What determines private and household savings in India?

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Abstract

This paper uses annual data from 1960 to 2016 to examine the determinants of private and household saving behavior in India. The results indicate that per capita real income and access to banks are significant determinants with favorable impacts on private as well as household saving rates in short as well as long run. Further, as inflation accelerates, the uncertainty about the future value of their accumulated savings and expected real rate of return discourage households and other private agents from saving. A desire to maintain a certain level of real expenditures also contributes to this decrease in saving rate. An increase in dependent population reduces private and household saving rates in the short run while it increases the private saving rate in the long run. The results further indicate that a rise in the real interest rate increases household saving rate in the short run but reduces both private and household saving in the long run. It does not seem to have any significant impact on total private saving in the short run. Additionally, increased corporate saving tends to reduce household saving in both time horizons. Further, both private and household saving rates have declined significantly after the global financial crisis. Finally, any deviation from the long run equilibrium for saving rates dissipates rather quickly. Overall, these results seem to suggest that policies intended to increase per capita income, lower inflation, and increase accessibility to banking will go a long way in increasing private and household saving in India.

Keywords: Private saving rate; household saving rate; Autoregressive Distributed Lag (ARDL); Bounds test; India

JEL Codes: E21; E43

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1. Introduction

The importance of saving and investment for economic growth is highlighted in any introductory level macroeconomics textbook.¹ For an economy to grow, capital investment is crucial. In order to finance such investment, the society must consume less and save more of its current income. Thus, saving is of vital importance for economic growth. There is a large volume of empirical research on the nexus between saving and economic growth.² Even a casual examination of data for India reveals that there are strong positive associations between investment and growth, saving and investment, and saving and growth (see Figure 1). Further, it has been long recognized that India’s investment needs have been primarily satisfied by domestic saving of which private saving is the largest component.³, ⁴ Further, household saving has been the major source of private saving in India. Although its share has declined to about 60 percent in recent years, household saving accounted for as high as 90 percent of total private saving in the past, specifically in the late 1970s. Since private and household savings seem to have played an important role in the process of economic growth, it is but natural to ask what determines private and household saving in India.⁵

[Insert Figure 1]

There are only a handful of macroeconomic studies on the saving behavior in India. In one of the earliest studies available, Krishnamurty et al (1987) examine saving data from 1954-55 to 1981-82

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¹ For example, see Principles of Macroeconomics by NG Mankiw (Eighth Edition).
³ For example, see Loayza and Shankar (2000)
⁴ According to the World Bank data, even at its peak in 2008, foreign direct investment (FDI) net inflows accounted for less than 4 percent of GNP and for most years prior to 2001 it was less than 1%.
⁵ The gradual divergence in their respective trends over the long run and variations in short-run movements (see Figure 2) make a case for separate investigations for private and household saving.
to show that the size of the non-agricultural sector, real interest rate, inflation, and strengthening of banking infrastructure have favorable effects on savings rate. Loayza and Shankar (2000) study private saving in India during 1960-95. While this study expends some effort in defining alternative measures of private saving by adjusting for capital losses due to inflation, and incorporating expenditures on consumer durables and human capital, it also examines the short and long run determinants of private saving in India. The regression results reported by the study suggest that greater access to credit, higher age dependency ratio, and larger real interest rate reduce and the larger share of agriculture increases the unadjusted private saving rate (similar to the private saving variable we use in the current study) in the long run. Interestingly, the study does not find any evidence of significant short run effects of these variables on private saving behavior in India.

Using annual data from 1954 to 1998, Athukorala and Sen (2004) provide evidence of significant positive impacts of the level and growth of disposable income, real interest rate, inflation, and the spread of banking facilities on private saving in India. The study also shows that public saving crowds out private saving although less than proportionately. Furthermore, changes in the external terms of trade have a negative impact on private saving. The authors make a distinction between short and long run effects of the explanatory variables. In another study, Agrawal et al (2010) use data from 1960 to 2004 and show that per capita income and access to banking facilities are important determinants of saving behavior in India. Further, foreign and public savings have negative impacts on private and household savings. None of these studies, however, covers the most recent years that include the global financial crisis during which India also experienced some of the highest rates of economic growth.6

This paper uses annual macroeconomic time series data from 1960 to 2016 to examine the determinants of private and household saving in India. Since the variables considered in this study

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6 According the World Bank data, India’s real GDP grew at an annual average rate of 7 per cent during 2005 – 2018.
are integrated processes of mixed orders, it uses an Autoregressive Distributed Lag (ARDL) model, and a general-to-specific model selection approach to achieve parsimony. This model framework also allows us to test for the existence of a long-run cointegrating relationship and thereby to examine the short and long run effects of the most relevant variables separately. The results indicate that an increase in per capita real income leads to higher private and household saving in the short as well as the long run. An increase in the proportion of dependent population reduces private and household saving rates in the short run while it increases the private saving rate in the long run. The results further indicate that a rise in the real interest rate increases household saving rate in the short run but reduces both private and household saving in the long run. However, it does not seem to have any significant impact on total private saving in the short run.

Our analysis further shows that as inflation accelerates, both private and household saving rates decrease indicating a tendency for the private sector to dis-save in the face of higher inflation in order to maintain a certain level of expenditures. Furthermore, access to banking is a significant determinant of private and household saving in the short as well as long run. Additionally, increased corporate saving tends to reduce household saving in both time horizons. Finally, both private and household saving rates have declined significantly after the global financial crisis. These results seem to suggest that policies that are intended to increase per capita income, lower rate of inflation, and increase access to banking will go a long way in increasing private saving in India.

This paper makes three important contributions to the empirical macroeconomic literature on India’s saving function. First, it chooses an empirical strategy and a methodology that take into account a number of econometric issues that arise due to the specific characteristics of the underlying data generating processes (DGP) of the variables considered in the study, the sample...
size, and the potential differences in short and long run dynamics of saving behavior. Second, it covers an important episode of economic growth in India - a leading emerging market economy - that was not covered by previous studies. Third, the results of our empirical analysis uncover interesting facts about how the most relevant determinants affect private and household saving behavior in India, that contrasted with the results reported in previous studies indicating changes in the saving behavior in most recent years.

