

GDN RRCIII Project “Economic Fluctuations in Central and Eastern Europe” Abstracts & Non-Technical Summaries

Paper 1: “Diversification and Development” by Miklós Koren and Silvana Tenreyro

Abstract

This paper explores the relationship between output volatility and economic development. We develop a methodology to assess countries' extent of sectoral diversification. The productive structure of a country tends to be risky when the country

- (i) specializes in highly volatile sectors,
- (ii) has high sectoral concentration, and/or
- (iii) specializes in sectors highly affected by country-specific fluctuations.

Within the context of a portfolio choice model, we derive the implied mean-variance frontiers both for individual countries and for the world, and compute countries' distances to each. We find that

- (i) as countries develop, they move from riskier sectors to safer ones. In addition, sectoral concentration declines with development at early stages, whereas at later stages the relation flattens out and tends to reverse slowly;
- (ii) the concentration index we construct is robust to the arbitrariness of sectoral classification;
- (iii) poor countries are typically inside their mean-variance frontier, that is, they could achieve the same level of productivity at lower risk by modifying their sectoral composition.

Existing theories linking volatility and development are not consistent with all of our findings. We propose new directions for future theoretical work.

Keywords: specialization, diversification, economic fluctuations, mean-variance frontier, factor model

Nontechnical summary

In this paper, we explore the links between economic development and risk diversification. We investigate how the sectoral structure affects the riskiness of economic activity. This yields direct evidence on the sources of economic fluctuations. More specifically, we distinguish between four dimensions of the overall riskiness of an economy's output mix. The first dimension relates to the degree of specialization in the economy (e.g., typically, an economy that is highly concentrated will tend to be more risk prone). The second dimension relates to the volatility of sectoral shocks (e.g., an economy that specializes in sectors that exhibit high intrinsic volatility will tend to be riskier). The third dimension relates to country-specific risks (e.g. some countries are subject to higher policy and political instability). And the fourth relates to the propensity of different sectors within the economy to be exposed to domestic macroeconomic fluctuations (e.g., some sectors are more exposed to political, fiscal, or monetary shocks).

We carry out three empirical exercises. First we decompose the volatility of labor productivity in different countries and different sectors to the four components mentioned above using a latent factor model, and look at the relative

importance of these components. Second, we investigate how each of these volatility measures relate to economic development, proxied by real gross domestic product per capita (at purchasing power parity), both across countries and over time. Third, we calculate the mean variance frontier of each country, treating its economy as a portfolio of different sectors.

The following findings stand out in our exploration of the diversification dynamics: First, as countries develop, they tend to move towards less risky sectors. Therefore, sectoral risk decreases with the level of development. Second, sectoral concentration sharply declines with development at early stages, whereas at later stages the relation flattens out and tends to reverse slowly. This suggests that there is no monotonic relationship between sectoral riskiness and concentration. We show that our measure of concentration differs from standard ones, in that it is immune to classification issues. Third, country-specific risk falls with development. This result could be the outcome of higher political stability and sounder macroeconomic policies in more developed economies. As for the covariance between country and sectoral shocks, we find that, while there is a high variation across countries, it does not systematically relate to development.

The mean-variance analysis reveals that most countries, particularly developing ones, are inside their mean-variance frontier. This means that they could achieve the same average level of labor productivity with lower variance, by changing the sectoral composition of output. Moreover, the distance to the mean-variance frontier decreases with the level of development, which means that the high economic volatility at early stages of development reflects inefficient diversification, rather than the result of some risk-return optimization.

Our analysis is based on industry-level data from UNIDO for a broad sample of developing and developed countries from 1963 to 1998. The findings are robust to the addition of agriculture and services, despite the loss of observations imposed by data constraints. We provide extensive robustness checks with different specifications.

Decomposing Volatility of Labor Productivity

Our measure of sectoral risk takes into account the riskiness of the different sectors and the comovement across sectors. The top five countries according to this dimension of risk are Bangladesh, Pakistan, Egypt, Ghana, and India, whereas Singapore, Hong Kong, Denmark, Israel and the Netherlands exhibit the lowest levels of sectoral risk. The highest weighted Herfindahl indices of sectoral concentration correspond to Bolivia, Egypt, Ghana, Pakistan, and Bangladesh. The United States, France, Japan, Australia and the United Kingdom are the countries with the lowest (weighted) Herfindahl indices. In terms of country-specific risk, Iran, Ghana, Nicaragua and Bangladesh appear to be the riskiest countries, whereas Finland, South Africa, the United States, Denmark and Austria qualify as the least risky. The overall riskiness of the economy is a sum of all these volatility components. Iran, Ghana, and Nicaragua ranks first in the level of overall riskiness, whereas the United States, Finland, and Canada rank last.

