# Finding a Balance between Growth and Vulnerability Trade-Offs

## Lessons from Emerging Europe and the CIS

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## Abstract

This paper examines the growth patterns of emerging Europe and the Commonwealth of Independent States (CIS) countries prior to the global financial crisis. The aim is to draw lessons on what policies can best position these countries going forward to enjoy growth without a buildup in macro and financial vulnerability.

Cluster analysis is used to classify these countries across the growth and vulnerability dimensions; namely, a classification into low or high growth outcomes, each of which may occur with low or high vulnerability features. The vulnerability indicators used are multifaceted, covering both the domestic and the external dimensions that have been identified in previous studies as being good indicators of likelihood of crisis—itself understood as multidimensional. Based on multinomial logit regressions, the initial conditions and the economic policies that might affect the probabilities of being in each of the four possible cluster combinations are examined.

Many (if not most) of the countries in the sample experienced very large capital inflows relative to their gross domestic product prior to the crisis, which can complicate macroeconomic management and lead to a buildup of vulnerability. These large inflows were partly due to the high liquidity in global markets and, at least for some countries in the country sample, the particular attractiveness of "new Europe and emerging countries in the region" in the eyes of foreign investors. Nonetheless, the analysis finds strong evidence that the macroeconomic and structural policies that over time influence the structure of the economy, can play a significant role in explaining (and, going forward, in influencing) the different growth and vulnerability patterns experienced by the countries covered in this paper.

# Finding a Balance between Growth and Vulnerability

# Trade-Offs—Lessons from Emerging Europe and the CIS

by

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### *Finding a Balance between Growth and Vulnerability*
### *Trade-Offs—Lessons from Emerging Europe and the CIS* [1]

Although all the transition countries and Turkey were affected by the global financial crisis, there was a significant variation across countries.[2] Some countries in the region experienced larger capital outflows and suffered severe recessions. For instance, Latvia experienced capital outflows—after controlling for exchange rate changes—amounting to almost 16 percent of GDP during 2008-10 (Table 1) and a contraction in economic activity from peak to trough (2007-09) of 21.4 percent (Table 2), but other countries experienced lower capital reversals and milder contractions in economic activity.

But a close examination suggests that there were significant differences in the growth-vulnerability experiences of countries prior to the onset of the crisis. Some sustained relatively high growth without a buildup of excessive domestic and external imbalances that have been documented by others as a source of vulnerability (both to the possible onset of a crisis and to the deeper recessions that typically follow).[3] At the other end of the spectrum, some countries experienced a buildup in vulnerability through the accumulation of imbalances without enjoying high growth. In fact, individual countries also had a variety of experiences during the decade, shifting from—relatively speaking—lower growth to higher growth and from lower vulnerability to higher vulnerability—and all other possible combinations.[4] In part these differences reflect that countries were at different stages of both their transition and convergence paths; thus, the role of initial conditions is key in identifying empirical regularities on economic policies.

What drives these differences? The goal of this paper is precisely to shed light on the factors behind the variety of growth-vulnerability experiences. Is there a set of initial conditions and policies that might best position countries to enjoy growth without a buildup of vulnerability? What role do trade and financial openness play in the growth-vulnerability outcomes? Are there types of trade and financial openness that might diminish the risks of falling into unwanted outcomes? Undoubtedly, the best is for countries to achieve higher growth without making themselves vulnerable to a crisis. Moreover, the worst possible combination is to achieve lower growth while being highly vulnerable to a crisis. In sum, this paper takes the view that policy makers need to be aware of the possible combinations of risk and reward and do what is in their power to achieve the coveted high reward-low risk combination.

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[2] The countries in the econometric estimation include: Azerbaijan, Albania, Armenia, Belarus, Bosnia and Herzegovina (BiH), Croatia, FYR Macedonia, Georgia, Kazakhstan, Moldova, Turkey, Russia, Ukraine, and seven new EU member states. It excludes Czech and Slovak Republics, and Slovenia due to the lack of the debt data required to carry out the cluster analysis exercise.

[3] Bakker and Gulde (2010) find that, for the new EU member states, the countries with the largest growth in domestic credit to the private sector experienced the sharpest increase in aggregate demand and overheating prior to the crisis and, in turn, saw the sharpest drop in domestic demand (and output) following the crisis.

[4] It is worth clarifying that the classification is a relative one into lower or higher growth and lower or higher vulnerability. We also pursued a more granular classification with similar conclusions, such as low, medium, and high growth and vulnerability outcomes. The difficulty of such classification is that it results in too many categories that complicate the presentation and discussion—as well as resulting in too few observations within each group; a 3 by 3 matrix generates 9 possible outcomes.

To our knowledge, the only paper that has pursued a similar line of analysis is Atoyan (2010). This paper expands his analysis, however. First, vulnerability is defined more broadly. Atoyan uses two indicators of external vulnerability: namely the current account deficit and the accumulation of external debt. By contrast, we consider vulnerability to be multifaceted, covering both external and domestic dimensions. For instance, external vulnerabilities may be a source of risk, but they might occur with or without banking sector vulnerabilities. Thus, monitoring banking sector developments is also critical. Second, our focus is primarily on the policy angle. To this end, controls are introduced not only for a country's initial conditions and economic structure, but also for global push factors that might impact the growth-vulnerability dimensions. This allows a more detailed examination of the role of economic policies; namely, the role of fiscal, monetary, and exchange rate policies, as well as of de jure measures on capital account liberalization. Finally, the interpretation of the estimated coefficients from multinomial logits is always cumbersome. This paper puts forward two graphical representations based on underlying probabilities that, in our view, facilitate the interpretation of the estimation results.

**Table 1: External Positions of Western Banks vis-à-vis Transition Countries and Turkey**
(adjusted for exchange rate changes)

| | Levels (in billions of US$) | | | Levels (in % of 2008 GDP) | | | Flows (in % of 2008 GDP) | |
|---|---|---|---|---|---|---|---|---|
| | 2007Q3 | 2008Q3 | 2010Q2 | 2007Q3 | 2008Q3 | 2010Q2 | 2007-2008 | 2008-2010 |
| Latvia | 18.6 | 23.4 | 18.0 | 55.0 | 69.0 | 53.1 | 14.0 | -15.9 |
| Estonia | 17.2 | 19.1 | 16.0 | 72.6 | 80.7 | 67.5 | 8.1 | -13.2 |
| Lithuania | 16.0 | 22.3 | 17.8 | 33.9 | 47.3 | 37.8 | 13.3 | -9.4 |
| Ukraine | 24.0 | 38.1 | 22.7 | 13.3 | 21.2 | 12.6 | 7.8 | -8.5 |
| Romania | 49.5 | 70.2 | 59.4 | 24.2 | 34.4 | 29.1 | 10.1 | -5.3 |
| Russia | 178.0 | 210.3 | 126.9 | 10.7 | 12.6 | 7.6 | 1.9 | -5.0 |
| Kazakhstan | 18.0 | 21.2 | 15.0 | 13.3 | 15.6 | 11.1 | 2.3 | -4.5 |
| Bulgaria | 13.2 | 24.6 | 22.4 | 26.5 | 49.2 | 44.9 | 22.7 | -4.3 |
| Turkey | 125.2 | 156.1 | 138.5 | 17.1 | 21.4 | 19.0 | 4.2 | -2.4 |
| Bosnia & Herzegovina | 3.9 | 4.6 | 4.2 | 20.8 | 25.0 | 22.7 | 4.2 | -2.3 |
| Hungary | 72.2 | 94.3 | 90.7 | 46.4 | 60.6 | 58.3 | 14.2 | -2.3 |
| Moldova | 0.4 | 0.6 | 0.5 | 6.2 | 10.6 | 8.7 | 4.4 | -2.0 |
| Poland | 95.6 | 128.2 | 123.1 | 18.1 | 24.2 | 23.3 | 6.2 | -1.0 |
| Croatia | 39.3 | 42.2 | 41.6 | 56.7 | 60.9 | 60.1 | 4.2 | -0.8 |
| Belarus | 2.5 | 3.1 | 2.8 | 4.1 | 5.1 | 4.5 | 1.0 | -0.5 |
| Georgia | 0.5 | 0.5 | 0.5 | 3.7 | 4.3 | 3.8 | 0.6 | -0.5 |
| Azerbaijan | 1.5 | 3.6 | 3.5 | 3.2 | 7.8 | 7.6 | 4.6 | -0.2 |
| Armenia | 0.2 | 0.2 | 0.3 | 1.3 | 1.9 | 2.6 | 0.6 | 0.7 |
| FYR Macedonia | 0.3 | 0.5 | 0.6 | 3.1 | 5.4 | 6.5 | 2.2 | 1.1 |
| Albania | 0.6 | 0.7 | 1.2 | 4.3 | 5.5 | 9.4 | 1.2 | 3.9 |

Source: BIS Locational Statistics and IMF WEO Database October 2010; authors' calculations.

A caveat is in order. On the one hand, the strength of the results may be specific to the region, which indeed experienced some of the largest external imbalances (and, eventually, external adjustments) that emerging markets have ever had to tackle. Moreover, it must be acknowledged that some of the global events that characterized the increased process of integration might not repeat themselves in the near future; for example, the excessive global liquidity of 2003-07. On the other hand, however, some regularities are evident from the data and, thus, provide policy prescriptions going forward: a better understanding of the determinants of different growth-vulnerability combinations seems warranted and this paper attempts to provide some preliminary answers.

