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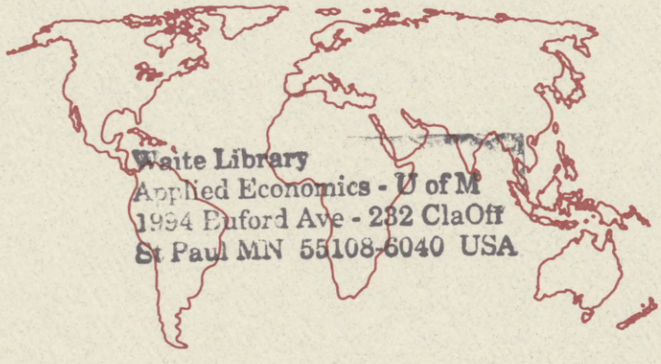

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Development Discussion Paper No. 544

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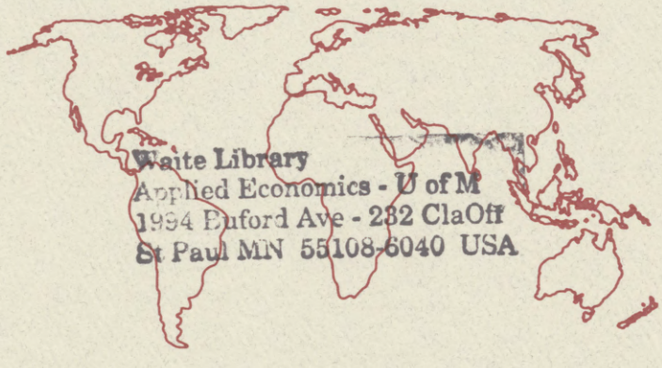

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Harvard Institute for International Development
Harvard University
One Eliot Street
Cambridge, Massachusetts 02138
617-495-2161
Fax: 617-495-0527
http://www.hiid.harvard.edu

"Achieving Rapid Growth in the Transition Economies of Central Europe"
Jeffrey D. Sachs and Andrew M. Warner

Abstract

The preeminent economic challenge for Central European economies in transition is to grow rapidly for a sustained period of time. On current policies, the Central European economies can expect to grow at moderate rates, faster than Western Europe, but far short of the rapid growth rates achieved in the very fast growing economies (VFGEs) in Asia and elsewhere. This paper discusses the sources of rapid growth in the VFGEs, and the ways in which Central Europe could emulate key aspects of the economic policies of the VFGEs in order to raise the growth rates of the Central European economies.

Jeffrey D. Sachs is the Director of the Harvard Institute for International Development and the Galen L. Stone Professor of International Trade at Harvard University. Sachs serves as an economic advisor to several governments in Latin America, Eastern Europe, the former Soviet Union, and Asia. He has also been a consultant to the IMF, the World Bank, OECD, and the UNDP.

Andrew Warner is a Research Associate at the Harvard Institute for International Development. He received his Ph.D. in economics from Harvard University in 1991, and has worked at the Board of Governors of the Federal Reserve and the World Bank. He has previously published papers on the international debt crisis of the 1980s and on American trade performance.

I. Introduction

The preeminent economic challenge for the Central European economies in transition (hereafter CEEs) is to grow rapidly for a sustained period of time in order to narrow the economic gap with Western Europe. There are two important reasons to believe that the gap can be reduced sharply in the next couple of decades. First, before the Soviet imposition of socialism on the CEEs at end of World War II, the CEEs had enjoyed per capita income levels comparable to those of many countries of Western Europe. Czechoslovakia was one of the most prosperous industrial economies of Europe, while Poland and Hungary had income levels comparable to those of the poorer economies of Western Europe, such as Greece, Portugal, and Spain. Second, and more generally, economic history shows that poorer countries that are closely integrated with richer countries tend to grow more rapidly than the richer countries, thereby tending to narrow the gap in per capita income levels.

Table 1 shows comparison of per-capita income levels of three formerly planned economies in Central Europe with three Western European economies: Poland and Spain; Hungary and Greece; and Czechoslovakia and Austria. Five of these economies had roughly similar income levels in 1935. The sixth, Poland, had an lower income of about 60 percent of the others. As early as 1955, Austria's income was significantly higher than neighboring Hungary and Czechoslovakia. Between 1955 and 1970, all three Western economies grew faster than their Eastern counterparts. The income gap widened considerably during the 1970-1990 period, when the Western economies surged in growth while growth stagnated in the planned economies. By 1992, real per-capita income levels of the central European economies ranged between 40 and 55 percent of their Western counterparts.

Table 2 compares the 1993 levels of real GDP in the three Central European economies with 14 European Union economies (EUEs), on a purchasing power parity basis. The table shows both World Bank and Eurostat estimates. The World Bank figures show that the richest of the three, the Czech Republic, was 47 percent of the average for the European Union, and was 16 percent below the poorest country of the European Union (EU), Greece. Poland, the poorest of the three CEEs, was a mere 31 percent of the EU average, and only 55 percent of the Greek level. The Eurostat estimates are

Table 1. Real GDP Per Capita

	1935	1955	1970	1992
Poland	1597	2788	4428	4726
Spain	2792	3995	7291	11711
Ratio: Poland/Spain	.57	.70	.61	.40
Hungary	2471	2480	5028	5636
Greece	2526	2560	6327	10314
Ratio: Hungary/Greece	.98	.97	.79	.55
Czechoslovakia	2410	3922	6460	6845
Austria	2926	5087	9813	17160
Ratio: Czech./Austria	.82	.77	.66	.40

Source: Maddison, Angus, Monitoring the World Economy 1820-1992 Development Centre of the OECD, 1995.

Table 2. Estimates of GDP per-capita in Central and Western Europe

	GDP per-capita in PPP prices		Percent of EU Average			
			unadjusted		adjusted for unofficial economy	
	World Bank U.S. Dollars 1994	Eurostat Index Austria =100 1993	World Bank	Eurostat	World Bank	Eurostat
Austria	20230	100				
Belgium	20450	103				
Denmark	20800	101				
Finland	16390	81				
France	19820	98				
Germany	19890	97				
Greece	11400	56				
Ireland	14550	73				
Italy	18610	92				
Netherlands	18080	93				
Portugal	12400	61				
Spain	14040	69				
Sweden	17850	88				
United Kingdom	18170	89				
EU Average[3]	17334	86				
Czech Republic	7910	44	46	51	53	58
Hungary	6310	31	36	36	48	48
Poland	5380	24	31	28	36	33

The World Bank numbers are taken from World Bank Atlas, 1996. The Eurostat numbers are taken from Eurostat, Statistics in Focus: Economy and Finance, 1996:4. Estimates of the share of the unofficial economy are taken from Kaufmann and Kaliberda, Integrating the Unofficial Economy into the dynamics of Post-Socialist Economies, Table A1 page 35. These estimates are 17 percent for the Czech Republic, 29 percent for Hungary and 19 percent for Poland. We adjust GDP for the unofficial economy by using the formula GDP=(1/(1-α))GDPR, where GDPR is reported GDP, and α is the share of the unofficial economy. In the EU, the unofficial economy is assumed to be 5 percent. Luxembourg is not included because of missing data.

very close to the World Bank figures. They show the Czech Republic as being slightly richer, and Poland slightly poorer, than the World Bank data.

Some observers argue that numbers such as these exaggerate the true income gap because of the greater importance of the unofficial economy in the formerly planned economies. To our knowledge there is no single study that provides estimates of the importance of the unofficial economy in both East and West, but we can nevertheless offer some rough estimates. Kaufmann and Kaliberda (1995) show estimates of the fraction of the unofficial economy in formerly planned economies. They in turn rely on several further studies[1] as well as time series statistics on electricity production to bring all of their estimates up to 1993. According to their estimates, the share of the unofficial economy in the Czech Republic is estimated to be 17 percent, while Poland is 19 percent, and Hungary at 29 percent. This means that the true GDP in the Czech Republic in 1993 was actually about 1.2 times as large as reported[2]. If we assume further that the unofficial economy in the EU is on average 5 percent, we arrive at the income ratios shown in the last two columns of Table 2 (note that some observers, however, put the unofficial economy in Western Europe at much higher levels, comparable to those in the East). The table shows that the actual ratio of Czech income to that of the EU average would then be 54 percent rather than the 47 percent reported in Table 2. Similarly, the income ratio for Hungary would be 50 percent and that for Poland 36 percent. However, even with these adjustments, it is clear that the income levels in Central Europe are still about half those of the European Union.

Recent cross-country evidence suggests that now that the CEEs have adopted market economies and open trade with Western Europe, they will experience a strong tendency towards economic convergence, i.e. towards growth rates consistently in excess of those of the EU, so that the income gap will tend to narrow over time. The tendency towards convergence has been shown to hold for economically integrated economies (i.e. those linked by trade and factor movements) in several recent

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[1] See footnote 25 in Kaufmann and Kaliberda. The estimates for Poland are from RCES and T Helleniak; those for Hungary are from A. Vertes, and those for the Czech Republic are from T Helleniak.

[2] This can be calculated by manipulating the equation $.17 = y^u/(y^u + y^r)$, where y^u is the unreported gdp and y^r is reported gdp.

studies, including the U.S. states (Barro and Sala-I-Martin, 1995), Japanese prefectures (Barro and Sala-I-Martin, 1995), the regions of Western Europe, the member countries of the Organization for Economic Cooperation and Development (OECD) (Dowrick and Nguyen, 1989), and the subset of the entire world economy composed of the open trading economies (Sachs and Warner, 1995).

The key economic issue facing the CEEs in the future will probably not be convergence *per se*, but rather the *speed* of convergence. If the CEEs grow only slightly faster than the EU, convergence will take several decades, a point made by earlier authors (e.g. Baldwin, 1994). To see this, suppose that per capita income in the EU grows on average at 1 percent per year. Suppose further that Poland income level today is 36 percent of average income in the EU. If Poland's per capita income increases at an average of 3 percent per year, then it would take nearly half a century, 46 years, for Poland to reach 90 percent of the average per capita income of the EU. On the other hand, if Poland manages to grow at 5 percent per capita per year, the period until Poland reaches 90 percent of EU per capita income would be cut in half, to 23 years. The key issue for Poland and the other CEEs therefore is to achieve high rates of economic growth in the coming decades.

To do this, the CEEs will have to do better in the coming years than the recent performance of the poorer European Union economies (hereafter PEUEs) -- Greece, Ireland, Portugal, and Spain. In Table 3, we show growth rates for these (and other) economies for the three most recent five-year periods: 1980-1985, 1985-1990 and 1990-1995. While Portugal, Ireland and Spain each grew rapidly in the last five years of the 1980s, only Ireland has achieved rapid growth in the 1990s. Greece has never achieved sustained rapid growth in the past 15 years, and Spain and Portugal grew very slowly in early 1980s and early 1990s. For the entire fifteen year period 1980-95, all four countries fell short of 5 percent per capita growth. Therefore, instead of being satisfied with the recent growth performance of the PEUEs, the CEEs should instead try to match the performance of the countries that have a proven record of rapid growth. We return to the list in Table 3 to identify the fast growing economies, and in the rest of this paper, we ask what actually distinguishes these economies from other economies.

Turning again to Table 3, we have listed all the countries in the world that grew faster than 4

Table 3. Growth Rates

COUNTRY	Average annual real per-capita GDP growth 1980-1985	1986-1990	1990-1995	Population	Reason for Exclusion
Part A: All countries with growth greater than 4 percent between 1986-1990					
KOREA, SOUTH	6.25	9.61	6.54	42380.0	none
SOLOMON IS.	-0.11	9.35	2.15 *	360.0*	not sustained
GRENADA	.	9.11	0.51 *	91.0	not sustained
TAIWAN	3.61	8.18	5.87	20101.0	none
PORTUGAL	-0.09	8.13	2.24	9883.0	not sustained
ST.KITTS&NEVIS	.	7.90	4.52 *	40.0*	size
THAILAND	2.39	7.81	7.12	55448.0	none
HONG KONG	3.81	7.04	4.51	5686.0	none
MAURITIUS	1.20	6.92	3.47 *	1063.0	not sustained
BELIZE	.	6.61	2.21 *	189.0*	not sustained
SINGAPORE	3.15	6.37	6.59	2648.0	none
YEMEN, N	4.08	6.00	.	10896.0	not a country
BULGARIA	.	5.87	-6.40	8868.0*	not sustained
BARBADOS	.	5.77	-3.37	254.0*	not sustained
MALTA	3.44	5.68	3.96 *	350.0	size
CYPRUS	3.93	5.25	3.04 *	695.0	size
IRELAND	1.21	5.03	4.18	3515.0	none
SOMALIA	-0.93	4.97	.	7566.0	war
SPAIN	0.14	4.93	1.21	38888.0	not sustained
CHILE	-3.74	4.64	5.44	12961.0	none
SEYCHELLES	-3.24	4.63	2.42 *	67.0	not sustained
MALAYSIA	1.50	4.54	6.32	17353.0	none
TANZANIA	-3.46	4.35	-1.39 *	27791.0*	not sustained
ETHIOPIA	-1.69	4.35	-2.31 *	51070.0*	not sustained
LUXEMBOURG	1.99	4.33	4.47	377.0	size
DJIBOUTI	.	4.28	-1.83 *	390.0*	not sustained
FIJI	-2.59	4.24	0.85 *	726.0	not sustained
TURKEY	1.41	4.06	0.76	54916.0	not sustained
JAPAN	3.08	4.02	0.93	123116.0	not sustained
Part B. Growth rates of other economies of interest					
CHINA					
Open coastal provinces	7.70	2.60	13.80		
Interior provinces	8.00	2.50	7.60		
ITALY	0.85	2.93	1.06	57541	
GREECE	0.97	1.71	0.63	10039	

The growth rates in the first two columns are from the purchasing-power-adjusted estimates of real GDP, from Penn World Tables, Summers and Heston (1991) version 5.6. The 1990-1995 growth rates are based on constant local price GDP data from the IMF's World Economic Outlook database or the World Bank's CDROM data disk, in which case the growth rates are for 1990-1994 (Source: World Data 1995, March 1996). The World Bank Data is indicated with an asterisk next to the number. The population data are either 1989 estimates from Penn World Tables, version 5.6, or as indicated by an asterisk, 1992 estimates from the 1994 World Almanac. Growth rates for China are from the regional data set developed by Jian, Sachs and Warner (forthcoming, 1996).

percent for the period 1985-1990, and then have included the growth in the two neighboring 5-year periods, 1980-1985 and 1990-1995. If we ask which countries grew faster than 4 percent per year for each of the two five-year periods 1985-1990 and 1990-1995, the list includes 10 countries: Korea, Taiwan, St. Kitts and Nevis, Thailand, Hong Kong, Singapore, Ireland, Chile, Malaysia and Luxembourg. If we lower the threshold to 3 percent growth, the list would also include Mauritius, Malta and Cyprus. St Kitts and Nevis, Malta, Cyprus and Luxembourg are quite small, with populations of less than a million, and therefore do not seem to be ideal models for the Central European countries. Therefore, our list of the very fastest growing countries (hereafter VFGEs) in the world in the past decade includes the remaining nine countries. These fast-growing economies share important characteristics of economic strategy which underlie their superior growth performance. They therefore highlight important policy directions for the CEEs as they aim to achieve very rapid growth in the coming decades.

