

# Working Paper

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## Rapid Growth in Transition Economies: Panel Regression Approach

*Garbis Iradian*

**IMF Working Paper**

Middle East and Central Asia Department

**Rapid Growth in the CIS: Panel Regression Approach**

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**Abstract**

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This paper analytically explores and empirically tests a number of hypotheses to explain the rapid growth in transition economies. The paper finds that growth in the Commonwealth of Independent States (CIS) has been higher because of the recovery of lost output, progress in macroeconomic stabilization and market reforms, and favorable external conditions. Some of these factors are unlikely to continue for a very long time. The challenge is to improve the investment climate in the non-primary sectors, which will require broadening the scope of macroeconomic reform into a second generation of reforms encompassing structural and institutional areas.

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## ACRONYMS

**Countries**

ALB	Albania	MON	Mongolia
ARM	Armenia	LTU	Lithuania
AZE	Azerbaijan	LVA	Latvia
BEL	Belarus	POL	Poland
BGR	Bulgaria	ROM	Romania
BIH	Bosnia and Herzegovina	RUS	Russia
CZE	Czech Republic	SLK	Slovak Republic
GEO	Georgia	SLN	Slovenia
EST	Estonia	TAJ	Tajikistan
HRV	Croatia	TUR	Turkey
KAZ	Kazakhstan	HUN	Hungary
KGZ	Kyrgyzstan	UKR	Ukraine
MDA	Moldova	UZB	Uzbekistan
MAC	FYR Macedonia	SER	Serbia

**Regions**

CIS	Commonwealth of Independent States (Armenia, Azerbaijan, Belarus, Georgia, Moldova, Mongolia, the Kyrgyz Republic, Kazakhstan, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan).
FSU	Former Soviet Union Republics
CE	Central Europe (Czech Republic, Poland, Hungary, Slovakia, and Slovenia).
CEB	Central Europe and the Baltics.
SEE	Southeast Europe (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, and Romania)

**Other**

EBRD	European Bank for Reconstruction and Development
FDI	Foreign direct investment
GLS	Generalized least squares
GMM	Generalized-Method-of-Moments
IFS	International Financial Statistics
IOM	International Organization for Migration
IV	Instrumental Variables
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary least squares
PPP	Purchasing power parity
SUR	Seemingly Unrelated Regressions
TOT	Terms of trade
UNCTAD	United Nations Conference for Trade and Development
UNECE	United Nations Economic Commission for Europe
WEO	World Economic Outlook
2SLS	Two-stage least squares

## I. INTRODUCTION AND SCOPE OF THE STUDY

The economies of the Commonwealth of Independent States (CIS) are in a resurgent phase.<sup>2</sup> Simple average growth, at about eight percent a year in 2001–06, compares very favorably with the fastest growing economies in East Asia developing countries. This strong performance is in welcome contrast to the 1990s, when the CIS underperformed compared with most other regions in the world. The extent to which output collapsed in the early 1990s far exceeded expectations, partly due to special factors including regional political conflicts and the absence of support institutions to manage the transition to a market economy.<sup>3</sup> The pick up in growth rates since the output troughs has been impressive. As compared with real GDP of 1990=100, as of end 2006, Armenia, Azerbaijan, and Kazakhstan exceeded 125 percent, Russia reached 100 percent, while real GDPs of Kyrgyzstan, Ukraine, Tajikistan, Georgia, and Moldova were still well below their 1990 levels.

This paper uses up-to-date data and experiences of many countries to identify the key determinants of the rapid growth in the CIS. It adopts the panel regression approach as compared with the growth-accounting approach used in Iradian (2007). The central questions surrounding growth in the CIS include the following:

- Is the recent strong growth explained by a bounce back from the initial post-transition setbacks (recovery of lost output)?
- Have improved economic policies played an important role? Do market reforms and improved institutions explain the variance in relative output performance?
- To what extent is the recovery of growth driven by favorable external conditions? Did the recent improvements in the terms of trade and the large inflows of remittances to low-income CIS contribute to their strong growth?
- Has the positive growth performance been accompanied by improvements in investment and basic institutions, suggesting a more durable foundation?

Transition countries have been typically excluded from cross-country studies of long-term because of the short historical span (most of these countries have become independent states only since the early 1990s), and because earlier data collection methods were unreliable. However, significant improvements have been made in data quality in recent years.

The main findings of the paper are as follows.

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<sup>2</sup> The CIS region includes Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, the Kyrgyz Republic, Moldova, Mongolia, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan. Mongolia, which is not a member of the CIS, is included in this group for reasons of geography and similarities in economic structure.

<sup>3</sup> Examples of regional conflicts include the war over Nagorno-Karabakh between Armenia and Azerbaijan (1990–94), secessionist pressures in Georgia and Moldova, and the civil war in Tajikistan (1991–97).

- Transition countries that experienced larger declines in output during the early 1990s tended to grow at faster rates.
- Improvements in macroeconomic policies and market reforms explain about half of the total growth in the CIS countries.
- The growth acceleration payoff to reforms in 2001–06 was enhanced by the favorable external environment (positive terms of trade shock, large increases in remittances, and global technological innovation). These external factors have accounted for about two percentage points of the average annual growth in the CIS region.

The rest of the paper is organized as follows. Section II describes the main stylized facts of growth in the CIS from a macroeconomic perspective and market reforms. Section III uses the panel regression approach to explain the determinants of per capita growth and total factor productivity growth. It then uses these estimates to identify the main factors that contributed to the acceleration of growth in individual countries between 1996–2000 and 2001–06. Section IV summarizes the findings and draws conclusions.

## **II. OVERVIEW OF MACROECONOMIC STABILIZATION AND MARKET REFORMS**

Macroeconomic performance in the CIS countries has improved significantly in recent years (Table 1). Growth has been impressive, benefiting from macroeconomic stabilization, market reforms, a sharp increase in commodity prices, and large inflows of remittances and foreign direct investment. Inflation rates fell significantly in most countries in the region, in part because of greater fiscal and monetary discipline. However, in some CIS countries inflation has risen modestly in the past two years largely because of increases in foreign exchange inflows.

The average fiscal deficit narrowed from about six percent of GDP in 1996–2000 to one percent in 2001–06. In addition to cutting unproductive expenditures (as reflected in lower government consumption to GDP ratios), fiscal responsibility has been facilitated by growing revenues due to strong growth and some improvement in the administration of tax collection. Also, rising oil and gas prices helped the resource-rich economies of Azerbaijan, Kazakhstan, Russia, and Turkmenistan to strengthen their fiscal positions, moving from fiscal deficits to significant surpluses in recent years.

Foreign exchange flows to the region—whether in the form of export earnings, workers’ remittances, or official financing—accelerated, boosting foreign exchange reserves. The unweighted average external current account deficit narrowed significantly, although there is much variation across countries. Most countries in the region benefited from the boom in commodity prices (including Azerbaijan, Kazakhstan, Russia, Turkmenistan, and Ukraine). In Armenia, Georgia, Kyrgyzstan, Moldova, and Tajikistan, the adverse impact of higher energy prices on the external current account was more than offset by the substantial increase in remittances, particularly from Russia.

Some progress has also been achieved in structural reforms (Table 2). However, the CIS countries still remain far behind the five Central European (CE) and the three Baltic countries. In general, reform in the region is most advanced in the privatization of small scale enterprises, the liberalization of foreign trade and exchange, and the elimination of price controls. Structural reforms are least advanced in the regulation and supervision of the banking and financial sector, the development and enforcement of competition, and the reform of governance in both the private and the public sectors. Among the CIS countries, Armenia, Georgia, and the Kyrgyz Republic have so far achieved an average market reform index as measured by the European Bank for Reconstruction and Development (EBRD) score of more than three.<sup>4</sup> Progress in market reforms has been particularly slow in Belarus and Uzbekistan. Turkmenistan virtually did not reform its economy with the exception of some small-scale privatization and price liberalization.

Moreover, the business climate has improved significantly in recent years. As Table 2 shows, the time required to start a new business has been reduced to only 16 days in Georgia, 20 days in Kazakhstan, and 24 days in Armenia. The unweighted average for the Baltic region (Estonia, Latvia, and Lithuania) is 26 days. In the CE countries, it takes 24 days in the Czech Republic, 31 days in Poland, and 38 in Hungary to complete the process of starting a business, which takes only 22 days in Korea and 19 days in Ireland.

However, the scores for institutional quality in the CIS are still among the lowest in the world. Table 2 shows the simple average of six measures of institutional development based on the indices provided by the World Bank's cross-country governance dataset (Kaufmann and others, 2005), which include voice and accountability, political instability, government effectiveness, regulatory burden, rule of law, and control of corruption. Each of these indicators is distributed normally, with a mean of zero and a standard deviation of one. This implies that virtually all scores lie between -2.5 and 2.5, with higher scores corresponding to "better" outcomes. As shown, the average for the CIS in 2005 was negative 0.80 as compared with positive 0.81 in the Baltics.

In some CIS countries the quality of institutions was worse in 2005 than in 1996, in areas such as voice and accountability, rule of law, and corruption. Policy makers have failed to take advantage of the favorable economic circumstances in recent years to accelerate the pace of systemic change. The record of structural reforms and institutional quality suggest that most CIS economies have not yet reached a critical mass of structural transformation (Owen and others 2003, p. 60).

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<sup>4</sup> The EBRD market reform index ranges from 1 to 4.3, where 1 represents conditions before reform in a centrally planned economy with dominant state ownership of the means of production, and 4.3 indicates that the country's structural characteristics are comparable to those prevailing on average in market economies.



