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SAVING BEHAVIOUR AND GLOBAL IMBALANCES

THE ROLE OF EMERGING MARKET ECONOMIES

by Gianluigi Ferrucci
and Cesar Miralles

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by Gianluigi Ferrucci[2]
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Abstract

In recent years there has been considerable variation in savings patterns across countries and regions, with implications for the configuration of global current account balances, asset valuations and real interest rates. This paper looks at the empirical drivers behind these trends. It uses a reduced-form model that relates private savings to a set of economic fundamentals, while controlling for structural and institutional differences across countries. Addressing a typical shortcoming of the previous literature, estimates are obtained from a dynamic model, which accounts for cross-sectional heterogeneity. The results suggest that saving rates in emerging economies are higher than cross-country estimates based on fundamentals, particularly in Asia. Demographic factors and financial catching-up have been key drivers of the observed changes in savings in these economies. Looking ahead, the prospective population aging is likely to lead to a considerable fall in saving rates in many economies — albeit the process will take decades to unfold. Further progress in financial deepening in developing economies may be conducive to a redistribution of international saving flows and may potentially support a smoother adjustment of global imbalances.

Keywords: Private savings; global imbalances; panel error correction model; pooled mean group estimation; emerging economies.

JEL classification: E20, E60

Non-Technical Summary

Although global private savings have represented a relatively stable share of world GDP at around 20% for the past quarter of a century or so, there has been considerable variation in saving patterns across countries and regions. Why do saving rates differ so widely across countries and over time? What are the major drivers behind the observed changes over the past decades? How much do public policies contribute to these saving disparities across countries compared with other structural and institutional determinants? Answering these questions is important in several respects. For example, it is relevant for the issue of the abundance of global liquidity, with ample savings in Emerging Market Economies (EMEs) possibly contributing to explain some puzzles in asset valuation. Moreover, it is relevant in the context of the debate on the "global savings glut", which is one potential explanation of the widening current account imbalances globally, and may contribute to identify the most appropriate policy response to the unwinding of these imbalances.

This paper attempts to address these issues empirically. It examines the drivers of saving behaviour in a panel of major developed and developing economies. The model equation relates private savings to a set of economic fundamentals, controlling for structural factors and institutional differences among countries. The theoretical underpinning for the selection of the relevant macroeconomic fundamentals is provided by various extended versions of the life-cycle, permanent-income hypothesis originally developed by Modigliani and Brumberg. Unlike most previous studies, which commonly assume homogeneous and static long-run relationships between private savings and the underlying economic fundamentals, the model equation is dynamic and allows separating between short-run adjustment and long-run equilibrium. Moreover, it controls for the possible heterogeneity of saving behaviour across countries. These are important features of the model as it was shown in the literature that neglecting dynamics and heterogeneity may lead to misleading inferences about the key determinants of saving behaviour.

An important finding of this investigation is that for EMEs as a group, the long-run saving trend is well explained by changes in fundamentals as captured by the model. However, within EMEs, private savings are too high in most Asian EMEs, whereas they are below the estimated long-run equilibrium in Latin America. Likewise, in developed economies private savings appear too low. Regarding the causes of the observed variations in saving patterns in recent years, demographic factors and financial catching-up have been key drivers in EMEs. In developed economies, fiscal consolidation effort explained most of the observed fall in private savings relative to GDP.

These findings have important policy implications. Financial catching up and projected population ageing are likely to lead to a decline in saving rates in emerging economies in the years to come, although these effects will be slow and only visible in the long run. In so far as the large external surpluses in some EMEs are symptoms of deeper structural imbalances domestically, in particular a growing gap between savings and investment, a gradual fall in saving rates in the countries involved will contribute to the unwinding of external surpluses and will reduce the risk of a disorderly adjustment of global imbalances.

1 Introduction

Private saving rates have experienced marked divergences across countries and regions in recent years. In the past two decades, savings as a share of GDP have increased significantly in many emerging Asian economies, particularly in China, have fluctuated widely in Latin America and have fallen in many poor African countries. At the same time, savings have fallen relative to GDP in several developed economies, most noticeably in the United States, whereas they have been highly correlated with oil prices in oil exporting countries, as these economies have typically set aside a large share of their windfall oil revenues.

From a policy perspective, these developments raise a number of interesting questions: why do saving rates differ so widely across countries and over time? What are the major drivers behind the observed changes over the past decades? How much do public policies contribute to these saving disparities across countries compared with other structural and institutional determinants? Answering these questions is relevant for the issue of the abundance of global liquidity, with ample savings in Emerging Market Economies (EMEs) possibly contributing to explain some puzzles in asset valuation, in particular low bond yields and low real interest rates. Moreover, understanding saving behaviour is relevant in the context of the debate on the "global savings glut", which is one potential explanation of the widening current account imbalances globally, and may help to identify the most appropriate policy response to the unwinding of these imbalances. In this respect, it has been argued that the emergence of global imbalances is linked to the rise in national savings in many EMEs, particularly in Asia, which resulted in a "savings glut" that has been channelled to the United States to finance its large current account deficit.[1]

This paper attempts to address these issues empirically. It proposes a framework that allows to examine the drivers of saving behaviour in a panel of major developed and developing economies. The empirical analysis uses a reduced form equation, which relates private savings to a set of economic fundamentals, controlling for structural factors and institutional differences among countries. The theoretical underpinning for the selection of the relevant macroeconomic fundamentals is provided by various extended versions of the life-cycle, permanent-income hypothesis originally developed by Modigliani and Brumberg (1954) and Friedman (1957). These models point to a set of variables that are important components of the policy and structural constraints that determine a country's saving choice, although in our empirical investigation we also experiment with several additional determinants that are not explicitly discussed in the more basic versions of the permanent income hypothesis.

[1] See Chapter 2 of the IMF World Economic Outlook, September 2005 and Bernanke (2005).

Previous studies have commonly assumed homogeneous and static long-run relationships between private savings and the underlying economic fundamentals (eg Edwards, 1996; Masson et al, 1998; Dayal-Gulati and Thimann, 1997). By contrast, our model equation is dynamic and allows separating between short-run adjustment and long-run equilibrium. Moreover, it controls for the possible heterogeneity of saving behaviour across countries. These are important features of the model as it was shown in the literature that neglecting dynamics and heterogeneity may lead to misleading inferences about the key determinants of saving behaviour (Haque et al, 1999; Sarantis and Stewart, 2001). The model is estimated using the pooled mean group technique due to Pesaran et al (1999).

We employ the model to address three important issues. First, we aim to provide a benchmark measure of private saving ratios against which actual private savings can be meaningfully compared (*benchmarking*). This exercise may help to assess whether actual savings are consistent with the level implied by the selected fundamentals. Second, we use the model to identify the major drivers of the observed change in savings over the past decades from an ex post perspective (*explaining patterns in savings*). Third, we ask how financial liberalisation and projected changes in demographic trends will impact EMEs' savings in the years to come (*outlook assessment*). Clearly, an important side benefit of this analysis is to improve our understanding of the empirical relationship between macroeconomic fundamentals and the determinants of private saving behaviour across countries.

Data limitations highlighted in the paper mean that the results have to be interpreted with caution. Nevertheless, the model is informative and allows to reach interesting conclusions. One main finding is that the average saving ratio in EMEs is broadly consistent with the estimated benchmark based on the selected fundamentals. However, this apparent consistency at the aggregate level masks significant divergences at the regional level. In particular, savings in emerging Asia are significantly higher than the model's predictions and savings in Latin America somewhat lower. Moreover, the model highlights that favourable demographics have been an important driver of the rise in EME saving ratios in the past decades. Increasing financial depth has put downward pressures on saving ratios in Asia, whereas inflation and fiscal policy have been relatively more important factors in Latin America.

Looking ahead, these findings may have potentially important implications for the size of external balances in the economies concerned, for the distribution of global saving flows and hence for the design of public policies to address global imbalances. As private savings in EMEs have a large life-cycle component, they are likely to fall in the years ahead as population ages. Moreover, as the fall is likely to be relatively more pronounced in the countries that currently display the highest savings, *ceteris paribus*, aging will be conducive to a natural redistribution of global saving flows and potentially might lead to some correction of external imbalances. But public policies may also play a supportive role in this process. Fiscal policy has only a limited impact on aggregate national saving, since our estimates suggest that there is a large offset between public and private savings. However, governments might take action to increase the depth of the domestic financial system, which would help to remove borrowing constraints and improve the ability of households to smooth consumption over time. In this regard, our model suggests that financial underdevelopment has been a key variable explaining the discrepancy in current saving ratios between developed economies and EMEs and that financial catching up has put downward pressure on private savings in many EMEs, especially in Asia. This finding confirms that further progress in financial deepening in EMEs would likely give some positive contribution to the unwinding of external imbalances in these economies, and would support a smoother adjustment of global imbalances.

The paper is structured as follows. The next Section describes the dataset employed in the paper and provides an overview of recent trends in global savings. Section 3 presents the empirical analysis. Section 4 focuses on the main implications. The last Section concludes.

2 Preliminary analysis of savings

Comparative analyses of saving behaviour across countries are typically confronted with severe issues of data limitation, concerning the availability of appropriate measures of savings and their economic determinants, their coverage and quality, and their comparability across countries and over time. This section describes the dataset adopted in the paper, discusses its main limitations, and examines the broad trends observed in saving behaviour globally in the past decades.

2.1 The dataset

This paper uses a panel of private savings measured from national income data, and drawn from the *IMF World Economic Outlook* (WEO) database. This is one of the largest and most up-to-date sources of savings data and related macroeconomic determinants presently available, where additionally differences in data collection methodologies across countries are kept to a minimum. Thus this dataset ensures — in addition to size and timeliness — that savings data are homogenous and that they are measured consistently across countries and over time.

The WEO database contains selected macroeconomic series for a maximum of 218 cross sections over the period 1980-2005, providing in principle a total of 5,450 annual observations. However, this initial set of data was subject to a number of preliminary screenings and consistency checks, which led to the loss of a significant number of observations, but also to important gains in terms of data quality — and hence for the empirical analysis and the reliability of the results.

In order to obtain sufficiently long time series, needed to implement the dynamic panel estimation, we drop all the countries for which savings data are not available throughout the entire sample period (1980-2005). Furthermore, we exclude several countries where we judge that the saving ratios are implausible — eg those consistently saving more than they produce, and those displaying negative saving rates for extended periods of time. These adjustments lead to a final estimation sample consisting of 48 countries — 26 EMEs[2] and 22 High Income Countries (HICs)[3] — and 25 yearly observations from 1980 to 2005, making up a balanced panel of 1,200 observations. Developing countries account for over half of the total number of observations.

The definition of saving and the saving rate employed in the analysis also deserves some comment. Among the savings measures provided in the WEO database, we select gross private saving at current prices in local currency. We obtain the corresponding saving rate by taking the ratio of private savings to GDP, also expressed at current prices and in local currency.[4] Following the standard practice in the most recent literature, we focus on private savings — that is the sum of household and corporate savings, but excluding government savings. The main reason for this choice is that the process of determination of government saving is fundamentally different from the forces driving private saving.[5]

Moreover, the importance of further decomposing private savings into household and corporate saving boils down to whether households, which are the ultimate owners of incorporated businesses, take into account the saving plans of corporations when formulating their own saving and consumption decisions. If this is the case, then as explained by Poterba (1987), households "pierce the corporate veil", aggregate private

[2] Argentina, Brazil, Chile, China, Colombia, Dominican Republic, Ecuador, Egypt, Hong Kong, India, South Korea, Morocco, Mexico, Malaysia, Nigeria, Pakistan, Panama, Peru, Philippines, Singapore, El Salvador, Thailand, Tunisia, Turkey, Venezuela, and South Africa.

[3] Austria, Australia, Belgium, Canada, Denmark, Finnland, France, Germany, Iceland, Ireland, Italy, Japan, Netherland, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and the United States.

