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On the long-run economic performance of ex-communist economies, 1990-2019 [1]

Sobre o desempenho econômico de longo prazo das economias ex-comunistas, 1990-2019

Marcelo de Albuquerque e Mello[2]

Resumo: Nós avaliamos o desempenho econômico de longo-prazo de 29 economias ex-comunistas durante o período 1990-2019, através de exercícios de decomposição do nível e da taxa de crescimento do produto por trabalhador. Entre as economias ex-comunistas, nossas estimativas sugerem que na última década, a maior parte da variação internacional do PIB por trabalhador é explicada pela variação transversal na quantidade dos fatores de produção. Os exercícios de decomposição do crescimento sugerem que as economias ex-comunistas da Europa Central apresentam crescimento robusto da PTF, consistente com o crescimento da PTF das economias de mercado ocidentais. Mais especificamente, nossas estimativas sugerem que as economias com melhor desempenho são aquelas que experimentaram o período mais curto sob o regime comunista e têm instituições "ocidentalizadas", ao passo que as economias com pior desempenho passaram por períodos mais longos sob o regime comunista e são mais propensas a ter governantes autoritários.

Palavras-chave: Contabilidade do Desenvolvimento, Contabilidade do Crescimento, Economias de Transição, Economia ex-Comunista, Crescimento de Longo-prazo.

Abstract: *We evaluate the long-run economic performance of 29 ex-Communist economies over the period 1990-2019, through growth and level decomposition exercises. Among ex-Communists economies, we find that over the last decade the bulk of the international variation in GDP per worker is accounted for by the cross-country variation in factor inputs. Growth decomposition exercises suggest that ex-Communist economies in Central Europe exhibits robust TFP growth, consistent with TFP growth of western market economies. More specifically, we find that the best performing ex-Communist economies are the ones that experienced the shortest spell of Communism and have "westernized" institutions, whereas the worst performing economies have experienced longer spells of Communism and are more likely to have authoritarian rulers.*

Keywords: *Development Accounting, Growth Accounting, Transition Economies, ex-Communists Economies, Long-run growth.*

Classificação JEL: O5; O40; O47; P0; P270.

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The data that support the findings of this study are openly available at: https://www.rug.nl/ggdc/productivity/pwt/?lang=en. In addition, all excel files constructed by the author are available upon request.

1. Introduction

After the fall of the "Berlin Wall" in November of 1989, ex-Communist countries began transiting from central planning to a market-based economy. The scope and depth of reforms needed were daunting. Reforms included the construction of a legal framework conducive to a market economy (e.g., how to open/close a business, how to declare bankruptcy, dispute resolution, among others), the liberalization of prices, exchange rate convertibility, macroeconomic stabilization, integration with global production chains, large scale privatization, and the construction of an encompassing institutional framework consistent with a market economy.

Initially, the literature on transition economies concentrated on the types of reforms, e.g., whether to follow a "Fast Track" or a "Gradual" approach, the sequencing of reforms (e.g., whether one should first develop the institutional framework and then liberalize and privatize, or execute reforms concomitantly), among others. Examples in this strand of the literature include Fischer and Gelb (1991), who discuss the tradeoffs associated with the pace of reforms, and Svejnar (2002) who discusses the types of reform strategies and the effect of the initial conditions on the reforms.

Recent studies use short-run macroeconomic variables and social indicators to review the progress made by transition economies since the initial reforms. See, for instance, Havrylyshyn, Meng and Tupy (2016), and Roaf et ali (2014). Naturally, it is important to analyze the transition process in its many dimensions, including social indicators, and its impact on short-run macroeconomic variables. However, it is equally important to analyze its long-run economic effects. This is especially true now with the availability of three decades of high-quality data on aggregate variables such as productivity and the capital-output ratio, i.e., variables that are proper of long-run growth models.

In this sense, our objective here is to assess the long-run economic performance of the ex-Communist economies through the lenses of the neoclassical growth model. More specifically, we construct a panel from the Penn World Tables (version 10) with data on 29 ex-Communist economies over the period 1990-2019. We perform growth and level decomposition exercises following the tradition of the growth and development accounting literatures, as laid out in Solow (1957) and Caselli (2005), respectively.

Our level decomposition exercises suggest that in the beginning of the 1990s, about 40%-50% of the international variation in GDP per worker can be accounted for by the cross-section variability in factor inputs. This percentage decreases over time reaching about 20%-30% in mid-2000s, when it starts increasing and reaches 40%-50% again around 2019. This finding is robust to an alternative level decomposition. Interestingly, our estimates differ somewhat from the pattern found in the literature, which suggests that the explanatory power of factor inputs is decreasing over time, giving way to differences in technology as the key explanatory factor.

Our growth accounting exercises suggest that there are three distinct groups of countries at different stages in the transition to a market-based economy. The first group consists of 11 countries located in Central and Eastern Europe that are members of the European Union and spent less time under Communist rules[3]. This group of countries has shown the best economic performance among the ex-Communist Block, and they have advanced reforms on both fronts, economic and political.

A second group consists of Southern European countries such as Albania, Bosnia & Herzegovina, North Macedonia, Montenegro, Moldova, e Serbia. This group includes five of the former six members of the now extinct Yugoslavia (with exception of Albania, all the other five countries belonged to Yugoslavia). Some of these countries are EU candidates, such as Albania, North Macedonia, Montenegro, and Serbia. This group has a mixed performance record, with some countries advancing economic and political

[3] These countries are: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia, and Slovenia.

reforms, like Albania, while others still dealing with a turbulent political and economic history, like Serbia.

The third identifiable group consists of countries from the Commonwealth of Independent States (CIS)[4]. All of these countries were part of the former Soviet Union and spent the longest time interval under the spell of Communism, with the corresponding effects on the political and economic life. Given the extended length of time spent under Communism, it is not surprising that these countries exhibit institutional inertia, which translates into a slow speed of transition. As discussed below, the slow speed of transition may be linked to the existence of groups with vested interests in maintaining the status quo and intrinsic preferences for heavy state intervention.

The average per capita GDP of the 29 ex-Communist economies grew at the annual rate of 2.30% over the period 1990-2019, which is consistent with the per capita GDP growth of successful western economies. The striking fact behind this estimate is that population growth for the entire group increase at 0.02% annually. Seventeen countries present declining population, whereas 18 countries present a declining work force. The combined work force of the 29 ex-Communists countries has decrease at a rate of 0.16% annually. In sum, the good performance of the GDP per capita hides a worrying trend in the dynamics of the population and the work force.

This paper is structured as follows. Section 2 discusses the related literature. Section 3 discusses the methodology for the growth and level decomposition exercises we perform. Section 4 discusses the construction of the dataset, and some basic descriptive statistics. Section 5 presents our estimates of the level decomposition exercises. Section 6 presents the results of our growth accounting exercise, while section 7 provides an alternative growth decomposition. Finally, section 8 concludes.

2. Related Literature

Roaf et ali (2014) reviews the progress made by transition economies in the first 25 years after the fall of communism. They focus on short-run variables, such as inflation, exchange rates, external accounts, among other short-run macroeconomic variables. However, they also include a report on economic policies that are key for long-run economic performance, such as institutional building associated with the transition from a centrally planned economy to a market-based one.

As reported in Roaf et ali (2014), communist economies share many macroeconomic traits, such as large state-owned firms, and highly interventionist policies. Additionally, relative prices are strategically distorted to favor heavy industries. Moreover, the fiscal and monetary policies are aimed at keeping the industrial sector at full capacity, which typically implied a situation of permanent disequilibrium in the goods and product markets, with excess demand in some markets and shortages in other markets.

The extent of macroeconomic distortions as well as external factors, and the depth and scope of reforms, were key determinants to a successful transition to a market economy. The list of reforms included liberalization of prices, integration with the global economy through international trade, foreign exchange conversion, large scale privatization and the construction of institutions conducive to a market economy, such as a legal framework for a business environment. Some reforms were quickly implemented, because they were easier to implement, such as the liberalization of prices and markets. However, reforms that involved institution-building were harder to promote because of opposition from groups with vested interests.

Roaf et ali (2014) report that transition economies that adopted the so-called "shock therapy" reforms, as opposed to a gradualist approach, had a better overall economic performance. Poland and the Baltics are classic examples of the "shock therapy" approach

[4] The CIS is a regional organization created after the breakdown of the Soviet Union. Nowadays it consists of a group of ten countries that were part of the former Soviet Union. The member countries are the following: Armenia, Azerbaijan, Belarus, Kazakhstan, Kyrgyzstan, Rep. of Moldova, Russia, Tajikistan, Uzbekistan, and Turkmenistan. In the past, Georgia and Ukraine were also part of the CIS, but are no longer part of it. Georgia was withdrawn from the group after the Russian-Georgian war in 2008, and Ukraine quit participating in the group activities following the invasion of Crimea by Russian forces in 2014.

to reforms, whereas the former Yugoslavian economies exemplify the gradualist approach. In general, Central and Eastern European economies promoted deeper and ampler reforms, while the former Yugoslavian and ex-Soviet economies experienced more limited reforms.

An important point observed in Roaf et ali (2014), concerns the role played by accession to the European Union (EU). In 2004, eight countries were admitted to the EU, namely, Czech Republic, Slovakia, Estonia, Latvia, Lithuania, Hungary, Poland, and Slovenia. Bulgaria and Romania were admitted in 2007, and Croatia in 2013[5]. Accession to the EU impacted the transition to a market-based economy through four main channels. The first channel operated through international trade, which promoted integration with the EU block and its international production chains. The second channel operated through flows of capital and labor[6]. The third channel, was via the development of institutions and a legal framework conducive to a market economy, in order to match the standards of EU member countries. Finally, EU funding became available to the new members, reaching up to 2.5% of the GDP within three years of accession.