This paper describes ways that the CEEs can speed their convergence with the EU by emulating the growth strategies of the very fast growing economies. In Section II, we discuss some of the sources of their superior growth performance. In Section III, we demonstrate the role of key policy variables in the context of cross-country growth equations. In Section IV, we examine how the CEEs can emulate key aspects of the economic policies of the VFGEs, in order to raise their growth in the coming years.

II. Sources of Growth in the VFGEs

We define the VFGEs as all middle-income developing countries with populations in 1989 of more than 1 million that achieved a per capita growth rate of 4 percent per annum or higher during the two periods 1985-90 and 1990-94. There are eight countries that meet this standard: Chile, Hong Kong, Malaysia, Mauritius, Singapore, South Korea, Taiwan, and Thailand. Ireland also meets this standard but we classify Ireland among the European Union economies rather than the developing economies. Of course, there is no universally accepted interpretation of the striking successes of the

VFGEs, and especially of the East Asian countries that form the bulk of the group, whose growth performance has been most studied and debated. Our own interpretations of the outstanding VFGE success is based on four clusters of factors.

The first cluster involves **allocative efficiency**, that is the efficiency with which resources are allocated among the various sectors of the economy at a point in time. In our interpretation, allocative efficiency is especially high in the VFGEs because these economies have relied mainly on market forces in the allocation of resources, and have kept government intervention to relatively low levels. These countries evidence a high degree of market competition, built upon a low degree of government intervention in the economy, a high degree of openness of the economy to international trade, flexibility of labor markets, and generally low levels of taxation, especially of labor income.

The second cluster involves the **promotion of high rates of saving and investment.** The VFGEs have achieved rates of saving and investment as a percent of GDP that are far in excess of the averages for other economies at similar income levels. These high saving and investment rates are the result of a combination of high rates of *government* saving and investment, high rates of *private* saving, and high rates of *foreign* direct investment (FDI) from abroad. In turn, the high private savings and FDI seem to be related mainly to a combination of demographic characteristics, national pension (retirement) policy, and overall fiscal and regulatory policies described below.

The third cluster involves **technological upgrading**, that is the ability of national economies to absorb new technologies from abroad and to adapt them in domestic production. None of the VFGEs is a major innovator in technology, but all have been effective in utilizing world-class technologies for purposes of upgrading domestic production. Technological efficiency seems to be achieved by a combination of attraction of foreign technologies (through foreign direct investment and licensing), infrastructure spending, and education policy.

The fourth cluster involves **favorable structural endowments** of the VFGEs, related to their resource base and geographical characteristics. The VFGEs enjoy some favorable structural conditions which have supported their high rates of growth. Fortunately, the CEEs share these key

characteristics. Both the VFGEs and the CEEs are relatively poor in natural resources; perhaps somewhat paradoxically, a scarcity of natural resources have been an advantage to economies seeking to establish export-led growth in manufactures. Also, the VFGEs are blessed with good access to international shipping. The CEEs, similarly, enjoy low transport costs to the markets of Western Europe.

We now turn to these four clusters of characteristics, to show in some detail the unusual characteristics of the VFGEs. In the next section, we then demonstrate that these characteristics are related to high rates of economic growth, in the context of cross-country econometric growth equations.

Allocative Efficiency

A convenient starting point for assessing the allocative efficiency of the VFGEs is the Index of Economic Freedom (henceforth IEF) first created by the Heritage Foundation in 1995, and updated in 1996 (see Johnson and Sheehey, 1996). The IEF aims to measure, on a consistent cross-country basis, the extent of market distortions in 140 economies. The index focusses on two main kinds of distortions: (1) market distortions caused by government intervention (e.g. through taxation, wage and price controls, trade barriers); and (2) the absence of well-defined property rights (e.g. through government corruption, arbitrary government confiscation of property, high levels of black market activity). The IEF is constructed from ten sub-indexes, measuring market distortions resulting from: protectionist trade policy; taxation; government consumption expenditure, monetary policy (inflation), restrictions on capital flows and foreign investment, restrictions on banking, wage and price controls, the absence of secure property rights, interventionist regulatory policy, and black market activity. For each category, a sub-index is created which runs from 1 (the lowest level of distortion) to 5 (the highest level of market distortion). The overall index is a simple arithmetic average of the 10 sub-indexes.

In Table 4, we present the sub-indexes and overall IEF for several sub-groups of countries. The first sub-group is the VFGEs, which is the focus of our immediate attention. The second sub-

Table 4. Data from the 1996 Index of Economic Freedom

	Trade	Taxation	Gov. Cons.	Mon. Policy	Foreign Inv.	Banking	Wage/ Prices	Property Rights	Regu-lation	Black Market
Very Fast Growing Economies	2.2	2.8	1.4	1.6	2.3	2.4	2.3	1.1	2.0	1.7
Slow Growing Economies	3.3	3.9	2.0	5.0	2.3	2.8	3.0	2.5	3.0	3.5
Rest of the Developing Economies	4.2	3.7	2.7	2.9	2.8	3.2	2.9	3.1	3.6	3.9
Poor European Union Economies	2.0	4.5	2.5	2.0	2.0	3.0	2.5	1.8	2.8	2.8
Other European Union Economies	2.1	4.5	2.6	1.1	2.1	2.2	2.2	1.3	2.6	1.0
Central European Economies	3.0	3.8	2.7	3.7	2.0	2.0	2.3	2.0	2.3	2.7

Trade: Based on average tariffs (ranges from 1 (<4%) to 5 (>20%)).
Taxation: Based on income and corporate taxes (from 1 (low) to 5).
Government Consumption: Based on ratio of government consumption to GDP (1 (<10%) 5 (>46 %)).
Monetary Policy: Based on average inflation rate (1 (<6% 5 (>30%)).
Foreign Investment: 1 (encourages foreign investment 5 (actively prevents foreign investment).
Banking: 1 (few restrictions) 4 (banks tightly controlled) 5 (financial institutions in chaos).
Wages/Prices: 1 (no wage/price controls) 5 (complete control).
Property Rights: Protection of property rights: 1 (very high) 5 (nonexistent).
Regulation: 1 (clear, uniformly applied, no corruption) 5 (unclear, randomly applied, bribes mandatory)
Black Market: 1 (black market is less than 10 % of GDP) 5 (>30%).

group is four prominent slow-growing economies (SGEs) among the middle income nations: Argentina, Brazil, Mexico, and Turkey. This group provides a useful contrast to the VFGEs among developing countries. Our third sub-group for comparison includes all developing countries other than the VFGEs (henceforth RDEs, signifying the *r*est of the *d*eveloping *e*conomies). The fourth comparator group is the four poorest European Union economies, the PEUEs. The fifth comparator group is the European Union. The sixth and final comparator group is the three CEEs themselves, the Czech Republic, Hungary, and Poland.

As we see from the Table, for almost all sub-categories vis-a-vis almost all comparator groups, the VFGEs display a relatively low level of market distortions. We can summarize these findings along three broad dimensions: openness to trade, size of government spending and taxation, and distortions of property rights caused by government intervention or lack of legal enforcement. First, we see that the VFGEs are much more open to trade than the average developing country (and about the same as the PEUEs, the post-1989 CEEs, and EUEs). Second, the VFGEs have small governments, as measured by tax rates, the level of government consumption as a percent of GDP, and the restrictive monetary policy (measured by the inflation rate over the past decade). Third, these economies have a low extent of regulation (e.g. the absence of price controls and the restriction of entry of new banks), combined with a strong enforcement of property rights, and the absence of black markets. The combination of low taxes, open trade, and relatively low levels of market regulation is, in fact, probably the main *cause* of the low level of black market activity, since black markets thrive precisely at points where governments distort market-based exchange, through regulations, taxation, or other restrictions on international and domestic trade.

The IEF offers us useful comparative summary measures of the main aspects of market distortions. To understand the particular policies of the VFGEs, however, it is important to look in more detail at the three main aspects of government intervention in the economy: restrictions on international trade, the size of government, the regulatory regime. A closer look supports the view that the VFGEs are characterized by small government and a strong reliance on market forces. It also helps

to allay suspicions that the IEF values are *ex post* market-based rationalizations of the superior growth performance of these countries. (This concern naturally arises from the fact that only the first four sub-indexes, for trade, taxation, government consumption, and monetary policy, are based on objective quantitative indicators, while the remaining six criteria are based on non-quantitative indicators and the judgments of the authors of the report).

The issue of trade policy has been examined in depth in Sachs and Warner (1995a). This earlier study demonstrated that protectionism was the rule, rather than the exception, among developing countries during the decades of the 1960s-1980s. Only a handful of developing countries bucked the general trend towards protectionism, by keeping markets open to world trade. For purposes of that study, openness was defined as the absence of strong protectionist policies in any of four dimensions of trade policy: tariffs; quotas and licensing; inconvertibility of the currency; and export taxation. If a country was protectionist in at least one of the four dimensions in a particular period, it was judged to be protectionist overall during the period in question. *The VFGEs are all characterized by a very early date of trade liberalization in the post-war era.* In fact, it is in the *duration* rather than the purity of open trade policies that these countries most stand out from their counterparts in the developing world. According to our earlier assessments, shown in Table 5, five of the eight VFGEs have always maintained open trade policies: Hong Kong, Malaysia, Mauritius, Singapore, and Thailand. The three others opened very early by the standards of the developing world: Taiwan in 1963, Korea in 1968, and Chile in 1976 (these dates signify the first year in which the country meets the threshold conditions for openness as defined in the paper). Today, after more than a decade of trade liberalization throughout the developing world, these countries no longer stand out as much as they used to on indicators such as average tariff rates (see Table 5 for examples).

The VFGEs are also notable, in comparison with most other countries, both developing and developed, in the limited size of the state in the economy, as measured by *government spending and taxation.* In Table 6, we show recent government expenditure ratios, and the division between consumption spending and investment spending, for the VFGEs and four other sub-groups: the SGEs,

Table 5. Global Economic Integration

	Year in which Economy first Integrated with the rest of the world[a]	Average tariff 1994[b]
Very Fast Growing Economies		
Chile	1976	11.0 (%)
Hong Kong	1960	0.0
Korea, south	1968	4.0
Malaysia	1963	9.0
Mauritius	1968	n.a.
Singapore	1965	0.4
Taiwan	1963	4.9
Thailand	1960	9.3
Slow Growing Economies		
Argentina	1991	10.0
Brazil	1991	14.0
Mexico	1986	11.0
Turkey	1989	5.0
Poor European Union Economies		
Greece	1959	3.6
Ireland	1966	3.6
Portugal	1960	3.6
Spain	1960	3.6
Central European Economies		
Czech Republic	1991	5.0
Poland	1990	14.0
Hungary	1990	13.0

Notes:

[a] This is based on the criteria for openness in Sachs and Warner (1995), "Economic Reform and the Process of Global Integration", Brookings Papers on Economic Activity, 1995:1, Brookings Institution: Washington, DC. For the Central European countries we use information from Transition Report 1995, EBRD.

[b] Average tariffs are taken from Johnson and Sheehy, 1996 Index of Economic Freedom.

Table 6. Level of Government Spending, and its Distribution Between Consumption and Investment

	Government Spending (percent of GDP, 1995)[1]			Production of State-owned Enterprises [2] (percent of GDP)
	Total	Consumption	Investment	
Very Fast Growing Economies				
Chile	20.8	24.0	4.1	12.9
Hong Kong	16.6	11.4	5.2	n.a.
Korea S.	20.3	11.6	8.7	10.3
Malaysia	30.6	14.1	16.5	17.0
Mauritius	23.8	20.0	3.8	1.8
Singapore	20.4	14.1	6.3	n.a.
Taiwan	25.7	22.5	3.2	6.2
Thailand	22.1	12.3	9.8	5.4
Slow Growing Economies				
Argentina	18.1	16.4	1.7	4.7
Brazil	37.5	37.0	0.5	8.6
Mexico	33.5	30.0	3.5	11.0
Turkey	26.3	24.7	1.6	9.1
Poor European Union Economies				
Greece	54.0	49.7	4.3	n.a.
Ireland	45.1	43.9	1.2	n.a.
Portugal	47.3	44.8	2.5	14.2
Spain	46.0	43.1	2.9	n.a.
Central European Economies				
Czech Republic	50.9	46.6	4.3	30.0 (1994)
Poland	49.4	47.3	2.1	40.0 (1994)
Hungary	54.6	53.0	1.5	40.0 (1994)

[1] Government spending data is taken either from the Government Finance Statistics Yearbook, IMF, or from the World Economic Outlook database at the IMF. The figures are for general government (federal and local) except for Argentina, Hong Kong, Korea and Singapore, where it is for the central government.