[4] For most countries, the WEO provides aggregate national saving and a sectoral breakdown into gross private and government saving. These measures are reported in constant and current prices and in local currency and US dollar.

[5] The literature on public choice highlights that government saving tends to respond to political considerations as much as to economic factors. See Edwards (1996) for a survey.

saving becomes the variable of interest and little information is gained from further breaking down private saving into household and corporate saving. Many studies have documented the existence of a strong negative correlation between household and corporate saving. Although the offset is generally found to be less that one for one, the finding that household saving indeed reacts to corporate saving seems to be sufficiently well documented to allow focusing this study on aggregate private saving.

In addition to the saving ratio, the full dataset includes a number of determinants of saving (whose selection and theoretical underpinnings are discussed in more detail in Section 3.2 below). These are collected from the IMF WEO and the World Bank *World Development Indicators*. Table 1 describes the sources of these variables in more detail. Table 2 provides some standard descriptive statistics for all the series included in the sample.

2.2 Data limitations

Private savings from national income data are defined as the difference between personal disposable income and personal consumption outlays. As such, any measurement problem affecting either income or consumption will carry over into savings. Measurement issues may stem from the impact of inflation on private and public saving. The inflation tax provides a source of additional revenues for the government, but it also reduces the value of private savings in real terms. While this source of measurement error has probably become less relevant as global inflation has fallen in recent years, it may still affect the pre-1990 data.

Movements in asset prices may also affect saving behaviour. Broader measures of savings may be defined as the change in the accumulated stock of net wealth, which would include also accrued and realised capital gains (and losses) due to movements in asset prices. Given the sharp increases in asset valuations, particularly equity and house prices in many developing and developed economies in recent years, the magnitude of these gains represents an important component of wealth accumulation, and hence of private saving behaviour in the economies concerned.

Although there would be some merit in adjusting savings for asset price changes, this study focuses on conventional measures derived from national account data, which do not capture capital gains. The main reason for this is that long enough time series on equity, bond and real estate prices are only available for a limited number of countries. Thus, turning to wealth-based measures of savings would severely constraint the sample size for our study. Moreover, moving to wealth-based measures of savings is not likely to be equally important for all countries. As observed by Broadband et al (2006), valuation changes on financial assets are likely to be more important in countries where wealth is invested in assets such as equities, for which capital gains account for a large share of the overall returns. Similarly, valuation changes on the housing stock are likely to be more relevant in countries where households' home-ownership is widespread and sophisticated financial markets allow owners to borrow against the accrued capital gains from their properties. In these countries, as higher financial and housing wealth translates into higher disposable income, consumption increases and savings fall.

Finally, in the countries that do experience large asset price movements, capital gains can be considered a form of saving only to the extent that they contribute to raise permanent income. This requires identifying the sources of the asset price movement (Broadband et al, 2006; Gale et al, 1999). If the price increase stems from a permanent productivity shock, then the capital gain leads to an increase in permanent income, which in turn affects savings and consumption patterns. By contrast, if the price increase reflects market volatility, current and future saving behaviour should remain unaffected. Unfortunately, there is no easy way to identify in practice the nature of the capital gain. Schultze (1990) argues that most capital gains have little to do with increases in future production and productivity and thus should not be counted as saving. Moreover, given the shallow financial markets in most EMEs, capital gains are likely to be only a relatively minor source of households' wealth accumulation compared to measured savings from national income data, so that any measurement error in private saving through this channel is likely to be small.

Similar arguments might apply to other items entering the definition of savings. For example, human capital shares many of the properties as physical and financial wealth, but this expenditure is currently not treated as saving. Intangible assets do not add to a country's capital stock, although they provide services and income flows that are comparable in many respects to those provided by tangible assets. Similarly, Loayza and Shankar (2000) advocate the use of measures of savings that correct for consumer durables, on the ground that these expenditures are perceived by households as a form of deferred consumption — and hence of saving. Developing empirically comprehensive measures of saving which take into account such factors would clearly be helpful. However, data availability constraints prohibit a full investigation of these issues. We will bear in mind these limitations when interpreting the empirical results.

2.3 Recent trends in global savings

Global private savings have been relatively stable at around 20% of world GDP for the past quarter of a century (Figure 1). However, a broadly stable saving ratio at the aggregate level has masked considerable variations among countries and regions.

In particular, the private sector saving ratio in HICs has trended slightly downwards since the mid-1990s, when measured as a share of the group's GDP (Figure 1). By contrast, the private sector saving ratio in emerging Asia has risen steadily over almost the entire sample period, with the exception of the years in the immediate aftermath of the financial crisis of 1997-98.[6] The ratio in Latin America has been relatively more volatile, fluctuating around an average level of 18% of GDP.[7] In EMEs as a group, saving rates have largely overtaken those in advanced economies.

Within emerging Asia, the increase in savings has been particularly remarkable in China and Singapore, especially since 2000 (Figure 2). In China, private savings now account for more than 40% of GDP. While an increase in savings and a fall in consumption are not uncommon among catching-up economies, China's private saving has been more than sufficient to finance the high and growing level of capital formation that has characterised the country's growth pattern over the past decades. As the saving-investment gap has widened, China's external imbalances have also increased.

Among developed economies, the fall in private savings has been particularly marked in the United States, whereas saving ratios have changed little in countries such as Japan and Germany (Figure 3). Although the dispersion of private saving rates has narrowed somewhat in HICs during the past 25 years, large differences in saving behaviour still remain. In 2005, for example Japan's saving ratio of 25% of GDP was significantly higher than the ratio of 14% in some low-saving economies such as France, the United Kingdom and the United States.

These regional divergences in saving behaviours have been closely matched by diverging patterns of current account balances globally. Across world regions, increases in saving rates have tended to be associated with higher current account surpluses, and vice versa. Clearly, a full understanding of a country's current account position requires a joint analysis of developments in both domestic savings and investment trends, but gross national savings (and within this, private savings) seem to have played a prominent role in explaining the widening external imbalances recently.

Focusing on developments since 1997, the period when substantial global current account imbalances have emerged, Figure 4 shows that the widening current account surplus in EMEs and oil producers has been associated with a sharp increase in national savings, whereas investment has remained broadly flat as a share of GDP. In advanced economies taken as a group, widening current account deficits have also

[6]Emerging Asia includes China, India, Korea, Singapore, Hong Kong, Thailand, Malaysia, Philippines, and Pakistan.

[7]Latin America includes: Argentina, Brasil, Chile, Colombia, Domenican Republic, Ecuador, El Salvador, Mexico, Panama, Peru, and Venezuela.

been associated with sharp changes in savings, but an increase in investment has compounded the external imbalance problem (Figure 5) — although developments in HICs may have been driven to a large extent by developments in the United States.

3 Methodology

The existing literature commonly investigates the determinants of savings by regressing static, linear, long-run equations and assuming homogenous responses across countries to given shocks. The modelling strategy relies on pooled OLS or static fixed-effect estimators, in which a country-specific intercept allows for a limited degree of heterogeneity across countries (eg Raut and Virmani, 1990; Schmidt-Hebbell et al, 1992; Edwards, 1996; Dayal-Gulati and Thimann, 1997; Masson et al, 1998). However, these models give little emphasis to the role of institutional differences among countries and how these affect saving. In particular, while country-specific fixed effects control for structural factors that do not vary over time but are specific to each cross-section, relative changes over time in these factors are ignored.

Clearly, saving is a dynamic process and imposing a static specification is likely to severely constraint the empirical estimations. For example, static models ignore the evidence that habit formation and inertia are key elements of saving and consumption behaviour and that shocks typically affect savings with a delay. In addition, static specifications do not distinguish between short-run adjustment and long-run equilibrium. This is an important distinction because, as noted by Haque et al (1999), homogeneity restrictions are likely to hold, at best, only for long-run parameters, whereas short-run responses are likely to differ across countries. Moreover, while economic theory provides some guidance on long-run parameters, it is typically silent on the nature of the adjustment process in the short run.

More recently, a number of studies have included lags of the dependent variable as an explanatory factor to account for some simple dynamics (eg Loayza et al, 2000). However, lagged values of fundamentals may also have an impact on current saving behaviour — an issue that has received only scant attention so far. More importantly, several studies have shown that neglecting heterogeneity in standard panel techniques may lead to inconsistent estimates and potentially misleading inferences about the estimated coefficients even in the presence of large datasets (eg Pesaran et al, 1999; Haque et al, 1999). This problem becomes more acute in the case of dynamic panels.

A wide range of techniques has been proposed in the literature to deal with dynamic and heterogeneous panel datasets. In our study, we choose the Pooled Mean Group (PMG) estimator proposed by Pesaran et al (1999), which is an intermediate approach to estimate dynamic and heterogeneous panels involving a mix of pooling and averaging. This technique assumes a dynamic error correction equation where the intercept, short-run coefficients, and error variances are allowed to differ across countries, while the long-run elasticities are restricted to be the same.

Common long-run elasticities lead to more stable and economically plausible estimates, while still allowing for full cross-sectional heterogeneity in the short run. In this regard, Baltagi and Griffin (1997) and Boyd and Smith (2000) show that pooled estimators have desirable properties and typically outperform their fully heterogeneous counterparts. For example, pooled models tend to produce more plausible estimates even for panels with relatively long time series and provide overall superior forecast performance. By contrast, heterogeneous estimators are normally unstable and unreliable, but they have the desirable property of allowing for differences among countries. PMG, which assumes long-run commonalities but permits short-term elasticities to vary across groups, combines the benefits of both classes of estimators.

Sarantis and Stewart (2001) and Haque et al (1999) look at the long-run determinants of aggregate private saving using dynamic, heterogeneous panel datasets. However, our estimates extend these studies in several important ways. First, we consider EMEs and HICs, whereas both studies focus on OECD countries only. Second, we extend the time coverage of the panel to 2005 for most countries, whereas in both earlier studies the sample ends in the mid-1990s. Finally, we emphasise the role of institutional factors in determining savings, particularly of financial development.

3.1 Estimation framework

For our empirical investigation, we assume a linear, reduced-form equation, where the saving rate is a function of a number of macroeconomic and institutional factors. However, unlike most previous studies we impose a richer dynamic structure and assume that the saving-to-GDP ratio s_{it} for country $i = 1, 2, ..., N$ at time $t = 1, 2, ..., T$ follows an autoregressive distributed lag (ARDL) model. Assuming for simplicity a fixed and common lag of one for both the dependent and the independent variables, the resulting $ARDL(1, 1, ..., 1)$ specification can be written as:

$$s_{it} = \alpha_i + \lambda_i s_{it-1} + \sum_{j=1}^{J} \beta_{ji} x_{jit} + \sum_{j=1}^{J} \delta_{ji} x_{jit-1} + u_{it} \tag{1}$$

where α_i is a country-specific fixed effect, λ_i, β_{ji}, and δ_{ji}, are the ARDL coefficients to be estimated, x_{jit} are a set of J explanatory factors $\{x_{1it}, x_{2it}, ..., x_{Jit}\}$ deemed to be important determinants of the saving ratio in country i, and u_{it} is the regression residual, assumed to be i.i.d. (both over time and across countries) with zero mean and a constant variance σ_i^2.

Clearly the assumption made in equation (1) of a common T, and a common and fixed lag of one for the dependent variable and the regressors across groups is for notational convenience only, and one can easily generalise the model to the case of an unbalanced panel with $t = 1, 2, ..., T_i$ observations for each country i, where the lag structure is of order greater than one, differs depending on the explanatory factor, and is also country-specific, that is: $ARDL(p_i, q_{i1}, q_{i2}, ..., q_{iJ})$. However, it is interesting to notice that, despite the simplifying assumptions made, equation (1) nests all the models that are typically employed in previous saving studies. For example, assuming $\lambda_i = \delta_{ji} = 0$ and $\beta_{ji} = \beta_i$ yields the static, fixed-effect estimator common to most earlier analysis. Letting $\lambda_i = \lambda$, $\delta_{ji} = 0$ and $\beta_{ji} = \beta_i$ yields the auto-regressive model used for example in Loayza et al (2000).