There is enormous variance across countries regarding the relative importance of the different dimensions of risk. For example, in Iran, the (weighted) sectoral concentration and the sectoral risk contribute little to the extremely high risk of the economy. Most of the risk is country specific. For France, instead, a significant part of the risk (40 percent) is explained by the high covariance between country- and sector-specific risk. The United States, in contrast, have a relatively large negative sector-country covariance, which contributes to lower overall risk.

Volatility and Development

We first study the relationship between sectoral risk and real GDP per capita. We uncover a negative correlation, which is remarkably strong in the within-country evidence. The within-country evidence is perhaps more relevant in our context, as it shows the evolution of sectoral concentration for the typical country along its development path. (Or, in other words, it controls for country-specific effects, which in a simple cross section might blur the evolution of specialization by shifting the curve.)

For the weighted Herfindahl index, which measures the overall concentration of sectoral composition, both the cross-country and the within-country estimations show a declining curve, which flattens out at latter stages of development, showing tenuous signs of reversal at very late stages. The weighting of the index takes proper account of the asymmetry of the sectors and better captures the extent of (lack of) diversification. Equally important, the weighted Herfindahl index is immune to classification biases.

Putting the two pieces together, one can infer that at early stages of development, countries tend to concentrate heavily on relatively high-risk sectors. As countries grow, they shift production towards lower-risk sectors, experiencing a decrease in sectoral risk together with a decrease in concentration. Later in the development process, while sectoral risk continues to decline, concentration tends to flatten out and even reverses to higher levels at sufficiently large values of per capita GDP. A closer look into the change in sectoral composition reinforces the claim that more developed countries move resources from riskier to less risky sectors. This claim is enforced by looking at the employment shares in the textile industry (a highly risky industry with a standard deviation of shocks of 8 percent) and the electric machinery industry (the safest industry, with a standard deviation of 4 percent) against the level of GDP per capita. As anticipated, the electric machinery industry expands with development while textile rapidly shrinks.

The relationship between country-specific risk and the level of development is starkly negative. This suggests that countries at higher levels of development enjoy higher macroeconomic stability, which could be the result of lower political risks and better conduct of fiscal and monetary policies, among other factors.

The Mean Variance Frontier

The mean variance frontier of a country answers the question: What is the lowest possible risk attainable holding average labor productivity constant? We calculate this frontier and measure countries' distances to it. Ghana, Hungary, and the Philippines exhibit the largest difference between their own minimum variances and the world's minimum, given their average level of per worker productivity, whereas the United States and Sweden exhibit the smallest difference. As countries develop, they tend to move closer to their own minimum variance frontier. The relation flattens out at high levels of development. In other words, for given levels of productivity, developed countries can achieve lower volatility.

The relationship between risk, diversification, and economic development is an important theme in the growth and development literature. Developed countries tend to exhibit stable growth rates over long periods of time, whereas poorer countries are prone to experience sharp fluctuations in growth rates. Understanding the sources of volatility is a first-order issue for less developed countries, for not only are income fluctuations larger and more abrupt in these economies, but also their ability to hedge against fluctuations is particularly limited by the weakness of their financial infrastructure. Furthermore, identifying the sources of volatility allows to empirically assess existing theories linking risk and development, and may help discern the relevant institutions and policies to mitigate volatility.

Paper 2: “Economic Fluctuations in Central and Eastern Europe. The Facts” by Peter Benczur and Attila Rattai

Abstract

We carry out a detailed analysis of quarterly frequency dynamics in macroeconomic aggregates in twelve countries of Central and Eastern Europe. The facts we document include the variability and the persistence in, and the co-movement among output, and other major real and nominal variables. The major findings are the following:

- consumption is highly volatile and government spending is procyclical
- gross fixed capital formation is highly volatile
- net exports are countercyclical
- imports are procyclical, more than exports
- exports are most procyclical and persistent in open countries
- labor market variables are all highly volatile
- employment is leading or coincidental, and procyclical
- real wages are dominantly procyclical
- productivity tends to be procyclical and coincidental
- private credit is procyclical and dominantly lagging the cycle
- volatilities in M1 and M2 are relatively low
- the CPI is countercyclical, and is weakly leading or coincidental
- the cyclicity of inflation is unclear, but its relative volatility is low
- the nominal exchange rate is more persistent than the real one

Overall, we find that fluctuations in CEE countries are larger than in industrial countries, and are of similar size than in other emerging economies. This is particularly true about private consumption: citizens of transition economies spend a lot when the economy does well, and they cut back their expenditures heavily in bad times. The comovement of variables, however, shows a large degree of similarity. A notable exception is government spending: unlike in industrial economies, it is rather procyclical in transition economies. This indicates that transition economy governments have not yet used government expenditures as an automatic stabilizer. The findings also indicate that Croatia and the accession group show broadly similar cyclical behavior to industrial countries. The most frequent country outliers are Bulgaria, Romania and Russia, especially in labor market, price and exchange rate variables. Excluding these countries from the sample makes many of the observed patterns in cyclical dynamics more homogenous.

