



**European Bank**  
for Reconstruction and Development

# Reforms and growth in transition: re-examining the evidence

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## **Abstract**

A positive link between progress in market-oriented reforms and cumulative growth has been recorded across transition countries. Some less reform-minded countries, however, have also grown strongly in recent years. This paper examines whether there is a robust causal impact of reforms on growth, and whether there are important feedback influences from growth to reform. Strong evidence has been found for both effects. Progress in transition in one period can significantly affect growth in the subsequent period, and this growth can act as an immediate spur to further reform. While the importance of initial conditions as a determinant of growth has declined over time, fiscal surpluses are positively associated with higher growth. Other factors such as recovery, oil prices and external growth also drive growth to some extent but do not mitigate the importance of reforms. These results still hold when one controls for the influence of the current level of output on future growth.

*Keywords:* transition; structural reforms; economic growth.

*JEL classification number:* O57; P24

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This paper expands on the analysis of reforms and growth in transition presented in Chapter 1 of the EBRD Transition Report 2004. We are grateful to colleagues at the EBRD, including Willem Buiters, Libor Krkoska and Utku Teksoz, and to Laza Kekic, Colin Lawson, Martin Raiser, Karsten Staehr, Haifeng Wang and seminar participants at Brunel University for comments and suggestions.

Funding for this research by the Japan-Europe Cooperation Fund is gratefully acknowledged.

The working paper series has been produced to stimulate debate on the economic transformation of central and eastern Europe and the CIS. Views presented are those of the authors and not necessarily of the EBRD.

## INTRODUCTION

One of the most fundamental issues in transition economies is the link between market-oriented reforms and economic growth. Many countries in transition, especially those that have recently joined the European Union (EU), have made significant advances in reform, to the point where standards in some (though not all) dimensions of transition have reached those of advanced industrial economies (see EBRD, 2004). These new EU members on average have enjoyed higher cumulative real growth than other transition countries since 1989, and in general they also have the highest standards of living in the region.<sup>1</sup> But the link between reforms and growth in transition is not a simple one. Other factors can outweigh the importance of reforms, in the short-run at least, and high growth rates sometimes occur in the least reform-minded countries. Indeed, average growth in the Commonwealth of Independent States (CIS), where reforms are typically least advanced, has outpaced the rest of the transition region in recent years.<sup>2</sup>

It remains an open issue whether progress in transition enables a country to grow faster, and if it does, whether the benefits are large and durable and outweigh the short-term costs often associated with transition. This paper attempts to shed some new light on these questions. We first synthesise the existing evidence from the growing literature on the topic and distinguish between areas where a consensus has been reached and those where disagreement remains. We then present new evidence, based on a range of econometric tests, in an effort to pin down more precisely the influence of reforms on growth in transition, as well as the reverse link from growth to reform.

The main result of this paper is that there is a strong, positive link between the advance of transition in one year and growth in subsequent years. This result is quite robust to differences in estimation techniques, time span, and inclusion of macroeconomic and regional effects. Another important result is that there are strong, contemporaneous feedback effects from growth to reforms. That is, not only are reforms good for growth, but higher growth in turn can immediately encourage further reforms.

One innovation of this paper is that it takes account of other factors that influence growth which have been neglected in many previous studies. We model explicitly the effects of oil prices on growth, and capture the benefits brought to some oil-rich countries by the high prices of recent years. We also incorporate recovery considerations; that is, the further a country has fallen in terms of real output, the greater the potential for subsequent growth (provided that output capacity has not been damaged to the same extent). Finally we recognise that transition countries are increasingly integrating into the world economy, and we therefore control for external demand from the main trading partners. Our results show that all of these factors matter to some extent, but do not detract from our basic conclusion about the link between reforms and growth.

The paper proceeds as follows. Section 1 briefly surveys the empirical literature, distinguishing between the first wave of papers, which generally supported the hypothesis of a link between reforms and growth, and the more recent literature, which presents a more ambiguous picture.<sup>3</sup> Section 2 discusses some methodological and measurement issues associated with the data in transition countries. Section 3 presents the results, starting with the most simple single-equation estimates and proceeding to more complex specifications. Section 4 concludes the paper.

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<sup>1</sup> Unless otherwise indicated, the “region” refers to the 27 transition countries of central eastern Europe and the Baltics (CEB), south-eastern Europe (SEE) and the Commonwealth of Independent States (CIS).

<sup>2</sup> See EBRD (2004) for a comprehensive overview of the latest macroeconomic and reform developments across the region.

<sup>3</sup> Havrylyshyn (2001) is a useful survey of the main literature in this area up to the year 2000.

# 1. REVIEW OF EMPIRICAL LITERATURE

## 1.1 EARLY STUDIES

The empirical literature on reforms and growth in transition began in earnest around 1996-97, when economists felt they had enough data to be able to test formal hypotheses and to say something substantive about these developments, rather than merely speculate about them or rely on anecdotal, country-specific evidence.<sup>4</sup> The relatively short time span since the start of transition still rules out any definitive statement about what drives long-term growth. Transition recessions and recoveries are typically determined by reallocation of inputs within and across sectors, rather than by the long-run educational or institutional trends that feature in much of the current empirical growth literature.<sup>5</sup> However, by the late-1990s, there were enough years to permit an analysis of the short-term dynamic interactions among reforms and output fluctuations and the role of different types of policies in shaping the paths of these variables.

A consensus soon emerged that three types of variables were important. First, a country's starting point was likely to have a strong effect on subsequent development, at least in the short-run. This led some economists to construct a series of potentially relevant "initial conditions". Second, most countries initially faced a burst of high inflation and fiscal deficits, and a credible macroeconomic stabilisation programme was seen as essential for returning to growth. Third, it was quickly recognised that a range of reforms would be needed for sustainable growth, from early reforms such as price and trade liberalisation and small-scale privatisation, to deeper institutional reforms such as corporate restructuring, competition policy and financial sector development.

Most papers found that different starting points are important for economic performance, particularly during the first years of the transition (Fischer and Sahay, 2000; de Melo *et al.*, 2001). Even today there still remains a positive correlation between a good starting point and overall growth in transition, as shown in EBRD (2004, Chart 1.4). However, there was general agreement that this influence declines over time. Several studies show that the effect diminishes quite rapidly and countries with weak initial conditions are catching up after a delayed recovery.<sup>6</sup> However, the fact that there is still a link between the starting point and growth suggests that there may be important indirect effects from initial conditions, possibly through their impact on reform.

There was a strong consensus in the early literature that sound macroeconomic policies are good for growth. Two common ways of capturing the effectiveness of stabilisation measures are the annual inflation rate and the size of the fiscal balance relative to GDP. Most studies have found that lower inflation rates and smaller budget deficits are associated with economic recovery and higher growth rates.<sup>7</sup> Conversely, high inflation appears to be particularly damaging: Loungani and Sheets (1997) estimated that a country with 500 per cent inflation in one year loses about 2 per cent of GDP the following year and 4 per cent of GDP in the longer term. However, several papers found a threshold inflation level in the region of 10-20 per cent, below which any causal link from low inflation to growth appears to be small.<sup>8</sup>

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<sup>4</sup> The "stylised facts" of transition are summarised in Campos and Coricelli (2002).

<sup>5</sup> Comprehensive surveys of the empirical growth literature include Sala-i-Martin (1997), Solow (2000) and Temple (1999).

<sup>6</sup> See Berg *et al.* (1999), and de Melo *et al.* (2001).

<sup>7</sup> See, for example, Fischer and Sahay (2004), Fischer, Sahay and Vegh (1996) and Loungani and Sheets (1997).

<sup>8</sup> Christoffersen and Doyle (2000) find evidence of an inflation-output threshold of 13 per cent in a sample of 22 transition countries between 1990 and 1997. Inflation above that level reduces growth, while it does not have a significant effect when it is below the threshold. Ghosh and Phillips (1998) find a much lower inflation threshold, which they estimate in the low single digits

Most of the early studies argued that reforms were beneficial for growth. A common finding was that an increase in a reform indicator firstly has a negative effect on growth, but after a year has a positive influence that outweighs the initial decline (see, for example, de Melo *et al.*, 2001). However, there is no obvious unique way to measure reform. One common division is to distinguish between initial-phase reforms such as price and trade liberalisation and small-scale privatisation, and second-phase reforms which address deeper institutional reforms such as corporate governance, competition policy and reform of financial institutions. Other papers have broadened the debate to focus on quality of institutions and factors affecting the business environment (see, for example, Havrylyshyn and van Rooden, 2003).

Several papers have concluded that early-stage, liberalisation measures (including small-scale privatisation) are driving growth. For example, Havrylyshyn and van Rooden (2003) show that economic liberalisation has a more significant impact on economic performance than the quality of the institutional environment, although the latter's importance is increasing over time. In contrast, Stiglitz (1999) reports simple cross-section results showing growth to be positively influenced by progress in privatisation only if there has been concomitant improvement in governance.

