

Road to Stock Market Participation

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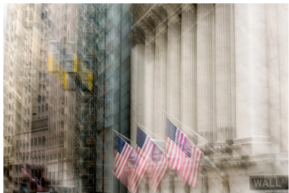
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Motivation: Non-Participation Puzzle

Textbook financial theory implies that all households, no matter how risk averse, should hold some equities if the equity premium is positive. –Campbell (2006), Presidential Address

The New York Times

We All Have a Stake in the Stock Market, Right? Guess Again



Roughly half of all households don't have a cent invested in stocks.

Participation rates are even lower in developing countries!

- Greater puzzle given high savings rate.

Motivation: Policy Implication for Development and Regulations

Macro economy

- Capital market development
- Economic growth and inequality
- Democratization of finance

Household

- Household returns
- Consumption
- Risk behaviors



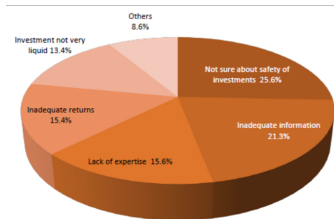
The elusive retail investor: How deep can (and should) India's stock markets be?

Reasons for low participation

In Developed Economies

- Fixed costs of participation – Vissing-Jørgensen [2003].
- Financial literacy and household education – Bernheim and Garrett [1996], Campbell [2006], Calvet et al. [2007], Christiansen et al. [2008], Bayer et al. [2009], Van Rooij et al. [2011].
- Social interaction and peer effects – Madrian and Shea [2001], Duflo and Saez [2002] and Hong et al. [2005].
- Lack of stock market awareness – Hong et al. [2004], Guiso and Jappelli [2005], Brown et al. [2008].
- IQ stanine or Trust – Guiso et al. [2008], Grinblatt et al. [2011]

How about Emerging Market?



Source: SEBI Investor Survey 2015

Research Question

How does development of physical infrastructure affect stock market participation in developing countries?

- In particular, how does increased road connectivity affect stock market participation in **India**?
- Is there heterogeneity across investor types – age, gender?
- Heterogeneity across urban vs rural, richer vs poorer regions?

Focus on 2 mechanisms:

- Financial inclusion/enabling channel.
- Information channel.

Financial Inclusion Channel

Financing typically follows infrastructure investments in developing countries.

Banks allow for:

- Greater savings potential.
- Opening of trading accounts
 - The Securities and Exchange Board of India (SEBI) requires everyone who wants to trade Indian securities to have a **Demat (dematerialized)** account.
 - Most Demat accounts in our time period were opened in person rather than online.

Roads \implies Greater access to banks \implies Greater stock market participation.

Information Channel

Infrastructure improvements bring in

- Increased connectivity.
- Reduce information costs.
- Greater awareness.

Roads \implies Greater exposure to information \implies Greater stock market investment.

Main Findings - I

1. A significant increase in [stock market participation](#) associated with building of new feeder roads.
 - **33.2%** increase in new investors and **90.6%** increase in trades by new investors.
 - Largest effects within the first-year of road construction but effects exist even five years out.
2. Heterogeneity across investors and regions
 - Male investors and mature investors (over age of 55).
 - Investors in pincodes at intermediate levels of economic development.
3. Support for [information channel](#).
 - Improved connectivity leads to increased stock market participation in more distant pincodes, increased portfolio diversification, and increased trading in stocks of firms whose HQ are farther away.

Main Findings - II

- Evidence consistent with **financial inclusion/enabling** channel.
 - Greater impact when there is a new bank branch opened within a 3-year window after road construction.
 - Not just the marginal investor investing after positive wealth shock.
- Suggestive evidence of **capital re-allocation** in households.
 - Decline in consumption in districts with new roads.
- Finally, no evidence that the new investors are taking on more risk or earning large monetary profits.

Contributions

Literature on stock market participation puzzle

- *fixed costs* (e.g. Vissing-Jorgensen [2003]), *financial literacy and household education* (e.g. Bernheim and Garrett [1996], Bayer et al. [2009]), Campbell [2006], Calvet et al. [2007], Christiansen et al. [2008], Van Rooij et al. [2011]), *social interaction and peer effects* (e.g. Madrian and Shea [2001], Duflo and Saez [2002] and Hong et al. [2005]), *lack of stock market awareness* (Hong et al. [2004], Guiso and Jappelli [2005], Brown et al. [2008]), *IQ stanine* (e.g. Grinblatt et al. [2011]) and *lack of trust* (Guiso et al. [2008]).
- Our paper advances a new mechanism: **infrastructure improvement**.