Table 1. Developments of Selected Determinants of Growth in Transition Economies, 1996–2006

	Real GDP Growth Rate (In percent)		CPI Inflation Rate period average (In percent)		Investment to GDP Ratio (In percent)		Fiscal Developments				Terms-of-Trade Index (2000=100)		Real GDP Index (1990=100)	
	1996–2000	2001–06	2000	2006	1996–2000	2001–06	Gov. Consumption (As percent of GDP)		Fiscal balance (As percent of GDP)		1995	2006	1996	2006
							1996–2000	2001–06	1996–2000	2001–06				
CIS	3.0	8.2	31.7	9.0	21.0	25.0	16.5	15.6	-5.6	-0.8	100	117	55	103
Armenia	5.1	12.4	-0.8	2.9	17.3	24.3	11.5	10.5	-6.6	-1.9	161	112	56	136
Azerbaijan	6.1	15.1	1.8	8.4	30.3	39.8	14.0	13.1	-3.1	0.1	38	158	42	128
Belarus	6.4	7.9	168.6	7.0	24.7	24.8	21.9	21.5	-1.1	-1.0	99	111	66	138
Georgia 1/	5.9	7.6	4.0	9.2	22.9	26.4	9.6	11.4	-6.0	-1.5	125	92	33	61
Kazakhstan	2.5	10.4	13.3	8.6	16.9	24.7	11.8	11.5	-5.3	2.3	72	138	62	126
Kyrgyzstan	5.6	3.6	18.7	5.6	16.0	19.8	18.6	18.6	-10.5	-5.0	94	102	54	82
Moldova 1/	-2.4	6.6	31.3	12.7	19.1	20.6	22.8	18.5	-6.8	0.3	86	83	38	52
Mongolia	2.9	6.2	11.6	5.0	32.3	38.4	16.0	16.2	-10.1	-0.9	117	130	89	143
Russia	1.6	6.2	20.8	9.7	17.2	18.5	17.8	17.1	-5.2	3.4	78	155	60	96
Tajikistan	0.5	9.0	32.9	10.1	11.3	17.3	8.8	9.2	-5.6	-2.9	113	46	32	64
Ukraine	-1.8	7.7	28.2	9.0	19.8	21.7	21.1	19.0	-2.9	-1.5	106	133	47	73
Uzbekistan	3.3	5.7	49.5	19.5	23.8	23.5	24.5	20.3	-3.5	-1.5	113	147	83	135
Baltics (BAL)	5.5	8.4	2.6	4.9	23.3	26.3	22.7	19.1	-2.0	-1.0	90	99	64	131
Estonia	6.2	8.8	4.0	4.4	26.8	30.4	23.5	19.5	-0.8	1.3	95	99	76	162
Latvia	5.7	8.7	2.6	6.5	21.2	27.1	21.9	19.8	-1.9	-2.1	106	93	55	116
Lithuania	4.7	7.7	1.1	3.8	21.9	21.5	22.6	18.1	-3.3	-2.1	69	106	62	116
Central Europe (CE)	3.9	4.2	8.9	2.6	25.7	25.6	17.7	17.8	-2.8	-4.3	100	102	100	146
Czech Republic	1.5	4.1	3.9	2.5	28.8	28.9	20.7	22.2	-1.9	-3.4	99	103	99	130
Hungary	4.0	4.3	9.8	3.9	21.4	24.2	10.2	10.2	-3.8	-7.6	101	100	90	139
Poland	5.4	3.5	10.1	1.0	22.4	20.0	17.7	18.0	-2.9	-5.1	98	105	118	176
Slovakia	3.7	5.2	12.0	4.4	30.2	27.0	22.2	20.6	-4.7	-4.3	102	94	92	141
Slovenia	4.7	3.7	8.8	1.0	25.6	27.9	17.7	18.0	-0.7	-1.2	101	107	100	147
Southeast Europe (SEE)	2.1	4.6	12.9	4.5	18.3	22.9	17.1	18.0	-4.4	-2.6	102	99	85	121
Albania	5.8	5.3	0.0	2.2	20.0	26.7	9.7	9.7	-10.2	-5.2	97	99	96	156
Bugaria	-0.4	5.1	8.2	7.3	12.5	21.1	14.9	18.2	-2.7	1.0	119	104	79	113
Croatia	3.4	4.7	4.6	3.2	22.9	27.4	26.7	21.4	-4.4	-4.9	97	99	81	119
Macedonia	3.0	1.8	5.8	3.2	16.4	16.4	19.4	21.5	-0.2	-2.0	105	98	77	98
Romania	-1.2	6.1	45.7	6.6	19.5	22.7	14.9	19.1	-4.6	-1.9	93	95	93	119

Sources: Derived from the IMF World Economic Outlook (WEO) database.

Notes: Regional figures are unweighted averages.

1/ The relatively low real GDP index for Georgia (last two columns) may be due to the exclusion of the autonomous regions of Ossetia and Abkhazia from national accounts.

2/ Also, the relatively low real GDP index for Moldova (last two columns) may partly be explained by the breakaway of Transnistrian region (where a significant part of industry is concentrated), which was captured in the data for 1990.

Table 2. Market Reforms, Business Environment, and Institutions

	EBRD Market Reform Index 1/			(2006) Doing Business Days Needed		Institutional Quality 2/		
	1995	2000	2006	To Enforce Contract	To Start Business	1996	2000	2005
	<u>CIS</u>	2.0	2.4	2.6	227	34	-0.72	-0.77
Armenia	2.1	2.7	3.3	185	24	-0.39	-0.54	-0.34
Azerbaijan	1.6	2.3	2.8	267	53	-0.93	-0.82	-0.91
Belarus	1.9	1.7	2.0	225	69	-0.87	-1.13	-1.05
Georgia	2.0	3.0	3.2	285	16	-0.72	-0.63	-0.58
Kazakhstan	2.4	2.8	2.9	183	20	-0.62	-0.59	-0.68
Kyrgyzstan	2.9	3.0	3.1	140	21	-0.30	-0.60	-0.99
Moldova	2.2	2.9	2.9	310	30	-0.19	-0.61	-0.61
Mongolia	1.8	2.4	2.7	314	20	0.08	0.26	-0.04
Russia	2.8	2.7	2.9	178	28	-0.63	-0.80	-0.71
Tajikistan	1.7	2.2	2.5	257	67	-1.83	-1.30	-1.12
Turkmenistan	1.2	1.4	1.3	...	...	-1.42	-1.31	-1.42
Ukraine	2.2	2.6	3.0	183	33	-0.54	-0.75	-0.42
Uzbekistan	1.8	1.7	1.7	195	29	-1.04	-1.18	-1.49
<u>Baltic States</u>	3.2	3.4	3.7	227	26	0.40	0.63	0.81
Estonia	3.4	3.7	3.8	275	35	0.67	0.93	0.98
Latvia	3.0	3.3	3.6	240	16	0.25	0.47	0.70
Lithuania	3.2	3.3	3.8	166	26	0.27	0.50	0.75
<u>Central Europe</u>	3.4	3.6	3.7	810	36	0.67	0.70	0.78
Czech Republic	3.5	3.6	3.9	820	24	0.89	0.68	0.80
Poland	3.4	3.6	3.7	980	31	0.60	0.62	0.53
Hungary	3.6	3.9	3.9	335	38	0.72	0.88	0.85
Slovak Republic	3.3	3.4	3.7	565	25	0.34	0.49	0.78
Slovenia	3.1	3.4	3.4	1350	60	0.79	0.82	0.92
<u>Southeast Europe</u>	2.4	3.0	3.2	464	36	-0.13	-0.17	-0.11
Albania	2.6	2.8	3.0	390	39	-0.10	-0.49	-0.50
Bosnia & Herzegovina	1.2	2.1	2.6	595	54	...	-0.56	-0.55
Bulgaria	2.6	3.4	3.5	440	32	-0.15	0.12	0.18
Croatia	2.9	3.3	3.5	561	45	-0.25	0.26	0.30
Romania	2.5	3.2	3.4	335	11	-0.15	-0.15	0.00
<u>Selected fast growing economies</u>								
Chile	...	...	...	480	27	1.16	1.15	1.18
Korea Republic	...	...	...	230	22	0.59	0.53	0.69
Ireland	...	...	...	217	19	1.62	1.67	1.50

Sources: Derived from the EBRD Transition reports, various years; World Bank database on doing business and governance.

1/ Simple average of eight EBRD transition reform indicators (price liberalization, competition policy, banking reform, trade and foreign exchange system, large-scale privatization, small-scale privatization, governance and enterprise reforms, and infrastructure). The transition indicators range from 1 to 4.3, with 1 representing little or no change from a rigid centrally planned economy and 4.3 representing the standards of an industrialized market economy.

2/ Simple average of six institutional concepts: voice and accountability, political stability and absence of violence, government effectiveness, regulatory burden, rule of law, and control of corruption. Each of these indicators is distributed normally, with a mean of zero and a standard deviation of one.

The scores lie between -2.5 and 2.5, with higher scores corresponding to better outcome.

### **Box 1. Literature Review on Growth in Transition Economies**

While a number of research papers have analyzed the determinants of the sharp fall in output in transition economies in the 1990s, less attention has been paid to the recent rapid recovery. While there is agreement that stabilization policies are important, it is fair to say that no consensus has yet been reached on the role of reforms in the recent recovery. Below are the main papers and their findings relevant to the current study:

- Berg, Borensztein, Sahay, and Zettelmeyer (1999) found that the difference in economic growth over the period 1991–96 between Commonwealth of Independent States (CIS) and Central Europe (CE) can largely be explained by differences in policies rather than initial conditions.
- Fidrmuc (2003) cast doubts on the benefits of reform and Lawson and Wang (2004) failed to find a strong and positive effect of reforms on growth.
- Merlevede (2003) provided strong evidence that backtracking in reform (as indicated by a downgrade in the market reform score as measured by the European Bank for Reconstruction and Development (EBRD) is bad for growth.
- Falcetti and others (2005) found a positive and strong link between progress in market-oriented reforms and economic growth.
- Havrylyshyn and van Rooden (2003) concluded that “liberalizing” measures have a larger positive impact on long-term growth than measures to improve the institutional environment.
- Shiells and others (2005) found that Russian growth was a significant determinant of economic growth in other CIS countries prior to the crisis in 1998, but that this link weakened significantly thereafter.
- Beck and Laeven (2006), using natural resource reliance and the years under socialism to extract the exogenous component of institution building, showed the importance of institutions in explaining the variation in economic development and growth across transition economies during the first decade of transition.
- Schadler et al. (2006), examined the progress toward income convergence achieved by the eight CE countries and the policy challenges that these countries will face in facilitating the catch-up process. The main variables used to explain growth were population growth, partner country growth, relative price of investment goods, schooling, openness, government taxation, and institutional quality.

This paper extends Schadler’s and others’ (2006) work by broadening the scope of their analysis of the growth impetus, focusing mainly on the CIS, and examining a different set of policy and market reform indicators in explaining the rapid growth in the CIS and the Baltics.

### III. ECONOMETRIC ANALYSIS

This paper differs from previous empirical studies on the determinants of growth in the following aspects. First, the main focus is on the sources of the recent strong recovery in the CIS countries. Second, it uses the latest information (1991–2006) and analyzes a new set of explanatory variables, including output recovery index, workers’ remittances, terms of trade, and EBRD market reform index. Third, it does not simply assume, but tests for, endogeneity of some of the explanatory variables so that appropriate econometric methods can be chosen. Fourth, it assesses the importance of period-specific effects (in the form of world economic conditions) based on a large sample of countries that includes developing and developed countries.

#### A. Methodology and Data Issues

The empirical methodology is based on the estimation of panel growth regressions. Although the main focus of the paper is the CIS, a heterogeneous data set is used including all previous transition economies, advanced economies, and developing economies. Such an approach would improve the statistical reliability of the results. The transition sample includes 12 CIS, the three Baltics, five CE and seven Southeastern European (SEE) countries covering the period 1991–2006.<sup>5</sup> The global sample consists of 139 countries with data spanning the period 1980–2006 (data for the transition economies have a shorter span). The use of a large panel of countries over an extended period of time allows sufficient freedom to enrich the menu of variables used on the determinants of growth, and improves the statistical reliability of the results. For both samples, annual and five-year average are used to estimate the regressions. The growth equation of the global sample has also been estimated using a pure cross-section covering the period 1996–2006, given that data on institutional quality from the World Bank are available only starting 1996.

