Effect of Interest Rate on Consumption*

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Abstract

This paper estimates the response of consumption to higher real interest rate. We exploit the change in Indian banking legislation which encourages all banks to offer a higher interest rate on deposits to citizens above sixty years. We use Indian National Sample Survey for monthly consumption expenditure and calculate regression discontinuity estimates, based on age cut-offs. We find that an increase of 50 basis points in interest rate leads to an immediate decline of consumption expenditure by 10 percent. A breakup of monthly consumption expenditure reveals that the decline is primarily in non-food, non-essential items. Next, we calculate similar estimates for data prior to the banking legislation and find no significant difference in the monthly consumption expendture.

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1 Introduction

Under the Permanent Income Hypothesis the elasticities of consumption and saving to interest rate depends on the model parameters such as the intertemporal elasticity of substitution. These elasticities have wide ranging implications for monetary policy, business cycles [King, Plosser and Rebelo 1988], and tax incentives for saving. Most studies have found small effects of interest rates on consumption and saving [e.g. Hall 1988]. However, it remains unclear whether interest rate elasticities are truly small or these findings are spurious due to endogeneity of interest rate [Summers 1982, Hall 1988 and Balassa 1989] or measurement problems like the difficulty of observing household specific interest rate [Browning and Lusardi 1996; Mishkin 1995].

To test the real effect of interest rate, this paper exploits an Indian banking legislation of April 2001, when the Reserve Bank of India permitted and actively encouraged banks to offer higher interest rates on fixed deposits of any size to senior citizens - defined as people over 60 years of age. The Government of India too launched a Senior Citizens Savings Scheme (SCSS) in 2004 with higher interest rate exclusively for the benefit of senior citizens. Today all private and public sector banks in India provide a higher interest rate to senior citizens amounting to 50 basis points on an average. This provides a neat identification strategy. We use the regression discontinuity

approach to estimate the precise causal effect that interest rate has on consumption and savings of individuals.

This paper makes two major contribution to the literature. First, it employs unusually good data from two sources - the National Sample Survey (NSS) 61st Round (2005-06) from India for consumption details and proprietary client level savings data from a leading private bank in India which includes transaction details and exact birth dates of clients. The NSS includes a representative sample of close to 40,000 households while the bank data is for 800,000 clients. The bank data has monthly transactions and balance details of all accounts that an individual client possesses with the particular bank.

Second, the methodology used in this paper precisely estimates the causal effect of interest rate on savings and consumption by overcoming the bias due to endogenous relationship of interest rate to savings and consumption.

To preview the results, we find that an increase of 50 basis points in interest rate leads to an immediate decline of consumption expenditure by 11 percent. A breakup of monthly consumption expenditure reveals that the decline is primarily in non-food, non-essential items. Next, we compare the change in consumption expenditure prior to the banking legislation and find no significant difference.

The paper proceeds as follows. Section II describes the empirical strategy, while section III describes the data. Sections IV and V discuss results for Consumption and Savings respectively. Section VI discusses an alternate hypothesis that could explain the pattern of results and provides evidence against it - robustness check. Section VII concludes with policy implications.

2 Empirical Strategy

Our main empirical approach exploits the discontinuity in interest rate at age 60 to estimate the causal effect of interest rate on consumption. A linear model estimated by OLS provides a starting point:

$$C_{ia} = \alpha + \beta_1 r_{ia} + X_{ia}\beta_2 + \epsilon_{ia} \tag{1}$$

where C_i is the monthly consumption expenditure of individual i of age a , r_i is the rate of interest earned by this individual and X_i is a vector of household variables and the errors ϵ_i are independently distributed.

To improve on equation C1, we exploit the exogenous variation on the interest rate earned by individual above 60 years of age. Identification of interest rate effect on consumption is based on comparing the outcomes of "treated" individuals consumption expenditure, who are 60 years and above with those of the control group - individuals who are just below the cutoff age. The causal

interpretation of such comparisons hinges upon the assumption that birth dates are random near the cutoff. In our context this is perfectly valid assumption. Consider the regression model:

$$C_{ia} = \alpha + \beta_1 D_{ia} + \delta(a) + X_{ia}\beta_2 + \epsilon_{ia} \tag{2}$$

where the effect of age on consumption is captured by $\delta(a)$ and D is a treatment dummy that captures higher interest rate for individuals who are 60 years or older. In equation C2, β_1 is the causal effect on consumption of an unit increase in interest rate. The identification assumption that underlies the regression discontinuity strategy is that $\delta(a)$ is a smooth function. Under this assumption, the treatment effect β_1 is obtained by estimating the discontinuity in the empirical regression function at the point where the treatment variable switches from 0 to 1. We have a "sharp" RD design since the treatment variable is a deterministic function of the regression variable (age).