[2] For the Central European countries, source is Transition Report 1995, and numbers are for the latest available year. For other countries, the source is World Bank (1995) Bureaucrats in Business, Table A.1., the numbers are for 1985-91.

the PEUEs, the EU, and the CEEs. We see that the VFGEs have the lowest levels of government consumption spending and overall current government spending among these groups. The EU countries and the CEEs are on very high end, reflecting the extensive social welfare spending within Western Europe and Central Europe. The VFGEs also spend a greater share on investment rather than consumption.

In Table 7 we show a finer breakdown of the composition of government spending across countries. The data are reported by 13 expenditure categories, and follow the consistent methodology of the Government Finance Statistics of the IMF. The data are given for a selected list of countries where the data are available and cover the latest available year in the 1990's. The data show that much of the cross country variation in government spending comes from two spending items: social security and welfare (in which old-age pensions are an important sub-category) and interest payments on government debt. After taking out these items, the two VFGEs in this sample, Singapore and Malaysia, have spending ratios that are much more similar to the rest of the world. The table also shows that the spending ratios of the three central European countries are among the highest in the world, even *after* excluding social payments.

One crucial consequence of high levels of government expenditure as a percent of GDP is the distortionary effects of the taxes levied to pay for the government spending. The VFGEs greatly limit the distortionary effects of taxation by keeping overall government expenditure under control. To measure the extent of the tax distortions, it is important, though very difficult, to examine the incentive effects of the overall tax system, not just particular tax rates. To do this precisely, we would need to know the marginal tax rates for the entire range of taxes in the economy, and presumable for various income groups (which would tend to face different marginal tax rates). We would also need a model of tax incidence in order to assess the general-equilibrium effects of the tax system. As a much simpler and cruder expedient here, we calculate one measure of the burden of labor-income taxation, by calculating the tax wedge between the cost of labor to the enterprise and the real take-home pay of a worker of average income.

Table 7. General Government Spending, percent of GDP	Singapore 1993	Malaysia 1993	United States 1993	Mexico 1990	Brazil 1992	Spain 1992	France 1990	Greece 1993	Germany 1991	Holland 1994	Czech Rep. 1994	Hungary 1994	Poland 1994
1 general public services	2.10	2.71	2.02	0.95	4.50	1.15	3.65	3.44	3.92	4.34	3.88		
2 defense	5.04	3.24	3.38	0.78	0.87	1.62	2.89	4.81	2.00	1.74	2.53		
3 public order and safety	0.80	1.60	1.17	0.15	0.64	1.57	0.86	1.28	1.32	1.69	2.66		
4 education	5.04	5.59	5.81	4.60	1.21	2.03	4.98	4.59	3.60	5.55	5.63	6.00	4.90
5 health	1.22	1.57	5.45	0.63	1.74	2.87	7.45	4.01	7.25	6.61	7.29	6.80	4.50
6 social security and welfare	0.78	1.61	7.11	4.11	9.88	17.94	21.54	7.24	18.12	19.60	12.42	9.90	15.00
7 housing and community ame	1.42	1.52	0.69	0.20	0.17	0.23	2.56	0.69	2.13	4.61	3.72		
8 recr. relig. & cult. affairs	0.09	0.00	0.29	0.10	0.02	0.23	1.03	0.36	0.85	1.02	0.99		
9 subsidies to industry	0.08	1.60	0.56	2.14	0.69	0.76	0.51	0.00	1.40	0.68	2.70	4.40	2.00
12 transport and communicati	0.51	2.27	1.52	0.65	1.71	1.94	1.34	1.81	2.36	2.36	3.49		
13 other economic affairs	1.74	1.23	0.38	1.64	0.10	1.05	0.97	0.54	1.68	0.77	1.22		
14 interest payments	1.53	5.17	4.60	14.80	15.98	4.39	2.76	15.86	2.58	5.59	1.84		
15 other expenditures	0.00	2.53	-0.51	2.73	0.00	10.16	3.75	6.58	3.52	2.84	2.53		
Total	20.36	30.64	32.47	33.49	37.50	45.96	54.72	53.96	50.73	57.40	50.90	61.60	49.30
Total excluding 6	19.58	29.03	25.35	29.38	27.63	28.01	32.76	43.97	32.61	37.80	38.49	51.70	34.30
Total excluding 6 and 14	18.05	23.86	20.75	14.58	11.64	23.62	29.99	28.11	30.04	32.21	36.65		

Sources: International Monetary Fund, Government Finance Statistics Yearbook, 1995.
Barbone, L., and Hana Polackova, Public Finances and Economic Transition, World Bank, PRP No. 1585, March 1996. (for Hungary and Poland)
Line 14, Interest payments, are for the central government, and line 6, for Hungary and Poland, includes only pension payments.

In our calculation, the tax wedge has four components: the payroll tax paid by the firm; the payroll tax paid by the worker; the personal income tax; and the value added tax (which raises the price of goods to the final consumer). Suppose that the pre-tax price level is P, and the pre-tax wage level is W. The nominal take-home pay of workers is $W(1-\tau y)(1-\tau pw)$, where τy is the marginal rate of income taxation, and τpw is the payroll tax paid by the worker. Since P is the pre-tax price level, the consumer price level is $P(1+\tau v)$, where τv is the rate of consumer taxation (or VAT taxation). The real-take home pay is therefore given by $W(1-\tau y)(1-\tau pw)/P(1+\tau v)$. The cost of labor to the firm , deflated by the price level P, is $W(1+\tau pf)/P$, where τpf is the rate of payroll tax paid by the firm. Now, if taxes are such that the firm pays twice the wage that the worker actually receives, we say that the tax wedge is 100 percent, since the cost of labor to the firm is 100 percent above the real take home pay of the employee. Specifically, we define the tax wedge as 100*((cost-of-labor)/(real-take-home-pay)-1). We can see directly that this tax wedge is given by:

$$\tau w = [((1+\tau pf)(1+\tau v)/(1-\tau y)(1-\tau pw))-1]*100 \quad (6)$$

In the final column in Table 8, we show the calculation of the tax wedge for four subgroups of economies: the VFGEs, SGEs, PEUEs, and the EU-8. The VFGEs have, by far, the lowest tax wedges, suggesting the lowest levels of tax distortions in the labor market. *Note in particular that the VFGEs rely very little, if at all, on payroll taxation, in sharp distinction to the European economies (including the EUEs, the PEUEs, and the CEEs).* This low reliance on payroll taxation is mainly a consequence of the distinctive character of the pension systems in the VFGEs, a point to which we return later in our discussion of national saving rates.

The low rates of the labor tax wedge in the VFGEs have two main consequences. First, there is a powerful incentive to operate in the legal market rather than in the black market, since the gains to tax evasion are relatively small. We have already seen evidence that black market activity is relatively low in the VFGEs, at least as measured by the sub-index of the IEF. Second, there is the incentive for

Table 8. Tax Policy as of 1994

	Income Tax Rate of the Average Person[a]	Corporate Income Tax Rate[b]	Social Security Tax Rate[c]	Value Added Tax Rate[d]	Tax Wedge[e]
Very Fast Growing Economies					
Chile	5.0 (%)	35.0	9.0	18.0	35.7
Hong Kong	2.0	17.0	0.0	0.0	2.0
South Korea	9.0	35.0	8.0	10.0	31.4
Malaysia	10.0	40.0	23.0	10.0	53.8
Mauritius	n.a.	n.a.	9.0	n.a.	n.a.
Singapore	15.0	27.0	0.0	1.0[2]	18.8
Taiwan	6.0	25.0	6.0[3]	5.0	18.9
Thailand	5.0	30.0	5.0	7.0	18.4
Slow Growing Economies					
Argentina	21.0	40.0	46.0	18.0	130.4
Brazil	25.0	48.0	35.0	16.0	114.7
Mexico	17.0	34.0	20.0	10.0	59.8
Turkey	30.0	27.0	33.0	15.0	128.3
Poor European Union Economies					
Greece	5.0	40.0	36.0	18.0	74.8
Ireland	27.0	50.0	20.0	21.0	101.6
Portugal	16.0	40.0	38.0	16.0	96.2
Spain	25.0	35.0	38.0	15.0	114.6
Central European Economies					
Czech Republic	20.0	41.0	42.0	23.0[4]	128.5
Poland	21.0	40.0	48.0	22.0[5]	128.5
Hungary	35.0	36.0	61.0[6]	25.0	223.8

Notes:

[a] The marginal income tax rate of the tax bracket that contains the average per-capita GNP.

[b] Typically there is only one rate. If not, this is the maximum rate.

[c] Sum of employer's and employee's payroll tax rates to fund benefits such as unemployment, health care, occupational insurance, and pensions.

[d] The reported rate is the rate that covers most goods and services. Some countries have special rates for luxuries and imports. In countries without value added taxes, this is the sales tax rate.

[e] Cost of labor to the firm as a percentage of real take home pay of the average wage worker:
= 100*(((1+sstf)(1+vat)/(1-inctax)(1-sstw)-1)

[1] Approximate employer contribution rate for disability insurance for low-wage employees.

[2] Does not include 4% tax on food and beverages.

[3] Does not include additional occupational risk insurance required in special industries.

[4] VAT on food and energy is 5%.

[5] VAT on food, construction and some pharmaceuticals is 7%.

[6] Includes employer contributions to the social security fund (44%), unemployment fund (7%), and vocational fund (1.5%) and employee contribution to the social security fund (10%).

Source: 1995 International Tax Summaries, Coopers and Lybrand.

high rates of labor market participation, assuming realistically that the elasticity of labor participation with respect to the post-tax wage is positive. In the other countries, by contrast, the high tax wedges will discourage labor-market participation, through a variety of channels: more frequent spells of unemployment, reductions of average hours at work per month, temporary withdrawals from the labor force, and early permanent retirement. It is surely no accident that unemployment rates in the VFGEs are negligible, while they often stand at double-digit rates in the SGEs and the EU economies. Similarly, average working hours per month are much higher in the VFGEs than in the SGEs, though per capita income levels are comparable.

The IEF underscores not only the relative openness and small size of government in the VFGEs, but also the relative security of property rights, the operation of the rule of law, and the low levels of market distortions through government regulations and wage and price controls. These dimensions of government policy are difficult to measure, so the rankings of the IEF should be viewed as provisional only. Nonetheless, we can find independent supporting evidence on each dimension.

One good indicator of weak property rights is the propensity of governments to confiscate private property, perhaps most visibly in the form of nationalizations of enterprises. During 1960-1980, U.S. foreign investors experienced a total of 327 instances of nationalizations in a total of 67 developing countries. *While most developing countries engaged in at least some nationalizations, there was, remarkably, not one single instance of nationalizations in seven of the eight VFGEs: Hong Kong, Korea, Malaysia, Mauritius, Singapore, Taiwan, and Thailand.* Only Chile among the VFGEs undertook any nationalizations, and most of these nationalization were concentrated in the Allende Regime, 1970-1973. There were no nationalizations after the Pinochet coup of 1973. Interestingly, virtually every developing country that engaged in nationalizations in the period 1960-80 ended up in severe macroeconomic crises in the 1980s, usually crises of very high inflation and non-payments on foreign debts. The linkage between nationalizations and subsequent macroeconomic crises is not direct, but both phenomena are probably symptoms of "overactive" governments that attempted to implement state-led industrialization policies, and ended up in financial bankruptcy as a result.

As for further evidence on the rule of law, we can draw upon an index of the Rule of Law (ROL) used by Knack and Keefer (1995), and by Barro (1995). The ROL is an index based on survey data to measure the extent "to which the citizens of country are willing to accept the established institutions to make and implement laws and adjudicate disputes." Higher values of the index signify "sound political institutions, a strong court system, and provisions for an orderly succession of power." Lower values mean that there is a "tradition of depending on physical force or illegal means to settle claims." The range is 0-6. The variable is for the year 1982. The VFGEs indeed show a much higher value of ROL than the average for the rest of the developing countries, 4.7 compared with 1.8. On average, the VFGEs are at about the same level as the PEUEs, which have an average value of 4.8, and slightly below the EU average of 5.6. We will use the ROL index in our cross-country regression estimates in the next section.

Finally, we turn to market distortions caused by government regulations and wage and price controls. One area of particular importance is labor-market regulation. While most of the VFGEs have active trade union sectors, the framework of labor law in these countries is very market oriented, with few government-imposed standards on the freedom of hire and fire, prior notification of layoffs, severance payments, and minimum wage. Wage negotiations take place at the enterprise level, rather than at the industry or regional level as in more corporatist settings. The terms of the contractual labor relationship is left mainly to enterprises and workers themselves. In Hong Kong, for example, firms have the freedom under law to lay off workers with only one week's notice (or subject to the terms of collective bargaining agreements freely negotiated between the enterprise and unions). Similar freedom to adjust the labor force is found in the labor legislation governing Malaysia, Singapore, and Thailand.

As an illuminating contrast, consider Spain's labor laws. The labor legislation puts enormous obstacles in the way of enterprise layoff decisions (see IMF, 1995a). As a general principle, workers kept beyond a short trial period (2-6 months) are considered permanent, and are thereafter entitled to

generous severance payments and judicial appeals in the event of layoffs.[3] Collective dismissals required government approval via an Employment Regulation Procedure (ERP) with the Ministry of Labor. As the IMF notes (p. 45): "Businessmen and economists who study the Spanish labor market are virtually unanimous in the opinion that these high dismissal costs act as a major deterrent to the creation of permanent jobs, and thus have been a contributing factor to the high Spanish unemployment." Recent labor law reforms have somewhat reduced the burdens of these regulations. Labor legislation, in addition, has "maintained tight controls on geographical mobility, the length of the working day, number of permissible overtime hours, minimum vacation time, and other features of the employment relationship." (p. 30)

Many other developing countries, such as the slow-growing Latin American countries, have maintained similar restrictions on hiring, firing, and working conditions. Argentina has had long mandatory notification periods for layoffs, as well as collective bargaining agreements backed by labor legislation which has given enormous power to union members vis-a-vis the unemployed and new entrants to the labor force. For example, Argentina's 1975 labor legislation enshrined the principle of "ultra-actividad," according to which a collective agreement remained in force even after expiration, until a new agreement was reached between the unions and the employers, thereby giving enormous power to the unions in negotiation. (For further details, see IMF, 1995b, p. 49).

