# Economic Growth, Financial Development, and Trade Openness in Emerging Markets: Panel Approach

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# Economic Growth, Financial Development, and Trade Openness in Emerging Markets: Panel Approach

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***Abstract***

This paper examines the long-run relationships of the growth model in 21 emerging countries and their alteration when countries in the considered panel vary. Panel estimations using quarterly data for the period 1995-2013 are made for different groups of emerging countries, such as the Full, F-10, Advanced, and Secondary. Additionally, the paper analyzes the changes in the relationships between growth, financial development, and trade openness in groups of emerging countries by taking the presence of structural shifts into account where they exist. Recent panel techniques are employed in this study. The empirical findings reveal that economic growth is highly related to financial development and trade openness only in emerging countries which are not exposed to structural shifts. However, the estimation results illustrated that economic growth is not related to financial development and trade openness in countries exposed to structural shifts. Division of the sample into more narrow groups does not change the estimation results for unstable countries.

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**Key Words:** Economic growth, financial development, trade openness, emerging markets, cointegration test, structural shifts.

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## 1. Introduction

The discussion about the relationship between economic growth, financial development, and trade openness has been continuing for decades. The neoclassical growth theory (Solow, 1956) argues that long-run economic growth is not affected by the changes in the policies. The endogenous growth theory suggests that long-run economic growth may be achieved through financial development (Romer (1986), Lucas (1988), Rebelo (1991), Grossman and Helpman (1991), Pagano (1993), Khan (2001)). Economic growth increases with financial development (Bagehot (1873), Schumpeter (1934), Hicks (1969), McKinnon (1973), Shaw (1973), and Claessens and Laeven (2005)). Increasing the pace of financial liberalization may enhance economic growth (Bekaert and Harvey (2000), Bekaert et al. 2001, 2002, and 2005). Blackburn and Hung (1998) allocate the endogenous growth theory to explain that financial development and trade liberalization do not influence economic growth significantly.

The endogenous growth theory indicates that policy changes such as investments to human capital, research and development, and infrastructure may create economic growth in the long run. Capital accumulation, technological innovation, and efficient allocation of resources may be achieved through financial development (Menyah, Nazlıoğlu, and Wolde-Rufael, 2014). Trade openness and policies regarding trade and finance influence the economy through; competition, economies of scale, increasing inputs and production, capacity utilization, and spillover effects. Financially developed economies produce more aggregate output via better human capital and increasing returns on investment which in turn increases the savings rate of such countries (Kar, Peker, and Kaplan, 2008). Rajan and Zingales (2003) indicate that higher levels of capital flows and trade lead to financial development. A positive long-run relationship is present between trade openness and financial development (Kim et al., 2010). Imports and exports increase with financial development (Wolde-Rufael, 2009).

Levine (2003) states that financial development may increase the returns to saving and decrease risk; thereby decreasing savings and in turn economic growth. Robinson (1952) argued that economic growth creates financial development. Lucas (1988) stated that finance is not strongly influential on economic growth, in other words its role is overemphasized. Schumpeter (1934) argued that financial development increases economic growth through efficient allocation of resources that leads to technological innovations. Patrick (1966) suggested two perspectives; the demand following hypothesis, and the supply leading

hypothesis which reflect the direction of the causality to be of importance. The direction of causality may be analyzed in four categories: (i) unidirectional causality from financial development to economic growth (supply leading hypothesis), (ii) unidirectional causality from economic growth to financial development (demand following hypothesis), (iii) bidirectional causality between financial development and economic growth, and (iv) no causality between financial development and economic growth (neutral hypothesis).

In the literature, most of the studies use Granger causality tests, cross-section analysis (Goldsmith (1969), Atje and Jovanovic (1993), King and Levine (1993a and 1993b), Levine and Zervos (1998)), panel time-series analysis (Levine, 2005), panel GMM estimation (Levine, Loayza, and Beck, 2000; Beck, Levine, and Loayza, 2000) with fixed and random effects estimators (Hsiao et al., 1989; Pesaran and Smith, 1995; Weinhold, 1999; Nair-Reichert and Weinhold, 2001), and panel cointegration analysis (Neusser and Kugler, 1998; Christopoulos and Tsionas, 2004) to analyze the relationship between economic growth and financial development. Roubini and Sala-i-Martin (1991), state that economic growth is positively influenced by trade and financial liberalizations. The developed and developing countries that have well-functioning financial markets experience higher economic growth rates (Hassan et al., 2011, Kar et al., 2011).

Hurlin (2008) assumes slope heterogeneity, but not cross-sectional dependency in applying panel data causality test. Bai and Kao (2006) indicate that panel data may not be able to satisfy the assumption of cross-sectional independence. Hence, the results may be biased and inconsistent. Konya (2006) considers coefficient heterogeneity and cross-sectional dependency using a panel Granger causality test for 24 OECD countries between 1960 and 1997 based on SUR systems and Wald tests with country specific bootstrap critical values for two different models where; in the bivariate one, GDP and exports relationship is analyzed and in the trivariate one the relationship between GDP, exports, and openness is explored. Authors find one-way causality: (i) from exports to GDP for Belgium, Denmark, Iceland, Ireland, Italy, New Zealand, Spain, and Sweden by testing the export led growth hypothesis, and (ii) from GDP to exports for Austria, France, Greece, Japan, Mexico, Norway, and Portugal by testing the growth driven exports hypothesis. Canada, Finland, and the Netherlands have two-way causality between exports and economic growth. Australia, Korea, Luxembourg, Switzerland, the UK, and the USA show no evidence of causality.

King and Levine (1993a), Savvides (1995), Levine et al. (2000), Khan and Senhadji (2003), Hassan and Bashir (2003), Chuah and Thai (2004), Christopoulos and Tsionas (2004), Al-Awad and Harb (2005), and Shahbaz (2009) state a positive relationship between financial

development and economic growth. The causality is from financial development to economic growth (King and Levine, 1993a and 1993b; Levine, 1997 and 2005; Levine et al., 2000; Khan and Senhadji, 2003; Christopoulos and Tsionas, 2004; Habibullah and Eng, 2006). Friedman and Schwartz (1963) and Lucas (1988) support a negative relationship between the two variables.

Kyophilavong et al. (2014) apply the ARDL bounds testing approach to cointegration in their study and find a long-run relationship between financial development and economic growth. They indicate that while unidirectional causation running from financial development to economic growth supports the supply leading hypothesis, unidirectional causation running from economic growth to financial development supports the demand following hypothesis. A consensus about the direction of causality between economic growth and financial development has not been established yet. Shahbaz and Rahman (2012) suggest that the causality runs from financial development to economic growth, supporting the supply leading hypothesis.

Kemal et al. (2004) analyze the causal relationship between financial development and economic growth for 19 high income countries by employing heterogenous panel data for the period 1974-2001. They find that economic growth may be negatively affected by financial development when the inflation is high. The results of the heterogenous panel causality analysis do not reflect a causal relationship between finance and economic growth or vice versa. According to the authors, finance and growth literature consists of four different groups: (i) finance promotes growth (Schumpeter, 1934), (ii) finance hurts growth (Levine, 2003), (iii) finance follows growth (Robinson, 1952), and (iv) finance does not matter (Lucas, 1988). In line with Kar et al. (2011), Kemal et al. (2004) indicate that their results do not provide evidence of causality between finance and growth, except the case where growth leads to finance when the stock market activities are taken into account. They find that although direct finance is positively and significantly correlated to economic growth, indirect finance is not.

Hassan et al. (2011) analyze the relationship between financial development and economic growth across geographic regions and income groups in low and middle income countries, and find a strong correlation between financial development and economic growth in the long run. The growth rates of annual GDP per capita are employed in panel regressions and variance decompositions to find the proxy measures that are important for financial development. The results support a positive correlation between financial development and economic growth in developing countries. Hassan et al. (2011) apply Granger causality tests

to find the direction of causality between finance and economic growth. In line with Demetriades and Hussein (1996), Blackburn and Hung (1998), Luintel and Khan (1999), Khan (2001), Shan et al. (2001), Calderon and Liu (2003); their results reflect two-way causality for all the regions except Sub-Saharan Africa, East Asia and Pacific in the short run, contradicting with McKinnon (1973), King and Levine (1993a), Levine et al. (2000), Christopoulos and Tsionas (2004) who state unidirectional causality from finance to growth. Kemal et al. (2004); Gurley and Shaw (1967); Goldsmith (1969), and Jung (1986) state that economic growth increases the demand for financial services, thereby increasing financial development. The causal relationship is unidirectional, from growth to finance for Sub-Saharan Africa, East Asia and Pacific regions where per capita GDP is very low.

Hsueh et al. (2013) support the supply-leading hypothesis in their study stating that financial development increases economic growth in the Asian countries such as China. Rousseau and Wachtel (2005), state that the correlation between financial development and economic growth is stronger for the 84 countries analyzed for the period 1960-2003. Controlling for cross-sectional dependence, Kar et al. (2011) use panel causality test to explain the correlation between financial development and economic growth for the Middle Eastern and North African (MENA) countries. Authors indicate that, while most of the cross-sectional and panel studies find a positive correlation between financial development and economic growth most of the literature employing time series states either unidirectional or bidirectional causality. Kar et al. (2011) suggest that economic reforms and efficient financial systems may enhance economic growth in the long-run, and trade openness may influence financial development.

