, because of a large initial trade shock or because of large traditional sectors). There are several interpretations to this argument. One is that, to the extent that reforms could be expected to have an initially adverse effect (for example, via a contractionary effect on the state sector), the short-run pain of reforms over and above the pain of adverse initial conditions was simply too much to bear. A related interpretation is that, with reforms hurting the state sector, they were politically infeasible in countries with large state sectors.[39] A third, and distinct, interpretation is that

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[38] In the sense that implicit coefficient restrictions are imposed.

[39] This argument is explored in Blanchard (1996).

the *effect* of reforms might depend on initial conditions, and that in countries with particular structural conditions at the outset, would have simply not worked.

The regression models of Section III have already lent limited support to the first two versions of these arguments, insofar as we have found that there is evidence of a contractionary effect of liberalization on the state sector, so that countries with intially larger state sectors will typically benefit less from reform. It is worth reemphasizing, however, that we have found that (i) structural reform would have benefitted almost all countries later in transition and most countries even initially and (ii) variation in initial conditions across countries does little to explain variation in growth performance. This analysis also applies to the third version of the argument, to the extent that it emphasizes different initial sizes of the state sector as the factor that conditions success of reforms. However, this still leaves the possibility, which we have ignored so far, of policy effects being modified by initial characteristics of the economy *other* than the size of the state sector, e.g. by initial overindustrialization, trade dependency, or initial macro imbalances. This is addressed in the remainder of this section.

To test this proposition, we include interaction terms between policy variables and three key initial conditions—initial overindustrialization, trade dependency and repressed inflation—in the models of Section IV (gA and gB), and test for the significance of the interaction terms. This approach is correct under the null hypothesis that the interaction terms do not matter, since these terms were ignored in the specification search that led to models gA and gB. Because the modeling of the policy variables in these models involves lags as well as interactions with the private sector share, the number of potential interactions we could test is very large. We consequently limit ourselves to testing interactions with contemporaneous policy variables, to the extent that these are present in the model. In the case of model gA, this led to the inclusion of 12 interaction terms—between the three initial conditions mentioned above and the variables *LII*, *lLII*, *LIE* and *lLIE*—whereas in the case of model gB, we included interactions between the three initial conditions and *LIE*, *LIP* and *lLIP* (9 additional terms). We then went on to simplify among the candidate interaction terms, beginning with the interactions with repressed inflation. For the surviving variables and the main policy effects, the results are shown in Table 13.

The main findings are as follows. First, most of the interaction terms we added were insignificant, and as a result, very few survive (one in the case of model gA and three in the case of model gB). Second, a comparison between Table 13 and Table 5 reveals that the "main effects" of policy variables are largely unchanged. In particular, there are no sign changes and variables that were significant stay significant. Together, these two points suggest that we did not commit a large model specification error by ignoring interaction terms when we first derived models gA and gB. Third, the main insight from the coefficients on the surviving interaction terms is that an adverse initial economic structure, (as captured by initial overindustrialization or trade dependency) does *not* mitigate the beneficial effects of liberalization. If anything, the opposite is the case, as the interaction terms were either insignificant or are significant and *positive.*

Table 13. Results from Tests for Interactions between Structural Policy Variables and Initial Conditions

Variable	Dependent Variable: Growth			
	Model gA+		Model gB+	
	Coefficient	(t-value)	Coefficient	(t-value)
LII	-18.93	-1.88		
lLII	60.57	2.33		
DLII-1s			8.57	2.46
LIE	25.85	2.28	14.69	1.94
lLIE	-44.59	-1.44		
LIE-1s	11.19	1.29	-1.02	-0.24
lLIE-1s	-28.79	-1.05		
DLIE-2s	-34.09	-3.10	-28.50	-2.51
DlLIE-2s	68.40	2.74	70.51	2.78
LIP			-15.23	-1.82
lLIP			89.96	4.98
LIP-1s			-22.51	-3.48
DLIP-1s	-46.13	-2.71		
DlLIP-1s	102.71	2.64		
*LII*OverInd*	13.47	2.06		
*LIE*OverInd*			8.19	1.61
*LIE*RepInf*			-0.45	-1.43
*lLIP*RepInf*			0.81	2.20
Memorandum Items				
k	35		30	
R^2	0.87		0.86	

Variable Definitions: See notes to Table 3.
Estimation sample: 143 observations.

VI. Conclusion

This paper has attempted to bring closure to a wide range of issues related to the evolution of output in transition economies since the collapse of the centrally planned system. The main questions that was addressed in this paper was: what explains the U-shaped profile of output over time that was common across all transition economies; what explains the cross-country differences in output; and, in particular, what was the relative significance of the three set of factors–initial conditions, macroeconomic policies, and structural reforms? In addressing these general questions we also are able to answer a set of questions that have been at the center of the debate regarding transition. These include: what caused the generally worse performance of the BRO (Baltics, Russia and other countries of the former Soviet Union) relative to the countries of central and eastern Europe, and can one model explain both groups?; did the speed of reform matter for output?; and, were the effects of reforms themselves dependent on initial conditions? In attempting to answer all these questions, we tried to confront a wide range of methodological problems, which will not be repeated here.

We worked with four classes of models, defined by the left-hand side variable (output level or output growth) and the modeling of non-policy variables (initial conditions or country dummies). Our results fall in three broad categories.

First, in an effort to see which results were robust across the many theoretically plausible specifications, we applied a systematic sequence of exclusion test to see to what extent the data would "tolerate" the elimination of the main goups of policy variables (fiscal balance, inflation, internal liberalization, external liberalization and privatization/private sector conditions, with lags and interaction terms). The results are striking.

- If we consider all four classes of models, *no single policy variable considered was always robust to exclusion tests.* Furthermore, it is equally true that no policy variable can *always* be excluded (i.e. in all four model classes). This is a somewhat discouraging result, as it shows that "alone" (without putting additional structure on the model selection process) the data offer very little guidance on the relative significance of specific policies. In other words, the same dataset could be used to make contradictory claims about the significance or lack of significance of various policy variables. Ad-hoc regressions of growth on a small number of policy variables, abundant as they are in the literature, thus deserve skepticism.
- The one robust conclusion from this set of regressions is that policies matter, in the sense that it is illegal to exclude all groups of policy variables at the same time in any of the four model classes. Moreover, with the exception of one class of models (output level specification with initial conditions), we found that at least one macroeconomic policy variable and at least one structural reform variable always rejected exclusion. Finally, it was harder to exclude some variables than others: fiscal balance survived in most models, as did *either* internal liberalization *or* external liberalization.

Second, we imposed some additional structure on the model simplification process—essentially, to simplify among macroeconomic variables before structural reform variables, and to simplify among all possible lags and interaction terms for each variable group, thus trying to avoid the exclusion of the group in its entirety. However, these conventions did *not* yield a unique "final" specification, and as a result we studied a small set of relatively parsimonious models in detail. The essence of our findings is that while these models continue to disagree on the effects attributable to individual policy variables to some extent, they give fairly consistent answers to the most basic questions motivating this paper.

- The main force behind the **initial output decline** are adverse initial conditions, particularly trade dependency and initial over-industrialization. However—unlike Wolf (1997) and Havrylyshyn et al. (1998)—we find little or no evidence supporting a "J-curve effect" of structural reforms. Structural reforms tend to have offsetting effects on the state and private sectors, particularly at the beginning. The net effect is either positive or negative but small (*inter alia*, depending on the relative size of the two sectors).
- The driving force behind the **recovery** are overwhelmingly structural reforms. Macroeconomic stabilization helps, but its quantitative impact appears relatively small. Surprisingly, our parsimonious regressions disagreed on the role of initial conditions as a group in shaping the upward-sloping portion of the output "U-shape", with one model suggesting a "tapering off" of the adverse effect of initial conditions as a group, while the another did not. In either case, however, we find that in the absence of structural reforms output would continue to slide in the time period studied—in that sense, there is no automatic recovery.
- The role of initial conditions in explaining **cross-sectional variation** in growth is surprisingly minor. In particular, the difference in performance between the CEE and the BRO countries (particularly the timing of the recovery) is mostly explained by differences in structural reforms, rather than initial conditions. Moreover, a BRO dummy for the entire transition period was insignificant (although, we do find that the *initial* output collapse in BRO countries was significantly larger than that predicted by initial conditions and policies).

Third, we used our "parsimonious" specifications to study a set of issues which have been at the center of debate both among policy makers and academics. A noteworthy finding is that the notion that fast liberalization benefits growth is strongly supported, not just in the sense that economies in a more liberalized *state* grow faster, but in that chosing a faster *path* to this more liberalized state does not imply an offsetting cost. If anything, fast reforms appear to provide an *additional* impulse to growth. Finally, adverse initial conditions do *not* seem to have affected the efficacy of policies: interactive terms between initial conditions and policy variables were generally insignificant, and the main effects of policy variables remain largely unchanged.

In summary, our results underline the pre-eminence of liberalization and structural reform: as the primary force in the recovery; as the main determinant of cross-country differences in performance; the faster, the better; and *even* in the face of adverse initial conditions. These are findings that strongly support a "radical" approach to reforms.

APPENDIX

1. Private Sector Share Estimates

Our estimate for the private sector share in GDP is based on two main sources: estimated private sector shares from the World Bank's 1996 "World Development Report", which are available for two years (1990 and 1995) and estimates published in the EBRD's "Transition Report", which are available since 1994. For 1995, these two sources roughly agree; when they did not, we either used the World Bank estimate or (in exceptional cases, when there was a larger discrepancy) information from IMF desk economists as a "tie breaker".[40] Next, the "missing years" (i.e. 1991-93) were interpolated using de Melo et al's *LIP* index and IMF information for additional guidance. The resulting series for 1990-96 is reproduced in Table A1.

2. Regressions Involving Country Dummies

In the following, we show results from sensitivity analyses and "parsimonious" regression regression models which include country dummies instead of initial conditions. Both sets of results condition on a model which has already been somewhat simplified in terms of time dummies and interaction terms between country dummies and the private sector share; see the next section for details.