The overall image of the VFGEs as open economies, with small government sectors, and with a very light degree of government regulation, may surprise some readers. One popular interpretation of the East Asian experience is that strong, autonomous "developmental states" have led the industrialization process through detailed industrial policies and strong government intervention. Amsden (1994) has argued, for example, that the East Asian economies have deliberately "gotten the prices wrong" as part of a government-led industrial policy that has worked against market forces.

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[3]In Spain in 1994, the average severance payment was for approximately 50 weeks of work, or about 260 days (IMF, 1995a, p. 13a). In Malaysia, by contrast, the severance payment by law is 10 days for each year of employment for total employment under 2 years; 15 days for each year of employment for total employment between 2 and 5 years; and 20 days for each year of employment for total employment above 5 years.

Wade (1992) has made a similar, widely noted analysis in the cases of Korea, Taiwan, and Hong Kong. These authors are correct that most of East Asia has not abided by textbook laissez faire policies (though Hong Kong comes rather close, and Singapore, like Hong Kong, has almost completely free international trade). But these authors compare East Asia with pure textbook *laissez faire*, instead of with the rest of the developing world. On an international comparative standard, the East Asian economies stand out as highly market oriented, with a long period of relatively free trade, low levels of government spending relative to GDP, and limited distortions from government regulations. Moreover, the view of East Asia as strongly influenced by industrial policies was arguably correct for Japan until the mid-1960s and for Korea until around 1979, but it is much less true for these countries in recent years. Moreover, it has never been particularly true for Taiwan since the early 1960s, and is even less true for the very fast growing Southeast Asian countries during their entire rapid growth era from the mid-1960s. All of these other countries have had consistently smaller roles for industrial policy than in Japan and Korea. Moreover, as we shall note later on, there is little evidence in the cases of Korea and Japan that the industrial policies contributed to accelerated economic growth.

The promotion of high national saving and investment rates

One of the distinguishing characteristics of the VFGEs is the very high rates of national saving and investment achieved in these economies, as shown in Tables 9 and 10. Many studies have demonstrated that countries with higher rates of saving and investment achieve higher rates of overall growth, so the high rates of saving and investment surely merit our careful attention. We surmise that the overall macroeconomic stability, moderate tax rates, and rule of law, in the VFGEs, all contribute to the high rates of saving and investment. But equally important, in our view, are other channels through which *fiscal policy* promotes high rates of saving and investment in these economies.

Most importantly, the VFGEs tend to achieve high rates of government saving, i.e. an excess of current government revenues over current government expenditures, as we show in Table 10. This government saving is used partly to achieve an overall budget surplus, and partly to finance a relatively

Table 9. Rates of Growth, Savings, and Investment

	Growth of real GDP per person [1] 1985-94	Growth of real GDP per economically-active pop.[2] 1985-92	Savings as a share of GDP[3] 1995	Investment as a share of GDP[4] 1995	Real GDP per person (PPP adjusted 1994 dollars)[5] 1994
Very Fast Growing Economies					
Chile	5.1 (%)	4.8	25.9	24.9 (%)	3467
Hong Kong	6.4	6.4	n.a.	28.8	10599
South Korea	9.2	8.3	35.8	33.5	4217
Malaysia	5.1 [3]	4.8	33.7	27.9	4146
Mauritius	5.7	5.5	24.8	27.8	4226
Singapore	5.7	5.7	42.3	33.1	8616
Taiwan	7.7	7.3	32.1	22.6	5449
Thailand	7.4	5.9	28.8	33.8	2463
Slow Growing Economies					
Argentina	2.1	2.3	19.1	16.6	5324
Brazil	-0.5	-1.1	24.0	21.0	4017
Mexico	1.6	0.3	19.7	21.1	5621
Turkey	3.1	2.4	21.5	23.2	3077
Poor European Union Economies[7]					
Greece	1.4	1.0	15.2	19.2	6224
Ireland	4.1	4.1	20.7	17.6	7275
Portugal	8.1	8.6	20.4	28.5	5070
Spain	3.8	3.3	21.0	23.3	7526
Central European Economies[6]					
Czech Republic	2.4	n.a.	21.2	30.4	5880
Poland	6.0	5.0	18.8	16.9	3826
Hungary	2.5	2.1	17.1	21.3	4645

Notes:

[1] Average annual growth in real gross domestic product per person for the period 1985-1992, unless otherwise specified. The source is the real GDP data (adjusted for purchasing power) in version 5.6 of the Penn World Tables, which is an update of the data in Summers and Heston (1991).

[2] The economically-active population is defined as the population between ages 15 and 64. The figures in column 2 equal those in column 1 minus the average annual growth in the ratio of the economically active population to total population, between the years 1985 and 1990. The demographic data is from World Tables, 1994, data diskette.

[3] Defined as (GDP-C-G)/GDP. Source is the data assembled for the 1995 World Economic Outlook, International Monetary Fund.

[4] Ratio of nominal gross fixed capital formation to nominal gross domestic product. Source is the data assembled for the 1995 World Economic Outlook, International Monetary Fund.

[5] From Penn World Tables, version 5.6 (See Summers and Heston, 1991). The figures for the Central European countries are estimates based on Summers and Heston data and data from the World Development Report, various issues.

[6] For the Central European countries, growth rates are taken from Transition Report 1995, European Bank for Reconstruction and Development, annex 1.1 and table 3.1, pages 185 and 68. Population growth is taken from the Penn World Tables, version 5.6.

[7] The growth data are taken from OECD Economic Outlook, June 1995. Growth in labor force participation rates is from p. A22; GDP growth is from p. A4.

Table 10. Government Saving and Private Saving

	National Saving (% of GDP) 1995	Government Saving (% of GDP) 1995	Private Saving (% of GDP) 1995
Very Fast Growing Economies			
Chile	28.2 (%)	6.9 (%)	21.3
Hong Kong	33.9	5.3	28.5
Korea S.	36.1	9.2	26.9
Malaysia	32.4	13.0	19.4
Mauritius	24.8	3.9	20.9
Singapore	49.4	19.1	30.3
Taiwan	28.1	2.7	25.4
Thailand	33.1	12.3	20.7
Slow Growing Economies			
Argentina	17.6	0.3	17.3
Brazil	19.1	-0.6	19.7
Mexico	16.9	5.2	11.7
Turkey	23.8	-2.7	26.5
Poor European Union Economies			
Greece	20.6	-5.9	26.5
Ireland	21.7	-0.5	22.1
Portugal	24.4	-1.6	26.0
Spain	22.2	-1.8	24.1
Central European Economies			
Czech Republic	21.2	6.2[a]	15.0
Poland	18.8	-0.6	19.4
Hungary	17.1	-2.1	19.2

Notes:
National saving is defined as (GDP-C-G)/GDP, government saving is government revenue minus *current* government expenditure, and private saving is the national saving minus government saving. The source is the data assembled for the 1995 World Economic Outlook, International Monetary Fund.

high rate of public investment spending as a proportion of GDP. Since national saving is the sum of public saving plus private saving, the high public saving rate contributes to a high overall national saving rate, unless the high government saving "crowds out" an equal rate of private saving. While it is theoretically possible that lower private saving would offset high public saving on a one-for-one basis, extensive cross-country evidence suggests that such a tradeoff between public and private saving, when it exists, is much less than one for one. (For recent international evidence, see Edwards, 1995, and our estimates in Table 13).

The high rates of government saving are associated with high rates of government investment spending. While the VFGEs restrict their *current* spending as a percentage of GDP, they certainly engage in considerable infrastructure investment in energy, communications, and transport, often in support of international trade activities. The relatively high rates of government investment were shown in Table 6.

Another important contribution of fiscal policy in the VFGEs is to raise *private* saving rates via the organization of the national retirement system. While the European economies tend to rely on pay-as-you-go (PAYG) pension systems, with nearly universal coverage, most of the VFGEs have either small state-run pension systems, e.g. covering only government employees, or state-regulated systems that depend on *individualized savings plans* rather than PAYG financing. The most important distinction between various retirement systems is the link between an individual's saving for retirement and the individual's eventual benefits at the time of retirement. In the PAYG systems, retirement benefits tend to be only loosely related to an individual's preceding payroll tax payments. In individualized systems, by contrast, an individual's retirement benefits depend directly on the accumulation of the individual's own personal savings.

A comparison of old-age pension data is shown in Table 11. We present three different indicators. In the first column we see that the VFGEs have a lower proportion of elderly people than the economies in western and central Europe. Partly as a result of this, we see in the second column that pension spending tends to be a low share of GDP in the VFGEs. But the fast-growing countries

Table 11. Pensions

	Elderly Population divided by working-age Population [1]	Public Pension Spending divided by GDP [2]	State-provided pension benefits as a share of per-capita GDP [3]
Very Fast Growing Economies			
Chile	9.3 (%)	5.7 (%)	0.0 (%)
Hong Kong	12.7	n.a.	8.0
South Korea	7.1	n.a.	40.0
Malaysia	6.3	1.6	0.0
Mauritius	8.2	2.6	n.a.
Singapore	7.8	2.2	0.0
Taiwan	9.3	n.a.	20.0
Thailand	6.0	n.a.	10.0
Slow Growing Economies			
Argentina	14.8	4.6	70.0
Brazil	7.2	2.9	70.0
Mexico	6.3	1.0	80.0
Turkey	7.0	2.4	80.0
Poor European Union Economies			
Greece	21.2	12.3	80.0
Ireland	18.4	6.1	68.0
Portugal	19.5	7.7	60.0
Spain	19.8	7.5	90.0
Central European Economies			
Czech Republic	18.2	8.2	66.0
Poland	15.4	12.4	n.a.
Hungary	20.2	9.7	75.0

[1] For 1990. Source is table A.1, page 343, in Averting the Old Age Crisis, World Bank (1994).
[2] Source is table A.5. in the same publication, page 358. The years range from 1985 to 1992.
[3] These are the authors estimates based on data in *Social Security Programs Throughout the World, 1995*, U.S. Social Security Administration. We estimate how much annual income an average person can expect to receive from the various state-provided pensions, without any saving effort of his own, and divide by per-capita GDP (for 1995). Calculations are based on the main pension system in operation between 1990-1995. The figures are reported in percent, so a value of 100 means that the estimated value of the state-provided pension benefits was equal to per-capita GDP.

also have an important difference in pension policy from other countries. Chile, Malaysia, and Singapore, have instituted a retirement system based on individualized savings accounts. Another four countries, Hong Kong, Korea, Taiwan, and Mauritius, have pay-as-you-go systems, but with very low rates of taxation and benefits. Korea's system began only in the 1990s. Thailand still does not have a state-run system, either pay-as-you-go or individualized, though a pay-as-you-go system is scheduled to be introduced in 1996. By contrast, all of the European economies shown in the table operate on a pay-as-you-go system, with much higher rates of taxation and benefits.

To compare pension policy across countries on a common yardstick, we report in the third column of Table 11 our own estimates of the annual value of the state-provided pension benefits as a percentage of each country's average per-capita GDP. For each country, we calculate what a person with the average retirement age and average life expectancy can expect to receive from the state pension system during each year of retirement, *without drawing on any personal savings*. In provident fund systems where all retirement income comes from the cumulation of previous private saving, this figure is of course 0. In pension systems that give the worker a lump sum at retirement, we divide this lump sum by the likely duration of retirement, to estimate annual benefits, and then divide this by per-capita GDP. In pension systems which offer the retiree a fixed fraction of his income during his latest working years, we assume that the average worker can qualify for the pension and often use this fraction directly (this is reasonable because the conditions are usually easy to satisfy). For example, in Brazil, a pensioner can receive 70 percent of average annual earnings in the last 36 months of his working life, plus 1 percent of average earnings for each year of contribution, up to a maximum of 100 percent of average earnings. So for Brazil we have estimated the value of the state pension benefits to be 70 percent of average per-capita income. This may be an underestimate because many pensioners probably receive closer to the maximum of 100 percent, but we also wanted to take into account the fact that the pension system covers less than 100 percent of the workforce. Although these estimates are certainly quite rough, the cross-country differences in national pension polices along this dimension are also quite large, so that this indicator is nevertheless informative about an important basic

difference in pension policy. We see in Table 11 that the fast growing economies tend to have much lower values on this variable than the rest of the countries.

The pay-as-you-go systems prevalent in Europe, and in the advanced industrial economies more generally, have several features which tend to lower national saving rates. Modern fiscal theory, especially as pioneered by Feldstein (1974) and Auerbach and Kotlikoff (1987), teaches that pay-as-you-go pension benefits reduce national savings in several ways. In general, the benefits are paid for by taxing the younger workers and transferring the taxes to the retirees. The pay-as-you-go financing therefore involves a transfer of income from young workers, who tend to have moderate propensities to consume (given a long life-cycle time horizon ahead), to older retirees, who tend to have much higher marginal propensities to consume (given a short life-cycle time horizon ahead). Even when retirement benefits are merely promised for the future, and therefore do not involve any *current* fiscal spending or taxation, the mere promise of future retirement income will tend to reduce the saving of the working-age population, as they anticipate the state provision of their retirement income.

Since the PAYG systems offer benefits essentially unrelated to contributions (or related to contributions with linkages that are highly complex and therefore not clearly evident to the worker/taxpayer), there are intense and recurrent political pressures to *increase* the retirement benefits for the current retirees, who typically form a powerful interest group. During the 1970s and 1980s, such pressures in the U.S. and Europe led to large transfers of income to the elderly from the current workers and, implicitly, from the yet-unborn generations. In the 1990s, the same phenomenon occurred in most of the post-communist economies of Central and Eastern Europe.