Al-Avad and Harb (2005) employ panel cointegration approach to analyze ten MENA countries for the period between 1969 and 2000. Although, the causal relationship between financial development and economic growth is not strong in the short-run, it may be stronger in the long-run. Achy (2004) analyzes the causal relationship between financial development and economic growth for five MENA countries between 1970 and 1997 by controlling human capital and private investment and taking trade openness into account, and finds that economic growth may not be explained by financial development. Schich and Pelgrin (2002) apply a panel error correction approach to data for 19 OECD countries between 1970-1997, and state that financial development and investment levels are significantly related to each other in the long-run for low and middle income economies.

Kar et al. (2008) examine human capital, trade liberalization and financial development on economic growth for the period 1960-2004. They state that trade and

financial liberalizations affect economic growth positively by applying principal component analysis. Habibullah and Eng (2006) use a panel data set with GMM technique by Arellano and Bover (1995), and Blundell and Bond (1998) using a causality testing analysis. Their results indicate that financial development and economic growth are strongly correlated in the developing countries. The study supports the supply leading hypothesis which suggests that financial development leads to economic growth.

Christopoulos and Tsionas (2004) employ panel unit root tests and panel cointegration analysis to explain the correlation between financial development and economic growth in the long-run. They find unidirectional causality from the former to the latter in the long-run. Menyah et al. (2014) allocate a bootstrapped panel causality analysis in order to explain the causality between financial development, trade openness, and economic growth. They find support for the demand-following hypothesis for three countries out of 21. Financial development and trade openness show a limited causal relationship in this study. Agbetsiafia (2004) supports the supply-leading hypothesis and finds unidirectional causality from financial development to economic growth for Sub-Saharan Africa. Odhiambo (2007) finds supply-leading hypothesis for Tanzania, but demand-following hypothesis for Kenya and South Africa. Wolde-Rufael (2009) refers to bidirectional causality between financial development and economic growth for Kenya. Fowowe's (2011) results state homogeneous bidirectional causality for the so-called variables.

In July 2011, Frontier Strategy Group (FTSE) released the F-10, a list of the top 10 emerging markets that are most tracked by global multinational companies, namely: China, Brazil, India, Mexico, Russia, Indonesia, Colombia, Argentina, Chile, and Turkey[4]. The FTSE group, on the basis of the national income and the development of the market infrastructure, classifies the emerging markets into two different groups: the Advanced Emerging Markets and the Secondary Emerging Markets. The Advanced Emerging Markets group consists of countries with upper or lower middle Gross National Income (GNI) with advanced market infrastructure or countries with high GNI with lesser developed market infrastructure. The Secondary Emerging Markets group encloses countries with low, lower middle, upper middle and high GNI with reasonable market infrastructure and upper middle GNI countries with lesser developed market infrastructure (FTSE, 2014). The first group includes Brazil, Czech Republic, Hungary, Malaysia, Mexico, Poland, South Africa, Taiwan, Thailand, and Turkey.

[4] http://blog.frontierstrategygroup.com/2011/07/keeping-an-eye-on-latin-america-you%E2%80%99re-in-good-company/

The second group consists of Chile, China, Colombia, Egypt, India, Indonesia, Morocco, Pakistan, Peru, Philippines, Russia, and the United Arab Emirates.

This paper examines the long-run relationships in the growth model between economic growth, financial development, and trade openness in 21 emerging countries[5] for the period 1995-2013 on quarterly basis. These emerging countries are analyzed in both narrower groups and according to the FTSE Group classifications -F-10, Advanced, and Secondary[6]- in order to compare the results of the analysis when emerging countries are combined in different panels.

The novelty of this study is the analysis of the long-run relationships in growth model of emerging countries in the presence of structural breaks. The rest of the paper is organized as follows. In the next section, the applied methodological approach is presented. In section 3, the obtained empirical results are reported, and finally, the last section concludes.

## 2. Methodology

Numerical studies on the relationships between economic growth and its determinants in emerging countries estimate the basic model that demonstrates the linear relationships between variables (Halicioglu, 2007, Vo, 2010, Polat et al., 2014). Thus the relationships between economic growth, financial development and trade openness take the following form:

$$\ln GR_{j,t} = \beta_0 + \beta_1 \ln FD_{j,t} + \beta_2 \ln TO_{j,t} + \varepsilon_t \qquad (1)$$

where $GR_{j,t}$ is economic growth of the $j^{th}$ country at period $t$. Following general practice in the literature, economic growth is presented by the real income per capita. $FD_{j,t}$ is the financial development of the $j^{th}$ country and is proxied by Money Supply (M2) as a ratio to the GDP of the particular country. Finally, $TO_{j,t}$ is the trade openness of the $j^{th}$ country expressed as the sum of export and import share to the GDP at period $t$. $\varepsilon_t$ is the error term associated with each observation at period $t$. Financial development and the increase in the

[5] Estimated 21 emerging countries are: Argentina, Brazil, Bulgaria, Chile, Colombia, Estonia, Hungary, India, Indonesia, Lithuania, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand, Turkey and Ukraine.

[6] Data for China, Czech Republic, Egypt, Morocco, Pakistan, Taiwan, and the United Arab Emirates were lacking and thus not included in the estimations.

degree of trade openness are expected to have a positive effect on the economic growth of a country, therefore coefficients $\beta_1$ and $\beta_2$ are expected to have positive signs.

*2.1 Unit root tests*

In this paper different tests for the panel unit root are used. The first group consists of tests that do not allow for structural changes in series. These are the Levin, Lin and Chu (LLC) test (Levin et al., 2002), the Im, Pesaran and Shin (IPS) test (Im et al. 2003), the Fisher-type tests using ADF and PP tests Maddala and Wu (1999) and the Choi (2001), and the Hadri (Hadri, 2000) test. The LLC test is based on orthogonalized residuals and on the correction by the ratio of the long-run to the short-run variance of each variable. Although the LLC test has become a widely accepted panel unit root test, it has homogeneity restriction, allowing for heterogeneity only in the constant term of the ADF regression. The IPS test is a heterogeneous panel unit root test based on individual ADF tests and was proposed by Im et al. (2003) as a solution to the homogeneity issue. This test allows for heterogeneity in both the constant and slope terms of the ADF regression. Maddala and Wu (1999) and Choi (2001) proposed an alternative approach by using the Fisher test, which is based on combining the P-values from the individual unit root test statistics such as ADF and PP. One of the advantages of the Fisher test is that it does not require a balanced panel. Finally, the Hadri test is a heterogenous panel unit root test that is an extension of the test of Kwiatkowski et al. (1992), the KPSS (Kwiatkowski–Phillips–Schmidt–Shin) test, to a panel with individual and time effects and deterministic trends, which has as its null the stationarity of the series.

However, the considered unit root tests do not take into account the presence of any structural shifts in series. Therefore, as proposed by Im et al. (2005), the LM unit root test was employed. This is a panel extension of the Schmidt and Phillips (1992) test allowing for one and two structural shifts in the trend of a panel and of every individual time series. Im et al. (2005) illustrated that in the series where structural shifts do not exist the size of distortions and loss of power in the panel unit root tests remain insignificant when structural shifts are accommodated. However, size distortions and loss power in the tests were found to be significant when unit root tests were applied to the time series without taking into account the existing structural shifts. The break date in the Im et al. (2005) test is chosen using the minimum LM statistics of Lee and Strazicich (2003, 2013). In this method, the break date is selected when the t-statistic of possible break points is minimized.

*2.2 Stability test*

In order to be able to apply panel cointegration tests allowing for structural shifts, it is necessary to examine series for stability. The Hansen's (1992) stability test was employed in this study to estimate parameter stability in cointegration relationships. The test is based on the fully modified OLS residuals proposed by Phillips and Hansen (1990). A necessary requisite of the test is that series have to be non-stationary. The stability test produces three test statistics: *supF*, *meanF* and *Lc*. The *supF* statistic tests for the null hypothesis of cointegration with no structural shift in the parameter vector against the alternative hypothesis of cointegration in the presence of sudden structural shifts. The *meanF* and *Lc* statistics test for a cointegration with constant parameters against an alternative hypothesis of gradual variance in parameters, which is considered no cointegration. Particularly, the *meanF* statistic is used to capture the overall stability of the model.

*2.3 Cointegration tests*

Cointegration tests were employed in this study in order to determine whether long-run relationships exist in the growth model of emerging countries. One of them is the Pedroni (1999) cointegration tests, which does not allow for structural shifts in series. The next one is the Westerlund (2006) panel cointegration test, which allows for multiple structural breaks in series. The following system of cointegrated regressors is considered for estimation in cointegration tests:

$$y_{it} = \alpha_i + \beta x_{it} + \varepsilon_{it} \qquad (2)$$

Where $i$=1,…, $N$, and $t$=1,…., $T$, $\alpha_i$ are constant terms, $\beta$ is the slope, $y_{it}$ and $x_{it}$ are non-stationary regressors, and $\varepsilon_{it}$ are stationary disturbance terms.

Pedroni (1999) developed a panel and group cointegration test where seven residual-based tests (with four panel statistics and three group statistics) were introduced in order to test the hypothesis of no cointegration in dynamic panel series with multiple regressors. The first four panel cointegration tests, which are defined as within-dimension- based statistics, use the following null and alternative hypotheses: $H_0 : \phi = 1, \quad H_1 : \phi < 1$, assuming the homogeneity of coefficients under the null hypothesis. The other three group statistics, which are defined as between-dimension-based statistics, use $H_0 : \phi_i = 1,$ versus $H_1 : \phi_i < 1$ for all $i$.