Averaging the data over time eliminates short-run business cycle dynamics while allowing one to test for long-run market reform dynamics. Failure to eliminate short-run dynamics typically leads to highly correlated time series and to gross overestimation of coefficients. The choice of five-year periods is dictated by the data time span for the CIS economies (1991–2006), which gives three observations for each country. The definition and sources of data are described in the data appendix.

In the majority of growth studies, the model postulates that the per capita growth rate, in a given country ( $i$ ) and period ( $t$ ), is explained by the following factors:<sup>6</sup>

$$g_{it} = \beta Z_{it} + \lambda X_{it} + \mu_i + v_t + \varepsilon_{it} \quad (1)$$

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<sup>5</sup> Turkmenistan is excluded from the transition sample due to its poor quality of national accounts statistics.

<sup>6</sup> See Mankiw et al (1992), Islam (1995), Barro (1997), and Barro and Sala-i-Martin (2004).

where  $g_{it}$ , the dependent variable, is the per capita real GDP growth rate or total factor productivity (TFP)<sup>7</sup> growth rate in country  $i$  during the period  $t$ ,  $Z$  is the vector of “core explanatory variables” that are believed to have contributed to the rapid growth in the CIS (including recovery of lost output index, EBRD measure of market reforms, institutional quality, terms of trade, and remittances).  $X$  comprises a set of control variables that are often used in the growth literature, including level of development as proxied by initial GDP per capita, macroeconomic stabilization, government size in the economy, trade openness, investment, and educational attainment.  $\mu_i$  is a country specific unobservable effect,  $v_t$  is a time specific factor, and  $\varepsilon_{it}$  is the disturbance term. The paper also controls for time-specific growth effects emanating from changes in the external economic environment by including World cycle dummies.

The panel regressions for annual and five-year average are estimated using Fixed Effect (FE) methodology.<sup>8</sup> For the pure cross-section, the Ordinary Least Squares (OLS) is used.<sup>9</sup> But the OLS and the FE techniques may be subject to endogeneity resulting in biased estimated coefficients, possibly leading to a magnification of the estimated growth effects through reverse causality. To examine whether there exists an endogenous relationship between dependent variables (per capita growth and TFP growth) on the one hand, and market reforms and investment on the other hand, the Durbin-Wu-Hausman test is applied. This test suggests that endogeneity is present, albeit not very strong. To address this problem, a Two Stage Least Squares (2SLS) or Instrumental Variable (IV) technique can be used. The fundamental problem with 2SLS is that there are no ideal instruments available. The standard Breusch-Pagan Lagrange multiplier poolability test favors the fixed effect model/random effect model over the cross-section model. The Hausman test is then applied to choose between the random effect and fixed effect models. The test produces statistics that lead to the rejection of the random effect model.

Data quality and measurement errors are major concerns in the CIS, particularly in the case of national accounts statistics. A new database has been compiled mainly from the World Economic Outlook (WEO), the United Nations Economic Commission for Europe (UNECE), and the World Bank databases. The dataset, in particular, suffers from various serious weaknesses due to underreporting by private enterprises, particularly in the early years of transition, to avoid taxes and regulations. The decline in output in the CIS during the first

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<sup>7</sup> The TFP series are calculated in Iradian (2007).

<sup>8</sup> There are two main estimation procedures for panel data, fixed, and random effects. In this paper, the fixed effect method is more appropriate. First, the main interest is in measuring differences between countries. Second, in small samples (relatively shorter time span there may be practical problems preventing parameter estimation when the random effect model is applied; this is not the case with the fixed effect model. Also the Hausman specification test confirmed that the fixed effect model is the more appropriate technique for the data used in this paper.

<sup>9</sup> Based on Monte Carlo simulations, Hauk and Wacziarg (2004) argue that taking account of all the advantages and limitations of the different estimation procedures, the cross-section OLS estimator that averages data over longer periods might be the most efficient.

half of the 1990s could be overstated because the statistical system was designed to collect information only on publicly owned enterprises. Beyond the mid-1990s, the information on the emerging private sector gradually became available and incorporated in the statistical system. Also the data on investment for the Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan are still incomplete and not always of good quality, hence data from these countries should be interpreted cautiously.

There is also a concern about the reliability of the EBRD reform market reform scores, particularly during the early years of transition. In 2000, EBRD made an effort to backdate the indicators to 1990. This implies that the ratings for the early 1990s have to be treated cautiously, especially as these were the years in which information flows were limited. This problem can be partially overcome by dropping the early years and testing the sensitivity of the results. Another alternative would be to use the World Bank's institutional quality index as a proxy for market reforms. However, it could be argued that both the EBRD market reform and the World Bank's institutional quality scores are output-oriented rather than measuring inputs. Recognizing this bi-directional causality, this paper attempts to extract the exogenous component of institutional development and relate it to growth.<sup>10</sup>

## **B. Determinants of Growth**

The explanatory variables used in this paper can be divided into four groups: (a) recovery of lost output or catch-up process (in the case of the "transition" sample); (b) investment; (c) stabilization and structural reforms; and (d) external conditions.

### **a. Recovery of lost output**

For the sample that includes only transition economies, the real GDP index (1990=100) of the previous period is used to test whether the amplitude of output recovery is influenced by the magnitude of the fall in output before recovery. The experiences of many countries show that usually sharp contractions in output due to crisis, wars, or other major shocks to the economy, may be followed by strong growth that offsets the initial decline. This, combined with corrective policies and structural reforms to reduce inefficiencies could spur strong economic recovery above the original trend line.

Negative shocks in theory impose only a temporary restraint on output, but may lead to rapid future growth that offsets the initial decline. First, negative shocks could stimulate political and economic reforms. Corrective policies could prompt an economic recovery above the original trend line if they reduce inefficiencies. Second, following Schumpeter's idea of "creative destruction," a sharp fall in output may cleanse the economy of inefficient firms, leading to higher productivity and economic growth (Caballero and Hammour, 1994). Blanchard (1997) defines the core process of change as comprising two elements: reallocation of resources from old to new activities (via closures and bankruptcies, combined

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<sup>10</sup> See Beck and Laeven (2006).

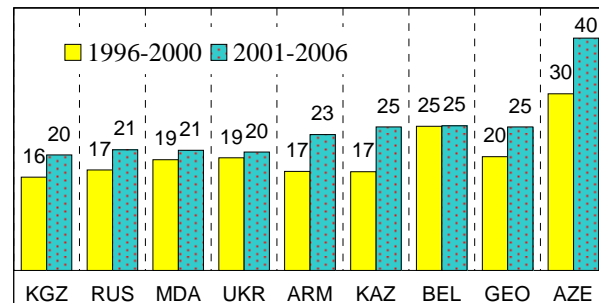
with the establishment of new enterprises), and restructuring within surviving firms (via labor rationalization, product line change, and new investment). These can be thought of as the dynamic movements resulting from the establishment of new incentives and are reminiscent of the Schumpeterian concept of “creative destruction” by entrepreneurial activity, only with a much larger impact than what Schumpeter’s model envisioned. However, Cerra and Saxena (2005) found that recessions or large contractions in output due to crisis, wars, or other reasons, are in general not followed by high-growth recovery phases. They conclude that when output drops, it tends to remain well below its previous trend. The data used by Cerra and Saxena consisted of annual observations spanning 192 countries from 1960 to 2001, and thus their sample did not capture the recent strong growth in transition economies.

In the case of the full sample, the paper also considers convergence as one of the determinants of growth. Most neoclassical growth models have shown that the potential for economic growth rate also depends on a country’s level of development as proxied by the initial per capita income (Barro and Sala-i-Martin, 2004). The coefficient for this variable is expected to be negative, implying that poor countries tend to grow faster than richer countries as each country converges toward its steady state.

## b. Investment

There is little disagreement in the general growth literature that investment is a major engine of growth. In the CIS economies, with a history of excessive capital accumulation and inefficient use, the role of investment in the initial recovery phase (perhaps through the late 1990s) was relatively less important. In this regard, Havrylyshyn and others (1999) found little evidence that recovery in output depended on investment. Instead, the initial output expansion in some of the transition economies came primarily from a variety of efficiency improvements. In recent years, however, there has been some increase in the investment ratio, albeit from a very low level. Most of the increase in investment has been in the hydrocarbon and metallurgy sectors.

Figure 1. Investment, 1996–2006  
(In percent of GDP)



Source: Authors' calculations from the IMF's WEO database.

## c. Macroeconomic stabilization, structural reforms, and institutional quality

There is an array of policy and institutional determinants of growth.<sup>11</sup> In this paper the impact of macroeconomic stabilization is measured by the logarithm of the inflation rate,<sup>12</sup> and the

<sup>11</sup> See Barro and Sala-i-Martin (2004); Turnovsky (2003); and Kolodko (2004).

overall fiscal balance as a ratio of GDP. Inflation is a policy result, while the fiscal balance refers more to the policy itself. It should be noted that the improvement in the overall fiscal position in Azerbaijan, Kazakhstan, Russia and Uzbekistan was largely due to the substantial increase in government revenues from oil, gas, and other major commodities.

Fiscal policy may influence growth through the size of government in the economy, as measured by the ratio of government consumption to GDP. Higher government consumption is believed to reduce growth prospects. This effect is normally associated with the crowding out of private sector investment, higher rent-seeking behavior, and distorted market incentives including higher taxation.

When the transition sample is used to estimate the regressions, this paper uses the EBRD reform index as the main indicator of the status of structural reforms in the economy. It is constructed as a simple average of eight structural reform indicators: price liberalization, small-scale privatization, large-scale privatization, competition policy, trade liberalization, financial sector reform, governance and enterprise reforms, and infrastructure reform.<sup>13</sup> For the global sample, the World Bank's institutional quality indices are used. Unfortunately, World Bank institutional data do not exist prior to 1995.

Education as measured by secondary school enrolment or years of schooling is widely used in cross-country determinants of growth. But secondary school enrolment or years of schooling tend to be high for all CIS countries, and there is little variation across countries included in the transition sample. Also, consistent data on education are available only for a limited number of years and are several years apart for most developing and transition economies. For these two reasons this variable is entered only in the global sample with pure cross-section.

#### **d. External conditions**

Economic activity in a country is also affected by external conditions. The literature provides ample evidence of the transmission via international trade and external financial flows.<sup>14</sup> The change in the terms-of-trade index is included to account for possible exogenous shocks in international commodity prices that may have an impact on per capita growth. This index is

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<sup>12</sup> A high rate of inflation is harmful to growth because it raises the cost of borrowing and thus lowers the rate of capital investment. At the same time, highly variable inflation make it difficult and costly to forecast accurately costs and profits and hence investors and entrepreneurs may be reluctant to undertake new projects. Likewise, given that financial resources in the form of domestic savings and loans are limited, a larger fiscal deficit will mean that more of those limited resources must be devoted to financing the budget defect. Fewer resources will thus be available for private sector investment.

<sup>13</sup> The reform indices are not perfect and their assessment is sometimes influenced by the observed macroeconomic performance, which raises the problem of possible endogeneity.