Havrylyshyn, Meng and Tupy (2016) analyze the progress made by transition economies in the first 25 years after the initial reforms on the economic, political and social fronts. In line with Roaf et ali (2014), they observe that countries that fast-tracked reforms performed better than countries that adopted a gradualist approach, on both fronts, the economy and on social indicators. In addition, Havrylyshyn, Meng and Tupy (2016) show that rapid reformers had shorter recessions and faster recoveries, contradicting the view that associates fast-track reformers with greater social welfare costs. Another argument in favor of gradualism, establishes that institution-building had to come before the liberalization of markets. However, according to Havrylyshyn, Meng and Tupy (2016), fast-track reformers ended up with better institutions when compared to gradualist reformers.

Interestingly, they argue that the gradualist approach favored the emergence of a class of oligarchs. This hypothesis is fitting to the case of Russia, Ukraine, and Belarus, for example. Although, this is an interesting hypothesis, one may consider the possibility that the oligarchs were already present in the economy and were able to hold back and/or delay reforms in order to extract more rents or simply maintain their status quo in the post-reform period. In other words, we may have a case of reverse causality here.

Havrylyshyn, Meng and Tupy (2016) main conclusions can be summarized as follows: (i) Fast-track reforms was a better strategy than gradualism, judging by economic and social indicators; (ii) The concentration of wealthy and political influent individuals is higher among gradualist reformers than fast-track reformers, and among large economies of the former Soviet Union; (iii) Institutional development was fastest among Fast-track reformers; and (iv) The argument that institutional development should precede liberalization of markets is not supported by the historical evidence; (v) While their work is related to ours, we differ on an important dimension, as they focus on short-run variables and the pace of reforms, while we focus on the long-run economic performance.

It can be argued, as suggested above, that the main findings in Havrylyshyn, Meng and Tupy (2016) may suffer from either reversed causality or omitted variables bias, or both. For instance, it may be the case that fast-track reformers were able to reform rapidly and build the appropriate institutions because they experienced shorter spells of communism, so that the communist ideology was not deeply rooted in society, making it easier to advance with reforms. Is it a coincidence that the large economies of the former Soviet Union were exactly the ones that adopted a gradualist approach to reforms, made the least progress towards building institutions, and exhibit a concentration of oligarchs? It is hard to argue that this is mere coincidence. Perhaps, this is so exactly because these

[5] Currently, there are five countries with "candidate" status for accession to the EU, namely, Albania, Montenegro, North Macedonia, Serbia, and Turkey. Additionally, Bosnia and Herzegovina, and Kosovo have "potential candidates" status for accession to the EU.

[6] This second channel probably benefited the old members of the EU and burdened the transition economies, given the large migration of workers from the ex-communist economies to the West. According to Roaf et ali (2014), some estimates suggest that approximately 2-3 million workers moved from the transition economies to old members of the EU.

are the economies in which the Communism regime lasted longer. That is, the duration of Communism may be the omitted variable all along.

Alesina and Fuchs-Schündeln (2007) address an interesting question, related to the above on the effects of the duration of the communism spell on society. They investigate to what extent the 45-year-long Communist regime in East Germany influenced individuals' preference in relation to capitalism and the role of the State as a provider of services and redistribution.

Communist regimes typically adopt a policy of tight control over school curricula, the media (press and TV), and promote the State via official government propaganda. In general, the objective of this indoctrination policy is to instill in people's mind the idea that the State is an essential component for a fair and just society, and that capitalism is evil. In this sense, it is plausible to hypothesize that this indoctrination policy bias individuals' preferences in favor of communism and extensive government intervention. Indeed, Alesina and Fuchs-Schündeln (2007) find evidence that East Germans were deeply affected by this indoctrination policy and held true the belief that "social conditions determine individual fortunes", which is one of the pillars of the communism.

Additionally, Alesina and Fuchs-Schündeln (2007) find that the effects of communism on individuals' preferences are deep and persistent. They estimate that it would take about one or two generations for former East and West Germans to converge in terms of preferences towards the role of government in the economy and society. Based on these findings, we can plausibly speculate that the longer a country stays under the Communism regime, the stronger and long-lasting will be the effects on preferences. If this reasoning is correct, we would expect the effect of communism on intrinsic preferences to be stronger in countries that experienced longer spells of communism, such as the former economies of the now extinct Soviet Union. Indeed, as we discuss in sections 4 and 5, the former members of the Soviet Block, on average, are the worst performing economies and present the worst indicators of democracy.

Fuchs-Schündeln and Schündeln (2020) also find long-lasting effects of communism on preferences over economic and political views in Eastern European countries. Based on cohort analysis, they find that older generations, who lived under the communist regime for longer, have preferences aligned with the main pillars of communism. On the other hand, younger generations, i.e., those born in 1960-1974 and, especially those born after 1974, exhibit convergence to the West with respect to preferences over market economy and support for democracy. These results corroborate the findings in Alesina and Fuchs-Schündeln (2007) and imply that the longer the Communist regime stays in place, the harder it is to promote reforms towards democracy and market economy.

Svejnar (2002) discusses the types of reform strategies and initial outcomes of the transition economies. Like many articles in this literature, Svejnar concentrates on analyzing short run economic variables, such as GDP, inflation, exchange rates, and social indicators, such as marriage and divorce rates. He concludes that, as of year 2000, Central Eastern economies, such as Czech Republic, Slovakia, Poland, Slovenia, and Hungary, had better overall performance compared to the Baltics (Latvia, Lithuania, and Estonia). The worst performers were Russia, Ukraine, and the former members of the now extinct Soviet Block (except for the Baltic countries).

Svejnar (2002) observes that the worst performers, in general, are located further east, which suggests that geographic related variables may have been important, at least during the initial stages of the transition. One obvious dimension where geography matters for integration is via international trade. In addition, physical proximity may promote cultural convergence, so that if neighboring countries have good institutions and favorable attitudes towards a market economy, these ideas and attitudes may overflow to a neighboring economy. In fact, Svejnar (2002) emphasizes that Central

Eastern economies benefitted from their geographic proximity and cultural links with Western economies. This is a benefit that Russia and the former members of the Soviet Block did not have.

An additional important point raised by Svejnar (2002) that helps explain the poor performance of Russia and the former members of the Soviet Block is the political turmoil associated with the disintegration of the Soviet Union, which included attempted coups, the presence of organized crime, widespread corruption, and pervasive rent-seeking activity, which led to the emergence of a class of oligarchs.

We can summarize the key points highlighted above as follows: (i) The literature on transition economies concentrates on reform types and strategies, in particular, whether they fall in the category of "fast-track" or "gradual"; (ii) There is an emphasis on short-run macroeconomic variables, typically, associated with internal and external equilibrium, and how they evolve according to the unfolding of the reforms; (iii) The literature identifies that proximity with the West, physically and institutionally, is associated with better reform outcomes, whereas the longer the duration of communism the harder it is to reform; (iv) A branch of the literature focus on the effects of communism on individuals' preference, and finds that the indoctrination policy, typical of Communist regimes, tilts individuals' preference towards a heavy presence of the State and governmental intervention; and (vi) There is no study, to our knowledge, that analyzes the performance of the transition economies, i.e., ex-communist economies, using the long-run growth model.

3. Methodology

We perform growth and level decomposition exercises on the output per worker for a group of 29 ex-Communist economies over the interval 1990-2019. The growth decomposition exercise is carried out as in the classical tradition of growth accounting exercises, introduced in the seminal application of Solow (1957). The level decomposition exercise follows the development accounting literature, as laid out in Caselli (2005) and Hsieh and Klenow (2010). However, instead of working with a single cross-section for each of the 29 countries as is common in the literature, we perform the level decomposition exercise for each year of the sample period (i.e., 1990-2019), following Mello and Rodrigues (2017).

As it is well-known, based on the source of growth, whether it comes from accumulation of inputs or TFP growth, a growth accounting decomposition can tell whether economic growth is sustainable or not. If the source of growth comes from the accumulation of inputs, then growth can be accelerated, however, it tends to be temporary. On the other hand, if the source of growth comes from total factor productivity growth, then growth tends to be moderated, however, it can be sustained.

Alternatively, the level decomposition exercise evaluates the relative contribution of inputs vis-à-vis technology in accounting for cross-country variation in output per worker. If we find that most of the cross-country variation in output per worker comes from factor inputs, then a policymaker should focus on policies aimed at increasing investment rates and accumulation of inputs, to augment the relative productivity of the economy. Alternatively, if differences in technology are responsible for most of the cross-sectional variation in output per worker, then the policymaker should focus on eliminating barriers to the adoption of efficient technologies, and the promotion of best practices on the business environment.

To perform the level decomposition exercises, we assume that the aggregate production function is given by a Cobb-Douglas technology:

$$y = K^{\alpha}\left(AhL\right)^{1-\alpha} \tag{1}$$

where *Y* is output, *K* is physical capital, *A* is Harrod-neutral (labor-augmenting) technological progress, h is human capital per worker, and L is the number of workers. The above production function is commonly used in the literature. See, for instance, Hall and Jones (1999).

We write the production function in per worker terms as follows: $y = A\left(\frac{K}{Y}\right)^{\frac{\alpha}{1-\alpha}} h$, where *y* denotes output per worker. This equation shows that output per worker has two components, a technology component, given by *A*, and a factor input component, denoted by y_{KH}, given by $y_{KH} = \left(\frac{K}{Y}\right)^{\frac{\alpha}{1-\alpha}} h$. This way of breaking down output per worker is the well-known Klenow and Rodriguez-Clare (1997) decomposition.