The rest of the paper is organized as follows. Section 2 discusses the analytical framework for the empirical model specification. A discussion on the data and the empirical strategy and methodology is included in Section 3. In Section 4, we present the results from our empirical analysis. Section 5 presents a discussion of the results and their policy implications. We summarize and conclude in the last section.

2. The Analytical Framework and Empirical Model Specification

The theoretical models proposed over the years to explain people’s consumption and saving behavior provide the analytical framework for examining the macro-level determinants of private saving in an economy. In this section, we discuss the variables that are suggested by the major theoretical models and their extensions and will specify an empirical model for the current study.

An extension of the life cycle model (LCM) to the national level projects the growth rate of per capita income to be a major determinant of the saving rate. Higher growth rate increases the lifetime resources (including saving) of younger-age groups relative to older-age groups and thereby is expected to increase aggregate saving. However, at sufficiently high rates of economic growth, if the lifetime income and wealth of the young are high enough relative to their elders, the aggregate saving.

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8 Modigliani (1966) discusses the theory behind the LCM and presents empirical support for the original version using cross-country data.
saving rate may decrease. Thus, whether higher growth leads to an increase or a decrease in the saving rate depends on whether the age profile of saving is negatively correlated. As for per capita income, Keynes postulates that consumption and, therefore, saving are linearly related to it. Even within the LCM framework, Modigliani (1993) argues that in low income countries it is current income rather than lifetime income that plays an important role in determining saving.

The LCM framework also suggests that wealth could be another important determinant of saving. With high level of accumulated assets, there is relatively lesser need for saving to maintain certain level of consumption in the future. Thus, we would expect wealth to have a negative impact on saving.

According to the LCM, real interest rate (RIR) is another important determinant of private saving. There are two offsetting effects of real interest rate. As RIR increases, the opportunity cost of consumption relative to the future cost rises and it encourages people to save more. This is the substitution effect. However, if a household is a net lender (saver), it also raises lifetime income that tends to increase consumption and decrease saving. This is the income effect. The net effect will be positive if the substitution effect outweighs the income effect and it will be negative if opposite is the case. Nevertheless, the net effect of an increase in RIR on saving is a priori ambiguous.

The age structure of the population is also an important determinant of the saving rate. Under the assumption of “balanced population growth” (Modigliani 1993), an increase in the population growth rate caused by an increase in age-specific fertility rates increases the number of savers relative to the number of dis-savers. This implies a positive association between population growth rate and the savings rate. However, this link becomes complicated if we relax the “balanced population growth” assumption. In general, while an increase in the population growth rate may increase economically active individuals, it may also increase the number of dependent population. An
increase in the number of dependent – young and old – relative to the working age population is likely to decrease saving.

There are additional variables that are likely to influence saving behavior in developing countries. For example, people in the lower end of the income distribution may have no or limited access to credit. This is often influenced by a lack of collateral in the form of accumulated wealth or/and guaranteed future income flows. Thus, in order to undertake future major expenses (e.g. construction of houses, unproductive expenses like wedding), they are forced to save more. Thus, the credit constraint is likely to increase the saving rate.

Inflation is yet another factor affecting private and household saving. However, there are two potential effects of inflation, which work in opposite directions. If higher inflation increases uncertainty about future income, households and private parties would increase precautionary saving. In contrast, if higher inflation increases uncertainty regarding the future value of accumulated savings and reduce the rate of expected returns on savings, it may likely to discourage saving. Further, if households and private parties want to maintain a certain level of real expenditures, as the rate of inflation rises, they may spend more and save less.

The external terms of trade (TOT) may have an impact on private saving behavior. According to the Harberger-Laursen-Metzler hypothesis, deterioration in the terms of trade (a reduction in the price of domestically produced goods relative to that of foreign goods) reduces real income and thereby saving. However, the private agents’ forward-looking behavior may bring in ambiguity to the effects of TOT on private saving. In particular, their attempt to smooth consumption in the face of uncertain changes in income will have implications for impact of TOT on saving. If they perceive TOT deterioration as temporary, it may lead to dissaving while if they perceive it as permanent, it may lead to an increase in saving.

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9 See Athukorala and Sen (2004)
10 See Jongwanich (2010)
The government’s fiscal position may have an impact on private saving. Private households and corporations may respond to government actions with regard to public saving. Barro’s Ricardian equivalence theorem (Barro 1974) predicts an extreme response from the private sector. According to this theorem, as government issues bonds to finance its deficits, the private sector saves in anticipation of a future tax increase to service the bonds and consequently there is an equal increase in private saving. However, if the underlying assumptions of perfect capital markets and absence of uncertainty do not hold, it is unlikely that private and public savings will be perfect substitutes. Foreign savings may also have an impact on the private saving behavior in India. Availability of larger foreign saving may encourage higher consumption and thereby may reduce private saving.

In developing countries, bank deposits are an important form of household saving. On an average, household financial saving accounted for about a third of total private saving in India during our sample period.\textsuperscript{11} Thus, as Athukorala and Sen (2004) argue, access to financial intermediaries – primarily banks - is very important for saving. The larger the number of bank branches, the higher would be the saving rate. Alternatively, as the population per bank branch (bank density) decreases, private and household savings are expected to rise.

Some studies (e.g. Krishnamurty \textit{et al} 1987; Loayza and Shankar 2000) argue that since a large segment of Indian population is dependent on agriculture for their livelihood, these people face the uncertainty of agricultural income and therefore are likely to save more out of precautionary motive.\textsuperscript{12} Thus, the share of agriculture in GNP is expected to have a positive impact on the overall private saving rate.

Finally, corporate saving may influence household saving as well. Since households own the firms, they may decide to save less when the firms do the saving on their behalf thereby leaving the

\textsuperscript{11} According to the authors’ calculations based on RBI data.
\textsuperscript{12} According to International Labor Organization data, agriculture accounted for about 63 percent of India’s total employment in 1991 (the earliest for which data are available). This ratio has declined to 45 percent in 2016 (World Bank, 2019).
overall private saving unaffected. In this case, households “pierce the corporate veil”. However, as Jongwanich (2010) argues, households’ ability to completely offset corporate saving may be restricted by imperfect information, tax policies, liquidity constraints, and other capital market imperfections.