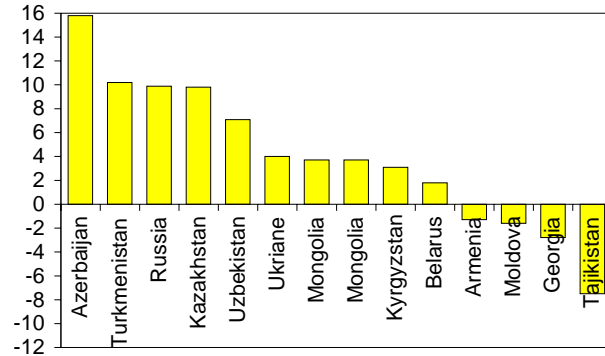
<sup>14</sup> See Mendoza and Enrique (1997) and Eicher (1999).



derived from export prices relative to import prices. Terms-of-trade shocks capture changes in both the international demand for a country's exports and the cost of production and consumption inputs.<sup>15</sup> This variable may also be included in the list of instrumental variables because its movement depends primarily on world conditions and therefore, is largely exogenous with respect to per capita growth for an individual country.

Several empirical studies have found a positive and significant link between improvement in the terms of trade and economic growth (Fisher, 1993, and Mendoza, 1997). Barro, 1997, notes that if the quantities of domestically produced goods do not change, then an improvement in the terms of trade raises real gross domestic income, but does not affect real GDP. Movements in real GDP occur only if shifts in the terms of trade bring about a change in domestic employment and output.

Figure 2. Terms of Trade, 1999-2006  
(Average annual change)



Source: Authors' own calculations from the WEO database.

**Workers' remittances**, which may be included in the set of external conditions, have become an increasingly important channel for meeting external financing needs and may be behind the recent strong economic growth in some CIS countries.<sup>16</sup> Large-scale labor emigration from these economies in the 1990s and an associated substantial increase in workers' remittance flows, largely from Russia, in recent years, have increasingly shaped the economic and social landscape of the countries in the region. Armenia, the Kyrgyz Republic, Tajikistan, Georgia, and Moldova have lost a significant portion of their labor force due to emigration to Russia and OECD countries. The migration rates seem to be particularly striking for highly skilled workers. The items compensation of employees plus workers' remittances, plus migrant transfers (all debit) to CIS countries in the Russian balance of payments statistics have been growing at a fast pace in recent years to about US\$10 billion by 2006.

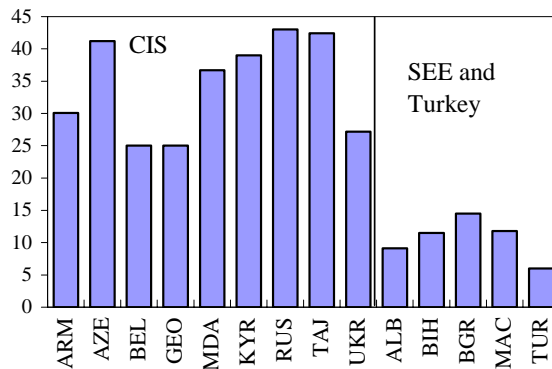
Empirical evidence of the impact of remittances on growth is inconclusive. The impact depends on how the remittances are spent in the economy. Chami, Fullenkamp, and Jahjah (2005), did not find a significant positive relationship between remittances and growth. Mishra (2005), using data for Caribbean countries, shows that remittances have a statistically

<sup>15</sup> See Fischer (1993) and Barro and Sala-i-Martin (2004).

<sup>16</sup> Wage income earned abroad has become a sizeable component in the balance of payments of several CIS and south-east European economies. Income earned abroad by short-term workers (residents for less than a year) appears in the balance of payments as workers' compensation under the income account while income earned abroad by migrants (foreign residence for over a year) appears as workers' remittances under the current account private transfers.

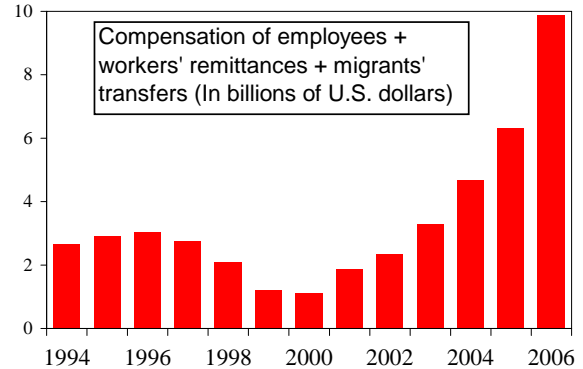
and economically significant impact on private investment. This result is striking, given the common perception that remittances are used largely for consumption purposes. It is, however, consistent with micro-level studies that show that remittances have a strong impact on investment in real estate, small enterprises, and agriculture.

Figure 3. Highly Skilled Expatriates in the OECD  
(as percentage of expatriates, by country of birth)



Source: OECD, 2004, Trends in International Migration.

Figure 4. Transfers and Remittances from Russia  
to CIS Countries



Source: Derived from Central Bank of Russia Database.

Giuliano and Ruiz-Arranz (2005) showed that remittances can help alleviate a lack of credit and can compensate for an underdeveloped financial sector. The 2005 survey of over 600 micro and small businesses conducted by the EBRD showed that workers' remittances have been a major source of investment financing in the low-income CIS countries (EBRD, 2006). A significant portion of the remittances received in the CIS were used to finance investment in existing small business and to finance the start-up of new businesses. Remittances also have the potential to bring a larger share of the population in contact with the formal financial system, expanding the availability of credit and saving products. The effects of brain drain—the loss of skilled and highly trained people emigrating to industrial countries—may be mitigated by the financial flows from workers' remittances and the diffusion of new ideas and technologies, either when they return home or simply by facilitating the exchange of information.

In addition to the above, this paper also uses regional and period dummies in the global sample. The period dummies could reflect worldwide recessions and booms, changes in the allocation and cost of international capital flows, and technological innovations. According to the IMF's May 2007 WEO report, productivity growth has accelerated in recent years in most countries in response to the increasing use of new information and communications technology.

Table 3. Cross Correlation Between Variables, Transition Sample

	Per capita growth	Log of per capita income	Real GDP recovery index	EBRD reform index	Remittances to GDP	Terms of trade growth	Investment to GDP	Price of investment	Log of inflation rate	Fiscal balance to GDP	Gov't consumption to GDP	Openness (exports+ imports) to GDP	Institutional quality index
Per capital growth	1.00												
Initial income per capita	-0.08	1.00											
Real GDP recovery index	-0.15	0.41	1.00										
EBRD reform index	0.65	0.52	0.41	1.00									
Remittances/GDP	0.26	-0.31	0.01	-0.13	1.00								
Terms of trade growth	0.25	0.07	0.19	0.24	0.02	1.00							
Investment/GDP	0.36	0.25	0.35	0.15	-0.15	0.10	1.00						
Price of investment	-0.23	0.24	0.05	-0.08	0.04	0.07	-0.35	1.00					
Log (Inflation rate)	-0.17	-0.32	-0.38	-0.12	-0.20	0.19	-0.19	-0.21	1.00				
Fiscal balance/GDP	0.62	0.29	0.07	0.41	-0.08	0.19	0.20	0.07	-0.18	1.00			
Gov't consumption/GDP	-0.14	0.21	-0.15	0.03	-0.17	-0.03	-0.07	0.14	-0.01	-0.06	1.00		
Openness	-0.04	0.23	-0.06	0.11	-0.12	-0.03	0.17	0.05	0.02	0.08	0.18	1.00	
Institutional quality index	0.21	0.45	0.14	0.61	0.15	0.09	0.34	0.17	-0.10	-0.31	0.19	0.27	1.00

Source: Authors' own calculation based on 27 transition economies covering the period 1996-2006.

## C. Estimation Results

### Results of the Transition Sample

The correlation matrix (Tables 3) of the explanatory variables indicates no serious problem except where the correlation coefficient is greater than 0.50 in the following three explanatory variables: the log of per capita income, EBRD reform index, and institutional quality. This implies that if these variables are included in the same regression, the estimated coefficients may not be individually reliable due to high multicollinearity.

The estimation results for the transition sample are reported in Table 4 for five-year period averages, and Appendix Table 10 for annual data. Overall, the fit is good for this type of panel data (adjusted  $R^2$  ranging from 0.50 to 0.81). In all cases, the variables have the theoretically expected sign, but their magnitude and significance differs depending on the variables included, annual or period averages used, and the estimation techniques.

The estimated coefficient on the recovery of lost output is negative, as expected, and highly significant both in the per capita growth regression equations (columns A to D) and TFP growth regression equations (columns E to H). The recovery of lost output effect is sizable: according to the point estimate, given that the average real GDP index in 1996 of was about 50 for the CIS (1990=100) as compared with 100 in the Central European economies, the difference in per capita growth is expected to be about 3 percentage points in favor of the CIS, assuming other things are equal. Also, in 2000, the average real GDP for the CIS region was 68 percent of the 1990 level, implying that of the eight percent annual average growth in 2001–06, about two percentage points are estimated to have been attributed to the recovery of lost output.

There is a strong link between progress in market reforms as measured by the EBRD reform index on one hand, and growth in per capita real GDP or TFP on the other hand. Unlike Fidrmuc (2003) and Lawson (2004) but in agreement with Falcetti (2005), the estimated coefficients for the EBRD reform index in this study are always positive and highly significant. Running the regressions with each of the eight indicators of the EBRD reform index, one at a time, resulted also in positive and highly significant coefficients because they are highly correlated with each other. The magnitude of the estimated coefficient implies that if the average EBRD score for the CIS countries in 2006 were close to the three Baltics then the average growth would have been about 3 percentage points higher than the outcome for 2001–06.

Unlike previous studies on transition economies, the results suggest that investment is one of the variables that has contributed to the recent rapid growth. The regressions are also estimated without the investment variable. The reason is that the interpretation of the role of this variable is problematic even after the endogeneity problem is addressed. Investment could be capturing the effects of structural reforms that are difficult to quantify, or are already included in the EBRD market reform index. Investment could also change for

reasons other than those related to reforms (for example, the large investment in the oil and gas sectors in Azerbaijan and other resource-rich countries).

Sound macroeconomic policies (including smaller fiscal deficits and lower inflation rates) are associated with higher growth in per capita and in TFP growth. It should be noted that the fiscal coefficient is quite large and robust to changes in the specification of the equation and the estimation technique.

The estimated coefficients for changes in terms-of-trade (a higher growth rate of the ratio of export prices to import prices) and remittances to GDP ratio are positive and significant. Together these two factors are estimated to have accounted for about 1.5 percentage points of the region's annual average growth.

The results of the regression equation (F) and (G) in Table 4 show that per capita growth and TFP growth are also strongly linked to the quality of institutions as computed by Kaufmann, Kraay, and Mastruzzi (2005).<sup>17</sup> Property rights and contract enforcement are two crucial elements of the institutional framework. By allowing for the efficient enforcement of contracts, the institutional framework encourages market-based commercial and financial transactions.