We follow Caselli (2005) and consider the ratio of the variance of the log of y_{KH}, the factor-only component of output per worker, to the variance of the log of output per worker. We denote this measure of success by S1.

$$S1 = \frac{Var\left(\log\left(y_{KH}\right)\right)}{Var\left(\log\left(y\right)\right)} \tag{2}$$

If all countries have the same technology level *A*, then S1=1. Thus, the closer S1 is to unity, the higher the explanatory power of the factor-only model. To avoid potential problems with the S1 measure caused by extreme values, we also consider a second measure of success for the factor-only model, denoted by S2, which is defined as the ratio of the 90th to 10th percentile of the factor-only model to the ratio of the 90th to 10th percentile of the observed output per worker. Thus, the S2 measure is given by.

$$S2 = \frac{y_{KH}^{90th} / y_{KH}^{10th}}{y^{90th} / y^{10th}} \tag{3}$$

where y_{KH}^{90th} and y_{KH}^{10th} denote, respectively, the level of output per worker of the factor-only model at the 90th and the 10th percentile, and y^{90th} and y^{10th} denote the observed level of output per worker at the 90th and 10th percentile, respectively.

We perform two exercises. In the first growth decomposition exercise, we include all 29 economies over the period 1990-2019. However, due to limited data availability, we do not include human capital in this first exercise. This is the price we pay to have a broader set of countries for the entire sample period. In this case, we assume that technological progress is Hicks-neutral, as in the seminal work of Solow (1957), and write the production function in terms of growth rates as follows:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \alpha\frac{\dot{K}}{K} + \left(1-\alpha\right)\left(\frac{\dot{h}}{h} + \frac{\dot{L}}{L}\right) \tag{4}$$

We assume that α is constant. As usual, the technology or Total Factor Productivity (TFP) term is obtained residually. Since we do not have data on human capital, for this particular exercise, our estimate of the TFP growth is overestimated by the factor $(1-\alpha)\frac{\dot{h}}{h}$. This is still an informative exercise because we can evaluate the role capital and labor in the growth process. Additionally, if the factor $(1-\alpha)\frac{\dot{h}}{h}$ is stable over time and not particularly big, as we suspect it is the case, the growth decomposition exercise gives an idea of the dynamics of TFP growth.

An alternative growth decomposition exercise is performed using data on human capital from Barro-Lee dataset. However, in this case again, we have a restricted set of countries (only 21 countries), and a reduced sample period, from 1990 to 2010. For the alternative growth decomposition, we follow Madsen (2010) and start out with the following production function:

$$Y = AK^{\alpha}\left(hLz\right)^{1-\alpha} \tag{5}$$

where *h* denotes human capital, *z* denotes the annual hours of work, and the remainder of the notation is the same as above. We rewrite this production function in terms of the capital output ratio, following Klenow and Rodriguez-Clare (1997):

$$Y = A^{\frac{1}{1-\alpha}} \left(\frac{K}{Y} \right)^{\frac{\alpha}{1-\alpha}} hLz \tag{6}$$

From the above specification, dividing up both sides of the equation by the population size, denoted by POP, we obtain the following expression:

$$\frac{Y}{pop} = \frac{L}{pop} A^{\frac{1}{1-\alpha}} \left(\frac{K}{Y} \right)^{\frac{\alpha}{1-\alpha}} hz \tag{7}$$

Equation (7) decomposes per capita output as the product of the labor force participation rate, given by the term *L/POP*, the technology or TFP term, given by $A^{\frac{1}{1-\alpha}}$, and the term involving the capital-output ratio and human capital. We assume that human capital is a function of the average number of schooling years of the workforce assuming a Mincerian exponential form as follows:

$$h = e^{\psi u} \tag{8}$$

where *u* denotes the average number of years of schooling of the workforce, and ψ is the parameter determining the returns to education. Taking logs and differentiating with respect to time, we obtain the following expression for the decomposition of per capita GDP growth:

$$g_{Y/POP} = g_{L/POP} + \frac{1}{1-\alpha} g_A + \frac{\alpha}{1-\alpha} g_{K/Y} + \psi \Delta u + g_z \tag{9}$$

where $g_{Y/POP}$ denotes the growth rate of output per capita, $g_{L/POP}$ denotes the growth rate of the labor force participation rate, g_A denotes the growth rate of TFP, $g_{K/Y}$ denotes the growth rate of the capital-output ratio, Δu denotes the absolute change in schooling years, and g_z denotes the growth rate in hours worked. As usual, the TFP term is computed residually.

4. Data and Descriptive Statistics

Our main panel is constructed from the Penn World Tables (PWT) dataset, version 10. It includes 29 ex-Communists economies over the period 1990-2019. As mentioned above, we have a second panel that includes 21 countries over the period 1990-2010, which we use for an alternative growth decomposition exercise, and includes data on schooling years from Barro-Lee (2012) dataset. Table 1 displays the 29 countries in our panel.

For the level decomposition exercises, we use as a measure of output the series RGDPO (output-side real GDP at chained PPP in millions of 2005 USD), the measure used for the aggregate stock of capital is the series CN (capital stock at PPP in millions of 2005 USD), and the measure of workers is the series EMP (number of individuals engaged in production). GDP per worker is calculated as the ratio RGDPO/EMP, and the capital-output ratio is computed as the ratio CN/RGPO. We also use the index of human capital from PWT, which is the series *hc*, based on years of schooling, from Barro-Lee (2012) dataset, and returns to education, from Psacharopoulos (1994). We assume that the capital share is constant across time and space, and we set its value at α=0.4.

For the growth decomposition exercises, we use the series RGDPNA (real GDP at constant 2017 national prices) and RNNA (real capital stock at constant 2017 national prices), as measures of output and capital stock, respectfully. For the panel with 21 countries, used in the alternative growth decomposition, we use data on schooling years from Barro-Lee dataset. Due to lack of data on schooling years, the small panel excludes

the following eight countries: Azerbaijan, Bosnia & Herzegovina, Belarus, Georgia, North Macedonia, Montenegro, Turkmenistan, and Uzbekistan. For the remainder 21 countries, we have a complete set of data, although available for a reduced sample period, i.e., interval 1990-2010.

We initially perform a growth decomposition exercise for the entire sample period, 1990-2019, and for three sub-periods, namely, 1990-1999, 2000-2009, and 2010-2019. Each decade nicely encapsulates the main events of entire period. The first decade captures the immediate aftermath of the transition, the first "shockwave" of transiting from central planning to a decentralized market economy. The second decade captures the boom years in the global economy ending with the Subprime crisis in 2007/8, and the third decade captures the recovery from the global financial crisis.

Table 1 presents basic descriptive information about the ex-Communist economies. As shown in Table 1, most countries have small population numbers, with 13 countries having less than 5 million inhabitants in 2019, and 21 countries having less than 10 million inhabitants. Only three countries have populations between 30 and 50 million (Poland, Ukraine, and Uzbekistan), and only Russia has more than 100 million inhabitants. Estonia and Montenegro are the least populous countries with 1.33 and 0.63 million inhabitants, respectively.

The combined population of the entire set of countries has shown little growth over the 1990-2019 period. The annual average growth of the combined population is close to nill, at 0.02% annually. Seventeen countries present negatives growth rates of population, with large countries such as Russia and Ukraine posting annual growth rates of, respectively, -0.04% and -0.54%. The two fastest growing population are in Tajikistan with 1.98% and Uzbekistan with 1.67%.

In 2019, the GDP per capita at PPP dollars for the group as a whole was $23.631,25. Czech Republic and Slovenia have the highest GDP per capita, with $37.504,22 and $34.102,64, respectively. The two lowest GDP per capita are in Tajikistan and Kyrgyzstan, with $3.889,41 and $6.127,70, respectively.

The per capita GDP for the group as a whole grew at an annual rate of 2.30%, whereas the total GDP grew at an annual rate of 2.32%. As mentioned above, these rates of growth are consistent with the long-run growth rates of successful western economies. Therefore, focusing only on per capita GDP growth performance, we can write that, as a first approximation, the transition process from an economic point of view is a success case.

On the political front, the typical communist country was characterized by an authoritarian regime. However, when the transition to a market-based system started to take place, i.e., right after the fall of the Berlin Wall, there was a general movement towards political openness and democracy. In this sense, having an index of democracy would be helpful to capture the degree of political transition experienced by the ex-Communist economies.

The Economist Intelligence Unit (EIU) constructs an index of democracy since 2006. There are four categories, Full Democracy, Flawed Democracies, Hybrid regimes, and Authoritarian regimes. Full democracies are characterized by a functional system of checks and balances, independent judiciary, efficient government, and an independent press. As of 2019, the United Kingdom was an example of a full democracy.

A Flawed democracy is characterized by having fundamental democratic rights, such as free and fair elections and respect for basic civil rights, but it is not a fully developed democracy, because it may have limited political participation, attempts by the government to constrain the press and political opposition. Brazil and United States are examples of Flawed democracies.

Table 1: Ex-Communists Economies, Region, Population and GDP.

