

Financial Inclusion and Household Welfare: An Entropy-Based Consumption Diversification Approach

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Introduction

- ▶ Does higher financial inclusion, measured through higher access to formal banking, lead to enhanced household welfare?
 - ▶ Higher financial inclusion leads to easier access to savings and credit facilities (Bharadwaj and Suri, 2020) ...
 - ▶ which can alter production and employment choices (Banerjee, 2004) ...
 - ▶ which, in turn, can lead to higher income and, thus, change the pattern of consumption expenditure (Engel, 1895)
- ▶ The empirical evidence, however, remains inconclusive:
 - ▶ Poverty declines through higher deposit mobilization and credit disbursement (Burgess and Pande, 2005; Young, 2015)
 - ▶ However, expansion in access to banking can also increase consumption inequality (Kochar, 2011)
- ▶ We study the association between financial inclusion and household welfare using the recent PMJDY initiative as the backdrop.

Outline

Data and Methodology

- ▶ We use country-wide household-level panel data, from the Consumer Pyramids survey by the CMIE
- ▶ We employ fixed effects panel data method as our main empirical strategy.
- ▶ Additionally, we use Hausman-Taylor estimation method (Hausman and Taylor 1981; Poprawe 2015; Quayes 2015)
- ▶ To measure household-level welfare, we compute Theil's entropy-based consumption diversity index for each household and for each wave (Chai et al. 2015; Chakrabarty and Mandi 2019; Falkinger and Zweimüller 1996; Theil and Finke 1983)

Outline

Findings

- ▶ We find an increase in diversity due to increase in total expenditure after introduction of PMJDY scheme.
 - ▶ The effect on food items is ambiguous - the effect is negative immediately after launch of the programme, but is positive after one year of launch
 - ▶ The effect on non-food expenditure, as well as on the shift from food to non-food expenditure are on the expected lines

Financial Inclusion Programmes in India

- ▶ Various programmes have been undertaken over the last 50 years
- ▶ In 1969, the RBI mandated commercial banks to open branches in rural unbanked locations
- ▶ In 2006, financial extension services were implemented
- ▶ Commercial banks were encouraged, simultaneously, to provide zero minimum balance accounts access to the economically weaker section
- ▶ The Pradhan Mantri Jan Dhan Yojna (PMJDY), was launched in August 2014

PMJDY

- ▶ Announced by the Prime Minister on 15th August, 2014; formally launched on 28th August.
- ▶ The primary aim is to open one bank account per household. allows zero balance accounts in public sector, private sector, as well as in RRBs.
- ▶ Additionally, an overdraft facility of up to Rs. 10,000, life insurance cover of Rs. 30,000, and a debit card with in-built accidental insurance coverage of Rs. 100,000 are included.
- ▶ The scheme also aims to provide DBTs through these accounts.
- ▶ 180 million accounts opened within the first year of launch; 325 million accounts opened within three years of launch.

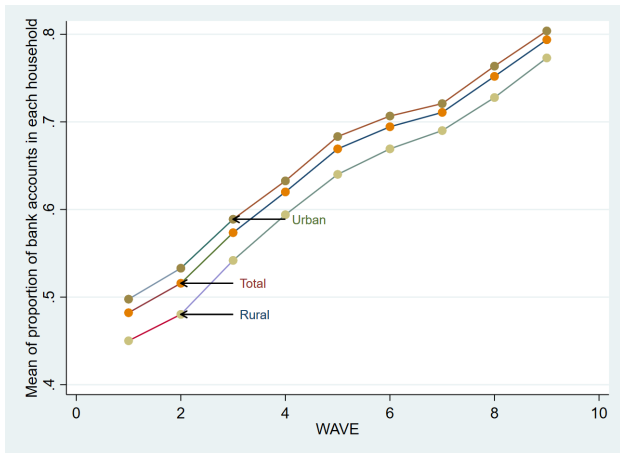
Data Source

- ▶ We use Consumer Pyramids Survey data, collected by the CMIE
 - ▶ Large representative sample for both rural as well as urban households
 - ▶ Data collected in 'waves'; one wave spans four months; three waves in a year
 - ▶ Panel data—same households surveyed over periods
 - ▶ Collects information on demographic characteristics, income and consumption, asset holding, among other variables
- ▶ We use the first nine waves of data, starting from January 2014 to December 2016
 - ▶ Subsequent waves are excluded to avoid confounding effects of other large macroeconomic shocks