Sensitivity Analyses and Regression Results for Policy Variables

These are shown in Figures A1 and A2 and Tables A2 and A3, which are analogous to Figures 3 and 4 and Tables 3 and 4, respectively. Note that unlike in the set of models with initial conditions discussed in the text, lagged dependent variables survive in the country dummy models (even in the "growth specification"), as does on time dummy. Due to the presence of the lagged dependent variables, the paths of Table A3 (which ignore any endogenous dynamics of growth) cannot be interpreted as impulse responses and should be viewed merely as a convenient way of summarizing the coefficients on the structural variables of Table A2.

The bottom line of Table A3 is that structural reforms would have unambiguously helped aggregate growth in all cases from $t = 2$ onwards. This supports (and in fact, is even stronger than) a similar finding in the context of the models with initial conditions disucussed above. For the first two years, there is more ambiguity. The lines distinguishing between state

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[40] Most of the discrepancies were attributable to the fact that the World Bank estimates are expressed to the nearest half percent whereas the EBRD's are expressed to the nearest five percent. Thus, when the discrepancy was less than three percent, it was within the margin of rounding of the EBRD and we consequently used the World Bank number. The reason why we did not use information from IMF desk economists more generally is that it was not collected systematically for all countries over our sample period.

APPENDIX

Table A1. Private Sector Share Estimates
(in percent of GDP)

	1990	1991	1992	1993	1994	1995	1996
Albania	5.0	5.0	10.8	38.3	50.0	60.0	75.0
Armenia	12.0	12.0	31.5	37.1	40.0	45.0	50.0
Azerbaijan	10.0	10.0	12.6	13.3	20.0	25.0	25.0
Belarus	6.0	6.0	10.2	13.3	15.0	15.0	15.0
Bulgaria	9.5	17.8	26.2	26.2	33.0	36.0	39.0
Croatia	10.0	27.0	30.0	31.0	40.0	47.0	52.0
Czech Republic	5.0	23.3	33.7	33.1	64.3	70.0	75.0
Estonia	10.0	10.0	24.9	39.8	55.0	62.0	68.0
Georgia	15.0	15.0	18.1	18.7	20.0	30.0	50.0
Hungary	19.0	25.0	39.0	54.0	55.0	60.0	70.0
Kazakhstan	7.0	7.0	8.3	10.6	20.0	25.0	40.0
Kyrgyz Republic	7.0	7.0	14.1	22.8	30.0	40.0	50.0
Latvia	10.0	10.0	26.9	39.2	55.0	60.0	62.0
Lithuania	11.5	11.5	22.8	38.2	50.0	55.0	65.0
FYR Macedonia	14.0	14.0	14.0	37.5	35.0	40.0	50.0
Moldova	10.0	10.0	12.1	16.9	20.0	30.0	40.0
Mongolia	10.0	42.1	55.0	55.0	55.0	55.0	60.0
Poland	27.0	31.4	45.3	47.0	53.0	58.0	60.0
Romania	16.5	23.6	25.7	32.0	35.0	40.0	55.0
Russia	6.0	6.0	23.5	32.9	50.0	58.0	60.0
Slovak Republic	6.0	23.3	32.4	39.0	56.0	60.0	69.0
Slovenia	11.0	15.0	20.0	25.0	30.0	40.0	45.0
Tajikistan	10.0	10.0	11.2	11.5	15.0	15.0	20.0
Turkmenistan	10.0	10.0	10.9	12.3	15.0	15.0	20.0
Ukraine	10.0	10.0	25.5	18.7	31.0	36.5	42.0
Uzbekistan	10.0	10.0	12.5	15.8	20.0	30.0	40.0

Sources: see text.

Figure A1: Exclusion Possibilities from Model with Growth on Left Hand Side, Country Dummies

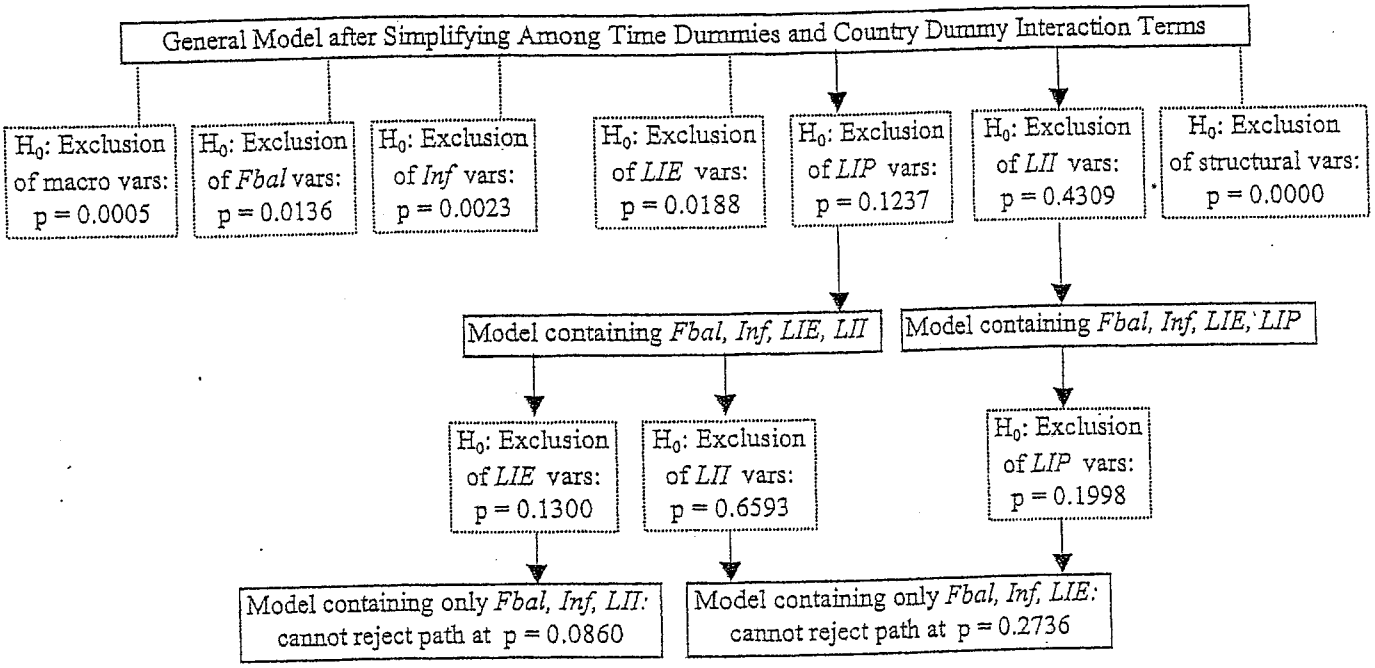
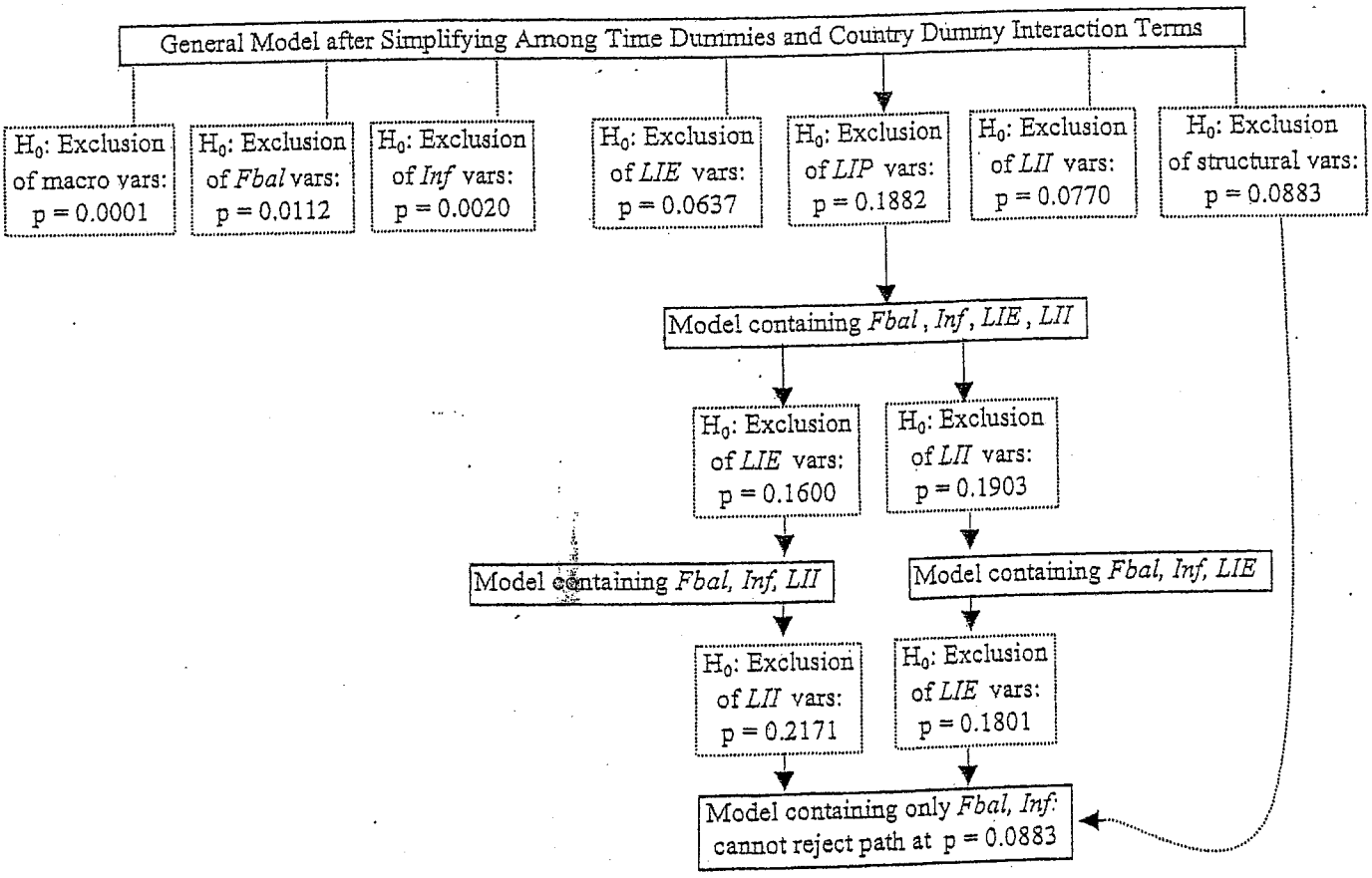