Even if a political equilibrium is eventually reached, in which current benefits are exactly financed with current payroll taxes, without further increases in benefits relative to GDP, a long-standing pay-as-you-go system leaves a **permanent negative legacy** on national savings. Each worker pays taxes when young (to be transferred the current elderly), and later receives benefits when old (paid out of taxes of the future young generation). But the present value of the taxes paid will be greater than the present value of the benefits received, so that the worker would be better off saving on

his or her own account. If the government allows the younger workers to opt out of the pay-as-you-go system, as we recommend below, the government will still be stuck with a large stock of debt, reflecting the promises that have already been made to current retirees, and to current workers who have been contributing payroll taxes in anticipation of state retirement benefits. This stock of debt permanently lowers national saving rates (unless, of course, it is later reduced through a period of budget surpluses), and thus reflects a *lasting adverse legacy* of the pay-as-you-go system.

Nonetheless, there are still good reasons to shift partly or fully from the current arrangements to a national system based on individualized savings accounts. There are two main reasons to make the shift. The first is political. If benefits are linked directly to individual contributions, there will be less electoral pressure and indeed fewer institutional mechanisms to raise benefits for current retirees at the expense of future generations. The second is strictly economic. Under pay-as-you-go systems, workers tend to receive their state-mandated pensions largely irrespective of their own payroll tax payments, or at least so it seems to the individual worker.[2] The worker therefore views his or her payroll "contributions" as taxes on labor income, rather than as saving towards future retirement. The payroll taxes thereby tend to discourage work effort and labor force participation, and to encourage black market activity, as we discussed earlier. In an individualized saving system, the same payments are viewed as contributions by the individual to his or her own savings account, and so do not act as taxes on labor effort.

There is another aspect of the Malaysian, Singaporean and Taiwanese systems, that might be a spur to additional household savings. In all three cases, households receive a *lump-sum payment* upon retirement, rather than a flow of benefits throughout the remaining lifetime. As Kotlikoff (1995) explains, the lump-sum payment typically can not be converted, at actuarial value, into an annuity, because of the thinness of annuity markets.[4] Therefore, households in these three countries have the incentive to engage in *precautionary savings* in old age, in order to protect against large medical expenses or survival well beyond life expectancy. These older households are then subject to leaving

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[4]In turn, this thinness is the result of adverse selection problems in annuity markets.

unexpected bequests at the time of death, which in turn raises the overall saving rate.

In summary, a pay-as-you-go system has three serious defects. In steady state, it reduces national saving rates. Outside of the steady state, as in the past two decades, it stokes political pressures to *increase* transfers from young to old, further reducing national saving rates. And by relying on payroll taxation, it tends to discourage work effort and to encourage black-market activity.

In support of the negative linkage from pension policy to private saving rates, we report savings regressions for the early 1990s in Table 12. The explanatory variables in the saving regression are our pension policy indicator, the dependency ratio, the government saving rate, the level of income and GDP growth rate. We find, somewhat surprisingly, that neither the growth rate nor the level of income is significantly related to savings. In the regression in column (2), we drop these variables and re-estimate the regression. We find that higher state-provided pensions are associated with lower national saving, that higher dependency rates are associated with lower national savings, and that higher government saving rates tend to raise national savings, but by less than one-for-one. Edwards (1995) also finds that countries with high levels of government pension spending -- generally the countries with extensive PAYG systems -- have lower rates of private savings than countries with lower levels of government pension expenditures.

Technological Improvements

The very rapid growth of the VFGEs resulted mainly from rapid factor accumulation and allocative efficiency, rather than from technological innovation. In addition, most of the VFGEs achieved sustained increases in total factor productivity, but as stressed by Young (1995) in the case of the East Asian economies, the productivity growth played a smaller role than factor accumulation in the outstanding performance of these economies. Of course, factor accumulation without allocative efficiency would not prove sustainable (as is shown by the collapse of the communist economies), since rapid production would not be geared towards market demand. For example, the Soviets invested heavily in steel production, and indeed achieved rapid growth in steel output, but in the end, the steel

Table 12. Two-stage least squares estimates of the effect of pension indicators on cross-country savings and growth.

Part 1. Saving Regressions. Dependent Variable: Savings ratio in 1995

	(1)	(2)
Pension	-0.091	-0.096
	(-2.780)	(-3.163)
Dependency Ratio	-12.50	-17.58
	(-1.17)	(-2.55)
Government Saving	0.53	0.65
	(2.71)	(3.98)
Log real GDP 1989	0.65	-
	(0.42)	
Growth 1990-1995	0.51	-
	(1.03)	
R^2	0.63	0.62
N	41	41

Part 2. Growth Regressions. Dependent variable: Growth per capita 1990-1995

	(Least Squares)	(Instrumental Variables)
Log real GDP in 1989	-0.95	-0.86
	(-2.58)	(-2.20)
Savings ratio 1995	0.16	0.21
	(4.37)	(4.12)
Labor market efficiency index	1.72	1.36
	(2.91)	(2.06)
R^2	0.53	0.48
N	43	40

Note: The instruments for the saving variable in the growth regressions are the pension indicator, the dependency ratio and the government saving rate.

industry came crashing down since its output dramatically outstripped real market needs. Therefore, it is the *combination* of allocative efficiency together with high saving and investment rates that are the hallmarks of the VFGE's success.

Many observers have argued that government-led industrial policies in East Asia ("picking winners" through selective protectionism and selective subsidies) gave a special boost to productivity growth. As a economy-wide proposition, this is doubtful for any of the VFGEs. As we noted earlier, only Korea among the VFGEs undertook extensive industrial policies, and then only in the 1960s and 1970s. By the early 1980s, the Korean government had pulled back from its most interventionist policies (especially directed credits to industry and high trade protection for targeted industries), after its so-called Heavy and Chemical Industry (HCI) Drive during 1973-79 had helped to bring on macroeconomic instability. The other VFGE governments played a much smaller role than the Korean government in direct industrial promotion.

Moreover, the results of Korea's interventions were decidedly mixed. Detailed industry analysis does not reveal positive effects of government interventions on productivity growth (Lee, 1995). In particular, sectoral trade protectionism was consistently correlated with *slower* productivity growth in the sector, while tax incentives led to faster capital accumulation in the sector but not faster productivity growth. Thus, there is little evidence that the capital accumulation thereby promoted actually increased the overall productivity of the economy. These findings are consistent with the detailed case studies in Perkins, Stern, et. al. (1995), which showed that Korean industrial planning involved a mix of successes and failures, not the unvarnished successes sometimes imagined. Similar negative findings regarding Japan's industrial policies have been found by Weinstein, 1995. Direct comparisons of nearly *laissez faire* Hong Kong with more interventionist Singapore, have come down on the side of Hong Kong (Young, 1993).

Nonetheless, the VFGEs all shared certain policies to promote productivity improvements in the economy. They have all invested in expanded public education, first to promote universal literacy, and then secondary and tertiary education. They all promoted the inflow of technology from abroad,

either through foreign direct investments or through licensing of foreign technologies (the latter especially in the case of Korea, which tended to shun foreign direct investment until the mid-1980s). Third, almost all of the countries experimented with special economic zones to encourage new export-oriented industrial, as well as science parks for high-tech industries in some of the East Asian countries. These zones are supported by favorable tax treatment, and government provision of certain infrastructrual support (such as land, energy, communications, warehousing, expedited customs processing, and support for improved transport linkages to nearby airports and seaports).

Favorable Structural Conditions

The VFGEs also have some natural advantages that have enabled them to pursue rapid export-led growth. They are all coastal economies, with natural seaports that could be equipped with modern container port facilities. We shall see below that during the period 1970-1990, landlocked countries tended to grow more slowly than coastal economies, after controlling for other policy and structural characteristics. Second, the VFGEs, on the whole, were labor-abundant economies and relatively scarce in natural resources (Chile and Malaysia are the two exceptions in this regard). The abundance of labor meant low initial wages and the ability to compete internationally on the basis of labor-intensive manufactures. These labor-intensive manufactures, such as footwear, apparel, textiles, and electronics assembly operations, provided the starting point for export-led industrialization in all of the VFGEs except for Chile. By contrast, Chile's recent export-led growth has come mainly in agriculture and resource-based industries. We shall note below that resource-poor economies have tended to grow more rapidly than resource-rich economies in the past twenty-five years (see Sachs and Warner, 1995b, for details).

III. Economic Growth and Economic Convergence

In this section, we turn to a more formal econometric analysis of cross-country growth, to measure the contributions to growth of the various policy and structural variables that we have

discussed up to this point. We follow the widely used specification of Barro (1991), which describes country I's growth rate during a particular interval as a function of the initial level of income of country I, and other policy and structural variables[5]. Let Gi be the growth rate between year 0 and year t, measured as (1/t)dln(Yit/Yi0), where Yit is the level of per capita income in purchasing power parity terms in year t. Yi0, therefore, is the per capita income in the initial year. We write yi0 = ln(Yi0). We then write:

(1) $$g^i = \beta_0 + \beta_1 Z^i + \beta_2 Y_0^i$$

According to this specification, the per capita income growth of country I depends on a vector of structural and policy characteristics of the country, Zi, and on the country's initial log level of per capita income, yi0. As long as β_2 is negative, an initially poorer country will tend to grow faster than an initially richer country, all other things being equal. Therefore, a negative and statistically significant value of β_2 indicates *conditional convergence*, conditional in the sense that we hold constant the policy and structural characteristics in the Z vector.

We adopt a specification that makes growth depend on initial income and four structural variables: (1) the Index of Economic Freedom, modified to exclude the sub-index for trade policy (which is taken into account with SOPEN), to measure the overall extent of market distortions in the economy; (2) the degree of openness of the economy, using the measure SOPEN introduced in Sachs and Warner (1995a); (3) the dependence of the country on natural resource exports, SXP, as measured in Sachs and Warner (1995b); and (4) an Index of Market access, to measure the physical access of the country to sea-based international merchandise trade.

The definitions of the variables are as follows. The IEF has been introduced earlier, and is described in detail in Heritage Foundation (1996). There are two problems with using the IEF in the cross-country regression equations. First, the IEF is calculated as of 1995, and is not available for the period of the regression estimates. Some of the sub-indexes reflect long-term characteristics of the

[5] This specification is discussed in more detail in the technical appendix.

economies, or are averages for many years (e.g. inflation is measured for the interval 1985-93), but others reflect current characteristics that did not prevail during the 1970s and 1980s. Therefore, the IEF is measured with error, and if the error is random, contributions of market distortions to slower growth will be *understated* by the regression estimates. Second, some of the sub-indexes of the IEF measure public goods (e.g rule of law) that economies with 20 years of rapid growth may be more likely to pursue. This means that there may be causality running from growth to the IEF index, and this will lead us to *overstate* the impact of changes in the IEF impact on growth. Since these two biases go in the opposite direction, it is unclear if the net effect is to overstate or understate the relation between the IEF and growth.

The SOPEN variable is from Sachs and Warner, 1995a, and measures the proportion of years between 1970 and 1989 that the country is open to trade (i.e. number of years of open trade divided by 20). Openness is measured by four dimensions of trade policy: tariffs, quotas and licensing, export taxes, and black market premia. A country is deemed to be open if it is sufficiently open on all four aspects of trade policy. Tariffs must be less than 40 percent on average; quotas and licensing must cover 40 percent or less of total imports; export taxes must be moderate (see Sachs and Warner, 1995, for more details); and the black market premium over the official exchange should average less than 20 percent.

The natural resource dependence variable, SXP, is taken from Sachs and Warner, 1995b. It measures the share of primary exports in GDP in 1971. It is calculated from the World Tables 1993 data diskette. Both the numerator (primary exports) and the denominator (GDP) are measured in nominal dollars. The dollar GDP data in World Tables uses a smoothed exchange rate to convert local currency GDP to dollar GDP. Primary exports are the sum of the categories "non-fuel primary products" and "fuels." Non-fuel primary products cover SITC categories 0, 1, 2, 4, and 68. Fuels cover SITC category 3. These categories are from revision 1 of the SITC.

The fifth variable is an Index of Market Access (access). As international trade is one of the key engines of economic growth (through its effects on the diffusion of knowledge, the size of the

market, domestic competition, and so forth), countries *physically* cut off from international trade are likely to suffer lower rates of economic growth, all other things equal. Since shipping by sea plays the overwhelming role in international merchandise trade, we focus on measuring each country's physical access to international shipping. Countries that are landlocked, or are for other reasons are without sea ports, have a much higher cost of integration in the world market economy than coastal economies with sea ports.

Our index of physical access gives countries a value of 1 if it is completely landlocked, and if it lacks river-access to sea ports in other countries. Countries with container ports are given a value of 0. Countries that are landlocked but have some river-access to sea ports in other countries (e.g. Switzerland, linked to the North Sea port at Rotterdam by the Rhine River port at Basel) are given a value greater than 0 and less than 1, depending upon the navigability of the riverway. Similarly, countries with coastlines but without container ports (which may occur, for example, because of poor natural conditions of the coastline), are given a value of 0.1, signifying *almost* full access, but not full access. The access variable is expected to enter the regression estimates with a negative sign, signifying that landlocked countries grow less rapidly than coastal economies, all other things equal.

Finally, note that we measure per capita income (and growth of per capita income) as GDP per *economically active* population (aged 20-65), rather than as GDP per total population. This is based on the natural view that GDP is produced by those in the workforce. Some countries have economically active populations that are growing much faster than the overall population (because of a rising proportion of the population in the age group 20-65). We would expect these countries to grow faster in terms of GDP per total population as a result of the rise in the proportion of the population that is of working age. Preliminary tests of the cross-country growth equations using GDP per economically active population, and GDP per total population, favored our choice of variable.