Drawing on these theoretical insights and existing empirical studies, we identify the following potential explanatory variables belonging to four broad categories. We list them below with an acronym and a brief description of the data we use. We also include the expected signs for the respective regression coefficients based on theoretical intuitions.

A) Macroeconomic variables

1) Per capita income growth: annual percentage change in real Gross National Product, GNP \((YG, + or -)\)

2) Per capita real income: per capita real GNP \((PCY, +)^{13}\)

3) Per capita real wealth: proxied by broad money (M3) deflated by CPI and normalized by population \((W, -)^{14}\)

4) Inflation rate: percentage change in CPI \((INF, + or -)\)

5) Share of agriculture: percentage share of agriculture value added in GNP \((AGSH, +)\)

B) Demographic variables

6) Population growth rate: annual percentage change in population \((POPG, + or -)\)

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13 In the literature, it is common to use per capita real GNP, per capita real GDP, or per capita disposable income as a measure of per capita income, which is suggested as a potential determinant of private or household saving by relevant theories. For example, in the Indian context, Krishnamurty et al. (1987) uses per capita real GNP (like we do in the current study), Loayaza and Shankar (2000) uses per capita real private disposable income, Athukorala and Sen (2004) uses Gross National Disposable Income (GNDI), and Agrawal et al. (2010) uses per capita real GDP. Please note that these measures are highly correlated (correlation coefficients of 0.98 – 0.99) and therefore capture similar time series variations in per capita income.

14 There are no data on the value of all assets that would be included in a comprehensive definition of wealth. Furthermore, the asset portfolio has certainly changed and has presumably been more diversified over the years. This proxy measure is used by, among others, Athukorala and Sen (2004).
7) Age dependency ratio: the number of people under the age of 15 and above the age of 64 as a percentage of working age (15 – 64 years) population \( (DEP, - ) \)

C) Financial sector variables

8) Real interest rate: nominal interest rate adjusted for inflation \( (RIR, + or - ) \)

9) Credit constraint: proxied by private bank credit as a percentage of GNP \( (BC, - ) \)

10) Bank density: population per bank branch \( (BDN, + or - ) \)

11) Public saving rate: public saving as a percentage of GNP \( (PUB, + or - ) \)

12) Corporate saving rate: corporate saving as a percentage of GNP \( (CS, - ) \)

D) External sector variables

13) Foreign saving rate: current account balance as a percentage of GNP \( (FOR, + or - ) \)

14) Terms of trade: ratio between export prices and import prices \( (TOT, + or - ) \)

Note that the private saving rate \( (PVS) \) and the household saving rate \( (HHS) \), calculated as the percentage share of private saving and household saving in GNP respectively, are our dependent variables.\(^{15}\) We specify the following private saving function as the general framework for our empirical model estimation\(^{16}\):

\[
PRV = f (YG, PCY, W, INF, AGSH, POPG, DEP, RIR, BC, BDN, PUB, FOR, TOT, CRD1, CRD2)
\]

(1)

For our household saving function, we add corporate saving rate, \( CS \), as an additional variable for this general specification. Note that we also include two dummy variables: \( CRD1 \) and \( CRD2 \).

\(^{15}\) There are variations in the definition of saving rates among previous studies. For example, Krishnamurty et al (1987) use, like the current study, GNP share of saving; Loayza and Shankar (2000), and Athukorala and Sen (2004) use disposable income share; while Agrawal et al (2010) use GDP share of various saving measures as the dependent variables. However, these different saving rates are highly correlated.\(^{16}\) One may argue that investment or reinvestment may also influence saving. However, in macroeconomic discussion, saving is the source of supply and investment is the source of demand for loanable funds. In the equilibrium, saving equals investment and the equilibrium interest rate is determined. That is, saving and investment are simultaneously determined. Thus, in this study (like many others in this literature), we investigate the supply side of the loanable funds market. However, investment or reinvestment may be a motivation for saving at the micro level (say, for a household or a firm).
takes the value 1 for 1992 when there was a sharp drop in private and household saving rate immediately after the market oriented reforms and trade liberalization were implemented, and 0 otherwise. Further, CRD2 takes the value 1 for the years after 2010 when the saving rates were consistently declining, and 0 otherwise. We use natural logarithmic values of $PCY$, $W$, and $BDN$. The other variables – including the dependent variable are in percentages.

3. Data and Methodology

3.1 Data

We obtain the relevant data from two major sources: (i) Handbook of Statistics on Indian Economy (HSIE) published and maintained online by the Reserve Bank of India (RBI) and (ii) World Development Indicators (WDI) database compiled and maintained by the World Bank. The sample period spans more than five decades from 1960 to 2016 and its choice is dictated by the availability of data.\(^\text{17}\) Data on various categories of saving: total private, household, corporate, public, foreign (current account balance); GNP; per capita real GNP; population; the deposit rates (nominal interest rate); broad money (M3); and the number of bank branches per one million people are taken from source (i). We obtain data on consumer price index (CPI); GNP share of agriculture; age dependency ratio; exports; and imports (both current and constant prices) from source (ii). We use these data to construct various ratios and rates relevant for this study.\(^\text{18}\)

\[^{17}\text{Note that most Indian sources report the data by financial year (FY) that starts on April 1 every year and ends on March 31 of the next year. For convenience, we use the second year to refer to a FY. Thus, the FY 1959-60 is referred to as 1960.}\]

\[^{18}\text{In particular, we use the minimum of 1 – 3 year deposit rate as the nominal interest rate (i) and calculate the real interest rate as follows:}\]

\[RIR = \ln \left( \frac{1 + i}{1 + \pi} \right)\]

\(^{\text{where } \pi \text{ is the rate of inflation and measured as the average of current and one-period ahead inflation rate, as in Loayza and Shankar (2000) and Athukorala and Sen (2004)}}\]
Figure 1 plots the private (that combines both household and corporate) and the household saving rates in India for the sample period. We make the following observations. First, the private savings as a percentage of GNP increased from about 9 percent in 1960 to a maximum of about 36 percent in 2010 and subsequently declined to about 31 percent in 2016. The corresponding rates for household savings are about 8 percent in 1960, a maximum of about 27 percent in 2010, and finally 19 percent in 2016. Second, the corporate savings rate increased from about 1 percent in the beginning of the sample period to about 12 percent by the end. Finally, there have been short-run fluctuations in the saving rates. However, we observe declining trends in both private and household saving rates since their peaks in 2010, i.e. after the global financial crisis.