## 1. Methodology and Stylized Facts

The goal of this paper is to empirically investigate the relative importance of economic policies and other factors in defining the balance between vulnerability (risk) and growth (reward). As mentioned earlier, a multifaceted approach to vulnerability is taken. Specifically, several indicators are

used to define vulnerability across the domestic and external dimensions—all of which have been well documented in previous studies as heightening a countries' vulnerability to crises (e.g., Kaminsky and Reinhart, 1999). Also, as noted earlier, the classification is a relative one that is obtained through a arms-length methodology described below. The domestic indicators include financial sector factors as well as public finances; namely, loan-to-deposit ratios as a measure of banks' balance sheets, private sector credit growth as a measure of economic overheating, and fiscal balances to measure the nature of the saving-investment imbalances. External indicators focus on FX liquidity indicators (short-term debt on a remaining maturity as a share of a country's foreign exchange reserves), a balance sheet indicator (debt-to-GDP), and the overvaluation of the real effective exchange rate measured by the deviation from its HP filtered series. Across both the domestic and external dimensions the focus is on indicators that can be considered the outcome of initial conditions and economic policies, and the state of global economic conditions.

**Table 2. Change in GDP and Its Components—From Peak to Trough**

|  | GDP | Domestic Demand | Exports | Imports |
|---|---|---|---|---|
| Latvia | -21.4 | -35.3 | -13.8 | -42.7 |
| Estonia | -18.3 | -26.5 | -18.3 | -37.3 |
| Ukraine | -15.1 | -23.0 | -25.6 | -38.6 |
| Lithuania | -14.8 | -25.3 | -14.3 | -29.4 |
| Armenia | -14.2 | -16.5 | -11.9 | -19.4 |
| Russia | -7.9 | -14.1 | -4.7 | -30.4 |
| Romania | -7.1 | -12.6 | -5.5 | -20.6 |
| Moldova | -6.5 | -16.4 | -7.8 | -19.3 |
| Hungary | -6.3 | -11.5 | -9.1 | -15.4 |
| Croatia | -5.8 | -9.3 | -16.2 | -20.7 |
| Bulgaria | -5.0 | -15.0 | -9.8 | -22.3 |
| Turkey | -4.7 | -7.2 | -5.3 | -14.3 |
| Georgia | -3.9 | -11.6 | -0.9 | -19.4 |
| Bosnia & Herzegovina | -3.1 | -6.7 | -4.0 | -11.0 |
| FYR Macedonia | -0.8 | -2.5 | -7.9 | -10.5 |

Source: IMF WEO Database, October 2010.
Note: Albania, Azerbaijan, Belarus, Kazakhstan, and Poland are excluded as they have not suffered a decline in real GDP. Latvia and Estonia are the only two countries that reached their GDP peak in 2007; all others did so during 2008.

Comparing countries across multiple dimensions is never straightforward. Debt-to-GDP ratios might increase, but banking sector developments might be a source of stability; or, on the contrary, add to already weak balance sheet developments. This paper looks at these indicators simultaneously using a methodology known as cluster analysis (CA). The advantage of cluster analysis is that it does not impose ad-hoc thresholds to identify groups in the data. Instead, it lets the data speak for itself. In a nutshell, it minimizes differences within each cluster of data and maximizes the differences across clusters (Everitt, 1993). Specifically, for each country *i* in the sample and each year *t* in the period 2000-08, the six indicators mentioned above are normalized.[5] CA is applied on these normalized indicators and two groups are created: lower vulnerability countries and higher vulnerability countries. The methodology does not fully eliminate the arbitrariness common to the setting of ad-hoc thresholds (e.g. Kaminsky and Reinhart, 1999). In fact, one must still decide into how many groups the data needs to be divided. Nevertheless, it is still considered an arms-length tool to classify data and allows choosing the number of groups in such way that their interpretation becomes tractable.[6] Of course it helps that we

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[5] Given the lack of a theory on how to gauge the relative importance of the six vulnerability indicators, all six indicators enter CA with the same weight.

[6] This paper also chooses two groups or clusters in both the growth dimension and the vulnerability dimension, which in effects allows a more tractable interpretation of country groups.

restrict groups to low and high and CA ensures these are determined based on data characteristics. Indeed, while more groups would increase accuracy, it would also make the presentation more difficult to follow.

The cluster analysis methodology is also applied across the growth dimension so that countries can be classified each year as being either lower or higher growth. Here too growth is viewed as the outcome of policies, initial conditions and global conditions—and, once again, it should be viewed as a relative classification. Together with the classification into lower or higher vulnerability, this yields four possible clusters; namely, lower growth and lower vulnerability (L), lower growth and higher vulnerability (V), higher growth and lower vulnerability (G), and higher growth and higher vulnerability (H). Clearly, the best outcome for any country is cluster G and the one that countries should aim to avoid is cluster V. The methodology allows us to classify countries differently each year. It can be argued that growth determinants have medium-term features and that using an annual classification might mask cyclical factors. Thus, we also consider a two-year average classification and are restricted from adopting an even longer classification on account of the size of the data sample. As an example, Table 3 presents the clustering results across the growth dimension for 2004 and 2008. BiH and Hungary are the two countries within the lower growth clusters that experience the highest growth rate (respectively, growth was 6.31 and 4.86 percent), and both of these countries had growth rates below the minimum of those recorded among the two higher growth clusters G and H.

Table 4 shows the results of the clustering exercise. A few examples facilitate the interpretation of the table. In 2000, three countries experienced higher growth and lower vulnerability—Estonia, Kazakhstan, and Russia (cluster G). In contrast, six countries are classified as experiencing lower growth and higher vulnerability in the same year (cluster V); these are Belarus, Bosnia and Herzegovina (BiH), Latvia, Moldova, Turkey, and Ukraine. In all cases the classification is a relative one. Interestingly, no country belongs to the higher growth and higher vulnerability cluster (cluster H) in 2000, while eleven countries belong to the lower growth and lower vulnerability cluster (cluster L) during that year. In 2008, no country is classified in the higher growth and higher vulnerability group. This reflects the fact that many of the highly vulnerable countries, such as Latvia and Lithuania, had already started to experience an economic slowdown. Croatia, Turkey, and Kazakhstan fall at the opposite end of the spectrum (cluster L). It is interesting that countries classified in 2008 as vulnerable (cluster V) are most of those that faced balance of payments problems; the one exception is Romania.

**Table 3. Real GDP Growth Statistics in Each Cluster—2004 and 2008**

| Cluster | N | Mean | Std. Dev. | Min. | Max. | Country of Max. |
|---------|---|------|-----------|------|------|-----------------|
| 2004 | | | | | | |
| L | 5 | 5.46 | 0.85 | 4.08 | 6.31 | BiH |
| V | 2 | 4.56 | 0.43 | 4.25 | 4.86 | Hungary |
| G | 4 | 9.07 | 1.56 | 7.15 | 10.47 | Armenia |
| H | 12 | 8.81 | 1.83 | 6.64 | 12.08 | Ukraine |
| 2008 | | | | | | |
| L | 3 | 2.07 | 1.29 | 0.66 | 3.20 | Kazakhstan |
| V | 6 | -0.05 | 3.20 | -4.55 | 2.76 | Lithuania |
| G | 12 | 6.92 | 1.94 | 4.80 | 10.80 | Azerbaijan |
| H | - | - | - | - | - | - |

Source: IMF WEO Database, October 2010.

As shown in Figure 1, the six indicators that define vulnerability at the level of each of the four clusters (or groups) behave largely as expected. The red line tracks the median values of countries classified in

the H cluster (higher growth and higher vulnerability) and the blue line does the same for countries in cluster L (lower growth and lower vulnerability). The difference between the red and blue lines is usually, though not always, the starkest. Perhaps this reflects the extent to which the indicators have a greater impact along the growth dimension or along the vulnerability dimension. For example, countries classified in the H cluster (red line) seem to experience the highest growth rates in private sector credit, higher rates of real exchange rate overvaluation, very high loan-to-deposit ratios, and the highest levels of short-term debt to foreign exchange reserve ratios. Debt-to-GDP ratios are also high (together with those observed among the lower growth and higher vulnerability countries). In contrast, countries in the L cluster (blue line) have, for the most part, the opposite characteristics. At the level of the G (higher growth, lower vulnerability, depicted by the green dash line) and V (lower growth and higher vulnerability, depicted by the purple dash line) clusters, the outcomes are more mixed. The G cluster (higher growth and lower vulnerability) shows high private sector credit growth and a relatively large increase in the loan to deposit ratio until 2007. This cluster also shows a slight REER overvaluation in 2007 and 2008. On the other hand, the G cluster's external debt and short term debt are the lowest among all clusters. For the lower growth and higher vulnerability cluster V, the fiscal deficit and debt ratios are high.