Figure A2: Exclusion Possibilities from Model with Output on Left Hand Side, Country Dummies



APPENDIX

Table A2. Results from Regressions with Country Dummies: Coefficients on Lagged Endogenous Variables and Policy Variables

Variable	Dependent Variable: Output Growth				Dependent Variable: Output Level			
	OLS		IV		OLS		IV	
	Coeff.	(t-value)	Coeff.	(t-value)	Coeff.	(t-value)	Coeff.	(t-value)
Growth-1s	-0.241	(-4.15)	-0.241	(-3.14)				
Growth-2s	-0.252	(-4.16)	-0.194	(-1.53)				
Output-1s					0.432	(9.64)	0.396	(6.92)
t0					2.091	(10.08)	1.961	(7.59)
Inf	-2.602	(-3.09)	-3.230	(-1.51)				
lInf					-0.040	(-1.69)	0.049	(0.82)
Inf-1s					-0.009	(-0.52)	0.003	(0.14)
lInf-1s					0.042	(0.88)	-0.028	(-0.40)
DInf	4.020	(3.34)	6.164	(1.86)				
DlInf	-15.061	(-3.71)	-22.726	(-2.27)				
Inf-2s	-2.196	(-3.12)	-1.910	(-1.65)	-0.070	(-5.66)	-0.076	(-5.12)
lInf-2s					0.131	(4.09)	0.133	(3.39)
Fbal					0.004	(2.66)	0.005	(1.22)
lFbal					-0.009	(-2.00)	-0.004	(-0.43)
lFbal-1s					-0.006	(-2.47)	-0.003	(-0.67)
DFbals	0.285	(4.97)	0.420	(1.33)				
LII-1s					0.123	(1.74)	0.167	(1.99)
LII-2s	11.076	(2.27)	10.850	(2.10)	0.185	(3.16)	0.195	(2.60)
LIE	32.350	(3.98)	29.398	(2.46)	0.203	(2.26)	0.221	(2.10)
lLIE	-45.391	(-2.26)	-42.134	(-1.54)	-0.450	(-1.76)	-0.451	(-1.39)
LIE-1s	11.439	(2.58)	11.110	(2.30)	0.279	(1.93)	0.304	(1.66)
lLIE-1s					-0.536	(-1.44)	-0.570	(-1.16)
LIE-2s	-36.380	(-3.49)	-34.911	(-2.98)	-0.623	(-4.10)	-0.643	(-3.29)
lLIE-2s	73.165	(3.40)	67.683	(2.25)	1.340	(3.91)	1.352	(3.07)
LIE-3s	7.011	(1.90)	6.759	(1.68)				
LIP	-10.830	(-1.43)	-9.557	(-1.10)				
LIP-1s					-0.225	(-3.20)	-0.209	(-2.36)
DLIP-1s	-49.349	(-3.48)	-54.949	(-3.26)				
DlLIP-1s	110.300	(3.19)	126.760	(3.09)	0.355	(2.30)	0.383	(2.00)
Memorandum Items								
k	50		50		58		58	
R^2	0.9269				0.9999			
Specific. χ^2 (p-value)			0.27				0.64	

Variable Definitions: *Output* is natural log of an index of real output; *Growth* is annual average output growth (in percent), *Inf* is natural log of (1+π), where π denotes average annual inflation expressed as a fraction; *Fbal* is the fiscal balance (in percent of GDP); *LII*, *LIE* and *LIP* are de Melo, Denizer and Gelb's (1996) indices of internal liberalization, external liberalization, and private sector entry conditions, respectively (see text). Notation: the prefix "*l*" denotes an interaction (multiplication) with the estimated private sector share; "*D*" denotes the first difference operator. The suffix "*s*" denotes that the series only contains observations corresponding to the transition sample, i.e. pre-transition lags are truncated (replaced by zero entries), see text. Estimation sample: N = 143

APPENDIX

Table A3. Growth Effects of a Permanent 0.1 Increase in Structural Reform Indices at t = 0 (Country Dummy Model)

Model	Sector or Country	Transition Time 0	1	2	3	4	5
OLS	state sector effect	2.15	-1.64	0.77	1.47	1.47	1.47
	private sector effect	-2.39	4.85	3.54	4.24	4.24	4.24
	non-BRO average	1.26	0.11	1.70	2.70	2.81	3.03
	Albania	1.93	-0.94	1.83	2.86	3.13	3.55
	Bulgaria	1.34	0.06	1.49	2.38	2.47	2.55
	Czech Republic	1.09	0.55	1.68	3.25	3.41	3.55
	BRO average	1.35	-0.16	1.61	2.47	2.66	
	Estonia	1.02	0.95	2.29	3.19	3.36	
	Russia	1.08	0.50	2.15	3.08	3.13	
	Turkmenistan	1.66	-0.84	1.18	1.88	2.02	
IV	state sector effect	1.98	-2.40	0.69	1.36	1.36	1.36
	private sector effect	-2.23	6.06	3.24	3.92	3.92	3.92
	non-BRO average	1.16	-0.12	1.55	2.50	2.61	2.80
	Albania	1.77	-1.48	1.67	2.64	2.90	3.28
	Bulgaria	1.23	-0.19	1.36	2.21	2.28	2.36
	Czech Republic	1.00	0.45	1.53	3.01	3.15	3.28
	BRO average	1.24	-0.47	1.47	2.29	2.47	
	Estonia	0.93	0.97	2.09	2.95	3.10	
	Russia	0.99	0.39	1.97	2.85	2.90	
	Turkmenistan	1.52	-1.36	1.07	1.75	1.88	

and private sector effects suggest that the latter would have been negative on impact ($t = 0$) and the former negative at $t = 1$ (but positive on impact). Both the negative impact effect on the private sector and the net positive impact effect on the state sector are driven by the initial effects of external opening (see Table A2). As to the second transition year ($t = 1$), the negative state sector effect is a manifestation of adverse effects of reforms captured by the index *LIP* on the state sector (see coefficient on *DLIP-1s* in Table A2). Importantly, the *net* contribution of these offsetting effects is positive throughout for $t = 0$—contradicting a widely held belief that structural reforms will typically lead to declines in aggregate output at the beginning—and at $t = 1$ it is negative only for countries with low private sector shares (Bulgaria, Turkmenistan and, by a small margin, the BRO average). Even in those countries, however, the *sum* of aggregate growth effects of structural reforms is positive in the first two years. In this sense, the country dummy regressions agree with the initial conditions regressions presented in the text in lending little support to the idea that structural reforms initially have an "destruction" effect on *aggregate* output.

Coefficients on Country Dummies

Table A4 shows the coefficients on country dummies corresponding to the growth regressions of Table 3. In seven cases, an additional interaction term between the country dummy and the private sector share could not be eliminated (see Section II.C. for a motivation of these terms). For these countries, the average country-specific effect is obtained by adding the coefficient on the country dummy with the product of the coefficient on the interaction term and the average estimated private sector share over the sample (about 0.36 for Armenia, about 0.38 for Croatia, about 0.28 for Georgia, about 0.31 for the Kyrgyz Republic, about 0.46 for Lithuania, about 0.45 for Russia and about 0.31 for Ukraine; see Table A2).

The overall country-specific effect is between -15 to -30 for most countries, with three outliers: Uzbekistan, Belarus and Turkmenistan (at -5.5, -11.5 and -9.4, respectively, in the OLS model). Since the regression was run without a constant term, the interpretation for this effect is that this is the average annual rate at which these economies would have declined over the sample transition period in the absence of structural reforms, and setting the values of the macroeconomic policy variables to zero. The outlier status of Uzbekistan, Belarus and Turkmenistan reflects that fact that these countries declined relatively less than would have been expected based on their (weak) average structural reform record over the period.[41]

It is also noteworthy that Armenia, Croatia, Georgia and Lithuania have positive interaction terms while the Kyrgyz Republic, Russia and Ukraine have negative interaction terms. The interpretation is that the former group of countries provided a favorable environment for private sector growth *over and above* the effects on the private sector which are already captured by the structural reform indices, while the latter group provided an adverse environment for private sector growth over and above that effect.

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[41] For an analysis of the case of Uzbekistan, see Zettelmeyer (1998).

Table A4. Coefficients on Country Dummies
(Dependent Variable: Output Growth)

Dummy	OLS		IV	
	Coeff.	(t-value)	Coeff.	(t-value)
Albania	-21.7	-5.0	-19.7	-3.0
Armenia	-82.4	-4.6	-56.4	-1.4
lARM	158.2	3.7	99.3	1.1
Azerbaijan	-23.7	-7.0	-22.0	-3.8
Belarus	-11.5	-3.1	-9.6	-1.5
Bulgaria	-24.0	-4.6	-21.3	-2.6
Croatia	-46.9	-4.5	-41.7	-2.7
lCRO	51.0	2.3	43.1	1.6
Czech Republic	-24.3	-4.0	-22.5	-3.2
Estonia	-30.4	-5.4	-29.0	-4.1
Georgia	-52.5	-7.5	-46.8	-3.3
lGEO	116.1	5.4	100.7	2.9
Hungary	-25.3	-4.8	-23.3	-3.3
Kazakhstan	-22.9	-5.5	-21.3	-3.1
Kyrgyz Republic	-12.9	-1.8	-11.2	-1.1
lKGZ	-31.7	-1.8	-31.2	-1.6
Latvia	-34.0	-7.1	-32.3	-5.1
Lithuania	-76.9	-8.6	-75.5	-7.6
lLTU	77.2	4.9	78.7	4.4
FYR Macedonia	-31.2	-5.6	-28.8	-3.4
Moldova	-29.9	-6.7	-27.7	-3.9
Mongolia	-9.6	-2.0	-8.8	-1.7
Poland	-20.6	-3.8	-18.6	-2.7
Romania	-14.2	-3.4	-12.5	-2.2
Russia	1.2	0.1	5.1	0.5
lRUS	-52.2	-3.3	-57.9	-3.3
Slovak Republic	-22.2	-3.9	-20.5	-3.1
Slovenia	-21.2	-3.5	-18.8	-2.3
Tajikistan	-18.8	-5.5	-17.3	-3.3
Turkmenistan	-9.4	-3.0	-8.1	-1.6
Ukraine	1.0	0.1	4.0	0.4
lUKR	-66.5	-2.4	-71.5	-2.4
Uzbekistan	-5.5	-1.4	-4.8	-0.9
Memorandum Items				
k	50		50	
R^2	0.927			
Specific. χ^2 (p-value)			0.27	

Note: the notation "lXXX" is denotes a "country dummy interaction term" constructed as the product between a dummy variable for the country abbreviated as "XXX" and the estimated private sector share for this country in each year of

3. Additional Tables for Regression Models gA and gB

IV regression coefficients on policy variables in models gA and gB

See Table A5. Note that no IV regression is given for the "levels" model with initial conditions since this did not contain contemporaneous macroeconomic variables (see Table A5).