Equation (1) can be easily rearranged, re-parameterised and expressed in error correction form:

$$\Delta s_{it} = \phi_i \left\{ s_{it-1} - \eta_i + \sum_{j=1}^{J} \theta_{ji} x_{jit} \right\} + \sum_{j=1}^{J} \delta_{ji} \Delta x_{jit} + u_{it} \tag{2}$$

where we have defined:

$$\phi_i \equiv -(1 - \lambda_i)\,;\ \eta_i \equiv \left(\frac{\alpha_i}{1 - \lambda_i} \right); \text{ and } \theta_{ji} \equiv \left(\frac{\beta_{ji} + \delta_{ji}}{1 - \lambda_i} \right).$$

The term in $\{\cdot\}$ in equation (2) is the long-run relationship and θ_{ji} are the long-run elasticities. The error correction coefficient ϕ_i, the fixed effect η_i, and the short-term elasticities δ_{ji} are unrestricted and allowed to vary by country. The assumption of long-run commonalities in the equilibrium relationship (pooled model) requires the further assumption that long-run slope coefficients are constant for all cross-sections ($\theta_{ji} = \theta_i$ for all i). Thus the estimating model becomes:

$$\Delta s_{it} = \phi_i \left\{ s_{it-1} - \eta_i + \sum_{j=1}^{J} \theta_i x_{jit} \right\} + \sum_{j=1}^{J} \delta_{ji} \Delta x_{jit} + u_{it} \tag{3}$$

3.2 Saving determinants

The selection of the saving determinants to be included in equation (3) is underpinned by the theoretical and empirical literature on savings. The model includes factors grouped in the following four categories: demographics, fiscal policy, macro environment, and institutional factors.

The age structure of the population is expected to affect the savings ratio within a society. Modigliani's life-cycle hypothesis (Modigliani, 1966; Modigliani and Ando, 1963) suggests that individuals save for retirement when they are in working age and dis-save when they are old. Thus, younger societies are likely to display higher savings than older ones. We test for demographics by incorporating the dependency ratio, defined as the ratio of dependants – people younger than 15 and older than 64 years – to the working-age population.

Fiscal policy may also influence private agents' saving decisions. For instance, the Ricardian equivalence suggests a trade-off between private and public savings, so that an increase in government spending financed through debt creation (ie a fall in public savings) is offset, in full or in part, by an increase in current private savings, as consumption-smoothing agents anticipate the future tax increases required to pay back the additional public debt. Moreover, Masson et al (1998) suggest that the offset between public and private savings may depend on whether the higher public deficit is driven by lower taxes or higher government spending. An increase in government spending may crowd out resources available to the private sector, and hence have a negative effect on private savings, regardless of whether it affects the fiscal balance. Furthermore, the level of government consumption may also be important when assessing the impact of public saving on private saving. The under-provision of public services in the areas of pension, education and health care may increase uncertainty, thereby fostering precautionary savings, particularly in EMEs. We include as explanatory variables the government's budget balance and the amount of public spending, both as a share of GDP.

The country's macro environment, as summarised by income growth, changes in the terms of trade, and inflation, is also expected to affect private agents' decision to save. Under the permanent income hypothesis, a transitory, positive income shock leads to an increase in savings as agents smooth consumption over time. Instead, a permanent income shock has ambiguous effects on savings. Higher permanent income with unchanged individual saving rates by age groups raises aggregate savings because it increases the aggregate income of the working population relative to pensioners and those not earning labour incomes. However, in the context of the life-cycle hypothesis, Tobin (1967) points out that unchanged individual savings rates by age group require myopic expectations of future income. If workers correctly expect that their income will grow in the future, they would also want to anticipate part of the future income increases and consume more today. In this case, saving rates for working individuals could fall by a sufficient amount to offset the aggregate effect of higher growth. Thus, whether the overall correlation between income growth and saving rate is positive or negative is a question that needs to be addressed empirically, although most studies do seem to find a positive correlation.

Turning to the link between savings and the terms of trade (the Harberger-

Laursen-Metzler effect), it has been argued that an improvement in a country's terms of trade increases real income, measured as the purchasing power of its exports in world markets, therefore affecting private savings in the same way as income growth (Ostry and Reinhart, 1991). Thus, the effects of a terms of trade shock on savings is ambiguous, for the same reasons as income shocks have ambiguous effects on savings.

As pointed out in Masson et al (1998), the impact of higher inflation on savings is also somewhat unclear. Inflation erodes the real value of the savings stock. This reduces current savings as the future value of the saving stock becomes uncertain. However, inflation also leads to higher nominal interest rates, and hence higher measured household income and saving. Moreover, saving choices depend on macroeconomic policy discipline, and inflation can be regarded as a proxy for the quality of economic and monetary management (eg because high inflation may reflect accommodation of fiscal imbalances). In this respect, high inflation is typically indicative of macroeconomic volatility, leading to high precautionary savings. The empirical literature tends to find a null impact of inflation on savings (Loayza et al, 2000).

Finally, financial development may be a "double-edged sword" with regards to savings (Dayal-Gulati and Thimann, 1997). On the one hand, it removes borrowing constraints, thereby increasing current consumption and reducing saving. On the other hand, it increases the availability of saving instruments and likely also their expected returns. The rise in expected returns has two opposite effects on savings: a positive intertemporal substitution effect, which leads to an increase in savings due to the fact that current consumption becomes relatively more costly than future consumption; and a negative income effect, which leads to a reduction in savings due to the fact that, as expected consumption increases, current consumption also needs to increase to keep marginal utility constant over time. The ambiguous impact of financial development on savings may be linked to the presence of threshold effects, such that in the early stages of development the negative effect from the removal of borrowing constraints dominates the effect on expected returns and savings fall, whereas in more advanced stages of financial development, the effect on returns dominates and the sign of the correlation becomes uncertain. For lack of better data, we measure financial development with the ratio of credit to the private sector as a share of GDP, admittedly a crude proxy for the level of development of a country's financial system. In addition, we also proxy financial development through an index of the degree of capital account openness developed by Chinn and Ito (2005), and through the ratio of stock market capitalisation to GDP.

Because of data limitations, it is not possible to control explicitly for the evolution of disposable income, the social safety net and the quality of infrastructure. Lack of data on disposable income is unfortunate, as this is an important driver of savings. We use GDP growth as a proxy for income growth. Moreover, though public consumption may be seen as a proxy for the generosity of social safety nets, changes in public consumption are likely dominated by fiscal consolidation effects and therefore provide only a weak proxy for the generosity of social safety nets. Also, public consumption may be in part a substitute for private consumption, while social safety nets can be thought of as complementary. Finally, though the list of controls omits a measure of the quality of the capital stock, the regressions include country-specific fixed effects. As it is likely that the quality of the capital stock does not change rapidly over time, the country dummies will control for this factor at least in part.

3.3 Empirical results

We estimate equation (3) using the maximum likelihood estimator and compute the elasticities using the Newton-Raphson algorithm, which employs both the first and the second derivatives of the likelihood function. These maximum likelihood estimators are referred to as PMG, to highlight both the pooling implied by the homogeneity restriction on the long-run coefficients, and the averaging across countries used to obtain means of the estimated error-correction coefficients and other short-run parameters. Existence of the long-run relationship requires the error correction coefficient ϕ_i to be different from zero.

The model allows to try a variety of lag specifications. In general, we obtain most estimates from restricted ARDL models, imposing a common and fixed lag of one for all cross-sections. But we also test more complex lag structures adopting a selection criterion through a two-step approach, as suggested by Pesaran et al (1999). This method involves stacking equation (3) by cross section and running unrestricted ARDL with common lag structures for each country separately (we try maximum common lags of one and two). These estimates are then used to choose the appropriate lag order for each variable, using the Schwartz-Bayesian Criterion (SBC) subject to a pre-specified maximum lag. Then, using these SBC-determined lag orders, we impose homogeneity and compute the maximum likelihood estimators of the long-run coefficients.

The model is separately estimated for the two sub-samples of EMEs and HICs. To choose our preferred model, we try a number of alternative specifications and select the model that best fits the data using a general-to-specific approach. But because we have to take into account the limited degrees of freedom and the high number of estimation parameters implied by the PMG technique, we only test parsimonious models. Imposing homogeneity of the long-run parameters, Table 3 reports the coefficient estimates of our preferred models for EMEs and HICs. In all cases, the dependent variable is gross private saving as a share of GDP. The results appear satisfactory both from the viewpoint of the explanatory power of the regressions, and from the viewpoint of the sign and level of significance of the coefficients. In particular, all regression coefficients are statistically significant at conventional significance levels and are broadly signed according to expectations. They are also robust across a wide spectrum of model specifications.[8] The results suggest that in the long run private savings relate to fundamentals in the expected way.

Population aging tends to lower private savings over time quite significantly, in EMEs by around half a percentage point (pp) of GDP for each percentage point increase in the dependency ratio. The impact is smaller in HICs (0.2 pp of GDP). This result is in line with the prediction from the life-cycle hypothesis and suggests that population aging may have profound effects on saving ratios going forward. The result is also consistent — at least with respect to the sign — with earlier estimates reported in the literature, obtained using different samples and estimation techniques (eg Edwards, 1996 and Masson et al, 1998).

An increase in government borrowing is associated with an increase in private savings in the long run. A one pp increase in the fiscal deficit to GDP ratio in EMEs leads to a 0.3 pp of GDP increase in private savings in the long run. In HICs the impact is larger, lowering private savings by 0.9 pp of GDP. Interestingly, as in absolute value these elasticities are significantly lower than one, full Ricardian equivalence is rejected in both EMEs and HICs. This implies that fiscal consolidation leads to an overall increase in national saving, as higher public saving is not fully offset by lower private saving. This result is consistent with earlier findings (eg the elasticities reported in Haque et al (1999) using a dynamic model specification).

Government consumption is found to be negatively correlated with private savings in the long run. The coefficient estimates imply that a one pp of GDP increase in public consumption reduces private savings in the long run by around 0.6 pp of GDP in both EMEs and HICs. Taking government consumption as a proxy for the quality and coverage of a country's social security system, this result suggests that, by providing better social safety nets, governments can reduce the need for precautionary savings and crowd in private consumption. A similar elasticity is also reported by Edwards (1996), which however uses a different proxy for social security expenditure.

Higher GDP growth tends to increase private savings in the long run, in line with the predictions of the life-cycle hypothesis. In other words, private agents tend to save

[8] For example, we estimate models including GDP per capita, the real interest rates, and trade openness (not reported in Table 3).

part of a growth spurt, in order to smooth consumption over time.[9] The coefficient estimates suggest that a one pp increase in GDP growth would increase savings by around 0.2 pp of GDP in the long run in both EMEs and HICs. Note that in our empirical framework, GDP growth is a proxy for disposable income. In so far as institutional factors create a wedge between the two variables, the interpretation of this coefficient in the context of the life-cycle hypothesis has to be taken with some caution, a point on which we will return later.

Inflation is positively correlated with private savings: a 1% rise in inflation leads to a rise in savings by 0.05 pp of GDP in EMEs and 0.21 pp of GDP in HICs in the long run. This suggests that increased macro uncertainty (regarding for instance future income and macro policies) induces agents to save a larger fraction of their incomes for precautionary motives. Higher inflation would also reduce the real value of the savings stock, and through this channel would induce agents with desired wealth targets to increase their saving. As noted in the previous section, the empirical literature tends to find a null impact of inflation on savings.