**Table 4. Evolution of the Growth-Vulnerability Clusters—Period 2000-08**

**Lower Growth and Lower Vulnerability (Group or Cluster L)**

| Year | Countries |
|------|-----------|
| 2000 | Albania, Armenia, Azerbaijan, Bulgaria, Croatia, FYRM, Georgia, Hungary, Lithuania, Poland, Romania |
| 2001 | Azerbaijan, Belarus, BiH, Bulgaria, Croatia, FYRM, Georgia, Hungary, Poland, Romania, Russia |
| 2002 | Albania, Belarus, BiH, Bulgaria, Croatia, FYRM, Georgia, Poland, Romania, Russia |
| 2003 | Albania, BiH, FYRM, Poland, Romania |
| 2004 | Albania, BiH, FYRM, Georgia, Poland |
| 2005 | Russia |
| 2006 | Albania, BiH, Bulgaria, FYRM, Moldova |
| 2007 | Albania, BiH, Bulgaria, Croatia, FYRM, Moldova, Poland, Russia, Turkey, Ukraine |
| 2008 | Croatia, Kazakhstan, Turkey |

**Lower Growth and Higher Vulnerability (Group or Cluster V)**

| Year | Countries |
|------|-----------|
| 2000 | Belarus, BiH, Latvia, Moldova, Turkey, Ukraine |
| 2001 | Moldova, Turkey |
| 2002 | Hungary, Turkey, Ukraine |
| 2003 | Bulgaria, Croatia, Hungary, Moldova, Turkey |
| 2004 | Croatia, Hungary |
| 2005 | Albania, BiH, Bulgaria, Croatia, FYRM, Hungary, Poland, Romania, Ukraine |
| 2006 | Croatia, Hungary, Poland |
| 2007 | Estonia, Hungary, Romania |
| 2008 | Estonia, Georgia, Hungary, Latvia, Lithuania, Ukraine |

**Higher Growth and Lower Vulnerability (Group or Cluster G)**

| Year | Countries |
|------|-----------|
| 2000 | Estonia, Kazakhstan, Russia |
| 2001 | Albania, Armenia, Estonia, Kazakhstan, Lithuania |
| 2002 | Armenia, Azerbaijan, Estonia, Kazakhstan, Lithuania |
| 2003 | Armenia, Azerbaijan, Georgia, Kazakhstan, Russia |
| 2004 | Armenia, Azerbaijan, Romania, Russia |
| 2005 | Armenia, Azerbaijan |
| 2006 | Armenia, Azerbaijan, Russia, Turkey |
| 2007 | Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan |
| 2008 | Albania, Armenia, Azerbaijan, Belarus, BiH, Bulgaria, FYRM, Moldova, Poland, Romania, Russia |

**Higher Growth and Higher Vulnerability (Group or Cluster H)**

| Year | Countries |
|------|-----------|
| 2000 | |
| 2001 | Latvia, Ukraine |
| 2002 | Latvia, Moldova |
| 2003 | Belarus, Estonia, Latvia, Lithuania, Ukraine |
| 2004 | Belarus, Bulgaria, Estonia, Kazakhstan, Latvia, Lithuania, Moldova, Turkey, Ukraine |
| 2005 | Belarus, Estonia, Georgia, Kazakhstan, Latvia, Lithuania, Moldova, Turkey |
| 2006 | Belarus, Estonia, Georgia, Kazakhstan, Latvia, Lithuania, Romania, Ukraine |
| 2007 | Latvia, Lithuania |
| 2008 | |

Source: Authors' calculations. Cluster H has no countries in 2000 and 2008, but does have countries in all other years in the covered period.

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**Figure 1: Median Values of the Sources of Vulnerability**
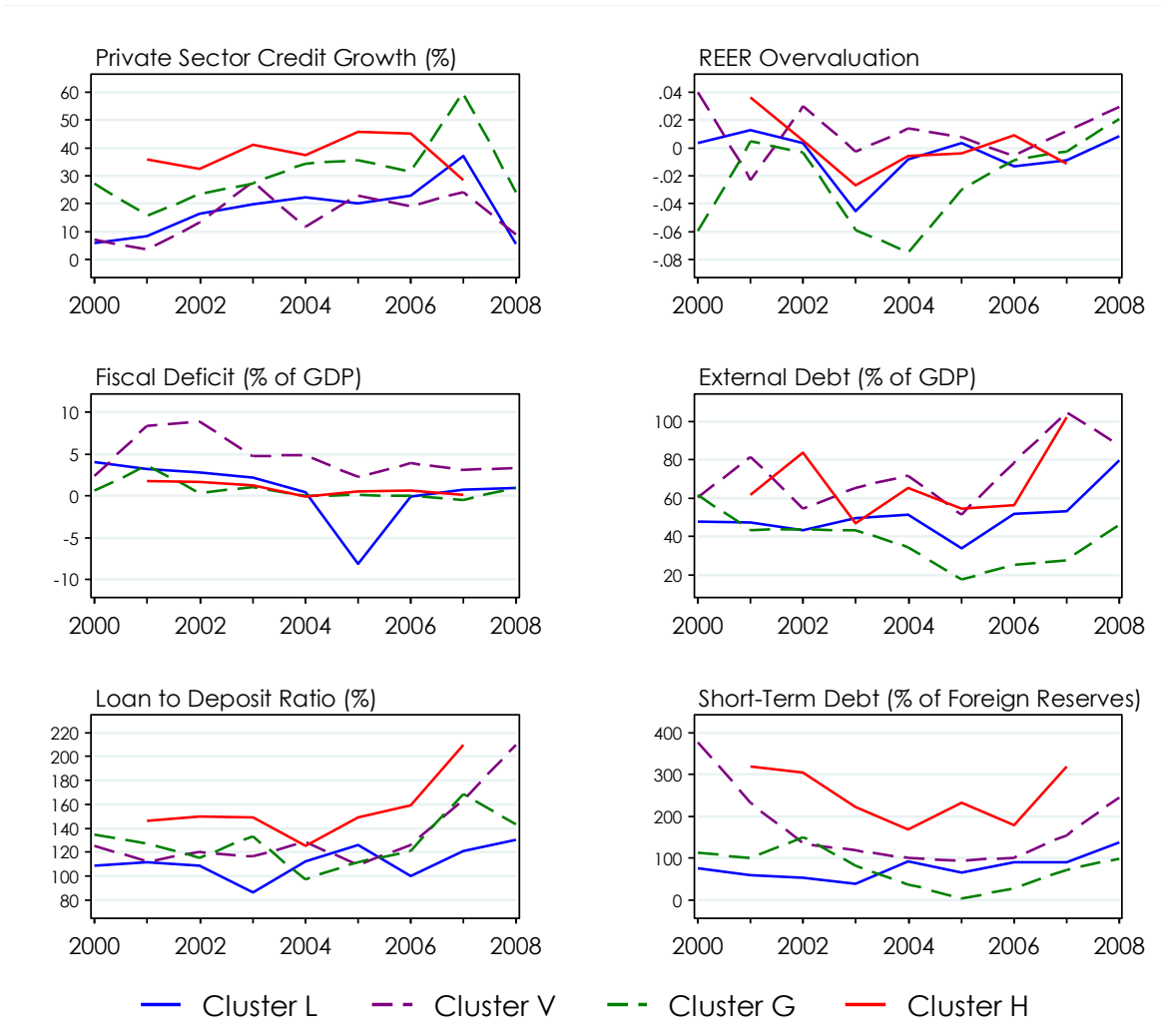


Sources: IMF's World Economic Outlook database and authors' calculations.
Notes: The lower growth and lower vulnerability is identified by L, the lower growth and higher vulnerability is identified by V, the higher growth and lower vulnerability is identified by G, and the higher growth and higher vulnerability is identified by H. The absence of higher growth and higher vulnerability countries in 2000 and 2008 reflects the lack of data in such cluster for those years.

Is there a correlation between the growth and vulnerability dimensions? As Figure 2 shows, high credit growth rates and loan-to-deposit ratios are typically associated with higher growth rates. In contrast, higher fiscal deficits, debt-to-GDP ratios, real exchange rate overvaluation, and short-term debt (on a remaining maturity basis) to foreign exchange reserves ratios are associated with lower rates of economic growth. A more detailed understanding of these growth-vulnerability combinations requires relying on econometric evidence, which is what is pursued in the next section.

## 2. Estimation Results

Table 5 presents the descriptive statistics for each of the regressors and the components of the growth and vulnerability clusters; Appendix 1.A and 1.B describe in greater detail the descriptive statistics of the cluster methodology. The next step is to estimate the multinomial logit. The paper chooses the worst of all possible outcomes—lower growth and higher vulnerability (V)—as the reference cluster. The estimated coefficients show the likelihood of being in one group relative to this

reference cluster. The variables and their sources are described in Appendix 2. The regressors fall into three broad categories:

**Figure 2: Correlations between Growth and the Sources of Vulnerability**
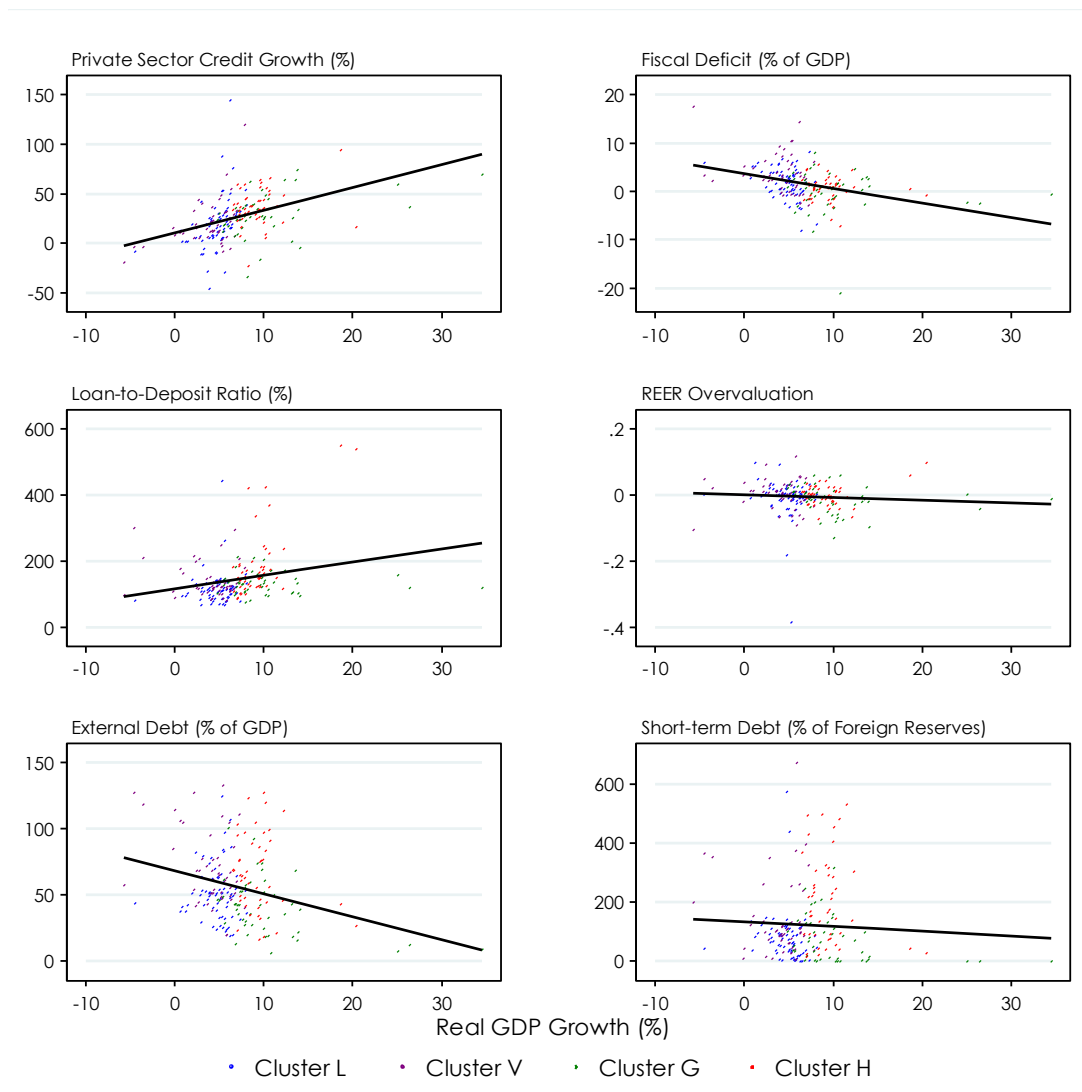


Private Sector Credit Growth (%)
Fiscal Deficit (% of GDP)
Loan-to-Deposit Ratio (%)
REER Overvaluation
External Debt (% of GDP)
Short-term Debt (% of Foreign Reserves)
Real GDP Growth (%)

• Cluster L    • Cluster V    • Cluster G    • Cluster H

Sources: IMF's World Economic Outlook database and authors' calculations.
Notes: The lower growth and lower vulnerability is identified by L, the lower growth and higher vulnerability is identified by V, the higher growth and lower vulnerability is identified by G, and the higher growth and higher vulnerability is identified by H. The absence of higher growth, higher vulnerability data in 2000 and 2008 reflects the lack of countries in such cluster.

• Initial conditions. These comprise measures that may be susceptible to policies and institutional changes over a relatively long period. This category includes measures that reflect a country's economic development and its economic structure, as well as the degree to which an economy is open to the flows of goods and capital. This includes the initial level of income and oil trade balance as a share of total exports plus imports. In addition, measures of trade (exports and imports as a percentage of GDP) and financial (FX assets plus liabilities as a percentage of GDP) openness are included and, in turn, these are accompanied by indicators that serve to qualify the type of openness experienced by individual countries. Specifically, the difference between export and import growth rates is used to assess the type of trade openness. Also, FDI (net, as a percent of

GDP) is intended to qualify the extent to which financial openness occurs in parallel with an increased reliance on capital flows that might involved greater stability features.

**Table 5. Descriptive Statistics of the Variables in the Econometric Estimations**

| | Lower Growth / Lower Vulnerability (Cluster L) | | | | | | Lower Growth / Higher Vulnerability (Cluster V) | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | obs. | min | max | median | mean | std. dev. | obs. | min | max | median | mean | std. dev. |
| Real GDP growth (%) | 60 | -4.5 | 8.1 | 4.8 | 4.5 | 2.0 | 38 | -5.7 | 7.2 | 4.4 | 3.8 | 3.0 |
| Private sector credit growth (%) | 60 | -27.7 | 76.1 | 18.7 | 19.0 | 18.7 | 38 | -19.2 | 69.4 | 16.9 | 19.7 | 17.9 |
| Fiscal deficit (% of GDP) | 60 | -8.2 | 8.3 | 2.0 | 1.9 | 3.3 | 38 | -2.9 | 17.6 | 3.2 | 3.8 | 4.3 |
| Loan-to-deposit ratio (%) | 60 | 67.0 | 187.4 | 112.0 | 110.2 | 25.6 | 38 | 81.1 | 300.9 | 124.1 | 140.8 | 48.0 |
| REER Overvaluation | 60 | -0.2 | 0.1 | 0.0 | 0.0 | 0.0 | 38 | -0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| External debt (% of GDP) | 60 | 20.2 | 106.9 | 49.5 | 49.2 | 18.0 | 38 | 20.4 | 128.0 | 62.8 | 68.1 | 27.2 |
| Short-term debt, remaining maturity (% of FX reserves) | 60 | 0.0 | 576.9 | 76.5 | 85.9 | 90.1 | 38 | 6.4 | 674.0 | 115.9 | 173.5 | 135.2 |
| Trade openness; exports plus imports (% of GDP) | 60 | 49.5 | 151.0 | 86.3 | 89.0 | 27.3 | 38 | 41.8 | 171.5 | 102.2 | 106.2 | 31.0 |
| Export and import growth rates, difference in % | 60 | -22.8 | 76.7 | 0.0 | 3.4 | 15.8 | 38 | -18.0 | 26.9 | 0.7 | 0.7 | 9.3 |
| Financial openness; FX assets & liabilities (% of GDP) | 60 | 3.3 | 63.9 | 15.5 | 16.8 | 10.8 | 38 | 3.7 | 120.6 | 18.5 | 25.9 | 23.0 |
| FDI, net, % of GDP | 60 | -0.2 | 23.9 | 3.8 | 4.6 | 3.7 | 38 | 0.0 | 16.4 | 4.1 | 4.7 | 3.2 |
| Counter-cyclical fiscal policies 2/ | 60 | -1.1 | 1.7 | 0.0 | 0.1 | 0.5 | 38 | -1.6 | 2.0 | 0.0 | 0.2 | 0.7 |
| Monetary tightening; Δ in velocity | 60 | -56.4 | 23.0 | -6.9 | -7.8 | 12.5 | 38 | -26.2 | 15.3 | -4.2 | -5.2 | 8.8 |
| Exchange rate flexibility | 60 | 1.00 | 5.00 | 2.00 | 2.27 | 1.16 | 38 | 1.00 | 5.00 | 2.00 | 2.24 | 1.17 |
| Capital controls | 60 | -2.54 | 1.81 | 0.09 | 0.06 | 1.18 | 38 | -2.54 | 1.81 | -0.96 | -0.59 | 1.46 |
| Initial level of income, share of G7 | 60 | 0.02 | 0.33 | 0.08 | 0.11 | 0.08 | 38 | 0.01 | 0.39 | 0.15 | 0.17 | 0.12 |
| Vulnerability index, VIX | 60 | 11.6 | 40.0 | 23.8 | 23.2 | 6.8 | 38 | 11.6 | 40.0 | 20.4 | 22.0 | 9.9 |
| Oil trade balance as share of exports and imports | 60 | -9.5 | 37.2 | -3.4 | -1.0 | 9.4 | 38 | -8.7 | 0.0 | -3.6 | -4.3 | 2.3 |

| | Higher Growth / Lower Vulnerability (Cluster G) | | | | | | Higher Growth / Higher Vulnerability (Cluster H) | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | obs. | min | max | median | mean | std. dev. | obs. | min | max | median | mean | std. dev. |
| Real GDP growth (%) | 44 | 4.8 | 34.5 | 9.1 | 10.4 | 5.7 | 36 | 6.5 | 12.2 | 9.3 | 8.9 | 1.5 |
| Private sector credit growth (%) | 44 | -33.8 | 74.4 | 27.6 | 29.3 | 21.0 | 36 | 7.8 | 65.8 | 37.9 | 39.6 | 13.7 |
| Fiscal deficit (% of GDP) | 44 | -21.0 | 8.0 | 0.6 | -0.1 | 4.5 | 36 | -7.2 | 4.4 | 0.9 | 0.2 | 2.4 |
| Loan-to-deposit ratio (%) | 44 | 75.4 | 209.9 | 132.1 | 131.7 | 29.9 | 36 | 100.6 | 244.8 | 150.7 | 155.0 | 37.0 |
| REER Overvaluation | 44 | -0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 36 | -0.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| External debt (% of GDP) | 44 | 6.5 | 100.9 | 39.2 | 40.4 | 21.8 | 36 | 17.0 | 127.7 | 63.7 | 62.5 | 27.3 |
| Short-term debt, remaining maturity (% of FX reserves) | 44 | 0.0 | 318.0 | 71.1 | 80.8 | 78.1 | 36 | 74.5 | 533.9 | 227.3 | 250.7 | 136.7 |
| Trade openness; exports plus imports (% of GDP) | 44 | 47.2 | 172.2 | 87.2 | 93.1 | 30.2 | 36 | 47.4 | 166.6 | 110.7 | 111.0 | 26.4 |
| Difference between export and import growth rates, % | 44 | -38.2 | 85.8 | 1.8 | 3.0 | 21.0 | 36 | -16.1 | 14.3 | -0.8 | -1.5 | 6.6 |
| Financial openness; FX assets plus liabilities (% of GDP) | 44 | 3.4 | 60.3 | 9.8 | 13.0 | 11.2 | 36 | 3.8 | 107.3 | 13.1 | 29.4 | 30.5 |
| FDI, net, % of GDP | 44 | -15.2 | 32.3 | 4.0 | 6.2 | 8.3 | 36 | 0.4 | 15.6 | 3.7 | 4.7 | 3.6 |
| Fiscal tightening; Δ (fiscal balance - structural balance) | 44 | -3.4 | 1.6 | -0.1 | -0.2 | 0.8 | 36 | -1.2 | 1.0 | -0.1 | -0.2 | 0.4 |
| Monetary tightening; Δ in velocity | 44 | -46.0 | 23.9 | -11.6 | -9.4 | 12.6 | 36 | -27.9 | 12.6 | -9.7 | -9.7 | 8.3 |
| Capital controls | 44 | 1.00 | 5.00 | 2.00 | 2.09 | 0.83 | 36 | 1.00 | 5.00 | 2.00 | 2.03 | 0.94 |
| Initial level of income, share of G7 | 44 | -2.54 | 1.81 | 0.09 | -0.57 | 1.60 | 36 | -2.54 | 1.13 | -1.50 | -0.72 | 1.78 |
| Oil trade balance as share of total exports | 44 | 0.03 | 0.28 | 0.07 | 0.09 | 0.06 | 36 | 0.02 | 0.30 | 0.14 | 0.13 | 0.08 |
| Oil prices, index | 44 | 11.6 | 40.0 | 23.8 | 25.2 | 10.1 | 36 | 11.6 | 28.6 | 13.3 | 15.3 | 5.0 |
| Vulnerability index, VIX | 44 | -8.2 | 63.2 | 0.0 | 10.3 | 18.2 | 36 | -7.4 | 29.7 | -2.7 | -0.8 | 8.8 |

Sources: IMF's World Economic Outlook database and authors' calculations.
Notes: Only the observations in the estimation sample for annual data are included in this table.