Some early papers recognised that the feedback effect of growth to reforms is likely to be important, and they took this into account in their estimation procedure. These include Heybey and Murrell (1999) and Wolf (1999), who allow for a feedback of growth to structural reforms. Berg *et al.* (1999) and Ghosh (1997) also recognise the potential endogeneity of stabilisation and adopt an instrumental variables approach to control for this. De Melo *et al.* (2001) estimate the impact of initial conditions on growth in two stages, allowing first for an indirect impact on reforms (see also Krueger and Ciolko, 1998).

By the start of the new millennium, a consensus appeared to have emerged on three points. First, macroeconomic stabilisation is essential for recovery and growth; second, while initial conditions do matter, their influence on growth is declining steadily over time; and third, the impact of structural reforms is strong and robust. The EBRD *Transition Report* (2000) noted the return both of reform momentum and of strong growth to much of the region. It seemed clear at the time that the two processes were going hand-in-hand, and that the way ahead for countries in the region, especially for the laggards, was to push ahead further with reforms.

## 1.2 RECENT LITERATURE

Recent econometric research on the link between reforms and growth in transition, taking advantage of more recent data, has shown that a more nuanced interpretation of the evidence may be required. There still appears to be agreement that stabilisation policies are important and that initial conditions matter in the early years at least, with a declining influence in later years. But the influence of reforms on growth has become more, rather than less, controversial. Increasing attention has been paid to the endogeneity of reforms, the multicollinearity among different measures of reform, and the sensitivity of results to the exclusion of the early years of transition.

Falcetti *et al.* (2002) focus on initial reforms to address these three issues and come to the following conclusions. First, there appears to be a significant feedback effect of growth on reforms. When this effect is accounted for in econometric work, the coefficients on the reform variables in a growth equation change significantly, though not necessarily in a consistent way. Therefore, simultaneous equation estimation may be a fruitful approach to identifying the interaction between reforms and growth. Second, the results are quite sensitive to small changes in the panel size, and specifically to the choice of starting point for transition time in the CIS (1991 or 1992). Third, and most important, there is no clear evidence that the net effect of reforms on growth is positive. That is, initial-phase reforms (the only type analysed in this paper) lower the growth rate contemporaneously but raise it one year after (consistent

with de Melo *et al.*, 2001, discussed above; see also Merlevede, 2003). Formal statistical tests cannot reject the hypothesis that the sum of the two coefficients is zero. The authors, therefore, conclude that the positive effect of initial reforms on growth is less robust than the earlier literature had suggested.

Some of these themes have also been addressed in other recent papers. The fragility of the relationship between different types of reforms and growth is discussed in Radulescu and Barlow (2002), Fidrmuc (2003) and Lawson and Wang (2004). The paper by Radulescu and Barlow is perhaps the most sceptical about the benefits of reform; a variety of equations using a simple average of the EBRD transition indicators (see below for more discussion) fails to reveal any robust evidence of a link. The authors then pare down the indices to just three (large-scale privatisation, governance and enterprise restructuring, and price liberalisation) and show that while contemporaneous reforms negatively affect growth and lagged reform positively, the two impacts cancel each other out. However, it is possible (the authors argue) that liberalisation helps reduce inflation, which is robustly (negatively) correlated with growth. Similarly, Lawson and Wang (2004) test the effect of each EBRD indicator, both level and first-difference, exhaustively through partial regressions on each transition indicator. They claim that the dominant link between transition indicators and growth is negative, especially with regard to price liberalisation and enterprise reform. The negative effect of price liberalisation (both level and first-difference) appears to hold even in the early years of transition (1991-95).

The sensitivity of results to the choice of time period is discussed in Fidrmuc (2003) and Lysenko (2002). Fidrmuc employs an innovative approach by using five-year moving averages and estimating separate cross-section regressions for each period. The most interesting result is that the liberalisation index (an average of EBRD indicators), which is instrumented in the regressions, is positive and significant in the early period (1990-94, 1991-95, etc.), but not in the last period (1996-2000). Lysenko adopts the Falcetti *et al.* (2002) specification but extends the econometric analysis in two ways. First, the panel (in transition time) is divided into two sub-periods, one for the first four years of transition, and the other for the second five years. Second, a dynamic specification with lagged growth on the right-hand side of the equation is estimated. Interestingly, the form of the model used makes little difference, but the results change significantly between the first and second period. Initial-phase reforms influence growth significantly in the early years of transition, but not in the later years.

Other recent papers provide a more sanguine view of the influence of reforms on growth. Merlevede (2003), for example, uses a similar specification to Falcetti *et al.* (2002) and incorporates a dummy variable to take account of reform reversals, defined as a reduction in the average EBRD index. With this modification, reversals have an immediate and serious negative effect on growth, and reversals appear to be more harmful at higher levels of growth. Therefore, there is certainly no justification for countries to engage in backtracking. Staehr (2003) has added further evidence, based on a careful series of robustness checks, that a broad-based reform policy is good for growth. This paper is one of the few in the literature to incorporate a dynamic specification (with a lagged dependent variable). Several papers find support for a positive effect of reforms on growth at a regional level, one example being Loukoianova and Unigovskaya (2004), who focus on a group of low-income CIS countries.

## 2. DATA SOURCES AND MEASUREMENT

### 2.1 GROWTH DATA

The dependent variable in most of the literature is the annual percentage change in real GDP. This raises an immediate and severe problem: annual growth rates in many transition economies are often rough guesses at best, especially in the early years of transition. Not only are the official statistics highly inaccurate, but they were also systematically biased downwards in the first few years, with the result that the severity of the transition recession was exaggerated. The reasons for this are well-known (see, for example, Bartholdy, 1997) and reflect mainly the weaknesses of statistical agencies, the over-emphasis on existing large industries, many of which reduced output drastically or shut down, and the corresponding failure to include new businesses in the formal data. In addition, a large informal sector sprang up quickly in most cases, and most available estimates of its share in GDP suggest that it is much larger in the region than in western countries (see Schneider, 2002). While some statistical agencies try to incorporate estimates of the grey economy in official statistics, in most countries the data are only partially representing the true picture.

Some researchers have attempted to construct alternative estimates of growth, based for example on estimates of electricity use (this approach is sometimes used to estimate the size of the informal economy – see, for example, Lacko, 1998, 2000). However, these measures often have their own problems. For example, electricity use is driven not just by economic growth but also by increased efficiency measures, availability of other sources of energy, price changes and other factors. Because of the lack of a better alternative, we take the data as they stand, but test for robustness by dropping earlier years of transition, when the data were most unreliable. As we shall see, the results are reasonably robust to these procedures.

### 2.2 INITIAL CONDITIONS

Measuring initial conditions is a complicated task. There is a wide variety of indicators that could be used to capture differences among countries at the start of transition. Some things are straightforward to measure: for example, the degree of urbanisation, the extent of phone penetration, or distance from a western European capital, such as Brussels. Others are more complicated; for example, measuring repressed inflation or the black market premium.

We adopt the approach pioneered by de Melo *et al.* (2001) and used in Falcetti *et al.* (2002) and other papers. This involves putting together a large list of variables and then constructing some kind of composite index, or indices (principal components), through “factor analysis”. The full list of variables we use in this analysis is shown in Table A2 in the Annex. The advantage of the factor analysis approach is that the weights accorded to each variable are determined endogenously, rather than by an ad hoc weighted average. The number of principal components to use in the model can then be determined according to standard criteria, but for simplicity we focus on the first principal component only, which explains over 50 per cent of the variance of all initial conditions.

### 2.3 STABILISATION

Two ways of capturing stabilisation measures are commonly used in the literature: the inflation rate, and the size of the general government fiscal balance.<sup>9</sup> In fact the results below change little depending on which variable is used, but the inflation measure has the drawback of some extreme values in the early years of transition. Therefore, we use the fiscal balance to

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<sup>9</sup> Strictly speaking, both of these measures are *outcomes* of stabilisation rather than exogenous policy tools, but under certain circumstances they may serve as suitable proxies of the degree of commitment by the authorities to a stabilisation programme.

represent the government's approach to stabilisation.<sup>10</sup> It should be noted that both this variable and the inflation rate are themselves affected by growth rates, in the sense that growth is clearly good for stabilisation. Any conclusion about the effects of stabilisation on growth must be made with this caveat in mind.

## 2.4 REFORMS

The hardest conceptual issues concern the definition and measurement of reform. Any attempt to assign numbers to a country's progress in transition is inherently difficult and carries a large degree of subjectivity. But cross-country and temporal comparisons are almost impossible to make without having some numbers to work with. This is why, in the face of obvious difficulties, economists have tried to construct indices that capture, at least crudely, where countries stand in transition and how the quality and progress of reforms fare against comparator countries.