Coefficients on Initial Conditions Variables

See Table A6. The notation is the same as in Table A4, except for variables ending with a small b, c, d, or r, which were generated in the course of testing the equality restrictions described in Table A4 above and are defined as follows: RepInftD1b = RepInftD1 - 2*RepInfD1; RepInftD1c = RepInftD1 - RepInfD1; RepInftD2b = RepInftD2 - 2*RepInfD2; lRepInftD1c = lRepInftD1 - lRepInfD1; NatRRtD3b = NatRRtD3 - 4*NatRRD3; UrbantD1b = UrbantD1 - 2*UrbanD1; lUrbantD1b = lUrbantD1 - 2*lUrbanD1; lUrbantD2b = lUrbantD2 - 3*lUrbanD2; AgSh89tD2c = AgSh89tD2 - 2*AgSh89D2; lAgSh89tD2c = lAgSh89tD2 - 2*lAgSh89D2; lAgSh89tD2d = lAgSh89tD2 - 3*lAgSh89D2; lOverIndD2c = lOverIndtD2 - 2*lOverIndD2; lOverIndtD1b = lOverIndtD1 - 2*lOverIndD1; TraddeptD2c = TraddeptD2 - 2*TraddepD2; TraddeptD3b = TraddeptD3 - 3*TraddepD3; TraddeptD3c = TraddeptD3 - 4*TraddepD3.

Initial conditions variables that show the suffix "r" (for "relative") were expressed as deviations from the (cross-sectional) mean. Thus, the regression constants do not have an interpretation distinct from the initial conditions group, because the decision on whether or not to express initial conditions as deviations from the mean or not (which is otherwise inconsequential in the sense that the standard error of the regression and all other coefficients are unaffected) will affect the regression constant. This is the reason why in Tables 8-11 the impact of the initial conditions is always shown *joint* with the regression constant. The question of whether to express initial conditions as deviations from the mean or not is merely one of interpretation. In the case of regression gA, *Urban*, *AgSh89* and *Traddep* were expressed in this way.

Table A5. Regressions including Initial Conditions:
Coefficients on Lagged Endogenous Variables and Policy Variables (IV)

Variable	Dependent Variable: Growth			
	Model gA (IV)		Model gB (IV)	
	Coefficient	t-value	Coefficient	t-value
Output-1s				
Output-2s				
Output-3s				
lInf-2s				
DInf	2.169	0.76	5.611	2.43
DlInf	-10.551	-1.16	-16.132	-2.24
Fbal	0.332	0.92	0.977	4.82
lFbal	-1.197	-1.35	-2.680	-4.89
Fbal-1s			-0.193	-2.64
lFbal-1s				
Fbal-2s				
DFbal-1s	-0.182	-2.49		
LII	-14.255	-1.20		
lLII	51.794	1.68		
DLII-1s			10.759	2.89
LII-2s				
LIE	26.716	2.19	10.025	2.33
lLIE	-39.531	-1.18		
LIE-1s	11.318	1.17	-0.699	-0.15
lLIE-1s	-25.366	-0.81		
DLIE-2s	-32.316	-2.72	88.051	3.63
DlLIE-2s	63.968	2.39	-34.487	-3.14
LIP			-12.314	-1.53
lLIP			101.400	5.63
LIP-1s			-26.685	-3.92
lLIP-1s				
DLIP-1s	-51.477	-2.78		
DlLIP-1s	109.730	2.62		
Memorandum Items				
k	34		27	
Specification χ^2 (p-value)	0.19		0.08	

Variable Definitions: See notes to Table 3. Estimation sample: 143 observations.

Table A6. Regressions including Initial Conditions:
Coefficients on Initial Conditions Variables

Variable	Dependent Variable: Growth								Dep.Var.: Output	
	Model gA (OLS)		Model gA (IV)		Model gB (OLS)		Model gB (IV)		Model y (OLS)	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value	Coeff.	(t-value)
dInfa-1	-10.40	-2.37	-8.37	-1.52					-0.46	-6.84
dFbal-1	1.31	3.02	1.62	3.12						
dlFbal-1	-7.48	-3.76	-8.44	-3.80						
GrIniD0	-2.32	-2.40	-2.83	-2.66					-0.07	-4.25
ypc89D1									0.28	6.57
ypc89tD1									-0.33	-8.99
ypc89O1									-0.08	-3.97
RepInf					0.15	2.07	0.17	2.29		
RepInftD1b	-0.32	-3.64	-0.29	-2.69						
RepInftD1c									-0.06	-8.35
RepInftD2b					-0.35	-4.52	-0.36	-4.21		
lRepInf									0.01	2.70
lRepInftD1c									0.23	7.30
NatRR									-0.05	-2.27
NatRRtD3b					2.67	3.61	2.80	3.28		
NatRRD1	-5.91	-1.76	-2.92	-0.60						
LIIniD1									2.17	7.51
LIInitD1	-32.17	-2.83	-23.66	-1.55					-1.73	-6.16
LIIniO1	-45.89	-3.10	-36.24	-2.16						
lLIIniO1	62.93	2.11	47.30	1.43						
Urbanr	-0.50	-6.09	-0.50	-5.56						
UrbanD2					-0.39	-6.26	-0.40	-6.16		
UrbantD1b									0.01	7.31
lUrban					-1.02	-5.97	-1.03	-5.72		
lUrbanD1									0.19	8.22
lUrbantD1									-0.13	-8.66
lUrbanO1									-0.01	-3.09
lUrbantD1b	-0.65	-2.71	-0.61	-2.43						
lUrbantD2b					-0.78	-6.19	-0.77	-5.77		
AgSh89r	-82.76	-6.01	-85.26	-5.68						
AgSh89									-0.85	-4.90
AgSh89tD2c	-44.66	-2.63	-49.69	-2.40					-4.82	-8.14
AgSh89O2					-59.04	-5.30	-62.21	-5.30		
lAgSh89tD2c	355.08	3.61	360.61	3.23					17.41	7.64
lAgSh89tD2d					191.46	5.77	195.48	5.79		
OverIndD1									2.20	6.51
OverIndtD1									-0.77	-3.98
OverIndD2					21.72	3.67	22.73	3.75		
lOverIndD2c	118.20	4.87	117.48	4.49	174.50	7.67	183.64	7.66		
lOverIndtD1b									4.94	6.60
Traddepr	0.30	3.47	0.31	3.37						
TraddeptD2c									0.00	4.32
TraddeptD3b					0.12	3.13	0.12	2.95		
TraddeptD3c	0.09	3.27	0.09	2.97						
Memorandum Items										
Regression Const.	-8.85	-3.16	-9.09	-2.94	18.73	4.80	19.10	4.44	1.11	4.41
k	34		34		27		27		38	
R^2	0.86		NA		0.85		NA		0.96	
Specific. χ^2 (p)	NA		0.19		NA		0.08		NA	

Variable Definitions: See text. Estimation sample: 143 observations.

4. General-to-Specific Model Selection Sequence

Tables A7 and A8 summarize all steps by which the final regression models discussed in the text and in the appendix were generated,[42] and show the p-values associated with undertaking each step.[43] In addition, they show the models on which the "sensitivity analysis of policy variables" described in the main text were based. In the case of the models with country dummies, these followed after stage 2 (growth version) or stage 3 (levels version) of the simplification process. In the case of the models with initial conditions, they followed after Part II (Table A8 (II)).

As discussed above, the general rule was to simplify first among time dummies and second among variables capturing non-policy, country-specific effects. In the context of the **models with country dummies** (Table A7), the latter are captured by country dummies and by interaction terms between country dummies and the private sector share (see Section II.C). However, since the use of country dummies is intrinsic to the econometric method used (in effect, a fixed effects estimator), simplifying within the group of country-specific non-policy variables was limited to simplifying among the interaction terms between the country dummies and the private sector share. The rule followed was to eliminate the largest possible set of interactions terms that could be legally eliminated at the 0.1 significance level, in other words, for which the hypothesis that the coefficients are jointly zero could not be rejected. After this, we reduced the model by eliminating and restricting policy variables using the criteria described in Section II.D of the text.

In the case of the **models with initial conditions**, the model selection process was much more complicated, in particular, reflecting the need to model the effects of initial conditions in a way that comprised three-parts, which are reflected in the subdivisions of Table A8 and which are described as follows.

After testing and eliminating the time dummies and lagged dependent variables (of which only the second lag was eliminated initially) we first attempted to eliminate all terms involving a given initial condition and its interaction with the private sector share *as a group* (i.e. we tested for the joint significance of *all* time interactions associated with the initial condition—see Section II.C. and Table A8). The convention was to first test the joint significance of an initial condition "group" that included all interaction terms with the private sector and time (a total of 8 variables, see for example step 6). In the event of not rejecting the significance of this group at the ten percent level, we proceeded to test the joint significance

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[42] Among the models with initial conditions, we only show the model selection steps for models gA and gB, since the "levels" model y (see Tables 5 and 7) closely followed the steps used in generating model gA.

[43] In other words, the p-value given for a given step is the alpha-level at which the hypothesis embodied in the step could just not be rejected. The acceptable threshold for any individual step was generally taken to be 0.1, i.e any steps with p-values of less than 0.1 were rejected.