In this case for each *i*th unit it is necessary to calculate *N* coefficients, where slope heterogeneity across countries is now allowed under the alternative hypothesis.

In the long run, macroeconomic series such as GDP, money supply and trade may contain a variety of structural changes within a country or at the international level. Therefore, in order to examine the regression model (1) in the case when structural breaks are detected, Westerlund (2006) methodology is employed in this study. This is the panel cointegration test that allows for multiple structural breaks accommodation in the level as well as in the trend of cointegrated regression. This test is based on the panel cointegration residual-based LM test proposed by McCoskey and Kao (1998), which does not allow for structural shifts. The advantage of Westerlund's test is that it allows for the possibility of known a priori multiple structural breaks or it allows for breaks the locations of which are determined endogenously from the series. At the same time this test allows for a possibility of structural breaks that may be placed at different locations in different individual series. Westerlund (2006) showed in his work that the test is free of nuisance parameters under the null hypothesis and that the number and location points of structural shifts do not affect the limiting distribution. The null of the test is $H_0 : \phi_i = 0$ for all $i = 1,...., N$, versus alternative hypothesis: $H_1 : \phi_i \neq 0$ for $i = 1,...., N_1$, and $\phi_i = 0$ for $i = N_1 + 1,...., N$. One of important advantages of this test is that the alternative hypothesis is not just a general rejection of the null like in the commonly used LM panel cointegration test of McCoskey and Kao (1998), but allows $\phi_i$ to differ across individual series.

## 3. Empirical Results

### *3.1 Unit root tests*

First, in order to examine the cointegration relationships between growth, money supply, and trade openness panel series for the considered groups of emerging countries -Full, F-10, Advanced, and Secondary- it is necessary to investigate the integration order of panel series. Five alternative unit root tests, the LLC, IPS, ADF, PP, and Hadri tests are employed in order to test for the presence of the unit root in panel series. The LLC test has a null hypothesis of the common unit root process presence. The IPS, the ADF, and the PP test for the presence of individual unit root process in series. Finally, the Hadri test hypothesizes that there is no unit root in the common unit root process. The results of the unit root tests are presented in Table

1. The GDP per capita and trade openness series demonstrate the presence of the unit root in levels and no unit root process in their first differences for all four groups in general. However, results of various unit root test estimations are not similar for the money supply series. Thus, the LLC test rejected the hypothesis of the unit root presence in the levels for all groups of estimated emerging countries. The ADF and PP tests rejected the presence of the individual unit root process in the money supply series for Full and F-10 groups. However, Banerjee et al. (2004 and 2005) illustrated in their studies that if common sources of non-stationarity exist, tests such as the LLC tend to over-reject the null hypothesis of non-stationarity in series. The LLC test is based on the pooled regressions, therefore this test may not perform well compared to other tests where there is no need for pooling in series. Im et al. (2003) illustrated that the LLC test tends to over-reject the null hypothesis in models with serially correlated errors. Breitung (2000) demonstrated that if individual specific trends are included in pooled series the LLC test may lose power. Therefore, based on the results of the alternative unit root tests, it can be concluded that the money supply series for all countries' groups are generated by a non-stationary stochastic process as well as GDP per capita and trade openness series.

The prerequisite of Hansen's (1992) stability test is that the variables have to be non-stationary. The results of the various panel root tests presented in Table 1 indicated the existence of unit root in the considered variables. However, in order to acquire stronger evidence of a unit root presence in unstable as well as in stable series, the panel unit root tests proposed by Im et al. (2005) that allow for one and two structural shifts in series were applied. The results for the LM unit root tests with structural shifts for Full, F-10, Advanced and Secondary groups are reported in Tables 2-9. Both types of unit root tests with one and with two structural shifts provide strong evidence of the unit root presence in the panel series of all four considered groups of countries. The LM statistics for individual countries failed to reject the stationarity hypothesis in some cases where one structural shift was allowed. However, the tests which allowed for two structural shifts demonstrated stronger power to reject the null hypothesis of series' stationarity.

### *3.2 Stability test*

Based on the results of the panel unit root tests which are reported in Tables 1-9, GDP per capita, money supply and trade openness series are accepted as non-stationary, therefore

Hansen's (1992) stability test can be applied. The results of the stability tests for all considered countries are presented in Table 10. The *supF* statistic rejects the stability of model parameters indicating the presence of structural change in parameters for Argentina, Brazil, Bulgaria, Chile, Hungary, India, Indonesia, Philippines, Poland, Thailand, Turkey, and Ukraine. In all other cases, the model parameters appeared stable. The *meanF* statistics of Colombia, Estonia, Mexico, South Africa, and Ukraine failed to reject the hypothesis of cointegration. The *meanF* statistic rejects the hypothesis of cointegration in favor of the instability of the overall model for all the other cases. The *Lc* statistic failed to reject the null hypothesis of constant parameters only in Estonia, Mexico, Peru, and South Africa. In all other cases, the statistic rejects the hypothesis of constant parameters. The results of the stability test clearly divide the considered countries into two groups. The first group consists of Estonia, Mexico, and South Africa where no evidence was found for the presence of structural shifts. None of the applied tests provide evidence of instability in these countries. The second group consists of the other estimated countries where at least one of the stability tests detects the presence of sudden structural shifts in the model.

*3.3 Cointegration test*

After investigating the stability properties of cointegrating vectors, the Westerlund (2006) panel cointegration test with multiple structural breaks can be applied to the unstable series. Tables 11-14 present the results of the panel cointegration test allowing for multiple structural shifts. The countries which are found unstable by the stability test (Table 10) are included to the panel cointegration test that was applied to the Full, F-10, Advanced, and Secondary groups only. The test assumed to detect five structural breaks at maximum. Panel A demonstrates the results of the test in which structural shifts are allowed in constant. Panel B illustrates test results where structural shifts are allowed for both constant and trend of the regression. The results indicate that the test detected different break locations for the estimated countries. However, a tendency may be followed in results around some particular dates. For example, there is a prevalence of breaks (in constant and in constant and trend) occurring in the periods 1997-1998 and 2003-2004. The 1997-1998 period can be explained by the Asian financial crisis by which the Asian and many other emerging countries were affected. The 2003-2004 period can be explained by rapid growth of commodity prices such as nickel, copper, zinc and others. This may be one of reasons of considerable growth in emerging markets (Arbatli and Vasishtha, 2012).

The statistics of the LM panel test in all groups of countries are consistent with each other in both cases when breaks are allowed only in constant and in both constant and trend. In both cases, the LM statistics reject the null hypothesis of cointegration, providing no evidence for cointegration in all considered panels. Thus, the GDP per capita, money supply, and trade openness variables in the panels with unstable models are not cointegrated when multiple structural breaks are allowed.

The Pedroni (1999) panel cointegration test is employed to series after finding evidence of variables non-stationarity (Table 1). Table 15 presents the results of the Pedroni (1999) panel cointegration test. The panel cointegration test is applied to four groups: Full, F-10, Advanced, and Secondary. The panel ADF-statistic failed to reject the hypothesis of no cointegration in all groups except, the secondary group in which the constant was considered only. At the same time, the group ADF-statistic failed to reject; both the hypothesis of no cointegration in full, F-10, and secondary groups when constant and trend are allowed, and the hypothesis of the advanced group when constant and constant with trend are allowed in the regression. All other statistics of the Pedroni cointegration test rejected the hypothesis of no cointegration in all groups, providing strong evidence of stable long-run relationships among panel series.

The results of the Pedroni cointegration test for the panels of the Full, F-10, Advanced, and Secondary groups which are presented in Table 15 provide significant evidence for cointegration relationships between estimated variables. At the same time, LM statistics of the test for cointegration with multiple structural breaks rejected the hypothesis of the presence of cointegration in unstable series. However, in order to analyze the growth equation in emerging countries thoroughly, it is necessary to test for cointegration in panels which include the stable and the unstable countries separately. Therefore, Table 16 presents the results of the Pedroni panel cointegration tests, where Full, F-10, Advanced, and Secondary groups are divided into two sets. One set consists of unstable countries (U) and the other set includes stable countries (S). The Pedroni panel test could not be applied to the subgroup of stable countries due to panel absence in F-10 and Secondary groups. The Johansen cointegration test was applied to Mexico since it is the only country included in this group. There are no stable countries in the secondary group. Hence, the estimations are only made for the set of unstable countries. From results of Table 16 it can be seen that the division of the Full and F-10 groups into stable and unstable countries did not change the results which are extracted from the full sample in Table 15. Although, the ADF based statistics fail to reject the hypothesis of no

cointegration, other five statistics of the Pedroni test do reject it. Based on the results, the long-run relationships exist in growth models of stable countries in Full and F-10 groups. Results of cointegration tests provided weak evidence of cointegration in the set of stable countries of the advanced group.