Every year the EBRD *Transition Report* provides numerical scores for a range of reform indicators. The scores range from 1, which represents little or no change from a planned economy, to 4+, which represents the standard of an advanced market economy. As noted earlier, many studies of the relationship between reforms and growth in transition use the EBRD transition indicators, or a subset thereof, as the measure of reform. We do the same in this paper, by constructing the simple average of eight indicators: initial-phase reforms, which consist of price liberalisation, trade and foreign exchange liberalisation, and small-scale privatisation; and second-phase reforms, which are large-scale privatisation, governance and enterprise reform, competition policy, banking reform and interest-rate liberalisation, and non-bank financial institutions.<sup>11</sup>

There are a number of issues that should be borne in mind before using the indicators in empirical work. The first issue concerns the reliability of the scores. While every effort is made to ensure that comparability is maintained across countries and time, anomalies can sometimes arise, necessitating the backdating of certain scores.<sup>12</sup> A more fundamental issue concerns the early years of transition. Transition scores were first presented in the 1994 *Transition Report*, the first in the series. The series have been updated each year but it was only in 2000 that an effort was first made to backdate the indicators to 1989.<sup>13</sup> This means that the ratings for the early years of transition have to be treated cautiously, especially as these were the years in which information flows were most limited. Again, this problem can be partially overcome by dropping the early years and testing the sensitivity of the results.

A second issue concerns the bounded and ordinal nature of the indicators. When a country reaches 4+, it means that it has achieved the standards in this dimension of a typical advanced industrial economy, and no further advances in reform along this dimension are reflected in the transition score. A higher score means more progress in that dimension than a lower score, but there should be no presumption that the difference between a score of 1 and 2, for example, is the same as between 2 and 3. In fact, many countries have found it relatively easy to make the first steps (1 to 2) but much harder to complete the process. In practice, however,

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<sup>10</sup> The data on fiscal balances in the early years of transition are subject to large margins of error, as governments frequently failed to account properly for a number of budgetary items and credits from the central bank.

<sup>11</sup> The EBRD also publishes transition indicators for several infrastructure sectors, but these have not yet been fully backdated to 1989 and are, therefore, not included. More details on the transition indicators are provided in the data appendix (in this paper?), and in EBRD (2004).

<sup>12</sup> In the 2004 *Transition Report*, the scores for Albania, Estonia, FYR Macedonia and Romania were backdated in one dimension each to reflect historical conditions (see Chapter 1, Table 1.1 for details).

<sup>13</sup> See EBRD (2000, Annex 2.1).

the scores are usually treated as cardinal. We also adopt this approach, but the sensitivity of the results to the inclusion of “threshold effects” (using dummy variables) is discussed later.

A third issue is the high correlation among the different indicators, both cross-sectionally and across time. Clearly, it is not possible to include all indicators in a regression, because of multicollinearity, and some sort of choice must be used. But if an average is used, should all indicators be weighted equally? This would assume implicitly that a score of 3 in one dimension, say, is equivalent to a 3 in another. However, it is clear that some reforms are easier to do than others, so arguably “harder” reforms should attract more weight, but any weighting scheme is bound to be somewhat arbitrary and difficult to justify.<sup>14</sup>

Finally, it should be noted that the link between reform commitment and the EBRD transition scores is not straightforward. Sometimes far-reaching reforms can be undertaken without being reflected immediately in the score; conversely, a rise in the transition indicator may be recorded without being explicitly linked to any particular reform that year. While we use the terms “reform” and “transition progress” interchangeably, the distinction between the two should be kept in mind in the subsequent discussion.

## **2.5 OTHER DETERMINANTS OF GROWTH**

The discussion so far has focused on three factors – initial conditions, stabilisation policies and reforms – that potentially drive growth. But other factors are likely to be important too. In this paper we investigate the role of three extra variables: recovery; oil prices; and trade dependence. Each one is discussed briefly in turn.

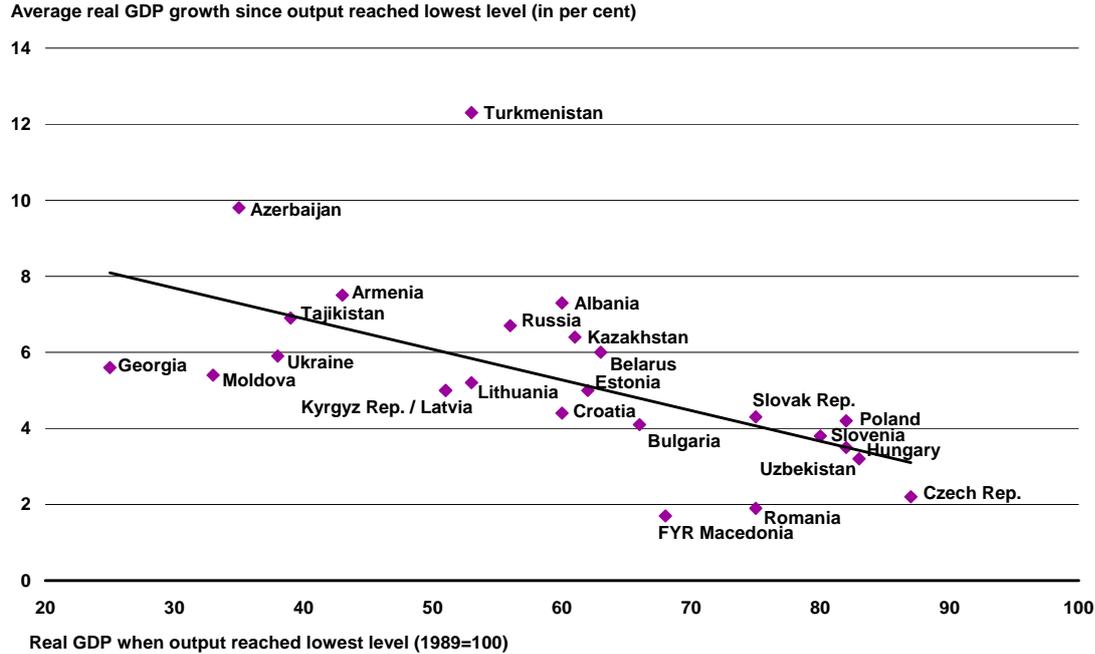
When countries suffer the kind of output falls that many transition countries have witnessed over the past decade, it is hardly surprising if, once the floor has been reached, they start to bounce back again. Other things being equal, the harder the fall, the greater the potential for a period of rapid growth once the recovery starts. One way to illustrate this is by looking at average growth rates in the years after an economy has suffered a deep, cumulative decline.

Chart 1 compares two series: on the x-axis is the value of real GDP at its lowest point in the transition (relative to the 1989 value); the y-axis shows average annual growth since it recovered this minimum point. For most countries that had long, deep recessions, average annual growth rates in the recovery phase were in the range of 6 to 8 per cent and even higher in a few cases. For those countries that had relatively mild recessions, subsequent growth was generally slower. Undoubtedly, some of the high growth rates in recent years in the CIS are explained by the initial collapse. The next section investigates the quantitative importance of this factor.

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<sup>14</sup> Fidrmuc and Tichit (2003) construct a weighted average of transition indicators using factor analysis to determine the appropriate weights.

**Chart 1: Recovery of output in transition countries**



Source: EBRD (2004).

A second factor affecting growth in some countries, especially in recent years, has been the surge in commodity prices, and in particular the price of oil. For those countries rich in oil, this has been a major boon, partly through the improved terms-of-trade, but for oil importers, it is likely to have been a significant constraint on growth.<sup>15</sup> This is likely to be especially important in the CIS, where several countries are oil-rich and others can benefit indirectly through trade and other linkages. Chart 2 shows the strong correlation between CIS growth rates and the annual average oil price. The strength of this correlation, especially since 1997, strongly suggests that the influence of oil prices should be included in the analysis.

The third factor that may influence growth is external demand. Transition countries have become increasingly integrated into the world economy.<sup>16</sup> While there is some evidence that openness is generally good for long-run growth, an increased dependence on trade with the rest of the world can bring short-run benefits if the main trading partners are booming, but also costs if they are stagnating or in recession.<sup>17</sup> The prolonged slowdown in the EU-15 in recent years may have had an adverse effect on some of the new EU members, many of whom conduct more than half of their trade with the EU-15. Chart 3 shows that as the share of exports to the EU-15 (as a percentage of GDP) has risen steadily over the past ten years, growth rates in CEB have moved increasingly in step with the EU, where growth has fallen in the past three years to less than 2 per cent. In contrast, the recent boom in Russia has had important beneficial spillover effects for growth in a number of other CIS countries.<sup>18</sup>