Table 1 presents summary statistics of the variables considered in this paper. Over the sample period, private saving rate averages about 20 percent. The higher standard deviation for private saving rate than for household saving rate indicates higher relative volatility of corporate savings. During the sample period, India experienced an average annual growth rate of 3.1 percent in per capita GNP with a maximum of 7.9 percent growth and a minimum of 7.6 percent decline. Per capita real GNP grew almost seven times during the sample period with an average of Rs.19,381 (at 2005 constant prices). Similarly, per capita real wealth increased from Rs. 2,382 in 1960s to about Rs. 39,000 in 2016 representing a 16-fold rise with an average of about Rs.12,000 over the sample period. The population has been growing at an average annual rate of 1.9 percent. Although the average real interest rate for the sample period is 0.2 percent, it ranges between -14.7 and 8.1 percent. Public and foreign savings are relatively low accounting for, on an average, 2.9 percent and 1.3 percent of GNP respectively. Corporate saving rate increased from about 1 percent in the beginning to about 12 percent by the end of the sample period with acceleration in growth since the
mid-2000s. A bank branch serves a population of 19,630, on an average, between 1969 and 2016. This number has declined significantly over the sample period.

3.2 Empirical Strategy and Methodology

We consider a number of important issues in determining our empirical strategy and methodology. First, the time series variables under consideration may be integrated of different orders. The knowledge of their stochastic trend properties is very important for multivariate time series modelling. Second, given the limited number of usable observations on the relevant variables, a parsimonious specification of the empirical model is desirable. Third, there are likely to be important differences between short-run and long-run relationships among variables. Some of these differences are not a priori obvious in the light of existing theories.

Following usual conventions, we conduct the Augmented Dickey-Fuller (ADF) and the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests to examine the stochastic trend properties of the underlying data generating process for each of the variables we consider in this study. The null hypothesis for the ADF test is that the series has a unit root or $I(1)$ process and the alternative is that the series is $I(0)$. In contrast, the KPSS procedure tests for the null of stationarity, i.e. $I(0)$, against the alternative of an $I(1)$ process.

It is reasonable to assume that past saving would influence current saving. In addition, lagged values of certain explanatory variables are likely to affect current saving. Thus, an Autoregressive Distributed Lag (ARDL) model would be an appropriate choice estimating the saving function. However, with a large number of variables and their lags, we quickly lose degrees of freedom and

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19 We use the term ‘long-run relationship’ to refer to a cointegrating relationship between nonstationary variables. Such a long-run relationship – also called equilibrium relationship – “may be causal, behavioral, or simply a reduced-form relationship among similarly trending variables” (Enders 2004, p. 322). In contrast, we use the term ‘short-run relationship’ to refer to a deviation from the long-run equilibrium relationship. Such deviations are usually transitory in nature. For the technical exposition of these concepts in the context of ARDL model, see Pesaran (2015), pp. 125-127.
achieving precision in estimation becomes a major challenge. Thus, parsimony in specification of the empirical model almost becomes a necessity. In order to address this concern, we adopt a general-to-specific modelling strategy. In the first stage, we start with a very general specification with all potential explanatory variables along with a maximum lag of 2 for the dependent and each of the independent variables included in our empirical model and use Schwarz Information Criterion (SIC) to select the lag lengths for the variables. In the second stage, we drop the variables that are not significant - individually as well as jointly - determinants of saving in India. We conduct formal test procedures to determine and drop these redundant variables.

There are other advantages of the ARDL model. We may include variables that are integrated of orders: 0 and 1. Further, it allows us to conduct the bounds test - proposed by Pesaran and Shin (1999) and Pesaran et al. (2001) – to determine if there exists a cointegrating relationship among the variables. We can derive a dynamic Error Correction Model (ECM) from ARDL through a linear transformation and use it to distinguish between short and long run effects of the explanatory variables. Thus, we can have a deeper understanding of the long run and short run dynamics of private and household saving behavior in India.

A typical ARDL model is represented as follows:

\[ Y_t = \alpha + \delta t + \sum_{i=0}^{p} \beta_i Y_{t-1-i} + \sum_{k=1}^{K} \sum_{i=0}^{p} \gamma_{k,i} X_{k,t-i} + \epsilon_t \]  

(2)

where \( \alpha \) is a constant, \( t \) is a time trend, \( Y_t \) is the endogenous variable, \( X_{k,t} \) is the \( k^{th} \) explanatory variable \((k=1, 2, \ldots K)\), \( p \) is the maximum lag for endogenous as well as exogenous variables, and \( \beta_i \) and \( \gamma_{k,i} \) are parameters to be estimated.

We can re-parameterize the above equation in terms of differences and lagged levels so as to separate the short-run and long-run multipliers of the system. The error correction version of the ARDL model is:

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\[ \Delta Y_t = \alpha + \delta t + \sum_{i=0}^{p} \beta_i \Delta Y_{t-1-i} + \sum_{k=1}^{K} \sum_{i=0}^{p} \gamma_{k,i} \Delta X_{k,t-1-i} + \theta_0 Y_{t-1} + \sum_{k=1}^{K} \theta_k X_{t-1} + \varepsilon_i \]  

(3)

where \( \beta_i \) and \( \gamma_{i} \) are the short-run dynamic parameters of the model, and \( \theta_0 \) and \( \theta_k \) are the parameters representing long-run relationship. We can further manipulate to write the equation as follows:

\[ \Delta Y_t = \alpha + \delta t + \sum_{i=0}^{p} \beta_i \Delta Y_{t-1-i} + \sum_{k=1}^{K} \sum_{i=0}^{p} \gamma_{k,i} \Delta X_{k,t-1-i} + \theta_0 \left( Y_{t-1} - \sum_{k=1}^{K} \varphi_k X_{t-1} \right)_{t-1} + \varepsilon_i \]  

(4)

where \( \varphi_k = - \theta_k / \theta_0 \) and \( \theta_0 \) is the adjustment speed parameter. The term inside the bracket is the error correction term and the sign and value of \( \theta_0 \) tells us how quickly a deviation from the long-run equilibrium tapers off. The bounds test for cointegration involves testing for the joint significance of the lagged level parameters, i.e. the null hypothesis of \( H_0 : \theta_0 = 0 \) and \( \theta_k = 0 \). We then compare the estimated F-statistic with the critical values reported by Pesaran et al. (2001). If the test statistic is greater than the upper critical value, we reject the null hypothesis of no long-run relationship. In contrast, if the test statistic is smaller than the lower critical value, we fail to reject the null hypothesis. However, an estimated test statistic that lies between these two bounds makes the result inconclusive.