Broader literature on financial development and growth

- Levine et al. (2005); Brown et al. (2009)
- Our paper has implications for how to facilitate capital market deepening.

Mixed evidence on effect of PMGSY program

- Mukherjee (2012), Adukia (2017), Asher and Novosad (2020), Shamdasani (2021), Agarwal et al (2021)
- Our paper is unique in its focus on spillovers to investment.

Data

NSE Data

- Comprehensive data on the daily trading information across 13,514,473 investors between 2004 and 2015. [State Distribution](#)
- For each investor, we also know their gender, age, and location (with pincode being the most granular level).
- Each trading data contains: date of the transaction, account type, scriptsize traded, the number of shares purchased or sold, and the execution price.
- We exclude tradings on ETFs and only focus on trading on domestic companies.

PMGSY Data.

- Government of India's flagship program launched in 2000 with the aim of improving rural connectivity.
- Data from SHRUG platform provided by Asher et al. (2020).
- For each new road built under the program, we have the exact completion date, village, and geocode location.
- Restrict sample to all pincodes that received a new PMGSY road between October 2004 and February 2015 and did not receive a new road prior to October 2004.
- So all pincodes receive a new road at some point during our sample period.

Other Data

Bank Branch Data

- Confidential and proprietary bank branch level data from the Reserve Bank of India (RBI).
- For each bank branch location, we have information on the pincode and the opening date of the branch office.

Empirical Strategy

Baseline Specification

$$\text{Log}(Y_{i,t}) = \beta \cdot \text{Connect}_{i,t} + \xi_i + \kappa_t + \Theta_{D,Y} + \varepsilon_{i,t}$$

- Y – different measures of stock market participation in each pincode i in year-month t : *Number of Trades* and *Number of Investors*, across different type of investors
- $\text{Connect}_{i,t}$ – equals 1 in the year-month (and thereafter) when a pincode is connected by a paved road under the PMGSY program and 0 otherwise.
- Include location (pincode), month and district-year fixed effects to absorb time-invariant factors across locations and month.

We also estimation the similar model by adding state-year effects for robustness check.

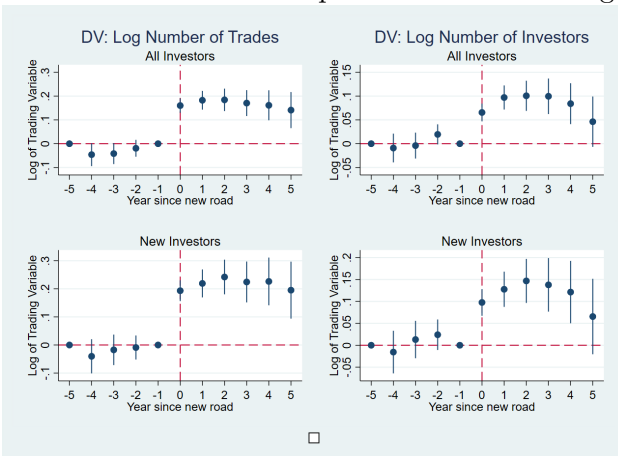
Baseline Results

	Number of Trades	Number of Investors	Number of Trades	Number of Investors	Number of Trades	Number of Investors
	All Investors		New Investors		Experienced Investors	
Connect	0.557*** (0.022)	0.182*** (0.010)	0.645*** (0.021)	0.287*** (0.010)	0.396*** (0.020)	0.154*** (0.010)
Pincode FE	Y	Y	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y	Y	Y
District-Year FE	Y	Y	Y	Y	Y	Y
N	592195	592204	592195	592204	592195	592204
Adj. R-sq	0.863	0.939	0.802	0.899	0.832	0.904

- Construction of a new feeder road in a pincode leads to an average increase of **33.2%** in the number of new investors and **90.6%** increase in trades by new investors over time in that pincode. Translates into **7 new investors** and **300 additional trades**.
- Across demographic groups, we find the road effects are most prominent among **male** and **mature** investors.
- The baseline results are robust for different settings robust