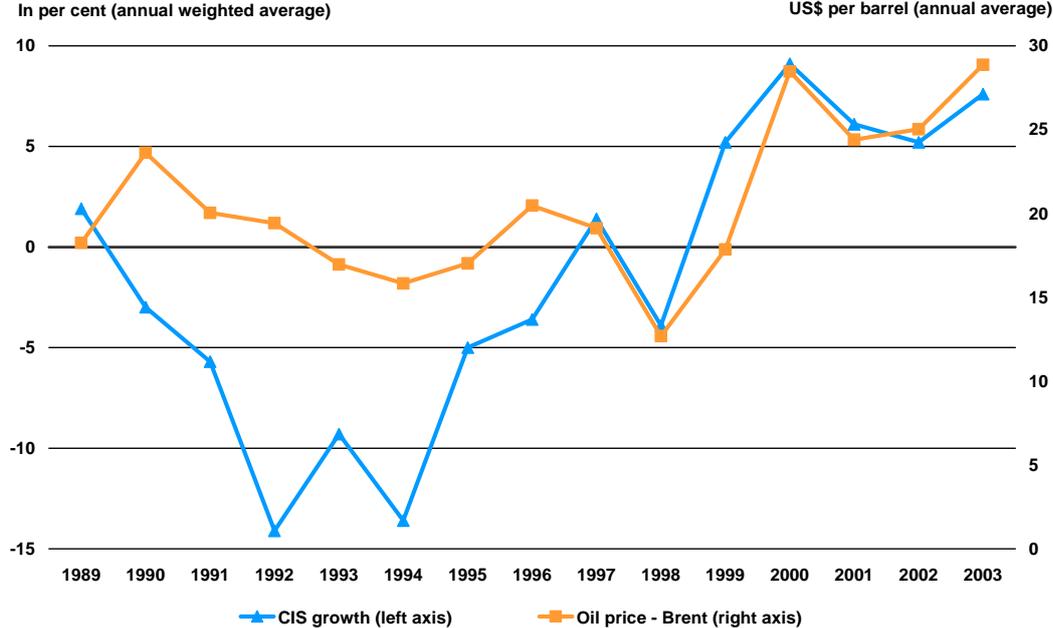
<sup>15</sup> See Carruth *et al.* (1998) for an analysis of the effects of oil prices on unemployment and output growth in the United States.

<sup>16</sup> See Chapter 4 of the 2003 *Transition Report*.

<sup>17</sup> For an empirical analysis of the relative role of trade and institutions on growth see Alcalà and Ciccone (2002), Dollar and Kraay (2003) Frankel and Romer (1999), Rodrik *et al.* (2002) and Lee *et al.* (2004).

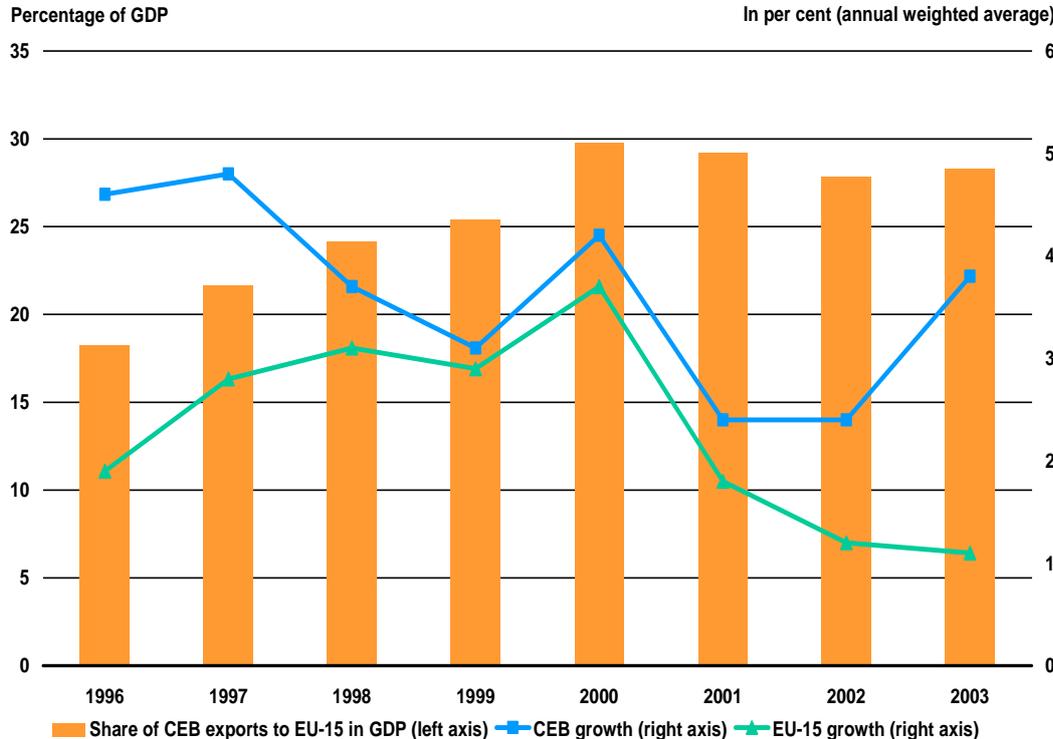
<sup>18</sup> See Chart 3.6 of the 2003 *Transition Report* for an illustration of the importance in CIS countries of exports to Russia. Loukoianova and Unigovskaya (2004) suggest that the recent high growth rates in low-income CIS countries could be partly explained both by catch-up effects and by increased demand from Russia and other countries.

**Chart 2: Oil price and average growth in the CIS, 1989-2003**



Source: EBRD (2004).

**Chart 3: Trade integration and growth in CEB and EU-15**



Source: EBRD (2004).

### 3. ECONOMETRIC RESULTS

We investigate the relationship between reforms and growth using data derived from the EBRD database. These data draw on a variety of sources including national authorities and statistical institutes, as well as other international organisations such as the IMF and World Bank. All transition countries in which the EBRD operates are included, with the exception of Bosnia and Herzegovina and Serbia and Montenegro for which reliable data for some years on key variables are not available. Therefore, the data set covers 25 countries in transition. The time coverage is from 1989-2003. However, following the approach in Falcetti *et al.* (2002), we operate in “transition time” rather than calendar time. The transition process started at different times in different countries. Therefore, some countries are included for a longer time span than others. More details on the choice of transition time, and sources and definitions of all variables, are included in the data appendix in this paper.

#### 3.1 SINGLE EQUATION RESULTS

Our approach to estimating the relationship between reforms and growth is to begin with the most simple, single-equation approach, before moving to a simultaneous equation specification that attempts to capture the feedback effect from growth to reforms. We, therefore, start by estimating the following equation:

$$(\Delta Y/Y)_{i,t} = \beta_0 + \beta_1 IC_{i,t} + \beta_2 IC_{i,t}^2 + \beta_3 t + \beta_4 t^2 + \beta_5 Ref_{i,t-1} + \beta_6 Fis_{i,t} + \varepsilon_{i,t}, \quad (1)$$

where  $Y$  is an index of real output; hence  $(\Delta Y/Y)_{i,t}$  is annual growth of country  $i$  at time  $t$ , where  $t$  is measured in transition time,  $IC$  is the initial conditions index,  $Ref$  is an average of the eight EBRD transition indicators and  $Fis$  is the general government balance relative to GDP. Country dummy variables are also included to capture fixed effects. The specification is similar to the growth equation estimated in Falcetti *et al.* (2002), with one important exception (discussed in the next paragraph). The goal is to see if there is a link between reforms in one period and growth in the following period, while allowing for macroeconomic stabilisation (through the fiscal balance), the changing effect of initial conditions through time, and the possibility that a deterministic non-linear time trend captures the uniformity of growth patterns across transition countries.

Before proceeding to the results, it should be noted that we have not followed the approach of several previous papers that include both current and lagged reform as explanatory variables for growth. EBRD reform indicators are highly autocorrelated and including both variables can lead to spurious inferences, as demonstrated with a numerical example by Rzońca and Cizkowicz (2003). Intuitively, one would not expect reforms to have an immediate effect on growth, so lagging the variable appears to make more sense. If this intuition is correct, it also helps reduce the simultaneity problem, although, as we argue below, it does not get around it completely.<sup>19</sup>

Table 1 contains the results. In the simplest specification (column 1), reforms have a positive and statistically significant (at 1 per cent) lagged effect on growth. The coefficient on reform – 4.61 – can be interpreted as follows: an increase in the reform variable of 0.1 represents approximately two-and-a-half “upgrades” in the transition indicators. According to the result in Column 1, therefore, this is associated, *ceteris paribus*, with an increase in growth in the following year, and in each subsequent year for which the average reform variables maintains its new value, by approximately 0.46 percentage points. This sounds like a modest increase but clearly comes to a significant amount of extra output when cumulated over a number of years.

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<sup>19</sup> We have experimented with the inclusion of current instead of lagged reforms, and results are broadly similar, though less strong in the former case.