Positive terms of trade shocks tend to increase savings, which can again be explained by households smoothing consumption in the face of transitory shocks. The point estimates suggest that a 10% increase in the terms of trade reduces consumption by close to 1.6 pp and 1.8 pp of GDP in EMEs and HICs, respectively. This result provides support for the Harberger-Laursen-Metzler effect, so that transitory improvements in the terms of trade may increase a country's real income, measured as the purchasing power of its exports in world markets, therefore affecting private savings in the same way as income growth (Ostry and Reinhart, 1991).

Financial development, as measured by the share of private sector credit in GDP, exerts the anticipated negative effect on savings in EMEs, whereas it increases savings in HICs, suggesting the presence of threshold effects and non-linearities in the relationship between financial development and savings. In our estimates, a 10% increase in the ratio of credit to GDP reduces savings by 0.4 pp of GDP in EMEs, and it raises savings by 0.1 pp of GDP in HICs. The negative coefficient in EMEs is likely to reflect the fact that households face borrowing constraints that are normally relaxed by the process of deregulation and innovation in financial markets. In HICs on the other hand, financial development may be associated with more efficient capital markets leading to higher expected returns and hence higher savings.

Together with private sector credit, we try also two further indicators of financial development. The first is stock market capitalisation as a share of GDP, which was found to be uncorrelated with private savings. This may be due to the fact that

[9] Carroll and Weil (1993) and Carroll et al (2000) discuss the link between growth and saving.

stock markets are still relatively underdeveloped in EMEs. The second indicator is the Chinn-Ito index of capital account openness, which was found to have a negative impact on savings in EMEs, suggesting that capital account liberalisation facilitates cross-border investment and trade, thereby increasing EME access to global savings and facilitating external borrowing.

One important advantage of our estimation methodology is that, for a given shock, it allows to distinguish between the short-run impact on savings (which is country specific) and the impact on the long-run equilibrium (which is restricted to be the same for all countries). For space reasons, we do not report the full estimates of these country-specific coefficients.[10] However, in Table 3 we report two of these elasticities, calculated as averages across countries. One is the error correction coefficient, which is statistically significant in all regressions, negative and smaller than one, implying that saving rates tend to return back to equilibrium following a shock. The average value of this coefficient (the mean estimator) is –0.62 in Model 1, implying that around 62% of the gap between the equilibrium and the observed level of saving ratio is closed in each period, or that the half-life of the gap – the time required for the gap to halve – is less than a year. The second elasticity is the intercept, which controls for structural factors that vary across countries but not over time. The inclusion of country-specific fixed effects in the model is important because it allows to capture cross-sectional differences in saving behaviour related to institutional factors, agents' preferences, and cultural differences affecting the degree of impatience of society. Although these factors are generally thought to be important determinants of savings, they change only very slowly over time and thus cannot be included explicitly as explanatory variables, as they are correlated with the intercept and would lead to multicollinearity.[11]

3.4 Diagnostics

To test the goodness of fit of the model, Figure 6 reports the actual private saving ratio in China, together with the fitted values generated by the full model (which includes both the long-run and the short-run coefficients) and the fitted values based

[10] These estimates are available upon request from the authors.

[11] A simple regression exercise shows that the country-specific intercepts are highly correlated with institutional differences across countries. In particular, we regress the cross-country fixed effects on a series of institutional factors and find that the models are overall highly significant and have relatively high fit. The institutional factors included are the followings: poverty measures (headcount and poverty gaps); income distribution measures (as summarised by the Gini coefficient and the country's income shares by quintiles); safety nets (unemployment benefits); indices of the rule of law and corruption; measures of risk and uncertainty (political, economic, and financial); measures of financial liberalization, as summarised by the indices proposed by Kaminsky and Schmuckler (2003), and Abiad and Mody (2005). These estimates are available from the authors upon request.

on the long-run equation. It shows that the full model replicates the actual data fairly closely and that Chinese savings have been consistently above their estimated long-run equilibrium in recent years. Given the structure of the model and the relatively low persistence coefficient, this wedge stems from a succession of short-term shocks all pulling savings in the same direction.

PMG imposes homogeneity of the long-run slope coefficients, but this is a hypothesis that can be tested using a standard likelihood ratio test, since this estimator is a restricted version of the set of individual group estimates. Though it is common practice to use pooled estimators without testing the implied restrictions, in cross-country studies the likelihood ratio test normally rejects equality of error variances and slope coefficients at conventional significance levels. This is the case also in our models. A common explanation for this features is that the group-specific estimates may be biased because of omitted variables or measurement errors that are correlated with the regressors. If the bias is non-systematic and averages to zero over groups, pooled estimation would still be appropriate despite the homogeneity assumption being rejected. Unfortunately there is no obvious way to determine from the data whether this is the case (Pesaran et al, 1999).

As we have discussed earlier, the lag structure that best fits the data is first chosen testing a number of unrestricted ARDL models, that is, models where the long-run coefficients are not required to be the same across countries. To shed more light on the quality of the estimation output and how it differs from estimates obtained using alternative econometric techniques, Table 4 reports the estimates for these group-specific, unrestricted models. The cross-sectional averages of these coefficients and the associated significance levels are also included at the bottom of the table. These are the mean group estimates (MGE) and they are contrasted with the coefficients obtained using PMG.

The long-run country-specific slope coefficients are more dispersed than the restricted estimates reported in Table 4. For example, the individual estimates of the dependency ratio vary from -5.2 in Brazil which however is not statistically significant at conventional significance levels to +11.8 in Philippines, which compare oddly with a long-run estimate of 0.5 pp of GDP in the restricted PMG model. Reflecting the broad dispersion of individual estimates, the MGE coefficients have large standard deviations and hence are mostly not significant, with the only exception of inflation. Additionally, individual estimates are also mostly insignificant – only 82 of the 182 coefficients reported in the table are statistically different from zero. Boyd and Smith (2000) consider a number of explanations for this wide dispersion of cross-country estimates. They suggest that it may be the product of poor data – and indeed data limitations were highlighted in previous sections. Alternatively, it may stem from simultaneity biases, resulting from one or more endogenous determinants. Or it may be the result of spurious regressions: the variables are not cointegrated and the error term is I(1). Thus the coefficient estimates converge to non-degenerate random variables, accounting for the dispersion. However, although we do not test formally for cointegration in equation (3), we test the presence of a unit root in the residuals of the PMG estimators and we find that these are stationary. Table 5 presents the results from running the t-test for unit roots in heterogeneous panels with cross-section dependence, proposed by Pesaran (2003).[12]

Clearly, it is possible that countries are really different in the sense that private savings respond differently to a given change in fundamentals across countries. However, while this may be true in the case under consideration, it cannot explain the size of the measured differences, which are so large as to be implausible. As we have mentioned before, a more plausible explanation may be that country-specific shocks and measurement errors associated with unobservable variables act like omitted variables correlated with the regressors. If these are structural factors, operating in all time periods and countries, they would cause a systematic bias in the average estimate of the long-run parameters. But if they are not structural, but just happen to be correlated in a particular sample, they would average to zero and would cancel out across countries or over time. Such correlated shocks would cause structural instability (because the biases are not constant overt time), heterogeneity (because the biases are not constant over countries) and forecasting failure. If we estimate an equation for each individual group we might experiment with different specifications until plausible estimates are obtained. But in models with large groups this in not possible and a statistical solution is robust estimators which reduce the effect of outliers. A simple version of this involves using pooled estimators.

To summarise, the restricted models provide overall good results in terms of sign and level of significance of coefficients, and in terms of explanatory power of the regressions, though because some variables may be missing the goodness of fit measures presented are probably lower bounds. Additionally, the specification tests suggest that the choice of a pooled model is probably more appropriate than mean group or other common unrestricted estimators. But the diagnostic statistics also suggest that there is a systematic pattern of the cross-sectional error terms, which we take as evidence of potential measurement errors in the data and/or omitted variables. Measurement errors are a common problem when dealing with data from national accounts, especially from EMEs. Moreover, our proxies have some limitations. For instance, we were un-

[12] The null hypothesis is that all series are non-stationary. At standard significant levels, we reject the null hypothesis of nonstationarity.

able to collect yearly data on house prices or disaggregate data on public expenditure in education and health care in EMEs. We also find a high degree of heterogeneity, suggesting that by pooling long-run coefficients we are imposing restrictions that are not followed by the data.

4 Implications

Section 2.3 points out that private saving rates are widely dispersed internationally and that they have changed significantly over the past 25 years. It also suggests that the wide dispersion of private saving behaviour across countries and regions may be one important factor behind the prevailing configuration of global current account balances, and may help to explain a few puzzles in asset valuation, as well as the relatively low level of real interest rates. In this Section we attempt to explain these stylised facts using the saving equation presented above. We ask: Does the model account for the wide dispersion of actual private saving rates across countries? Does it explain the observed changes in private savings over the past decades and what have been the main drivers of these changes? Looking ahead, how will global saving patterns evolve in the coming decades, given the projected demographic changes and the expected progress in financial liberalisation in many EMEs?

Answering these questions may potentially provide some useful insight for policy making. However, a number of caveats have to be emphasised. A preliminary consideration is that any analysis of saving is affected by concerns regarding data quality. In this regard, a number of issues have been mentioned in the previous sections. Other empirical issues such as the lack of appropriate controls for disposable income, the quality of public spending and of the capital stock may also affect the empirical results. Moreover, a further issue is that in this framework each variable is considered separately and not as part of an integrated economic model. Thus, complex interactions among the variables are not properly accounted for. For example, while the model provides an estimate of the first-round effect of, say, an increase in the dependency ratio on saving, it does not capture the second-round effect through the impact on other explanatory factors, such as growth, fiscal spending and so on, which are kept constant.

4.1 Benchmarking saving ratios

The first experiment assesses whether actual private savings are consistent with the predictions generated by the model on the basis of the selected set of fundamentals. To do this, we measure the deviation between the actual private saving ratio and the estimated long-run equilibrium provided by the model. A positive deviation indicates that the observed ratio is higher than the model's prediction – ie that the country saves more than what a cross-country comparison based on fundamentals would suggest. Figures 7 and 8 show the deviation by country, where both the actual saving ratio and the long-run equilibrium correspond to the average for the period 2000-2005. In addition, Figure 9 reports the same statistic, but with countries grouped by regions.

This comparison shows that for EMEs as a whole, the deviation of the actual private saving rate from its predicted long-run value has been minor in recent years and that the long-run level of the saving ratio can be well explained by the model. However, within EMEs, the ratio is too high in most Asian economies, whereas it is below the estimated long-run equilibrium in most Latin American countries. Regarding the HICs, we find that in most countries (15 out of 22 in the sample) private savings appear to be too low.[13]

Linking these results to global imbalances and the "savings glut" debate, this exercise provides some evidence in support of the view that (gross) private savings are indeed "excessive" in emerging Asia, particularly in China, and correspondingly that there is a shortage of saving in the United States. In particular, according to the model, China's current private saving ratio (of around 40% of GDP) is more than 10 pp of GDP higher than would typically be observed in a developing economy with comparable macroeconomic features. Conversely private savings in the United States are around 9 pp of GDP lower than in comparable HICs.

The omission of disposable income from the regression means that any deviation between actual and predicted savings could reflect the compression over time in disposable income. This factor is especially important for the results for China, where disposable income has fallen sharply relative to GDP in recent years. Thus, the model estimate of the fitted saving ratio in China should be seen as an upper bound estimate, and the actual deviation from equilibrium may be even higher than the estimate of 10 pp of GDP reported in Figure 7.

[13] The occurrence of large deviations raises a general issue of interpretation: what do we make of savings that are very different from those predicted by the model? Clearly, one possibility is that agents may be savings too much or too little, but equally plausibly saving behaviour might be appropriate, given the prevailing fundamentals, and agents might have more information than the model. Unfortunately, there is no obvious way to address this problem. However, what we can say is that other qualitative evidence, as well as part of the previous literature, also points to high saving in Asian EMEs and low saving in some developed economies, thereby indirectly supporting the conclusions of the model.