4. Empirical Results

We first conduct the ADF and KPSS unit root test procedures on each of the variables considered in this study to determine the order of integration. Table 2 summarizes the results. These test procedures involve several important decisions regarding whether to include a constant and a deterministic trend in the test equation. Additionally, the ADF test requires us to select an appropriate lag length for the augmented terms. For both procedures, we start with the most general specification that includes a constant as well as a linear trend. We then decide whether to keep both, only the constant, or none by examining whether the corresponding estimated coefficients are
To decide on the lag length for the augmented terms in the ADF test, we begin with a relatively large number of lags and pare it down based on Schwarz Information Criterion (SIC).^{21}

The results indicate that some of the variables (e.g. PVS, PCY, W, and DEP) are unambiguously I(1) while others (e.g. GY, INF, RIR, and FOR) are unambiguously I(0). For the remaining variables, the conclusions that we draw from these two test procedures contradict. The evidence of mixed orders of integration supports our decision to use ARDL model specification.

4.1 The Private Saving Function

The parsimonious model selection strategy described above chooses an ARDL (2, 0, 1, 2, 1, 0) model with per capita real GNP, inflation, age dependency ratio, real interest rate, bank density (in that order with indicated lags), and a crisis dummy for post-2010 period to be the most relevant determinants of private saving in India during the sample period.^{22} The variables that turn out to be unimportant include per capita real GNP growth, per capita real wealth, GNP share of agriculture, population growth, credit constraint, public saving, foreign saving, and terms of trade. Thus, there is a lack of evidence in our data in support of some of the major determinants of private saving.

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^{21} A common rule of thumb for determining $p_{max}$, suggested by Schwert (1989), is $p_{max} = \left[12 \times \left(\frac{T}{100}\right)^{1/4}\right]$ where $[x]$ denotes the integer part of $x$. However, this choice is ad hoc!

^{22} In the first stage, we estimate an ARDL Model with the specification in Eq. (1) along with a constant and a deterministic time trend. With maximum lag lengths of 2 for both the dependent and each of the independent variables, there are 3168464 potential models. SIC selects an ARDL (2, 0, 0, 1, 0, 0, 2, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0). Since the estimated coefficient for trend is statistically insignificant, we drop it and re-estimate the model. In the second stage, we look at the explanatory variables for which estimated coefficients are not significant, conduct F/Wald tests for redundant variable(s) individually and jointly, and based on the test results drop them from the final specification.
suggested by the LCM framework. Our result with respect to per capita income growth is consistent with those reported by Krishnamurty et al (1987), Loayza and Shankar (2000), and Agarwal et al. (2010) but contradicts that of Athukorala and Sen (2004). However, the results on the irrelevance of per capita real wealth and population growth are consistent with those reported by Athukorala and Sen (2004). In contrast to the results presented by these authors, there is little evidence in our data of any significant role for public saving and terms of trade in determining private saving in India. Furthermore, unlike in Krishnamurty et al. (1987) and Loayza and Shankar (2000), the share of agriculture does not appear to be important for private saving during our sample period. Similarly, in contrast to the results reported in Agarwal et al (2010), there is little evidence of a significant role for foreign saving. Finally, that credit constraint – proxied by domestic credit as a share of GNP – is not a significant determinant of private saving is consistent with the results reported in Loayza and Shankar (2000). Some of these contradictions with the results presented in previous studies may have stemmed from fundamental changes (including changes in saving behavior) that have taken place in the Indian economy in recent years. We discuss some of these changes as potential explanations for our results in Section 5.

Table 3 presents the Error-Correction Model (ECM) representation of the estimated coefficients along with the results from standard diagnostic tests for goodness of fit and the bounds test for cointegration. The first set of estimated coefficients presented at the top represent short-run effects of the relevant explanatory variables. They are followed by coefficient estimates representing the long-run equilibrium relationship. The diagnostic test results indicate that the explanatory variables in the selected model are jointly significant (significant $F$-statistic); the residuals are normally

23 With falling dependence of the workforce on agriculture for livelihood (from about 63 percent in 1991 to 45 percent in 2016) and increased urbanization (urban population share increased from about 18 percent to more than 33 percent in 2016), the importance of uncertainty associated with agricultural income for saving behavior may have declined.
distributed (JBN Test); and there is no evidence of serial correlation (LM test) and heteroscedasticity (ARCH test) in the error term, and of functional misspecification (RESET test). A comparison of the estimated F-statistic for bounds test with the critical values of the lower and upper bounds suggest that we can reject the null hypothesis of no cointegration at the 1% significant level. Thus, there is enough evidence of a long-run equilibrium relationship between private saving rate and the selected explanatory variables (PCY, INF, DEP, RIR, and BDN). For a visual inspection of the performance of the selected model, we also plot the actual and fitted values of private saving rate in Figure 2 along with the estimated residuals. The model seems to do a reasonably good job of capturing the movements of saving rate during the sample period.

[Insert Figure 3]

According to these results, per capita income has a significant long-run positive impact on private saving rate. A one percent increase in per capita income leads to a 0.37 percentage point increase in the private saving rate. Even in the short-run, the impact of changes in per capita income on changes in saving rate is positive and statistically significant. Thus, in India, an increase in current income is important for higher private saving, a result that is consistent with the Keynesian saving function that postulates a direct relationship between current income and saving.24 Athukorala and Sen (2004) and Agrawal et al. (2010) draw similar conclusions.