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- ▶ We use the first nine waves of data, starting from January 2014 to December 2016
 - ▶ Subsequent waves are excluded to avoid confounding effects of other large macroeconomic shocks
- ▶ The main independent variable of our interest is the indicator that captures bank account opening status for each member of a household, for each wave

Trend of the proportion of household members holding a bank account



There was approximately 6 percentage point jump in the number of mean bank accounts per household between wave 2 and wave 3, and the difference is statistically significant.

Empirical Strategy

Dependent variable

- ▶ We use diversification of consumption expenditure as the measure of household welfare (Chai et al. 2015; Chakrabarty and Mandi 2019; Clements et al. 2006)
- ▶ Specifically, we consider entropy-based measure proposed by Henry Theil (Theil 1967; Theil and Finke 1983).
 - ▶ Entropy in general captures the degree of 'dividedness' in a system.
 - ▶ Theil introduces this concept as a 'measure of dividedness' of economic variables, such as racial division, industrial diversification, political diversification etc. (Theil 1972).
 - ▶ One advantage of using Theil's measure is that it allows decomposition of the diversity index into two components: the diversity within separate entities and also the diversity between these entities (Palan 2010; Reardon and Firebaugh 2002).

Theil's Diversification Index

- ▶ If a household consumes n commodities, and spends w_i share of its total budget on i^{th} commodity, then Theil's diversification measure $H(w)$ is given by:

$$H(w) = -\left(\sum_{i=1}^n w_i \log w_i\right) \dots (1)$$

- ▶ Further, Theil's Entropy Decomposition Theorem shows that overall entropy can be divided into within group and between groups entropy as follows:

$$\text{Overall entropy} = \text{Between Group entropy} + \text{Weighted average of within group entropies} \dots (2)$$

- ▶ We consider two broad groups of commodities: food items and non-food items. The entropy measure between these two broad groups gives the between-group entropy.
- ▶ Within each of these broader groups, we construct several sub-groups. There are 13 sub-groups within the food group and 7 sub-groups in the non-food group.

Hypotheses: Income channel

- ▶ We hypothesize the link between financial inclusion and welfare gain through the following channel:
 - ▶ financial inclusion improves employment opportunities, and thus household income
 - ▶ Increased income leads to both increase and diversification of consumption expenditure
- ▶ Accordingly, we formulate our hypotheses as follows:

Financial inclusion will -

- ▶ H1: lead to diversification in food expenditure
- ▶ H2: lead to diversification in non-food expenditure
- ▶ H3: lead to shift in expenditure from 'within only food group' to 'between food group and non-food group'.

Two-stage regression model

- ▶ First stage:

$$\log MCPE_{it} = \alpha_0 + \alpha_1 PMJDY1_t + \alpha_2 PMJDY2_t + \alpha_3 AssetIndex_{it} + \alpha_4 No.ofChildren_{it} + \alpha_5 MeanEdu_{it} + \alpha_6 PropWorking_{it} + \alpha_7 Wave_t + \sum_{k=1}^3 \alpha_k^{caste} Caste_i + \sum_{j=1}^2 \alpha_j^{Religion} Religion_i + \sum_{s=1}^{19} \alpha_s^{State} State_i + \rho_i + u_{it} \dots \quad (3)$$

- ▶ Second stage:

$$Y_{it} = \beta_0 + \beta_1 \log \widehat{MPCE}_{it} + \beta_2 AssetIndex_{it} + \beta_3 No.ofChildren_{it} + \beta_4 MeanEdu_{it} + \beta_5 Wave_t + \sum_{k=1}^3 \beta_k^{caste} Caste_i + \sum_{j=1}^2 \beta_j^{Religion} Religion_i + \sum_{s=1}^{19} \beta_s^{State} State_i + \mu_i + \epsilon_{it} \dots \quad (4)$$

- ▶ We use these equations to run six sets of regressions, separately for rural and urban regions.