Table A7. Model Selection Steps for Regressions with Country Dummies

Step	Dependent Variable: Output Growth Characterization	p-value	Dependent Variable: Output Level Characterization	p-value
	Initial model: full set of time dummies, two lagged dependent variables, policy variables with lags and interaction terms, and country dummies with interaction terms		Initial model: full set of time dummies, three lagged dependent variables, policy variables with lags and interaction terms, and country dummies with interaction terms	
1	eliminate time dummies	0.18	eliminate time dummies except for t0	0.55
2	eliminate largest set of country dummy interaction terms that was not significant at 0.1 level 1/	0.48	eliminate second and third lagged dependent variable	0.89
3	eliminate Fbal interaction terms	0.96	eliminate largest set of country dummy interaction terms that was not significant at 0.1 level 2/	0.29
4	eliminate Fbal-2s	0.81	eliminate Fbal-2s, lFbal-2s	0.92
5	impose equal and opposite coefficients on Fbal and Fbal-1 (replace by first difference)	0.97	eliminate Fbal-1s	0.82
6	eliminate lInf-2s	0.11	eliminate Inf	0.24
7	eliminate lInf	0.35	eliminate LIE-3s, lLIE-3s	0.88
8	eliminate LII-3s and lLII-3s	0.30	eliminate LIP, lLIP	0.59
9	eliminate LII, lLII, LII-1s, lLII-1s, lLII-2s	0.98	eliminate LIP-3s, lLIP-3s	0.24
10	eliminate lLIE-3s.	0.14	impose equal and opposite coefficients on lLIP-1s and lLIP-2s.	0.79
11	eliminate lLIE-1s	0.80	eliminate LIP-2s	0.45
12	eliminate lLIP-3s	0.35	eliminate LII-3s, lLII-3s	0.82
13	eliminate LIP-3s	0.39	eliminate lLII-1s, lLII-2s	0.92
14	eliminate lLIP	0.66	eliminate lLII	0.51
15	impose equal and opposite coefficients on LIP-1s and LIP-2s, and lLIP-1s and lLIP-2s, resp.	0.33	eliminate LII	0.40
	p-value of joint restrictions (i.e. all steps):	0.60	p-value of joint restrictions (i.e. all steps):	0.85

Notation: see notes to Table 3.

1/ All interaction terms except for lARM, lCRO, lGEO, lKGZ, lLTU, lRUS, lUKR (see Table A1).

2/ All interaction terms except for lARM, lAZE, lLTU, lMAC, LMDA, lPOL, lRUS, lSVK, lSVN, lTJK, lUKR.

Table A8 (I). Model Selection Steps for Models gA and gB
Part I: Groupwise elimination of initial conditions (expressed as cubic functions of time)

Step	Model gA Characterization	p	Model gB Characterization	p
	Initial model: constant, time dummies; two lagged dep. variables; policy variables with lags and interaction terms; all initial conditions defined in Table 7 plus "time under communism" (TCOMM) with corresponding interaction terms, each mutliplied with a cubic function of time (except GrIni, dFbal-1 and dInf-1, which are specific to year t=0). 1/			
1	eliminate time dummies	0.92	eliminate time dummies	0.92
2	eliminate second lag of dependent variable	0.37	eliminate second lag of dependent variable	0.37
3	eliminate dlInf-1	0.11	eliminate dlInf-1	0.11
4	eliminate lTraddep, lTraddept, lTraddept2, lTraddept3	0.13	eliminate lTraddep, lTraddept, lTraddept2, lTraddept3	0.13
5	eliminate lGrIniD0	0.67	eliminate GrIniD0, lGrIniD0	0.11
6	eliminate TCOMM, TCOMMt, TCOMMt2, TCOMMt3, lTCOMM, lTCOMMt, lTCOMMt2, lTCOMMt3	0.18	eliminate TCOMM, TCOMMt, TCOMMt2, TCOMMt3, lTCOMM, lTCOMMt, lTCOMMt2, lTCOMMt3	0.18
7	eliminate lypc89, lypc89t, lypc89t2, lypc89t3	0.36	eliminate ypc89, ypc89t, ypc89t2, ypc89t3, lypc89, lypc89t, lypc89t2, lypc89t3	0.16
8	eliminate lRepInf, lRepInft, lRepInft2, lRepInft3	0.14	eliminate lRepInf, lRepInft, lRepInft2, lRepInft3	0.18
9	eliminate lagged dependent variable (Growth-1s)	0.34	eliminate LIIni, LIInit, LIInit2, LIInit3, lLIIni, lLIInit, lLIInit2, lLIInit3	0.22
10			eliminate dFbal-1, dlFbal-1	0.33
11			eliminate lagged dependent variable (Growth-1s)	0.51
	Joint restrictions (i.e. all steps above):	0.31	Joint restrictions (i.e. all steps above):	0.14

1/ The same notation is used as in Table 7, see notes to that table. In addition, the suffix t, t2, and t3 means that the preceding variable is multiplied with t (transition time), t to the power of 2 and t to the power of 3, respectively. As before, the prefix l denotes an interaction with the private sector share. GrIni, dFbal-1, dInfa-1 and their interaction terms with the private sector were ordered prior to the groups of time-interacted initial conditions. The ordering of the latter was as follows: TCOMM, ypc89, RepInf, bmkt, NatRR, Urban, AgSh89, OverInd, LIIni, Traddep.

Table A8 (II). Model Selection Steps for Models gA and gB
Part II: Simplification of piecewise linear initial conditions

	Model gA		Model gB	
Step	Characterization	p	Characterization	p
	Initial model: constant, policy variables with lags and interaction terms; WARd, GrIniD0, dInf-1, dFbal-1, dlFbal-1 and the following time-dependent initial conditions (piecewise linear, breakpoints in parentheses): ypc89 (4), RepInf (1), NatRR (1), Urban (1), lUrban (1), AgSh89 (2), lAgSh89 (2), OverInd (2), lOverInd (2), LIIni (1), Traddep (3). 1/		Initial model: constant, policy variables with lags and interaction terms; WARd, dInf-1, and the following time-dependent initial conditions (piecewise linear, breakpoints in parentheses): RepInf (2), NatRR (3), Urban (2), lUrban (2), AgSh89 (2), lAgSh89 (2), OverInd (2), lOverInd (2), Traddep (3). 1/	
1	impose time-invariance of ypc89	0.44	eliminate NatRRO3	0.97
2	eliminate RepInfO1	0.12	impose NatRRtD3 = 4*NatRRD3	0.35
3	impose RepInftD1 = 2*RepInfD1	0.35	impose lUrbantD2 = 3*lUrbanD2	0.28
4	eliminate lNatRRD1, lNatRRtD1, lNatRRO1	0.53	eliminate UrbanO2	0.97
5	eliminate NatRRO1	0.40	eliminate UrbantD2	0.82
6	eliminate NatRRtD1	0.77	eliminate lAgSh89O2	0.73
7	eliminate lUrbanO1	0.22	impose lAgSh89tD2 = 3*lAgSh89D2	0.85
8	impose lUrbantD1 - 2*lUrbanD1	0.82	eliminate AgSh89D2	0.86
9	impose lUrbantD1 - 2*lUrbanD1	0.77	eliminate AgSh89tD2	0.19
10	impose flat path of Urban (eliminate UrbantD1b)	0.23	eliminate lOverIndO2	0.83
11	eliminate lAgSh89O2	0.89	impose lOverIndtD2 = 2*lOverIndD2	0.76
12	impose lAgSh89tD2 = 2*lAgSh89D2	0.89	eliminate OverIndO2	0.81
13	impose AgSh89tD2 = 2*AgSh89D2	0.45	eliminate OverIndtD2	0.88
14	eliminate lOverIndO2	0.45	eliminate TraddepO3	0.41
15	impose lOverIndtD2 = 2*lOverIndD2	0.96	impose TraddeptD3 = 3*TraddepD3	0.84
16	eliminate OverIndD2, OverIndtD2, OverIndO2	0.46	impose RepInftD2 = 2*RepInfD2	0.08
17	eliminate lLIIniD1, lLIInitD1	0.70		
18	eliminate LIIniD1	0.09		
19	impose TraddeptD3 = 4*TraddepD3	0.64		
20	eliminate ypc89	0.18		
	Joint restrictions (i.e. all steps above)	0.77	Joint restrictions (i.e. all steps above):	0.96

1/ As before, the prefix l refers to the private sector share. The suffix Dτ denotes a dummy variable that takes the value 1 for t smaller or equal τ, and 0 else, and Oτ is defined as 1 - Dτ. τ is referred to as the "breakpoint" of a piecewise linear initial condition parametrized in accordance with section II.C. For example, lUrban (1) means that lUrbanD1, lUrbantD1 and lUrbanO1 entered the regression, where lUrbantD1 = l*Urban*t*D1, etc.

Table A8 (III). Model Selection Steps for Models gA and gB
Part III: Simplification of policy variables (continues Part II)

	Model gA		Model gB	
Step	Characterization	p	Characterization	p
20	eliminate lFbal-2s	0.88	eliminate lFbal-2s	0.59
21	eliminate lFbal-1s	0.21	eliminate lFbal-1s	0.31
22	impose equality of Fbal-1s and Fbal-2s	0.14	eliminate Fbal-2s	0.08
23	eliminate Inf-2s, lInf-2s	0.61	eliminate Inf-2s lInf-2s	0.27
24	impose equality of Inf and Inf-1s; and lInf and lInf-1s, respectively	0.39	impose equality of Inf and Inf-1s; and lInf and lInf-1s, respectively	0.31
25	impose equality of LIE-2s and LIE-3s; and lLIE-2s and lLIE-3s, respectively	0.46	impose equality of LIE-2s and LIE-3s; and lLIE-2s and lLIE-3s, respectively	0.50
26	eliminate lLIP-3s	0.58	eliminate lLIE	0.29
27	eliminate lLIP	0.94	eliminate lLIE-1s	0.15
28	eliminate LIP	0.19	eliminate LIP-3s, lLIP-3s	0.74
29	eliminate LIP-3s	0.13	eliminate lLIP-2s	0.35
30	impose equality of LIP-1s and LIP-2s; and lLIP-1s and lLIP-2s, respectively	0.44	eliminate LIP-2s	0.64
31	eliminate LII-3s, lLII-3s	0.74	eliminate lLIP-1s	0.96
32	eliminate LII-2s, lLII-2s	0.99	eliminate LII-3s lLII-3s	0.71
33	eliminate lLII-1s	0.45	eliminate lLII, lLII-1s, lLII-2s	0.46
34	eliminate LII-1s	0.46	impose equality of LII-1s and LII-2s	0.20
35			eliminate LII	0.34
	Joint restrictions of Parts II and III (i.e. all steps 1-34 above)	0.84	Joint restrictions of Parts II and III (i.e. all steps 1-16 and 20-35 above)	0.89

Notation: See notes to Table 3.

of the four terms involving interactions between the same initial condition and the private sector (see, for example, step 8), and finally the significance of the remaining four terms in which the initial condition was directly interacted with time. Initial conditions were subjected to these tests in a certain order, which is listed in the footnote to Table A8 (I), and reflected our priors on their relative importance for growth in transition. In particular, the conditions characterizing the pre-transition structure of the economy were ordered last (trade dependency, over-industrialization and initial liberalization). The only exception to this order was that we tested the private sector *interaction* terms involving *Traddep* early, since this variable was supposed to reflect the "CMEA shock" on *aggregate* demand in transition countries, and one would thus not expect a strongly differential impact on the private and public sectors.