### **Results of the Global Sample**

The correlation matrix Table 9 is used as a guide in selecting the variables that could be included together in the regression equations. There is a high correlation between the institutional quality, the logarithm of initial per capita income, and education (initial secondary school enrollment). This suggests that, included in the same regression, parameter estimates for these variables may not be individually reliable, due to multicollinearity. In the pure cross-section model, all variables were converted into one period by averaging for 1995–2006. For the panel version, the data cover the periods 1980–2006 with five-year period averages (columns K and L), and 1995–2006 when the institutional quality index is included (columns M and N).

Table 5 shows that all included variables have the right sign and are significant at the one percent level, except for the remittances which is not significant in the cross-section regressions (columns I and J). The regional dummies were used to test the hypothesis that different regimes may have characteristics that affect growth differently. This is confirmed with respect to South and East Asia, which, on average, performed better with respect to per capita growth than did other regions in the period under consideration. The coefficients of the African and Latin American dummies are negative but weakly significant.

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<sup>17</sup> The EBRD reform score and investment are highly correlated with institutional quality and are not used in the same regression equations.

Table 4. Regressions Results with Five-Year Average Panel, Transition Sample 1/

Dependent variable →	Per Capita Real GDP Growth				TFP Growth			
	Fixed Effects (FE)		2SLS 2/	FE	FE	2SLS 2/	FE	2SLS 2/
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)
<i>Recovery of lost output 3/</i>	-0.09**	-0.08**	-0.07**	-0.06**	-0.05**	-0.05**	-0.04**	-0.05**
<i>Investment/GDP</i>	0.29**	...	0.26**	...	...	...	...	...
<i>Stabilization and market reforms</i>								
Log (inflation rate)	-1.89**	-1.40**	-1.57**	-1.42**	...	...	-1.07**	-1.29**
Fiscal balance/GDP	0.24**	0.39**	0.29**	0.32**	0.29**	0.25**	0.31**	0.26**
EBRD reform index 4/	5.16**	5.45**	3.54**	...	3.43**	3.31**	...	...
Government consumption/GDP	-0.21**	-0.15*	-0.27**	-0.24**	-0.32**	-0.29**	-0.32**	-0.16*
<i>Institutions 5/</i>	...	...	...	5.15**	...	...	3.15**	3.42
<i>Institutions * log (income) 6/</i>	...	...	...	-1.28**	...	...	-0.93**	-0.97**
<i>External conditions</i>								
Terms of trade growth	0.10*	0.08**	0.08**	0.09*	0.06*	0.06*	0.08*	0.10**
Remittances/GDP	0.19**	0.18**	0.22**	0.18*	0.13**	0.17**	0.09*	0.05
Number of countries	27	27	27	26	27	27	26	26
Number of observations	105	105	75	75	75	53	75	53
R <sup>2</sup> (unweighted)	0.81	0.73	...	0.72	0.71	...	0.68	...

Source: Authors' calculations.

Notes: The symbols \* and \*\* indicate that the estimated coefficients are significantly different from zero at the 5 and 1 percent confidence level, respectively.

1/ Includes twelve CIS, three Baltics, five Central European, and seven Southeast European countries.

2/ Two-stage least squares (2SLS) with instrumental variables as described in the text.

3/ As proxied by real GDP index in the previous period (1990=100).

4/ Simple average of eight EBRD transition reform indicators (price liberalization, competition policy, banking reform, trade and foreign exchange system, large-scale privatization, small-scale privatization, governance and enterprise reforms and infrastructure). The transition indicators range from 1 to 4.3, with 1 representing little or no change from a rigid centrally planned economy and 4.3 representing the standards of an industrialized market economy.

5/ Simple average of six institutional concepts: voice and accountability, political stability and absence of violence, government effectiveness, regulatory burden, rule of law, and control of corruption. The scores lie between -2.5 and 2.5, with higher scores corresponding to better outcome.

6/ Captures the interaction between initial GDP per capita and institutions. When per capita income and institutional quality are both low, the ability to take advantage of growth opportunities is limited.

The coefficient of the output recovery index is highly significant, implying that on average growth in the CIS economies was about 2.5 percentage points higher than in other countries. To recall, the recovery index in the global sample depends on the level of real GDP in 1995 as compared with real GDP in 1990 (see Appendix I for description of the data).

The value of the estimated coefficient of institutional quality and its significance increases when some of the macroeconomic policy, investment, and structural variables are excluded from the right hand side of the regression equation. This may reflect the impact of institutions on policy sustainability variables and indicate that institutions play a dominant role in explaining cross-country differences in growth. More efficient institutions allow an economy to produce the same output with fewer inputs; bad institutions lower incentives to invest, to work, and to save.

Government consumption ratio has a significantly negative effect on growth (by depressing investment). An increase in government consumption to GDP ratio of 10 percentage points is estimated to lower the growth rate by 0.8 percentage points. The estimated coefficients for the terms of trade and remittances are positive but modestly significant and smaller than in the transition sample.

Education, a generalized measure of human capital, is found to be a robust determinant of growth in the global sample. The estimated coefficient implies that a 10-percentage-points increase of the net secondary school enrollment rate is associated with a 0.25 percentage-point increase of the growth rate. For a given level of initial per capita income, a higher initial stock of human capital (as proxied by net secondary school enrollment) tends to generate higher economic growth through at least two channels. First, more human capital facilitates the absorption of superior technologies from developed countries. Second, countries that start with a high ratio of human to physical capital—such as the transition economies in the aftermath of the sharp drop in output and physical capital in the early 1990s—tends to grow rapidly by adjusting upward the quantity of physical capital.

More importantly, changes in the external environment—captured by the World cycle dummies in Table 5—appear to have had adverse and favorable growth effects, that were substantial and statistically significant in certain periods. While in the early 1980s, the global environment explains on average 1.2 percentage points of annual decline in output, the very favorable environment in 2001–06 explains on average one percentage point increase in per capita output in most countries.<sup>18</sup> This latter could reflect the rapid progress in technological innovation worldwide, lower interest rates, and easier access to capital markets for most developing and transition economies.

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<sup>18</sup> The unfavorable external environment in 1980–82, is reflected in higher international interest rates, higher oil prices, and growth slowdown in industrial countries.

Table 5. Regression Results, Global Sample

Data → Method of estimation → Regression →	Pure Cross-Section		Five-Year Averages			
	OLS (I)	2SLS 1/ (J)	Fixed Effects (K)	2SLS 1/ (L)	Fixed Effects (M)	2SLS 1/ (N)
<i>Convergence or catch-up</i>						
Log (initial GDP per capita)	-1.96**	-1.81**	-1.82**	-1.67**	...	...
Output recovery index 2/	2.71**	2.65**	...	...	...	...
<i>Investment/GDP</i>	0.11**	0.10**	0.16**	0.12**	0.14**	0.13**
<i>Stabilization and institutions</i>						
Fiscal balance/GDP	0.04	0.27	0.09**	0.10**	0.17**	0.16**
Openness	0.02	0.02	0.02*	0.03*	0.04*	0.04*
Institutions 3/	4.79**	3.27**	...	...	2.51**	2.26**
Institutions * log (income) 4/	-1.22**	-0.82**	...	...	-1.22**	-0.82**
Initial education	0.02**	0.02**	...	...	...	...
Government consumption/GDP	-0.07**	-0.08**	-0.04**	-0.06**	-0.04**	-0.04**
Population growth	-0.48**	-0.51**	-0.94**	-0.91**	...	...
<i>External conditions</i>						
Terms of trade growth	0.11**	0.11**	0.07**	0.07**	0.05*	0.05*
Remittances/GDP	-0.03	-0.03	0.09**	0.09**	0.13**	0.11**
<i>World cycle</i>						
1980-1985	...	...	-1.25**	-1.25**	...	...
1986-1990	...	...	...	...	...	...
1991-1995	...	...	-0.46	-0.46	...	...
1996-2000	...	...	0.17	0.16	...	...
2001-2006	...	...	1.04**	1.04**	...	...
<i>Regional Dummies</i>						
Sub-Saharan Africa	-0.55*	-0.49*	...	...	...	...
Latin America	-0.67*	-0.62*	...	...	...	...
South and East Asia	1.21**	1.16**	...	...	...	...
Period	1996-2006	1996-2006	1980-2006	1980-2006	1996-2006	1996-2006
Countries	139	139	139	139	139	139
Observations	139	139	633	633	411	411
R <sup>2</sup> (adjusted)	0.62	...	0.54	...	0.51	...

Source: Authors' calculations.

Notes: The symbols \* and \*\* indicate that the estimated coefficients are significantly different from zero at the 5 and 1 percent confidence level, respectively.

1/ Two-stage least squares (2SLS) with instrumental variables as described in the text.

2/ The following indices are used: 0 for countries with real GDP in 1995 of more than 90 percent of the real GDP in 1990; a value of 0.33 if real GDP in 1995 was between 75-89 percent of its level in 1990; 0.66 if it was between 60-74 percent; and 1 if real GDP was below 60 percent of its value in 1990.

3/ Simple average of six institutional concepts: voice and accountability, political stability and absence of violence, government effectiveness, regulatory burden, rule of law, and control of corruption. The scores lie between -2.5 and 2.5, with higher scores corresponding to better outcome.

4/ Captures the interaction between initial GDP per capita and institutions. When per capita income and institutional quality are both low, the ability to take advantage of growth opportunities is limited.



#### D. Robustness of the Results

The coefficient estimates for investment as a share of GDP and the average EBRD measure of market reforms (or the World Bank's institutional quality index in the case of the global sample) may be biased, since these variables are not entirely exogenous. If the causality runs mainly from these variables to growth then the problem may be benign, but if it runs from growth to these variables then the problem is more severe. This problem is addressed, to a certain extent, by using the instrumental variable (IV) technique. A minimum of two observations per country is required to run the IV methodology. Since one observation must be reserved for instrumentation, the first period in the regression corresponds to 1995–99 for the transition sample using five-year averages.

The following variables are used as instruments: (1) lagged values of the exogenous explanatory variables; (2) the relative price of investment, which is found by Barro and Sala-i-Martin (2004) to be less subject to endogeneity than the investment ratio; (3) distance to Brussels (transition sample); (4) raw material exports as share of total exports;<sup>19</sup> and (5) an index measure of ethnic and linguistic fractionalization as measured by Alesina and others (2003) in the case of the global sample.<sup>20</sup> Using more appropriate instruments would yield more efficient IV estimates. But given the large number of explanatory variables and the relatively small cross-sectional dimension (particularly in the “transition” sample) by the standards of common panel data, over fitting should be avoided by working with a reduced number of instrumental variables. A comparison of the point estimates of the market reform variables did indeed point to a small systematic OLS magnification bias. That is, the 2SLS estimates of the effects of the EBRD reform index and investment ratio were smaller than the OLS estimates.

