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DOMESTIC SAVINGS-INVESTMENT GAP AND GROWTH: A CROSS-COUNTRY PANEL STUDY

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ABSTRACT Standard neoclassical growth models assume that foreign savings are perfect substitutes of domestic savings in financing domestic capital thus growth rate is independent of domestic savings rates. However, these models fail to explain the divergence of growth rates between East Asian countries with higher domestic saving rates and other emerging economies. This study forwards the view that saving-investment gaps, if not domestic savings themselves, may explain to some extent the divergence of growth rates among those countries. We adopt the methodology of Aizenman et al. (2007) in calculating cumulative saving-investment gaps of 46 countries for the period of 1993-2010. Empirical analysis suggests that increasing the fraction of domestic savings in the financing of domestic capital, i.e. a rise in self-financing ratios, contributes to growth performance of countries. This finding is more pronounced for low-middle income countries and/or countries with lower self-financing ratios.
JEL C23, E21, O40
Keywords Growth, Self-financing ratio, Domestic savings, Panel data analysis

ÖZ Geleneksel neoklasik büyüme modeli, açık ekonomilerde yurtiçi tasarruf oranının büyüme için belirleyici olmadığını ileri sürmekte ve büyümeyi sağlayacak yatırımların finansmanında kullanılacak yurtiçi tasarrufların dış tasarruflarla (sermaye girişleriyle) ikame edilebileceğini öngörmektedir. Ancak, söz konusu modeller yüksek tasarruf oranlarına sahip Doğu Asya ülkeleri ile diğer yükselen piyasa ekonomisi ülkelerinin arasındaki büyüme oranı farklarını açıklamakta yetersiz kalmaktadır. Bu çalışma, söz konusu ülkelerin büyüme oranlarının farklılaşmasında, doğrudan yurtiçi tasarruf oranları olmasa dahi, yurtiçi tasarruf açıklarının (tasarruf-yatırım farkları) önemli rol oynayabileceğini ileri sürmektedir. Aizenman ve diğerleri (2007) tarafından önerilen yöntem uygulanarak yurtiçi kaynak kullanım oranları, 46 ülke için 1993-2010 dönemi baz alınarak hesaplanmaktadır. Tanımlayıcı istatistik ve ekonometrik tahmin yöntemlerini kapsayan analizler neticesinde, yatırımların finansmanında kullanılan yurtiçi tasarrufların payındaki artışın, diğer bir ifadeyle yurtiçi kaynak kullanım oranındaki yükselişin, ülkelerin büyüme oranlarını olumlu yönde etkilediği sonucuna ulaşılmıştır. Söz konusu bulgunun yurtiçi kaynak kullanım oranının düşük olduğu ve/veya orta-düşük gelirli ülkelerde daha etkili olduğu tahmin edilmiştir.
YURT İÇİ TASARRUF-YATIRIM AÇIĞI VE BÜYÜME: PANEL ANALİZ
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1. Introduction

Empirical literature provides evidence that the sustainability of growth faces a significant risk when saving-investment gap or the share of foreign savings in total financing is excessively high in developing countries. In other words, countries with large external imbalances or displaying high reliance on the foreign capital in financing their domestic investments are observed to be more vulnerable to external shocks in terms of their growth performances. Unlike the theoretical models that hardly suggest a link between growth rates and saving-investment gaps of countries, empirical studies provide robust and rich evidence related to this relationship (Prasad et. al., 2007; Aghion et al., 2009; Aizenman et al., 2007).

Policy implications are more outspoken, as observed in the policy reports of the international institutions such as the World Bank and the IMF. For instance, the World Bank in its report on Turkey claims that "low domestic saving jeopardizes the sustainability of high growth". It further explains the potential channel from low domestic savings or high external financing to lower growth as "…for credit-constrained firms (small and medium enterprises) with little or no means of external financing, the lack of domestic saving lowers investment and thus lowers growth of the economy…" (World Bank, 2012: 11-12).

In this study, our major concern is to investigate empirically the relationship between countries' growth rates and a measure of "saving-investment gaps", which is named as "self-financing ratio" (*SFR*) by Aizenman et al. (2007). Being inspired with the empirical research carried out by Aizenman et al. (2007) and Prasad et al. (2007), we aim to contribute to the empirical analysis in Aizenman et al. (2007) firstly, through improving the calculation of the key variable named *SFR* by allowing capital-output ratios (k) to vary across countries and secondly, by extending the period of analysis to 2000s as well as exploring a wider range of econometric specifications beyond that in Aizenman et. al. (2007).

In this framework, *SFR* is at the center of our empirical analysis as a proxy for cumulative saving-investment gap. *SFR* measures the fraction of domestic capital that is financed by discounted cumulative domestic savings for a time-horizon of 10 years. This measure can also be interpreted as "wealth gap" of a country, which is expected to have contemporaneous growth impact. This is best expressed by Deaton (1999:38)'s saying "Growth has to come from somewhere, and it is hard to think of growth rates as a pure time-series process, unaffected by previous levels of

investment (=saving)". In parallel to this view, *SFR* takes past values of investments and savings into account.[1]

There is ample empirical evidence suggesting the link between domestic savings and growth even though traditional theoretical approaches often fail to identify this linkage.[2] Firstly, empirical evidence suggests a positive association between domestic saving and investment or an imperfect substitution between domestic and foreign savings, i.e. Feldstein-Horoika puzzle (Feldstein and Horoika, 1980). Although recent empirical studies find evidence that domestic saving and investment are decoupled in high income countries, it is documented that the investment-saving association is still present for low-middle income countries [3] (Hevia, 2010 and World Bank, 2012). This implies that policies towards increasing saving may have implications for increasing investment and consequently overall economic growth. Secondly, in contrast to the predictions of theoretical models, empirical observations show that the direction of net capital flows is not actually from high income to low income countries, as suggested by Lucas paradox (Lucas, 1990). Besides this challenge facing neoclassical theory, empirical studies also claimed that foreign capital inflows do not lead to major increases in the growth rates of developing countries.[4] Lastly, Prasad et al. (2007) put forward the view that non-industrial countries with relatively low reliance on foreign savings in financing domestic capital, grow faster on average in the long-term than countries that relied more on foreign capital. For instance, China as the fastest growing developing country, exports capital, i.e., runs current account surplus over the years. Empirical findings of Aizenman et al. (2007) also support this view and suggest that countries financing a larger fraction of their capital by domestic savings, i.e. countries with high *SFRs*, grew faster than countries with low

[1] Findings from empirical and theoretical studies on the growth-saving causality do not suggest a strong judgment on the direction of causality. Therefore, in this study, we try to avoid going into details of the controversial discussions about saving-growth causality that exist both in theoretical and empirical framework. See Deaton (1999) for more discussion about this issue.

[2] Neo-classical growth models suggest a direct link between domestic saving rates and growth under the closed economy assumption (Solow, 1956; Cass, 1965; Koopmans, 1965). However, this link disappears under the open economy assumption, where foreign savings perfectly substitutes domestic savings in financing domestic capital. Endogenous growth models give most of the credit to total factor productivity, technological change and innovation rather than savings and capital accumulation in enhancing growth (Romer, 1986; Romer, 1990; Aghion and Howitt, 1992). These theoretical models fail to explain the divergence of growth rates between high-saver East Asian countries and other emerging countries, that is, countries in the former group have exhibited stronger growth performance compared to the latter group.