- Policy variables. This category is self-explanatory and is the main area of focus of this paper. For fiscal policy a measure of counter-cyclicality is used; namely, the difference between the fiscal balance and the cyclically-adjusted fiscal balance. An increase thus represents a tighter fiscal stance. Monetary policy enters through the change in money velocity; thus, an increase represents monetary tightening. The degree of exchange rate flexibility is measured by the index created by Reinhart and Rogoff (2004). This index ranges from 1 to 5 and a larger number represents greater exchange rate flexibility. The extent to which the country relies on capital controls is also part of the estimation through a de jure index that was created by Chinn and Ito (2008) using the IMF's AREAER report. A larger index implies more openness (i.e., liberalization) of the capital account.

- Global conditions. This is captured by the degree of global risk aversion as measured by the S&P volatility index. It is the only regressor that enters contemporaneously in the estimated regressions. All other regressors are lagged to limit endogeneity concerns with growth/vulnerability outcomes.

Table 6 shows the results from two estimations: one using annual data and the other using two-year averages.[7] As noted earlier, the objective of using the two-year averages is to smooth out business cycle effects. Clearly, an even longer period would have been desirable from the perspective of purging business cycle effects, but limitations in terms of the number of available data points prevented us from doing so. The estimated coefficient in the multinomial regressions reflects the likelihood of being in one cluster relative to a reference cluster. As noted earlier, the reference group used is the lower growth and higher vulnerability (V) cluster, which is the worst of all possible outcomes.

**Table 6. Multinomial Logit Estimations based on Growth and Vulnerability Clusters** 1/

| | | | VULNERABILITY | | | |
| --- | --- | --- | --- | --- | --- | --- |
| | | | Annual Data | | Two-Year Averages | |
| | | | Lower | Higher | Lower | Higher |
| **GROWTH** — Lower | Trade openness; exports plus imports (% of GDP) | | -0.024 *** | REFERENCE CLUSTER | -0.022 | REFERENCE CLUSTER |
| | Export and import growth rates, difference in % | | -0.017 | | 0.106 * | |
| | Financial openness; FX assets & liabilities (% of GDP) | | -0.024 | | -0.028 | |
| | FDI, net, % of GDP | | 0.038 | | 0.083 | |
| | Counter-cyclical fiscal policies 2/ | | -0.230 | | 0.975 | |
| | Monetary tightening; Δ in velocity | | -0.015 | | 0.025 | |
| | Exchange rate flexibility | | -0.292 | | 0.123 | |
| | Capital controls | | 0.273 | | -0.036 | |
| | Initial level of income, share of G7 | | -4.589 | | -7.907 | |
| | Vulnerability index, VIX | | 0.060 * | | -0.175 *** | |
| | Oil trade balance as share of exports and imports | | 0.318 ** | | 0.039 | |
| | Constant | | 4.283 *** | | 7.246 *** | |
| **GROWTH** — Higher | Trade openness; exports plus imports (% of GDP) | | -0.003 | 0.029 ** | -0.005 | 0.041 ** |
| | Export and import growth rates, difference in % | | -0.068 ** | -0.123 *** | 0.106 * | 0.084 |
| | Financial openness; FX assets & liabilities (% of GDP) | | -0.081 *** | 0.049 ** | -0.080 * | 0.039 |
| | FDI, net, % of GDP | | 0.062 | -0.151 | 0.098 | -0.029 |
| | Counter-cyclical fiscal policies 2/ | | -2.032 *** | -2.705 *** | -0.113 | -0.928 |
| | Monetary tightening; Δ in velocity | | -0.016 | -0.101 *** | 0.084 * | -0.026 |
| | Exchange rate flexibility | | 0.001 | 0.668 * | 0.294 | 1.170 ** |
| | Capital controls | | -0.633 ** | 0.008 | -0.481 | -0.462 |
| | Initial level of income, share of G7 | | -9.681 ** | -11.277 *** | -13.663 ** | -20.481 *** |
| | Vulnerability index, VIX | | 0.161 *** | -0.204 *** | -0.117 ** | -0.305 *** |
| | Oil trade balance as share of exports and imports | | 0.474 *** | 0.349 *** | 0.119 ** | 0.090 |
| | Constant | | -0.536 | 0.379 | 5.328 * | 0.497 |
| Pseudo R-squared | | | 0.396 | | 0.346 | |
| Number of observations | | | 178 | | 97 | |

Sources: IMF's World Economic Outlook database and authors' calculations.
1/ Robust (and clustered) standard errors. *, **, and *** denotes significance at 10, 5, and 1 percent. All regressors, except the VIX, are entered lagged. 2/ Difference between fiscal balance and cyclically-adjusted fiscal balance; in percent of GDP.

The estimation results are best discussed with a few examples. In the estimation that uses the two year average data, trade openness enters with a negative (but not statistically significant) sign in the lower growth and lower vulnerability (L) cluster. Thus, trade openness reduces the likelihood of being in this cluster relative to the reference cluster V (i.e., relative to the lower growth and higher vulnerability cluster). In contrast, trade openness enters with a positive (and statistically significant) sign in the higher growth and higher vulnerability cluster (H), which indicates that it increases the likelihood of being in

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[7] The simple two year average is performed for each of the variables; the first two-year average covers the period 1999-2000 and the last two-year average the period 2007-08. CA is performed on these average values.

this cluster relative to the reference cluster. Financial openness enters with a negative and statistically significant sign in the higher growth and lower vulnerability cluster G, which means that financial openness leads to a lower likelihood of belonging to this cluster than the reference cluster. In terms of economic policies, and only as examples, monetary tightening appears to reduce the likelihood of being in a higher growth and higher vulnerability cluster and greater exchange rate flexibility shifts a country to higher growth clusters—and, in both of these cases, the shifts are represented relative to the reference cluster V.[8]

**Figure 3. Probability in Individual Clusters (2-year average estimation)**
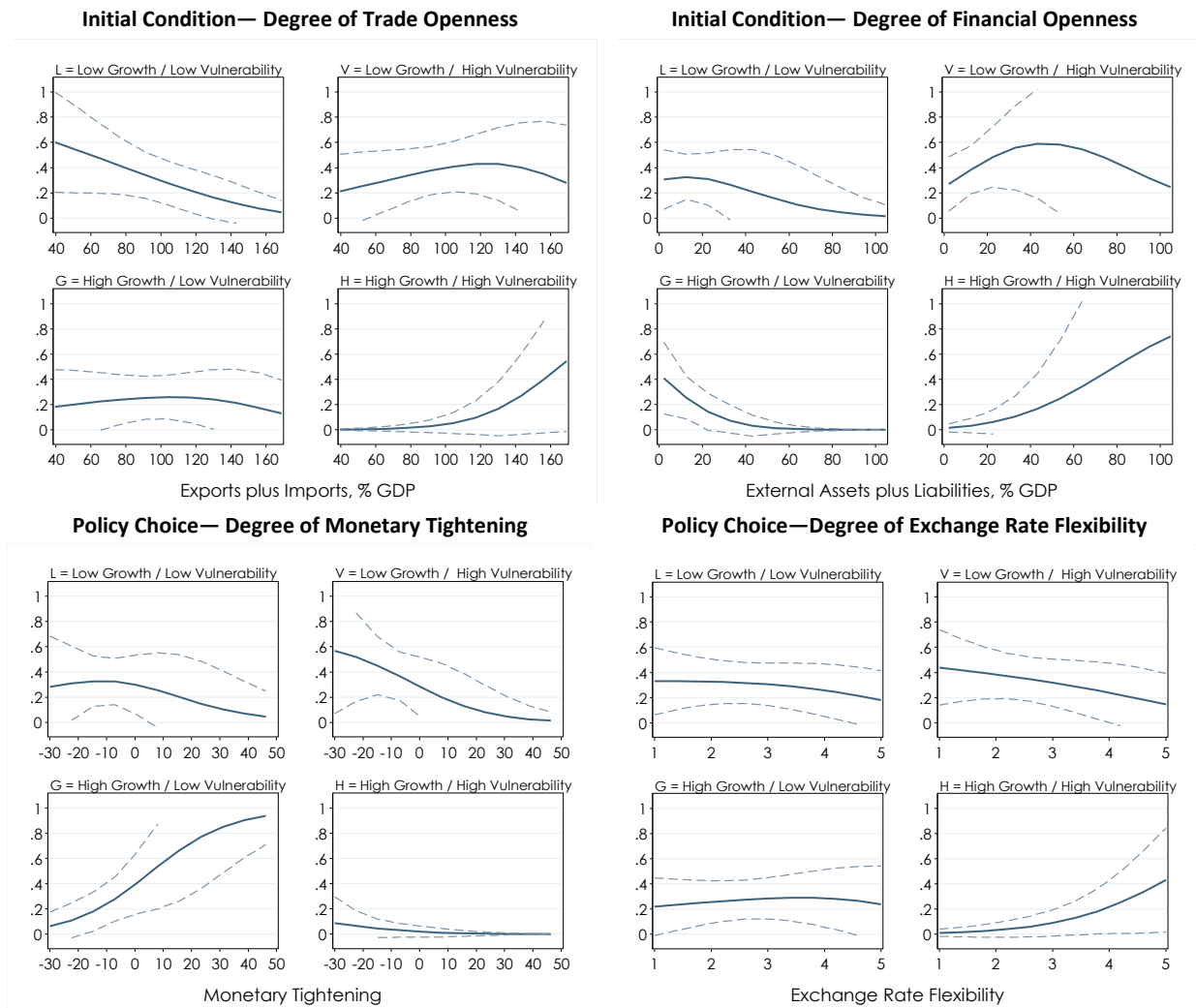


Source: Authors' calculations. Dash lines are 90 percent confidence bands.