The assumption that $\delta(a)$ is a continuous function means that differential interest rates are the only source of discontinuity in consumption level at age 60, after we control for observables X. There is, however, one crucial factor why the assumption of $\delta(a)$ being a continuous function at age 60 may be violated and we could find an abrupt change in consumption at age 60. The government of India revised the retirement age of employees from age 58 to 60 in 2000 and this

could potentially affect the consumption expenditure of households. We resolve this problem by only looking at sample of self employed households as there is no strict retirement age for this category.

We need to adapt the RD approach to the limitations of the data. One problem is that we only observe the age in years of the individual at the census day. This means that the best we can do is to compare all individuals who are 60 at census date. In other words, we cannot compare people who "just turned 60" to people "just about to turn 60". Because of this limitation, all the information available in the data can be summarized in the age specific means of the variables. The empirical model we work with is the age cell version of equation 2:

$$C_a = \alpha + \beta_1 D_a + \delta(a) + X_a \beta_2 + \epsilon_a \tag{3}$$

Regression estimates of equation 2 based on micro data are identical to weighted estimates of equation 3 when the weight used is the number of observations by age group. The bandwidth in our analysis is one year period. We have compared the consumption level of 60 year old population with that of 59 year old and 61 years old population.

3 Data Description

We used a nationwide sample from India collected by the National Sample Survey Organization (NSSO) as a part of it's 62nd round (July 2005-June 2006). The NSSO conducts regular consumer expenditure surveys through household interviews, using a random sample of households covering practically the entire geographical area of India. The household consumer expenditure schedule used for the survey collected information on quantity and value of household consumption with a reference period of "last 30 days" for some items of consumption and "last 365 days" for some less frequently purchased items. To minimize recall errors, a very detailed item classification was adopted to collect information, including 148 food items, 13 items of fuel, 28 items of clothing, bedding and footwear, 18 items of educational and medical expenses, 52 items of durable goods and about 85 other items. The total sample size is 39436 households of which 18992 are rural households and 20444 are urban.

The all India average monthly per capita consumption expenditure for a rural household was Rs.625 (USD14.7) and for an urban household was Rs.1171(USD27.6). A food and non-food breakup reveals that rural households on average spend Rs.333 on food and Rs.291 on non-food items. For urban households the magnitude is reversed as they spend lesser on food, (Rs.468)

and more on non-food (Rs.703). Table 1 highlights the summary statistics for an average Indian household.

Apart from consumption expenditure, the NSS data also has information on some additional aspects – mainly qualitative – of living conditions. The specific aspects are structure of dwelling unit, energy used for cooking and lighting, educational level of population, land ownership and covered area of dwelling unit. In addition, information on household occupational type and social group as well as occupancy status are also available.

In our analysis we are only looking at households that are self employed. The occupation definitions are based on the source of income. Several households are engaged in more than one form of occupation so the definitions depend on the majority source of income. From table 1, we see that nearly 60 percent of households are self employed. The self employed category includes households self engaged in agriculture, self employed in non-agriculture and urban self employed households.

For information on interest rates, we have looked at all private banks, public banks, foreign banks, State Cooperative banks and regional rural banks in India. The Reserve Bank of India displays their names and some details on its website. Data on exact interest rates that are being offered to senior citizens are available on their websites. On an average banks are offering about

50 basis points higher interest rates to senior citizens.

We provide a simple graphical representation of the monthly consumption expenditure for different age population. Figures1a and 1b shows the kernel densities of monthly household consumption expenditure. Figure 1a shows the kernel densities for the year 2005-06 which was after the banking legislation and figure 1b shows the densities for the year 2000-2001 which was before the legislation. It is clearly evident from the two graphs that the household monthly consumption expenditure is lower for the 60 year population than the 59 year olds in the year 2005-06. However there is no obvious difference in the year 2000-2001 which was prior to the change in banking norm. We have also tested for the equality of distributions using Kolmogorov - Smirnov tests which confirms that the distributions are statistically different in 2005-06 and equal in 2000-01.