Note that we do not *initially* include the national saving rate as one of the right-hand-side variables, though we do add the saving rate in later regressions. This is because the saving rate is neither a structural variable nor a policy variable, but is rather a reflection of underlying economic

policies, such as government saving rates and pension systems. We note that earlier, in Table 12, we report estimated regressions where savings depends on these variables and where these variables are also used as instruments for saving rates in growth regressions. The regressions in Table 12 use a smaller sample of about 40 countries where all the data are available to perform this analysis. Unfortunately, we do not have sufficient data to conduct the same analysis for the larger set of countries over the full 20-year period 1970-1990, but we can draw some useful conclusions from the regressions on the smaller sample in Table 12.

The saving regressions in Table 12 support the idea that high state-provided pensions serve to depress national saving, after holding constant the effects of demographics, government saving, lagged income and lagged growth. The growth regressions in Table 12 support the idea that saving rates help explain cross country growth. Note that the estimated effect of saving on growth is higher when the saving effect is estimated with instrumental variables. This provides some evidence against the concern that the saving coefficient has an upward bias when it is estimated with least squares. The estimated savings coefficients from the growth regressions over the longer period (1970-1990), which we later use in growth simulations, are uniformly lower than these estimates.

We turn now to estimated growth regressions that use a larger sample of countries and cover earlier, and longer, time periods. These are reported in Table 13. As we explain in the technical appendix, the regression coefficients are actually non-linear functions of the parameters in the growth equation. This means that the coefficients cannot be read directly as estimates of the β parameters in the growth regression. Therefore, in the last two columns of Table 13, we report the estimates of the β's that correspond to regressions (1) and (3). Note that the estimated β's are close, but not identical, to the regression coefficients. The estimated β's are typically about 16 percent larger than the corresponding coefficients in the regression equation.

In the regression estimated over the longer time period, regression (1), we see that all of coefficients are of the expected sign and statistical significance (t-statistics are reported in parentheses). Over the shorter period, all variables are of the expected sign, but the market access variable falls

Table 13. Cross Country Growth Regressions

Dependent variable is Growth in real GDP per economically active population

Explanatory Variables	1970-89 (1)	1986-90 (2)	1970-89 (3)	1986-90 (4)	Estimates of the β's regr. (1)	regr. (3)
Log of real GDP at the beginning of the period (t-ratio)	-1.49 (-5.38)	-0.88 (-2.45)	-1.38 (-5.95)	-1.15 (-3.60)	-1.77	-1.61
Openness	1.63 (3.32)	3.36 (3.64)	1.77 (3.93)	3.03 (3.73)	1.94	2.07
Natural Resource Intensity	-3.12 (-2.63)	-8.86 (-4.48)	-5.04 (-4.89)	-7.06 (-3.99)	-3.70	-5.90
Access to Sea	-1.76 (-2.26)	-1.01 (-1.04)	-1.03 (-1.72)	-0.57 (-0.67)	-2.09	-1.19
Economic Freedom Rating	-0.75 (-2.24)	-1.35 (-2.39)	-0.67 (-2.23)	-0.67 (-1.30)	-0.89	-0.78
Savings Rate	-	-	0.112 (5.17)	0.146 (4.89)	-	0.131
R^2	0.530	0.478	0.643	0.573		
N	79	85	77	83		
SE	1.37	2.36	1.18	2.07		

below statistical significance. Looking at regression 1, we see strong evidence for conditional convergence, since the regression coefficient is -1.49 (t = -5.38), and the estimate of β_2 is -1.77. According to this estimate, an economy half as rich per capita as another economy will tend to grow faster by 1.23 percentage points per year (= - 1.77 x ln(0.5)). On this basis, for example, Poland would initially grow faster than the EU, holding all other variables the same, by 2.07 percent per year, since Poland starts out at just 31 percent of the EU average (2.07 = -1.77 x ln(.31)). Of course, this growth advantage would narrow over time, as Poland converges with the EU average.

Openness is also highly significant. The average difference in annual growth between an always-open economy (SOPEN = 1) and an always-closed economy (SOPEN = 0) was 1.94 percentage points per year, which would cumulate to a 44 percent difference in real GDP over the 19 year period between 1970 and 1989, $(y(0)*1.0194^{19}=y(0)*1.44)$. The IEF is also significant, both economically and statistically. Consider the difference between the Index of Economic Freedom of the VFGEs (IEF = 1.96) and SGEs (IEF = 3.08). This difference is estimated to account for 1.00 percent per year, or 21 percent over the 19-year interval. As noted above, this may be an underestimate, since it fails to measure the "true" value of the IEF on average for the regression period, and instead relies on an estimate as of 1995. By 1995, many of the extreme anti-market distortions of the developing countries that prevailed during the 1970s and 1980s had been reduced or eliminated.

Natural-resource intensity and market access (to the sea) also are important determinants of growth, but they don't explain much of the difference between the VFGEs and the SGEs since both resource intensity and access to the sea are similar in the two groups of countries (none of the VFGEs or the SGEs is landlocked). For a landlocked country, however, the effect is large. The difference in growth between a coastal country with a container port facility, and a landlocked country without any river access to a seaport, is enormous. The regression estimate suggests that complete landlockedness reduces growth by 2.09 percentage points per year.

The regression estimate over the shorter recent period might be more informative regarding the role of market distortions, because of the more appropriate timing of the IEF. As in regression 1, there

is strong evidence of convergence, as well as for the role of the key policy and structural variables. The main differences in magnitude of coefficients are as follows. The point estimate of openness is larger in the shorter period, rising to 2.07. Natural resource intensity is far larger, probably reflecting the sharp terms of trade losses suffered by the resource-based economies after the mid-1980s. The market access variable has a smaller, and statistically insignificant coefficient. The coefficient on IEF is markedly larger, which is consistent with the idea that measurement error in the longer-period regression served to understate this effect.

In regressions 3 - 4, we add the national saving rate (calculated as [GDP - C - G]/GDP, with C and G being private and public consumption spending). Somewhat remarkably, given the multicollinearity of the right-hand-side variables, the saving rate enters regression 3 with economic and statistical significance, and *without* affecting the statistical or economic significance of the other right-hand-side variables (the one exception is the market access variable). According to the estimate, an increase in the saving rate of 10 percentage points of GDP is estimated to raise the growth rate by 1.3 percentage points per year. The coefficient 0.13 is within the range of the usual estimates in other studies (which are typically between 0.1 and 0.2), but is smaller than our instrumental variables regressions reported in Table 12. In the regression estimate for the shorter period, all variables enter with the expected sign, but the IEF variable and the market access variable are not significant. The coefficient on saving and openness rise compared to the longer period regression.

We now use the regression estimates to calculate the time needed for a poorer economy to close a given amount of income gap with a richer counterpart. Consider two countries, I and j, with $yi < yj$. Let $Dij(t) = \beta 1' [Zi(t) - Zj(t)]$, and let $\gamma(t)$ be the log difference in income levels, $\gamma(t) = yi(t) - yj(t)$. Since $d\gamma(t)/dt = Gi(t) - Gj(t)$, we can write:

$$\dot{\gamma}(t) = D_{ij}(t) - \beta_2 \gamma(t) \qquad (2)$$

Equation (2) is a first-order differential equation with the well-known solution given in (3):

(3) $$\gamma(T) = e^{-\beta_2 T}\gamma(0) + e^{-\beta_2 T}\int e^{\beta_2 \iota} D_{ij}(\iota)\, d\iota$$

Using (3), for a given initial gap in incomes $\gamma(0)$, and a given path of structural differences, Dij(t), we can readily calculate the time path of the log difference in per capita income. In particular, we can find the time needed for the gap to be closed to any particular target level. In the special case that Dij(t) is a constant value, (3) becomes:

(3') $$\gamma(T) = \frac{D_{ij}}{\beta_2} + e^{-\beta_2 T}\left[\gamma(0) - \frac{D^{ij}}{\beta_2}\right]$$

and we can solve for t algebraically.

In Table 14, we make calculations of the number of years that would be required for the Czech Republic, Hungary and Poland to reach 70 percent of the EU average, and 90 percent of the EU average, under alternative assumptions about the saving rate and the economic freedom index. We construct **three** alternative scenarios. In the first scenario, we assume that both variables remain fixed at their most recent values. These values are given below:

	Saving rate	Index of Economic Freedom
Czech Republic	21.2	2.11
Hungary	17.1	2.78
Poland	18.8	2.90
European Union	21.1	2.30
Very Fast Growing Economies	32.8	1.96

In the second scenario, we assume that each of the three Central European countries harmonize

Table 14. Years Required to Close the Gap with the European Union

	1993 GDP as Percent of EU Average[1]	"Policy" Action	Years to Raise GDP to 70 percent of the EU average	Years to Raise GDP to 90 percent of the EU average
Czech Republic	53	Keep Current Policies	23	56
		Harmonize with EU	36	111
		Harmonize with VFGE	10	20
Hungary	48	Keep Current Policies	not obtainable with current policies	
		Harmonize with EU	45	120
		Harmonize with VFGE	13	23
Poland	36	Keep Current Policies	194	not obtainable
		Harmonize with EU	65	141
		Harmonize with VFGE	21	31

[1] Taken from table 2 column 5. Note that these are, if anything, optimistic estimates of the initial income level since they take at face value the estimates of the share of the unofficial economy in Central Europe, and assume that the share in the European Union is only 5 percent.

with the level of the EU average. From the table above, we can see that this means SR=21.1 and IEF=2.3. In this scenario, by definition, there are no policy or structural differences between the CEEs and the EU, so Dij(t) = 0 in all future years; the greater growth experienced by the CEEs comes solely from the fact that they begin with a lower initial income. In the third scenario, we assume that each of the three Central European countries harmonize with the level of the very fast growing economies (SR=32.8, IEF=1.96). That is, the CEEs adopt a *rapid-growth strategy* based on the high-saving and low-market distortion policies of the VFGEs. This third scenario, of course, will produce the fastest rate of convergence with the EU.

The results are shown in Table 14. Let T70 signify the number of years until the CEE is at the 70 percent level of the EU, and T90 signify the number of years until it reaches 90 percent of the EU. For each country, we calculate three values for T70 and three values for T90, based on the three policy scenarios.

The first point to mention is that if Hungary maintains its current low saving rate and current IEF score of 2.78, our estimates of the growth equation imply that its real income will plateau at a level below 70 percent of the EU average. Consequently it will never achieve 70 or 90 percent of the EU average under current policies. For similar reasons our estimates imply that with current policies Poland will never reach 90 percent of the EU average. The technical explanation for this result is in the technical appendix. Essentially it comes from the fact that the parameter estimates in our growth regressions imply that all countries are currently in a process of transition between their current per-capita income and their long-run income. The *speed* of transition (the growth rate) is higher the larger is the gap between current income and long-run income, but the *level* of long-run income is determined by the structural and policy variables. It is possible for relatively poor economies (which have large gaps between current and potential income) to have at once a high speed of transition (high growth) and a low level of long run income (because of inefficient policies). Our calculations imply that with its savings rate of 18.8 percent and its Index of Economic Freedom of 2.9, Poland's long-term income will be around 72 percent of the EU's. This is why, with current policies, Poland is shown in Table 14 to

reach 70 percent of the EU average, but *never* to reach 90 percent of the EU average.

The second important point from Table 14 is that it will take a very long time for the Central European Economies to achieve European standards of living if they simply adopt prevailing European policies. Harmonization with the EU is not the path to rapid convergence with the EU. Our calculations suggest that with EU policies it would take the Czech Republic 111 years, Hungary 120 years, and Poland 141 years to reach 90 percent of the EU average income! Thus, even though the Central European countries may be expected to grow faster by virtue of their low initial income, this advantage alone is not sufficient to achieve very rapid convergence with the European Union.

With policies oriented toward rapid growth, however, Table 14 shows that the time until convergence can be dramatically reduced. Our calculations suggest that if the Central European countries adopt the policies of the fast growing economies, the time until Hungary reaches 90 percent of the EU can be cut from 120 years to 23 years, and the time until Poland reaches 90 percent can be cut from 141 years to 31 years. Similarly, the time to reach 70 percent of the EU average can be cut from 36 to 10 years for the Czech republic, from 45 to 13 years for Hungary and from 65 to 21 years for Poland.

We can also estimate the different growth rates that the Czech Republic, Hungary and Poland can initially expect to achieve under these three scenarios. The results are presented in Table 15. Since we need a reference point to begin with, we start by assuming that each country can, at a minimum, match the average per-worker growth of the European Union, which we assume to be 2 percent per year, as shown in the first row for each country in Table 15. This 2 percent growth assumption is somewhat arbitrary, but it corresponds to the average growth in the European Union in the past 15 years. In the next row, we add to this the forecasts for the average growth in the labor force, to arrive at an estimate of GDP growth. Since these forecasts for labor force growth are low, we can see from the table that this does not add much to the overall growth rates. In the third row, we add the extra growth that each country can expect to achieve purely from the fact that they start out with a lower per-capita income. We call this the catch-up effect. This catch-up effect is generally

Table 15. Central European Growth Prospects Under Alternative Policies

	Baseline	EU Standards	VFGE Standards
CZECH REPUBLIC			
Baseline Growth Rate	2.00	2.00	2.00
Labor force	0.45	0.45	0.45
Catch-up	1.03	1.03	1.03
Economic Efficiency	0.15	0.00	0.27
Saving Rate	0.23	0.00	1.53
Total Growth Rate	3.64	3.48	6.58
HUNGARY			
Baseline	2.00	2.00	2.00
Labor force	-0.38	-0.38	-0.38
Catch-up	1.19	1.19	1.19
Economic Efficiency	-0.38	0.00	0.27
Saving Rate	-0.52	0.00	1.53
Total	1.91	2.81	4.61
POLAND			
Baseline	2.00	2.00	2.00
Labor force	0.65	0.65	0.65
Catch-up	1.65	1.65	1.65
Economic Efficiency	-0.47	0.00	0.27
Saving Rate	-0.30	0.00	1.53
Total	3.53	4.30	6.10

large, as we would expect given the currently low levels of real income. Based on our regression estimates, we estimate that this effect will add about 1.7 percentage points to Polish growth, 1.2 points to Hungary's growth, and 1.0 point to the Czech Republic's growth.