**Table 1: Determinants of growth: OLS and 2SLS results**

	OLS	OLS	OLS	OLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Growth</b>						
Constant	-26.46 (-8.76)	-29.79 (-8.33)	-22.87 (-7.36)	-27.58 (-6.80)	-23.06 (-5.37)	-23.06 (-5.37)
Time	2.77 (4.05)	3.26 (4.52)	2.79 (4.14)	1.87 (2.12)	2.09 (2.38)	2.07 (2.46)
(Time) <sup>2</sup>	-0.14 (-3.68)	-0.16 (-3.95)	-0.14 (-3.88)	-0.09 (-1.99)	-0.10 (-2.11)	-0.10 (-2.18)
IC·Time	0.64 (3.65)	0.94 (4.54)	0.52 (2.93)	1.10 (4.96)	0.98 (4.23)	0.99 (4.26)
IC·(Time) <sup>2</sup>	-0.03 (-2.35)	-0.04 (-3.44)	-0.02 (-2.14)	-0.05 (-3.83)	-0.05 (-3.55)	-0.05 (-3.53)
Ref (lagged 1 period)	4.61 (3.48)	3.20 (2.32)	3.98 (3.10)	3.72 (2.55)	2.11 (1.54)	
Ref-inst						3.63 (1.83)
Fis	0.19 (2.58)	0.31 (2.91)	0.26 (2.70)	0.23 (2.99)	0.38 (3.38)	0.33 (2.90)
Recov (lagged 2 periods)		4.14 (4.43)			3.07 (3.14)	3.24 (3.33)
Oilbal			0.24 (3.59)		0.20 (3.00)	0.20 (3.13)
Exgrowth				0.31 (1.76)	0.31 (1.91)	0.28 (1.73)
R-square	0.66	0.67	0.69	0.66	0.70	0.70
Number of observations	291	272	271	269	247	247

Notes: Columns (1) - (5) report single-equation estimates (using OLS) and associated t-statistics, while column (6) reports a 2SLS estimation, where reform is regressed on its lagged value and all other exogenous variables, and the fitted value is included in the equation. Fixed country effects are included in all six models but not reported. The R-Square statistic indicates the overall significance of the model.

Source: See Annex.

The other variables, with the exception of some of the unreported country dummies, are also statistically significant. The time trend captures the general increase in growth, after initial falls, throughout the period, with some tapering off as transition has proceeded (indicated by the negative coefficient on the squared term). With regard to the interaction of initial

conditions and time, the positive value of the coefficient on this variable suggests that the influence of initial conditions on growth is falling over time.<sup>20</sup> To see this, recall that the IC index takes a higher *negative* value, the better initial conditions. Therefore, a positive coefficient on the interaction term indicates that the direct negative effect of bad initial conditions on growth declines as transition time proceeds. Note, however, that this direct effect cannot be estimated because this variable has no time dimension and would, therefore, be perfectly correlated with country dummy variables.

Finally, the fiscal balance is positive and significant, highlighting the importance of stabilisation for growth. As we shall see, this result is robust to virtually any specification of the growth equation. As noted earlier, there are obvious concerns about the endogeneity of this variable. It is not easy to tackle this issue. One possibility is to use the lagged fiscal variable either as an explanatory variable or as an instrument for the current fiscal balance. However, it is difficult to argue that the government's fiscal stance affects growth with a lag, hence the use of the lagged variable itself is not justified on economic grounds.<sup>21</sup> We have tested both specifications – with the lagged fiscal balance as a regressor and as an instrument for the current fiscal balance - and the resulting link between growth and fiscal performance is indeed much weaker than before.

Columns 2-5 of Table 1 investigate what happens to the results when we add the three extra variables – recovery, oil, and external growth – discussed in the previous section. Each one is added individually (columns 2-4), and then they are all included (column 5), along with the original variables. That is, column 5 reports the results of estimating the following equation:

$$(\Delta Y/Y)_{i,t} = \beta_0 + \beta_1 IC_{i,t} + \beta_2 IC_{i,t}^2 + \beta_3 t + \beta_4 t^2 + \beta_5 Ref_{i,t-1} + \beta_6 Fis_{i,t} + \beta_7 Recov_{i,t-2} + \beta_8 Oilbal_{i,t} + \beta_9 Exgrowth_{i,t} + \varepsilon_{i,t} \quad (2)$$

where the definitions of the added variables are explained below. The idea is to test whether the positive influence of reforms on growth is robust to the inclusion of other variables that can plausibly be expected to drive short-term growth.<sup>22</sup>

Column 2 includes an index for recovery (“Recov”). There is no obvious unique way to capture this phenomenon. We have adopted the following simple approach. First, we construct an annual index (dummy variable) that takes the value 1 if a country's real GDP level is less than 70 per cent of its value in 1989, and 0 otherwise. Second, to avoid including too many observations when countries are still in their transition recession and have falling output, we lag this variable by two years. That is, a country which has suffered a big drop in income is expected, after a suitable lag, to start growing faster. This construction and the chosen thresholds (below 70 per cent and two years) are somewhat arbitrary. Broadly similar results are obtained if the threshold is set at 50 per cent of initial value and the dummy variable is lagged one year.

The results in column 2 show a highly significant positive value for this recovery index, as expected, but a slightly weaker (though still statistically significant) effect of reforms on growth. Therefore, once recovery considerations are taken care of, the benefits of reforms for growth appear to come through almost as strongly as before.<sup>23</sup>

<sup>20</sup> This result, similar to that found in Falcetti *et al.* (2002), is only slightly attenuated by the negative coefficient on the interaction between IC and time-squared.

<sup>21</sup> Also, the lagged fiscal balance cannot serve as a good instrument for the current fiscal balance because the fiscal performance of a country in a given year is not necessarily carried over into the next year. Thus the correlation between the fiscal variables in two consecutive years may be weak.

<sup>22</sup> Other specifications where two extra variables are added were estimated but the results do not change the conclusions in the text.

<sup>23</sup> Another way to analyse the recovery effect would be to include the lagged level of a country's real GDP into the equation instead of a dummy variable. The inclusion of the lagged real GDP level results in a dynamic specification of the model, which is estimated in a later section.

Columns 3 and 4 include the oil balance (“Oilbal”), defined as exports minus imports of oil divided by GDP, and a weighted measure of external growth (“Exgrowth”, i.e., external growth rates of partner countries weighted by export shares to these countries) respectively. The oil balance is highly significant while the external growth variable is marginally significant at 10 per cent. In both cases, the coefficient on reforms remains robustly positive at between 3 and 4. However, this latter result is not robust. When all three variables are included (column 5), they are all positive and significant (at least at 10 per cent), while the reform variable becomes marginally insignificant.

Finally, column 6 replaces lagged reform by a two-stage least squares procedure, whereby current reform is first regressed on lagged reform and all other exogenous variables, and the predicted value of reform from this regressions (“Ref-inst”) is inserted into the growth equation. In contrast to the results in column 5, the coefficient on reforms returns to significance, notwithstanding the inclusion (and statistical significance) of all other variables. This is the first concrete indication in the paper that, when feedback effects from growth to reform are taken into account, the conclusions can change significantly.

### 3.2 SIMULTANEOUS EQUATION RESULTS

A systems approach carries two main advantages: first, it allows an insight into what drives the reform process, and second, it controls explicitly for feedback effects that may be biasing the coefficients from the single-equation estimation. We, therefore, estimate the following simultaneous system:

$$(\Delta Y/Y)_{i,t} = \beta_0 + \beta_1 IC_{i,t} + \beta_2 IC_{i,t}^2 + \beta_3 t + \beta_4 t^2 + \beta_5 Ref_{i,t-1} + \beta_6 Fis_{i,t} + \beta_7 Recov_{i,t-2} + \beta_8 Oilbal_{i,t} + \beta_9 Exgrowth_{i,t} + \varepsilon_{i,t} \quad (3)$$

$$Ref_{i,t} = \gamma_0 + \gamma_1 IC_{i,t} + \gamma_2 IC_{i,t}^2 + \gamma_3 t + \gamma_4 t^2 + \gamma_5 (\Delta Y/Y)_{i,t} + \gamma_6 (\Delta Y/Y)_{i,t-1} + \gamma_7 Civlib_{i,t} + \varepsilon_{i,t} \quad (4)$$

where Civlib is the Freedom House index for civil liberties, which ranges from 1, indicating the highest level of freedom, to 7 which represents the least free. This approach follows Falcetti *et al.* (2002) where, for identification purposes, civil liberties are assumed to affect reforms but not growth, while the fiscal balance and other macroeconomic variables affect growth but not reform. This approach is somewhat ad hoc, but is consistent with Fidrmuc’s (2003) finding that democracy is highly correlated with liberalisation (one narrow measure of reform) but has an ambiguous effect on growth. In this regard, it is worth noting that in our data, the simple partial correlation between civil liberties and reform is -0.62, whereas between civil liberties and growth is only -0.08.<sup>24</sup>

Equations (3) and (4) are estimated using three-stage least squares, and Column 1 of Table 2 shows the main results. For brevity we focus on results with the full set of regressors in the growth equation. Turning to the reform equation first, two results of interest stand out. First, civil liberties matter for reform. The results in column (1) show that a one-unit reduction in the Freedom House index (a one-unit rise in freedom) is associated with an increase in the average value of the reform index of 0.11, which would be nearly three upgrades of individual transition indicators. Second, current growth has a strong and statistically significant effect on reform, while lagged growth has little or no effect.