[3] Obstfeld and Rogoff (2000) also documented this fact for OECD countries during the period of 1990-1997. Blanchard and Giavazzi (2002) replicated the analysis for the Euro area and OECD countries over the period 1975-2001. Their findings suggest that the close and positive correlation between investment and saving could be weakening particularly for the countries in the Euro area. Hevia (2010) tested this relationship for a larger group of countries and extending the period of analysis. Hevia (2010) differentiated the high income countries from middle and low income countries.

[4] See Prasad et al.(2007), Aizenman et al. (2007) and Köse et al. (2006)

SFRs throughout the 1990s. These two empirical findings carry utmost importance in terms of questions addressed in this study.

Furthermore, the theoretical framework provided by Aghion et al. (2009) highlights the role of domestic savings in attracting foreign capital and contributing to growth. Within this framework, domestic savings are treated as collateral for attracting growth-enhancing foreign capital to countries that are far away from technological frontier, i.e. low-middle income countries with low saving rates. More specifically, countries which are in need of foreign capital and far away from technological frontier may enhance their growth performance by raising domestic savings through which the extent of asymmetric information is minimized and thus foreign investors feel confident about investing in good projects. This would ease the adoption of new technology by local firms and consequently leads to better growth performance.[5] In short, the transmission mechanism proposed by Aghion et al. (2009) is another channel through which a rise in domestic savings may enhance the growth performance of countries that are far away from technological frontier.

This study examines the empirical relationship between *SFRs* and growth rates for a sample of 46 countries (24 developed and 22 developing) over a time span of 1993-2010 using panel data techniques. Our analysis focuses on the medium-term perspective of growth dynamics. In order to test the sensitivity of our findings, we examine growth model at different frequencies (5-year averaged data and 3-year averaged data) to observe whether they provide a consistent story. Our main empirical findings indicate that medium-term growth rates in low-middle income countries as well as in countries with low SFRs, increase with SFR.

The next section of the paper gives intuition on the calculation of SFR and its interpretation on the basis of cross-country comparison of individual SFRs. Section 3 defines the empirical model and evaluates the main findings of the empirical analysis. The last section concludes the paper.

2. Descriptive Analysis of Self-financing Ratios (SFRs)

As mentioned previously, self-financing ratio developed by Aizenman et al. (2007), has been an important part of our empirical analysis. It roughly determines the fraction of domestic capital stock financed by cumulative national savings. In this section, initially, we describe the variable, *SFR* and summarize the main findings of the study by Aizenman et al. (2007). Later,

[5] This theoretical approach resembles "financial accelerator theory" in which firms with large collateral raise external financing at lower cost due to lower external finance premium, which, in turn, reduces the extent of asymmetric information (Bernanke, et al., 1996).

we describe how we improved the calculation of *SFRs* and discuss the patterns of *SFRs* that we calculated for 46 countries.

The formula for the approximated measure of self-financing ratio (*SFR*) is:

$$f_{t;n} = \frac{\sum_{i=1}^{n} S_{t-i}(1-d)^{i-1} + kY_{t-n}(1-d)^{n}}{\sum_{i=1}^{n} I_{t-i}(1-d)^{i-1} + kY_{t-n}(1-d)^{n}}$$

Where, *k* denotes *capital-GDP* ratio in the beginning of the period, d the depreciation rate, *Y* the real *GDP*, *I* real gross investment, *S* real gross domestic savings. The idea here is basically to "backcast" *S* and *I* for horizon of n periods. Therefore, *SFR* at time *t*, indicates a ratio that is calculated using "backcast" of *S* and *I* for horizon of n periods. As observed in the formula, larger weights are assigned to recent investment and savings figures.[6] A value of *SFR* below 1 designates a partial reliance on foreign saving, while a value of 1 resembles that the entire stock of domestic capital is self-financed, i.e., financed by domestic savings.

Aizenman et al. (2007) calculated the average *SFRs* for developing countries as below one, which exhibited a stable pattern throughout the 1990s, in an era of increased financial integration. They claimed that the wave of financial liberalization in the beginning of 1990s had little impact on *SFRs* in the 1990s. In other words, in a period of greater financial integration, changes in average *SFRs* remained almost negligible. Furthermore, their study suggests that "throughout the 1990s, countries with higher *SFRs* grew faster than countries with low *SFRs*".[7] Notwithstanding the increased financial integration, in low-middle income countries, foreign savings played a limited role in the financing of domestic capital stock.

By following the methodology employed in the calculation of *SFRs* by Aizenman et al. (2007), we attempt to improve the calculation of *SFRs*, firstly by allowing capital-output ratios (*k*) to vary across countries based on Saygılı and Cihan (2013) and secondly extending the period of analysis beyond that in Aizenman et al.(2007). We agree with Aizenman et al. (2007:687) that mentioned "the quality of the self-financing ratios evaluated in this study is limited by the quality and availability of the data, and the accuracy of the assumptions about the various parameters (*k*, *d*, etc.)". Therefore, we recalculate *SFRs* in order to improve the quality and accuracy

[6] For more details about the formula, see Aizenman et al. (2007).
[7] Aizenman et al. (2007:684).

of this ratio by allowing capital-output ratios to vary across countries.[8] Furthermore, the extension of period to 2000s enabled us to analyze the impact of growing global imbalances witnessed in 2000s on *SFR*, and relate them to the corresponding growth performances of selected countries. Then, on the basis of these changes, *SFRs* are calculated for 46 countries (24 developed and 22 developing) for the period of 1993-2010, which represent almost 90 percent of global *GDP*.[9]

Before discussing our main findings as regards the patterns of self-financing ratios, we would like to give a brief account of the trend of capital flows during the period of analysis of this study. This would also make clear our contribution in terms of extending the period of analysis in the calculation of *SFRs*. It is known that together with the stream of policies and reforms to liberalize trade and capital account regimes in the 1980s, there has been a rapid increase in the trade volume and capital flows globally in the 1990s. For instance, during the period of 1990-2008, world trade volume increased by 3.5 times in US dollar terms, reaching 64 percent of global *GDP* before the start of global crisis in 2008, while it was amounting to 40 percent of global *GDP* in 1990. Meanwhile, capital flows have increased in that period as well. Foreign direct investment (net) as a percentage of global *GDP* increased by 3.3 points to 4.2 percent during the period of 1990-2007. In other words, net foreign direct investments increased approximately by 8.5 folds annually during this period. A similar tendency is also observed for long-term borrowings and portfolio investments.

Our calculations reveal that together with a rapid increase in cross border trade and international capital flows during 2000s, countries have changed the patterns of financing their domestic capital stocks. On the one side, countries with low domestic saving rates began to rely more heavily on foreign savings to finance their growing investments; on the other side, there have been increases in capital outflows of the countries that have high domestic savings. Henceforth, capital flows across countries have affected countries' *SFRs*.