In the fourth row and below, we consider the effect of the different policy scenarios indicated in each column, so that the numbers also vary across the columns. Again based on our regression estimates, we estimate that if Poland does not change its policies and thus maintains its current rating on the IEF, it would loose about 0.5 percentage points in growth compared to the European Union's standards. Similarly, if it maintained its current savings rate of 18.8 percent, which is also below the EU's average of 21.1 percent, it would loose another 0.3 points. To summarize, we can see from the last number in column 1, that if Poland maintains its current policies, and the EU grows at 2 percent per year, Poland's growth in total GDP is estimated to be 3.5 percent per year.

There are three important conclusions from this table. First, even under current policies, we can expect the growth rates of the Czech Republic and Poland to be high by European standards, mainly by virtue of the fact that they start out far below the EU average. Second, further harmonization with the European Union will only lead to a modest increase in these growth rates (and will actually *lower* growth of the Czech Republic since its saving rate is slightly higher than the EU's). Finally, and most importantly, harmonization with the standards of the very fast growing economies will lead to a large increases in expected growth rates. We estimate that with VFGE policies the Czech Republic can grow at 6.6 percent, Hungary can grow at 4.6 percent and Poland can grow at 6.1 percent.

II. Can the CEEs sustain very fast growth?

Can the CEEs achieve very fast growth rates, at magnitudes needed to reach half of the average income level of the European Union within the next quarter century? Can they apply the lessons of the VFGEs in the European context?

A first sobering observation is that the *poorer EU economies* have mostly failed to achieve very

high rates of growth. The PEUEs probably offer the best guess of future CEE performance, since the PEUEs show the performance of poorer peripheral European economies under the real political and institutional conditions of EU membership. Spain and Portugal grew rapidly in the mid-1980s, but then got bogged down in fiscal difficulties in the 1990s. While Portugal achieved a growth rate of 5.2 percent during 1985-90, it managed just 1.2 percent during 1990-95. Spain has just managed 1.5 percent per annum during the first half of the 1990s. Greece has done even worse, essentially mired in crisis since the late 1980s. Only Ireland has seen an acceleration of growth, to the point where it was the fastest growing economy in the EU in 1994, and perhaps the fastest in all of the OECD.

If we point to the one critical area where the PEUEs fail to emulate the VFGEs, it is surely the area of fiscal policy. The PEUEs all have large governments; extensive social welfare systems; high rates of labor taxation; and heavy reliance on PAYG financing of social security. The large government leads to moderate-to-high values of market distortion (compare the IEF values of the PEUEs and the VFGEs, in Table 4), and to low or moderate saving rates (see Table 9). Three of the four (all but Ireland) saw steep increases in public spending and taxation as a percent of GDP during the 1980s and first half of the 1990s. Notably, Ireland bucked the trend after 1986, reducing total government spending from 53 percent of GDP in that year to around 43 percent of GDP in 1994. The rise of government spending and taxation in the other three countries has been associated with a rising tax wedge; a high and rising rate of unemployment during the 1980s and early 1990s; and a falling rate of national saving.

The Central European economies are subject to the same fiscal pressures as the PEUEs, and are therefore susceptible to the same mediocre long-term growth performance. The fiscal pressures are common to the PEUEs and the CEEs for several reasons. First, these fiscal pressures reflect a common ideological commitment to a universal social welfare state -- a European-wide commitment that even transcended the differences in economic systems between East and West before the 1990s. Second, they reflect the pressures, both political and legal, of the *acquis communitaire*, that is the accumulated body of law of the European Union. As the CEEs want to join the EU, they will be

pushed to harmonize social policy, fiscal policy, taxation policy, and other areas of economic management. With harmonization may well come a further push towards a large government role in the economy, including an expensive, PAYG social welfare system. Third, the CEEs, like the PEUEs, are subject to the political and economic ratchet effects of entitlement spending. Once generous social insurance systems are in place, they are extremely difficult to unwind. Interest groups, particularly of the elderly, have proven to be formidable opponents to any attempts to trim the prevailing social insurance system. Public trade unions, especially in France, Italy, Spain, and the CEEs, have also fought for the retention and even expansion of the prevailing entitlement.

While this outcome is likely, it is not inevitable. The EU itself is going through deep soul-searching over the role of the state, as country after country reaches a point of fiscal stress. Perhaps the CEEs will be able to take a faster step towards a smaller, and growth-promoting state, since the economic institutions in the CEEs are probably still more malleable, and subject to reform, than in the EU itself. Let us therefore return to the three clusters of characteristics that promote the rapid growth of the VFGEs: allocative efficiency, inter-temporal efficiency, and technological efficiency. We can assess the prospects of the CEEs in each area, to see their prospects of emulating the high-growth performance of the VFGEs.

Allocative efficiency

There is no doubt that the CEEs have achieved a stupendous breakthrough in allocative efficiency since the start of market reforms. The introduction of market forces, underpinned by administrative, political, and legal changes, has allowed these economies to become full-fledged market economies in a relative short period of time, approximately one-half decade. As the **1995 Transition Report of the European Bank for Reconstruction and Development** makes clear, the leading reformers (Czech Republic, Estonia, Hungary, Poland, Slovakia, and Slovenia) have completed the basic tasks of legal and institutional reform, and have even reached Western European best practices in several key areas, such as the openness of the economy to international trade. Within another few

years, the CEEs should rival the Western European economies in other areas of legal and administrative reform.

There is also little doubt that the rise in allocative efficiency is already paying off, in export-led GDP growth. All of the leading reforms have restored positive growth in 1995, after several years in which the introduction of market reforms forced the downsizing or liquidation of the old, heavy industrial enterprises. Much of the new growth is coming in small, export-oriented enterprises, as well as in services. Foreign direct investment is also starting to increase, with foreign-owned enterprises in the CEEs increasingly helping to integrate the region into European-wide, or even global, production networks.

The cross-country evidence after five years of reform suggests that the strongest market reformers have experienced the mildest downturns in measured economic activity and the fastest recoveries. This evidence is shown in Figures 1(a) and (b), where we plot economic growth against the degree of market reforms. The Index of Market Reforms (IMR) is an index constructed on the basis of EBRD measures of reform progress in the post-communist economies. The IMR is the simple sum of sub-indexes constructed by the EBRD to measure the progress of market reforms along nine dimensions, including: large-enterprise privatization, small-enterprise privatization, enterprise restructuring, price liberalization, trade and foreign exchange liberalization, competition policy, banking and interest rate reform, securities market reform, and legal institutions governing investment. We see the strong positive relationship between the Index of Market Reform and economic growth, both cumulative growth, 1989-95, and (projected) economic growth in 1995. Clearly, the faster reformers have experienced a smaller cumulative downturn, and a faster recovery as of 1995. Indeed, *all of the leading reformers are expected to show economic growth in 1995.*

By 1995, the CEEs had made considerable progress in all of the major areas of reform. In the crucial area of trade and exchange rate liberalization, the EBRD judges that six of the countries (Czech Republic, Hungary, Poland, Romania, Slovakia, and Slovenia) have reached the standards of the advanced industrial economies. Nonetheless, there is still considerable work to complete on the basic

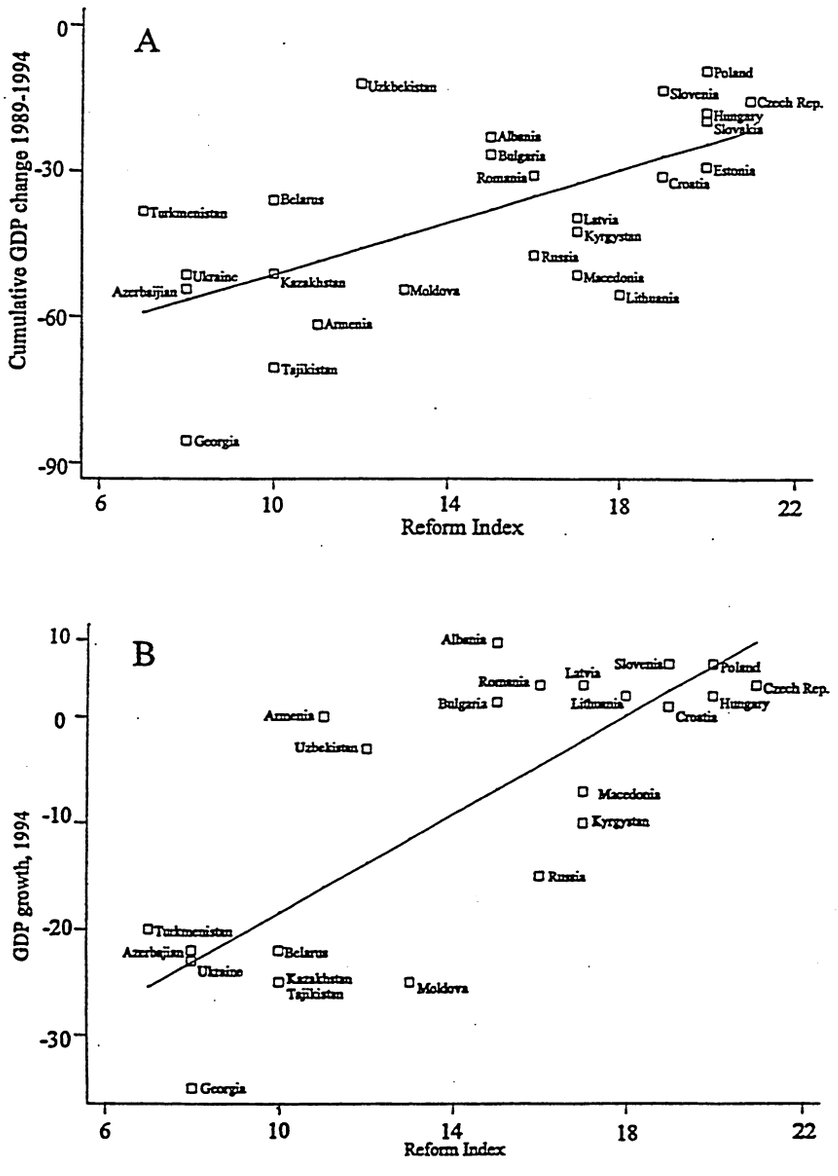

Fig. 1. The relationship of economic reforms and economic growth in Eastern Europe and the former Soviet Union: (A) cumulative GDP change 1989-1994, and (B) GDP growth, 1994.

institutional re-ordering, even for the three leading CEEs (Czech Republic, Hungary, and Poland). As shown in Table 9, these countries still have a state sector of 30 percent or more of GDP, according to the EBRD estimates. They also lag behind the advanced industrial countries in several areas of legal and administrative development, including: banking reform, securities market development, and competition policy.

The reforms to date are enough to generate gradual convergence with the EU, but not rapid convergence. In our view, CEE growth rates comparable to the VFGEs are in fact achievable, but only with a decisive medium-term reduction of the size of the state, particularly in budgetary spending and the provision of retirement pensions. As with the poorer EU countries, the CEEs carry a legacy of a very large public budget as a percent of GDP. Interestingly, and regrettably, the size of the government spending and taxation as a proportion of GDP *has not declined since the onset of reforms in 1989*. What has happened, instead, is that the composition of the state spending has changed, without reducing the overall levels as a percent of GDP.

The most important change, evident in Table 16, is a sharp cut in budget subsidies to enterprises and households, which has been essentially offset by a steep increase in social spending as a percent of GDP! Thus, while Poland cut budgetary subsidies by 9.6 percentage points of GDP between 1989 and 1993, it simultaneously increased social spending by 11 percentage points, from 10 percent of GDP to 21 percent of GDP. The bulk of the increased spending went to retirement pensions, as middle-aged Poles took up the options of early retirement and of generous qualification for disability pensions. The number of pensioners rose by a startling 28 percent during 1989 to 1993, at time when the overall population increase was a mere 1.5 percent. By 1993, roughly 32 percent of Polish adults were pensioners, compared with just 21 percent of the adult population in the United States. A sharp growth of the number of pensioners, and of pension spending as a percent of GDP, has occurred in most of the other transition economies of Central and Eastern Europe.

The result of these budgetary changes is that total public spending as a percent of GDP remains around 50 percent, among the highest in the world, and certainly the highest for market economies at

Table 16. From Subsidies to Social Expenditure in 3 Transition Economies

	Subsidies		Social Spending	
	1989	1993	1989	1993
Czech Republic	16.6[1]	-	13.2[1]	14.6
Hungary	10.7	3.1	15.8	22.5
Poland	12.9	3.3	10.0	21.0

[1] For Czechoslovakia.
Source: European Bank for Reconstruction and Development, *Transition Report, 1994*, and national data.

comparable levels of income. In Table 7, we offered comparisons of fiscal expenditure in the CEEs with other countries. The CEEs have a particularly high level of government consumption spending; total government expenditures; and government revenues as a percent of GDP. As we saw in Table 8, the high overall levels of tax collection are reflected as well in high marginal tax rates, and a tax wedge on labor income that is vastly higher than in the VFGEs, the SGEs, and even the PEUEs.

Oddly, while overall government spending is very high, budgetary investment spending is actually low in comparison with the VFGEs. It is difficult to make precise comparisons of the level of public investment, since a considerable amount of such spending will be off-budget, on the accounts of state enterprises. Nonetheless, it is likely that the Central European economies have squeezed infrastructure spending dramatically to make room for large current expenditures, particularly transfer payments.

The main effects of extremely high public expenditure and taxation in the CEEs are likely to include: a substantial disincentive to labor supply; a rise in the long-term unemployment rate; an encouragement of black-market activities; a reduced inflow of foreign direct investment; large public deficits; and a reduction in national saving rates. We can see many of these effects already at play in a comparison of the CEEs with the VFGEs. Public sector saving is lower; deficits are higher; and overall national saving and investment rates are far lower.