Country (Capital City)	Region/Area	Population, in millions, 2019	Annual POP Growth 1990-2019	GDP per Capita 2019 (PPP $)	GDP per capita Annual % 1990-2019
Albania (Tirana)	Southeast Eu.	2.88	-0.45%	$12,519.83	3.63%
***Armenia (Yerevan)**	Satellite	2.96	-0.62%	$14,718.06	3.45%
***Azerbaijan (Baku)**	Satellite	10.05	1.14%	$15,845.26	2.19%
Bulgaria (Sofia)	Southeast Eu.	7.00	-0.80%	$21,324.08	2.37%
B&H (Sarajevo)	Southeast Eu.	3.30	-1.03%	$13,791.68	6.98%
***Belarus (Minsk)**	Satellite	9.45	-0.25%	$21,645.51	2.67%
Croatia (Zagreb)	Southeast Eu.	4.13	-0.50%	$25,973.97	1.21%
Czech Rep. (Prague)	Central Eu.	10.69	0.11%	$37,504.22	1.90%
***Estonia (Tallin)**	Baltics	1.33	-0.57%	$33,856.48	2.77%
***Georgia (Tbilisi)**	Satellite	4.00	-1.04%	$17,033.42	1.22%
Hungary (Budapest)	Central Eu.	9.68	-0.24%	$29,235.96	1.97%
***Kazakhstan (Astana)**	Satellite	18.55	0.43%	$28,279.59	2.34%
***Kyrgyzstan (Bishkek)**	Satellite	6.42	1.33%	$6,127.70	0.07%
***Lithuania (Vilnius)**	Baltics	2.76	-1.00%	$32,498.90	2.56%
***Latvia (Riga)**	Baltics	1.91	-1.15%	$29,404.51	1.91%
North Macedonia (Skopje)	Southeast Eu.	2.08	0.15%	$15,766.45	1.60%
Montenegro (Podgorica)	Southeast Eu.	0.63	0.07%	$21,809.96	0.94%
Mongolia (Ulaanbaatar)	Satellite	3.23	1.35%	$11,890.34	3.18%
Poland (Warsaw)	Central Eu.	37.88	-0.01%	$31,970.86	3.76%
***R. of Moldova (Chisinau)**	Satellite	4.04	-0.26%	$9,431.026	-0.45%
Romania (Bucharest)	Central Eu.	19.36	-0.66%	$27,866.33	2.92%
***Russian Fed. (Moscow)**	Satellite	145.87	-0.04%	$28,498.48	0.79%
Serbia (Belgrade)	Southeast Eu.	6.99	-1.06%	$17,219.65	1.17%
Slovakia (Bratislava)	Central Eu.	5.46	0.11%	$27,467.72	2.70%
Slovenia (Ljubljana)	Central Eu.	2.08	0.12%	$34,102.64	2.01%
***Turkmenistan (Ashgabat)**	Satellite	5.94	1.66%	$26,001.56	2.57%
***Ukraine (Kiev)**	Satellite	43.99	-0.54%	$13,116.94	-1.02%
***Uzbekistan (Tashkent)**	Satellite	32.98	1.67%	$12,553.50	2.61%
***Tajikistan (Dushanbe)**	Satellite	9.32	1.98%	$3,889.41	-0.48%
All Countries	--	414.97	0.02%	$23,631.25	2.30%

Notes: Starred countries consist of the 15 members of the now extinct Union of the Soviet Socialist Republic (USSR). We also dubbed some of these economies "satellite", in a reference to their historical links with the Russian economy. GDP per capita is measured as RGDPO/POP from PWT version 10. The growth rate of GDP is computed as the geometric annual average growth rate of RGDPNA from PWT version 10. The last line "All Countries" displays the total GDP of the 29 countries divided by the total population. Similarly, the last cell displays the average growth rate of the total GDP of the combined 29 countries.

A Hybrid regime is characterized by regular electoral frauds, non-independent judiciary, weak enforcement of the rule of law, and a dysfunctional government. Examples of Hybrid regimes include Armenia and Ukraine. Finally, an Authoritarian regime is exemplified by an Absolutist Monarchy or a Dictatorship, in which case there are no guarantees of civil liberties, the media is biased and state-controlled, the judiciary is not independent, and criticism of government is suppressed or censored. Examples of Authoritarian regimes include Russia and Kazakhstan.

The first column of Table 2 displays the 2019 GDP relative to the U.S. GDP, where we observe that most of the ex-Communist economies are rather small. Twenty-one economies have a GDP that is less than 1% of the U.S. GDP. Six economies have relative GDPs that are between 1% and 6% of the U.S. GDP. Only Russia and Poland have GDPs that are more than 5% of the U.S. GDP. The combined GDP of the 29 ex-Communists economies reaches 47.61% of the U.S. GDP in 2019.

Column (2) in Table 2 shows that Czech Republic and Slovenia enjoy the highest per capita GDP in 2019, respectively, at 59.92% and 54.09% of the U.S. per capita GDP level. The two lowest relative per capita GDP belong to Tajikistan and Kyrgyzstan, respectively, at 6.21% and 9.79% of the U.S. per capita GDP level. Five countries have relative per capita GDP that is less than or equal to 20% of the U.S. per capita GDP level, 11 countries have relative per capita GDP in the 20.01% to 40% range, and the remaining 13 have relative per capita GDP in the 40.01% to 60% range.

Table 2: Relative GDP, EU status, and Political Regime.

Country	Relative GDP, 2019	Relative per capita GDP, 2019	European Union Status	Democracy Index, EIU, 2006/2019	Type of Regime	Years under Com.
	Col. (1)	Col. (2)	Col. (3)	Col. (4)	Col. (5)	Col. (6)
Albania	0.18%	20.00%	Candidate	5.91/5.89	Hybrid	46
***Armenia**	0.21%	23.51%	No	4.15/5.54	Hybrid	71
***Azerbaijan**	0.77%	25.32%	No	3.31/2.75	Authoritarian	70
Bulgaria	0.72%	34.07%	Member/2007	7.10/7.03	Flawed Dem.	44
B&H	0.22%	22.03%	No	5.78/4.86	Hybrid	47
***Belarus**	0.99%	34.58%	No	3.34/2.48	Authoritarian	70
Croatia	0.52%	41.50%	Member/2013	7.04/6.57	Flawed Dem.	47
Czech Rep.	1.95%	59.92%	Member/2004	8.17/7.69	Flawed Dem.	45
***Estonia**	0.22%	54.09%	Member/2004	7.74/7.90	Flawed Dem.	51
***Georgia**	0.33%	27.21%	No	4.90/5.42	Hybrid	70
Hungary	1.37%	46.71%	Member/2004	7.53/6.63	Flawed Dem.	45
***Kazakhstan**	2.55%	45.18%	No	3.62/2.94	Authoritarian	66
***Kyrgyzstan**	0.19%	9.79%	No	4.08/4.89	Hybrid	55
***Lithuania**	0.44%	51.92%	Member/2004	7.43/7.50	Flawed Dem.	51
***Latvia**	0.27%	46.98%	Member/2004	7.37/7.49	Flawed Dem.	51
N. Macedonia	0.16%	25.19%	Candidate	6.33/5.97	Hybrid	47
Montenegro	0.07%	34.85%	Candidate	6.57/5.65	Hybrid	47
Mongolia	0.19%	19.00%	No	6.60/6.50	Flawed Dem.	66
Poland	5.88%	51.08%	Member/2004	7.30/6.62	Flawed Dem.	44
***R. of Moldova**	0.19%	15.07%	No	6.50/5.75	Hybrid	51
Romania	2.62%	44.52%	Member/2007	7.06/6.49	Flawed Dem.	43
***Russian Fed.**	20.18%	45.53%	No	5.02/3.11	Authoritarian	75
Serbia	0.58%	27.51%	Candidate	6.62/6.41	Flawed Dem.	47
Slovakia	0.73%	43.88%	Member/2004	7.40/7.17	Flawed Dem.	45
Slovenia	0.34%	54.49%	Member/2004	7.96/7.50	Flawed Dem.	47
***Turkmenistan**	0.75%	41.54%	No	1.83/1.72	Authoritarian	67
***Ukraine**	2.80%	20.96%	No	6.94/5.90	Hybrid	71
***Uzbekistan**	2.01%	20.06%	No	1.85/2.01	Authoritarian	67
***Tajikistan**	0.18%	6.21%	No	2.45/1.93	Authoritarian	66
United States	--	--	No	8.22/7.96	Flawed Dem.	--
U. Kingdom	--	--	No	8.08/8.52	Full Dem.	--

Notes: Starred countries listed above consists of the 15 members of the now extinct Union of the Soviet Socialist Republic (USSR). Column (1) displays the GDP relative to the U.S. GDP, where GDP is measured as RGDPO from the PWT version 10. Column (2) displays the per capita GDP relative to the U.S. per capita GDP, both measured as RGDPO/POP, from PWT version 10. Information on country EU status in Column (3) can be obtained on the official website of the European Union. Data in Columns (4) and (5) was collected from the EIU, as detailed in the text. Column (6) gives the approximate number of years each country passed under socialist rules. This data was constructed based on information from the "The World Factbook", at the CIA website (www.cia.gov). We imputed 47 years under communism for all former six members of the now extinct Yugoslavia. The former Yugoslavia consisted of the following six countries: Bosnia & Herzegovina, Croatia, North Macedonia, Montenegro, Serbia, and Slovenia.

Column (3) shows the European Union (EU) status of the ex-Communists countries. There are 11 member countries, four candidate countries, and 14 countries that are not engaged in negotiations with the EU. Among the 29 ex-Communist economies, the first countries to be admitted to the EU, in 2004, were the following: Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia, and Slovenia. In 2007, Bulgaria and Romania joined the EU, and in 2013 Croatia was admitted to the EU. Albania, Montenegro, North Macedonia, and Serbia, currently have "candidate to admission" status.