After going through the elimination hierarchy once, we returned to the beginning to test whether there were "second round" elimination possibilities using the same criteria (see step 9 in the left column and step 10 and 11 in the last column of Table A8).

The main difference between the left and right column is that in the former we took a more conservative view on the acceptable p-values associated with a subset of simplification steps. The table only cites the p-values associated with individual steps and with the entire set of simplification steps; all of these exceed the 0.1 threshold in both cases. However, in the case of model gB, there are subsets of the simplification sequence (e.g, steps 5 through 11) that are associated with $p < 0.1$. This is due to the bunching of several steps with individual p-values close to 0.1. In the case of model gA, we allowed more variables to remain in the model to avoid this. As a result, until the end of Part I (but not beyond, see below), gB is strictly encompassed by gA.

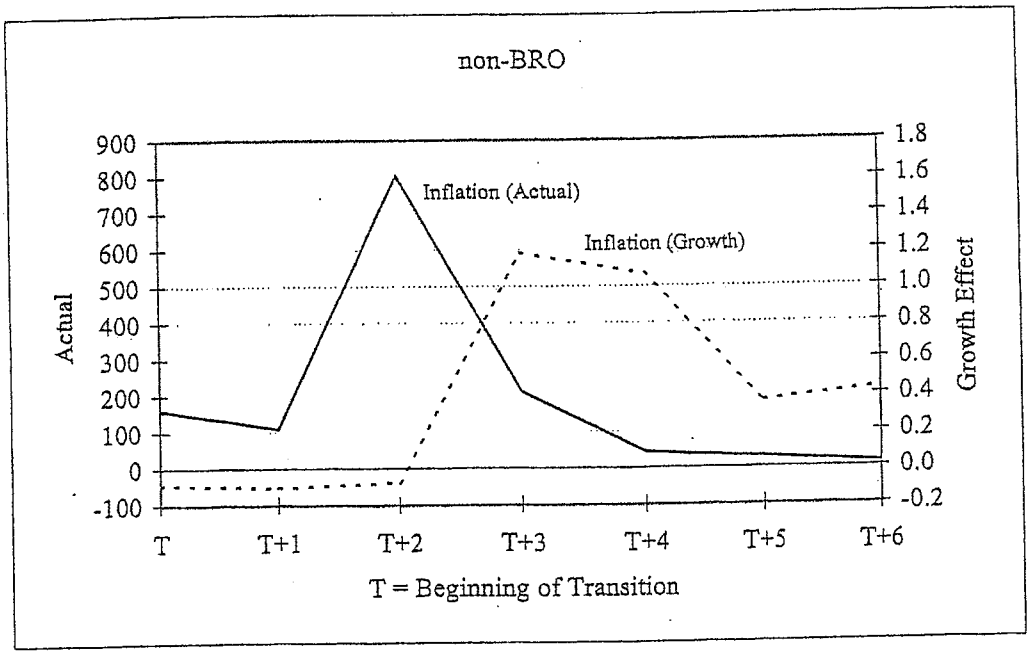
Ater completing Part I of the simplification process, we used the time paths of the effect of the surviving initial conditions to determine parameter τ (the "break point") of the piecewise linear functions of time described in Section II.C. We chose τ as the time period closest to, *and preceding*, the first inflection point of the non-linear time path. Since the piecewise linear specification allows a discontinuity between $t = \tau$ and $t = \tau + 1$ (because the parameter c that sets the level of the flat portion of the time path after $t = \tau$ is not constrained in any way, see Section II.C), this gives the piecewise linear specification most flexibility to approximate the underlying non-linear path. Note that τ was not always the same across models gA and gB for the same initial condition.

The resulting model—i.e. including the surviving initial conditions from Part I as piecewise linear functions of time, plus all policy variables with lags and interaction terms—was the point of departure for the remaining simplification process (Table A8 parts II and III). The objective of Part II was to reduce the number of parameters characterizing the (piecewise linear) time path of the effect of initial conditions by testing a series of linear restrictions, as detailed in Table A8 Part II. The order of testing was the same as in Part I, i.e. macroeconomic initial conditions came first and structural initial conditions last. As can be seen from Table A8 (II), the time paths were simplified by testing both exclusion and equality restrictions; the latter involved eliminating the discontinuity which the piecewise

linear specification allowed between $t = \tau$ and $t = \tau + 1$. Note that model gA allowed more such steps than model gB (unsurprisingly, since the former had been imposed to a heavier set of restrictions in Part I of the simplification process).

The outcomes of Part II formed the basis of both the sensitivity analysis of policy variables described in the main text, and a final round of simplification steps applied to the policy variables, which lead to the parsimonious specifications gA and gB (Table A8 Part III). This final round relied on the criteria described at the end of Section II in the main text.

Figure A3a. The Path of Inflation and Its Growth Effects (Model gA)
(Actual Inflation in percent)



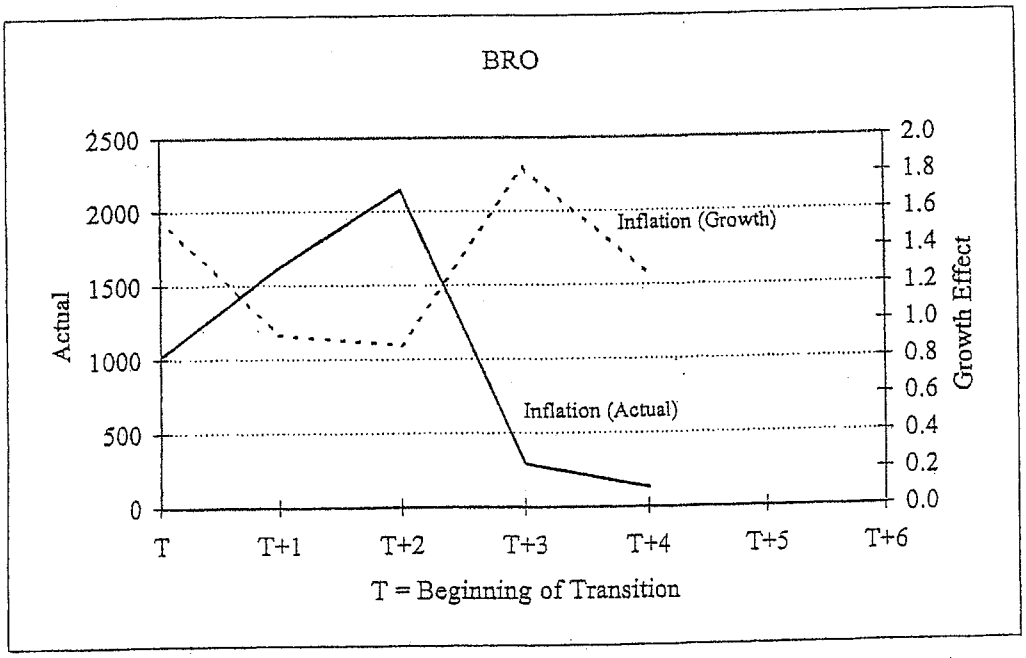
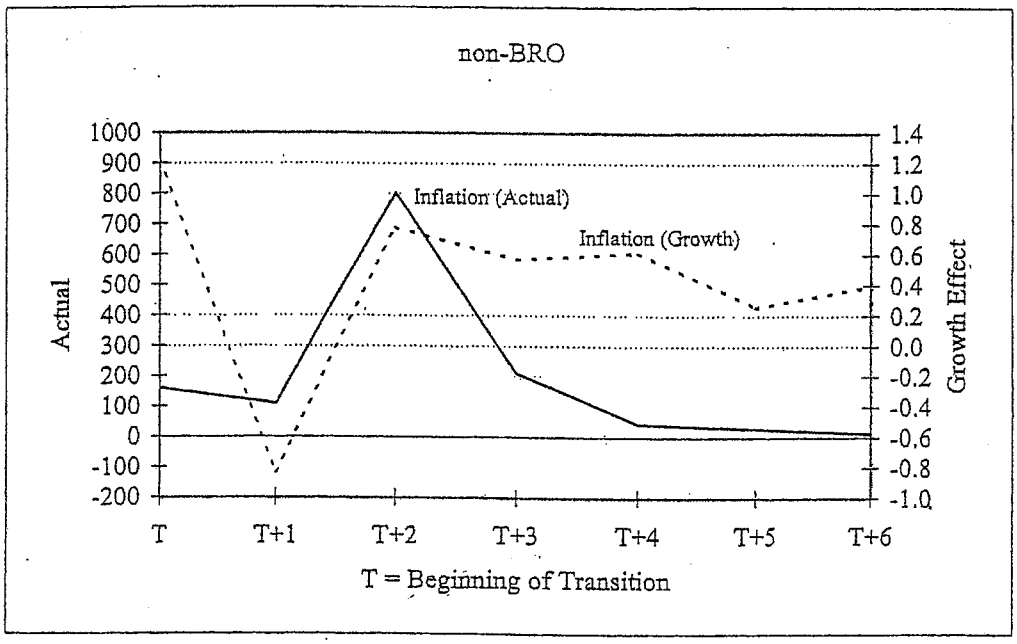


Figure A3b. The Path of Inflation and Its Growth Effects (Model gB)
(Actual Inflation in percent)