Pension Reform in the CEEs

The current heavy pension spending in the CEEs can be justified as a **one-time inter-generational transfer** from the young and unborn workers to the current population over age 50. After all, it is the older middle aged workers and the retirees that have the most difficult time adjusting to the new market economy, and therefore stand to suffer the largest losses of income as a direct result of the market reforms (and the high inflation that preceded it). The evidence from Poland suggests that in this regard, the heavy pension spending has been successful: the real consumption of the older population has been maintained throughout the transition. Even more notably, life expectancy has

continued to rise in the Czech Republic, Hungary, and Poland despite the tumult of the transition (and the sharp declines in life expectancy in the post-communist economies of the former Soviet Union).

Nonetheless, it would prove to be enormously costly if the current pay-as-you-go pension system becomes permanent, with today's younger workers viewing the current levels of pension payments as entitlement that they will also receive in the future. Pension reform in the CEEs should involve two major changes in the next decade: (1) a phase out of pay-as-you-go financing, with its replacement by an individualized savings account system as in Chile, Malaysia, and Singapore; and (2) a more realistic level of benefits and terms for qualification for future retirees within the state-funded pension system. The most ambitious reform would completely phase out the pay-as-you-go system, as Chile succeeded in doing in its 1978 reforms.

The basic mechanics of a shift from a PAYG to a funded, individual-savings system are as follows. Current pensioners continue to receive their benefits as if the system had remained unchanged (though the specific *level* of benefits might, of course, be adjusted). All workers who currently contribute to the system shift to an individual savings account, so that contributions in the future are deposited in the individual accounts. In addition, workers receive an initial "endowment" of equities and government bonds in their individual accounts, reflecting their previous "contributions" through payroll taxation. In Chile, this initial balance in the savings accounts was termed the "recognition bond," in recognition of past tax payments.

The recognition bonds immediately add to the stock of government debt, but this additional stock of debt is not really new debt. Rather, the government's commitment to future social security benefits already represents an *implicit* stock of government debt, which is now made explicit through the recognition bonds. The fact that current retirees must now be financed through general government revenues, rather than tax payments of the young, also adds a new *flow deficit* to the budget, but one that is matched by a reduced commitment to government retirement spending in the future (since retirement benefits will then come out of the assets in the individualized accounts, rather than from the budget). In a mechanical sense, the flow deficit can be readily financed: the pension-reform law can

mandate that the individualized accounts be invested largely in government debt in the first few years, in order to ensure the financing of the flow deficit. Alternatively, the government might offset part or all of the flow deficit through expenditure cuts or tax increases. Chile, for example, managed to finance its transition in the early 1980s through government surpluses on non-pension spending, which were used to cover the pension payments to the existing retirees.

In the case of Central Europe, workers should **not** receive the full actuarial value of their past contributions, *since some of those contributions should be recognized as a* ***one-time, uncompensated transfer*** *of income from the young to the older generation.* As an illustrative example, workers 50-55 might receive enough to ensure them 90 percent of the current benefits (taking into account their continuing contributions up to retirement age); workers 45-50 might receive enough to ensure 75 percent of the current benefits; and so forth, with reduced recognition bonds for younger workers. Workers currently 25 and younger might receive nothing, despite previous payroll taxation. At the same time, the retirement age should also be raised gradually.

The CEEs might be able to use an additional mechanism to fund the transition. Rather than paying recognition obligations exclusively in the form of government bonds, the CEE governments could also allocate some of the remaining state-owned equities to the funding of individualized savings accounts. In particular, the government would create diversified portfolios of state-enterprise shares which they would transfer to private investment trusts. The workers would then receive shares in the investment trusts as part of their initial balances.

There are, of course, many detailed issues that have to be resolved in the changeover from a PAYG system to an individualized system, including some of the following issues. First, who will manage the individualized accounts? Chile has relied on a regulated, private-sector, pension-fund industry, while Singapore and Malaysia have relied on centralized government funds that manage all of the savings. Second, what prudential standards will govern the management of the individualized accounts? There are many important choices here, involving the balance between government bonds and equities, and domestic versus foreign assets. Third, what will be the coverage of the new system?

Will participation be mandatory? Is there a minimum mandatory contribution (as a proportion of income) that each participant must make? These questions can be resolved, but inherently they must be tailored to national conditions, and are in any event beyond the scope of this paper.

Other remaining tasks for achieving high growth in the CEEs

The CEEs have several important growth-promoting tasks in addition to the *completion of market reforms* (especially privatization and financial market deepening) and *fiscal reform* (especially pension reform) to lower tax distortions and raise national saving rates. Three addition areas of concern include: (1) membership in the European Union in the near future; (2) improvements in infrastructure and education; and (3) a medium-term government strategy to support very fast growth.

De Crombrugghe, Minton-Beddoes, and Sachs (1995) stress the importance of rapid accession of the CEEs to the European Union. A clear target date for membership is important to lock in the economic reforms in Central Europe, and to boost investor confidence with regard to the CEEs' market access to the EU. Without a clear timetable for accession, there is the possibility of a vicious circle of loss of confidence in market reforms and falling investment spending in the CEEs, thereby confirming the view of some in the EU that accession should be delayed for decades, not years. Most of the perceived difficulties of accession can be overcome if a few basis principles are recognized. First, the CEEs need market access, not financial aid from the EU. Therefore, the CEEs should unilaterally renounce their desire for a significant share of the EU structural funds, in return for rapid accession. Second, the CEEs should join the EU with a long transition period, presumably a decade from the time of membership, in which to harmonize agricultural policy and free labor mobility. Third, the CEEs should opt out of the Social Charter (e.g. in return for agreeing to a postponement of free mobility of labor), as these economies should not be further burdened with high social costs at this point.

Together with rapid accession, the CEEs need to pursue a coherent medium-term strategy for expanded infrastructure investment spending, especially infrastructure linked to economic integration with Western Europe. Since the CEEs will aim for export-led growth, with a strong inflow of foreign

direct investment, they should focus their infrastructure spending on transport and communications facilities, especially in those projects linked to the European Union grid. Education is the other area for a major public spending commitment, in order to increase the scope and quality of tertiary education.

For all of this, the government requires a clear medium-term strategy. We believe that such a strategy should rest on six pillars that we have discussed throughout this text: (1) completion of main institutional steps of market reform, including most importantly the completion of privatization and deepening of the rule of law; (2) deep fiscal reform, to reduce the share of government spending and taxation in GDP; (3) investing in infrastructure, especially in transport and communications, in order to speed and deepen the economic integration with the EU markets; (4) membership in EU, but without accession to the Social Charter and to other aspects of EU policy that would tend to exacerbate the size of the state; (5) science, technology, and education policies to spur productivity growth; and (6) setting appropriate (and ambitious) growth targets for the next ten years, with the aim of emulating the growth performance of the VFGEs.

IV. Conclusion

We have noted that the CEEs are likely to experience economic convergence with the European Union, assuming that CEE economic policies are harmonized with those of the EU. On the other hand, the speed of convergence is likely to be relatively slow if policies do no more than achieve harmonization on EU standards. The CEEs should instead aim to achieve very high growth targets, by emulating the fiscal policies of the very-fast-growing middle-income countries. These fiscal policies include low rates of marginal taxation, low levels of current government expenditure as a percent of GDP, relatively high levels of government investment expenditure, and pension policies based on individual savings accounts rather than pay-as-you-go transfers. Pension reform merits a prominent place in the reform agenda in the coming years, as a centerpiece of a high-growth strategy.

Technical Appendix

As described in the text, our growth equation can be written as the following differential equation,

$$\dot{y}^i(t) = \beta_0 + \beta_1' Z^i + \beta_2 y^i(t)$$

where y is the natural log of GDP per economically active population, β_1 is a vector of coefficients corresponding to the variables in the vector Z, and β_2 is a parameter that determines the rate at which the economy converges to its level of income in the steady state. In a cross section of economies at different income levels, this parameter also determines the rate at which poorer economies 'catch up' to wealthier economies. When the parameters and the Z's do not vary over time, this equation may be integrated from time 0 to time T and rearranged to obtain.

$$y(T) = e^{-\beta_2 T} y(0) + (1 - e^{-\beta_2 T}) \frac{\beta_0 + \beta_1' Z^i}{\beta_2}$$

This equation clarifies the implicit model of the growth process that is inherent in the growth equation above, and indeed in most of the empirical research on cross-country growth. In this framework, all countries are assumed to be on a transition path between their current income level and their steady state income level. The current income is given by the term y(0), and the steady state income is given by the term $(\beta_0 + \beta_1'Z)/\beta_2$. Note that the equation says that actual income at any date "T" in the future will be a weighted average of current income and steady state income, with the respective weights given by the terms $e^{-\beta T}$ and $1-e^{-\beta T}$. For example, if β_2 is -0.0177, as in our estimates, and T is 20, the weights would be 0.70 and 0.30. If instead T was 40, the weights would be 0.5 and 0.5. This last example highlights the fact that the estimated rate of convergence to the steady state is quite slow. Even after 40 years, a country will have closed only half the gap between it's current income and its steady state income.

Estimation Issues

We measure average growth between year "0" and year "T" as the difference in log GDP divided by the number of years: (y(T)-y(0))/T. Given this, we must write the equation above in a form that corresponds to the growth rates that we actually measure. When we do this we obtain the following.

$$\frac{y(T)-y(0)}{T} = -\frac{(1-e^{-\beta_2 T})}{T} y(0) + \frac{(1-e^{-\beta_2 T})}{T} \frac{\beta_0 + \beta_1' Z^i}{\beta_2}$$

This is the form of the equation that we actually estimate. Note that the estimated coefficient on initial income, y(0), should be interpreted as an estimate of the term $-(1-e^{-\beta 2 T})/T$ rather than simply β_2. To recover estimates of the β's we have two choices. One is to use the result from asymptotic statistics that $\text{plim}(g(\hat{\alpha})) = g(\text{plim}(\hat{\alpha}))$, which states that if we have a consistent estimate of the function of the estimated b we can recover a consistent estimate of b itself by algebraic solution. The second is to estimate the equation as a non-linear function. We choose the first of these options. For example, an estimated regression coefficient on initial income (Table 11) of -1.49 implies an estimate of the term $(1-e^{-\beta T})/T$ of 0.0149 (because the dependent variable in the regression is multiplied by 100, all the regression coefficients are in effect multiplied by 100). The estimate for β_2 in the same units as the -1.49 coefficient is then -1.77 (=100*(ln(1-0.0149*20)/-20)). Note that the regression table (number 11) reports both the estimated regression coefficients as well as the implied estimates of the β's.

Procedure to compare the growth paths of two countries, and to compute the time it will take for the poorer country to catch up to the richer country.

Note also that we can again integrate the differential equation from 0 to T separately for two countries "I" and "j", and subtract the equation for "j" from "I" to obtain.

$$y^i(T) - y^j(T) = (y^i(0) - y^j(0))e^{-\beta_2 T} + (1 - e^{-\beta_2 T}) \frac{\beta_1'}{\beta_2} (Z^i - Z^j)$$

Now we define some terms to simplify this equation. Let $\gamma(t)$ denote the difference in log GDP at time T between two countries, hence $\gamma(t)=y^i(t)-y^j(t)$. We call this the log income gap. It is sometimes clearer to express the income gap as a percent, that is, the income of the poorer country as a percent of the richer country. We call this the percent income gap and denote it as $\gamma^p(t)=100*y^i(t)/y^j(t)$. Of course, these two ways of expressing the income gap are always related by the equation $\gamma(t)=\ln(\gamma^p(t)/100)$. Furthermore, let D_{ij} represent the (weighted) difference in the Z variables of any two countries, with the weights given by the estimated regression parameters, hence $D_{ij} = \beta_1'(Z^i - Z^j)$. Then the we can write an equation that describes the time path of the log income gap between any two countries, conditional on the parameters and the D_{ij} terms.

$$\gamma(T) = \gamma(0)e^{-\beta_2 T} + (1 - e^{-\beta_2 T}) \frac{D_{ij}}{\beta_2}$$

This equation is important to understanding our results. It says that the log income gap between any two countries will be a weighted average of the current income gap and the steady state income gap. Since $\lim(T\to\infty)\ \gamma(T)=D_{ij}/\beta_2$, the term D_{ij}/β_2 is the steady state (log) income gap. If the two countries have identical values for the Z variables, then $D_{ij}=0$ and the two countries will eventually reach the same level of steady state income. However, if one country has poorer growth-related policies then D_{ij} will be negative and the country will never close the income gap with the reference country beyond D_{ij}/β_2. For example, we calculate that with current policies Poland's steady state percent income gap vis-a-vis the European Union is 68 percent. Therefore without policy changes its income will rise no higher than 68 percent of the EU average.

We also use this equation to calculate the time it takes a poorer country, (country j), to close the income gap with a richer country (country I). This calculation can be performed with different

values of the Z variables, different parameter estimates, and different values of the initial income gap and the desired income gap. We simply solve the equation above for T given targets for $\gamma(T)$, known values of $\gamma(0)$ and the Z's, and regression estimates of the β's. The solution for T is the following:

$$T = \frac{-1}{\beta_2} \frac{\gamma(T) - D_{ij}/\beta_2}{\gamma(0) - D_{ij}/\beta_2}$$

Alternative values for T, corresponding to different targets $\gamma(T)$ and different D's are displayed in Table 12.

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1. The data were purchased from Political Risk Services, a political-risk assessment firm.

2. There are, in fact, linkages between a worker's contribution and future retirement benefits, since the benefits are linked to years of contributions, as well as to the wage levels prior to retirement. The linkages, however, tend to be complex and not especially tight. Workers tend to view their retirement benefits are largely independent of their individual payroll tax payments (see Auerbach, 1995, for a further discussion of this issue).

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