Empirical results indicate that ignorance of structural breaks produces wrong conclusions. Thus results of the Pedroni test in Table 15 provide strong evidence for the existence of long-run relationships in the growth model of the estimated emerging countries. Even if the emerging countries are grouped into two sets as the stable and unstable ones the results of the Pedroni test indicates the existence of cointegration relationships in unstable sets for all country groups. The application of the appropriate test to the unstable countries (Westerlund, 2006), Tables 11-14, shows that the long-run relationships in the growth model are not present in any of the emerging country groups. Therefore, no evidence supporting the long-run relationships in the growth model in countries where structural shifts are detected is found. The variables of the growth model are highly cointegrated in stable countries of the Full and F-10 groups, and very weak evidence is found in support of cointegration relationships in the group of advanced countries.

## 4. Conclusion

This paper examined the long-run relationships in the growth model between economic growth, financial development, and trade openness in 21 emerging countries. These emerging countries were analyzed in narrower groups as well -F-10, Advanced, and Secondary- in order to compare the results of the analyses when emerging countries are considered in different panels. Recently developed econometric methods were applied to the annual series in order to investigate the cointegration relationships of panel series in the growth model, taking into account the presence of structural shifts when it was relevant. Hansen's (1992) stability test was employed to detect the series where structural shifts took place. As a result, only three countries out of 21 estimated emerging countries were exposed as stable countries. The Westerlund (2006) cointegration test was applied to four groups of countries, Full, F-10, Advanced, and Secondary where only unstable countries were included, allowing for maximum five breaks. No evidence was found for the long-run relationships in the growth model of all groups in the presence of structural shifts. Opposing the results of the Westerlund (2006) test, the Pedroni panel cointegration test provided strong evidence of cointegration for

all groups of considered emerging countries when tests were run for full samples and for the sample divided into stable and unstable groups. For all groups, the Pedroni test provided strong evidence of cointegration between panel series. However, when the advanced countries group was divided into stable and unstable country sets, the evidence in support of cointegration relationships in the set of stable countries was very weak.

This study illustrates that the analysis of relations in the growth model of emerging countries is sensitive to panel selection: Full, F-10, Advanced, and Secondary. The presence of uncounted structural shifts leads to the misinterpretation of cointegration tests. Thus, the Pedroni test which does not consider structural shifts indicated the existence of cointegration relationships in unstable panels. The Westerlund test did not detect any cointegration relationships in the presence of structural breaks in countries which were identified as unstable countries. The results of this study reflect that the long-run relationships in the growth model exist, only in stable countries of the Full and F-10 groups and with weaker evidence in advanced countries group. In the emerging markets, economic growth is highly related to financial development and trade openness only in countries which are not exposed to structural shifts. The estimation results showed that economy's growth is not related to financial development and trade openness in countries that are exposed to structural shifts. Division of the sample into narrower groups does not change the estimation results.

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## 6. Appendix: Data

Table 1 Unit root tests

| | **Full** | | **F-10** | | **Advanced** | | **Secondary** | |
|---|---|---|---|---|---|---|---|---|
| | level | Δ | level | Δ | level | Δ | level | Δ |
| **GDP/capita** | | | | | | | | |
| LLC[a] | 0.85 | 5.84 | 1.73 | 3.15 | -0.44 | -1.92** | 2.06 | -4.01** |
| | I(1) | I(1) | I(1) | I(1) | I(1) | I(0) | I(1) | I(0) |
| IPS[b] | 5.17 | -15.71** | 4.65 | -9.07** | 2.24 | -12.22** | 4.85 | -6.29** |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |
| ADF[b] | 18.89 | 301.41** | 8.84 | 120.12** | 13.55 | 149.83** | 0.54 | 70.76** |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |
| PP[b] | 53.20 | 439.20** | 15.06 | 197.08** | 18.99 | 170.90** | 1.44 | 148.03** |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |
| Hadri[c] | 28.35** | -0.91 | 18.28** | -0.56 | 17.83** | -0.69 | 17.11** | 0.83 |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |
| **Money Supply** | | | | | | | | |
| LLC | -7.03** | -4.38** | -4.28** | -3.13** | -4.23** | -5.85** | -2.09* | -3.47** |
| | I(0) | I(0) | I(0) | I(0) | I(0) | I(0) | I(0) | I(0) |
| IPS | -1.44 | -14.99** | -0.26 | -9.58** | -0.34 | -10.77** | 1.25 | -4.91** |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |
| ADF | 68.51** | 314.86** | 30.44* | 136.42** | 23.17 | 146.22** | 10.87 | 54.91** |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | I(0) | I(0) | I(0) | I(0) | I(1) | I(0) | I(1) | I(0) |
| PP | 115.39** | 502.57** | 59.36** | 203.75** | 63.65** | 208.01** | 24.51 | 158.42** |
| | I(0) | I(0) | I(0) | I(0) | I(0) | I(0) | I(1) | I(0) |
| Hadri | 28.74** | 8.02** | 18.83** | 5.92** | 17.55** | 6.96** | 17.38** | 2.53** |
| | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) | I(1) |
| **Openness** | | | | | | | | |
| LLC | 0.34 | -24.64** | 1.46 | -6.95** | -0.19 | -8.58** | 2.03 | -12.41** |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |
| IPS | 4.03 | -27.11** | 4.02 | -12.95** | 2.61 | -8.37** | 2.62 | -9.78** |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |
| ADF | 17.43 | 475.91** | 2.06 | 172.18** | 3.48 | 105.49** | 10.32 | 105.62** |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |
| PP | 25.31 | 517.62** | 3.77 | 207.23** | 5.92 | 205.99** | 13.62 | 177.31** |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |
| Hadri | 27.73** | 0.47 | 17.64** | 0.57 | 17.76** | 0.28 | 15.75** | 0.49 |
| | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) | I(1) | I(0) |

*Note*: Estimations are made with inclusion of constant and trend, estimations are made with 1 specified lag, with increase of lag length the power of tests increases in favor of unit root presence in level estimations.
* denotes significance at the 5% significance level
a. tests the hypothesis of the presence of the common unit root process
b. tests the hypothesis of the presence of the individual unit root process
c. tests the hypothesis of no unit root in the common unit root process.

Table 2. Panel unit root test with one structural break - **Full**

| **Country** | **GDP/capita** | | | **M2** | | | **Openness** | | |
|---|---|---|---|---|---|---|---|---|---|
| | *LM* | *Break* | *Lag* | *LM* | *Break* | *Lag* | *LM* | *Break* | *Lag* |
| Argentina | -5.77** | 2009Q1 | 5 | -4.33** | 1999Q2 | 7 | -4.47* | 2010Q2 | 7 |
| Brazil | -5.78** | 2010Q3 | 5 | -6.08** | 2009Q2 | 1 | -6.99** | 2011Q2 | 1 |
| Bulgaria | -6.27** | 2011Q1 | 5 | -4.65** | 2002Q3 | 7 | -6.76** | 2004Q2 | 1 |
| Chile | -5.62** | 2010Q4 | 5 | -4.17** | 1998Q2 | 7 | -3.91 | 2009Q3 | 7 |
| Colombia | -5.42** | 1999Q1 | 5 | -4.99** | 1998Q2 | 7 | -4.48* | 2009Q2 | 7 |
| Estonia | -5.51** | 2005Q1 | 5 | -8.54** | 1998Q3 | 1 | -4.45* | 2010Q1 | 7 |
| Hungary | -5.52** | 2010Q4 | 5 | -9.06** | 1998Q3 | 1 | -7.62** | 2003Q4 | 1 |
| India | -5.49** | 2009Q4 | 5 | -5.39** | 2006Q3 | 8 | -4.47* | 2005Q1 | 7 |
| Indonesia | -5.39** | 1998Q1 | 5 | -4.22** | 2010Q2 | 7 | -6.33** | 2005Q4 | 1 |
| Lithuania | -5.43** | 1998Q4 | 5 | -4.78** | 2011Q3 | 8 | -7.24** | 2006Q2 | 1 |
| Malaysia | -5.59** | 1998Q3 | 5 | -3.66** | 2005Q3 | 6 | -6.39** | 1999Q4 | 1 |
| Mexico | -5.55** | 1998Q2 | 5 | -5.32** | 2005Q3 | 8 | -4.01 | 1998Q4 | 7 |
| Peru | -5.50** | 1998Q1 | 5 | -5.56** | 2001Q4 | 8 | -5.61** | 2004Q1 | 0 |
| Philippines | -5.94** | 1998Q3 | 5 | -5.72** | 2005Q1 | 8 | -8.16** | 2000Q1 | 1 |
| Poland | -5.79** | 1998Q2 | 5 | -4.32** | 2000Q4 | 8 | -7.97** | 2002Q1 | 1 |
| Romania | -5.32** | 2000Q1 | 5 | -4.06** | 1998Q3 | 3 | -4.55* | 1999Q4 | 7 |
| Russia | -5.56** | 1997Q4 | 5 | -4.72** | 2004Q2 | 7 | -7.95** | 1997Q4 | 1 |
| South Africa | -5.44** | 2009Q3 | 5 | -4.92** | 1998Q4 | 7 | -8.52** | 2001Q1 | 1 |
| Thailand | -5.24** | 2009Q4 | 5 | -3.68** | 1998Q2 | 7 | -4.63** | 2004Q2 | 7 |
| Turkey | -5.78** | 2011Q2 | 5 | -6.55** | 1997Q3 | 1 | -7.03** | 2008Q2 | 1 |
| Ukraine | -6.11** | 2011Q1 | 5 | -4.00** | 2003Q2 | 7 | -7.77** | 2010Q4 | 1 |
| **MinLM** | -6.11** | 2011Q1 | 5 | -4.00 | 2003Q2 | 7 | -7.77** | 2010Q4 | 1 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **LM statistic** | -28.57** | | | -24.95** | | | -32.26** | | |

*Notes*: The critical values for the panel LM test with a break at the 1%, 5% and 10% are −2.326, −1.645 and −1.282, respectively. The 1%, 5% and 10% critical values for the minimum LM test with one break are −5.11, −4.50 and −4.21, respectively (Lee and Strazicich [2013]). **denotes significance at the 1% level.