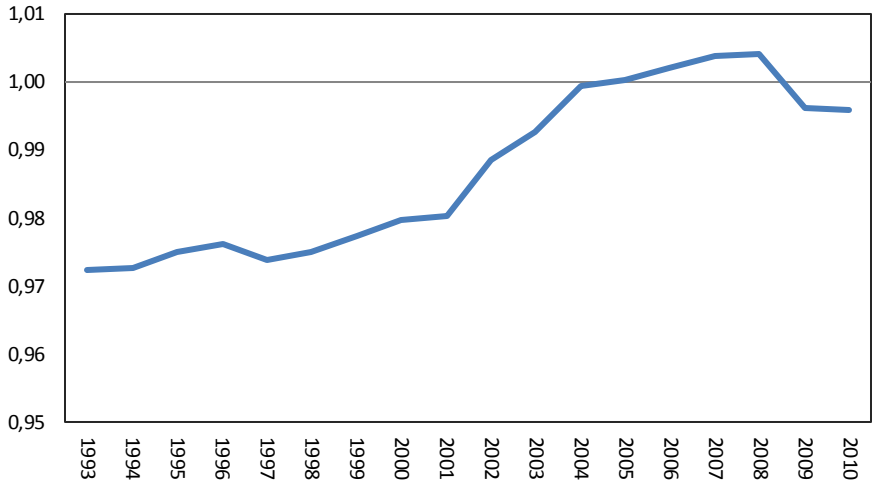
Average *SFR* of selected countries for the period between 1993 and 2010 can be viewed in Graph 1. It is observed that average *SFR* increased sharply in the first half of the 2000s, while they slightly declined during the global crisis. When average *SFR* is weighted by national incomes of countries, it is

[8] In the neoclassical Solow (1956) growth model, the long-run capital-output ratio β is equal to the ratio of the saving rate s to the growth rate of the economy g, i.e. $\beta=s/g$. In this respect, Piketty and Zucman (2014: 1265, 1306) pointed that "there has always been some confusion about what the level of the capital-output ratio is supposed to be ..... Capital-output ratios and capital shares have no strong reason to be constant. Since domestic saving rates and output growth rates g vary for all sorts of reasons over time and across countries, it is natural to expect β_k to vary widely".

[9] For the list of countries, see Appendix 1.

clear that throughout the period, average *SFR* is still below "1" and increased only slightly. Furthermore, the fact that most of the selected countries' *SFRs* are below "1" implies that countries generally financed their capital stock by domestic savings.

Figure 1. Average *SFR* of Selected Countries (1993-2010)

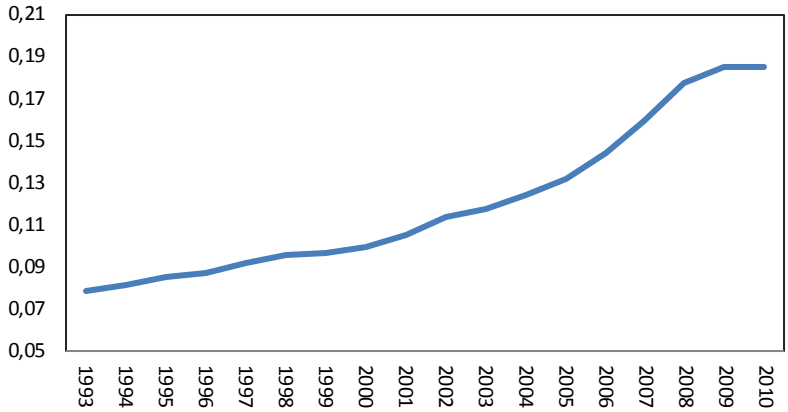


Source: Authors' calculations.

The dispersion or volatility in *SFRs* has also increased sharply in the 2000s, in the face of rapid increases in global capital flows, as a possible reflection of global imbalances (Graph 2). It is noteworthy that countries with already high domestic saving rates such as China, Malaysia, Norway and Germany raised their *SFRs* through further increases in their domestic savings. On the other hand, *SFRs* in some other countries such as United States, Turkey, Greece, South Africa, Bulgaria, Spain and Romania declined more, contributing to global imbalances. Although these imbalances are somewhat corrected during the global crisis of 2008-2009, it still continues to be a critical issue.

SFRs of a number of developed and developing countries have declined significantly in recent years. Countries that have been deeply affected by the global crisis, such as Greece, Iceland, Portugal, Romania, Spain, Italy and Ireland had already experienced a decline in their *SFRs* in the pre-crisis period. Furthermore, South Africa, United Kingdom, United States, New Zealand, Hungary, Bulgaria, Poland and Turkey also experienced falls in their *SFRs* to various degrees during the same period.

Figure 2. Volatility of SFR of Selected Countries (1993-2010)

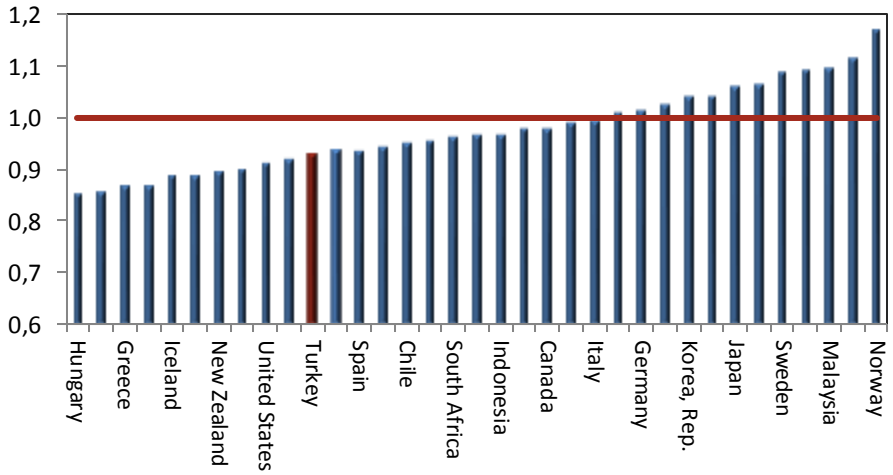


Source: Authors' calculations

Average *SFR* of some selected countries over the period of 2000-2010 can be viewed in Graph 3. Difference of average *SFRs* for the period of 2000-2010 as compared to the period of 1993-1999 is observed in Graph 4. For most of the countries in the dataset, it is observed that *SFRs* have increased. Countries that had already high average *SFR*, have generally increased their *SFRs* throughout the time. As can be viewed from the Graph 3 and 4, high-income countries such as Norway, Finland, Canada, France, Germany, Denmark, Japan, Belgium, Netherlands, South Korea and Sweden and some low-middle income East Asian countries such as Malaysia, Thailand and China are the ones that belong to this group of countries.