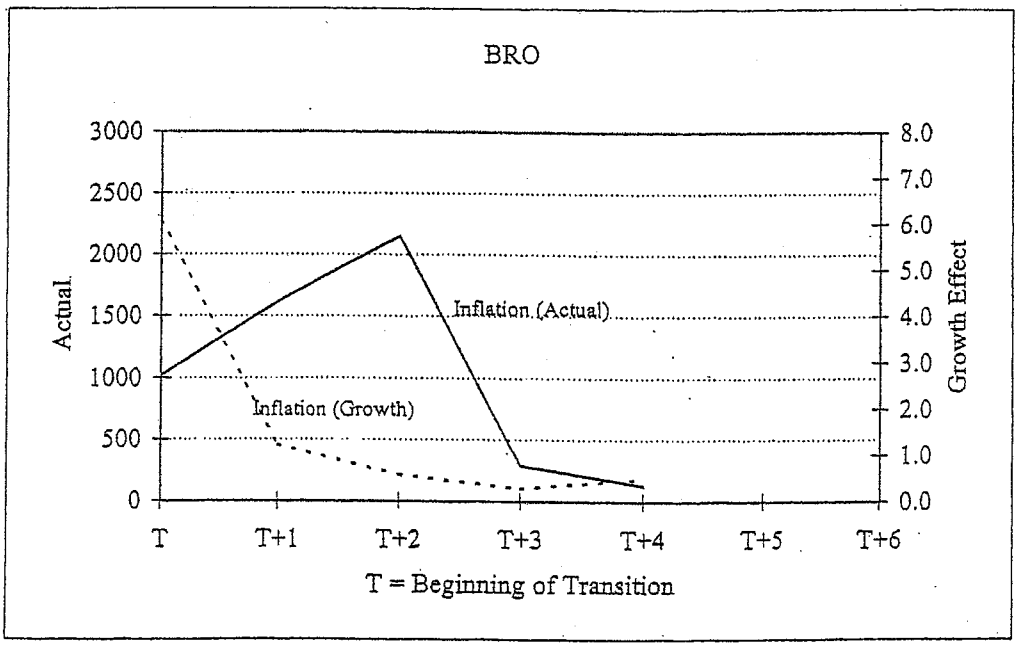
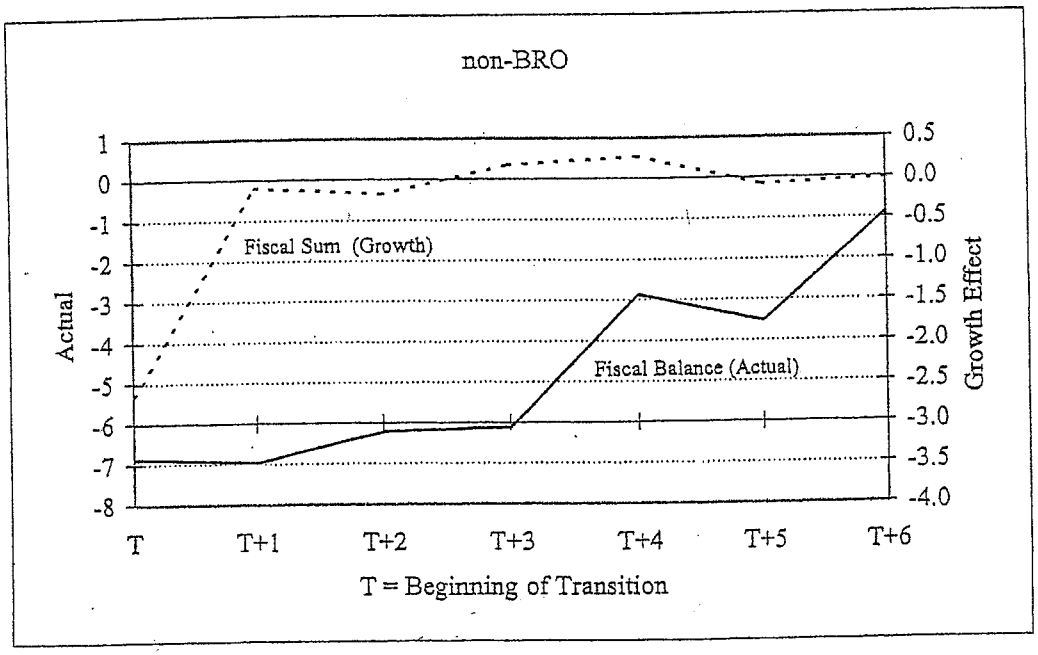


Figure A4a. The Path of Fiscal Balance and its Growth Effects (Model gA)
(Actual Fiscal Balance as % of GDP)



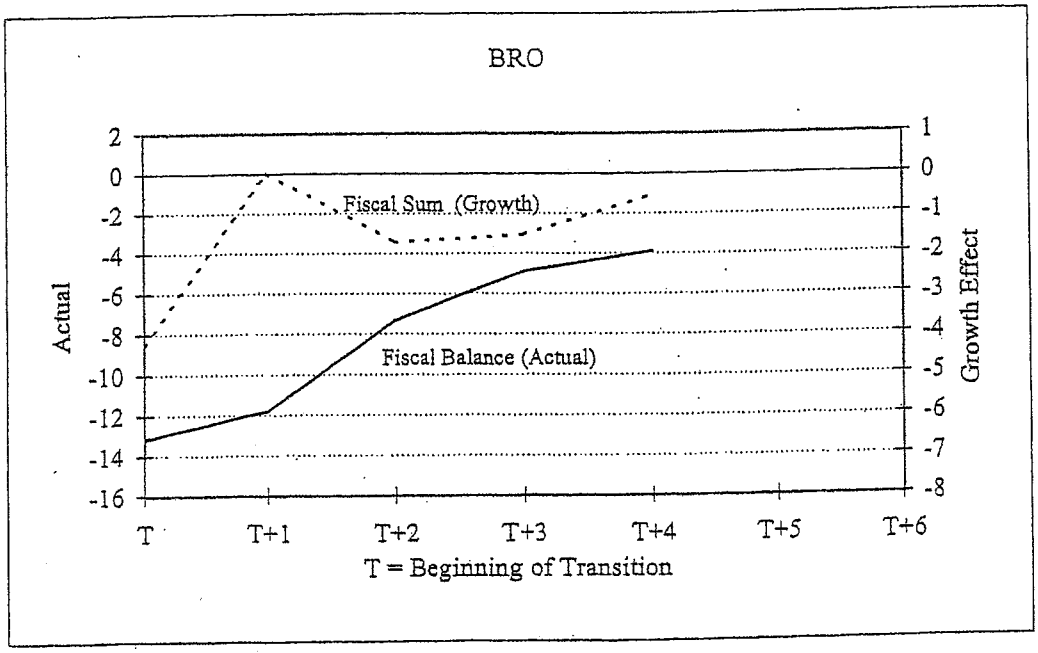
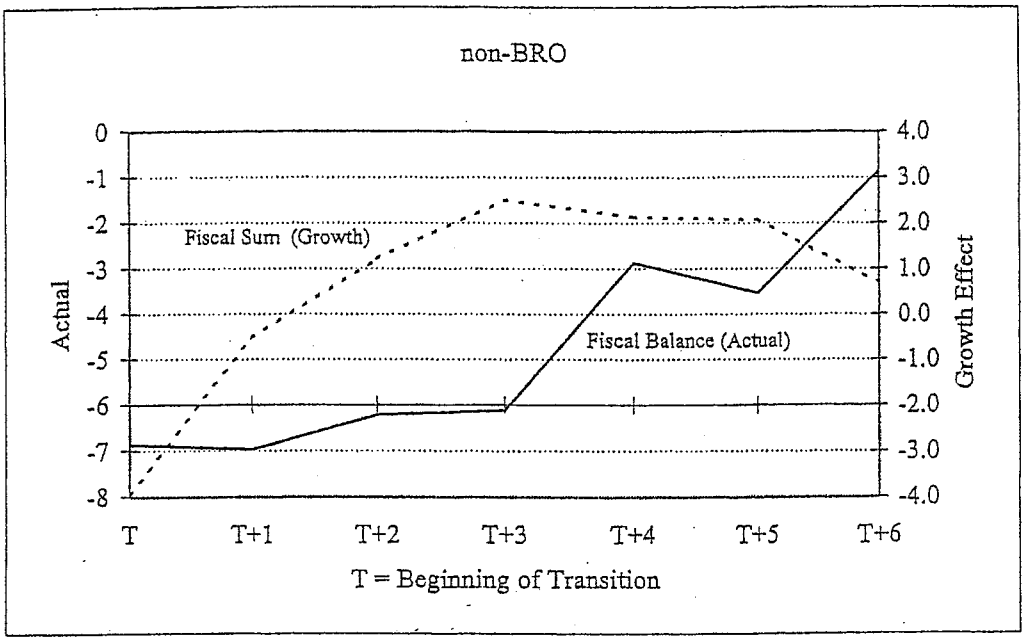


Figure A4b. The Path of Fiscal Balance and its Growth Effects (Model gB)
(Actual Fiscal Balance as % of GDP).