Column (4) displays the index of Democracy from EIU. The average index of democracy decreases from 5.79 in 2006, to 5.56 in 2019. The index decreases in 22 countries, and it increases in the remaining 7 countries. The highest scores are in Czech Republic (7.69) and Latvia (7.49), whereas the lowest scores are on Turkmenistan (1.72) and Tajikistan (1.93). Over the period 2006-2019, Armenia and Kyrgyzstan experienced the highest increases in the scores, respectively, +1.39 and +0.81, whereas Russia and Ukraine present the steepest decreases, respectively, -1.91 and -1.04. Column (5) presents the type of political regime based on the EIU index of democracy. There are 13 Flawed Democracies, nine Hybrid regimes, and seven Authoritarian states.

Column (6) displays the estimated number of years spent under the Communist regime. We group countries in two distinct categories. Some countries like those in Central Europe, e.g., Czech Republic and Hungary, spent about 45 years under

communism, which is about two generations. On the other hand, countries that belonged to the now extinct Soviet Union, on average, spent about 70 years under Communist rules. That is almost three generations under central planning and political repression. Naturally, the longer a country stays under the spell of communism, the harder it is to transit from central planning and political repression to democracy and market economy. The reason being is that, as mentioned in section 2, the deep-rooted indoctrination of individuals with the fundamental tenets of central planning and the social benefits of large government, typical of communism, bias individual's preference towards a big and interventionist state, which makes reforms harder to implement.

In this sense, all else equal, one would expect to see faster transition towards a market driven economy in countries in which the communism spell was shorter. In fact, as we discuss below, the picture that emerges in our investigation is consistent with this view, that is, the shorter the time span under communism, the better the overall economic performance of the economy.

Table 3: Political Regimes and Economic Performance.

	Flawed Democracy	Hybrid	Authoritarian
Avg per capita GDP growth rate up to 1.00%	Zero	4	2
1.01% to 2.00%	5	2	Zero
2.01% and above	8	3	5
Relative per capita GDP up to 20.00%	1	3	1
20.01% to 40.00%	2	6	3
40.01% and above	10	Zero	3

Notes: Average per capita growth rates are calculated over the interval 1990-2019. Classification of political regime is obtained from Table 2, as well as data on relative per capita GDP.

Table 3 displays the relation between political regime, average growth rates of per capita GDP and relative per capita GDP in 2019. Of the 13 countries in the Flawed Democracy category, ten are in the highest relative per capita GDP bracket (40.01% and above), and eight are in the fastest growing bracket (above 2%). Of the nine countries in the Hybrid regime category, none are in the highest relative per capita GDP bracket, six are in the 20.01%-40%, and the remaining three are in the lowest relative per capita GDP bracket. Moreover, three in the Hybrid regime category are in the fastest growing bracket (above 2%), two in the middle bracket (1.01% to 2%), and four in the lowest growth bracket. Of the seven countries with Authoritarian regime, three are in the highest relative per capita GDP bracket, three in the middle bracket, and one in the lowest bracket.

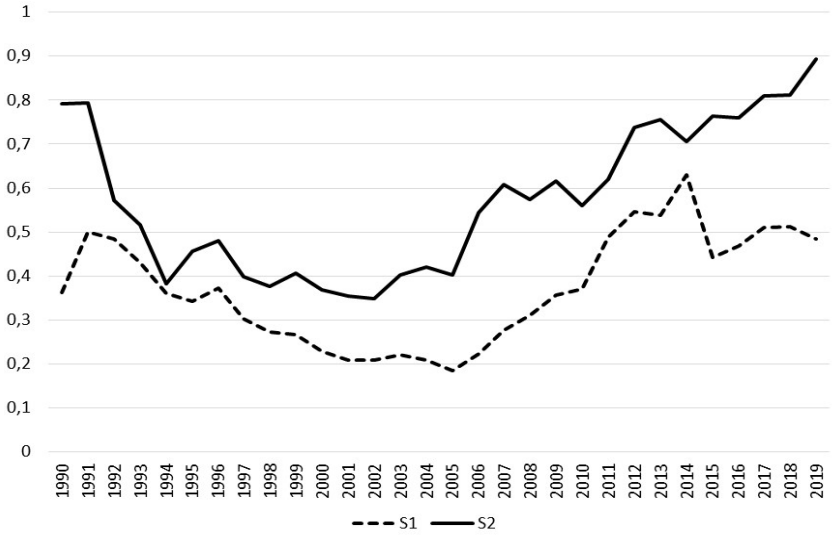
Five authoritarian countries are in the fastest growth bracket and two in the lowest growth bracket. The five authoritarian countries in the group of fastest growing economies are: Azerbaijan, Belarus, Kazakhstan, Turkmenistan, and Uzbekistan. These five countries have their economies dependent on the oil and gas industries and/or staple products like cotton or similar. They cannot be considered modern industrial economies enjoying a solid growth path.

Although Table 3 only establishes simple correlations, and not causality, it suggests that democracies, albeit flawed, are associated with high relative GDP per capita and fast growth, more so than autocratic regimes.

5. Level Decomposition Exercises

Figure 1 displays S1 and S2 measures for the 29 ex-Communists economies computed for each year over the interval 1990-2019. The measures S1 and S2 displayed in Figure 1 are constructed assuming that the level of human capital is fixed across countries.

Figure 1: S1 and S2 - ex-Socialists Economies, 1990-2019.



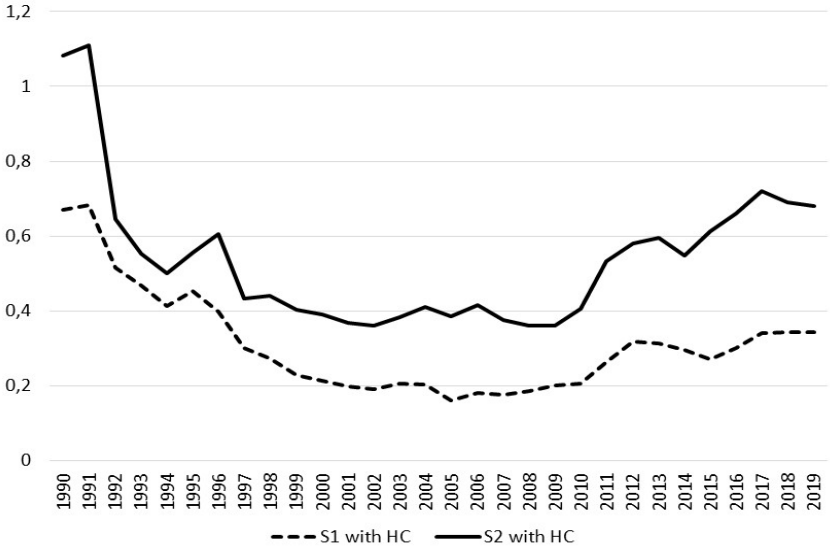
We observe that both measures, S1 and S2, exhibit a U-shaped form over the period 1990-2019. In the beginning of the 1990s, the S1 measure shows that about 40%-50% of the cross-country variation in GDP per worker among the 29 ex-Communists economies can be accounted for by the cross-country variation in inputs. This estimate is in line with general estimates from the development accounting literature (see Hsieh and Klenow, 2010). However, the S1 measure decreases over time, reaching a low of 20% in the mid-2000s, when it starts an increasing trend and end up in the 50%-60% range towards the end of the sample period.

The S2 measure, which is robust to extreme values, suggests that cross-country variation in factor inputs can account for up to 80% of the cross-country variation in GDP per worker in the early 1990s. The S2 measure decreases to a low around 35% in the early 2000s, when it reverses trend and increases somewhat continuously reaching 90% in 2019. This estimate is well above traditional estimates in the literature.

The U-shaped curve displayed by both measures, S1 and S2 is in contrast with the general pattern of estimates that emerges in the literature, which suggests that S1 and S2, are decreasing over time. More specifically, Mello and Rodrigues (2017) and Arezki and Cherif (2010), find that the explanatory power of factor inputs is decreasing over time, from a high of 50% in the 1970s, to a low of 20% in the mid-2000s. That is, for broad samples, technology is the key factor explaining cross-country variation in GDP per worker, whereas for our sample of ex-Communists economies the key explanatory variable is factor inputs.

As mentioned above, the measures S1 and S2 displayed in Figure 1 assume that countries have the same level of human capital, which underestimates the explanatory role of the factors-only model in accounting for the international variation in GDP per worker. Consequently, this overestimates the explanatory role of the technology component. In this sense, to have a more accurate role of factor inputs in accounting for the international variation in GDP per worker, we compute measures S1 and S2 taking account the cross-country variation in human capital. To construct the S1 and S2 measures with human capital data, we must work with a reduced panel of only 21 countries, as explained in section 4. Figure 2 displays the S1 and S2 measures constructed with the inclusion of data on human capital.

Figure 2: S1 and S2 with HC - ex-Socialists Economies, 1990-2019.



We observe in Figure 2 the same U-shaped pattern as in Figure 1, which suggests that cross-country variation in human capital does not affect the dynamic evolution of S1 and S2. However, it does affect the level of both curves, shifting them up, as expected. According to the S1 measure of success, the factor-only model explains about 50% of the international variation in GDP per worker in the final years of the sample period, which is about ten percentage points higher than the estimate in Figure 1. Similarly, the S2 measure in Figure 2 suggests that about 80-90% of the international variation in GDP per worker is accounted for the factor-only model, which is 10-15 percentage points higher than the estimate of S1 without human capital variation.