Table 3. Panel unit root test with two structural breaks – **Full**

| | **GDP/capita** | | | | **M2** | | | | **Openess** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *LM* | *Break1* | *Break2* | *Lag* | *LM* | *Break1* | *Break2* | *Lag* | *LM* | *Break1* | *Break2* | *Lag* |
| Argentina | -6.42** | 2003Q3 | 2006Q2 | 5 | -8.06** | 2000Q1 | 2010Q2 | 1 | -7.85** | 2000Q1 | 2010Q3 | 1 |
| Brazil | -6.39** | 2001Q1 | 2005Q2 | 5 | -7.68** | 1998Q2 | 2001Q4 | 1 | -8.42** | 1999Q3 | 2010Q2 | 1 |
| Bulgaria | -7.04** | 2005Q4 | 2010Q2 | 5 | -7.29** | 1998Q1 | 2002Q3 | 1 | -8.49** | 1997Q4 | 2002Q4 | 1 |
| Chile | -6.45** | 2005Q3 | 2010Q1 | 5 | -8.72** | 1999Q2 | 2008Q1 | 1 | -8.66** | 1999Q2 | 2009Q4 | 1 |
| Colombia | -6.55** | 2000Q4 | 2010Q3 | 5 | -9.73** | 1999Q1 | 2004Q1 | 1 | -7.68** | 2004Q1 | 2004Q4 | 1 |
| Estonia | -6.28** | 2005Q1 | 2011Q1 | 5 | -9.68** | 1998Q4 | 2003Q4 | 1 | -8.08** | 1998Q4 | 2004Q1 | 1 |
| Hungary | -6.27** | 2005Q3 | 2010Q1 | 5 | -9.94** | 1998Q3 | 2003Q4 | 1 | -8.59** | 2002Q1 | 2005Q2 | 1 |
| India | -6.19** | 2004Q3 | 2010Q3 | 5 | -8.15** | 1998Q2 | 2000Q1 | 1 | -8.59** | 2007Q1 | 2009Q2 | 1 |
| Indonesia | -6.79** | 1999Q4 | 2009Q3 | 5 | -8.34** | 1998Q2 | 2003Q1 | 1 | -8.53** | 2001Q2 | 2004Q4 | 1 |
| Lithuania | -6.77** | 1999Q3 | 2009Q2 | 5 | -9.32** | 1998Q1 | 2002Q4 | 1 | -8.74** | 2001Q2 | 2006Q2 | 1 |
| Malaysia | -6.61** | 1999Q2 | 2009Q1 | 5 | -5.09** | 2000Q3 | 2011Q2 | 7 | -8.01** | 2001Q1 | 2004Q2 | 1 |
| Mexico | -6.86** | 1999Q1 | 2008Q4 | 5 | -5.71** | 2005Q3 | 2010Q4 | 7 | -8.15** | 1999Q3 | 2008Q1 | 1 |
| Peru | -6.85** | 1998Q4 | 2008Q3 | 5 | -5.92** | 2002Q4 | 2007Q2 | 7 | -8.53** | 2000Q2 | 2011Q1 | 1 |
| Philippines | -6.37** | 1997Q4 | 2003Q4 | 5 | -6.08** | 1999Q3 | 2005Q1 | 7 | -8.89** | 2000Q1 | 2010Q4 | 1 |
| Poland | -6.20** | 1997Q3 | 2003Q3 | 5 | -7.51** | 1998Q3 | 2008Q3 | 1 | -8.98** | 2000Q1 | 2003Q2 | 1 |
| Romania | -6.44** | 1998Q1 | 2007Q4 | 5 | -7.19** | 1998Q1 | 2003Q1 | 2 | -7.81** | 1998Q2 | 2004Q4 | 1 |
| Russia | -6.09** | 1999Q3 | 2003Q1 | 5 | -7.77** | 1999Q2 | 2004Q3 | 1 | -8.57** | 1998Q2 | 1999Q2 | 1 |
| South Africa | -6.61** | 1997Q3 | 2007Q2 | 5 | -5.36** | 1998Q3 | 2004Q1 | 7 | -9.81** | 1999Q2 | 2001Q3 | 1 |
| Thailand | -5.73** | 2004Q2 | 2007Q4 | 5 | -6.80** | 1997Q3 | 2009Q4 | 1 | -9.18** | 1999Q1 | 2004Q1 | 1 |
| Turkey | -6.39** | 2007Q1 | 2011Q2 | 5 | -7.34** | 1999Q1 | 2002Q3 | 1 | -9.56** | 1998Q4 | 2003Q4 | 1 |
| Ukraine | -6.67** | 2006Q4 | 2011Q1 | 5 | -7.15** | 1998Q4 | 2002Q2 | 1 | -8.87** | 1998Q3 | 2003Q3 | 1 |
| **MinLM** | -6.67** | 2006Q4 | 2011Q1 | 5 | -7.15** | 1998Q4 | 2002Q2 | 1 | -8.87** | 1998Q3 | 2003Q3 | 1 |
| **LM statistic** | -35.15** | | | | -42.99** | | | | -50.68** | | | |

*Notes*: The critical values for the panel LM test with a break at the 1%, 5% and 10% are −2.326, −1.645 and −1.282, respectively. The 1%, 5% and 10% critical values for the minimum LM test with two breaks are −5.823, −5.286 and −4.989, respectively (Lee and Strazicich [2003]). **denotes significance at the 1% level.

Table 4. Panel unit root test with one structural break – **F10**

| **Country** | **GDP/capita** | | | **M2** | | | **Openness** | | |
|---|---|---|---|---|---|---|---|---|---|
| | *LM* | *Break* | *Lag* | *LM* | *Break* | *Lag* | *LM* | *Break* | *Lag* |
| Argentina | -15.19** | 1997Q3 | 8 | -4.92** | 1999Q2 | 8 | -7.96** | 1998Q4 | 8 |
| Brazil | -10.53** | 2001Q4 | 8 | -5.06** | 2001Q2 | 8 | -7.81** | 1999Q3 | 8 |
| Chile | -24.12** | 2011Q2 | 8 | -5.01** | 2001Q1 | 8 | -5.71** | 1999Q2 | 8 |
| Colombia | -13.64** | 1999Q3 | 8 | -4.65** | 1999Q1 | 8 | -7.42** | 2001Q4 | 8 |
| India | -23.2** | 1997Q3 | 8 | -7.85** | 2009Q2 | 8 | -11.12** | 2007Q1 | 8 |
| Indonesia | -9.38** | 2011Q1 | 8 | -7.24** | 1999Q3 | 8 | -4.42** | 1999Q2 | 8 |
| Mexico | -17.26** | 1997Q4 | 8 | -4.06** | 1999Q4 | 8 | -9.22** | 1998Q1 | 8 |
| Russia | -32.62** | 2011Q2 | 8 | -6.39** | 1999Q2 | 8 | -7.29** | 1998Q1 | 8 |
| Turkey | -14.43** | 1999Q3 | 8 | -6.59** | 1999Q3 | 8 | -6.03** | 2007Q1 | 8 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **MinLM** | -14.43** | 1999Q3 | 8 | -6.59** | 1999Q3 | 8 | -6.03** | 2007Q1 | 8 |
| **LM statistic** | -79.08** | | | -19.33** | | | -27.69** | | |

*Notes*: The critical values for the panel LM test with a break at the 1%, 5% and 10% are −2.326, −1.645 and −1.282, respectively. The 1%, 5% and 10% critical values for the minimum LM test with one break are −5.11, −4.50 and −4.21, respectively (Lee and Strazicich [2013]). **denotes significance at the 1% level.