4 Empirical Results

Our results based on the specification in section 2 are shown in the tables 2 through 4. First we look at the change in monthly household consumption expenditure (MHCE) in table 2. Then in order to understand the exact source of this reduction in consumption, we disaggregate the MHCE across food and non food items in table 3. Then finally in table 4, we look at the change in MHCE in 2000-01 i.e. before the banking legislation was changed.

In all the regressions we have used the logarithm of household monthly consumption expenditure as the dependent variable. The coefficients of interest are the ones against age dummies. There are some standard controls like the size of household, education level, amount of land owned, type of dwelling unit and energy used for cooking and lighting. We also have additional controls to capture state level effects and urban-rural effect by adding state dummies and a dummy for urban.

Our total sample consist of self employed households whose oldest members are 59, 60 or 61 years old. In the first set of regressions we have a sample size of 1470 households and prior to the banking legislation i.e. for the year 2000-01, we have a sample size of 2484 households. We use two age dummies. The first age dummy (Dummy for age=60) equals 1 if the oldest household member is 60 years of age and 0 if they are 59 years old. The second age dummy (Dummy for age=61) equals 1 if the oldest household member is 61 years old and 0 if they are 59 years old. So the benchmark group for both is age of 59 years.

4.1 Results (2005-06) and Discussion

Table 2 has the results of an OLS regression and the dependent variable is logarithm of the total monthly consumption expenditure of a household. Coefficient on the 60 age dummy is 0.1 and statistically significant. The average increase in interest rate for individuals who are 60 and older

is 50 basis points across all banks in India. This implies that when the interest rate increases by 50 basis points, the consumption of households aged 60 falls by 10 percent. This is not, however, the case for 61 year old households. This group too earns higher interest rate but their consumption is not significantly different from 59 year olds. The coefficient on 61 is small and statistically not significant.

The results reveal an interesting age-wise pattern to the effect of higher interest rate. There is an immediate reduction in consumption or an intertemporal substitution when interest rate is increased. However, over the long run the effect on consumption is smaller. This could be due to an income effect i.e. consumption rises due to higher income from interest earnings. It is important to note here that the 61 year old population in our sample also earned the higher interest rate when they were 60. This is because the data is from 2005-06 while the banking norm changed from middle of 2001 onwards. As expected, the household size and asset holdings positively impact the monthly consumption level. Households with more members consume more while households with larger covered area dwellings consume more. These are statistically significant results.

Next, to understand where the reduction in consumption is coming from, we will disaggregate the monthly consumption expenditure into food and non-food items. We run the same regressions on these two groups of expenditure separately. The findings are not unexpected. We see that an

increase in interest rate does not affect household expenditure on food items. The coefficient is insignificant. Whereas there is a significant reduction of nearly 13 percent on non-food consumption expenditure. Non food items include durables, clothing, footwear, medical and educational and travel expenses.

Once again within each of these categories of expenses, the 61 year dummy is insignificant. This implies that despite the higher interest rate earned by a 61 year old, her food and non-food expenses are not different from a 59 year old. The size of household and asset holding positively affects consumption expenditure for both food and non-food items.

4.2 Results (2000-01) and Discussion

Prior to the banking norm that lead to higher interest rate for senior citizens, was there a marked difference in the consumption pattern of 60 year olds from 59 year olds? To answer this question, we look the NSS round of 2000-01 which was held just before the change in banking norm in the middle of 2001. We run the regression with the same specification as before using the same controls. The sample size however is larger with 2484 households.

The results confirm our story. The coefficients on both the age dummies are insignificant. This implies that when there was no difference in the interest rates for people of 60 year and above,

there was no difference in their consumption behavior. The size of the coefficients on the 60 year dummy is similar to the 61 year dummy implying that both groups are not significantly different from 59 year group in consumption expenditures.

The effect of household size and asset holding on consumption is positive and the size of the coefficients are similar to earlier results.