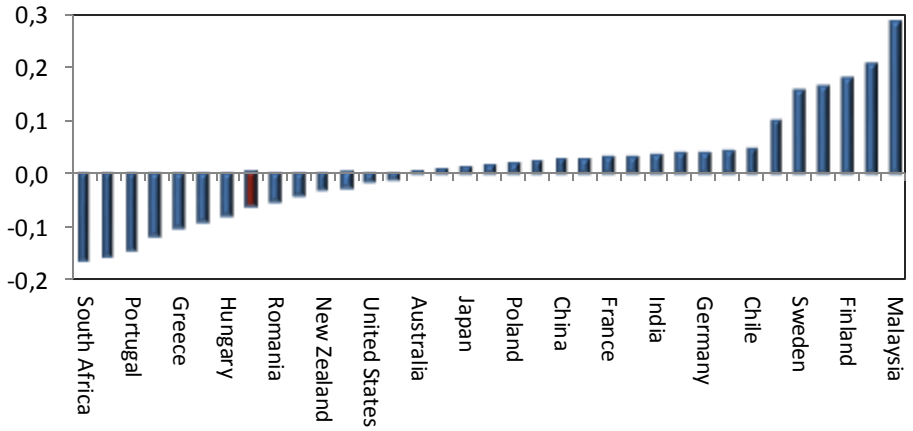
Countries that are in need of foreign financing generally financed their expenditures by importing capital in the forms of foreign direct investment and/or long-term debt from high-income countries along with borrowing from countries having high accumulated reserves. For instance, the fact that Central Bank of China holds an important portion of their reserves in the form of government bonds of USA, allows lower interest rates and higher consumption in USA. As can be viewed from Graph 4, Portugal, Bulgaria, Greece, Spain, Ireland, Romania, South Africa, Indonesia, Hungry, Turkey, New Zealand and USA are among the countries whose average self-financing ratios declined during the 2000s as compared to 1990s.

Figure 3. Average Self Financing Ratios of Selected Countries during the Period of 2000-2010



Source: Authors' calculations

Figure 4. Difference of Average Self Financing Ratios of Selected Countries for the Period of 2000-2010 as Compared to 1993-1999 Period



Source: Authors' calculations

Here, Table 1 provides descriptive statistics for the variables used in the empirical analysis in the following section. Variable definitions and data sources are reported in Appendix 2.

Table 1. Descriptive Statistics for the Variables

Variables	Obs.	Mean	Std. Dev.	Min	Max
GROWTH	820	2.4	3.5	-14.3	13.6
PCINCOME	828	9.3	1.2	5.7	11.7
SFR	786	1.0	0.1	0.6	1.5
POLSTAB	552	0.3	0.9	-2.4	1.7
TOPEN	828	84.3	64.6	15.0	460.5
WORKAGE	828	66.3	3.0	56.5	73.6
INVGDP	808	23.1	5.7	8.3	48.2
FDIGDP	817	9.5	46.9	-29.2	564.9
PORTFGDP	828	1.7	19.7	-113.4	312.0
INFGDP	809	15.1	112.0	-4.5	2075.9
GBALGDP	777	-1.9	4.5	-31.3	18.8
M2GDP	756	83.9	75.9	14.0	636.5

Table 2 shows the correlation coefficients of variables at 5 percent significance level. Growth rates seem to be highly and positively correlated with investment rates and government balance, while they are negatively correlated with per capita incomes. *SFRs* are positively correlated with trade openness, share of working age population, *FDI*, government balance and money supply.

Table 2: Correlation Matrix

	GROWTH	*PCINCOME*	*SFR*	*TOPEN*	*WORKAGE*	*INVGDP*	*FDIGDP*	*PORTFGDP*	*INFGDP*	*GBALGDP*	*M2GDP*
GROWTH	1										
PCINCOME	-0.25*	1									
SFR	0.07	0.18*	1								
TOPEN	0.04	0.59*	0.23*	1							
WORKAGE	0.13*	0.19*	0.22*	0.14*	1						
INVGDP	0.45*	-0.18*	-0.05	0.15*	0.21*	1					
FDIGDP	0.02	0.18*	0.30*	0.28*	0.06	-0.02	1				
PORTFGDP	0.017	0.10	0.11	0.13*	0.00	-0.01	0.63*	1			
INFGDP	-0.06	-0.12*	-0.08	-0.061	-0.09	-0.07	-0.02	0.00	1		
GBALGDP	0.25*	0.24*	0.45*	0.30*	0.13*	0.19*	0.16*	-0.02	-0.09	1	
M2GDP	0.11	0.31*	0.38*	0.25*	0.20*	0.01	0.81*	0.58*	-0.09	0.04	1

*Significant at 5% level

3. Empirical Analysis

Econometric analysis has been carried out for two different time frequencies to deal with the short-run variations in variables in explaining growth rates of the countries. Since our interest is mainly medium-term growth dynamics, initially, we construct a panel dataset that contains non-overlapping 5-year averages of the data for each country. Therefore, for instance, 18 annual observations for a particular country over the period of 1993-2010 are compressed into four observations for each country. First observations are the average of three years 1993, 1994, 1995, while the remaining three observations are the average of five years.[10] For the non-overlapping 5-year average figures, we carried out static panel estimations, i.e. fixed effect estimation. Alternatively, we do the same for non-overlapping 3-year averages, where 18 annual observations for a particular country are compressed into six observations over the period, which is sufficient number of observations for performing dynamic panel regressions. This method allows us not only to capture dynamic factors and deal with endogeneity problem, but also carry out additional regressions that identify the impact of global crisis.

3.a. Findings from Static Panel Estimation Model

We begin our empirical analysis by estimating the following model:

$$GROWTH_{i,t} = \beta_1 PCINCOME_{i,t-1} + \beta_2 SFR_{i,t} + \beta_3 SQSFR_{i,t} + \sum_{j=1}^{k} \delta_i X_{it,j} + \theta\, INTSFRLOW_{i,t} + \ell\, INTSFRLINC_{i,t} + \varepsilon_{it} \quad (1)$$

where $i = 1,\ldots,46$, $j = 1,\ldots,k$ and t, respectively refer to country, number of control variables and time series element of the data. ε is the error term. As mentioned above, we initially work with a panel data set that contains non-overlapping 5-year averages of the data for each country. The dependent variable, *GROWTH*, is the average per capita growth rate. Among regressors, the log of lagged per capita income (*PCINCOME*) is included to address convergence across countries. The square of *SFR*, *SQSFR*, allows for testing possible nonlinearities as well as our hypothesis that the growth impact of *SFR* weakens as *SFR* increases.[11] Other regressors used in this model represented by the vector of control variable *X*, involve trade openness (*TOPEN*)[12], the share working age population (*WORKAGE*),[13]

[10] *SFR* averages for different income group of countries across periods are reported in Appendix 1.
[11] Alternatively, we put savings rates instead of *SFR* into regressions, even though regression results are not reported here. The coefficient of domestic savings are estimated to be insignificant, implying that it is the saving-investment gap rather than saving rates themselves that matter for growth.
[12] See Yanıkkaya (2003) and Harrison (1996)
[13] In line with the empirical analysis of Mankiw et al. (1992), we included share of working age population in the model.

investment rate (*INVGDP*)[14] the share of foreign direct investment in *GDP* (*FDIGDP*), the portfolio investments as percent of *GDP* (*PORTFGDP*),[15] inflation rate (*INFGDP*)[16] and government balance as percent of *GDP* (*GBALGDP*).[17] Furthermore, two different interaction terms are included in the regressions interchangeably: *INTSFRLOW* and *INTSFRLINC*. *INTSFRLOW* is the product of dummy variable representing countries whose average *SFR* is below 0.96 (*DSRFLOW*) and *SFR*.[18] *INTSFRLINC* is the product of dummy variable representing low-middle income countries (*DLINC*) and *SFR*. This analysis allows us to test the hypothesis that foreign savings may not be perfect substitute for domestic savings and thus an improvement in saving-investment gap (rise in domestic savings) may enhance the growth performance of countries that are far from the technological frontier, i.e. low-middle income countries.