The growth equation parallels the earlier results in many ways, but with a couple of important differences. The most important new result is that lagged reform is consistently positive and significant, regardless of which variables are included in the regression. When all variables are in the equation, the quantitative effect of reforms on future growth is much larger than before: a 0.1-unit increase in reforms raises growth in each subsequent period by more than

<sup>24</sup> The simple correlations between Fis and Growth, and Fis and Ref, are 0.49 and 0.30 respectively.

0.8 percentage points. All other variables are statistically significant and have the same sign as before. Thus, taking account of the feedback effects between reforms and growth leads to the conclusion that reforms in one year give a significant boost to growth the following year, and this extra growth acts as a spur to further reforms. This suggests that countries may become locked into a “virtuous circle”, but countries should not take it for granted that once they enter this positive spiral they will remain there.

Columns 2-6 in Table 2 examine three further issues: the relative importance of initial- and second-phase reforms on growth; the effects of dropping the early years of transition from the analysis; and differences in regional results. Columns 2 and 3 give results that link growth with initial-phase reforms and second-phase reforms only. The results are virtually the same in both cases, and replicate the earlier results when an overall average of reforms is used. The estimated impact of initial-phase reforms on growth is slightly higher than that of second-phase reforms.

It is possible that the results so far are distorted by the early years of transition, when output falls were severe and data limitations, particularly on the variables of most interest (growth and the reform index) are most serious. Column 4 tests whether the results hold true when the first five years of transition are dropped from the sample.<sup>25</sup> This means that for almost all countries in the region the analysis begins at a point when the economy was growing.

Several interesting changes occur in this specification. First, civil liberties no longer influence reforms. Most of the variation in this indicator occurs in the early years of transition, so this result could be due to the relative uniformity of the index in later years. Second, the effects of fiscal stabilisation come through even more strongly than before, with a coefficient approximately double the size of that in column 1. Third, the oil balance and external growth variables are no longer significant in the growth regression. However, the beneficial effects of reforms and recovery on growth are still present.

Further insights into the relationship between initial conditions, reforms and growth can be derived by splitting the countries according to sub-regions. The last two columns of Table 2 compare the baseline results for the countries of CEB and SEE (column 5) to those of the CIS (column 6). The main difference between the two sets of results is that political factors (as measured by the extent of civil liberties) tend to have a significant impact on the degree of reforms in the CIS but not in CEB and SEE. There is also some limited evidence that the effect of initial conditions on reforms changes more quickly in CEB/SEE than in the CIS. Otherwise the results are unaffected; in particular, reforms have an approximately equal effect on growth in both sub-regions.

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<sup>25</sup> That is, for those countries that started transition in 1989, the sample is restricted to start from 1994; for countries that began transition in 1990, the sample starts from 1995; and so on.

**Table 2: Determinants of growth: System of equations results**

	3SLS (full sample)	3SLS (initial- phase reforms)	3SLS (second -phase reforms)	3SLS (excludi ng first five years)	3SLS (CEB and SEE)	3SLS (CIS)
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Reform</b>						
Constant	2.94 (10.33)	3.61 (8.79)	2.55 (9.85)	2.86 (10.92)	2.64 (11.93)	3.73 (6.46)
Time	0.09 (2.31)	0.04 (0.77)	0.11 (3.44)	0.03 (0.89)	0.14 (3.16)	0.17 (1.40)
(Time) <sup>2</sup>	-0.003 (-1.37)	-0.001 (-0.38)	-0.004 (-2.12)	0.001 (0.57)	-0.003 (-1.46)	-0.001 (-1.17)
IC·Time	-0.04 (-3.11)	-0.04 (-1.94)	-0.04 (-3.71)	-0.07 (-5.45)	-0.03 (-1.78)	-0.09 (-1.46)
IC·(Time) <sup>2</sup>	0.002 (2.26)	0.002 (1.59)	0.002 (2.53)	0.003 (4.83)	0.002 (1.86)	0.005 (1.21)
Growth	0.03 (3.95)	0.05 (4.56)	0.02 (2.68)	0.02 (3.68)	0.02 (3.20)	0.03 (2.57)
Lagged growth	-0.000 (-0.08)	-0.003 (-0.85)	0.002 (0.58)	-0.003 (-1.22)	-0.000 (-0.11)	-0.001 (-0.17)
CivLib	-0.11 (-5.00)	-0.15 (-4.55)	-0.10 (-4.52)	-0.01 (-0.80)	-0.02 (-1.21)	-0.21 (-4.58)
R-square	0.92	0.87	0.93	0.97	0.94	0.94
<b>Growth</b>						
Constant	-27.8 (-7.19)	-26.2 (-6.97)	-25.7 (-6.37)	-30.1 (-3.54)	-11.8 (-1.82)	-27.3 (6.46)
Time	0.21 (0.27)	0.77 (1.07)	1.02 (1.30)	-0.32 (-0.33)	-2.15 (-1.74)	-3.02 (-1.18)
(Time) <sup>2</sup>	-0.02 (-0.52)	-0.04 (-1.07)	-0.06 (-1.34)	-0.00 (-0.03)	0.09 (1.39)	0.20 (1.26)
IC·Time	1.03 (4.82)	0.83 (3.90)	1.11 (5.08)	1.01 (2.55)	-0.10 (-0.22)	2.28 (2.23)
IC·(Time) <sup>2</sup>	-0.05 (-3.79)	-0.04 (-3.23)	-0.05 (-4.12)	-0.04 (-2.18)	0.01 (0.24)	-0.13 (-2.01)
Ref (lagged 1 period)	8.13 (7.48)	6.25 (8.60)	5.52 (4.35)	10.8 (5.93)	8.07 (4.67)	7.37 (4.79)
Fis	0.44 (4.77)	0.40 (4.47)	0.44 (4.51)	0.58 (5.32)	0.50 (5.29)	0.38 (2.17)

Recov	1.98	1.60	2.67	1.01	1.42	3.50
(lagged 2 periods)	(2.47)	(2.04)	(3.12)	(1.27)	(1.78)	(2.22)
Oilbal	0.11	0.11	0.15	0.07	0.22	0.20
	(2.10)	(2.26)	(2.65)	(1.01)	(3.50)	(2.08)
Exgrowth	0.35	0.30	0.37	0.03	0.33	0.38
	(2.63)	(2.39)	(2.58)	(0.20)	(1.83)	(1.95)
R-square	0.67	0.67	0.68	0.49	0.66	0.66
Number of observations	247	247	247	190	127	120

Notes: The results in all columns are derived using standard three-stage least squares estimation methods. Column 1: The results are derived by defining reforms as the simple average of eight EBRD transition indicators. Column 2: Uses initial-phase reforms only, calculated as a simple average of the EBRD transition indicators for price and trade liberalisation and small-scale privatisation. Column 3: Uses second-phase reforms only, calculated as a simple average of the EBRD transition indicators for large-scale privatisation, governance and enterprise restructuring, competition policy, banking and the non-bank financial sector. Column 4: Drops the first five years of transition for each country. Column 5: CEB and SEE only. Column 6: CIS only.

Source: See Annex.

### 3.3 DYNAMIC PANEL METHODS

Throughout this paper we have argued that catch-up considerations are important and are likely to influence growth in the later years of transition. Earlier results provide strong support for this hypothesis. However, our approach so far – modelling catch-up using a dummy variable threshold approach – is somewhat ad hoc. An alternative and arguably superior approach is to include lagged output (or growth) directly in the growth equation. This raises important econometric issues that need to be taken into account in the estimation procedure.

The formulation of the growth equation in a dynamic panel framework has become popular in the recent empirical growth literature (see, for example, Islam, 1995; Caselli *et al.*, 1996; Dollar and Kraay, 2002; Bond *et al.*, 2001). However, to date there are few examples from the transition literature.<sup>26</sup> As noted earlier, the short time-span available does not lend itself to a detailed analysis of convergence and long-term trends. But it remains interesting nevertheless to try to capture these effects and to test whether the effects of reform on growth identified above carry over in a dynamic specification. Also, recent developments in dynamic panel techniques allow us to address the issues of measurement errors, endogeneity and omitted variables (see Bond *et al.*, 2001, and Dollar and Kraay, 2002), all of which are highly relevant for the transition countries.

In general terms, a standard model with panel dynamics takes the following form:

$$y_{i,t} = \alpha y_{i,t-1} + \beta' X_{i,t} + \mu_i + \varepsilon_{i,t}, \quad i = 1, \dots, 25 \quad (5)$$

where  $y_{i,t}$  is the log of the level of GDP (usually in per capita terms) of country  $i$  in year  $t$ ,  $y_{i,t-1}$  is its lagged value,  $X_{i,t}$  is a set of explanatory variables,  $\mu_i$  is an unobservable country-specific effect,  $\varepsilon_{i,t}$  is an error term. Equation (5) can also be written as:

$$y_{i,t} - y_{i,t-1} = \delta y_{i,t-1} + \beta' X_{i,t} + \mu_i + \varepsilon_{i,t}, \quad (6)$$

where  $\delta \equiv \alpha - 1$ .