The estimated coefficient for inflation is negative and statistically significant at the 1% level in both the short as well as long run. Ceteris paribus, a one percentage point increase in inflation leads to a 1.23 percentage point decrease, on an average, in private saving rate in the long-run. Thus, it appears that as inflation increases, people tend to dissave in order to maintain a certain level of expenditure. This may also indicate that higher inflation creates uncertainty regarding the future value of accumulated savings and reduce the rate of expected returns on savings and as such people

24 This may also be evidence in support of Modigliani (1993) who notes, “for a sufficiently low value of per capita income, …. the saving-income ratio for given growth would … tend to rise with income.”
save less. This result contradicts those of Krishnamurty et al (1987) and Athukorala and Sen (2004) who seem to suggest that as inflation rises the increased uncertainty leads the private sector to save more in India. Of course, while our sample period includes data from the most recent years in the current millennium, theirs ended in 1982 and 1998 respectively. Thus, the private sector may have valued maintaining a certain level of expenditure and expected loss of returns on savings more than using saving as a hedge against future uncertainty, in recent times indicating a change in saving behavior.

As the age-dependence ratio increases, private saving rate increases in the long run while it decreases in the short run. The estimated coefficients are both statistically significant. These results suggest that as the number of young and old people increases relative to the working age population, the latter group has to spend more to support the larger dependent population reducing their saving in the short run. With less flexibility to mobilize resources in the short time horizon may leave little room but to spend more of their income on those dependent groups. However, with an altruistic motive for giving better lives to their children and a forward-looking risk management strategy to cover for their old age, the society may be able to save more in the long run.

The results for real interest rate is interesting as well. The long-run effect of real interest rate on private saving rate is negative and statistically significant at the 1% level. However, the short-run effect is positive but statistically insignificant. In the long run, a one percentage point increase in real interest rate leads to a 1.27 percentage point decrease in total private saving rate. As we have discussed above, there are two offsetting effects of real interest rate on saving: substitution effect and income effect. In our case, the income effect appears to be dominant. The higher real interest rate tends to increase the lifetime income of the lenders and thereby encourage consumption and discourage savings. This negative result is consistent with those reported in Loayza and

The estimated coefficient for bank density (population per bank branch) is, as expected, negative and statistically significant at the 1% level both in short run as well as long run. This implies that as the accessibility to commercial banks increases (i.e. bank density decreases), the private saving rate increases. This result is consistent with other studies on India (e.g., Krishnamurty et al. 1987; Athukorala and Sen 2004; Agrawal et al. 2010).

Further, after the global financial crisis private saving rate in India has declined significantly since 2010. A careful look at the composition of private saving in India indicates that there was a sharp decline in household financial saving rate after 2010. While it started recovering since 2012, overall private saving continued to decline.

Finally, the speed of adjustment parameter for the EC term is negative and highly statistically significant. Since its absolute vale (0.44) is quantitatively much smaller than 1, it indicates that any deviation from the long run equilibrium for the private saving rate quickly dissipates.25

Overall, per capita income, inflation, age dependency rate, real interest rate, and access to banking are important determinants of private saving rates in India with some interesting differences in the short run and long run effects of age dependency ratio and real interest rate.

4.2 The Household Saving Function

The results for household saving function are presented in Table 4. The parsimonious model selection strategy chooses an ARDL (2, 0, 1, 1, 1, 0) model with per capita real GNP, inflation, age dependency ratio, real interest rate, bank density (in that order with indicated lags), corporate saving

25 A back-of-the-envelope calculation of half-life returns a value of 0.84 years or approximately 10 months. That is, the deviation would dissipate in less than two years.
rate, and two crisis dummy variables for 1992 and post-2010 period to be the most relevant determinants of household saving in India.  

[Insert Table 4]

The diagnostic goodness of fit test results and the plot of actual, fitted, and residuals (Figure 4) indicate that the selected model does a good job of capturing the movements of household saving rate over the sample period. There are some important differences with the private saving function. For example, age dependency ratio and bank density are not significant determinants of household saving in the long run. Further, the estimated coefficients for PCY, INF, and RIR are statistically significant only at the 10 percent level. However, their long-run effects on household saving rate are quantitatively larger.

[Insert Figure 4]

Our results indicate that corporate saving is an important determinant of household saving in short as well as long run. In the long run, a one percentage point increase in corporate saving rate leads to a 3.5 percentage point decrease in the household saving rate but only a 0.78 percentage point decrease in the short run.

The household saving rate fell significantly after the BOP (balance of payments) crisis and economic reform in 1991 and almost continuously since 2010 after the global financial crisis. As Loayza and Shankar (2000) note, the decline may be a reflection of the errors in measuring household saving in the early 1990s as there were portfolio reallocations from physical to financial

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26 In the first stage, we estimate an ARDL Model with a modified specification of Eq. (1) that includes CS and a constant. With maximum lag lengths of 2 for both the dependent and each of the independent variables, there are 3188646 potential models. SIC selects an ARDL (2, 0, 0, 0, 1, 0, 0, 2, 1, 0, 0, 0, 0, 0). In the second stage, we look at the explanatory variables for which estimated coefficients are not significant, conduct F/Wald tests for redundant variable(s) individually and jointly, and if they are not statistically significant, we drop them. from the final specification.
saving. The estimated speed of adjustment parameter of -0.22 indicates a quick dissipation of any deviation from the long-run equilibrium household saving rate.

Overall, per capita income, inflation, real interest rate, and corporate saving are important determinants of household saving rate in both short as well as long run. Additionally, age dependency rate and access to commercial banks also influence household saving behavior in the short run.