4.2 Explaining patterns in savings

In the second exercise, we apply the model to identify the drivers of the observed changes in private saving rates over the past 25 years. Figures 10 and 11 show for each country the cumulative change in the actual private saving rate between 1980 and 2005 (represented by a black dot), together with the estimated contribution of each explanatory factor to the overall change, as measured by the long-run elasticities of the model. As before, Figure 12 groups individual countries by regions.

Focusing on the regional groupings, Figure 12 shows that private savings in emerging Asia rose by slightly more than 8 pp of GDP between 1980 and 2005.[14] Based on developments in the underlying fundamentals, the model would have predicted half of the observed increase. Favourable demographics – in particular the fall in the dependency ratio from 67% of the total workforce to 50% over the period – accounted alone for around three-quarters of the rise. The reduction in government consumption by 2 pp of the group's GDP over the period accounted for a further 8% of the rise. Partly offsetting these positive contributions from demographic factors and government spending, a gradual improvement in the level of development of the financial system put significant downward pressure on private savings in emerging Asia.

By contrast, private savings in HICs fell on average by 2 pp of GDP during the period, broadly in line with the model's prediction. This fall was mainly explained by fiscal consolidation effort, with the contributions from inflation stabilisation and financial deepening largely offsetting each other.

Looking at the drivers of the changes in savings in individual EMEs, Figure 10 shows that the experience was rather mixed over the period. Nevertheless, some common patterns can be identified within regions. In particular, demographic factors (represented by yellow bars in Figure 10) were a major contributor to the changes in private saving rates in all EMEs — reflecting a general fall in dependency ratios in the period, which was quite substantial in some economies (eg by 22 pp in China), and given the estimated negative coefficient of this factor in the model.

Increases in government spending (as a share of GDP) contributed to putting significant downward pressure on private saving in several countries in Latin America, as shown by the large negative green bars in Figure 10, whereas the contribution in Asian EMEs was relatively muted. At the same time, inflation stabilisation put downward pressure on saving rates in Latin American countries (pink bars in Figure 10), whereas the contribution in emerging Asia was minor. In HICs, fiscal consolidation was the single most important contributing factor to the change in private saving

[14] The increase is calculated comparing the average saving ratio between 1980-1985 and the average between 2000-2005.

across the board, as shown by the large negative red bars in Figure 11.

Finally, financial development mattered proportionally more in emerging Asian countries (blue bars in Figure 10) and its contribution was mainly negative, reflecting an increase in the level of development of the financial system over the period and a negative estimated long-run coefficient. In HICs, where the estimated long-run coefficient is positive, increases in credit-to-GDP ratios generally exerted (a small) upward pressure on private saving over the period.

4.3 Long-term outlook

As a final experiment, we apply the model to assess how global private saving rates are likely to react in the years to come in response to two widely anticipated structural shocks: population aging and financial catching-up in EMEs. Rather than focusing on particular point estimates, the aim of this exercise is to compare broad trends across regions and to gauge whether saving ratios are likely to become more or less dispersed globally as a result of these changes. This approach is warranted in view of the largely idiosyncratic nature of the expected shocks, and the estimated heterogeneous responses to these shocks across countries.

To assess the impact of population aging, we construct the out-of-sample forecasts of the long-run private saving ratio for each country, assuming that the dependency ratio follows the projections produced by the United Nations (UN) for the period 2006-2050.[15] Figure 13 shows these UN projections for HICs and EMEs, where the groupings represent weighted averages of individual countries' forecasts, using GDP weights. Furthermore, we assume that the macroeconomic determinants on the righ-hand side of the model equation are exogenous and equal to their values in 2005 — admittedly a very benign year for growth and inflation in the global economy.[16] We also assume that the lagged dependent variable is backfilled recursively using the forecast value of the private saving ratio in the previous period (dynamic forecast).

The results are depicted in Figure 14 and suggest that, *ceteris paribus*, EME saving rates are likely to continue to increase in the next two decades as demographic trends continue to be favourable, and will fall quite significantly thereafter as population starts to age. Within EMEs, the saving ratio in emerging Asia is projected to peak in around 2020, before starting to fall to below its current levels by 2050. In Latin America, by contrast, the saving ratio is projected to increase over the whole simulation horizon, as a result of more favourable demographic dynamics. Interestingly, in HICs the simulations indicate that the impact of demographic change is likely to

[15] See United Nations, World Population Prospects: The 2004 Revision Population Database.

[16] In addition, we assume no trend change in the terms of trade.

be significantly smaller than in EMEs — despite comparatively worse demographic projections over the horizon; see Figure 13 — as the estimated life-cycle component of the saving ratio in the former group is typically smaller than in the latter.

Overall, as private savings in EMEs have a large life-cycle component, they are likely to fall in the years ahead as population ages, albeit with some significant differences across regions. The fall is likely to be relatively more pronounced in the countries that currently have the highest savings — and the largest external imbalances. But these effects will be slow and only visible in several decades. Indeed, in the next 15 years or so, demographic trends might even lead to more dispersed saving patterns across regions.

The findings on financial development also deserve mentioning. Increasing the depth of the domestic financial system helps to remove borrowing constraints and improves the ability of households to smooth consumption over time. In this regard, the model suggests that financial catching-up may put significant downward pressure on private savings in EMEs. For example, if bank credit to the private sector in these economies doubled from the average rate of 60% of GDP currently to 120%, in line with the average among HICs, the long-run private saving ratio would fall by 2.5 pp of GDP, provided everything else remained unchanged. Intuitively, the impact might be larger if reforms to remove borrowing constraints in the banking system are accompanied by reforms to develop capital markets more broadly. These findings confirm that further progress in financial deepening in EMEs may be conducive to a redistribution of global saving flows, which may help to narrow the discrepancy in current saving ratios between developed economies and EMEs.

5 Concluding remarks

Using an econometric framework that allows to take into account cross-country heterogeneity and dynamics in saving behaviour, this paper finds evidence that private saving ratios in emerging markets are too high compared with cross-country estimates based on fundamentals, especially in emerging Asia, whereas private savings in Latin America appear to be too low. Private savings also appear to be low in a number of HICs. Regarding the causes of the observed variations in saving patterns in recent years, our empirical investigation suggests that demographic factors and financial catching-up have been important determinants. To a lesser extent, inflation stabilisation and a small fall in fiscal spending (relative to GDP) also contributed to the change in private saving rates in some countries, especially in Latin America.

These findings have important policy implications. In particular, financial catching-up and projected population ageing are likely to lead to a decline in saving rates in emerging economies and to a redistribution of global saving flows in the decades to come — albeit these effects will be slow and only visible in the long run. Fiscal policy may have only limited effectiveness on aggregate savings, since the model finds that any fall in public savings is partially offset by an increase in private savings. In so far as the large external surpluses in some EMEs are symptoms of deeper structural imbalances domestically, in particular a growing gap between savings and investment, a gradual fall in saving rates in the countries involved may contribute to the unwinding of global imbalances and may reduce the risk of a disorderly adjustment.

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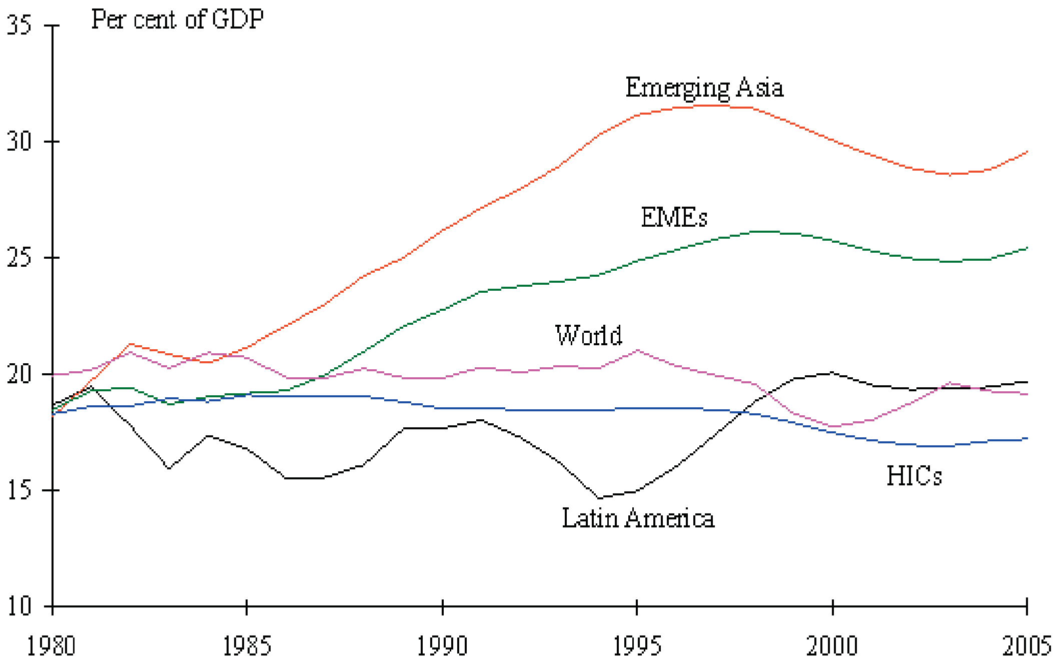
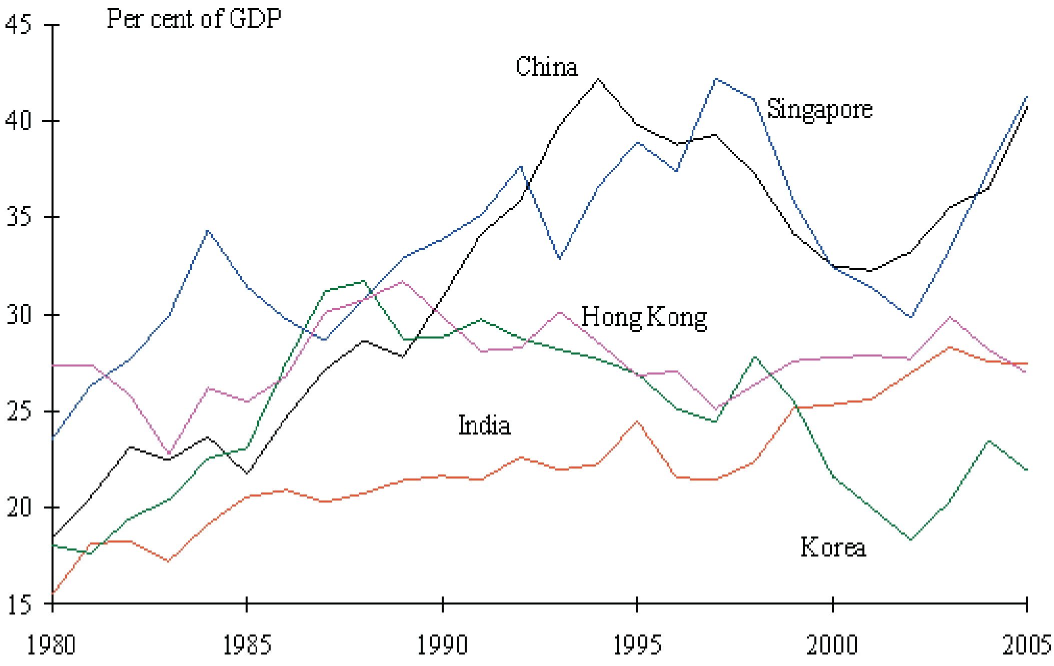
Figure 1 — Global private saving ratios



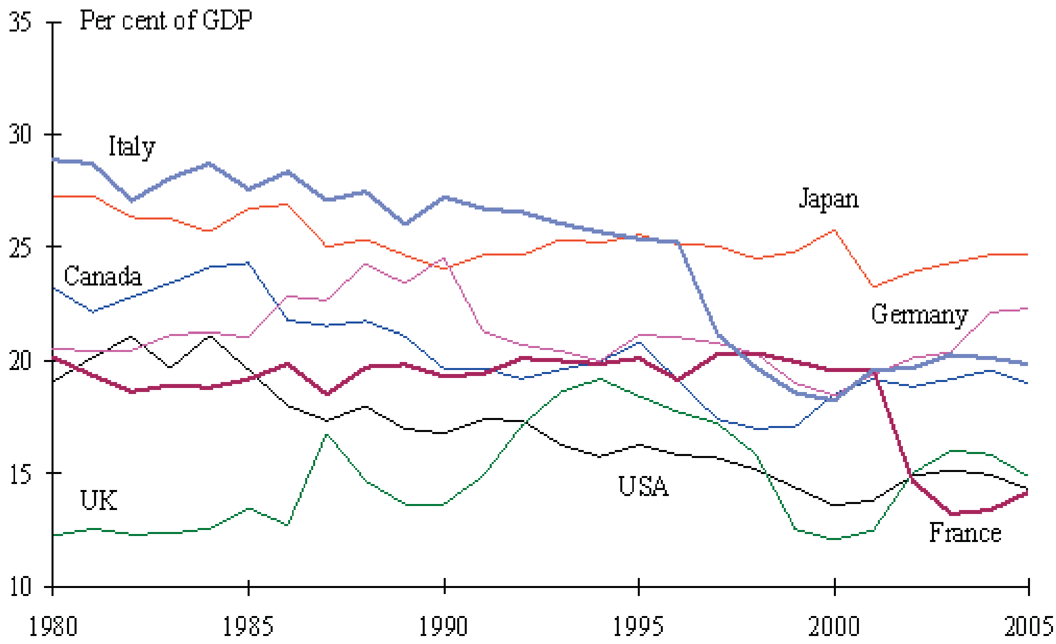
Source: IMF WEO.