Keywords: Business cycle facts, Central and Eastern Europe

Nontechnical summary

The main goal of this research is to report on business cycle facts in twelve Central and Eastern European (CEE) countries over the decade long period of economic transition, arguably the largest possible and meaningful panel of such observations, in terms of time frame and country coverage. While our exploration of facts is not driven by any particular model economy, the evidence we compile is meant to inform and serve as factual bases in modeling international business cycles. Our findings can also provide valuable tools in the design of stabilization and adjustment policies:

- documenting the relative cyclical movements of major macro variables can help policymakers identify the most important targets, instruments and the mechanism of cyclical policies in these countries;
- depending on similarities and differences relative to developed economies, our results can thus allow one to better judge how much of the common “smoothing” policies should be adopted, and how much “regional flavor” is needed.

In our analysis, we seek to answer the following specific questions:

- Is there already a common pattern to document in CEE business cycle fluctuations?
- Can we identify certain country characteristics (like their exchange rate regime or openness in goods and financial markets) that influence and explain differences among these countries?
- Are there important similarities and differences in the behavior of macroeconomic aggregates vis-à-vis developed countries, or other emerging market regions?

Answering these questions has required us to overcome a major hurdle, assembling a data set of quarterly frequency macroeconomic variables in transition economies. Dictated by data accessibility, the countries examined are Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, and Slovenia. The sample period spans over a period of about 10 years, starting in 1993:1 or one or two years later, and ending in 2002:4, resulting in an average time frame of about nine years. The variables studied include output, measures of the price level and inflation, components of aggregate demand, wages, employment, productivity, exchange rates, credit and monetary aggregates. We devoted large efforts to ensuring the quality and coverage of our data. In addition to standard electronic sources, we also browsed the websites of central banks and statistical offices, and contacted a large number of local experts. The dataset is available at request, and it will be made publicly available after some final cleaning.

We conduct a detailed analysis of quarterly frequency dynamics in major macroeconomic aggregates in individual CEE countries. Our focus is on fluctuations that occur at the horizon of a few years as opposed to the long-run growth prospects of these economies. Correspondingly, we define the business cycle component of macroeconomic variables as deviation from trend. We employ three alternative de-trending procedures, such as Hodrick-Prescott (H-P) filtering, log first differencing, and fitting a quadratic time polynomial in obtaining the cyclical component of macroeconomic variables. Here we restrict our attention to the most standard choice, the Hodrick-Prescott filtering procedure. Before de-trending, all series had to be de-seasonalized as well.

While our empirical approach places no constraint on the joint determination of the variables of interest, the transformation of data, the selection of statistics and the interpretation of results are all guided by economic theory. The most important themes we address include the variability and persistence in and the co-movement among output and other fundamental real and nominal variables. More specifically, we document:

- the *absolute and relative volatility* of the variables involved. This is to gauge the relative magnitude of economic fluctuations;
- whether de-trended variables move the same direction (*procyclical*), the opposite direction (*countercyclical*) or are unrelated to (*acyclical*) de-trended output;
- *phase shifts* in the variables, i.e. if they *lead* or *lag* the cycle, or *synchronous* (coincidental) with it. This serves two goals. First, it reveals which fluctuations can be mitigated by cyclical economic policies (e.g., monetary and fiscal policy). Second, it helps us uncover the structural sources of fluctuations. For example, a negative comovement between prices and output indicates supply-side shocks; while a positive correlation points towards the dominance of demand-side shocks.
- the degree of *persistence* in the series by reporting on their first-order autoregressive coefficient. High persistence may be indicative of structural rigidities in certain markets.

International comparison

Output is more volatile in transition countries than in developed economies, and is about as volatile as in other developing ones. For GDP, average output volatility in transition countries is about the same as in the small number of developing countries we have data for, and somewhat higher than in the EU countries. The persistence in output is similar across all countries in the table; the first two autocorrelations are typically significant, and the third one is marginally significant.