Control variables

- ▶ MPCE: Deflated using 2012 CPI as base
- ▶ Assets (Campbell and Cocco 2007; Caceres 2019): 19 types of household-related or financial assets considered
- ▶ Education (Maitra Ray, 2004): Level of education, averaged over all members of HH
- ▶ Number of children (Flurry, 2007): HH members below age 16 are considered children
- ▶ Proportion of working members
- ▶ Caste (Borooah et al. 2014): i) Sc or ST, ii) OBC, iii) Intermediate Caste, iv) Socially Advantaged Caste
- ▶ Religion (Khamis et al. 2012): i) Muslim, ii) Buddhist, Christian, Jain, & Sikh, iii) Hindu

Descriptive Statistics

Variable	Description	Mean	Std. Dev.	Min.	Max.
PANEL A: RURAL					
MPCE (Rs.)	Monthly Per Capita Total Expenditure	1,609.23	941.48	185.90	61,269.34
	Per Capita Food Expenditure	866.51	368.79	0	5,071.34
	Per Capita Non-food Expenditure	578.04	576.72	0	60,001.53
Caste (proportion)	Upper Caste	0.15	0.36	0.00	1.00
	SC or ST	0.36	0.48	0.00	1.00
	OBC	0.36	0.48	0.00	1.00
	Intermediate Caste	0.13	0.34	0.00	1.00
Religion (proportion)	Hindu	0.89	0.32	0.00	1.00
	Muslim	0.06	0.24	0.00	1.00
	Buddist/Christian/Jain/Sikh	0.05	0.22	0.00	1.00
Assets Index		0.24	0.07	0.00	0.89
No. of Children	Number of children in the household	1.11	1.21	0.00	9.00
PANEL B: URBAN					
MPCE (Rs.)	Monthly Per Capita Total Expenditure	2,130.40	1,395.33	0	61,463.47
	Per Capita Food Expenditure	1,033.23	473.32	0	8,435.55
	Per Capita Non-food Expenditure	846.60	826.51	0	55,655.17
Caste (proportion)	Upper Caste	0.30	0.46	0.00	1.00
	SC or ST	0.24	0.43	0.00	1.00
	OBC	0.38	0.48	0.00	1.00
	Intermediate Caste	0.08	0.28	0.00	1.00
Religion (proportion)	Hindu	0.85	0.35	0.00	1.00
	Muslim	0.09	0.28	0.00	1.00
	Buddist/Christian/Jain/Sikh	0.06	0.23	0.00	1.00
Assets Index		0.23	0.06	0.00	0.84
No. of Children	Number of children in the household	0.98	1.12	0.00	11.00

Independent effect of financial inclusion

- ▶ Apart from the income channel mentioned above, financial inclusion may affect welfare through other channels as well (Annim and Frempong 2018; Lai et al. 2020)
- ▶ To investigate this, we run six more regressions. While the first stage remains same as before, the modified second stage is as below:

$$Y_{it} = \beta_0 + \beta_1 PMJDY1_t + \beta_2 PMJDY2_t + \beta_3 \log \widehat{MPCE}_{it} + \beta_4 AssetIndex_{it} + \beta_5 No.ofChildren_{it} + \beta_6 MeanEdu_{it} + \beta_7 Wave_t + \sum_{k=1}^3 \beta_k^{caste} Caste_i + \sum_{j=1}^2 \beta_j^{Religion} Religion_i + \sum_{s=1}^{19} \beta_s^{State} State_i + \mu_i + \epsilon_{it} \dots (5)$$

- ▶ If β_1 and β_2 are greater than zero, that should indicate presence of separate channel(s)

Estimation Method

- ▶ The error terms turn out to be Non-IID; Therefore, we perform and report alternative Hausman Test.
 - ▶ The test indicates Fixed Effects estimation method
- ▶ Additionally, we employ Hausman-Taylor estimation method to take care of endogeneity of remaining variables (such as wealth)
 - ▶ This method yields coefficients for the time-invariant variables as well