Figure 2 — Private saving ratios in selected emerging Asian economies



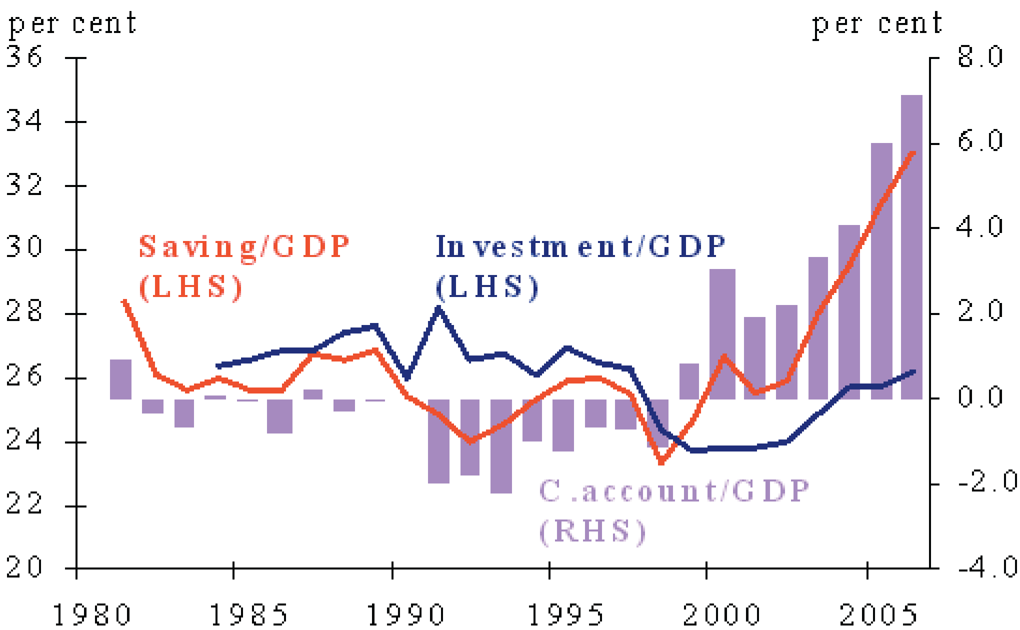
Source: IMF WEO.

Figure 3 — Private saving ratios in G7 economies



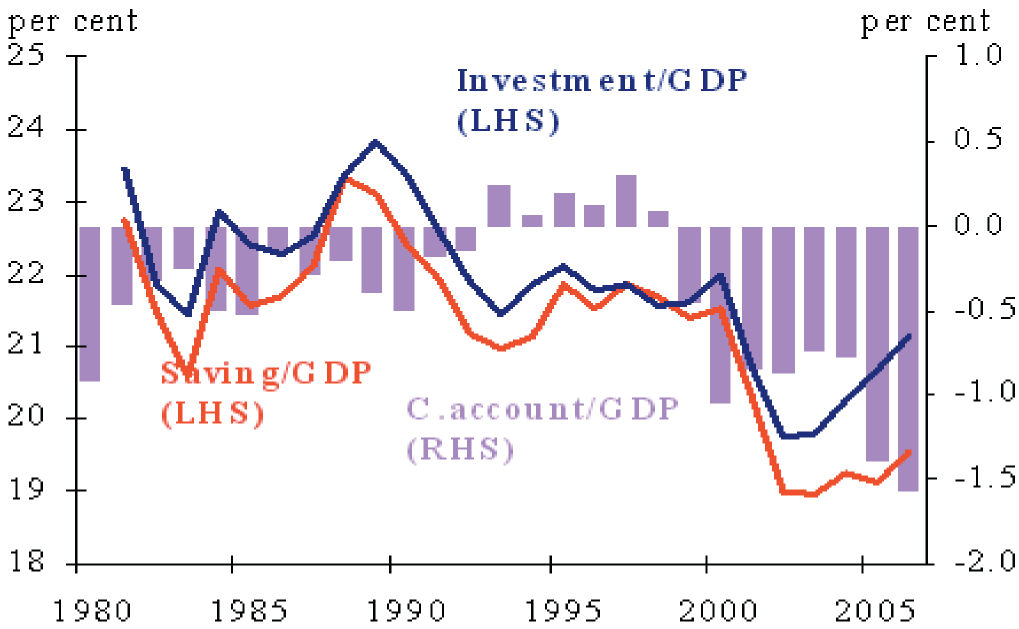
Source: IMF WEO.

Figure 4 — Saving, investment and current account: EMEs and oil producers



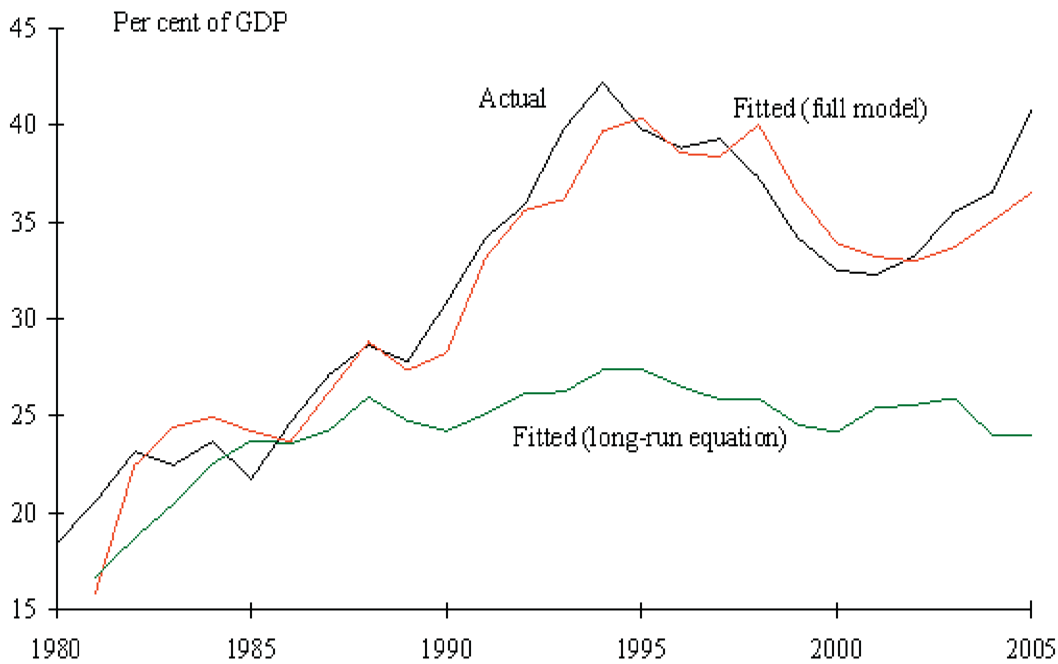
Source: IMF WEO.

Figure 5 — Saving, investment and current account: advanced economies



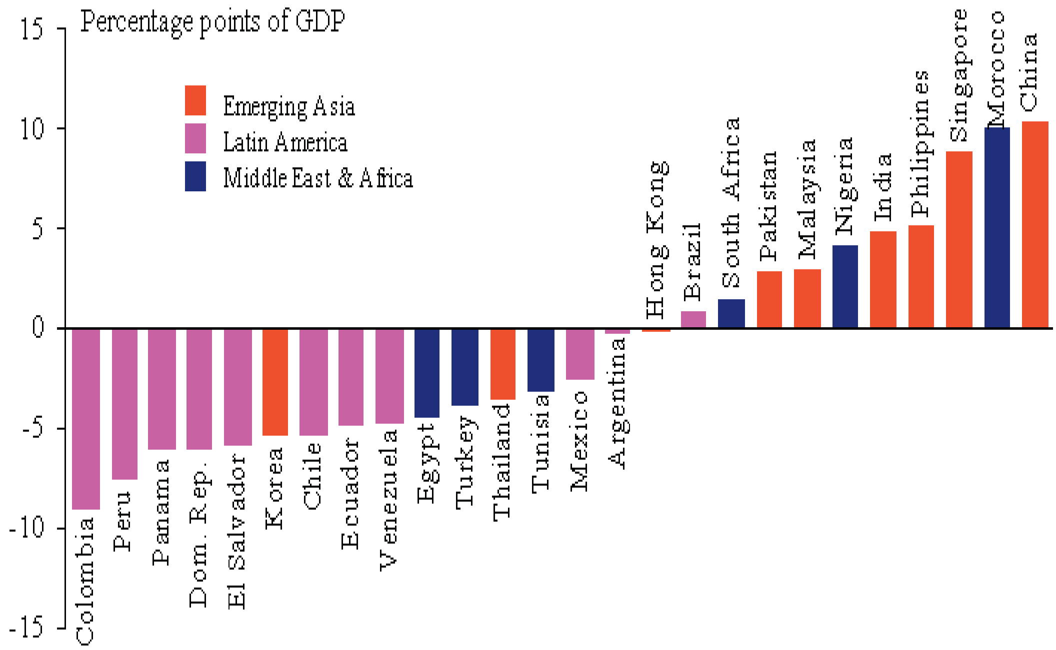
Source: IMF WEO.