In this form, the dependent variable is the difference in log levels of real GDP which, at low levels of growth, is a good approximation to the growth rate. However, our approach is to

<sup>26</sup> Lysenko (2002) and Staehr (2003) estimate dynamic models of growth.

take equation (5) which, when we include all our explanatory variables from above (except for the recovery index), can be written as:

$$y_{i,t} = \alpha y_{i,t-1} + \beta_0 + \beta_1 IC_{i,t} + \beta_2 IC_{i,t}^2 + \beta_3 t + \beta_4 t^2 + \beta_5 Ref_{i,t-1} + \beta_6 Fis_{i,t} + \beta_7 Oilbal_{i,t} + \beta_8 Exgrowth_{i,t} + \varepsilon_{i,t} \quad (7)$$

and estimate it using several techniques.<sup>27</sup> The dependent variable,  $y_{i,t}$ , is the log of an index of real GDP in country  $i$  at time  $t$ , which takes the value 100 in 1989.

Table 3 reports the results. Column 1 reports the coefficients from a simple OLS regression with fixed effects, which is equivalent to within groups estimation. The coefficient on the lagged dependent variable is 0.72, suggesting a fairly high degree of persistence in output. Importantly, the coefficient on reform is still positive and significant at 5 per cent, although the size of the coefficient (2.49) is somewhat lower than in most previous specifications. The oil balance and external growth variables remain positive and significant but the fiscal balance, somewhat surprisingly, now loses significance. The time variables and their interaction with the initial conditions index add little to the regression.

It is well-known that the inclusion of a lagged dependent variable in a panel framework is problematic from an estimation point of view. In addition, the simple “within groups” estimator above leads to biased estimates because of the correlation between one of the regressors (the lagged dependent variable) and the error term (see, for example, Nickell, 1981).<sup>28</sup> Columns 2 and 3, therefore, report the results from two alternative techniques. First, we use the well-known procedure developed by Arellano and Bond (1991). That is, equation (7) is estimated in first-differences, with lagged levels (by two or more periods) of the dependent variable, log GDP, used as instruments for the lagged changes in growth. In generic terms, we therefore estimate the first-difference version of equation (5):

$$y_{i,t} - y_{i,t-1} = \alpha(y_{i,t-1} - y_{i,t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + \varepsilon_{i,t} - \varepsilon_{i,t-1}. \quad (8)$$

The results in column 2 show two important differences compared to those in column 1: the coefficient on reform, at 5.85, is more than double the previous level, and the fiscal balance now returns to statistical significance. Interestingly, the coefficient on the lagged dependent variables is virtually unchanged, suggesting that the Nickell-type bias is fairly small.

Finally, column 3 shows the result of an alternative “system estimator” technique due to Arellano and Bover (1995). This estimator is recommended in circumstances where the time series of output is persistent and, therefore, the lagged levels of the dependent variable are weak instruments for the first-difference variables (see, for example, Bond *et al.*, 2001).<sup>29</sup> This procedure contains both a one-step and two-step estimation; we focus on the former as there is evidence from simulation results that it provides more reliable results than the two-step estimation (see Blundell and Bond, 1998). The results in column 3 demonstrate that, in the transition context, the use of this estimator makes little difference. The coefficients in columns 2 and 3 are broadly similar, and the effect of lagged reforms on growth comes through even more strongly than before, with a coefficient of 7.14.<sup>30</sup>

<sup>27</sup> In this section, we return to single-equation estimation, as dynamic panel systems estimation is beyond the scope of this paper.

<sup>28</sup> It should be noted, however, that the greater the number of years in the panel, the smaller the size of this bias.

<sup>29</sup> The tests on the first-differenced residuals of model (2) reject the hypothesis of significant serial correlation.

<sup>30</sup> The main reason why the size of this coefficient is larger than in column (5) of Table 1 (7.14 versus 2.11) lies in the inclusion of the recovery index in the earlier table’s specification.

**Table 3: Determinants of growth: Dynamic specification**

	Within group (1)	Arellano-Bond (2)	Arellano-Bover (3)
<b>Log level of GDP</b>			
Log level of GDP (lagged 1 year)	0.72 (24.30)	0.75 (19.4)	0.97 (17.1)
Time	0.21 (0.29)	-0.64 (-1.61)	-0.60 (-0.47)
(Time) <sup>2</sup>	0.07 (1.55)	0.13 (2.77)	0.03 (0.40)
IC·Time	0.13 (0.61)	0.02 (0.07)	-0.05 (-0.16)
IC·(Time) <sup>2</sup>	0.01 (0.65)	0.02 (1.19)	0.01 (0.45)
Ref (lagged one period)	2.49 (2.06)	5.85 (3.92)	7.14 (2.73)
Fis	0.08 (0.80)	0.35 (2.46)	0.76 (2.50)
Oilbal	0.26 (4.62)	0.22 (2.93)	0.31 (2.66)
Exgrowth	0.33 (2.26)	0.45 (2.93)	0.76 (2.64)
Number of observations	251	227	227

Note: Column 1: The results are derived by estimating equation (7) by simple OLS with fixed effects, which is equivalent to within group estimation. Column 2: Arellano-Bond estimates are derived by first-differencing equation (5) of this paper and using as instruments for the lagged changes in growth the lagged GDP levels by two or more periods of the dependent variable, log GDP. Column 3: First-step estimation results using the Arellano-Bover technique, which implies estimating a system of equations in first differences and levels, using as instruments lagged values of the GDP in levels and first differences, respectively.

Source: See Annex.

### 3.4 SENSITIVITY TESTS

We carried out a number of sensitivity tests, the results of which we comment on briefly here.<sup>31</sup> Specifically, we explored three issues: the possibility that reforms affect growth in a non-linear way; the potential complementarity of initial-phase and second-phase reforms, and the sensitivity of results to the exclusion of early years of transition. Each of these is discussed in turn.

The paper so far has treated the average reform indicator and its effect on growth as continuous and linear. However, it may well be that some reform steps yield higher benefits than others. This can be tested by dividing the reform index into separate dummy variables and carrying out a single regression. We divided the reform index into six dummy variables: the first one taking the value 1 if the reform indicator is between 1 and up to 1.5, and 0 otherwise; the second is 1 if reform is from 1.5 to 2, and 0 otherwise, and so on. The results suggested that there is a clear and substantial growth dividend in moving from the lowest to the second lowest category of reform, but much lower rewards from going further with reforms. This result is consistent with the earlier analysis of Falcetti *et al.* (2002).

Another possibility is that second-phase reforms only work if first-phase reforms are well advanced. A simple way to test this is to include in the growth regression an interaction term between the two variables, as well as second-phase reform on its own. A positive coefficient on the interaction term would support the hypothesis. While we do indeed find such a result, the size of the relevant coefficients varies considerably depending on whether we estimate by OLS or 3SLS. Nevertheless, there are likely to be important complementarities between different types of reform, and this is an area that will be explored further in future research.

Finally, we return to the issue of dropping early years of transition. We re-estimated the system model, dropping consecutively the first year, two years, three years, and so on up to seven years. In all cases, the reform variable stays positive and statistically significant. Interestingly, however, some of the extra control variables are not robust to the exclusion of early years. If we drop the first seven years, the catch-up index, oil balance and external growth variables are all insignificant, but the number of observations in this case is rather small.

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<sup>31</sup> Detailed results of these tests are available on request.

#### 4. CONCLUSION

The link between reform and growth in transition countries is complex. Many factors influence a country's growth rate in a given year and it is impossible to identify precisely the exact importance of market-oriented reforms. Other factors, such as catch-up and recovery, trade interdependence and oil prices, play important roles and complicate the picture. This paper has attempted to disentangle the relative contribution of different variables, and to see how stable the results are to different specifications.

The main conclusion of this paper is that there is a robust, positive influence of reforms in one period on subsequent growth across transition economies. This is reassuring to those who have promoted the virtues of reforms; it also serves as a warning of the dangers that arise when "reform fatigue" sets in, as it appears to have done in parts of the region (see EBRD, 2004). Perhaps equally importantly, we also find strong evidence that higher growth in turn is associated with further reform efforts. While strong statements about causation cannot be made on the basis of these correlations, our results suggest the possibility of a virtuous circle, described earlier, of reforms and growth proceeding in tandem.<sup>32</sup> Our econometric estimates also show that fiscal discipline, catch-up, oil prices, trade links and initial conditions all influence a country's growth performance, and some or all of these factors help to explain the high growth witnessed recently in countries less keen on reform.

Looking ahead, the results of this paper send a clear message to policy-makers in transition countries about the need to push ahead in transition, even in the most advanced countries of the region. However, it would be unwise to extrapolate too much from the findings reported above. We do not yet have a clear understanding of the long-term potential of these economies, of their "equilibrium" growth paths, or of the complexities of the interactions of different types of reform. As the transition proceeds further, these topics will continue to be fruitful areas of research and analysis.