A second estimation problem faced in this study is the decision of which explanatory variables to include in the growth equation. Variables could be significantly correlated with growth depending on which other variables are held constant. This is because economic theories are still not precise enough to decide on the determinants of growth. The high cross-correlation among some of the explanatory variables is also a problem (Table 3). For example, combining different sets of variables one finds that  $x_1$  is significant when the regression includes  $x_2$  and  $x_3$ , but becomes insignificant when  $x_4$  is included or  $x_2$  excluded. In general, however, the conclusion that recovery of lost output, macroeconomic stabilization, and market reforms significantly contributed to the rapid growth in 2001–06

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<sup>19</sup> Beck and Laeven, 2006, show that countries that had been longer under socialist government and rely more on natural resources experienced less institution building during the transition process. This finding is robust to using different indicators of institutions building and controlling for other factors that might be associated with institution building.

<sup>20</sup> Easterly and Levine (1997) have shown that per capita GDP growth is inversely related to ethno-linguistic fractionalization in a large sample of countries. In particular, they argued that much of Africa's growth failure is due to ethnic conflict, partly as a result of absurd borders left by former colonizers. Alesina and others (2003) conclude that ethnic and linguistic fractionalization variables, more so than religious ones, are likely to be important determinants of economic success, both in terms of output and quality of institutions.

appears robust to the alternative estimation methodologies and the choice of control variables.

A third concern with the estimated coefficients is the possible sensitivity of the results to the assumption about the form of the growth regression. In particular, the explanatory variables in equation (2) enter the growth equation regression linearly and independently. This reflects an ad hoc assumption that the marginal effect of a change in explanatory variable is constant, both across different levels of the variable and across different economies. In this regard, this paper tested for the robustness of the results by allowing for two types of nonlinearities for the explanatory variables of interest in the panel regression equation. Thus, the paper includes a squared term for the EBRD market reform and the proxy for the recovery of lost output variables in the regression specification:

$$g = \beta_1 Z + \beta_2 Z^2 + \lambda X + \mu_i + \nu_t + \varepsilon_{it} \quad (2)$$

The question of interest is whether the coefficient estimate  $\beta_1$  remains robust when a squared term is included (a secondary question is whether  $\beta_2$  is itself robust). Allowing for the inclusion of a squared term, the results show that the EBRD market reform and the recovery of lost output variables remain robust. In addition, the coefficients of the squared terms of these two variable ( $\beta_2$ ) are significant and have opposite signs as compared with  $\beta_1$ .

Another possibility is that the partial effect of a variable on growth varies over different levels of development. For example, the marginal effect of market reforms (as measured by the EBRD score) could be quite different in Armenia than in Slovenia. One way to capture such linearity is to include an interaction term between the variable of interest and a measure of the country's level of development (such as per capita income) in the regression specification. That is:

$$g = \beta_1 Z + \beta_2 Z * \log(Y_0) + \lambda X + \mu_i + \nu_t + \varepsilon_{it} \quad (3)$$

where  $Y_0$  measures the initial GDP per capita in PPP U.S. dollars. Again the key question is whether  $\beta_1$  becomes robust when the interaction term is included. Again the core explanatory variables remain robust. Combined with the results from equation (2), this suggests some important nonlinearities in the correlation between market reforms and growth. The negative interaction term indicate that market reform has less of an effect at higher levels of development.

## E. Contribution to Growth Changes

### Changes in Growth Rates over Time

With the exception of the Kyrgyzstan, all CIS economies grew faster in 2001–06 than in 1996–2000. On average, the region grew by 5.3 percentage points a year faster in the latter period. In this regard, the estimated regressions can provide a useful decomposition of the importance of the various factors in explaining differences in growth between the two periods. For this, both the estimated coefficients from the main regression (based on the results in Table 5 using the 2SLS) and the actual values of the explanatory variables for the two periods under consideration are used. The objective here is to assess the contribution of the change in each category of explanatory variables to a country's fitted growth equation. The difference between the average country growth performance in 2001–06, denoted by  $g_1$ , and average growth performance in the same country in the previous period (1996–2000), denoted by  $g_0$ , can be expressed as follows:

$$g_1 - g_0 = \beta [Z_1 - Z_0] + \lambda [X_1 - X_0] + \gamma [W_1 - W_0] + \varepsilon_{it} \quad (4)$$

$Z$  is the vector of “core explanatory variables” (recovery of lost output index, EBRD measure of market reforms, investment, terms of trade, and workers remittances).  $X$  comprises a set of control variables including fiscal balance, inflation rate, and government consumption.  $W$  can be interpreted as an exogenous world environment. It captures the extent to which unaccounted international exogenous factors related to growth (such as productivity of new inventions in 2001–06).  $\varepsilon_{it}$  is the residual (the difference between the actual and the predicted change in growth).

The results of this approach are reported in Table 6. The first two columns show the actual and the fitted changes in the growth rates between 2001–06 and 1996–2000. The effects of changes in external factors such as remittances, terms of trade, and other global favorable environment factors are shown in columns (3) to (5). The combined impact of macroeconomic stabilization and reforms (specifically lower inflation, improvement in the fiscal position, progress made in market reforms as measured by the EBRD, and smaller size of government in the economy as measured by the government consumption to GDP ratio) are reported in column (6).

The estimates predict changes in the per capita growth rates quite well for the CIS, the Baltics and the Central European economies but less well for the Southeastern European economies. For the CIS as a whole, 1.9 percentage points of the 5.3 percentage points predicted increase in growth is explained by external factors, and 3 percentage points are due to improvement in macroeconomic stabilization and reforms.

The following list includes the main factors according to their importance in explaining growth changes between 2001–06 and 1996–2000.

Table 6. Decomposition of Growth Increase between Periods  
(2001–2006 Compared with 1996–2000, in percentage points)

	Actual change in growth rates (1)	Predicted change in growth rates (2)	Contribution to Predicted Change in Growth Rates							Residuals (8)
			External			Total external factors (3)+(4)+(5)	Stabilization and reforms (5)	Invest- ment (6)	Recovery of lost output (7)	
			Remi- ttances (3)	TOT shock (4)	World cycle * (5)					
<b>CIS</b>	5.2	5.2	0.9	0.4	1.0	2.4	2.6	1.1	-0.5	0.1
Armenia	7.2	6.3	1.3	-0.5	1.0	1.8	3.5	1.8	-0.8	1.0
Azerbaijan	8.9	6.7	0.6	1.7	1.0	3.2	1.7	2.5	-0.6	2.2
Belarus	1.5	2.2	0.0	0.5	1.0	1.5	1.9	0.0	-1.0	-0.7
Georgia	1.7	2.0	-0.2	-0.3	1.0	0.5	1.9	0.9	-1.1	-0.3
Kazakhstan	7.9	5.9	0.0	1.3	1.0	2.3	2.4	2.0	-0.6	1.9
Kyrgyzstan	-2.0	3.5	0.7	0.2	1.0	2.0	2.1	0.7	-1.1	-5.5
Moldova	9.0	8.7	3.6	-0.3	1.0	4.3	3.4	0.4	0.6	0.3
Mongolia	3.3	5.2	0.5	0.2	1.0	1.7	2.8	1.6	-0.8	-1.9
Russia	4.7	4.5	-0.1	0.9	1.0	1.8	2.6	0.3	-0.2	0.2
Tajikistan	8.5	7.6	3.0	-0.5	1.0	3.5	2.4	1.6	0.1	0.9
Ukraine	9.5	6.8	0.6	0.8	1.0	2.4	2.8	0.5	0.9	2.7
Uzbekistan	2.4	2.4	0.4	0.9	1.0	2.3	1.2	-0.1	-0.9	0.0
<b>CEB</b>	1.3	1.9	0.1	0.2	1.0	1.3	1.8	0.3	-1.3	-0.6
Baltics	2.9	4.0	0.2	0.2	1.0	1.4	2.8	0.8	-0.9	-1.1
Estonia	2.6	4.1	0.2	0.2	1.0	1.4	3.1	0.9	-1.2	-1.5
Latvia	3.1	4.8	0.3	-0.1	1.0	1.2	1.8	1.5	0.2	-1.7
Lithuania	3.0	3.1	0.1	0.6	1.0	1.7	3.4	-0.1	-1.7	-0.2
<b>CE</b>	0.3	0.6	0.1	0.1	1.0	1.2	1.1	0.0	-1.6	-2.0
Czech Republic	2.6	1.7	0.1	0.4	1.0	1.5	0.9	0.0	-0.6	0.2
Hungary	0.3	0.5	0.1	-0.1	1.0	1.0	0.5	0.7	-1.5	-2.0
Poland	-1.9	-1.0	0.0	0.2	1.0	1.3	1.2	-0.6	-2.5	-3.7
Slovak Republic	1.5	0.7	0.1	-0.1	1.0	1.0	2.1	-0.8	-1.4	-0.7
Slovenia	-1.0	0.8	0.0	0.2	1.0	1.2	1.0	0.6	-1.8	-3.8
<b>SEE</b>	2.5	3.7	0.3	0.0	1.0	1.4	2.0	1.2	-0.4	-1.3
Albania	-0.5	2.6	0.2	-0.2	1.0	1.1	2.2	1.7	-2.1	-3.1
Bulgaria	5.5	7.2	0.4	-0.3	1.0	1.1	3.5	2.2	0.3	-1.7
Croatia	1.3	3.1	0.2	-0.1	1.0	1.1	2.2	1.2	-1.1	-1.8
Macedonia	-1.2	-0.3	0.2	-0.2	1.0	1.1	-0.3	0.0	-1.0	-0.9
Romania	7.3	5.6	0.5	1.0	1.0	2.5	1.8	0.8	0.4	1.7

Source: Authors' calculations.

\* Estimated in regression (J) or (K), Table 5, Global Sample (coefficient for World cycle dummy, 2001–2006).

- Azerbaijan: Investment followed by terms of trade and stabilization and reforms.
- Armenia: Stabilization and reforms followed by investment and remittances.
- Belarus: Stabilization (mainly lower inflation) and external factors.
- Georgia: Stabilization and reforms followed by investment.
- Kazakhstan: Stabilization and reforms followed by investment and terms of trade.
- Kyrgyz Republic: Prediction is poor due to special factors.
- Moldova: Remittances followed by stabilization and reforms.
- Mongolia: Stabilization and reforms followed by investment.
- Russia: Stabilization and reforms followed by terms of trade and investment.

- Tajikistan: Remittances followed by stabilization and reforms, and investment.
- Ukraine: Stabilization and reforms followed by terms of trade.
- Uzbekistan: Stabilization followed by terms of trade and remittances.
- Baltics: Stabilization and reforms.
- Southeast Europe: Stabilization and reforms (with the exception of Macedonia).

Had the market reform been deeper in the CIS, its impact on growth would have been correspondingly larger when multiplied by the estimated marginal growth effect. For example, if reforms in the CIS had attained the levels observed in the Baltics or in the Central European economies, the resulting aggregate growth acceleration impact would have been about 2 percentage points higher.