Figure 6 — Fitted and actual private saving ratios in China



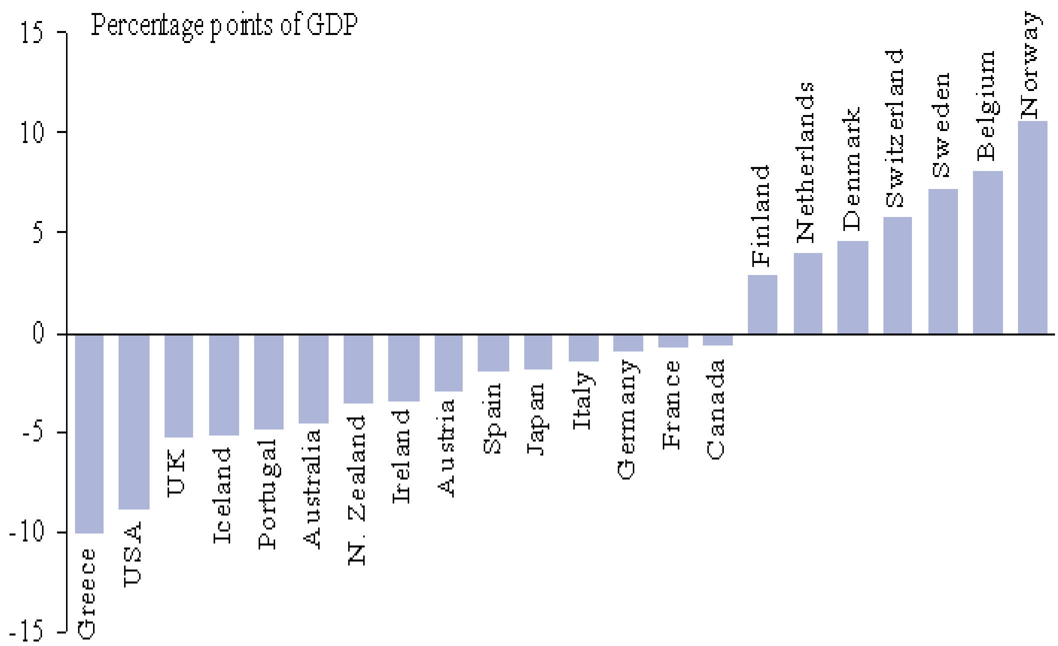
Source: IMF WEO and authors' calculations.

Figure 7 — Deviation of actual private saving rates from estimated long-run equilibrium by country: EMEs



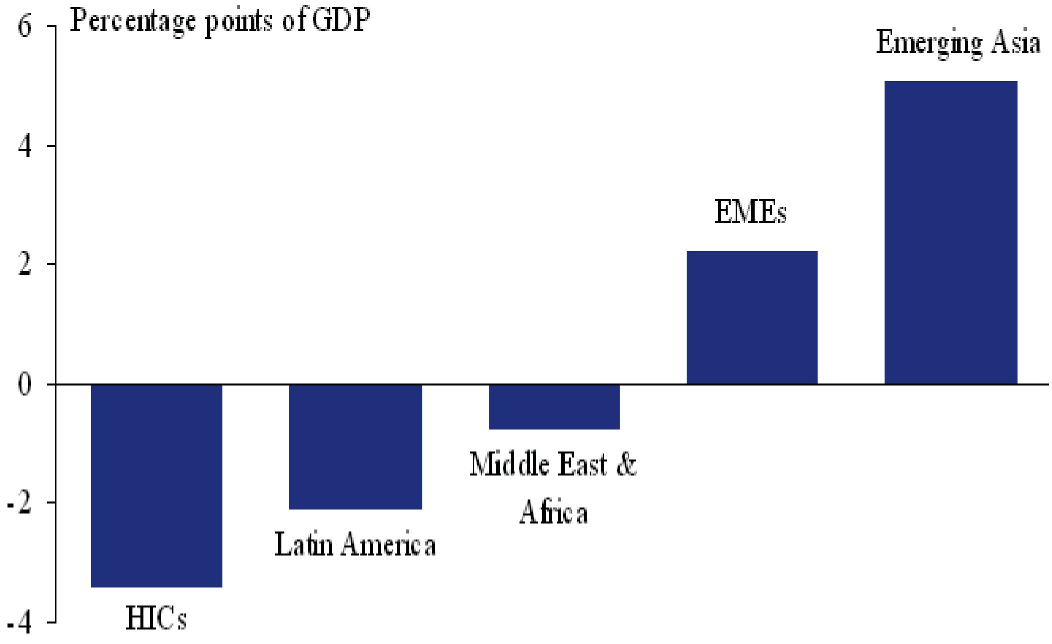
Source: Authors' calculations.

Figure 8 — Deviation of actual private saving rates from estimated long-run equilibrium by country: HICs



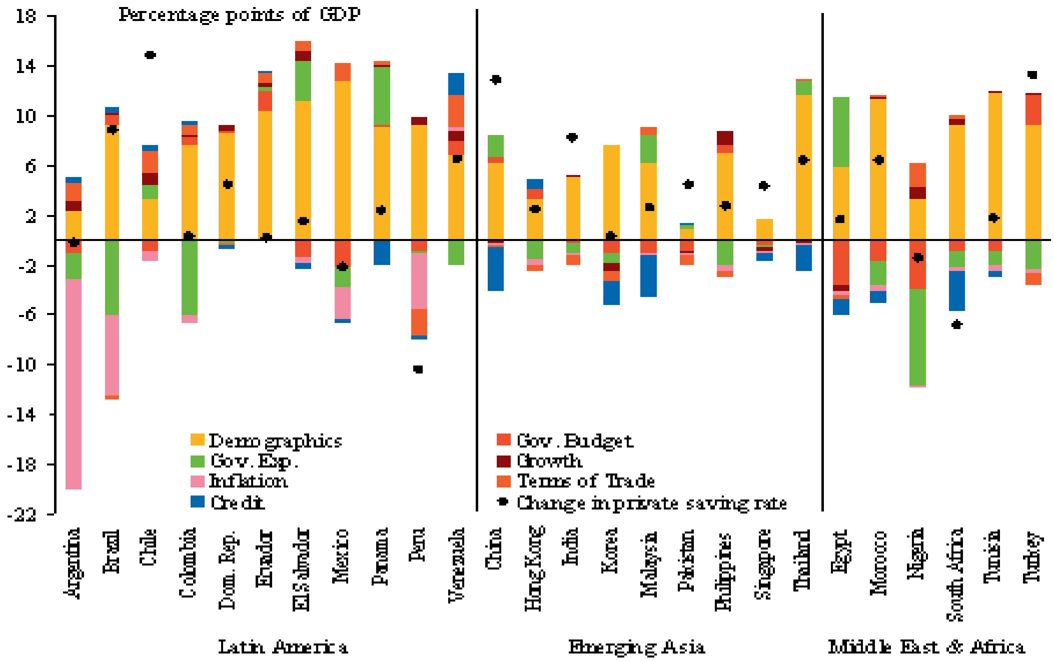
Source: Authors' calculations.

Figure 9 — Deviation of actual private saving rates from estimated long-run equilibrium by region



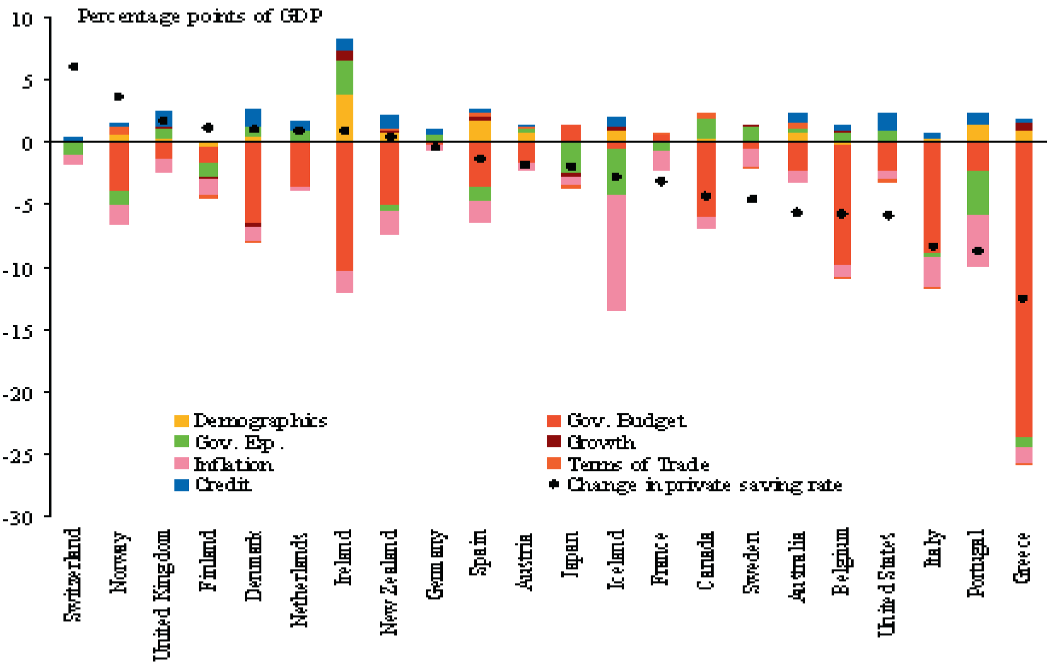
Source: Authors' calculations.

Figure 10 — Model contributions to cumulative change in saving ratios (1980-2005) by country: EMEs



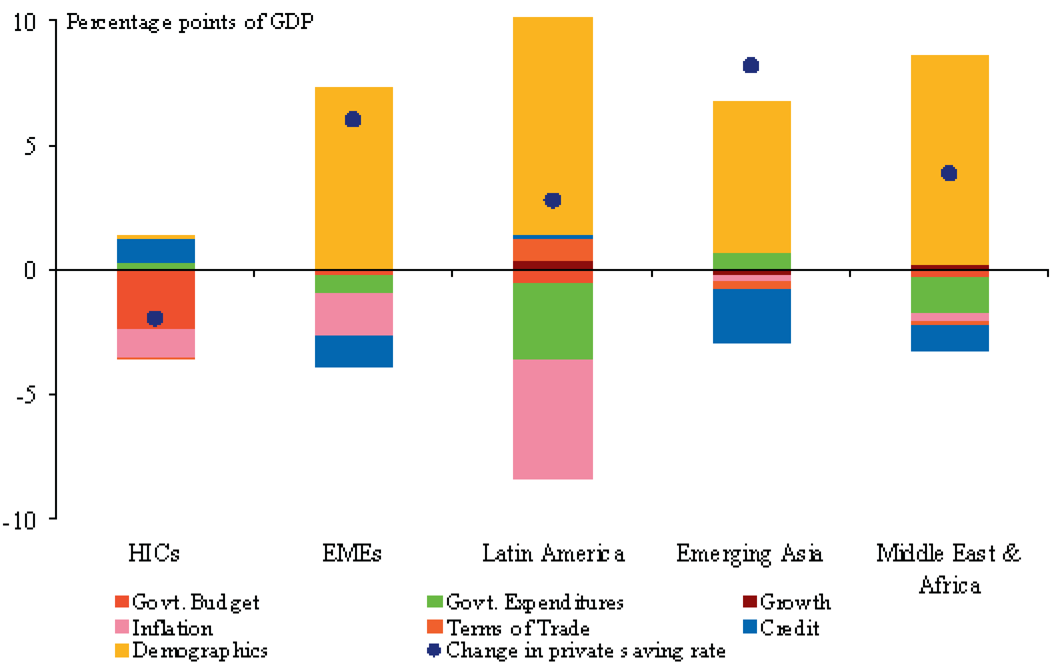
Source: Authors' calculations.