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[8] Two statistical tests are useful when estimating multinomial logits. The first is the likelihood-ratio (LR) test on if the coefficients associated with each of the independent variables are simultaneously equal to zero across all four clusters. The second is the LR test that checks if all pairs of clusters are relevant or can be combined. The calculations for the annual estimation in Table 6 suggest that all the independent variables are simultaneously significantly different from zero with one exception: FDI net in percent of GDP. However, other specifications do have this regressor as statistically different from zero so it is kept. As to the LR test for comparing pairs of clusters, all groups are significant at least at the 10 percent level in both the estimation that uses the annual dataset as well as the one that uses the 2-year average dataset. Thus, it can be concluded that using four clusters is justified.

Unfortunately, the need to relate the results to a reference cluster makes the interpretation of multinomial logits cumbersome. Two graphical options exist that help to shed more light on the estimation results. The first option is presented in Figure 3. It measures the probability (vertical axis) of belonging to each of the four clusters as a regressor (horizontal axis) is changed. At any level of a regressor, the sum of the resulting probabilities in all four charts adds up to one. But what matters is how the probability in each cluster changes as the regressor changes. Four examples are provided in Figure 3. It is clear that an increase in trade openness will increase the probability of being in the higher growth and higher vulnerability (H) cluster, and this is also the case for the lower growth and higher vulnerability (V) cluster for levels of trade openness between 0 and 120 percent. In contrast, the probability of belonging to cluster L or G declines or remains stable as trade openness increases. A similar pattern is observed for financial openness, though the impact on cluster V seems sharper. Other examples are on monetary tightening and exchange rate flexibility, the latter measured by the Reinhart and Rogoff (2004) exchange rate regime classification.[9] Specifically, tighter monetary policies lead to a greater probability of a country ending in cluster G while an increase in exchange rate flexibility leads to cluster H. In fact, exchange rate flexibility reduces the likelihood of the worst outcome (i.e., cluster V).

Still, Figure 3 does not provide a metric to gauge the impact of the changes in regressors that could be considered more likely. Undoubtedly, changes in regressors may have an effect on the growth or the vulnerability dimensions (or concurrently on both dimensions). For example, if the change in a regressor shifts a country from the L and V clusters to the G and H clusters (or vice versa), then the effect is on the growth dimension. In contrast, if the shift takes place from the L and G clusters to the V and H clusters (or vice versa), then the effect is on the vulnerability dimension. More involved cases also exist. For example, a change in a regressor may lead to a sharp increase in the G cluster: an optimal outcome. Or lead to a sharp increase in the V cluster: the worst of all possible outcomes. But in all of these cases it remains unclear how much of a change in the regressor it is sensible to expect.

Against this background, Figure 4 provides a second option for presenting the results of estimations. This figure shows the impact of a one standard deviation shock (that is, an increase) on each of the regressors and how this affects the likelihood of being in any one of the four clusters (again, lower growth and lower vulnerability (L), lower growth and higher vulnerability (V), higher growth and higher vulnerability (H), and higher growth and lower vulnerability (G)). The discussion below presents the main estimation results for degree of openness, economic structure, economic policies, and global conditions.

*Degree of Openness*

An increase in trade openness raises the likelihood of being in a higher vulnerability cluster. Indeed, a one standard deviation shock increases the probability of being in the higher growth and higher vulnerability (H) cluster by slightly over 0.15. It also marginally increases the probability of being in the lower growth and higher vulnerability (V) cluster and reduces the probability of being in the lower growth and lower vulnerability (L) cluster by about 0.20 percent. Thus, much of the effect appears to occur by shifting countries from a lower growth and lower vulnerability cluster to a higher growth and higher vulnerability cluster. Thus, trade openness has an effect on both the growth dimension and the vulnerability dimension.

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[9] This is extended to 2008 using the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions.

It is worth noting, however, that not all types of trade openness are equivalent. An increase in the differential between export and import growth rates (that is, exports growing faster than imports) reduces the probability of the worst outcome (cluster V). It also increases the probability of being in a higher growth and lower vulnerability (G) cluster and, even more, the probability of being in a lower growth and lower vulnerability (L) cluster. Thus, a country's export orientation reduces the worst of all possible outcomes (cluster V). It does provide a metric to gauge a country's choice of development path.

**Figure 4. Probability and Shocks in 2-Year Average Estimation**

**A One Standard Deviation Increase in:**



**Change in the Predicted Probability**
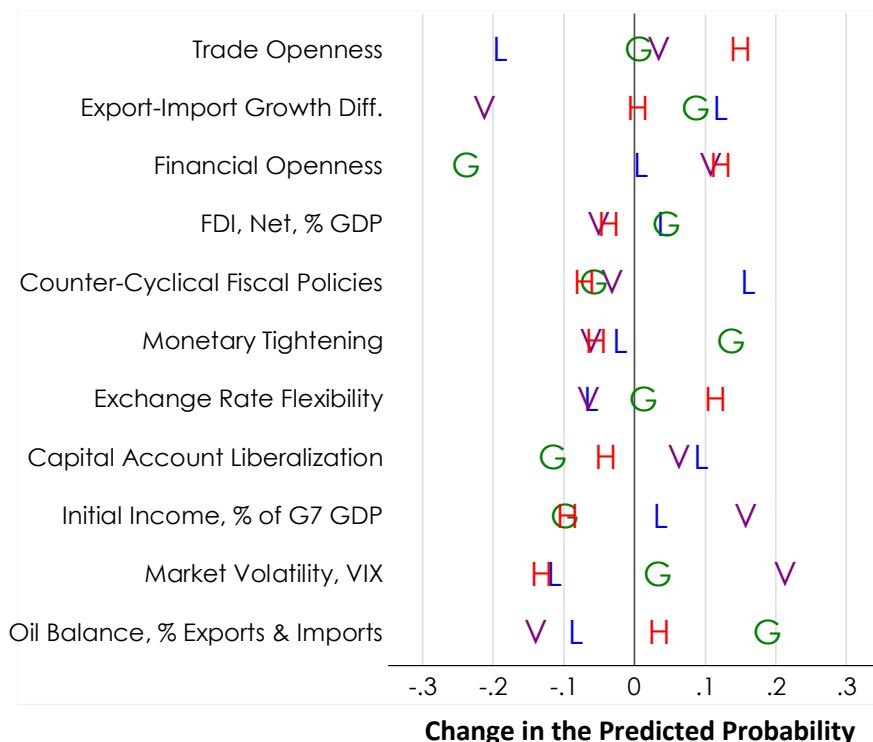
Sources: IMF's World Economic Outlook database and authors' calculations.
Notes: The horizontal axis measures the change in the predicted probability in each individual cluster following a change (a one standard deviation shock) in the indicator specified in the vertical axis. A positive value represents an increase in the probability of being in that cluster; e.g., greater exchange rate flexibility increases the probability of being in the higher growth and higher vulnerability (H) cluster. The opposite is the case for negative values; e.g., greater financial openness reduces the probability of being in the higher growth and lower vulnerability (G) cluster. The standard deviation shocks are derived from the data for the countries covered and that were observed during the period 2000-08. The charts are based on the 2-year average estimation.

As is the case with trade, financial openness also appears to increase vulnerability. However, it appears to do so in a similar magnitude in both the higher growth and higher vulnerability (H) cluster and the lower growth and higher vulnerability (V) cluster. Financial openness also appears to reduce quite significantly the probability of being in a higher growth and lower vulnerability (G) cluster, an effect that does not take place in trade openness. In other words, financial openness might deliver high growth, but might also lead to the worst of all possible outcomes (cluster V). Thus, financial openness appears to act primarily at the level of the vulnerability dimension. Interestingly, the type of financial openness also matters. If FDI plays an important role, then countries are more likely to end in either cluster L or cluster G, suggesting that FDI type financing sources have stronger stability features than other financing sources. While these results are in many ways in line with our priors, they still serve to

highlight that countries need to be more aware of these features to maintain sustainable development paths.

*Economic Development and Economic Structure*

An increase in the initial income level (relative to the G7 GDP) decreases the probability of being in either of the higher growth clusters and increases the probability of being in one of the lower growth clusters. This is consistent with income convergence—growth rates are expected to be lower at higher levels of initial income. Interestingly, vulnerability is also a factor—cluster V is more likely than cluster L. This is a control for level of development, which can be related to the income convergence path. Also, we controlled for a country's progress with its transition path was not statistically significant, but this could reflect the particular transition measure used. Specifically, we used the real GDP deviation from the pre-transition peak, but other measures, such as EBRD transition indicators, may be worth exploring.