### **Changes in Growth Rates Across Regions**

Another key advantage of the panel sample in this paper is that it permits the employment of an alternative standard of comparison, relying on cross-regional comparative analysis, to supplement the country-by-country time-series dimension. In this case, the unit of analysis is a comparison of regional aggregates. Specifically, the focus is on explaining the sources of the growth difference between the twelve CIS countries on one hand, and the eight Central European and Baltics (CEB) countries on the other hand. To maintain consistency with the previous predictions, the comparison is based on the growth performance in 2001–06. The difference between the average growth for the CIS region, denoted by  $g_{CIS}$ , and average growth for the CEB, denoted by  $g_{CEB}$ , can be expressed as follows:

$$g_{CIS} - g_{CEB} = \beta [Z_{CIS} - Z_{CEB}] + \lambda [X_{CIS} - X_{CEB}] + \varepsilon_{it} \quad (5)$$

where the core and the control explanatory variables are defined as before.  $W$  (world environment) or the period shift does not appear in the equation because comparisons are made in a single period (2001–06).

Table 7. Sources of Regional Differences in Growth  
(Between the CIS and Central Europe and the Baltics, in 2001–2006)

	Impact on growth (In percentage points)	Explanation CIS as Compared with Central Europe and the Baltics
Actual difference in growth	2.5	Growth was higher
Predicted change (from model)	2.4	Predicted difference in growth
Recovery of lost output	3.0	Initial real GDP index lower
EBRD market reforms measure	-3.1	Market reforms weaker
Government consumption/GDP	0.8	Government size smaller
Remittances and terms-of-trade	2.3	Favorable external environment
Investment	-0.4	Investment lower
Inflation rate	-0.7	Inflation higher
Fiscal adjustment	0.5	Greater fiscal adjustment

Source: Authors' calculations.

The following factors were in favor of the Central European and the Baltics countries (CEB): (i) reforms were more advanced in the CEB (EBRD score of 3.6) as compared with the CIS (average score of 2.7); (ii) investment was higher by two percentage points of GDP; and (iii) inflation was significantly lower. However, the positive impacts of these factors were more than offset by other factors in favor of the CIS, including (i) recovery of lost output was much higher (initial real GDP in the CIS was 64 percent of its level in 1990 as compared with 98 percent in the CEB); (ii) government consumption as a share of GDP was much lower; (iii) remittances averaged about four percent of GDP in the CIS as compared to one percent of GDP in the CEB; (iv) the terms-of-trade shocks were in favor of the CIS; and (v) stronger fiscal adjustment as measured by lower deficits.

#### F. Are the CIS Countries Facing the “Dutch Disease?”

While economic growth in the CIS countries has been very strong over the past six years, there are concerns regarding the factors (as estimated in the previous sections) behind the economic successes. Empirical research suggests that a majority of countries with large natural resource wealth lag behind comparable countries in terms of real GDP growth—the so-called oil curse (Sachs and Warner, 2001). This finding holds independently of trends in commodity prices, climatic variables, or other growth impediments. It applies not only to oil-dependent countries, but also to producers of other minerals.

The origins of the “oil curse” are threefold: (i) Dutch disease; (ii) poor fiscal policies to cope with the volatile nature of major commodity prices, raising sustainability issues; and (iii) the negative effects of the “rent-seeking” behavior—exacerbated by the dominance of extractive industries—on institutions, governance, and political processes. The Dutch disease refers to the possible deindustrialization in the aftermath of a natural resource discovery. The discovery may trigger a boom that raises the country’s real effective exchange rate (either

through an increase in domestic prices and costs or through an appreciation of the domestic currency on the foreign exchange market), making manufacturing goods (or other tradable goods) less profitable, and leading to the absolute or relative decline of the industries producing them. When the boom ends and revenues from natural resources disappear, these weakened industries are not able to generate alternative fiscal and foreign exchange revenues, leaving no choice but difficult economical and political adjustments.

A slowdown in the global economy could reverse the gains from the terms of trade. This downside risk arises from a high concentration of exports in commodities (Table 8). Also, a large portion of the new investment in the CIS has occurred in the extractive industries (particularly in Azerbaijan, Kazakhstan, and Turkmenistan), while relatively little has gone to other sectors of the economy. The commodity price boom may have complicated efforts to diversify production and exports away from primary materials to goods with a higher value-added component. While some CIS countries are relatively less dependent on commodities, they depend strongly on Russian import demand (machinery and equipment in case of Belarus and wine in the case of Moldova and Georgia). Also a slowdown in growth in the Russian economy and the possibility of more restrictive immigration laws in the future could significantly reduce workers' remittances to Armenia, Kyrgyzstan, Moldova, Tajikistan, and Uzbekistan.

Following Oomes and Kalcheva's (2007) approach on the Russian economy, Table 8 presents developments of selected symptoms of Dutch Disease in the CIS countries including: (i) appreciation of the real exchange rate; (ii) service sector growth; (iii) a slowdown in manufacturing growth (deindustrialization); (iv) growth in real wages; and (v) export concentration. While detailed examination of these symptoms in the CIS countries would be another topic for research, a preliminary review of developments over the past six years point to the following:

- The real effective exchange rate has appreciated significantly since 2000 in Russia and Armenia, and modestly in Kazakhstan and Ukraine. But several studies using cointegration techniques show no evidence that the real exchange rates have been above the estimated equilibrium level in the CIS countries. The appreciation of the real exchange rate reflects partly the significant improvement in productivity of labor in recent years.
- The share of services in GDP remained broadly the same. In general, increase in the share of services is a commonality that most countries experience in the development process.
- Growth in manufacturing in 2000-5 was relatively strong in most CIS countries except Kyrgyzstan and Uzbekistan.
- The average real growth in wages exceeded the growth in productivity of labor by large margins in some CIS countries.

- Export concentration is very high in most CIS countries, with the exception of Armenia, Georgia, and Ukraine.

The message from Table 8 is mixed. A more detailed analysis, which is beyond the scope of this paper, would be needed to assess the symptoms of the Dutch Disease in the region.

CIS countries could also learn from the divergent experiences of East Asia and Latin America. The reason for this comparison is that the export structure of CIS countries—mostly primary commodities—better resembles that of Latin America than East Asia. Real per capita economic growth in Latin America averaged slightly less than one percent as compared with 6.5 percent in East Asia in 1980–2006. Most of East Asia’s growth in intra-industry trade has been in textiles, light manufacturing and high-technology exports, which has been the category of most rapid growth in world trade. In Latin America, except in Mexico, export growth was heavily weighted toward natural resource commodities and low- and medium-technology exports. As a result, whereas East Asia’s share of global manufactured exports rose sharply, Latin America’s share remained flat.<sup>21</sup>

A key driver in the above trade dynamics has been FDI by multinational corporations. Not only has East Asia received more FDI flows than Latin America, but the flows to East Asia have been mostly channeled into manufacturing, which fed exports. In contrast, more than half of the FDI in Latin America was related to mergers and acquisitions in connection with the privatization of state-owned utilities and domestic banks. Much of the rest has been directed to the exploitation of natural resources, particularly mining and oil. The current situation in the CIS countries is similar to Latin America, where most of the FDI is related to privatization or directed to the exploitation of natural resources.

The main message of this section based on partial information is that the long-term rapid growth in the CIS countries will be increasingly dependent on the ability of the region to diversify and raise investment in the non-commodity sectors. This would require deepening and accelerating the reform process as well as improving the quality of institutions.

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<sup>21</sup> See Elson, 2006, “What Happened,” *Finance and Development*, June, Vol. 43, Number 2.



Table 8. Selected Symptoms of "Dutch Disease"

	Real Effective Exchange Rate April 2007 (2000 = 100)	Share of Services in GDP (%)		Real Annual Growth in		Growth in Real Wages 2001-05	Labor Productivity Growth 2001-06	Export of Major Commodities	
		2000	2005	Manufacturing	Services			Category	As percent of Exports
				2000-05	2000-05				
Armenia	117	40	39	9.2	12.2	15.8	13.1	Metals	21
Azerbaijan	93	38	30	9.1	8.8	17.0	14.5	Oil and petroleum products	87
Belarus	64	48	43	11.5	5.3	15.5	8.7	Petroleum products and metals	55
Georgia	99	56	57	6.3	7.8	16.8	8.1	Wine and metals	28
Kazakhstan	112	51	51	9.2	10.8	11.7	7.5	Oil and gas	57
Kyrgyzstan	108	32	38	0.9	7.3	11.9	2.1	Gold	40
Moldova	101	51	50	7.7	6.4	16.3	6.6	Wine	33
Mongolia	107	52	45	5.5	7.8	...	4.7	Copper and Gold	61
Russia	171	55	55	6.1	6.4	15.6	5.3	Oil and gas	55
Tajikistan	82	33	35	10.3	7.0	23.7	7.1	Aluminum and cotton	69
Turkmenistan	115	34	36	...	...	...	...	Gas, oil, and oil products	82
Ukraine	111	46	50	14.0	7.7	17.2	6.8	Iron and steel	40
Uzbekistan	81	45	32	1.8	5.1	9.1	3.7	Gold, cotton, and gas	65

Sources: Real effective exchange rate: IMF country reports; share of services: IMF country reports; growth in manufacturing and services: World Bank, World Development Indicators, 2007; growth in real wages: UNECE; labor productivity: Iradian, 2007; and export of major commodities: UNCTAD.

#### IV. CONCLUSIONS AND POLICY CHALLENGES

Using panel data regression, this study found that the region's rapid growth of CIS countries since 1999 is explained by the extent of how much their economies have contracted in terms of real GDP in the 1990s and the degree of progress made in market reforms. Other factors, such as the terms of trade, workers' remittances, and macroeconomic stabilization have also contributed to high economic growth. The results, according to different panel econometric techniques, are robust. Correcting for simultaneity bias changes the results marginally. The main findings are as follows:

- Transition countries that experienced larger declines in output during the early 1990s tended to grow at much faster rates. On average, of the eight percent annual average growth rate for the CIS in 2001–06, about two percentage points are attributable to the recovery of lost output.
- The growth impetus associated with macroeconomic stabilization and market reforms has been substantial because of their effect on the overall productivity. Had the market reform been deeper, its impact on TFP growth would have been correspondingly larger.
- The growth acceleration payoff to reforms in 2001–06 was enhanced by the favorable external environment (positive terms-of-trade shock, large increases in remittances, and global technological innovation). These factors have accounted for about two percentage points of the annual growth in the CIS. The global environment alone in 2001–06 explains one percentage point of the annual average growth in the CIS and other countries.

The above findings imply that almost half of the total growth in 2001–06 came from the recovery of lost output and a favorable external environment. These two factors are unlikely to continue for a very long time. The undiversified export structure and the terms-of-trade gains may expose the CIS countries to considerable external risks. Long-term rapid growth, therefore, will be increasingly dependent on the ability of the region to diversify and raise investment in the noncommodity sectors.