Figure 11 — Model contributions to cumulative change in saving ratios (1980-2005) by country: HICs



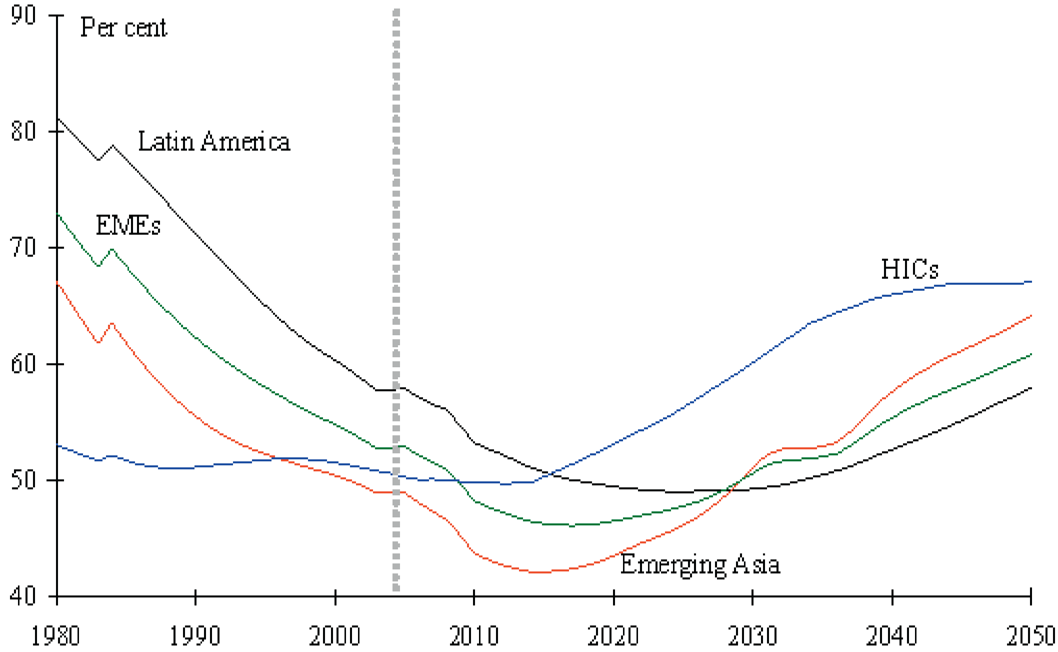
Source: Authors' calculations.

Figure 12 — Model contributions to cumulative change in saving ratios (1980-2005) by region



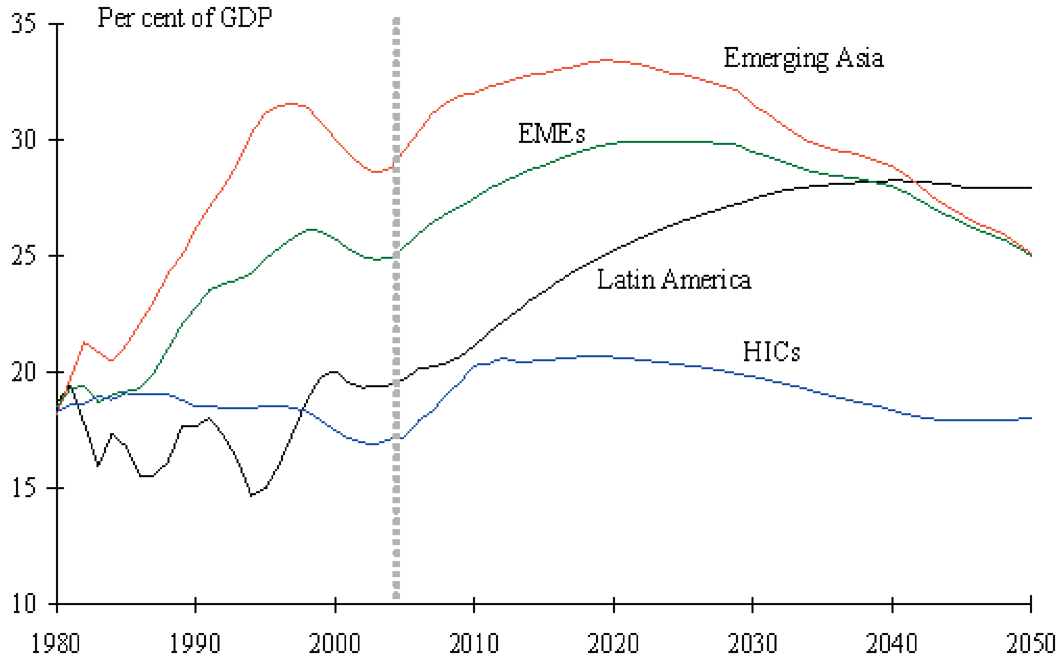
Source: Authors' calculations.

Figure 13 — United Nations dependency ratio forecasts



Source: United Nations.

Figure 14 — Projected saving ratios by regions



Source: Authors' calculations.

Table 1 — Data description

Variable	Description	Source
SY	Gross private saving, current prices (% of GDP)	WEO
DEP	Age dependency ratio (%)	WDI
GBY	General government balance (% of GDP)	WEO
GCY	Public consumption expenditure (% of GDP)	WEO
GR	GDP growth rate	WEO
INF	Inflation, change in consumer price index (%)	WEO
PCTT	Terms of trade (% change)	WEO
CRED	Domestic credit to private sector (% of GDP)	WDI
MCY	Market capitalization of listed companies (% of GDP)	GlobalFinData
KAOP	Capital account openness	Chinn & Ito (2005)

Table 2 — Descriptive statistics

	EMEs				HICs			
VARIABLE	MEAN	STD. DEV.	MAX	MIN	MEAN	STD. DEV.	MAX	MIN
SY	0.189	0.074	0.422	-0.107	0.206	0.050	0.340	0.051
DEP	0.659	0.137	0.969	0.371	0.509	0.043	0.704	0.436
GBY	-0.026	0.045	0.143	-0.243	-0.029	0.052	0.145	-0.393
GCY	0.122	0.038	0.271	0.025	0.195	0.040	0.301	0.096
GR	0.041	0.044	0.179	-0.136	0.026	0.022	0.178	-0.064
INF	0.634	3.911	74.817	-0.040	0.049	0.065	0.843	-0.010
PCTT	0.001	0.095	0.687	-0.542	0.004	0.043	0.291	-0.218
CRED	0.535	0.403	1.729	0.076	0.896	0.436	2.540	0.210
MCY	0.400	0.718	6.193	0.000	1.401	7.774	114.759	0.000
KAOP	-0.173	1.506	2.656	-1.725	1.682	1.254	2.656	-1.725

Table 3 — PMG estimates of long-run coefficients$^{(a)}$

	EMEs			HICs
	Model 1$^{(b)}$	Model 2$^{(c)}$	Model 3$^{(b)}$	Model 4$^{(d)}$
Dependency ratio (DEP)	-0.479***	-0.413***	-0.508***	-0.190***
	(0.032)	(0.038)	(0.049)	(0.042)
Government budget/GDP (GBY)	-0.332***	-0.387***	0.032	-0.848***
	(0.070)	(0.076)	(0.132)	(0.027)
Government consumption/GDP (GCY)	-0.615***	-0.706***	-0.240***	-0.584***
	(0.046)	(0.052)	(0.101)	(0.058)
GDP growth (GR)	0.199***	0.444***	0.412***	0.183***
	(0.056)	(0.067)	(0.109)	(0.047)
Inflation rate (INF)	0.045***	0.061***	0.053***	0.205***
	(0.008)	(0.008)	(0.019)	(0.035)
Terms of trade (PCTT)	0.160***	0.233***	0.130***	0.077***
	(0.026)	(0.031)	(0.041)	(0.015)
Bank credit/GDP (CRED)	-0.042***	-0.001	-0.007	0.012***
	(0.008)	(0.010)	(0.011)	(0.003)
Equity market capitalization (MCY)		-0.004		
		(0.004)		
Capital account openness (KAOP)			-0.016***	
			(0.003)	
Intercept$^{(e)}$	0.576***	0.485***	0.557***	0.378***
	(0.049)	(0.042)	(0.029)	(0.032)
Error correction coefficient$^{(e)}$	-0.622***	-0.613***	-0.262***	-0.747***
	(0.085)	(0.081)	(0.054)	(0.083)
No of observations	548	526	548	464
Log Likelihood	1141.838	1107.925	1429.331	1257.585
Std. dev of regressions$^{(f)}$	0.063	0.150	1.161	0.030

Notes: (a) Dependent variable is saving/GDP. Figures in parenthesis are standard errors. Sample period is 1980 to 2005. Observations are annual. (b) A fixed lag of one has been selected for all groups. All 26 EMEs have been included. (c) The Schwarz-Bayesian criterion has been used to select the appropriate lag orders for each group, conditional on a maximum lag of two. All 26 EMEs have been included. (d) A fixed lag of one has been selected for all groups. All 22 HICs have been included. (e) Average of group-specific coefficients. (f) Average of group-specific statistics. * Significant at 10% s.l.; ** Significant at 5% s.l.; *** Significant at 1% s.l..

Table 4 — Country estimates of long-run coefficients (model 1)$^{(a,b)}$

	DEP	GBY	GCY	GR	INF	PCTT	CRED
Argentina	1.558***	-3.579***	1.033	0.234	-0.005**	-0.306***	0.052
Brazil	-5.222	9.569	-4.384	-2.493	-0.028	-4.737	2.123
Chile	-1.160***	0.901***	0.623	-0.094	-0.232***	-0.003	-0.333***
China	-1.015	10.351***	5.827**	-0.809	1.619***	-2.177**	0.502***
Colombia	-0.157	4.056***	0.040	-0.916***	-0.880***	0.075	0.066
Dom. Rep.	-0.488***	0.530**	-0.245**	-0.281	0.066**	0.076**	0.902***
Ecuador	0.060	0.073	-0.571**	0.110	0.044	-0.001	0.207
Egypt	0.429**	-0.493***	-1.319***	-0.390	0.069**	0.007	-0.261
El Salvador	-4.309**	2.009	12.747**	-0.600	0.424	-0.430	-1.839
Hong Kong	-0.515***	-0.156	-5.794***	0.132	0.123	0.164***	-0.139***
India	-0.533***	0.251**	0.982***	-0.008	-0.099	0.044	-0.078***
Korea	-1.937***	-2.337***	-1.429***	0.933***	0.091	0.225**	-0.704***
Malaysia	-0.456***	-1.397***	0.243	0.145	-0.342	0.630***	-0.143***
Mexico	0.104	-0.663***	-1.046***	-0.099	-0.061***	0.187***	0.042***
Morocco	-0.457***	-1.235***	0.370	0.545***	0.502***	-0.257***	-0.341***
Nigeria	-3.326	-0.022	-0.767	-0.632	1.606**	-0.780**	-1.485
Pakistan	-0.667	-0.149	0.068	1.539***	0.171***	0.049	0.181
Panama	-2.054**	-1.595	-3.421**	0.605	0.285	0.428	0.774
Peru	0.430	0.962***	-0.201	-0.458**	-0.025	0.068	-0.027
Philippines	11.756	16.443	74.278	2.261	0.083	1.645	-3.641
Singapore	0.029	1.153	-0.939	2.103**	0.463	-0.399	0.101
South Africa	0.203	-0.158	-3.494***	-0.535***	-0.534	0.295	-0.008
Thailand	0.267***	-0.883***	0.006	0.154**	0.172**	-0.030	0.017
Tunisia	0.396	-23.441	0.027	-1.115	0.882	-0.209	-0.143
Turkey	0.171	2.406***	1.324***	0.995***	1.797**	0.309**	-0.066
Venezuela	-0.947***	1.620***	1.518***	-0.011	-0.042	0.658***	0.380
MGE$^{(c)}$	-0.345	0.547	2.903	0.051	0.237**	-0.172	-0.146
PMG$^{(d)}$	-0.479***	-0.332***	-0.615***	0.199***	0.045***	0.160***	-0.042***

Notes: (a) Dependent variable is saving/GDP. Estimates based on ARDL specification with a fixed lag of one for all cross sections. Sample period is 1980 to 2005. Observations are annual. (b) Key to column headings: DEP = dependency ratio; GBY = gvt budget/GDP; GCY = gvt consumption/GDP; GR = GDP growth rate; INF = inflation rate; PCTT = terms of trade (percentage change); CRED = bank credit/GDP. (c) MGE is mean group estimator of long run coefficient. (d) PMG is pooled mean group estimator of long run coefficient. * Significant at 10% s.l.; ** Significant at 5% s.l.; *** Significant at 1% s.l..

Table 5 — Unit root tests

Sample	Obs.	t-bar	cv10	cv5	cv1	Z[t-bar]	P-value
All	960	-2.247	-2.070	-2.150	-2.300	-2.583	0.005
EMEs	520	-2.568	-2.070	-2.150	-2.300	-3.915	0.000
HICs	440	-2.805	-2.040	-2.110	-2.230	-7.467	0.000

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