Estimation results for the fixed-effect model are reported in Table 3. The first column represents the basic model without the interaction terms. In the second column, *SQSFR* is added as a regressor to control for non-linearity. In the other columns, we incorporate above-mentioned interaction terms (*INTSFRLOW* and *INTSFRLINC*) interchangeably, while in the fourth and sixth columns, *SQSFR* is included in the regression as well.

In regression (1), the estimated coefficient of *SFR* is positive and statistically significant, suggesting that a 10 basis point increase in *SFR* will add 2.2 percentage points to the average per capita growth rate. This figure is larger for countries with lower *SFRs*. In regression (2) coefficient of *SQSFR* is negative as expected but not statistically significant, implying no clear evidence for non-linearity in the association between average growth rates and SFRs. Alternatively, in regression (3), *INTSFRLOW* is added as regressor in place of *SQSFR* to control for any non-linearity. The coefficient of *INTSFRLOW* is positive and statistically significant, supporting the view that a rise in SFR may contribute to growth rates significantly when *SFR* is low but this contribution disappears as it gets higher. In regression (4), we use both *SQSFR* and *INTSFRLOW* as regressors to control for non-linearity and only the coefficient of the latter is statistically significant. Furthermore,

[14] In endogenous growth models like Rebelo (1990) and Barro (1990), per capita growth and investment ratio tend to move together.

[15] In the theoretical literature, there are discussions as regards the impact of openness to capital flows on growth. Those discussions have been addressed by the variables of portfolio investment and FDI added as regressors to the model (Rappaport, 2000).

[16] In order to address the so called inverse relationship between growth and inflation in the literature, we have included inflation as an explanatory variable to the regression (Bruno and Easterly, 1998).

[17] Barro (1989); Barro (1990); Barro (1991)

[18] Low *SFR* countries, those having *SFR* in the lower 50 percentile, consist of Argentina, Australia, Brazil, Bulgaria, Chile, Colombia, Czech Republic, Greece, Hungary, Iceland, Israel, Slovak Republic, Mexico, New Zealand, Philippines, Peru, Poland, Portugal, Romania, Spain, Turkey, United States and United Kingdom.

the coefficient of interaction term *INTSFRLINC* is also positive and statistically significant in the regression (5), implying positive impact of *SFR* on growth in low-middle income countries. This outcome does not change when *SQSFR* is added as regressor alongside *INTSFRLINC* to regression (6).[19] This finding clearly supports the hypothesis suggested by Aghion et al. (2009) that lower income countries that are in need of technological transfer from abroad may benefit from having a stock of domestic savings, which can be regarded as collateral that raise willingness of foreign investors to invest in good domestic projects.

The regressors have been chosen on the basis of relevant empirical literature and their coefficients are generally estimated to be in line with theoretical predictions (Barro and Salai Martin, 1991; 2004; Barro, 1998). Coefficients of the lag per capita income (*PCINCOME*) are estimated to be negative and statistically significant. This finding suggests that countries with lower per capita income grow faster than countries with higher per capita income level or vice versa. That is, the empirical analysis confirms a strong convergence among countries included in the analysis.[20] In addition, estimated coefficients of the share of working age population in total population (*WORKAGE*) are positive and statistically significant, consistent with the expected positive impacts of labor supply, while the coefficients of trade openness (*TOPEN*) are positive but rarely significant. Again as expected, coefficients of investment rate (*INVGDP*) are positive and statistically significant, while those of inflation rate (*INFGDP*) in all regressions are negative and statistically significant in line with the literature (Bruno and Easterly, 1998; Barro, 1998). Furthermore, improvements in government balance (*GBALGDP*) have positive impact on growth in all regressions. However, coefficients of *FDIGDP* and *PORTFGDP* as indicators of capital inflows are estimated to be insignificant. This finding is not in line with expectations as regards foreign direct investments, which potentially is expected to support growth process, while dynamic panel estimations carried out in the next sub-section suggests positive and statistically significant coefficients for *FDIGDP* in line with expectations.

[19] F test in Table 3 reports the test result for the joint significance of *SFR* term and interaction term in the relevant regression. As can be noticed from test results, the null hypothesis of joint significance of these terms is not rejected except Regression (6).
[20] See Barro et al. (1995)

Table 3. Fixed-Effect Panel Regression

Dependent Variable: GDP growth rate (%)

	(1)	(2)	(3)	(4)	(5)	(6)
$PCINCOME_{i,t-1}$	-2.507	-2.383	-2.154	-2.252	-2.465	-2.452
	(2.52)**	(2.34)**	(2.22)**	(2.29)**	(2.53)**	(2.43)**
SFR_{it}	2.222	8.506	0.701	-6.258	0.077	0.834
	(1.69)*	(0.87)	(0.53)	(0.60)	(0.04)	(0.08)
$SQSFR_{it}$	-	-3.442	-	3.725	-	-0.395
		(0.64)		(0.65)		(0.07)
$INTSFRLOW_{it}$	-	-	6.132	6.773	-	-
			(3.90)***	(3.55)***		
$INTSFRLINC_{it}$	-	-	-	-	4.051	3.982
					(1.84)*	(1.78)*
$TOPEN_{it}$	0.018	0.019	0.026	0.025	0.018	0.018
	(1.11)	(1.16)	(1.83)*	(1.76)*	(1.16)	(1.16)
$WORKAGE_{it}$	0.448	0.438	0.337	0.336	0.304	0.305
	(3.03)***	(2.98)***	(2.36)**	(2.37)**	(1.77)*	(1.74)*
$INVGDP_{it}$	0.210	0.196	0.169	0.180	0.225	0.223
	(3.48)***	(2.84)***	(3.00)***	(3.08)***	(4.03)***	(3.34)***
$FDIGDP_{it}$	-0.005	-0.002	0.002	-0.001	-0.003	-0.002
	(0.38)	(0.11)	(0.15)	(0.11)	(0.19)	(0.15)
$PORTFGDP_{it}$	0.002	-0.002	-0.011	-0.008	0.000	0.000
	(0.10)	(0.06)	(0.49)	(0.36)	(0.02)	(0.00)
$INFGDP_{it}$	-0.031	-0.031	-0.030	-0.030	-0.029	-0.029
	(2.46)**	(2.51)**	(3.28)***	(3.23)***	(2.61)**	(2.60)**
$GBALGDP_{it}$	0.177	0.184	0.211	0.208	0.230	0.230
	(1.72)*	(1.86)*	(2.21)**	(2.18)**	(2.31)**	(2.29)**
INT	-11.227	-13.995	-7.542	-4.162	-2.263	-2.733
	(0.95)	(1.07)	(0.65)	(0.32)	(0.17)	(0.18)
R^2	0.40	0.41	0.47	0.47	0.43	0.43
F test			8.81	7.96	3.80	1.88
F test (Prob > F)			(0.000)	(0.001)	(0.029)	(0.164)
No. of obs.	170	170	170	170	170	170

The symbols * ,** and *** indicate statistical significance at 10 percent, 5 percent and 1 percent levels, respectively.