The improved fit of the factor-only model with the inclusion of human capital data is consistent with the development account literature that suggests that cross-country variation in human capital accounts for 10%-30% of the cross-country variation in GDP per worker (see again, Hsieh and Klenow, 2010). Ultimately, adding cross-country variation in human capital confirms the initial estimates we obtain in Figure 1.

Table 4: Growth Decomposition for the Baltic Countries, 1990-2019.

Country		%∆Y	%∆K	%∆L	%∆TFP
		Col. (1)	Col. (2)	Col. (3)	Col. (4)
Latvia	1990-2019	0.75%	0.37%	-1.15%	1.29%
	1990-1999	-5.43%	-1.11%	-2.90%	-3.25%
	2000-2009	4.82%	1.75%	-0.62%	4.49%
	2010-2019	2.50%	0.35%	-0.09%	2.42%
Lithuania	1990-2019	1.53%	1.64%	-0.73%	1.32%
	1990-1999	-3.86%	0.86%	-1.68%	-3.19%
	2000-2009	4.55%	2.31%	-1.04%	4.25%
	2010-2019	3.57%	1.67%	0.45%	2.63%
Estonia	1990-2019	2.19%	2.07%	-0.71%	1.78%
	1990-1999	-1.62%	0.36%	-3.66%	0.44%
	2000-2009	4.15%	3.53%	-0.03%	2.76%
	2010-2019	3.73%	2.18%	1.31%	2.07%

Notes: Column (1) displays the annual average growth of Real GDP. Column (2) displays the annual average growth of the real capital stock. Column (3) displays the annual average growth of the work force. Column (4) displays the annual average TFP growth.

4. Growth Decomposition Exercises

Table 4 shows that the best performing country in the Baltics is Estonia with an annual growth rate of total GDP of 2.19% over the period 1990-2019. Latvia exhibits a mediocre performance, with annual growth rate of GDP of 0.75%. The three Baltic countries exhibit a shrinking labor force over the period 1990-2019, with Latvia having its labor force decreasing at 1.15% annually. From 1990 to 2019, Latvia lost 28.5% of its labor force or 357,664 workers. However, in the last decade the labor force in Estonia and Lithuania posted positive growth, and Latvia presented a slower rate of decrease of its labor force with an annual growth rate of -0.09%. The three Baltic economies exhibit comparable TFP growth rates, ranging from 1.3% to 1.8% annually over the period 1990-2019.

Table 5: Growth Decomposition for Central Europe Countries, 1990-2019.

Country		%ΔY/L	%ΔK	%ΔL	%ΔTFP
Czech Republic	1990-2019	2.01%	0.75%	0.04%	1.69%
	1990-1999	0.12%	1.18%	-1.05%	0.28%
	2000-2009	3.35%	0.79%	0.44%	2.77%
	2010-2019	2.41%	0.34%	0.64%	1.89%
Hungary	1990-2019	1.73%	1.97%	-0.29%	1.12%
	1990-1999	-0.22%	1.60%	-2.46%	0.62%
	2000-2009	2.45%	2.69%	-0.36%	1.59%
	2010-2019	2.78%	1.58%	1.78%	1.09%
Poland	1990-2019	3.75%	3.41%	0.24%	2.25%
	1990-1999	3.62%	3.20%	-0.18%	2.45%
	2000-2009	3.99%	3.55%	0.59%	2.22%
	2010-2019	3.63%	3.45%	0.26%	2.10%
Slovakia	1990-2019	2.82%	1.69%	0.03%	2.12%
	1990-1999	0.79%	1.91%	-1.80%	1.11%
	2000-2009	4.49%	1.60%	0.67%	3.45%
	2010-2019	2.99%	1.58%	1.05%	1.73%
Slovenia	1990-2019	2.14%	1.57%	-0.26%	1.66%
	1990-1999	1.52%	1.90%	-2.42%	2.22%
	2000-2009	2.95%	2.60%	0.84%	1.40%
	2010-2019	1.88%	0.27%	0.61%	1.41%
Romania	1990-2019	2.23%	2.23%	-0.78%	1.81%
	1990-1999	-1.58%	0.16%	0.12%	-1.71%
	2000-2009	4.90%	3.39%	-1.74%	4.59%
	2010-2019	3.10%	2.97%	-0.63%	2.29%

Notes: Same as Table 4.

Table 5 displays the growth decomposition exercises for six countries in Central Europe. These are the overall best performers with the highest scores on the index of democracy, among the highest GDP per worker, solid growth rates and all six countries have the longest EU membership in the group (since 2004). All six countries exhibit annual GDP growth rates above 2%, with Poland posting the best performance growing strongly at 3.75% annually. Additionally, albeit modest, Poland shows an increasing work force over the period 1990-2019, with an annual growth rate of 0.24%. Hungary, Slovenia, and Romania had a relatively small decrease in their work force, posting negative annual average growth rate of total employment of 0.29%, 0.26% and 0.78%, respectively, over the period 1990-2019. Czech Republic and Slovakia present a somewhat stable labor force, with annual growth rates of 0.04% and 0.03%, respectively. The TFP growth of the six Central European countries range from 1.12% (Hungary) to 2.25% (Poland), which is consistent with traditional estimates for western economies. It seems that the bottleneck of long-run growth will be determined by the dynamics of the work force, rather than TFP growth.

Table 6: Growth Decomposition for Russia and its Satellite Economies, 1990-2019.

Countries		%ΔY/L	%ΔK	%ΔL	%ΔTFP
Russia	1990-2019	0.75%	-0.14%	-0.17%	0.90%
	1990-1999	-5.33%	-0.87%	-1.68%	-3.97%
	2000-2009	5.37%	-0.17%	0.78%	4.97%
	2010-2019	1.87%	0.56%	0.26%	1.49%
Ukraine	1990-2019	-1.56%	-1.05%	-1.43%	-0.28%
	1990-1999	-9.48%	-1.18%	-2.61%	-7.44%
	2000-2009	4.50%	-0.83%	0.22%	4.70%
	2010-2019	0.01%	-1.15%	-2.00%	1.67%
Belarus	1990-2019	2.42%	2.15%	-0.60%	1.92%
	1990-1999	-1.96%	0.76%	-1.73%	-1.22%
	2000-2009	7.19%	2.16%	0.31%	6.14%
	2010-2019	1.79%	3.40%	-0.48%	0.71%
Kazakhstan	1990-2019	2.78%	1.24%	0.53%	1.96%
	1990-1999	-4.97%	0.15%	-2.60%	-3.47%
	2000-2009	8.52%	0.91%	2.58%	6.61%
	2010-2019	4.45%	2.57%	1.38%	2.60%
Uzbekistan	1990-2019	4.32%	8.11%	2.18%	-0.23%
	1990-1999	-0.62%	7.50%	1.29%	-4.39%
	2000-2009	6.52%	6.43%	2.75%	2.30%
	2010-2019	6.74%	10.37%	2.42%	1.14%

Notes: Same as Table 4.

Table 6 displays the growth decomposition exercises for five of the former 15 member countries of the now extinct Soviet Union. In general, ex-Soviet economies experienced limited institutional and economic reforms, especially when compared to Central European economies. For instance, four of the five economies listed in Table 6 are characterized by having an authoritarian regime as measured by the EIU index of democracy, and one is considered to have a hybrid political regime. On the economic front, a common pattern among ex-Soviet member countries is to have the government playing a large role in organizing and controlling economic activity, and the economy being heavily dependent on extractive industries, such as oil and gas.

Russia is the biggest economy in the ex-Soviet block and according to estimates in Table 6, Russia's economic performance over the period 1990-2019 is mediocre; its annual growth rate of GDP is 0.75%, TFP growth is 0.90% and it presents a decreasing labor force with negative growth of 0.17% annually.

Ukraine is the second biggest economy in the ex-Soviet Union. It has a strong industrial sector, as well as a productive agricultural sector. The Ukrainian economy suffers from an incomplete set of reforms; it has an economy dominated by Russian style oligarchs, and the country is facing military conflict, after the invasion and annexation of Crimea by Russian forces in March 2014[7]. Its growth performance over the period 1990-2019 can be considered an economic disaster, with annual GDP growth rate of -1.56%, an annual decrease in its labor force at the rate of 1.43%, and negative TFP growth. In the most recent period, 2010-2019, Ukraine experienced stability in its GDP, with annual growth of 0.01%, but a decrease of 2.00% annually in its labor force.

Kazakhstan's economy experienced high annual average growth rate of GDP of 2.78% over the period 1990-2019, with TFP growth of 1.96%. In the most recent period, 2010-2019, the average GDP growth rate is 4.45% and TFP growth is 2.60%. Despite

these impressive numbers, its economy relies heavily on vast reserves of fossil fuels and extractive industries. It is unlikely that this recent economic performance will be replicated in the future without the diversification of the economy and heavy investment in human capital. Similarly, Uzbekistan has a strong performance over the period 1990-2019, and even stronger in the most recent period with annual average growth rate of GDP of 6.74% over the period 2010-2019, and TFP growth of 1.14%. Its economy is largely driven by state investment and relies heavily on the production and exports of cotton. With an economic structure close to a command economy, it is unlikely that this growth performance will continue in the future. Belarus also has a large chunk of its economy linked to the State and, despite good overall performance, to keep up with growth it will need profound economic reforms to make its outdated and inefficient industry efficient again.