It is important to note that the volatility characteristics of industrial economies show a marked difference in two subsamples (1960-1980 and 1990-2002). The 1990s have indeed witnessed a much more stable economic environment than the 60s, 70s or 80s. The stormy experience of transition economies in the 90s should thus be rather compared to the earlier sample of industrial economies, where volatility measures are quite close to each other. All in all, the dynamic properties of output fluctuations in transition economies are not drastically different from fluctuations in other developing countries, but are somewhat more pronounced than in more developed ones.

Properties of fluctuations in Central and Eastern European countries

CEE economic fluctuations exhibit a number of interesting patterns. First, industrial production is highly volatile, strongly procyclical, synchronous and persistent. Consumption is excessively volatile, even relative to output, typically procyclical, and persistent. The high consumption volatility can be related to large movements in future income, changing access to household loans, precautionary savings, catch-up in durable purchases or large

redistributive shocks. Similarly to developed economies, investment also tends to be volatile, procyclical, and in general coincidental. Government consumption is dominantly procyclical, and it is more volatile than in other countries. Given the large changes in public finance as well as lower political stability of these countries, the high volatility of public consumption is not surprising. Net exports are countercyclical and again highly volatile, although they are the least volatile component of GDP. Overall, investment is the most volatile component of GDP, followed by government consumption, private consumption and net exports. Exports are typically coincidental, and, as expected, are most procyclical in countries with open goods and capital markets and in major commodity exporters.

Employment is highly volatile, procyclical and persistent. It is often synchronous or leading. Real wages are typically procyclical; they are also volatile and persistent. Productivity is procyclical and shows no clear direction in phase shift. Volatility in productivity in CEE economies well exceeds the one in developed economies. Persistence in productivity is present but moderate. The behavior of the standard labor market variables (employment, real wages and productivity) is in many respects similar to related patterns documented in industrial countries, emphasizing the role of real shocks. It is also consistent with a strong technological improvement interpretation of the mature transition process. In fact, employment in transition economies is explained better by classic real business cycle theory than employment in industrial countries, as employment is lagging in the latter, pointing to the role of labor hoarding.

Private sector credit is highly volatile, persistent, procyclical in most countries, and is dominantly lagging the cycle, or concurrent with it. A strong positive sign has important consequences for monetary policy if credit *leads* the cycle: a monetary restriction usually depresses credit creation, which would lead to an output contraction if credit leads the cycle and the correlation is positive. The money stock is in general volatile, highly persistent, procyclical, and rather leading or coincidental. As for prices, the price level is countercyclical, and weakly leading or coincidental with GDP, suggesting the importance of supply-side shocks. Inflation is not particularly persistent or volatile, and shows mixed cyclical patterns. Countries with less volatile nominal effective exchange rate also appear to have less volatile price levels. Real exchange rates appear to be mostly countercyclical. Volatilities in nominal and real effective exchange rates are often on the same order of magnitude. It is well documented for many countries that nominal and real exchange rates trace each other closely at quarterly frequencies, pointing to the role of price rigidities.

Overall, economic variables in CEE countries tend to be more volatile both in absolute terms and relative to output than in developed economies. However, this is characteristic of other countries at similar stages of development, and industrial countries have also witnessed periods of large shocks and fluctuations. Even if liberalization, restructuring and other features of the transition process may have an effect on their long-run rate of growth, when it comes to cyclical fluctuations and the comovement of macroeconomic variables, CEE countries are not much different from their western neighbors.

Paper 3: “The Transmission of Euro-Zone Shocks to Central and Eastern Europe” by Peter Benczur, Miklos Koren and Attila Rattfai

Abstract

This paper investigates the contribution of external shocks to business cycle volatility in countries of Central and Eastern Europe, the role of different transmission channels, and the evolution of these patterns through time. The main focus is on the role of shocks originating from the Euro-zone. In a dynamic empirical model of shock transmission, it uses an instrumental variable approach to identify the relative importance of financial versus goods market channels in the data.

The findings show that:

- while external shocks explain a sizeable fraction of forecast error variance in CEE countries, most of the variation stems from local disturbances;
- financial and goods market channels of shock transmission are orthogonal to each other in most countries, as indicated by the low covariance term of the forecast error decomposition;
- countries in which some interaction between the two channels appears to be present are Hungary, Russia and Slovakia;
- the Baltic countries excluded, the financial channel of shock transmission is more important in countries with more flexible exchange regime.
- the financial channel transmission dominates in the Czech Republic, Estonia, Lithuania, Romania, Russia and Slovenia;
- the goods market channel is particularly important in Croatia, Hungary, Latvia, and to some degree, Slovakia;
- while there is no substantial difference between new member states and non-members in the contribution of the financial markets channel, the goods market channel is more powerful in new member states.

Keywords: Business cycles, International shock transmission, Central and Eastern Europe