A larger oil trade balance (as a percent of exports and imports) reduces the likelihood of being in a lower growth cluster. Specifically, it reduces the probability of being in lower growth and higher vulnerability (V) cluster and the lower growth and lower vulnerability (L) cluster. Conversely, it increases the probability of being in either of the higher growth clusters—and much more so in cluster G than in cluster H.

*Economic Policies*

A key challenge for emerging markets going forward is to what extent economic policies serve to avoid the worst of all possible outcomes (that is, cluster V); in other words, a high risk (increased vulnerability) and low reward (lower growth) scenario is clearly suboptimal. The main findings are,

- Counter-cyclical fiscal policies seem to lead to an increase in the probability of being in the lower growth and lower vulnerability (L) cluster at the cost of reducing the likelihood of all the other three clusters. This result could be reflecting the fact that fiscal policy is generally tightened when countries have already started showing growing imbalances and signs of vulnerability. Whatever its source, a counter-cyclical fiscal policy serves to slowdown overheating economies and reduce vulnerabilities; not a surprising result, but in line with traditional policy advice. In sum, counter-cyclical fiscal policies seem to have an effect on both the growth dimension and the vulnerability dimension and, in particular, are likely to lead to cluster L.
- Monetary tightening reduces vulnerability and, perhaps surprisingly, seems to support growth. An increase in monetary tightening reduces the probability of being in the lower growth and higher vulnerability (V) cluster and increases the probability of being in the higher growth and lower vulnerability (G) cluster. Here too the effect appears to be across both the growth and the vulnerability dimensions, but mainly through increasing the likelihood of cluster G.
- Greater exchange rate flexibility is likely to shift a country to a higher growth and higher vulnerability (H) scenario and, more importantly, lead it away from the two lower growth outcomes—cluster V and L. The effect appears to be primarily across the growth dimension, in particular on cluster H.
- De jure measures of capital account liberalization suggest these policies are not good for growth as they appear to shift countries away from clusters G and H while at the same time increasing the likelihood these countries shift to clusters V or L; in other words, the effect is primarily across the growth dimension. In sum, capital account liberalization has a negative growth impact. This

somewhat counterintuitive result is not new in the literature and could reflect difficulties with measuring the intensity of capital account liberalization measures.

*Global Conditions*

An increase in market volatility and global risk aversion, measured contemporaneously by the VIX, increases the probability of being in the lower growth and higher vulnerability (V) cluster and reduces the probability of a higher growth and higher vulnerability (H) cluster. The explanation seems obvious. Under conditions of market uncertainty, capital flows are likely to be more of a short term nature and more volatile; in turn, this increases the probability that countries will face vulnerability without growth.

*Discussion*

How good is the model at predicting the actual outcome of cluster analysis? The matrix in Table 7 shows the percentage of correct predictions by the model relative to the original cluster analysis classification. Undoubtedly, the model has much to improve. Still, it correctly predicts about 55 percent of the lower vulnerability cases and about 73 percent of the higher vulnerability cases.

What conclusions can be drawn that can best position countries in a higher growth and lower vulnerability path? First, though the results suggest that increased trade openness per se could lead to an increase in vulnerability, it also appears to help a country achieve the most beneficial of the vulnerability clusters (group H). Also, the factors underlying trade openness matter; e.g., strong export performance (which in turn would depend on structural and macro policies that are not explored in this paper) reduces the likelihood of higher vulnerability outcomes. It follows that a country's export orientation is a source of sustainable development. A similar conclusion was reached by Atoyan.

**Table 7. Model Fit (Predicted Correctly in Percent of Original Cluster Analysis Classification)**

|  | Low vulnerability | High vulnerability |
|---|---|---|
| Low growth | 52 | 74 |
| High growth | 56 | 72 |

Sources: IMF's World Economic Outlook database and authors' calculations. The shaded cell in the 2x2 matrix reflects the reference cluster, which is also been defined as the worst of all possible outcomes; that is, lower growth and higher vulnerability.

Second, the results indicate that increased financial openness is associated with increased vulnerability. While capital inflows can bring many benefits, including financing for productive investments and allowing diversification of investment risks, they can also complicate macroeconomic management and heighten vulnerabilities. In particular, they can lead to upward pressures on the exchange rate and contribute to overheating, with widening current account deficits and rapid credit growth. Moreover, often, when the flows are intermediated through the banking sector, the banking sector can play an important role in amplifying the macroeconomic challenges. Furthermore, Inflows into the banking sector that are extended as credit to the private sector can lead to the validation of demand that would otherwise be liquidity constrained and can fuel asset prices increases. In turn, the

rise in asset prices increases the value of the collateral that banks can lend against—thereby exacerbating the cycle. But here too the components of capital flows also seem to matter. For instance, higher FDI as a percentage of GDP reduces vulnerability. In part, this is because FDI flows do not contribute to the growth of short-term debt to FX reserves and debt-to-GDP (two vulnerability indicators). In addition, FDI flows are less likely to contribute to the macroeconomic overheating cycles that take place through the banking sector and that typically lead to rapid growth in domestic credit.

Third, the effect of changes in economic policies is quite strong. Monetary policy tightening can help reduce the probability of being in a vulnerable cluster as it dampens macroeconomic overheating associated with potential increases in vulnerability and it does so with a positive impact on growth. Counter-cyclical fiscal policies might on the other hand have a negative impact on growth. However, these policies reduce vulnerabilities. This finding seems to be in accordance with the experience of the countries in the region prior to the crisis. As discussed and documented in Mitra et al. (2009) and Bakker and Gulde (2010), in many of the new EU member states, fiscal policy was not sufficiently tight from a demand management perspective and instead served to heighten the overheating of the economy and the buildup of vulnerabilities. Indeed, countries that had rapid public expenditure growth also showed the pronounced signs of overheating and a buildup of vulnerability (such as widening current account deficits), as fiscal policy exacerbated private sector demand pressures in these countries. Also, our results suggest that exchange rate flexibility can deliver higher growth outcomes while avoiding the worst of all possible outcomes (cluster V). Again, this is consistent with the experience of countries in the region as discussed in Bakker and Gulde; specifically, they find that most of the countries with flexible exchange rates were able to have tighter monetary conditions by letting their nominal exchange rate appreciate, which helped to keep inflation low and real interest rates high. These countries managed to have much less pronounced credit booms and smaller current account deficits. Interestingly, from the empirical results in this paper, capital account liberalization does not seem to have an impact in reducing vulnerabilities, but does seem to negatively affect growth outcomes.

Finally, the estimation results indicate the importance of global conditions. Under conditions of global risk aversion and uncertainty, the probability of being in the higher growth and higher vulnerability (H) cluster appears to be low—presumably reflecting the fact that there is less global liquidity fuelling large capital flows which can complicate domestic macroeconomic management. As noted in Mitra et al. (2009), the role of global economic conditions, including the impact through income convergence aspirations, should not be underestimated as a factor behind the pre-crisis increase in capital flows to the region. It remains to be seen going forward, however, if capital market behavior will change and limit the economic overheating observed in the pre-crisis period.

## 3. Conclusions

The purpose of this paper has been to analyze the economic policies and initial conditions that can best position countries to enjoy growth without a buildup of vulnerabilities; in other words, a high reward and low risk outcome. To this end, the growth patterns of the transition countries and Turkey are classified prior to the onset of the 2008 global crisis using a methodology known as cluster analysis. Countries are classified into four categories—lower growth and lower vulnerability (L), lower growth and higher vulnerability (V), higher growth and lower vulnerability (G), and higher growth and higher vulnerability (H). The definition of vulnerability is multifaceted, taking into account both domestic and external dimensions that previous studies have found to be both good indicators of vulnerability to financial crises and good indicators of vulnerability to a prolonged recession once a crisis has hit.

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Using multinomial logit regression analysis, the policies that affect the probabilities of being in each of the four possible clusters are examined. This allows us to draw conclusions about policies that affect the growth and vulnerability (or reward and risk) patterns. It is true that many (if not most) of the countries in our sample experienced very large capital inflows relative to their GDP prior to the crisis, which can complicate macroeconomic management and lead to a buildup of vulnerability. These large inflows were partly due to the high liquidity in global markets and, at least for some countries in the country sample, the particular attractiveness of "new Europe" in the eyes of investors. Nonetheless, we find strong evidence that the macroeconomic and structural policies that over time influence the structure of the economy can play a significant role in explaining (and, going forward, in influencing) the different growth and vulnerability patterns experienced by the countries covered in this paper.