Table 7 displays the growth decomposition exercises for eight economies that we label Satellite, in a reference to their link with the Russian economy. Except for Mongolia, the other seven economies were members of the Soviet Union (hence, the "satellite" label). The best growth performers listed on Table 7 include Azerbaijan, Mongolia, and Turkmenistan with annual average growth rate of GDP of 3.35%, 4.58% and 4.27%, respectively. Despite excellent growth performance over the period 1990-2019, these three economies have in common an economic structure that is hardly consistent with sustainable long-run growth: economies largely based on extractive industries (mostly oil and gas), heavy state presence, and highly dependent on the Chinese and Russian economies.

Tajikistan and Kyrgyzstan are the two poorest ex-Soviet economies. Their recent growth performance is good, with GDP growth of 7.06% and 4.11%, respectively, over the period 2010-2019. However, these two countries have different prospects. Kyrgyzstan is making efforts to reform, having taken concrete steps to improve its economy like joining the World Trade Organization in 1998 and joining the Eurasian Economic Union in 2015. Many challenges remain though, like fighting corruption, diversification of the economy, among others. Tajikistan, on the other hand, has a more complex reality, having to deal with a large informal economy, civil war (1992-97), and a difficult business environment that chases away foreign investment.

Table 8 displays the growth decomposition exercise for seven countries in the Southeast Europe. Bulgaria and Croatia are two of biggest economies listed in Table 8. Bulgaria's growth performance over the period 1990-2019 is less than stellar with annual growth of GDP of 1.55%, and annual TFP growth of 0.30%, which suggests that future growth prospects are limited, unless substantial economic reforms are commissioned along the way. Despite having the highest per capita GDP among the seven countries listed on Table 8, Croatia has the worst growth record over the period 1990-2019, with low GDP and TFP growth and a decrease in its labor force of 0.62% per year, on average. However, Croatia joined the EU in 2013 and is commissioning a number of general economic reforms, including joining the Eurozone in the next few years, which could boost the economy's productivity. In any case, the challenge of dealing with a decreasing labor force remains.

What are the general lessons that can be drawn from the growth decomposition exercises above? First, these 29 economies are at some stage in the transition from an authoritarian centrally planned economy to a democratic market driven economy. The speed of transition varies across countries, and the transition may never be completed in some cases. One plausible determinant of the speed of transition is time spent under communist rules, which instills among the people preferences for large government and policy interventionism, particularly in older generations and in groups with vested interests.

[7] This analysis considers data for up to 2019 and, therefore, it excludes the large-scale invasion of Ukraine by Russian forces in February of 2022, which is still unfolding as of February of 2024.

Table 7: Growth Decomposition for Russia's Satellite Economies, 1990-2019 .

Countries	Period	%ΔY	%ΔK	%ΔL	%ΔTFP
Armenia	1990-2019	2.82%	2.51%	-2.18%	3.12%
	1990-1999	-4.83%	-0.18%	-2.58%	-3.21%
	2000-2009	8.51%	4.97%	-2.30%	7.90%
	2010-2019	4.44%	2.53%	-1.71%	4.45%
Azerbaijan	1990-2019	3.35%	4.97%	0.90%	0.82%
	1990-1999	-6.81%	0.74%	-0.07%	-7.07%
	2000-2009	15.43%	6.22%	1.13%	12.27%
	2010-2019	1.56%	7.66%	1.55%	-2.43%
Georgia	1990-2019	0.17%	4.97%	0.90%	1.53%
	1990-1999	-10.45%	0.74%	-0.07%	-6.15%
	2000-2009	5.83%	6.22%	1.13%	6.47%
	2010-2019	4.88%	7.66%	1.55%	4.24%
Kyrgyzstan	1990-2019	1.40%	1.70%	1.48%	-0.17%
	1990-1999	-4.98%	-0.56%	0.34%	-4.96%
	2000-2009	4.71%	1.25%	2.31%	2.83%
	2010-2019	4.11%	4.25%	1.70%	1.40%
R. of Moldova	1990-2019	-0.71%	-0.87%	-1.25%	0.38%
	1990-1999	-11.28%	-1.86%	-3.53%	-8.41%
	2000-2009	4.64%	-1.00%	-1.49%	5.93%
	2010-2019	4.25%	0.17%	1.10%	3.52%
Mongolia	1990-2019	4.58%	2.73%	2.35%	2.08%
	1990-1999	-0.15%	2.56%	1.66%	-2.17%
	2000-2009	5.95%	2.01%	2.69%	3.52%
	2010-2019	7.63%	3.59%	2.63%	4.61%
Tajikistan	1990-2019	1.49%	-1.75%	1.12%	1.52%
	1990-1999	-10.97%	-2.38%	-1.22%	-9.29%
	2000-2009	8.25%	-1.90%	2.44%	7.55%
	2010-2019	7.Z06%	-1.03%	1.93%	6.31%
Turkmenistan	1990-2019	4.27%	4.83%	2.72%	0.71%
	1990-1999	-3.21%	2.94%	2.84%	-6.10%
	2000-2009	7.34%	2.49%	2.86%	4.62%
	2010-2019	8.33%	9.00%	2.47%	3.24%

Notes: Same as Table 4.

Second, there are three distinct groups in the sample. The first group can be identified as the EU-members/East/Central European countries, which consists of 11 EU member countries that, on average, spent less time under Communist rules[8]. This group has advanced reforms on the economic and political front, and has the best overall performances among the ex-Communist Block. The other identifiable group is the non-EU-members/Southern European countries, some of which are EU candidates, namely: Albania, Bosnia & Herzegovina, North Macedonia, Montenegro, Republic of Moldova, e Serbia. This group includes five of the former six members of the now extinct Yugoslavia. Some of its members are EU candidates (Albania, North Macedonia, Montenegro, and Serbia). This group has a mixed performance record, with some countries advancing economic and political reforms and posting good performance, like Albania, while others still dealing with their turbulent political and economic history, like Serbia.

The third identifiable group consists of countries from the Commonwealth of Independent States. All these countries were part of the Soviet Union and spent more time under the spell of communism, with the corresponding effects on the political life and economic organization system. Given the extended length of time these countries spent under communism it is not surprising that they exhibit institutional inertia translated as a low speed of transition. Most likely, a plausible hypothesis for the cause of the low speed of transition is the existence of groups with vested interests in maintaining

[8] Recall that the 11 EU-East/Central European member countries are: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovakia, and Slovenia.

the status quo and intrinsic preferences for heavy state intervention[9].

Table 8: Growth Decomposition for Russia's Satellite Economies, 1990-2019.

Country		%ΔY/L	%ΔK	%ΔL	%ΔTFP
Albania	1990-2019	3.16%	2.49%	-0.71%	2.59%
	1990-1999	0.79%	0.16%	-3.63%	2.91%
	2000-2009	5.90%	4.34%	-0.53%	4.48%
	2010-2019	2.60%	2.79%	1.79%	0.41%
Bosnia and Herzegovina	1990-2019	5.88%	6.11%	-3.04%	5.26%
	1990-1999	12.46%	7.24%	-10.03%	15.58%
	2000-2009	4.06%	7.67%	0.08%	0.95%
	2010-2019	2.02%	3.58%	0.49%	0.30%
Bulgaria	1990-2019	1.55%	4.05%	-0.62%	0.30%
	1990-1999	-2.86%	0.71%	-3.09%	-1.29%
	2000-2009	4.89%	8.11%	1.09%	0.99%
	2010-2019	2.32%	3.14%	-0.06%	1.10%
Croatia	1990-2019	0.70%	1.25%	-0.62%	0.58%
	1990-1999	-2.07%	0.27%	-3.11%	-0.31%
	2000-2009	2.98%	2.54%	1.42%	1.12%
	2010-2019	0.98%	0.86%	-0.38%	0.86%
Macedonia	1990-2019	1.75%	1.85%	-0.38%	1.23%
	1990-1999	-0.63%	1.16%	-4.97%	1.88%
	2000-2009	3.09%	1.28%	1.61%	1.61%
	2010-2019	2.58%	3.06%	1.90%	0.21%
Montenegro	1990-2019	1.01%	2.32%	1.15%	-0.61%
	1990-1999	-4.59%	-0.25%	0.12%	-4.57%
	2000-2009	4.42%	3.13%	1.73%	2.13%
	2010-2019	2.86%	3.87%	1.51%	0.40%
Serbia	1990-2019	0.10%	-0.17%	-1.58%	1.12%
	1990-1999	-7.20%	-1.36%	-4.15%	-4.16%
	2000-2009	5.24%	0.40%	-1.83%	6.18%
	2010-2019	1.92%	0.34%	1.05%	1.16%

Notes: Same as Table 4.

Based on our analysis, we conclude that the ex-Communist countries are at different stages in the transition from political repression and economic controls to political openness and a market driven economy. Although we do not have the benefit of a counterfactual, the economic performance of most of the ex-Communist economies suggest that reforms bring forth economic progress, which in general comes with improvements in well-being. It is encouraging that the level of income for many of these countries, especially those in the first group, is converging to the income level of successful western economies.

7. Alternative Growth Decomposition

As discussed above, we perform an alternative growth decomposition exercise based on an extension of the Klenow and Rodriguez-Clare (1997) breakdown, following Madsen (2010). For convenience, we repeat below the growth decomposition in equation (9).

$$g_{Y/POP} = g_{L/POP} + \frac{1}{1-\alpha} g_A + \frac{\alpha}{1-\alpha} g_{K/Y} + \psi \Delta u + g_z \quad (9)$$

[9] This is the mechanism described in Alesina and Fuchs-Schündeln (2007), where individuals in the former German Democratic Republic exhibit preferences for heavy state intervention because of the indoctrination policies to instill communist ideas, and the control of the press and the schools.