While CIS countries have made much progress in macroeconomic stabilization, liberalization of foreign trade and exchange, privatization, and elimination of price controls, much needs to be done in the development and enforcement of competition policy in order to achieve the level of market reform found in the Baltics and Central European economies (as measured by the EBRD score). Such an advance in structural reforms would represent a gain of nearly about three percentage points in growth of per capita output over the medium term. This will be enough to offset the lost gains from the recovery of output, given the fact that in 2006 the CIS has already achieved the real GDP level of 1990.

Table 9. Cross Correlation Between Variables, Global Sample

	Per capita growth	log of income	log(INF) inflation rate	Fiscal balance to GDP	Investment to GDP	Remittances to GDP	Terms of trade growth	Gov't consumption to GDP	Private credit to GDP	Openness	Population growth	Price of investment index	Education	Institutional quality
Per capita growth	1.00													
Log(income)	0.06	1.00												
log(inflation rate)	0.07	-0.49	1.00											
Fiscal balance to GDP	-0.01	0.32	-0.34	1.00										
Investment to GDP	0.32	0.08	-0.05	-0.05	1.00									
Remittances to GDP	0.01	-0.32	0.10	-0.17	0.17	1.00								
Terms of trade growth	0.06	0.00	0.16	0.22	-0.01	-0.13	1.00							
Gov't consumption to GDP	-0.05	0.26	-0.04	-0.18	0.11	-0.01	0.19	1.00						
Private credit to GDP	-0.01	0.64	-0.50	0.09	0.03	-0.18	-0.18	0.18	1.00					
Openness	0.13	0.24	-0.15	0.05	0.09	0.04	-0.05	0.19	0.24	1.00				
Population growth	-0.46	-0.35	0.04	0.13	0.00	0.02	0.18	-0.14	-0.24	-0.07	1.00			
Price of investment index	-0.29	0.25	-0.26	0.06	-0.11	-0.12	0.01	0.19	0.18	0.04	0.18	1.00		
Education	0.15	0.39	-0.11	0.05	0.10	0.03	0.70	-0.04	0.29	0.10	-0.16	-0.03	1.00	
Institutional quality	0.14	0.81	-0.53	0.20	0.09	-0.25	-0.16	0.18	0.75	0.21	-0.29	0.23	0.24	1.00

Source: Authors' own calculation based on pure cross-section data for 139 countries over the period 1995-2006.

Table 10. Estimation Results, Transition Sample with Annual Data Panel 1/

Method of estimation →	SUR 2/		2SLS 3/	Fixed Effects			2SLS 3/
<i>Recovery of lost output 4/</i>	-0.07**	-0.06**	-0.07**	-0.12**	-0.11**	-0.13**	-0.09**
<i>Investment/GDP</i>	0.18*	...	...	0.07	0.24**	...	...
<i>Stabilization and market reforms</i>							
Log (inflation rate)	-0.86**	-0.77**	-0.65**	-1.34**	...	-1.34**	-1.44**
Fiscal balance/GDP	0.34**	0.34**	0.32**	0.19**	...	...	...
EBRD reform index	4.08**	4.63**	4.26**	3.18**	...	4.38**	4.41**
Openness (Exports+imports)/GDP	0.01	...	...	0.05**	0.05**	...	...
Government consumption/GDP	-0.14**	...	...	-0.20**	-0.32**	-0.31**	-0.31**
<i>External conditions</i>							
Terms of trade	0.09**	0.08**	0.08**	0.07**	0.13**	0.09**	0.08**
Remittances/GDP	0.15**	0.17**	0.16**	0.24**	0.37**	0.24**	0.28**
Wars and civil conflicts 5/	-6.98**	-7.39**	-4.72*	-5.01**	-8.41**	-6.79**	-5.78**
Number of countries	27	27	27	27	27	27	27
Number of observations	388	388	366	383	383	383	383
DW statistics	1.97	2.05	1.92	1.45	1.47	1.41	1.39
R <sup>2</sup> (adjusted)	0.68	0.65	0.51	0.74	0.74	0.72	0.71

Source: Authors' calculations.

Notes: The symbols \* and \*\* indicate that the estimated coefficients are significantly different from zero at the 5 and 1 percent confidence level, respectively. Data for 1991-2006, except for Bosnia and Herzegovina and Serbia which cover the period 1997-2006.

1/ Includes 12 CIS, 3 Baltics, 5 Central European, and 7 Southeast European countries.

2/ In estimating a GLS specification with period seemingly unrelated regressions (SURs), the residual obtained from first stage estimates are used to estimate the covariance. In the second stage a feasible GLS is performed (see Baltagi 2001).

3/ Two-stage least squares (2SLS) with instrumental variables as described in the text.

4/ Real GDP index in the previous period (1990=100).

5/ To quantify the effects of wars or civil conflicts a dummy of value 1 is used for the following: Armenia and Azerbaijan (1991–93), Croatia (1991-95), Serbia (1997), Georgia (1991–95), Moldova (1991–92), and Tajikistan (1991–97), Romania (1991), and Macedonia 1991-94).

## APPENDIX I. SAMPLE, DATA DEFINITION, AND SOURCES

### List of Countries

The global sample consists of the following 139 countries during 1983–2006:

CIS (12): Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, the Kyrgyz Republic, Moldova, Mongolia, Russia, Tajikistan, Ukraine, and Uzbekistan.

Baltics (3): Estonia, Latvia, and Lithuania.

CE (5): Czech Republic, Hungary, Poland, Slovak Republic, and Slovenia.

SEE (7): Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Romania, and Serbia.

OECD (21): Australia, Austria, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, United Kingdom, and the United States.

Sub-Saharan Africa (35): Angola, Benin, Botswana, Burkina Faso, Cameroon, Central African Republic, Comoros, Djibouti, Eritrea, Ethiopia, Ghana, Gabon, Guinea, Gambia, Guinea-Bissau, Ivory Coast, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Suriname, Swaziland, Togo, and Tanzania.

Latin America and the Caribbean (24): Argentina, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El-Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela.

Middle East and North Africa (18): Algeria, Egypt, Iran, Israel, Jordan, Lebanon, Malta, Morocco, Oman, Pakistan, Qatar, Tunisia, Turkey, Yemen, Kuwait, Saudi Arabia, Syria, and the UAE.

South and East Asia (14): Bangladesh, Cambodia, China, Hong Kong, India, Indonesia, Korea, Malaysia, Nepal, the Philippines, Singapore, Sri-Lanka, Thailand, and Vietnam.

The transition sample includes the CIS, Baltics, CE, and SEE.

### Sample period

Annual and period average data were used. The transition sample is divided into three sub periods: 1991–95, 1996–2000, and 2001–06. The global sample is divided into five sub periods: 1981–85, 1986–90, 1991–95, 1996–2000, and 2001–06. The resulting information was unbalanced because of data limitations for some countries.

## Definition and Sources of data

The data sources used are the IMF's World Economic Outlook (WEO), the United Nations Economic Commission for Europe's (UNECE) and the World Bank's databases.

- *Per capita growth* (dependent variable): Per capita real GDP growth rate calculated from national currencies in constant prices. Source: WEO.
- *Convergence* as measured by the initial income per capita in 1995 PPP-adjusted U.S. dollars). Source: World Bank.
- *Investment*
  - Gross fixed capital formation as a percent of GDP. Source: WEO and UNECE.
  - Relative price of investment, which is calculated as the ratio of the investment price deflator to the GDP deflator, both of which are taken from Penn World Tables (PWT) Version 6.1 (<http://pwt.econ.upenn.edu/>).
- *Recovery of lost output for Transition Sample*: The real GDP index (1990=100) is used. Source: own calculations based on the annual real GDP growth rates.
- *Recovery of lost output for Global Sample*: The following indices are used:
  - 0 if initial real GDP in 1995 was greater than 90 percent of its value in 1990.
  - 0.33 if initial real GDP in 1995 was between 75 and 89 percent of its value in 1990; and
  - 0.66 if initial real GDP in 1995 was between 60 and 74 percent of its value in 1990;
  - 1.0 if initial real GDP in 1995 was less than 60 percent of its value in 1990;
- *Market reform index* (only for transition countries): The unweighted average of eight EBRD structural reform indicators—price liberalization, small-scale privatization, large-scale privatization, competition policy, trade liberalization, financial sector reform, governance and enterprise reforms, and infrastructure reform. The EBRD indicators range from 1 to 4.3, where 4.3 indicates that the country's structural characteristics are comparable to those prevailing on average in market economies, and 1 represents conditions before reform in a centrally planned economy with dominant state ownership of the means of production. The reform indices are not perfect and their assessment is sometimes influenced by the observed macroeconomic performance, which raises the problem of possible endogeneity. Source: EBRD, Transition Reports, various years.
- *Institutional quality (in full sample)*: Measure the quality of institutions based on the work of Kaufmann and others (from 1996 to 2005) at the World Bank, available at

<http://www.worldbank.org/wbi/governance/pubs/govmatters4.html>. The institutional quality measure is constructed by calculating the simple average of six indicators:

1. Voice and accountability—focuses on the quality of the political process, civil and private liberties;
2. Political instability and violence—measures the threat and realization of destabilizing the government or regime by any unlawful means;
3. Government effectiveness—measures the quality of inputs, mostly of the bureaucracy, and the process by which policy is being formed, including independence of political interference;
4. Regulatory burden—looks at the quality of the policies and the degree to which they interfere negatively with the operation of the market economy;
5. Rule of law—estimates respect for the law and the quality of the judiciary and enforcement arms; and
6. Control of corruption—measures the inclination of people and officials to offer and accept bribes.

Each of these indicators is distributed normally, with a mean of zero and a standard deviation of one. This implies that virtually all scores lie between -2.5 and 2.5, with higher scores corresponding to “better” outcomes. Since these six measures are strongly correlated, distinguishing the separate impact of any single concept is problematic.

Education: Secondary school enrollment (regardless of age) to the population of the age group that officially corresponds to that level of education. Source: World Bank database. Another alternative would be to use the average years of schooling in the population as compiled by Barro and Lee educational attainment data set (<http://post.economics.harvard.edu/faculty/barro/data.html>). However, this data set does not cover most of the CIS countries.

Ratio of government consumption to GDP. Source: International Financial Statistics (IFS) and IMF WEO database.

International openness as measured by the ratio of exports plus imports to GDP. Source: IMF WEO database.

- *Macroeconomic stabilization* as measured by overall fiscal balance as a ratio of GDP, and the logarithm of the inflation rate. Source: IMF WEO database.

- *External Conditions*
  1. Terms-of-trade shocks: percentage change in the terms of trade index (2000=100). Source: IMF WEO database.
  2. Workers' Remittances: Is the sum of workers' remittances, compensation to employees (credit), and current account private transfers (credit) and then divided by GDP. Source: IMF country reports and IMF Balance of Payments Yearbooks.
  3. World cycle period-specific shifts: Time dummy variables. Source: authors' construction.
- *Raw material exports as share of total exports*: UNCTAD.
- *Index measure of ethnic and linguistic fractionalization*: Alesina, Alberto, W. Easterly, S. Kurlat, and R. Wacziarg, 2003, "Fractionalization," *Journal of Economic Growth*, Vol. 8, pp.



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