Table 5. Panel unit root test with two structural breaks – **F10**

| | **GDP/capita** | | | | **M2** | | | | **Openess** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *LM* | *Break1* | *Break2* | *Lag* | *LM* | *Break1* | *Break2* | *Lag* | *LM* | *Break1* | *Break2* | *Lag* |
| Argentina | -24.05** | 1997Q3 | 2011Q2 | 8 | -8.73** | 1998Q3 | 2001Q3 | 8 | -8.89** | 1998Q4 | 1999Q3 | 8 |
| Brazil | -29.86** | 1997Q3 | 1999Q3 | 8 | -8.54** | 1998Q2 | 2001Q2 | 8 | -9.31** | 2008Q3 | 2010Q1 | 8 |
| Chile | -20.02** | 2001Q3 | 2011Q2 | 8 | -8.15** | 1998Q2 | 1999Q3 | 8 | -9.07** | 1997Q3 | 2008Q2 | 8 |
| Colombia | -15.19** | 1997Q4 | 1999Q3 | 8 | -9.13** | 1999Q4 | 2011Q2 | 8 | -10.29** | 2002Q1 | 2004Q1 | 8 |
| India | -22.19** | 1997Q3 | 2011Q1 | 8 | -10.68** | 2008Q2 | 2009Q2 | 8 | -12.05** | 2001Q1 | 2002Q1 | 8 |
| Indonesia | -25.81** | 1997Q3 | 1999Q3 | 8 | -10.09** | 1998Q3 | 1999Q3 | 8 | -10.74** | 1998Q2 | 2006Q4 | 8 |
| Mexico | -23.74** | 1998Q1 | 2000Q1 | 8 | -9.99** | 1999Q3 | 2011Q3 | 8 | -9.99** | 1998Q1 | 2011Q1 | 8 |
| Russia | -27.9** | 2009Q1 | 2011Q1 | 8 | -9.29** | 1999Q4 | 2011Q2 | 8 | -9.59** | 2004Q1 | 2011Q1 | 8 |
| Turkey | -26.84** | 1997Q3 | 1999Q3 | 8 | -8.95** | 1999Q1 | 1999Q4 | 8 | -9.08** | 1998Q2 | 2009Q1 | 8 |
| **MinLM** | -26.84** | 1997Q3 | 1999Q3 | 8 | -8.95** | 1999Q1 | 1999Q4 | 8 | -9.08** | 1998Q2 | 2009Q1 | 8 |
| **LM statistic** | -109.42** | | | | -36.81** | | | | -39.82** | | | |

*Notes*: The critical values for the panel LM test with a break at the 1%, 5% and 10% are −2.326, −1.645 and −1.282, respectively. The 1%, 5% and 10% critical values for the minimum LM test with two breaks are −5.823, −5.286 and −4.989, respectively (Lee and Strazicich [2003]). **denotes significance at the 1% level.

Table 6. Panel unit root test with one structural break – **Advanced**

| **Country** | **GDP/capita** | | | **M2** | | | **Openness** | | |
|---|---|---|---|---|---|---|---|---|---|
| | *LM* | *Break* | *Lag* | *LM* | *Break* | *Lag* | *LM* | *Break* | *Lag* |
| Brazil | -8.35** | 2011Q1 | 7 | -4.93** | 1998Q3 | 7 | -7.05** | 1999Q1 | 7 |
| Hungary | -7.52** | 2011Q1 | 7 | -5.95** | 1999Q1 | 7 | -9.29** | 1999Q3 | 7 |
| Malaysia | -5.38** | 2007Q4 | 8 | -6.65** | 1999Q1 | 7 | -9.09** | 1999Q1 | 7 |
| Mexico | -5.94** | 2010Q1 | 8 | -6.61** | 2011Q3 | 8 | -8.23** | 1999Q1 | 7 |
| Poland | -6.25** | 1998Q2 | 8 | -5.86** | 2011Q1 | 8 | -5.31** | 1999Q1 | 7 |
| South Africa | -6.36** | 2007Q1 | 8 | -4.24** | 2000Q3 | 7 | -6.95** | 2000Q2 | 7 |
| Thailand | -4.67** | 1997Q3 | 8 | -7.91** | 1998Q1 | 7 | -5.15** | 1997Q3 | 7 |
| Turkey | -7.79** | 2001Q1 | 8 | -5.12** | 2011Q1 | 7 | -7.95** | 2003Q1 | 7 |
| **MinLM** | -7.79** | 2001Q1 | 8 | -5.12** | 2011Q1 | 7 | -7.95** | 2003Q1 | 7 |
| **LM statistic** | -21.85** | | | -18.89** | | | -25.74** | | |

*Notes*: The critical values for the panel LM test with a break at the 1%, 5% and 10% are −2.326, −1.645 and −1.282, respectively. The 1%, 5% and 10% critical values for the minimum LM test with one break are −5.11, −4.50 and −4.21, respectively (Lee and Strazicich [2013]). **denotes significance at the 1% level.

Table 7. Panel unit root test with two structural breaks – **Advanced**

| | **GDP/capita** | **M2** | **Openness** |
|---|---|---|---|

| | *LM* | *Break1* | *Break2* | *Lag* | *LM* | *Break1* | *Break2* | *Lag* | *LM* | *Break1* | *Break2* | *Lag* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Brazil | -8.26** | 2009Q1 | 2011Q2 | 8 | -7.84** | 1998Q2 | 2001Q3 | 7 | -7.92** | 1998Q3 | 2004Q2 | 7 |
| Hungary | -8.87** | 2009Q1 | 2010Q3 | 8 | -6.08** | 1998Q1 | 1999Q1 | 7 | -10.22** | 2004Q2 | 2005Q1 | 7 |
| Malaysia | -13.1** | 1998Q2 | 2000Q1 | 8 | -10.67** | 2009Q1 | 2011Q3 | 7 | -8.25** | 2007Q1 | 2007Q4 | 7 |
| Mexico | -10.36** | 2008Q1 | 2009Q4 | 8 | -8.91** | 1998Q4 | 2011Q3 | 8 | -9.66** | 2002Q1 | 2003Q4 | 7 |
| Poland | -15.86** | 1999Q2 | 2001Q1 | 8 | -10.29** | 2009Q2 | 2011Q2 | 7 | -11.78** | 1999Q4 | 2001Q3 | 7 |
| South Africa | -31.77** | 1997Q3 | 1999Q2 | 8 | -6.45** | 1998Q3 | 2010Q4 | 7 | -8.14** | 2007Q3 | 2009Q2 | 7 |
| Thailand | -30.94** | 2009Q2 | 2011Q1 | 8 | -7.91** | 1998Q1 | 2009Q2 | 7 | -8.35** | 2000Q2 | 2010Q3 | 7 |
| Turkey | -11.54** | 1999Q2 | 2001Q1 | 8 | -7.14** | 1998Q3 | 2007Q4 | 7 | -8.92** | 2000Q1 | 2003Q1 | 7 |
| **MinLM** | -11.54** | 1999Q2 | 2001Q1 | 8 | -7.14** | 1998Q3 | 2007Q4 | 7 | -8.92** | 2000Q1 | 2003Q1 | 7 |
| **LM statistic** | -67.64 | | | | -29.42** | | | | -34.06** | | | |

*Notes*: The critical values for the panel LM test with a break at the 1%, 5% and 10% are −2.326, −1.645 and −1.282, respectively. The 1%, 5% and 10% critical values for the minimum LM test with two breaks are −5.823, −5.286 and −4.989, respectively (Lee and Strazicich [2003]). **denotes significance at the 1% level.

Table 8. Panel unit root test with one structural break – **Secondary**

| **Country** | **GDP/capita** | | | **M2** | | | **Openness** | | |
|---|---|---|---|---|---|---|---|---|---|
| | *LM* | *Break* | *Lag* | *LM* | *Break* | *Lag* | *LM* | *Break* | *Lag* |
| Chile | -6.52** | 2011Q2 | 8 | -6.64** | 2011Q3 | 8 | -8.82** | 2011Q3 | 6 |
| Colombia | -5.25** | 1998Q4 | 7 | -6.26** | 1999Q1 | 6 | -7.59** | 1999Q1 | 8 |
| India | -5.97** | 2010Q4 | 8 | -5.9** | 1999Q1 | 7 | -9.91** | 2008Q2 | 6 |
| Indonesia | -8.14** | 2010Q4 | 8 | -5.47** | 1999Q3 | 6 | -6.79** | 2010Q4 | 8 |
| Peru | -5.69** | 1997Q4 | 8 | -4.76** | 1999Q1 | 6 | -9.83** | 1998Q1 | 6 |
| Philippines | -6.00** | 2010Q4 | 8 | -8.43** | 2002Q1 | 6 | -6.77** | 2009Q1 | 8 |
| Russia | -5.87** | 2009Q1 | 8 | -8.64** | 2010Q4 | 7 | -9.74** | 2010Q4 | 8 |
| **MinLM** | -5.87** | 2009Q1 | 8 | -8.64** | 2010Q4 | 7 | -9.74** | 2010Q4 | 8 |
| **LM statistic** | -19.01** | | | -20.79** | | | -27.92** | | |

*Notes*: The critical values for the panel LM test with a break at the 1%, 5% and 10% are −2.326, −1.645 and −1.282, respectively. The 1%, 5% and 10% critical values for the minimum LM test with one break are −5.11, −4.50 and −4.21, respectively (Lee and Strazicich [2013]). **denotes significance at the 1% level.