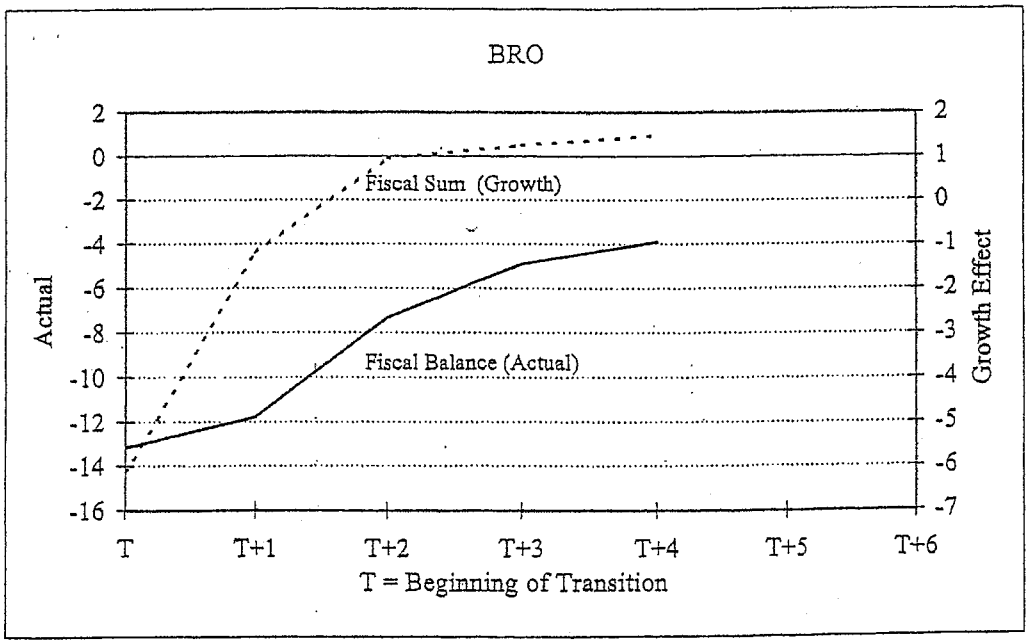
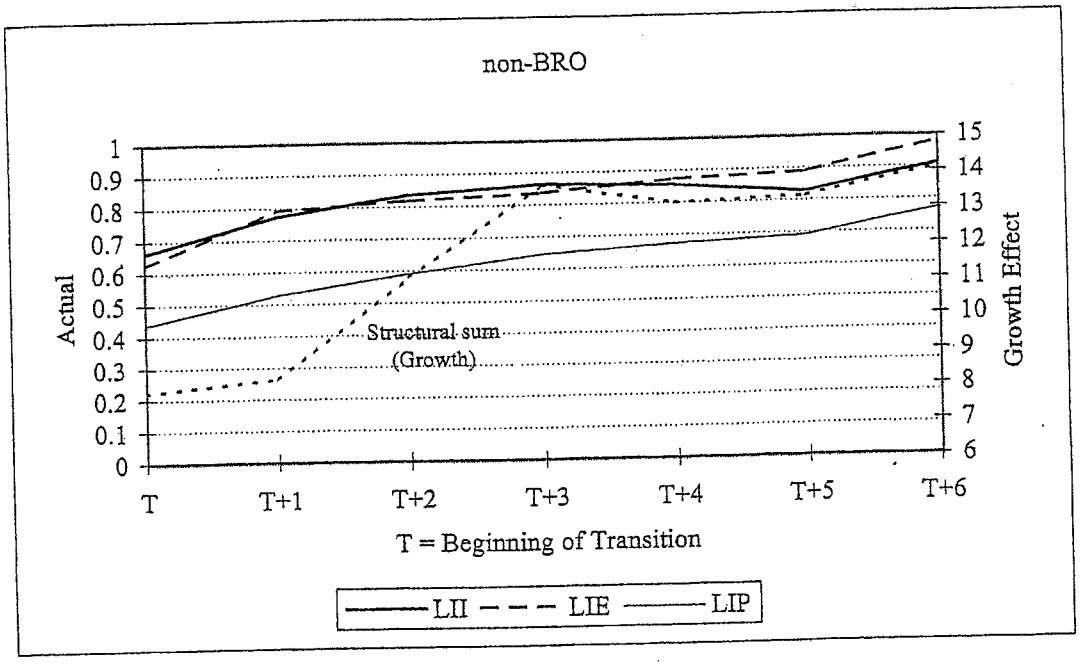


Figure A5a. The Path of Structural Reform and Its Growth Effect (Model gA)



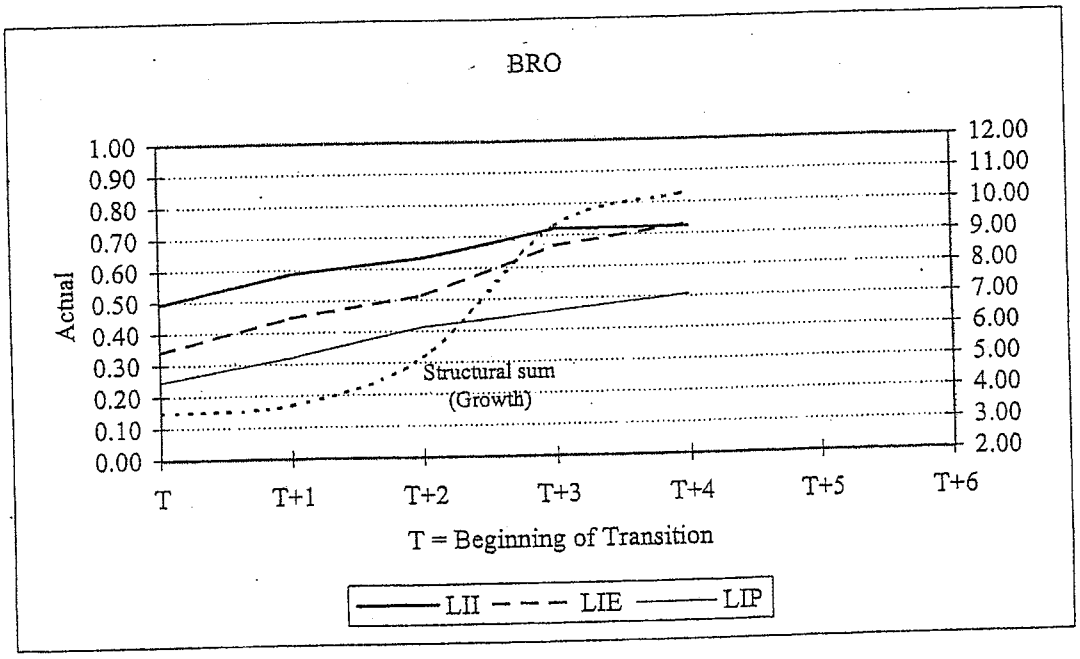
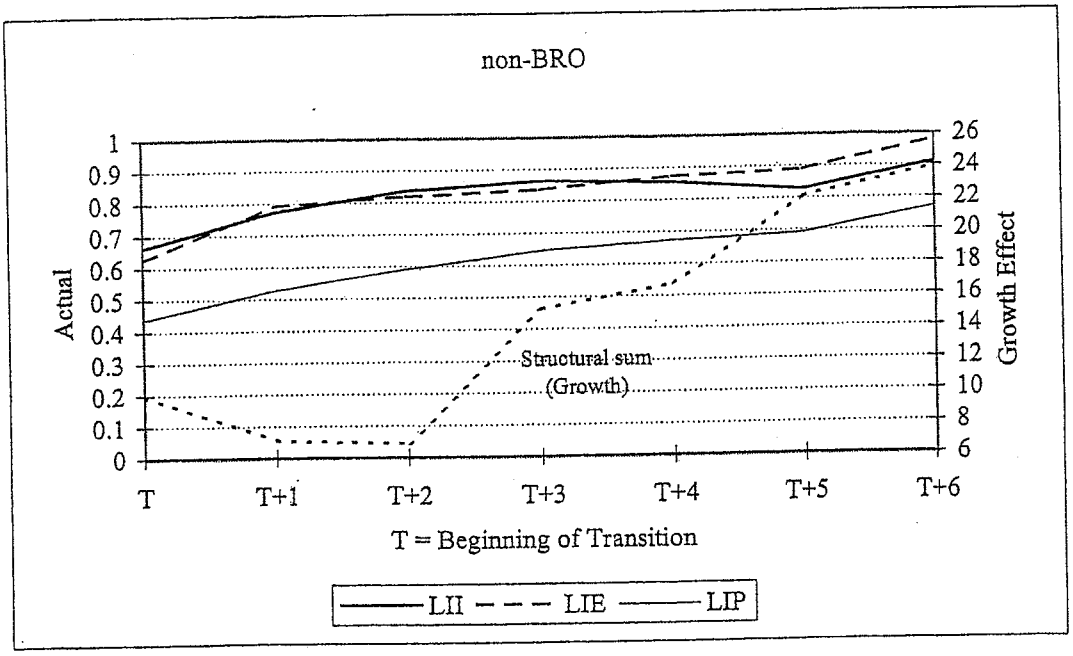
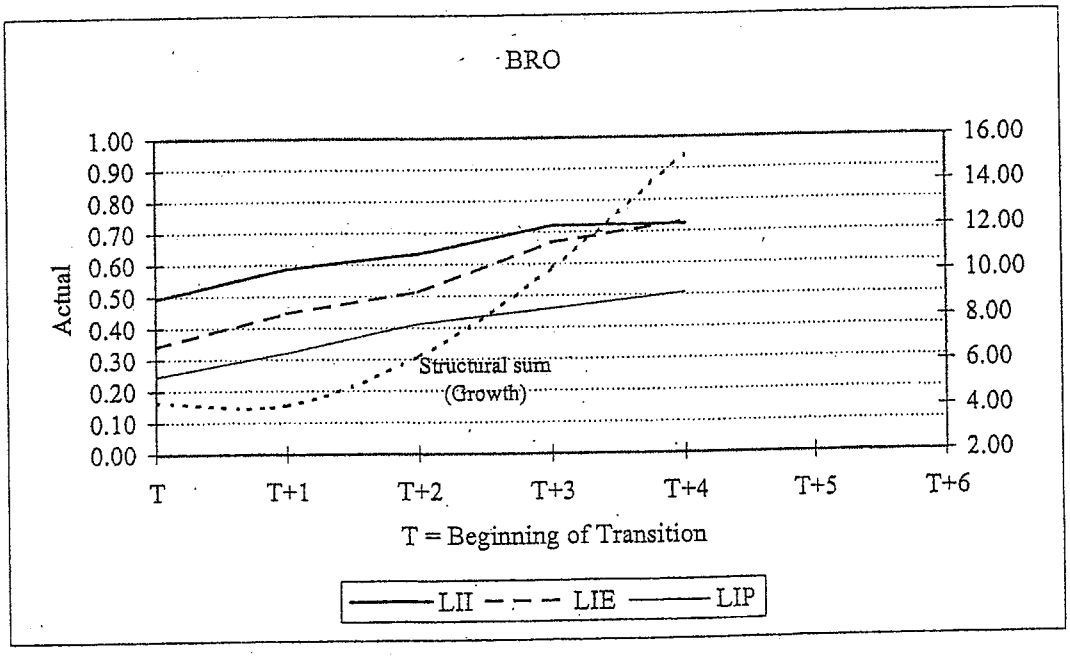


Figure A5b. The Path of Structural Reform and Its Growth Effect (Model gB)





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