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**Appendix 1.A. Summary Statistics by Cluster Group – Real GDP growth (%)**

| Cluster | N | Mean | Std. Dev. | Min. | Country of Min. | Max. | Country of Max. |
|---------|---|------|-----------|------|-----------------|------|-----------------|
| **2000** | | | | | | | |
| L | 12 | 4.58 | 1.57 | 1.94 | Georgia | 7.30 | Albania |
| V | 6 | 5.21 | 1.63 | 2.11 | Moldova | 6.92 | Latvia |
| G | 3 | 9.94 | 0.13 | 9.80 | Kazakhstan | 10.05 | Russian Fed. |
| H | 2 | 13.44 | 7.27 | 8.30 | Tajikistan | 18.59 | Turkmenistan |
| **2001** | | | | | | | |
| L | 12 | 3.71 | 2.91 | -4.53 | Macedonia, FYR | 6.49 | Azerbaijan |
| V | 3 | 1.91 | 6.61 | -5.70 | Turkey | 6.14 | Moldova |
| G | 5 | 9.05 | 2.69 | 6.74 | Lithuania | 13.50 | Kazakhstan |
| H | 4 | 11.95 | 5.70 | 8.05 | Latvia | 20.39 | Turkmenistan |
| **2002** | | | | | | | |
| L | 11 | 4.15 | 1.56 | 0.85 | Macedonia, FYR | 5.50 | Georgia |
| V | 4 | 3.94 | 2.74 | -0.02 | Kyrgyz Rep. | 6.16 | Turkey |
| G | 5 | 9.19 | 2.47 | 6.86 | Lithuania | 13.19 | Armenia |
| H | 3 | 7.79 | 1.31 | 6.47 | Latvia | 9.10 | Tajikistan |
| **2003** | | | | | | | |
| L | 5 | 4.25 | 1.23 | 2.82 | Macedonia, FYR | 5.77 | Albania |
| V | 6 | 4.76 | 1.37 | 2.45 | Serbia | 6.62 | Moldova |
| G | 5 | 10.43 | 2.49 | 7.25 | Russian Fed. | 14.04 | Armenia |
| H | 7 | 8.40 | 1.53 | 7.00 | Kyrgyz Rep. | 10.25 | Lithuania |
| **2004** | | | | | | | |
| L | 5 | 5.46 | 0.85 | 4.08 | Macedonia, FYR | 6.31 | Bosnia & Herzegovina |
| V | 2 | 4.56 | 0.43 | 4.25 | Croatia | 4.86 | Hungary |
| G | 4 | 9.07 | 1.56 | 7.15 | Russian Fed. | 10.47 | Armenia |
| H | 12 | 8.81 | 1.83 | 6.64 | Bulgaria | 12.08 | Ukraine |
| **2005** | | | | | | | |
| L | 1 | 6.39 | - | 6.39 | Russian Fed. | 6.39 | Russian Fed. |
| V | 12 | 4.23 | 1.83 | -0.16 | Kyrgyz Rep. | 6.70 | Tajikistan |
| G | 2 | 20.13 | 8.86 | 13.87 | Armenia | 26.40 | Azerbaijan |
| H | 8 | 9.06 | 1.06 | 7.47 | Moldova | 10.60 | Latvia |
| **2006** | | | | | | | |
| L | 6 | 5.31 | 0.91 | 3.90 | Macedonia, FYR | 6.32 | Bulgaria |
| V | 4 | 4.51 | 1.33 | 3.10 | Kyrgyz Rep. | 6.23 | Poland |
| G | 5 | 13.85 | 11.84 | 6.89 | Turkey | 34.50 | Azerbaijan |
| H | 8 | 9.42 | 1.66 | 7.30 | Ukraine | 12.23 | Latvia |
| **2007** | | | | | | | |
| L | 11 | 6.13 | 1.43 | 3.00 | Moldova | 8.06 | Russian Fed. |
| V | 4 | 5.56 | 3.13 | 0.97 | Hungary | 7.80 | Tajikistan |
| G | 6 | 12.85 | 6.34 | 8.50 | Kyrgyz Rep. | 25.00 | Azerbaijan |
| H | 2 | 9.91 | 0.10 | 9.84 | Lithuania | 9.98 | Latvia |
| **2008** | | | | | | | |
| L | 3 | 2.07 | 1.29 | 0.66 | Turkey | 3.20 | Kazakhstan |
| V | 6 | -0.05 | 3.20 | -4.55 | Latvia | 2.76 | Lithuania |
| G | 12 | 6.92 | 1.94 | 4.80 | Macedonia, FYR | 10.80 | Azerbaijan |
| H | 0 | - | - | - | - | - | - |

**Appendix 1.B. Average Values of Vulnerability Measures, by Cluster Group**

| | Domestic | | | External | | |
| | | | | | Short-term debt, | |
| | Private | | Loan-to- | External | remaining | |
| | sector credit | Fiscal deficit | deposit ratio | debt (% of | maturity (% of | REER |
| Cluster | growth (%) | (% of GDP) | (%) | GDP) | FX reserves) | Overvaluation |
|---|---|---|---|---|---|---|
| **2000** | | | | | | |
| L | 27.09 | 3.02 | 134.97 | 53.2 | 65.10 | -0.03 |
| V | 11.94 | 4.21 | 138.86 | 75.69 | 306.17 | 0.01 |
| G | 35.64 | -0.59 | 132.86 | 61.21 | 122.56 | -0.07 |
| H | 36.21 | 3.04 | 485.35 | 83.63 | 43.91 | -0.01 |
| **2001** | | | | | | |
| L | 9.85 | 2.62 | 119.65 | 49.68 | 102.49 | 0.00 |
| V | 1.42 | 7.45 | 108.62 | 91.05 | 163.86 | -0.01 |
| G | 22.06 | 2.50 | 115.81 | 47.69 | 113.27 | 0.01 |
| H | 24.32 | 1.50 | 313.86 | 67.78 | 181.44 | 0.05 |
| **2002** | | | | | | |
| L | 11.55 | 2.90 | 111.16 | 47.96 | 84.35 | 0.01 |
| V | 16.52 | 7.02 | 111.08 | 69.31 | 132.96 | 0.01 |
| G | 9.43 | 0.04 | 124.40 | 47.8 | 109.42 | 0.00 |
| H | 31.52 | 1.91 | 211.79 | 90.78 | 216.69 | 0.00 |
| **2003** | | | | | | |
| L | 22.96 | 2.81 | 98.86 | 42.11 | 54.43 | -0.03 |
| V | 22.47 | 4.11 | 118.18 | 67.31 | 106.09 | 0.00 |
| G | 24.07 | 0.05 | 128.18 | 45.27 | 63.73 | -0.06 |
| H | 34.54 | 1.39 | 154.31 | 63.26 | 249.53 | -0.01 |
| **2004** | | | | | | |
| L | 20.37 | 1.78 | 101.41 | 43.78 | 63.24 | -0.02 |
| V | 11.66 | 4.89 | 128.42 | 71.75 | 100.35 | 0.01 |
| G | 36.17 | -0.77 | 103.13 | 30.85 | 36.09 | -0.06 |
| H | 36.00 | 0.96 | 154.99 | 61.89 | 179.43 | 0.00 |
| **2005** | | | | | | |
| L | 20.02 | -8.15 | 126.10 | 33.65 | 64.48 | 0.00 |
| V | 25.81 | 1.93 | 126.64 | 54.78 | 70.75 | 0.00 |
| G | 35.65 | 0.11 | 111.67 | 17.44 | 3.61 | -0.03 |
| H | 44.40 | -0.56 | 154.80 | 57.02 | 241.46 | 0.00 |
| **2006** | | | | | | |
| L | 23.17 | -0.06 | 101.85 | 57.1 | 69.48 | -0.01 |
| V | 23.58 | 4.39 | 122.58 | 75.45 | 76.71 | -0.03 |
| G | 33.19 | -1.47 | 138.50 | 28.37 | 41.07 | -0.01 |
| H | 46.89 | -0.60 | 163.49 | 63.9 | 208.03 | 0.00 |
| **2007** | | | | | | |
| L | 34.52 | 0.23 | 117.54 | 57.32 | 80.59 | -0.01 |
| V | 52.29 | 2.84 | 169.25 | 75.98 | 158.65 | 0.01 |
| G | 56.65 | 0.18 | 163.63 | 39.91 | 65.58 | -0.01 |
| H | 28.40 | 0.17 | 209.29 | 102.34 | 319.80 | -0.01 |
| **2008** | | | | | | |
| L | 2.76 | 0.89 | 146.11 | 66.76 | 119.17 | 0.01 |
| V | 10.80 | 3.64 | 218.84 | 86.42 | 239.36 | 0.03 |
| G | 22.94 | -0.44 | 143.62 | 42.93 | 90.60 | 0.02 |
| H | - | - | - | - | - | - |

**Appendix 2. Description of Variables and Country Coverage**

The country coverage is described in Table 4 and includes: Azerbaijan, Albania, Armenia, Belarus, Bosnia and Herzegovina (BiH), Croatia, Czech Republic, Estonia, FYR Macedonia, Georgia, Hungary, Kazakhstan, Latvia, Lithuania, Moldova, Poland, Turkey, Russia, Slovak Republic, and Ukraine. All data sources are from the IMF WEO and IMF IFS databases, unless otherwise noted. The definition of the variables used in this paper is as follows:

Trade openness: Exports of goods and services plus imports of goods and services, as a percentage of GDP.

Export-import growth differential: Differential between growth rate of exports and that of imports.

Financial openness: Foreign assets plus foreign liabilities of commercial banks, as a percentage of GDP. Foreign assets and liabilities are the 21 and 26C series, respectively, in IMF IFS database.

FDI, net: Foreign direct investment, net inflows, % of GDP.

Counter-cyclical fiscal policies: Differential between fiscal balance and cyclically-adjusted fiscal balance, as a percentage of GDP. The latter is calculated by subtracting government expenditure from cyclically-adjusted revenue. The adjustment is done by using the Hodrick-Prescott (HP) filter. Positive and negative values indicate counter-cyclical and pro-cyclical fiscal policies, respectively.

Monetary tightening: Differential between growth rate of nominal GDP and that of broad money in current local currency. An increase means tightening of monetary policies, and vice versa.

Exchange rate flexibility: Exchange rate arrangements as classified in Reinhart and Rogoff (2004) and Ilzetzki, Reinhart and Rogoff (2008). The values range from 1 to 5: higher, more flexible (the coarse classification). The original series goes up to 2007 only, and, for 2008, the values in 2007 are used.

Capital account liberalization: An index measuring the degree of capital account openness defined in Chinn and Ito (2006 and 2008). Higher values reflect that a country is more open to capital transactions.

Initial income: Per capita GDP, as a percentage of GDP of G7 country average.

Market volatility: Chicago Board Options Exchange Volatility Index (VIX), end of year. The data are from Bloomberg.

Oil trade balance: Oil trade balance, as a percentage of exports plus imports.