Table 9. Panel unit root test with two structural breaks – **Secondary**

| | **GDP/capita** | | | | **M2** | | | | **Openness** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *LM* | *Break1* | *Break2* | *Lag* | *LM* | *Break1* | *Break2* | *Lag* | *LM* | *Break1* | *Break2* | *Lag* |
| Chile | -8.74** | 2010Q3 | 2011Q3 | 7 | -17.82** | 2009Q3 | 2011Q3 | 6 | -12.63** | 1997Q3 | 1999Q1 | 8 |
| Colombia | -9.54** | 2007Q2 | 2008Q4 | 7 | -13.98** | 1997Q3 | 1999Q1 | 7 | -11.85** | 1997Q3 | 1999Q1 | 8 |
| India | -10.04** | 1997Q3 | 1999Q1 | 7 | -8.87** | 2001Q3 | 2007Q4 | 6 | -7.75** | 2000Q1 | 2008Q2 | 6 |
| Indonesia | -12.45** | 2010Q4 | 2011Q3 | 8 | -11.76** | 2001Q1 | 2010Q4 | 7 | -8.36** | 2010Q1 | 2010Q4 | 8 |
| Peru | -20.96** | 2010Q4 | 2011Q3 | 8 | -6.37** | 1998Q3 | 2000Q3 | 8 | -11.04** | 1998Q2 | 1999Q4 | 8 |
| Philippines | -9.00** | 2010Q4 | 2011Q3 | 8 | -8.28** | 2002Q1 | 2009Q4 | 6 | -13.19** | 1998Q1 | 1999Q3 | 8 |
| Russia | -20.87** | 1999Q2 | 2000Q4 | 8 | -8.34** | 1999Q2 | 2010Q4 | 7 | -10.66** | 2005Q3 | 2010Q3 | 6 |
| **MinLM** | -20.87** | 1999Q2 | 2000Q4 | 8 | -8.34** | 1999Q2 | 2010Q4 | 7 | -10.66** | 2005Q3 | 2010Q3 | 6 |
| **LM statistic** | -49.08** | | | | -39.2** | | | | -39.18** | | | |

*Notes*: The critical values for the panel LM test with a break at the 1%, 5% and 10% are −2.326, −1.645 and −1.282, respectively. The 1%, 5% and 10% critical values for the minimum LM test with two breaks are −5.823, −5.286 and −4.989, respectively (Lee and Strazicich [2003]). **denotes significance at the 1% level.

Table 10. Stability tests in cointegrated relations

| ***Country*** | *SupF* | | *MeanF* | | *Lc* | |
|---|---|---|---|---|---|---|
| | test | p-value | Test | p-value | test | p-value |
| Argentina | 1.05 | 0.01 | 9.35 | 0.01 | 16.54 | 0.03 |
| Brazil | 1.36 | 0.01 | 12.12 | 0.01 | 17.59 | 0.02 |
| Bulgaria | 1.36 | 0.01 | 39.83 | 0.01 | 96.49 | 0.01 |
| Chile | 0.78 | 0.02 | 15.19 | 0.01 | 26.13 | 0.01 |
| Colombia | 0.12 | 0.20 | 2.46 | 0.20 | 27.04 | 0.01 |
| Estonia | 0.26 | 0.20 | 4.29 | 0.18 | 13.15 | 0.11 |
| Hungary | 1.09 | 0.01 | 20.65 | 0.01 | 75.24 | 0.01 |
| India | 1.59 | 0.01 | 75.57 | 0.01 | 469.85 | 0.01 |
| Indonesia | 1.17 | 0.01 | 28.00 | 0.01 | 84.90 | 0.01 |
| Lithuania | 0.58 | 0.06 | 73.59 | 0.01 | 666.74 | 0.01 |
| Malaysia | 0.35 | 0.20 | 9.02 | 0.01 | 41.48 | 0.01 |
| Mexico | 0.38 | 0.19 | 3.39 | 0.20 | 8.03 | 0.20 |
| Peru | 0.57 | 0.07 | 6.44 | 0.04 | 13.28 | 0.10 |
| Philippines | 0.96 | 0.01 | 13.21 | 0.01 | 76.66 | 0.01 |
| Poland | 1.48 | 0.01 | 34.82 | 0.01 | 246.96 | 0.01 |
| Romania | 0.57 | 0.07 | 19.53 | 0.01 | 219.26 | 0.01 |
| Russia | 0.48 | 0.11 | 8.62 | 0.01 | 17.46 | 0.02 |
| South Africa | 0.16 | 0.20 | 3.54 | 0.20 | 9.69 | 0.20 |
| Thailand | 1.61 | 0.01 | 29.78 | 0.01 | 80.72 | 0.01 |
| Turkey | 1.06 | 0.01 | 25.55 | 0.01 | 57.20 | 0.01 |
| Ukraine | 0.62 | 0.05 | 5.12 | 0.11 | 17.54 | 0.02 |

Table 11. Estimated structural breaks using the approach of Westerlund (2006). **Full**

| **Panel A breaks in constant** | | | | | | |
|---|---|---|---|---|---|---|
| Country | Breaks | Date | | | | |
| Argentina | | 1995Q2 | 2001Q3 | 2006Q1 | | |
| Brazil | | 1995Q2 | 2006Q1 | 2009Q2 | | |
| Bulgaria | | 1995Q4 | 1999Q2 | 2002Q2 | 2005Q2 | 2009Q2 |
| Chile | | 1995Q4 | 2000Q3 | 2003Q4 | 2006Q3 | 2010Q3 |
| Colombia | | 1995Q4 | 1998Q3 | 2003Q2 | 2006Q1 | 2010Q3 |
| Hungary | | 1995Q3 | 1998Q1 | 2001Q1 | 2004Q1 | |
| India | | 1995Q1 | 2005Q2 | | | |
| Indonesia | | 1995Q4 | 1997Q4 | 2003Q1 | 2006Q2 | 2009Q3 |
| Lithuania | | - | - | - | - | - |
| Malaysia | | 1995Q2 | 1997Q4 | 2002Q1 | | |
| Peru | | 1995Q2 | 2004Q1 | 2007Q1 | | |
| Philippines | | 1995Q4 | 1997Q4 | 2003Q3 | 2006Q4 | 2009Q4 |
| Poland | | 1995Q2 | 2003Q3 | 2006Q3 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Romania | | 1995Q3 | 1998Q2 | 2002Q2 | 2005Q2 | |
| Russia | | 1995Q3 | 1997Q4 | 2006Q1 | 2008Q4 | |
| Thailand | | 1996Q1 | 1997Q4 | 2000Q3 | 2003Q2 | 2006Q1 |
| Turkey | | 1995Q3 | 1998Q4 | 2004Q2 | 2010Q1 | |
| Ukraine | | 1995Q3 | 1998Q3 | 2002Q1 | 2004Q4 | |
| ***Lm*** | 4.14 | | | | | |
| **Panel B breaks in constant and trend** | | | | | | |
| Country | Breaks | Date | | | | |
| Argentina | | 1995Q3 | 1998Q3 | 2003Q1 | 2008Q4 | |
| Brazil | | 1995Q3 | 1998Q4 | 2002Q4 | 2007Q3 | |
| Bulgaria | | 1995Q2 | 1997Q4 | 2008Q4 | | |
| Chile | | 1995Q3 | 1998Q2 | 2004Q3 | 2008Q4 | |
| Colombia | | 1995Q3 | 1998Q3 | 2002Q3 | 2008Q3 | |
| Hungary | | 1995Q4 | 1998Q3 | 2001Q3 | 2005Q3 | 2008Q3 |
| India | | 1995Q3 | 1998Q3 | 2004Q1 | 2008Q3 | |
| Indonesia | | 1995Q3 | 1997Q4 | 2000Q4 | 2004Q4 | |
| Lithuania | | 1995Q4 | 1997Q3 | 2000Q3 | 2005Q3 | 2008Q4 |
| Malaysia | | 1995Q4 | 1997Q4 | 2000Q4 | 2003Q3 | 2008Q3 |
| Peru | | 1995Q4 | 1997Q3 | 2000Q2 | 2004Q1 | 2007Q1 |
| Philippines | | 1995Q4 | 1997Q4 | 2000Q3 | 2006Q1 | 2010Q3 |
| Poland | | 1995Q4 | 1999Q1 | 2001Q4 | 2004Q3 | 2008Q3 |
| Romania | | 1995Q4 | 1998Q2 | 2001Q1 | 2004Q3 | 2007Q3 |
| Russia | | 1995Q3 | 1998Q2 | 2004Q3 | 2008Q4 | |
| Thailand | | 1995Q3 | 1997Q3 | 2003Q1 | 2009Q3 | |
| Turkey | | 1995Q3 | 1999Q2 | 2002Q1 | 2006Q1 | |
| Ukraine | | 1995Q4 | 1998Q2 | 2002Q3 | 2005Q2 | 2008Q4 |
| ***Lm*** | 10.86 | | | | | |

*Notes*: The CV at the 1 per cent level is 2.28.

Table 12. Estimated structural breaks using the approach of Westerlund (2006). **F10**

| **Panel A breaks in constant** | | | | | | |
|---|---|---|---|---|---|---|
| Country | Breaks | Date | | | | |
| Argentina | | 1995Q2 | 2001Q3 | 2006Q1 | | |
| Brazil | | 1995Q2 | 2006Q1 | 2009Q2 | | |
| Chile | | 1995Q4 | 2000Q3 | 2003Q4 | 2006Q3 | 2010Q3 |
| Colombia | | 1995Q4 | 1998Q3 | 2003Q2 | 2006Q1 | 2010Q3 |
| India | | 1995Q1 | 2005Q2 | | | |
| Indonesia | | 1995Q4 | 1997Q4 | 2003Q1 | 2006Q2 | 2009Q3 |
| Russia | | 1995Q3 | 1997Q4 | 2006Q1 | 2008Q4 | |
| Turkey | | 1995Q3 | 1998Q4 | 2004Q2 | 2010Q1 | |
| ***Lm*** | 2.49 | | | | | |
| **Panel B breaks in constant and trend** | | | | | | |
| Country | Breaks | Date | | | | |
| Argentina | | 1995Q3 | 1998Q3 | 2003Q1 | 2008Q4 | |
| Brazil | | 1995Q3 | 1998Q4 | 2002Q4 | 2007Q3 | |
| Chile | | 1995Q3 | 1998Q2 | 2004Q3 | 2008Q4 | |
| Colombia | | 1995Q3 | 1998Q3 | 2002Q3 | 2008Q3 | |
| India | | 1995Q3 | 1998Q3 | 2004Q1 | 2008Q3 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Indonesia | | 1995Q3 | 1997Q4 | 2000Q4 | 2004Q4 | |
| Russia | | 1995Q3 | 1998Q2 | 2004Q3 | 2008Q4 | |
| Turkey | | 1995Q3 | 1999Q2 | 2002Q1 | 2006Q1 | |
| ***Lm*** | 6.37 | | | | | |

*Notes*: The CV at the 1 per cent level is 2.28.