Baseline: Time Trends

Time Trends of Road Impacts on Stock Tradings



Local Economic Development

	1	2	3	4
	Number of Trades (New Investors)		Number of Investors (New Investors)	
Connect	0.060 (0.041)	0.562*** (0.028)	0.058*** (0.022)	0.198*** (0.013)
Connect X Rural	0.715*** (0.044)		0.281*** (0.023)	
Connect X Intermediate Development		0.146*** (0.037)		0.126*** (0.017)
Connect X Least Development		0.024 (0.063)		-0.005 (0.030)
Pincode FE	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y
District-Year FE	Y	Y	Y	Y
N	592195	592195	592204	592204
Adj. R-sq	0.804	0.802	0.900	0.899

- Rurali is an indicator variable which equals to 1 if the pincode is in a rural area (as identified by the post office) and 0 otherwise.
- A pincode will be classified as *Intermediate Development/Least Developed* if its *Consumption per capita* falls between 50%-10%/bottom 10% among all pincode.

Financial Inclusion Channel

Panel A: All Banks

	1	2	3	4
	Number of Trades (New Investors)		Number of Investors (New Investors)	
Connect	0.584*** (0.026)	0.599*** (0.023)	0.250*** (0.012)	0.274*** (0.011)
Connect X New Branch Dummy	0.096*** (0.034)		0.089*** (0.016)	
Connect X Number of New Branches	0.053*** (0.007)		0.013*** (0.004)	
Pincode FE	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y
District-Year FE	Y	Y	Y	Y
N	592195	592195	592195	592195
Adj. R-sq	0.802	0.802	0.900	0.899

- *New Branch dummy* is an indicator variable that takes the value 1 when a bank branch is opened within a 3-year window after the PMGSY road completion in pincode and 0 otherwise.
- *Number of New Branches* is the total number of bank branches opened within a 3-year window after the PMGSY road completion in pincode.
- We find the road effects are mainly driven the opening of **state-owned** banks rather than the private banks.

Information Channel

Panel A: Distance from nearest city

	1	2	3	4
Trading Variable	Number of Trades (New Investors)		Number of Investors (New Investors)	
City Type	Tier 1	Metro	Tier 1	Metro
Connect	0.468*** (0.036)	0.515*** (0.031)	0.234*** (0.017)	0.225*** (0.015)
Connect X Distance	0.037*** (0.006)	0.009*** (0.002)	0.011*** (0.003)	0.004*** (0.001)
Pincode FE	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y
District-Year FE	Y	Y	Y	Y
N	592195	592195	592195	592195
Adj. R-sq	0.802	0.802	0.899	0.899

● Distance is the distance between pincode and the nearest city.

Information Channel (Continue)

Panel B: Portfolio Diversification

	1	2	3	4	5
	Number of Unique Tickers	Number of Trades on Distant Companies			
		< 50 Kms	50-100 Kms	100-500 Kms	> 500 Kms
Connect	0.511*** (0.017)	0.002 (0.004)	0.019*** (0.005)	0.212*** (0.013)	0.606*** (0.021)
Pincode FE	Y	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y	Y
District-Year FE	Y	Y	Y	Y	Y
N	592218	592195	592195	592195	592195
Adj. R-sq	0.794	0.852	0.818	0.809	0.801

- The dependent variable in column 1 is the *Number of Unique Tickers*, and are the *Total Number of Stock Tradings* from New Investors on Companies 50km, 50-100km, 100-500km, and over 500km away in column 2-5.

Allocation from Consumption?

Panel A: Household Expenditure & Income

	1	2
	Log(Consumption)	Log(Income)
<i>Connect</i> ^{CPHS}	-0.051*** (0.051)	0.115*** (0.017)
Household FE	Y	Y
Month FE	Y	Y
N	125376	125376
Adj. R-sq	0.656	0.358

- ↓ in **consumption** in districts connected by new roads → suggestive of re-allocation.
- *Connect*_{d,t}^{CPHS} is an indicator variable which equals 1 if a district, *d*, received a new PMGSY road between 2014 and 2015 and had not received any road under PMGSY during the previous 5 years.

Allocation from Saving?