5 Conclusion

The findings of earlier works that have measured interest rate elasticities are spurious due to endogeneity of interest rate and/or measurement problems like the difficulty of observing household specific interest rate. To test the real effect of interest rate, this paper exploits an Indian banking legislation of April 2001, when the Reserve Bank of India permitted and actively encouraged banks to offer higher interest rates on fixed deposits of any size to senior citizens - defined as people over 60 years of age. The Government of India too launched a Senior Citizens Savings Scheme (SCSS) in 2004 with higher interest rate exclusively for the benefit of senior citizens. Today all private and public sector banks in India provide a higher interest rate to senior citizens amounting to 50 basis points on an average. This provides a neat identification strategy. We use the regression discontinuity approach to estimate the precise causal effect that interest rate has on consumption

of individuals.

Our basic findings are that an increase of 50 basis points in interest rate leads to an immediate decline of consumption expenditure by 10 percent. A breakup of monthly consumption expenditure reveals that this decline is primarily in non-food, non-essential items and the magnitude is 12.8 percent. There is no significant change in the consumption of essentials and food items.

The results also reveal an interesting age-wise pattern to the effect of interest rate. There is an immediate reduction in consumption when interest rate is increased. This is captured by reduced consumption expenditure of 60 year olds in comparison to 59 year olds. However, over the long run the effect of interest rate on consumption is smaller as is shown by insignificant difference in consumption expenditure of 61 year olds to the 59 year olds. This could be due to an income effect. Next, we compare the results with data prior to the banking legislation and find no significant difference in consumption behavior of different age groups.

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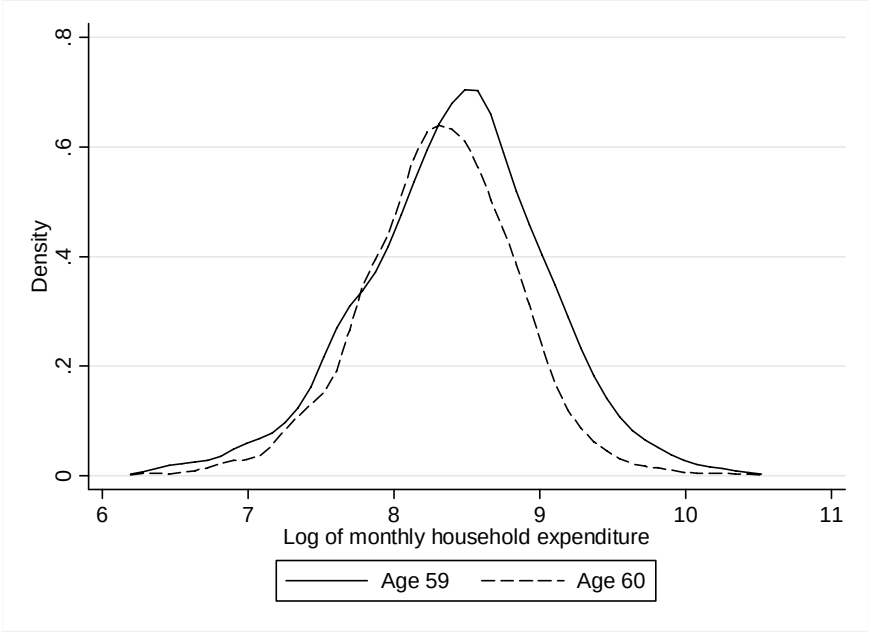
Table 1: Summary Statistics

Variable	Mean	Standard Deviation	Observations
Monthly Household Expenditure (in Rs.)			
Total	3902.73	124.46	1482
Food-Group	2019.25	58.26	1482
Non-Food Group	1883.53	77.36	1482
Incremental Interest Rate (basis points) roi(60years) – roi (59years)	47.06	25.23	76
Self employed households (dummy)	.59		1482