5. Discussion

The analysis of over five decades of data indicate that per capita real income and access to banking are the most important positive contributors to boosting private and household saving rates in India. As people earn more in real terms, they tend to save more. Note that per capita income has been consistently rising since 1993 after trade liberalization and market-oriented reforms. If this trend continues and per capita real income gets larger and larger it should have a positive impact on household and private saving rates. Similarly, as the number of bank branches increases, the private agents tend to save more. There are two major policy changes during our sample period that affected the proliferation of banking in India. In 1969, the government of India nationalized all major commercial banks. Subsequently, bank branches were opened both in rural and urban areas and people enjoyed greater accessibility to banking. In the 1990s, along with economic and financial reforms, the government allowed private banks to operate in India. The financial regulators split private sector banks into two groups: old and new. The private sector banks that existed prior to nationalization and continued to operate as private banks because they were either too small or specialized belong to the first group. The private sector banks that obtained their banking license

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27 Athukorala and Sen (1995) discuss this drop in saving rate in early 1990s in more detail.
28 The estimated half-life would be 0.46 years or less.
after the new policy in the 1990s belong to the second group. Although these new private sector banks were allowed to open branches, the bank density (number of people per bank branch) did not change much from around the mid-1980s to the mid-2000s. In fact, bank density slightly increased during the late 1990s and the early 2000s indicating the fact that the expansion of bank branches could not keep up with the population growth. Since 2005, the proliferation has been more rapid. The range of financial products and services has expanded, presumably contributing to the growth of household and private saving rates.

As the rate of inflation increases, private agents in India seem to be more concerned about the uncertainty surrounding the falling real value of their accumulated savings than about the macroeconomic uncertainty that may cost their future earnings completely. The apprehension that their savings would not hold much value and the real return would be low or negative seems to dissuade them from saving. Further, as the middle class grows people in that group may insist on maintaining a certain standard of living, i.e. a level of real expenditures. Consequently, as inflation increases, they dis-save in order to bear the additional nominal expenses.

With respect to the real interest rate, as it increases, the prospect of higher lifetime income seems to outweigh the increased opportunity cost of current consumption to persuade the households and other private agents to increase their current consumption and other expenses and to reduce saving. While this may be the case in the long run, households seem to recognize the increased opportunity cost of current consumption and therefore they increase their saving in the short run. These divergent results may indicate that it takes a while for the households to realize that their lifetime income increases as a result of the increase in real interest rate.

The ways age-dependency rate affects the private (and household) sector’s saving behavior in short and the long-run are interesting and somewhat puzzling. The short-run negative effects are

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29 According a recently published study by Aslany (2019), Indian middle class accounted for about 28% of its total population in 2011-12.
consistent with the expectation and frequently reported empirical results. As the number of dependent population increases, working age population has to spend more and, consequently, can save less. However, our results show that in the long run a higher dependency rate increases savings. It is possible that as parents, particularly middle and high income classes, care more about the quality of raising children, they would save more in anticipation of increased future expenses on children. Furthermore, a greater burden of older people may make the working age population aware of their future predicaments. As the longevity increases with tremendous advances in medical science, people nowadays tend to live longer retirement lives. Thus, they may save more. Apparently, according to a recent report, India is the only country to score more than 7.3 on the Aegon Retirement Readiness Index (ARRI) against the global average of 5.9. However, these conjectures need further investigation that is outside the scope of current study.

We can draw a few policy implications from the results reported here. Macroeconomic policies intended to increase productivity and real income, and lower inflation would contribute to increasing savings rate in India. Similarly, any policy that will facilitate proliferation of banking will also help mobilizing savings.

6. Concluding Remarks

In this paper, we use data from 1960 to 2016 to examine the determinants of private and household saving behavior in India. A desire for parsimony in the face of limited available data and evidence of mixed order of integration for relevant variables considered in this study led us to apply a general-to-specific strategy to an ARDL model for the estimation of the saving functions. This empirical strategy also allows us to study short run and long run dynamics separately. Our results indicate that

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per capita real income and access to banks are significant determinants with favorable impacts on private as well as household saving rates in short as well as long run. Further, as inflation accelerates, the uncertainty about the future value of their accumulated savings and expected real rate of return discourage households and other private agents from saving. A desire to maintain a certain level of real expenditures also contributes to this decrease in saving rate.

An increase in the proportion of dependent population reduces private and household saving rates in the short run while it increases the private saving rate in the long run. The results further indicate that a rise in the real interest rate increases household saving rate in the short run but reduces both private and household saving in the long run. It may be noted that as India formally adopted inflation targeting in June 2016, real interest rates have been consistently high. This could partially explain why household saving rate has continued to decline even after 2016. However, real interest rate does not seem to have any significant impact on total private saving in the short run. Additionally, increased corporate saving tends to reduce household saving in both time horizons. Further, both private and household saving rates have declined significantly after the global financial crisis. Finally, any deviation from the long run equilibrium saving rates dissipates rather quickly. Overall, our results seem to suggest that policies intended to increase per capita income, lower inflation, and increase accessibility to banking will go a long way in increasing private and household saving in India.

One major limitation of using aggregate data is that it does not adequately capture various heterogeneities (level of education and gender of the head of the household etc.) of the private sector agents that may be important for their saving behavior. An analysis of micro-level data collected through appropriately designed national sample survey may be the direction for future research to pursue.
References


Aslany, M. 2019. The Indian middle class, its size, and urban-rural variations. *Contemporary South Asia* 27(2), 196-213.


Figure 1. Saving, investment, and growth in India: 1960 - 2016
Figure 2. Household (HH) and private saving (PRV) rates in India: 1960-2016
Figure 3. Actual, fitted values of private saving rate and estimated residuals: 1969-2016