Notes: The dependent and independent variables are non-overlapping 5-year averages of the corresponding annual variables. Heteroscedasticity consistent robust t-statistics are reported in parenthesis. F test results give the joint significance of SFR term and the interaction term.

3.b. Robustness of Empirical Findings: Dynamic Panel Estimation Model (System-GMM)

As mentioned above, in order to contain dynamic factors and deal with endogeneity problem between *SFR* and growth rate, we estimate the following benchmark dynamic model by using system GMM technique:[21]

$$GROWTH_{it} = \beta_1 GROWTH_{i,t-1} + \beta_2 GROWTH_{i,t-2} + \beta_3 PCINCOME_{i,t-1} + \beta_4 SFR_{it} + \beta_5 SQSFR_i + \sum_{j=1}^{k} \delta_j X_{it,j}$$
$$+\theta\ INTSFRLOW_{it} + \ell\ INTSFRLINC_{it} + \sigma_i + \lambda_t + \varepsilon_{it} \qquad (2)$$

[21] This estimation technique is based on Arellano and Bond (1991) and Arellano and Bover (1995).

where σi is country-specific fixed effect and λt represents vector of period dummies. In all regressions, we include a full set of time dummies on the right-hand side to allow for a full set of time effects. The system-GMM model with two lags of independent variables needs at least 5 time series observations in order to carry out regressions. Therefore, as described earlier, we work with a panel data set that contains non-overlapping 3-year averages of the data for each country, yielding 6 time series observations per country. This also allows us to test the impact of SFR during the global crisis, i.e. 2008-2010 period.

Along with the set of regressors used in the previous model (1), first and second lags of the dependent variable (*GROWTH*) are also included in this model.[22] Furthermore, we add new control variables such as political stability (*POLSTAB*) and the ratio of broad money to *GDP* (*M2GDP*) in addition to the vector of control variables included in the previous model (*TOPEN, WORKAGE, INVGDP, FDIGDP, PORTFGDP, GBALGDP* and *INFGDP*), as observations for these variables are generally available during 2000s. We also reported both Sargan and Hansen test results to show instrument validity of over-identifying restrictions. In all regressions, Hansen test is found to have good *p*-values of 1.000, which is a sign of overfitting problem. On this issue, Roodman (2009a) argues that "there appears to be little guidance from the literature on how many instruments is "too many" (Ruud 2000: 515), in part because the bias is present to some extent even when instruments are few".[23] Hence, we report number of instruments as suggested by Roodman (2009a). In most of the regressions, Sargan test of over-identifying restrictions for the GMM estimators have *p* values larger than 5 percent. Therefore, additional instruments seem to be valid and informative.

Estimation results are reported in Table 4 and are generally in line with those reported in Table 3. Estimated coefficients of *SFR* are estimated to be positive and statistically significant in regressions (1) and (2). In contrast to the findings in Table 3, in Table 4 the coefficient of *SQSFR* is estimated to be negative and statistically significant as shown in regression (2). The two interaction terms are used interchangeably in estimations. The coefficient of the interaction term, *INTSFRLOW*, in regression (3) is estimated to be positive and statistically significant. Again, in regression (4) where *SQSFR* is included in the estimation, the coefficient of *INTSFRLOW* is consistently positive and statistically significant, while the coefficient of *SQSFR* turns to

[22] Number of lags of the dependent variable is decided so as to remove autocorrelation on the basis of the *Arellano-Bond test* for autocorrelation. See Roodman (2009a) for further discussion.

[23] In Roodman (2009b), it is mentioned that "there is no precise guidance on what is a relatively safe number of instruments". Henceforth, we relied on Sargan test results, as the Sargan test is not so vulnerable to instrument proliferation (Roodman, 2009b:142).

be insignificant. Overall, findings support the view that countries with low saving-investment gaps or high *SFRs* grow faster as claimed by Prasad et al. (2007) and Aizenman et al. (2007). In addition, our findings put forward the claim that the relation between *SFR* and growth is not linear, i.e. increases in *SFR* in countries with lower *SFR* have stronger favourable impact on growth rates.

In the last two columns of Table 4, instead of *INTSFRLOW* that has been included in regressions (3) and (4), we included *INTSFRLINC* in the estimations in order to test the hypothesis suggested by Aghion et al. (2009) for low-middle income countries, which are not close to technological frontiers. We found the evidence supporting the hypothesis that low-middle income countries require domestic savings not only to reduce external imbalances but also to attract foreign capital to invest in projects with high technology, which would in turn improve growth performance. Coefficients of *INTSFRLINC* are estimated to be positive and statistically significant, empirically supporting the view that higher *SFRs* have a large impact on growth in low-middle income or developing countries.[24]

In all regressions in Table 4, coefficient of lagged per capita income is estimated to be negative but not significant. In all regressions, the coefficients of *GBALGDP* are estimated to be positive and statistically significant, meaning that improvements in public saving contribute to growth dynamics positively. Furthermore, in almost all regressions, coefficients of *WORKAGE*, *INVGDP* and *POLSTAB* are estimated to be positive and statistically significant. Labor supply and investment rate which are used as a proxy for factors of production and political stability have a strong favourable impact on growth performance. The coefficients of *FDIGDP* are generally larger than the coefficients of *PORTFGDP*, suggesting that *FDI* financing is more favourable for the growth performance than portfolio investment that has a short-term nature[25]. On the other hand, inverse association between inflation and growth is confirmed once more in all regressions, even though estimated coefficients are not significant. Finally, openness seems to be an unimportant variable for the growth performance in regressions estimated in Table 4.

[24] F test in Table 4 reports the test result for the joint significance of *SFR* term and interaction term in the relevant regression. As can be noticed from test results, in regressions (3), (4), (5) and (6), the joint significance of *SFR* and interaction terms is not rejected.

[25] See Chowdhury and Mavrotas (2006), Alfaro et al. (2003), Xu (2000), Marino (2000), Lensink and Morrissey (2001) for an analysis of the contribution of *FDI* to economic growth. See also Soto (2000) for capital flows and growth relationship.