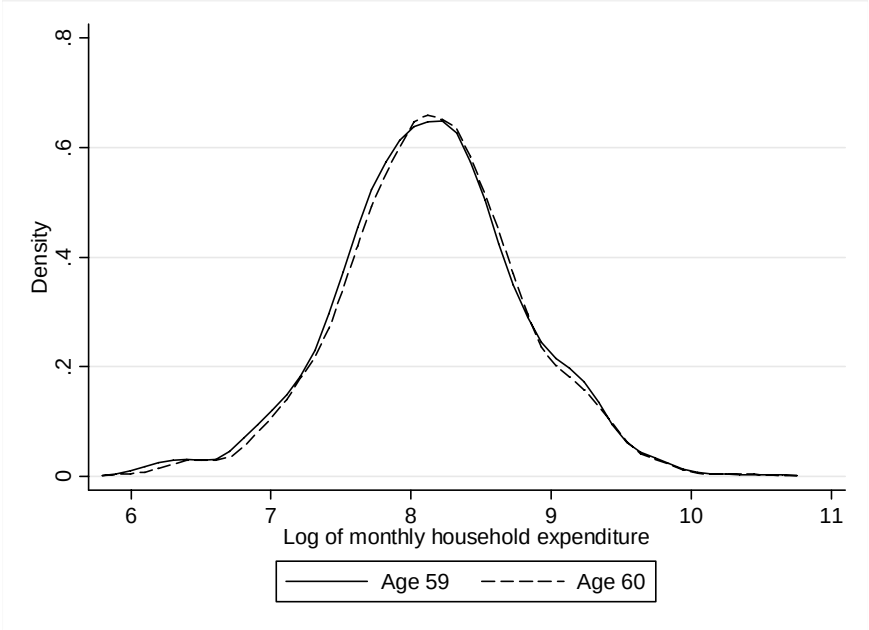
Source: Household Consumer Expenditure in India, 2005-06; NSS 62nd Round (July 2005-June 2006); National Sample Survey Organization, Ministry of Statistics and Programme Implementation, Government of India

Figure 1a: Kernel density graphs of Monthly Household Consumption Expenditure (2005-2006)



Source: National Sample Survey 62nd Round (July 2005 – June 2006): Household Consumption Expenditure in India

Figure 1b: Kernel density graphs of Monthly Household Consumption Expenditure 2000-2001)



Source: National Sample Survey 56th Round (July 2000 – June 2001): Household Consumption Expenditure in India

Table 2: Monthly Household Expenditure (OLS)

	Dependent variable: Log (MHE)
Dummy for Age = 60	-.10*
	(0.053)
Dummy for Age = 61	-.03
	(.074)
Log of Household Size	.665***
	(0.029)
Log of covered area	.12***
	(.03)
Number of Observations	1470
R^2	0.76

Note – Standard errors are in parenthesis; * significant at 10 % confidence; ** significant at 5 % confidence; *** significant at 1 % confidence. There are additional controls for education level, amount of land owned in hectares, dwelling unit, dwelling type, energy source used for cooking, lighting source and dummies for urban and state. Source: National Sample Survey 62nd Round (July 2005 – June 2006): Household Consumption Expenditure in India

Table 3: Monthly Household Expenditure (OLS) (Food- non food breakup)

	Log (MHE) **Food Items**	Log (MHE) **Non-Food Items**
Dummy for Age = 60	-.075	-.128*
	(0.047)	(.071)
Dummy for Age = 61	.060	-.035
	(0.066)	(.091)
Log of Household Size	.699***	.639***
	(0.032)	(.040)
Log of covered area	.072***	.166***
	(0.027)	(.036)
Number of Observations	1470	1470
R^2	0.773	0.693

Note – Standard errors are in parenthesis; * significant at 10 % confidence; ** significant at 5 % confidence; *** significant at 1 % confidence. There are additional controls for education level, amount of land owned in hectares, dwelling unit, dwelling type, energy source used for cooking, lighting source and dummies for urban and state. Source: National Sample Survey 62nd Round (July 2005 – June 2006): Household Consumption Expenditure in India

Table 4: Monthly Household Expenditure (OLS)

	Dependent variable: Log (MHE)
Dummy for Age = 60	-.03 (0.080)
Dummy for Age = 61	.037 (0.098)
Log of Household Size	.672*** (0.036)
Log of covered area	.111*** (.080)
Number of Observations	2484
R^2	0.71

Note – Standard errors are in parenthesis; * significant at 10 % confidence; ** significant at 5 % confidence; *** significant at 1 % confidence. There are additional controls for education level, amount of land owned in hectares, dwelling unit, dwelling type, energy source used for cooking, lighting source and dummies for urban and state. Source: National Sample Survey 56th Round (July 2000 – June 2001): Household Consumption Expenditure in India