Table 9: Alternative Growth Decomposition for Central and Eastern Europe, 1990-2010.

Country		Y/POP	L/POP	K/Y	Δu	Av.Hrs	%ΔTFP
		Col. (1)	Col. (2)	Col. (3)	Col. (4)	Col. (5)	Col. (6)
Bulgaria	1990-2010	2.00%	-0.28%	3.37%	0.08	-0.26%	-4.50%
	1990-1999	-1.86%	-2.10%	3.67%	0.04	-0.61%	-3.07%
	2000-2010	5.28%	1.24%	3.13%	0.04	-0.14%	-0.82%
Czech Rep.	1990-2010	1.74%	-0.39%	-0.88%	0.10	-0.18%	-4.95%
	1990-1999	0.15%	-1.02%	1.06%	0.07	0.33%	-4.17%
	2000-2010	3.06%	0.12%	-2.44%	0.03	-0.46%	1.10%
Hungary	1990-2010	1.40%	-1.11%	0.93%	0.21	-0.33%	-12.35%
	1990-1999	-0.08%	-2.33%	1.82%	0.17	0.37%	-10.46%
	2000-2010	2.62%	-0.11%	0.21%	0.03	-0.91%	0.36%
Poland	1990-2010	3.76%	0.03%	-0.39%	0.11	-0.11%	-4.60%
	1990-1999	3.44%	-0.36%	-0.40%	0.07	0.40%	-2.40%
	2000-2010	4.03%	0.35%	-0.38%	0.03	-0.29%	0.72%
Slovakia	1990-2010	2.77%	-0.67%	-1.12%	0.07	-0.06%	-1.91%
	1990-1999	0.56%	-2.02%	1.11%	0.04	-0.07%	-1.50%
	2000-2010	4.60%	0.46%	-2.91%	0.02	-0.06%	2.11%
Slovenia	1990-2010	2.13%	-0.88%	-0.04%	0.06	-0.29%	-1.57%
	1990-1999	1.63%	-2.32%	0.37%	0.03	-0.37%	0.50%
	2000-2010	2.54%	0.32%	-0.37%	0.02	-0.26%	0.27%
Romania	1990-2010	2.19%	-0.43%	0.40%	0.10	0.07%	-4.96%
	1990-1999	-1.01%	0.70%	1.76%	0.05	0.37%	-5.55%
	2000-2010	4.87%	-1.35%	-0.71%	0.04	-0.05%	1.76%
Croatia	1990-2010	0.95%	-0.42%	0.98%	0.08	0.07%	-4.65%
	1990-1999	-1.31%	-2.36%	2.39%	0.04	0.00%	-2.89%
	2000-2010	2.84%	1.20%	-0.16%	0.03	0.09%	-1.11%

Notes: Column (1) displays the annual average growth rate of Real GDP at constant 2017 national prices. Column (2) displays the annual average growth rate of the capital stock at constant 2017 national prices.

Table 9 displays estimates of the components in equation (9) for selected Central and Eastern European countries[10]. Since the methodology, the sample period and the dataset differ from the growth decomposition of section 6, TFP estimates shown in Tables 9 and 10 are not directly comparable with TFP estimates in Tables 4 to 8. In any case, this alternative decomposition can be informative once it includes explicitly the role of the employment ratio, L/POP, the role of human capital and workhours in the growth process.

All eight countries included in Table 9 present positive annual growth rate in per capita GDP over the period 1990-2010. The best performer is Poland with annual per capita GDP growth of 3.74%. Bulgaria, Slovakia, Slovenia, and Romania posted annual per capita GDP growth above 2% over the period 1990-2010. The worst performance is by Croatia with annual growth of 0.95%.

One aspect of estimates in Table 9 that causes concern is the dynamics of the employment ratio. As shown in Table 9, the annual average growth of the employment ratio is negative for all countries, except Poland which is close to stability at 0.03%. The worst case is Hungary, which presents negative annual rate of -1.11% over the period 1990-2010. Most countries exhibit strongly negative growth rates in the first decade after the fall of Communism. For example, Hungary, Slovenia, and Croatia posted annual average growth rates for the employment ratio of -2.33%, -2.32% and -2.36%, respectively, over the period 1990-1999. We observe a recovering trend in the employment ratio for Bulgaria and Croatia in the second decade (2000-2010) after the fall of Communism, with growth rates of 1.20% and 1.24%, respectively. However, the overall dynamics of the employment ratio remains a key variable to the long-run sustainability of growth for these transition economies.

The capital-output ratio presents relatively low growth rates for most countries in Table 9, except for Bulgaria in which the annual growth rate of the capital-output ratio

[10] As explained in section 4, to perform the growth decomposition expressed in equation (9) we need data on schooling years from Barro-Lee dataset which is available for a subset of countries (only 21 countries) and a reduced time interval (1990-2010).

is 3.37% over the period 1990-2010. Slovakia presents annual negative growth of 1.12% in its capital-output ratio. All countries in Table 9 present accumulation of human capital in the form of schooling years of their workforce. The three countries with the higher accumulation of schooling years are Hungary, Poland, and Czech Republic. For most of the countries in Table 9, the growth rates in hours-worked are negative, but quantitatively unimportant. Slovenia exhibits the most pronounced variation in hours-worked with an annual growth of -0.29% over the period 1990-2010.

Table 10 displays the alternative growth decomposition for five selected ex-Soviet countries. Ukraine and Kyrgyzstan exhibit the worst growth performance with annual growth in per capita GDP at -1.67% and -1.09%, respectively, over the period 1990-2010. Russia also presents a disappointing performance with annual per capita GDP of 0.51% over the period 1990-2010.

The contribution of the employment ratio to growth is negative for Russia, Ukraine, and Estonia. The annual growth in the employment ratio for these three countries are, respectively, -0.20%, -0.48% and -1.14% over the period 1990-2010. There are significant gains in schooling years over the period 1990-2010 for Ukraine, Estonia, and Kazakhstan. Data on hours-worked is only available for Russia and Estonia, and their annual average growth rate over the period 1990-2010 stand at 0.12% and -0.37%, respectively.

What we take from estimates in Tables 9 and 10 is that demographics, as measured by the ratio of workers to total population, is a central variable dictating the growth experience of these transition economies, with potentially limiting effects on the long-run growth performance of these economies.

Table 10: Alternative Growth Decomposition for selected ex-Soviet countries, 1990-2010.

Country		Y/POP Col. (1)	L/POP Col. (2)	K/Y Col. (3)	∆u Col. (4)	Av.Hrs Col. (5)	%∆TFP Col. (6)
Russia	1990-2010	0.51%	-0.20%	-0.82%	0.09	0.12%	-5.51%
	1990-1999	-5.29%	-1.64%	4.72%	0.06	0.23%	-8.45%
	2000-2010	5.52%	1.00%	-5.12%	0.02	0.06%	3.45%
Ukraine	1990-2010	-1.67%	-0.48%	1.26%	0.15	Na	-11.26%
	1990-1999	-9.05%	-2.15%	9.18%	0.10	Na	-14.55%
	2000-2010	4.81%	0.90%	-4.79%	0.04	Na	1.29%
Estonia	1990-2010	2.27%	-1.14%	0.49%	0.19	-0.37%	-10.23%
	1990-1999	-0.42%	-2.49%	2.01%	0.15	-0.07%	-9.31%
	2000-2010	4.52%	-0.02%	-0.73%	0.02	-0.48%	2.30%
Kazakhstan	1990-2010	2.21%	0.26%	-1.51%	0.19	Na	-10.70%
	1990-1999	-4.05%	-1.65%	5.38%	0.14	Na	-12.64%
	2000-2010	7.64%	1.85%	-6.81%	0.03	Na	3.95%
Kyrgyzstan	1990-2010	-1.09%	0.31%	0.53%	0.08	Na	-6.54%
	1990-1999	-6.09%	-0.84%	4.65%	0.07	Na	-9.54%
	2000-2010	3.20%	1.26%	-2.73%	0.01	Na	1.81%

Notes: Column (1) displays the annual average growth rate of Real GDP at constant 2017 national prices. Column (2) displays the annual average growth rate of the capital stock at constant 2017 national prices.

7. Conclusion

We construct a panel with macroeconomic variables from 29 ex-Communist economies over the period 1990-2019. We perform growth and level decomposition exercises on the GDP per worker and find that cross-country variation in factor inputs account for the bulk of the international variation in GDP per worker, in contrast with the literature that finds that differences in technology is the key explanatory factor.

Our growth decomposition exercises identify three groups of countries with distinct characteristics. The first group consists of countries in Central and Eastern Europe that are members of the EU and experienced Communist over a relatively shorter time span, compared to other ex-Communist countries. These economies have shown good

economic performance and seem to be converging to the income level of successful Western economies. The second group consists of Southern European countries, which present a mixed economic performance. Some of these countries are EU candidates and will probably advance reforms to "westernize" their economies and political institutions. The third identifiable group consists of countries which were part of the ex-Soviet Union and spent the longest time under the spell of Communism. Given the extended period under communist rules, commissioning reforms in these countries has been a more complex task; one possible reason for the incompleteness of reforms is the intrinsic preferences for a large and interventionist State and groups with vested interests. In addition to the incomplete set of reforms, these economies have a perverse demographic dynamic, in the sense that the number of workers is falling over time, which compromises long-run sustainability.

If one would conjecture a possible future for countries in the third group, this conjecture must be one of State capitalism, where one has a system in which there is a private sector, but any private business initiative will need to have the blessing of the State. It will be interesting to watch how the economies of China and Cuba evolve over time, for they may head the way to countries in the third group.

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