Results: First-stage regression

Variable	Rural	Urban
PMJDY1	0.0159*** (0.00289)	0.0370*** (0.00197)
PMJDY2	0.132*** (0.00290)	0.133*** (0.00206)
Control variables	Yes	Yes
Constant	7.445*** (0.0132)	7.719*** (0.0122)
Observations	145,962	301,684
R-squared	0.166	0.118
Number of HH	16,218	33,521

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Results: Food Index

Variable	Rural	Urban	Rural	Urban	Rural	Urban
PMJDY1					-0.00412*** (0.00129)	-0.00356*** (0.000943)
PMJDY2					0.0239*** (0.00236)	0.0313*** (0.00180)
$\log \widehat{MPCE}$	0.207*** (0.00866)	0.270*** (0.00615)	0.179*** (0.00706)	0.241*** (0.00507)	0.0976*** (0.0153)	0.118*** (0.0119)
No.of.Children	0.0297*** (0.00179)	0.0434*** (0.00128)	0.0290*** (0.00133)	0.0417*** (0.000949)	0.0107*** (0.00283)	0.0167*** (0.00216)
Mean Education	0.00765*** (0.000730)	0.00787*** (0.000449)	0.00957*** (0.000406)	0.0112*** (0.000203)	0.00244*** (0.000938)	0.00322*** (0.000538)
assets_proportion	-0.0616*** (0.0103)	-0.0997*** (0.00660)	-0.0635*** (0.00779)	-0.0938*** (0.00522)	0.00363 (0.0125)	-0.0306*** (0.00803)
wave	-0.00647*** (0.000241)	-0.00708*** (0.000149)	-0.00594*** (0.000192)	-0.00674*** (0.000120)	-0.00772*** (0.000351)	-0.00929*** (0.000252)
Caste (Base: Upper Caste) SC or ST			0.00707*** (0.00197)	-0.00659*** (0.00115)		
OBC			0.0128*** (0.00191)	0.00478*** (0.00101)		
Intermediate Caste			-0.00246 (0.00246)	-0.00151 (0.00155)		
Religion (Base: Hindu) Muslim			0.0148*** (0.00260)	0.0215*** (0.00139)		
Buddhist, Christian, Jain, Sikh			-0.00405 (0.00390)	0.00118 (0.00184)		
State Dummy			Yes	Yes		
Constant	0.502*** (0.0654)	-0.0110 (0.0479)	0.650*** (0.0531)	0.161*** (0.0394)	1.328*** (0.116)	1.181*** (0.0926)
Modified Wald Test for heteroskedasticity	2.3e+06***	2.1e+06***			1.2e+06***	1.2e+06***
Alternate Hausman Test	159.494***	401.562***			411.55***	1543.48***
Observations	145,962	301,689	145,962	301,689	145,962	301,689
R-squared	0.009	0.012			0.011	0.015
Number of HH	16,218	33,521	16,218	33,521	16,218	33,521

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Results: Non-Food Index

Variable	Rural	Urban	Rural	Urban	Rural	Urban
PMJDY1					0.0178*** (0.00205)	0.0343*** (0.00153)
PMJDY2					0.0280*** (0.00350)	0.0694*** (0.00276)
$\log \widehat{MPCE}$	0.312*** (0.0129)	0.397*** (0.00951)	0.306*** (0.0112)	0.362*** (0.00823)	0.220*** (0.0221)	0.0913*** (0.0179)
No.of.Children	0.0598*** (0.00268)	0.0693*** (0.00194)	0.0609*** (0.00212)	0.0658*** (0.00155)	0.0438*** (0.00413)	0.0168*** (0.00326)
Mean Education	0.0212*** (0.00108)	0.0140*** (0.000666)	0.0164*** (0.000649)	0.00853*** (0.00333)	0.0169*** (0.00138)	0.00501*** (0.000806)
assets_proportion	0.0855*** (0.0155)	0.0955*** (0.00997)	0.0809*** (0.0123)	0.0957*** (0.00842)	0.128*** (0.0183)	0.237*** (0.0121)
wave	0.0147*** (0.000391)	0.00937*** (0.000237)	0.0151*** (0.000304)	0.0103*** (0.000194)	0.00986*** (0.000504)	-0.00101*** (0.000386)
Caste (Base: Upper Caste) SC or ST			0.0288*** (0.00329)	0.0229*** (0.00196)		
OBC			0.0120*** (0.00319)	0.0151*** (0.00173)		
Intermediate Caste			-0.00565 (0.00409)	-0.00190 (0.00264)		
Religion (Base: Hindu) Muslim			-0.00236 (0.00434)	0.00628*** (0.00237)		
Buddhist, Christian, Jain, Sikh			-0.0428*** (0.00649)	0.00465 (0.00313)		
State Dummy Constant	-1.145*** (0.0971)	-1.841*** (0.0741)	-1.205*** (0.0843)	-1.652*** (0.0640)	-0.444*** (0.167)	0.545*** (0.139)
Modified Wald Test for heteroskedasticity	5.6e+05***	1.3e+06***			5.8e+05***	1.2e+06***
Alternate Hausman Test	439.848***	180.781***			217.82***	1873.22***
Observations	145,962	301,689	145,962	301,689	145,962	301,689
R-squared	0.100	0.066			0.101	0.069
Number of HH	16,218	33,521	16,218	33,521	16,218	33,521