Table 13. Estimated structural breaks using the approach of Westerlund (2006). **Advanced**

| **Panel A breaks in constant** | | | | | | |
|---|---|---|---|---|---|---|
| Country | Breaks | Date | | | | |
| Brazil | | 1995Q2 | 2006Q1 | 2009Q2 | | |
| Hungary | | 1995Q3 | 1998Q1 | 2001Q1 | 2004Q1 | |
| Malaysia | | 1995Q2 | 1997Q4 | 2002Q1 | | |
| Poland | | 1995Q2 | 2003Q3 | 2006Q3 | | |
| Thailand | | 1996Q1 | 1997Q4 | 2000Q3 | 2003Q2 | 2006Q1 |
| Turkey | | 1995Q3 | 1998Q4 | 2004Q2 | 2010Q1 | |
| ***Lm*** | 3.01 | | | | | |
| **Panel B breaks in constant and trend** | | | | | | |
| Country | Breaks | Date | | | | |
| Brazil | | 1995Q3 | 1998Q4 | 2002Q4 | 2007Q3 | |
| Hungary | | 1995Q4 | 1998Q3 | 2001Q3 | 2005Q3 | 2008Q3 |
| Malaysia | | 1995Q4 | 1997Q4 | 2000Q4 | 2003Q3 | 2008Q3 |
| Poland | | 1995Q4 | 1999Q1 | 2001Q4 | 2004Q3 | 2008Q3 |
| Thailand | | 1995Q3 | 1997Q3 | 2003Q1 | 2009Q3 | |
| Turkey | | 1995Q3 | 1999Q2 | 2002Q1 | 2006Q1 | |
| ***Lm*** | 5.75 | | | | | |

*Notes*: The CV at the 1 per cent level is 2.28.

Table 14. Estimated structural breaks using the approach of Westerlund (2006). **Secondary**

| **Panel A breaks in constant** | | | | | | |
|---|---|---|---|---|---|---|
| Country | Breaks | Date | | | | |
| Chile | | 1995Q4 | 2000Q3 | 2003Q4 | 2006Q3 | 2010Q3 |
| Colombia | | 1995Q4 | 1998Q3 | 2003Q2 | 2006Q1 | 2010Q3 |
| India | | 1995Q1 | 2005Q2 | | | |
| Indonesia | | 1995Q4 | 1997Q4 | 2003Q1 | 2006Q2 | 2009Q3 |
| Peru | | 1995Q2 | 2004Q1 | 2007Q1 | | |
| Philippines | | 1995Q4 | 1997Q4 | 2003Q3 | 2006Q4 | 2009Q4 |
| Russia | | 1995Q3 | 1997Q4 | 2006Q1 | 2008Q4 | |
| ***Lm*** | 2.55 | | | | | |
| **Panel B breaks in constant and trend** | | | | | | |
| Country | Breaks | Date | | | | |
| Chile | | 1995Q3 | 1998Q2 | 2004Q3 | 2008Q4 | |
| Colombia | | 1995Q3 | 1998Q3 | 2002Q3 | 2008Q3 | |
| India | | 1995Q3 | 1998Q3 | 2004Q1 | 2008Q3 | |
| Indonesia | | 1995Q3 | 1997Q4 | 2000Q4 | 2004Q4 | |
| Peru | | 1995Q4 | 1997Q3 | 2000Q2 | 2004Q1 | 2007Q1 |
| Philippines | | 1995Q4 | 1997Q4 | 2000Q3 | 2006Q1 | 2010Q3 |
| Russia | | 1995Q3 | 1998Q2 | 2004Q3 | 2008Q4 | |
| ***Lm*** | 6.54 | | | | | |

*Notes*: The CV at the 1 per cent level is 2.28.

Table 15. Panel cointegration tests

| | **Full** | | **F-10** | | **Advanced** | | **Secondary** | |
|---|---|---|---|---|---|---|---|---|
| | c | c&t | c | c&t | c | c&t | c | c&t |
| **Pedroni** | | | | | | | | |
| Panel v-Statistic | 16.68** | 26.10** | 14.07** | 24.35** | 20.31** | 24.48** | 10.22** | 29.87** |
| Panel rho-Statistic | -29.44** | -14.91** | -16.45** | -9.61** | -20.97** | -12.51** | -10.11** | -9.65** |
| Panel PP-Statistic | -20.92** | -14.05** | -12.39** | -10.74** | -14.98** | -13.48** | -9.86** | -9.41** |
| Panel ADF-Statistic | -0.38 | 3.99 | -1.16 | -0.22 | -0.28 | -0.19 | -2.30** | 0.20 |
| Group rho-Statistic | -17.83** | -11.29** | -10.69** | -6.49** | -11.88** | -7.28** | -9.11** | -5.87** |
| Group PP-Statistic | -19.66** | -12.55** | -10.64** | -8.02** | -13.94** | -9.03** | -9.16** | -6.34** |
| Group ADF-Statistic | -1.98* | 2.21 | -1.67* | -0.01 | -1.34 | 0.50 | -2.48** | 0.31 |

*Note*: The critical values are based on Pedroni (2004). Null hypothesis for cointegration tests: No cointegration. ** and * reject hypothesis of no cointegration at 1% and 5% level of significance. Lag selection is based on the SIC with automatic selection.

Table 16. Panel cointegration tests

| | **Full** | | | | **F-10** | | | | ***Advanced*** | | | | ***Secondary*** | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | c | c&t | c | c&t | c | c&t | c | c&t | c | c&t | c | c&t | c | c&t | c | c&t |
| **Pedroni** | ***U*** | | ***S*** | | ***U*** | | ***S*** [1] | | ***U*** | | ***S*** | | ***U*** | | ***S*** | |
| Panel v- | 15.41** | -26.03** | 6.52** | 4.04** | 13.34** | 23.32** | - | - | 17.90** | 21.83** | 2.67* | 1.49 | 10.22** | 29.87** | - | - |
| Panel rho- | -28.19** | -14.31** | -5.29** | -4.05** | -15.62** | -9.14** | - | - | -18.53** | -11.09** | - | - | -10.11** | -9.65** | - | - |
| Panel PP- | -19.94** | -13.51** | -3.82** | -3.69** | -11.75** | - | - | - | -13.16** | -11.92** | - | - | -9.86** | -9.41** | - | - |
| Panel ADF- | -0.52 | 3.77 | 0.56 | 1.62 | -0.16 | 1.17 | - | - | 0.15 | 1.76 | -1.07 | -0.55 | -2.30** | 0.20 | - | - |
| Group rho- | -18.17** | -11.36** | -2.696** | -2.04* | -10.99** | -6.42** | - | - | -13.00** | -7.76** | -1.25 | -1.12 | -9.11** | -5.87** | - | -- |
| Group PP- | -20.14** | -12.49** | -2.67** | -2.61** | -10.88** | -7.89** | - | - | -15.22** | -9.45** | -1.52 | - | -9.16 | -6.34** | - | |
| Group ADF- | -1.99* | 2.19 | -0.61 | 0.22 | -0.98 | 0.49 | - | - | -0.32 | 1.68 | -0.87 | -0.26 | -2.48 | 0.31 | - | - |
| Johansen | - | - | - | - | - | - | 28.94** | 22.85** | - | - | - | - | - | - | - | - |

*Note***:** The critical values are based on Pedroni (2004). Hypothesis for Pedroni cointegration test: No cointegration. ** and * reject hypothesis of no cointegration at 1% and 5% level of significance. Lag selection is based on the SIC with automatic selection. [1.] In this group of stable countries only Mexico is estimated.

## 7. Appendix: Data

Data used in this study are the quarterly data for the emerging markets between 1995 Q2 and 2013 Q2. The main source for the quarterly GDPs is the International Monetary Fund Financial Statistics (IFS). Data obtained from the IFS are in current domestic prices. These data are converted into current dollars by using the exchange rates obtained from the same source. M2 money supplies are acquired from different sources like the OECD, the World Bank, and respective Central Banks. For the countries where money supply (M2) is quoted in domestic currencies, values are converted into current dollars by employing the same exchange rates used in converting GDP figures into dollars. For some countries, quarterly M2 values are estimated by using annual M2. The main sources for

annual population data are the FED Saint Louis, the OECD, and the World Development Indicators. These annual figures are later converted into quarterly figures by interpolation technique. Finally, quarterly trade (Import and Export) values are obtained from the IFS and the FED Saint Louis database. Since, the values for some of the countries were expressed annually such values were transformed into quarterly ones. Later on, countries' values that are reflected in domestic currencies were converted into current dollars. Estimations employ the logs of individual data.