Table 4. System-GMM Estimations

Dependent variable: Three-year averages of GDP growth rate (%)

	(1)	(2)	(3)	(4)	(5)	(6)
$GROWTH_{i,t-1}$	-0.158	-0.121	-0.156	-0.167	-0.186	-0.163
	(1.39)	(1.09)	(1.44)	(1.50)	(1.95)*	(1.58)
$GROWTH_{i,t-2}$	-0.227	-0.191	-0.197	-0.209	-0.195	-0.165
	(3.27)***	(2.86)***	(3.04)***	(3.01)***	(2.99)***	(2.41)**
$PCINCOME_{i,t-1}$	-1.584	-1.479	-0.972	-0.780	-1.701	-1.768
	(1.05)	(1.03)	(0.72)	(0.57)	(1.33)	(1.42)
SFR_{it}	4.428	27.463	-2.759	-15.126	-4.283	16.072
	(2.13)**	(2.96)***	(0.80)	(0.90)	(1.05)	(1.47)
$SQSFR_{it}$	-	-11.551	-	5.195	-	-9.404
		(2.41)**		(0.73)		(2.14)**
$INTSFRLOW_{it}$	-	-	14.108	17.618	-	-
			(3.28)***	(2.97)***		
$INTSFRLINC_{it}$	-	-	-	-	14.475	12.421
					(3.32)***	(2.87)***
$POLSTAB_{it}$	0.051	0.057	0.041	0.037	0.065	0.065
	(2.55)**	(2.78)***	(2.17)**	(1.86)*	(3.36)***	(3.36)***
$TOPEN_{it}$	-0.000	-0.000	0.000	0.001	-0.000	-0.001
	(0.11)	(0.15)	(0.08)	(0.31)	(0.13)	(0.44)
$WORKAGE_{it}$	0.491	0.483	0.467	0.428	0.353	0.443
	(2.24)**	(2.32)**	(1.89)*	(1.68)*	(1.52)	(1.79)*
$INVGDP_{it}$	0.201	0.143	0.146	0.150	0.260	0.224
	(2.73)***	(2.07)**	(2.07)**	(2.10)**	(3.51)***	(3.01)***
$FDIGDP_{it}$	0.029	0.029	0.026	0.025	0.026	0.026
	(3.12)***	(3.35)***	(3.10)***	(3.06)***	(3.41)***	(3.43)***
$PORTFGDP_{it}$	0.018	0.017	0.015	0.015	0.017	0.016
	(3.69)***	(2.88)***	(2.53)**	(2.60)**	(4.53)***	(3.58)***
$INFGDP_{it}$	-0.046	-0.058	-0.051	-0.054	-0.035	-0.031
	(1.23)	(1.53)	(1.54)	(1.64)	(0.96)	(0.83)
$GBALGDP_{it}$	0.195	0.223	0.234	0.235	0.223	0.233
	(2.30)**	(2.56)**	(2.86)***	(2.88)***	(2.63)**	(2.84)***
$M2GDP_{it}$	-0.013	-0.007	-0.001	-0.002	-0.010	-0.005
	(1.12)	(0.68)	(0.13)	(0.20)	(1.02)	(0.54)
m_1(p-value)	0.010	0.005	0.004	0.003	0.007	0.005
m_2(p-value)	0.825	0.527	0.726	0.800	0.934	0.836
F test			14.00	7.68	10.02	9.92
F test (Prob > F)			(0.000)	(0.001)	(0.000)	(0.000)
Sargan test	0.026	0.061	0.120	0.104	0.124	0.141
Hansen-test	1.000	1.000	1.000	1.000	1.000	1.000
No. of instruments	101	106	106	106	106	106
No. of obs.	129	129	129	129	129	129

The symbols * ,** and *** indicate statitical significance at 10 percent, 5 percent and 1 percent levels, respectively.

Notes: The dependent and independent variables are non-overlapping 3-year averages of the corresponding annual variables. Heteroscedasticity consistent robust t-statistics are reported in parenthesis. F test results give the joint significance of *SFR* term and the interaction term.

We extended the model given in equation (2) as follows:

$$GROWTH_{it} = \beta_1 GROWTH_{i,t-1} + \beta_2 GROWTH_{i,t-2} + \beta_3 PCINCOME_{i,t-1} + \beta_4 SFR_{it} + \sum_{j=1}^{k} \delta_j X_{it,j}$$
$$+\theta\ INTSFRD2000_{it} + \ell\ INTSFRCRIS_{it} + \mu\ INTSFRLOWCRIS + \eta\ INTSFRLINCCRIS + \sigma_i + \lambda_t + \varepsilon_{it} \quad (3)$$

The main difference from benchmark specification given in (2) is that this one contains new interactions terms aimed to characterize the years of global crisis of 2008-2010. These interaction terms are *INTSFRD2000*, *INTSFRCRIS*, *INTSFRLOWCRIS* and *INTSFRLINCCRIS*. *INTSFRD2000* represents the interaction term, which is the product of *SFR* and the dummy variable taking the value of "1" for the years of 2002-2010 in order to capture the period when global capital flows surge to low saving countries. *INTSFRCRIS* is the product of *SFR* and the dummy variable (*DCRIS*) that takes value of "1" for the years of 2008-2010. Another interaction term, *INTSFRLOWCRIS*, is the product of the dummy variable of *DCRIS* and the interaction term of *INTSFRLOW*. Finally, *INTSFRLINCCRIS* represents the interaction term which is the product of *INTSFRLINC* and the dummy variable of *DCRIS*.

Regression results for the model in equation (3) are given in Table 5. The coefficient of *INTSFRD2000* is estimated to be negative and statistically significant only when *SQSFR* is not used as regressor, implying that the impact of *SFR* on growth seems to weaken during 2000s. This supports the findings that growth rates across country groups classified on the basis of *SFR* converged to advanced countries to some extent in 2000s. Likewise, the coefficient of *INTSFRCRIS* variable which reflect the impact of global crisis is estimated to be negative. This finding may imply that rising *SFRs* through fiscal austerity or tight policies during the global crisis would not be supportive for growth performance. Indeed, many countries have introduced loose fiscal and monetary policy measures to stimulate their domestic demand during that time. The coefficients of *INTSFRLOWCRIS* and *INTSFRLINCCRIS* are estimated to be positive but not significant statistically, implying that raising *SFRs* in either countries with low *SFRs* or developing countries during the recent global crisis had no significant impact on growth performance.[26]

[26] F test in Table 4 and Table 5 reports the test result for the joint significance of *SFR* term and interaction term in the relevant regression. As can be noticed from test results, in all regressions, the joint significance of *SFR* and interaction terms is not rejected.

Table 5. System-GMM Estimations

Dependent variable: Three-year averages of GDP growth rate (%)