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Results: Between Index

Variable	Rural	Urban	Rural	Urban	Rural	Urban
PMJDY1					0.00447*** (0.000453)	0.00190*** (0.000269)
PMJDY2					0.0118*** (0.000788)	0.00662*** (0.000497)
$\log \widehat{MPCE}$	0.0556*** (0.00288)	0.0411*** (0.00171)	0.0594*** (0.00253)	0.0344*** (0.00151)	0.0119** (0.00494)	0.0109*** (0.00320)
No.of.Children	0.00872*** (0.000609)	0.00529*** (0.000359)	0.00952*** (0.000481)	0.00471*** (0.000285)	0.00113 (0.000935)	5.99e-05 (0.000588)
Mean Education	0.00397*** (0.000236)	0.00235*** (0.000122)	0.00568*** (0.000148)	0.00365*** (6.27e-05)	0.00193*** (0.000305)	0.00145*** (0.000147)
assets_proportion	0.0696*** (0.00335)	0.0526*** (0.00185)	0.0719*** (0.00277)	0.0543*** (0.00153)	0.0921*** (0.00404)	0.0665*** (0.00224)
wave	0.00307*** (8.23e-05)	0.00182*** (4.17e-05)	0.00289*** (6.85e-05)	0.00186*** (3.54e-05)	0.00149*** (0.000110)	0.00101*** (6.86e-05)
Caste (Base: Upper Caste) SC or ST			-0.0144*** (0.000793)	-0.0118*** (0.000394)		
OBC			-0.00597*** (0.000770)	-0.00622*** (0.000348)		
Intermediate Caste			0.00218*** (0.000988)	-0.00518*** (0.000533)		
Religion (Base: Hindu) Muslim			-0.00772*** (0.00105)	-0.0113*** (0.000478)		
Buddhist, Christian, Jain, Sikh			0.00446*** (0.00157)	0.00191*** (0.000633)		
State Dummy			Yes	Yes		
Constant	0.163*** (0.0218)	0.301*** (0.0134)	0.0803*** (0.0190)	0.310*** (0.0118)	0.494*** (0.0374)	0.537*** (0.0249)
Modified Wald Test for heteroskedasticity	2.8e+06***	1.4e+07***			3.1e+06***	1.3e+07***
Alternate Hausman Test	1159.726***	614.987***			1419.80***	2773.39***
Observations	145,962	301,689	145,962	301,689	145,962	301,689
R-squared	0.093	0.057			0.095	0.058
Number of HH	16,218	33,521	16,218	33,521	16,218	33,521

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Conclusion

- ▶ State-led financial inclusion programmes can lead to higher economic welfare.
- ▶ We measure economic welfare through diversification of consumption
- ▶ Using a two-stage regression approach and Theil's entropy-based measure of diversification, we find robust evidence that households diversify their consumption expenditure as a result of increase in access to formal financial system.
- ▶ This increase is especially visible within non-food items, as well as between food and non-food items.