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<sup>32</sup> Kim and Pirttilä (2003) present empirical evidence in favour of a positive influence of past macroeconomic performance on reforms in transition countries, as well as a strong link between support for reform and the subsequent reform outcome.

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## ANNEX

**Table A1: Data sources and definitions**

Variable name	Source	Definition	Descriptive statistics
<b>GDP growth</b>	EBRD database; based on official publications, IMF, World Bank, and specialised statistical institutions. See EBRD <i>Transition Report</i> for details on each country.	Annual growth rate of GDP in country <i>i</i> and year <i>t</i> , in per cent	Mean= -0.15  Standard deviation=9.39
<b>Reform (Ref)</b>	EBRD rating from 1 (no reform) to 4+ (standards typical of market economies). For the purposes of this paper all “-” and “+” were converted into decimal points by subtracting or adding 0.33 points.	Ref is the simple average of reform ratings for the following eight indicators: price liberalisation, trade liberalisation, small-scale privatisation, large-scale privatisation, corporate governance and enterprise reform, competition policy, banking reform and interest rate liberalisation, and securities markets and other non-bank financial institutions. See EBRD <i>Transition Report 2004</i> , Table 1.1 for details on thresholds for each category. Data prior to 1994 were backdated using all available information, including the World Bank’s liberalisation indices.	Mean=2.60  Standard deviation=0.75
<b>Initial conditions (IC)</b>	EBRD staff calculations based on data in De Melo <i>et al.</i> (1997) updated and slightly modified. See EBRD <i>Transition Report 1999</i> , Box 2.1 for details.	Country score calculated from the first principal component of a factor analysis over 11 indicators (GDP per capita in 1989; pre-transition growth rate; trade dependence on CMEA; degree of over industrialisation; urbanisation rate; natural resources dummy; years spent under central planning; distance to EU; dummy for pre-transition existence as a sovereign state; repressed inflation; black market premium). The country score is calculated by multiplying each variable with a factor loading. It is normalised to have a mean of zero.	Mean=-0.17  Standard deviation=2.31
<b>Fiscal balance (Fis)</b>	EBRD database, based on official publications, IMF, World Bank, and specialized statistical institutions. See EBRD <i>Transition Report</i> for details on each country	Consolidated balance of the general government, in per cent of GDP. Note that this variable is negative if the balance is in deficit.	Mean=-4.88  Standard deviation=6.03

<b>Civil liberties (CivLib)</b>	Freedom House	Index ranging from 1 (free) to 7 (not free). Index gives weight to freedom of expression and assembly.	Mean=3.64  Standard deviation=1.55
<b>Catch-up (catch)</b>	EBRD database; based on official publications, IMF, World Bank, and specialized statistical institutions. See EBRD <i>Transition Report</i> for details on each country.	Dummy variable = 1 if real output is less than 70 per cent of value in 1989, and 0 otherwise.	Mean=0.43  Standard deviation=0.50
<b>Oil balances (Oilbal)</b>	EBRD database; based on official publications, IMF, World Bank, and specialised statistical institutions. See EBRD <i>Transition Report</i> for details on each country.	Annual net exports of oil, divided by GDP.	Mean=-2.03  Standard deviation=8.30
<b>External growth (Exgrowth)</b>	EBRD database; based on official publications, IMF, World Bank, and specialised statistical institutions. See EBRD <i>Transition Report</i> for details on each country.	A weighted average of real GDP growth in partner trading countries, where the weights are the share of total exports to each country.	Mean=1.54  Standard deviation=3.26
<b>Time (t)</b>		Transition time is defined as beginning in 1989 for Poland and Hungary, 1990 for other central and south-eastern European countries (except Albania), 1991 for Albania and the Baltic states, and 1992 for CIS countries.	Mean=7.02  Standard deviation=3.81

Note: All indicators are available year-on-year for most years since 1989.

**Table A2: Initial conditions**

	General Development						Structural distortions					Macro/Fiscal distortions				
	Per cap GNP at PPP	Average % growth	Urbanization (% of population)	Geographical distance from Brussels	Natural resources	Telephone penetration <sup>2</sup>	Employment shares in			Total Exports in GDP	CMEAc in total exports	Years under central planning	State <sup>3</sup>	Repressed Inflation <sup>4</sup>	Black market exchange rate premium <sup>5</sup>	Public expenditure in % of GDP
							Industry	Agriculture	Services							
US\$ 1989 <sup>1</sup>	1985-89	1989	Km	1989	1990	1990	1990	1990	1987-90	1990 (%)	1989					
Albania	2,163	3.0	35.8	1588	poor	1.2	na	na	na	0.05	0.46	47	2	4.3	434	56.80
Bulgaria	4,712	4.1	66.1	1698	poor	22.2	0.44	0.19	0.37	0.26	0.59	43	2	18.0	921	61.40
Croatia	5,295	na	53.7	1024	poor	16.7	0.45	0.05	0.50	na	na	46	1	12.0	27	na
Czech Republic	8,460	2.0	64.8	718	poor	15.1	0.44	0.13	0.43	0.24	0.41	42	1	-7.1	185	64.50
Estonia	5,237	2.2	71.6	1599	poor	19.8	0.37	0.21	0.42	0.29	0.94	51	0	25.7	1828	31.80
FYR Macedonia	4,514	na	57.4	1632	poor	13.6	0.50	0.09	0.41	na	na	47	1	12	27	40.40
Hungary	6,155	1.2	61.5	1129	poor	8.8	0.37	0.16	0.47	0.28	0.35	42	2	-7.7	46.7	61.49
Latvia	5,105	3.5	70.9	1454	poor	22.6	0.40	0.16	0.43	0.33	0.96	51	0	25.7	1828	31.00
Lithuania	5,523	7.4	68.0	1457	poor	19.9	0.41	0.19	0.40	0.37	0.91	51	0	25.7	1828	53.80
Poland	4,718	3.1	61.4	1160	moderate	8.2	0.35	0.27	0.38	0.33	0.5	41	2	13.6	277	48.80
Romania	4,043	-1.8	53.3	1770	moderate	10.4	0.43	0.29	0.27	0.12	0.28	42	2	16.8	728	42.70
Slovak Republic	6,680	2.7	56.0	971	poor	12.8	0.45	0.13	0.42	0.24	0.41	42	0	-7.1	185	64.50
Slovenia	9,384	na	50.3	916	poor	20.4	0.49	0.10	0.41	0.24	0.19	46	1	12.0	27	41.10
Armenia	5,345	na	67.3	3298	poor	15.1	0.42	0.18	0.40	0.22	0.97	71	0	25.7	1828	27.9
Azerbaijan	3,412	-3.0	54.3	3662	rich	8.4	0.25	0.31	0.43	0.36	0.92	70	0	25.7	1828	40.7
Belarus	5,365	6.1	65.5	1601	poor	14.4	0.43	0.20	0.38	0.5	0.89	72	0	25.7	1828	45.5
Georgia	4,865	-0.7	55.6	3224	moderate	9.5	0.31	0.26	0.42	0.21	0.91	70	0	25.7	1828	33
Kazakhstan	4,380	1.0	57.3	4528	rich	7.4	0.33	0.23	0.44	0.2	0.89	71	0	25.7	1828	35.4
Kyrgyzstan	3,220	3.9	38.2	5218	poor	6.7	0.28	0.33	0.39	0.22	0.97	71	0	25.7	1828	35.9
Moldova	3,384	2.8	47.0	1830	poor	9.9	0.31	0.33	0.36	0.27	0.93	51	0	25.7	1828	24.7
Russia	6,300	na	73.6	2259	rich	13.3	0.42	0.15	0.43	0.28	0.64	74	1	25.7	1828	49.5
Tajikistan	2,534	2.6	32.4	5097	poor	4.5	0.22	0.44	0.34	0.27	0.82	71	0	25.7	1828	38.6
Turkmenistan	3,675	3.4	45.1	4414	rich	5.9	0.21	0.43	0.36	0.35	0.96	71	0	25.7	1828	32
Ukraine	4,581	3.2	67.3	1836	moderate	13.0	0.41	0.20	0.39	0.3	0.82	74	0	25.7	1828	51.9
Uzbekistan	2860	6.1	40.6	4949	moderate	6.8	0.24	0.40	0.36	0.27	0.89	71	0	25.7	1828	35.9

Notes: \*/ Unweighted averages

1/ Data on per capita GNP at PPP reflect the most recent EBRD estimates.

2/ Telephone penetration is defined as the number of main lines per 100 inhabitants

3/ State is an indicator variable which takes the value 2 for independent states prior to 1989, 1 for decentralised states and 0 for new nations.

4/ Repressed inflation is calculated as the percent change in real wages less the percent change in real GDP over 1987-90.

5/ The black market exchange rate premium is an indicator of expectations and foreign exchange rationing.

Sources: De Melo, Denizer, Gelb and Tenev (2001), EBRD, IMF staff estimates and World Development Indicators.