	(1)	(2)	(3)	(4)	(5)
$GROWTH_{i,t-1}$	-0.128	-0.175	-0.150	-0.146	-0.137
	(1.07)	(1.56)	(1.27)	(1.21)	(1.16)
$GROWTH_{i,t-2}$	-0.187	-0.228	-0.188	-0.195	-0.201
	(2.92)***	(3.52)***	(2.83)***	(2.77)***	(2.66)**
$PCINCOME_{i,t-1}$	-1.572	-1.542	-1.634	-1.533	-1.929
	(1.17)	(1.12)	(1.21)	(1.08)	(1.36)
SFR_{it}	28.748	8.560	29.469	27.297	28.617
	(3.24)***	(2.94)***	(3.26)***	(3.04)***	(3.33)***
$SQSFR_{it}$	-10.993	-	-10.687	-11.123	-12.063
	(2.15)**		(2.25)**	(2.39)**	(2.79)***
$INTSFRD2000_{it}$	-1.817	-3.225	-	-	-
	(0.48)	(2.03)**			
$INTSFRCRIS_{it}$	-	-	-2.593	-	-
			(1.59)		
INTSFRLOWCRIS	-	-	-	0.475	-
				(0.90)	
INTSFRLINCCRIS	-	-	-	-	0.661
					(0.80)
$POLSTAB_{it}$	0.056	0.052	0.056	0.055	0.059
	(2.67)**	(2.42)**	(2.46)**	(2.50)**	(2.85)***
$TOPEN_{it}$	-0.001	-0.000	-0.001	-0.001	-0.001
	(0.40)	(0.11)	(0.45)	(0.44)	(0.28)
$WORKAGE_{it}$	0.516	0.403	0.487	0.501	0.476
	(2.32)**	(1.80)*	(2.11)**	(2.10)**	(2.02)**
$INVGDP_{it}$	0.159	0.236	0.195	0.176	0.161
	(2.11)**	(3.38)***	(2.70)***	(2.40)**	(2.29)**
$FDIGDP_{it}$	0.024	0.022	0.023	0.027	0.025
	(1.81)*	(2.69)***	(2.61)**	(3.09)***	(2.94)***
$PORTFGDP_{it}$	0.017	0.014	0.013	0.016	0.015
	(2.98)***	(3.16)***	(2.44)**	(2.74)***	(2.70)***
$INFGDP_{it}$	-0.042	-0.056	-0.051	-0.041	-0.045
	(1.11)	(1.45)	(1.30)	(1.07)	(1.18)
$GBALGDP_{it}$	0.211	0.169	0.189	0.200	0.206
	(2.42)**	(2.11)**	(2.31)**	(2.43)**	(2.26)**
$M2GDP_{it}$	-0.006	-0.014	-0.008	-0.008	-0.003
	(0.59)	(1.35)	(0.77)	(0.71)	(0.28)
m_1*(p-value)*	0.006	0.012	0.008	0.006	0.004
m_2*(p-value)*	0.836	0.893	0.707	0.859	0.815
F test	5.37	4.39	5.94	5.12	5.66
F test (Prob > F)	(0.008)	0.0182	(0.005)	(0.009)	(0.006)
Sarqan test	0.054	0.025	0.042	0.046	0.064
Hansen-test	1.000	1.000	1.000	1.000	1.000
No.of instruments	101	101	101	101	101
No. of obs.	129	129	129	129	129

The symbols *, ** and *** indicate statitical significance at 10 percent, 5 percent and 1 percent levels, respectively.

Notes: The dependent and independent variables are non-overlapping 3-year averages of the corresponding annual variables. Heteroscedasticity consistent robust t-statistics are reported in parenthesis. F test results give the joint significance of *SFR* term and the interaction term.

4. Conclusion

Analysis in this study indicate that domestic capital has been predominantly financed by domestic savings in selected countries, even though there has been a significant change in the composition of growth-financing during 2000s. This change manifested itself as a dramatic increase in capital flows from countries with high domestic saving rates to countries with low domestic saving rates. It eased the financial constraints in countries with low saving rates due to increased availability and reduced cost of finance and thus led to further drop in domestic savings (or rise in consumption) and *SFR*. In addition, these developments brought together an increased volatility and dispersion among *SFRs* across countries as well as an "imbalance" issue at the global perspective. As a result, average *SFRs* of countries with already high saving rates increased further, leading to higher average *SFRs* during 2000s than previous decade while those of countries with low saving rate decreased.

Empirical findings put evidence that higher *SFRs* generally support the growth performance in the medium term. This is more pronounced for countries with low *SFRs* and low-middle income countries, which are often financially constrained and far from technological frontier. These findings support the argument of Aghion et.al. (2009) that, a decline in saving-investment gap (or a rise in domestic savings rate) may attract foreign capital into growth-enhancing good projects. In other words, higher domestic savings help to reduce the extent of financial constraints and attract foreign capital with innovative capacity. Being consistent with this argument, growth enhancing impact of *SFRs* has been muted in 2000s when *FDI* flows to countries with low *SFRs* increased substantially.

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Appendix 1. Average *SFRs* for Different Income Group of Countries

High Income Countries				Low-Middle Income Countries			
	1993-2001	2002-2010	1993-2010		1993-2001	2002-2010	1993-2010
Germany	0.97	1.09	1.03	Argentina	0.86	1.00	0.93
United States	0.87	0.82	0.85	Brazil	0.89	0.92	0.91
Australia	0.83	0.83	0.83	Bulgaria	0.89	0.68	0.78
Austria	0.95	1.03	0.99	China	1.03	1.09	1.06
Belgium	1.16	1.18	1.17	Indonesia	0.81	1.08	0.94
Czech Rep.	-	0.86	0.86	Philippines	0.73	0.98	0.86
Denmark	1.04	1.11	1.08	South Africa	1.04	0.89	0.97
Finland	0.98	1.27	1.13	India	0.94	0.99	0.96
France	1.03	1.06	1.04	Colombia	0.81	0.87	0.84
Netherland	1.18	1.24	1.21	Hungary	0.82	0.73	0.77
United Kingdom	0.9	0.89	0.89	Malaysia	0.93	1.40	1.16
Ireland	1.06	0.97	1.01	Mexico	0.89	0.93	0.91
Spain	0.93	0.84	0.88	Peru	0.77	0.90	0.85
Israel	0.89	0.99	0.94	Poland	0.89	0.82	0.85
Sweden	1.03	1.31	1.17	Romania	0.85	0.73	0.79
Italy	1.00	0.98	0.99	Russia	-	1.40	1.40
Iceland	0.93	0.64	0.78	Chile	0.89	0.98	0.94
Japan	1.08	1.12	1.10	Thailand	0.90	1.10	1.00
Canada	0.88	1.05	0.97	Turkey	0.96	0.89	0.92
Korea	1.02	1.08	1.05				
Luxemburg	1.49	1.46	1.48				
Norway	1.12	1.55	1.33				
Portugal	0.89	0.66	0.78				
Singapore	1.34	1.68	1.51				
Slovak Rep.	-	0.77	0.77				
New Zealand	0.84	0.79	0.81				
Greece	0.88	0.68	0.78				

Appendix 2. Definitions and Sources of Variables

Variable Name	*Variable Description*	*Source*
PCINCOME	Log of per capita income (in US dollar)	World Development Indicators (WDI) online database. World Bank
GDPPCGR	Per capita income growth rate (percent)	World Development Indicators (WDI) online database. World Bank
GROWTH	GDP growth rate (percent)	World Development Indicators (WDI) online database. World Bank
SFR	Self-financing ratio	IMF World Economic Outlook Database
SQSFR	Square of self-financing ratio	
POLSTAB	Political Stability	World Bank Worldwide Governance Indicators
TOPEN	Sum of exports and imports (percent of GDP)	World Development Indicators (WDI) online database. World Bank
WORKAGE	The share of working age population in total population (percent)	World Development Indicators (WDI) online database. World Bank
INVGDP	Investment as a percentage of GDP	World Development Indicators (WDI) online database. World Bank
FDIGDP	Foreign direct investment (percent of GDP)	World Development Indicators (WDI) online database. World Bank
PORTFGDP	Portfolio investments (percent of GDP)	World Development Indicators (WDI) online database. World Bank
INFGDP	GDP Deflator (Inflation Rate)	World Development Indicators (WDI) online database. World Bank
GBALGDP	Government Balance (percent of GDP)	Bloomberg
M2GDP	Money supply, M2 (percent of GDP)	World Development Indicators (WDI) online database. World Bank