Figure 4. Actual, fitted values of household saving rate and estimated residuals: 1969-2016
<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Std. Dev.</th>
<th>Observations</th>
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<td>(2)</td>
<td>(3)</td>
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<td>6.2</td>
<td>57</td>
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<td>3.4</td>
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<td>-7.6</td>
<td>3.2</td>
<td>57</td>
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<td>$PCY$ (2005 Constant INR)</td>
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<td>52800</td>
<td>8964</td>
<td>11813</td>
<td>57</td>
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<td>$W$ (2005 Constant INR)</td>
<td>12185</td>
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<td>14308</td>
<td>57</td>
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<tr>
<td>$INF$ (%)</td>
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<td>7.5</td>
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<td>27.6</td>
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<td>1.2</td>
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<td>72.9</td>
<td>81.1</td>
<td>51.5</td>
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<td>$RIR$ (%)</td>
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<td>56†</td>
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<tr>
<td>$BC$ (%)</td>
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<td>8.0</td>
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<td>$BDN$ (No.)</td>
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<td>15220</td>
<td>62697</td>
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<td>48‡</td>
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<td>2.1</td>
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<tr>
<td>$PUB$ (%)</td>
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<td>57</td>
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<tr>
<td>$FOR$ (%)</td>
<td>1.3</td>
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<td>0.1</td>
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Notes: † data are available only since 1961; ‡ data are available since 1969
Source: Authors’ calculations from HSIE and WDI data
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<td>-7.64***</td>
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<td>GY (%)</td>
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<td>W (2005 Constant INR)</td>
<td>-3.40*</td>
<td>-4.42***</td>
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<tr>
<td>INF (%)</td>
<td>-5.82***</td>
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<td>AGSH (%)</td>
<td>-2.97</td>
<td>-7.56***</td>
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<tr>
<td>GPOP (%)</td>
<td>-2.19</td>
<td>-10.36***</td>
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<tr>
<td>DEP (%)</td>
<td>-0.68</td>
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<tr>
<td>RIR (%)</td>
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<td>I(0)</td>
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<td>BC (%)</td>
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<td>BDN (No.)</td>
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<td>PUB (%)</td>
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Table 2. Unit root test results
### Table 3. ARDL estimation of the private saving function for India, 1960 – 2016

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard error</th>
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<tr>
<td>Constant</td>
<td>-158.70***</td>
<td>24.72</td>
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<tr>
<td>(\Delta PV/S_{t,1})</td>
<td>-0.19*</td>
<td>0.10</td>
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<tr>
<td>(\Delta \ln(\text{PCY}))</td>
<td>15.97***</td>
<td>4.94</td>
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<tr>
<td>(\Delta \text{INF})</td>
<td>-0.19***</td>
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<td>(\Delta \text{DEP})</td>
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<td>(\Delta \text{DEP}_{t,1})</td>
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<td>(\Delta \text{RIR})</td>
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<td>(\Delta \ln(\text{BDN}))</td>
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<td>0.93</td>
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<td>(\text{CRD2})</td>
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<tr>
<td>(\text{ECM}_{t,1})</td>
<td>-0.44***</td>
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**Long-run equilibrium relationship (cointegrating relationship)**

<table>
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<tr>
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<tr>
<td>(\ln(\text{PY}))</td>
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<td>(\text{DEP})</td>
<td>1.57**</td>
<td>0.58</td>
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<tr>
<td>(\text{RIR})</td>
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<tr>
<td>(\ln(\text{BDN}))</td>
<td>-7.92***</td>
<td>2.29</td>
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</table>

**Standard diagnostic test results**

- Adjusted R-squared: 0.58
- F-statistic: 10.36 (p-value: 0.00)
- Jarque-Bera Normality (JBN) Test: 0.81 (p-value: 0.67)
- Serial Correlation LM Test: 0.18 (p-value: 0.84)
- Heteroscedasticity ARCH Test: 0.99 (p-value: 0.32)
- RESET Test: 0.01 (p-value: 0.92)

**Bounds test result**

- F-test statistic: 5.98

<table>
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<tr>
<td>5%</td>
<td>2.62</td>
<td>3.79</td>
</tr>
<tr>
<td>1%</td>
<td>3.41</td>
<td>4.68</td>
</tr>
</tbody>
</table>

Notes: *** indicates significance at the 1% level; ** significance at the 5% level; and * significance at the 10% level. Newey-West Heteroscedasticity-Autocorrelation-Consistent (HAC) standard errors are reported.
### Table 4. ARDL estimation of the household saving function for India, 1960 – 2016

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard error</th>
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<td>ΔINF</td>
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<td>ΔDEP</td>
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<tr>
<td>ΔRIR</td>
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<td>0.05</td>
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<tr>
<td>Δln(BDN)</td>
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<tr>
<td>CRD1</td>
<td>-2.91***</td>
<td>1.05</td>
</tr>
<tr>
<td>CRD2</td>
<td>-4.27***</td>
<td>0.82</td>
</tr>
<tr>
<td>ECM$_{t-1}$</td>
<td>-0.22***</td>
<td>0.11</td>
</tr>
</tbody>
</table>

**Long-run equilibrium relationship (cointegrating relationship)**

<table>
<thead>
<tr>
<th>Variables</th>
<th>Coefficient</th>
<th>Standard error</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(PY)</td>
<td>94.83*</td>
<td>54.19</td>
</tr>
<tr>
<td>INF</td>
<td>-1.47*</td>
<td>0.78</td>
</tr>
<tr>
<td>DEP</td>
<td>4.02</td>
<td>2.92</td>
</tr>
<tr>
<td>RIR</td>
<td>-1.40*</td>
<td>0.72</td>
</tr>
<tr>
<td>ln(BDN)</td>
<td>-8.44</td>
<td>5.12</td>
</tr>
<tr>
<td>CS</td>
<td>-3.50**</td>
<td>1.42</td>
</tr>
</tbody>
</table>

**Standard diagnostic test results**

- Adjusted $R$-squared: 0.66
- Jarque-Bera Normality Test (JBN) Test: 0.16 (p-value: 0.92)
- Serial Correlation LM Test: 0.36 (p-value: 0.70)
- Heteroscedasticity ARCH Test: 0.44 (p-value: 0.51)
- RESET Test: 0.06 (p-value: 0.81)

**Bounds test result**

- $F$-test statistic: 5.16

### Critical values for $k = 6$

<table>
<thead>
<tr>
<th></th>
<th>Lower bound</th>
<th>Upper bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>10%</td>
<td>2.12</td>
<td>3.23</td>
</tr>
<tr>
<td>5%</td>
<td>2.45</td>
<td>3.61</td>
</tr>
<tr>
<td>1%</td>
<td>3.15</td>
<td>4.43</td>
</tr>
</tbody>
</table>

Notes: *** indicates significance at the 1% level; ** significance at the 5% level; and * significance at the 10% level. Newey-West Heteroscedasticity-Autocorrelation-Consistent (HAC) standard errors are reported.