	1	2	3	4
	Current Account	Saving Account	Term Account	Total Deposit
Connect	-0.035 (0.024)	-0.031** (0.014)	-0.018 (0.019)	-0.041*** (0.014)
Branch FE	Y	Y	Y	Y
Year FE	Y	Y	Y	Y
N	157476	157483	157479	157485
Adj. R-sq	0.645	0.834	0.807	0.849

- ↓ in **bank deposits**, especially in the savings account in pincodes connected by new roads → suggestive of re-allocation
- Dependent variables are the log values of total amount of deposit in Current/Saving/Term account, and total value of deposit in branch b in year t .

Monetary Profits and Risk Taking

	1	2	3	4	5
	Average Profits (in Indian Rupees) per investor-month				Number of Trades on High Volatility Stocks
Holding Period	1 trading day	10 trading days	25 trading days	140 trading days	
Connect	72.341*** (9.563)	135.868*** (29.715)	13.538 (55.995)	-1644.754*** (186.261)	0.398*** (0.012)
Pincode FE	Y	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y	Y
District-Year FE	Y	Y	Y	Y	Y
N	586214	586214	586214	586214	592197
Adj. R-sq	0.171	0.296	0.321	0.319	0.572

Conclusion

We show a novel mechanism that affects stock market participation rates in developing countries - **improvement of physical infrastructure.**

We find support for two channels:

- Financial Inclusion Channel
 - Larger impact for state bank branch openings.
- Information Channel

In addition:

- Suggestive evidence on re-allocation.
- Not just the marginal investor benefiting from a positive wealth shock.

Takeaways

Improving physical infrastructure addresses the twin problems of financial access and inadequate information, allowing for better integration of investors in remote and rural areas.

Appendix

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State-level distribution of investors [back](#)

States	Number of Investors	%	States	Number of Investors	%
Maharashtra	2685160	19.875%	Assam	82744	0.612%
Gujarat	1954062	14.463%	Uttarakhand	78702	0.583%
Tamil Nadu	1046034	7.742%	Jammu and Kashmir	43869	0.325%
West Bengal	995263	7.367%	Himachal Pradesh	42182	0.312%
Karnataka	907781	6.719%	Goa	38684	0.286%
Uttar Pradesh	893399	6.613%	Pondicherry	10734	0.079%
Delhi	835927	6.187%	Tripura	10383	0.077%
Rajasthan	551151	4.079%	Dadra and Nagar Hav.	5176	0.038%
Telangana	532050	3.938%	Megalaya	4729	0.035%
Kerala	490173	3.628%	Chandigarh	4574	0.034%
Andhra Pradesh	432272	3.200%	Daman and Diu	3619	0.027%
Haryana	406657	3.010%	Manipur	2740	0.020%
Madhya Pradesh	398663	2.951%	Sikkim	2674	0.020%
Punjab	328561	2.432%	Nagaland	1998	0.015%
Bihar	228644	1.692%	Andaman and Nico.In.	1526	0.011%
Jharkhand	200192	1.482%	Arunachal Pradesh	1355	0.010%
Odisha	191229	1.415%	Mizoram	604	0.004%
Chattisgarh	96898	0.717%	Lakshadweep	64	0.000%
Total			13510473		

Robustness: Placebo Test [back](#)*Panel A: Randomization for Entire Sample*

	Number of Trades	Number of Traders	Number of Trades	Number of Traders	Number of Trades	Number of Traders
	All Investor		New Investor		Experienced Investor	
Connect	0.000102 (0.0027857)	-0.000004 (0.001339)	0.000296 (0.003719)	0.000029 (0.001549)	-0.000043 (0.003441)	0.000019 (0.001518)
Pincode FE	Y	Y	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y	Y	Y

Panel B: Randomization within Each Month

	Number of Trades	Number of Traders	Number of Trades	Number of Traders	Number of Trades	Number of Traders
	All Investor		New Investor		Experienced Investor	
Connect	0.000042 (0.002727)	-0.000066 (0.001344)	0.000221 (0.003694)	0.000012 (0.001615)	0.000032 (0.003306)	0.000062 (0.001405)
Pincode FE	Y	Y	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y	Y	Y

Robustness: Callaway and Sant'Abba (2021) DiD

[back](#)

	1	2	3	4
	Number of Trades	Number of Investors	Number of Trades	Number of Investors
	All Investors		New Investors	
Connect	0.481*** (0.103)	0.154*** (0.045)	0.538*** (0.152)	0.214*** (0.012)
Pincode FE	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y

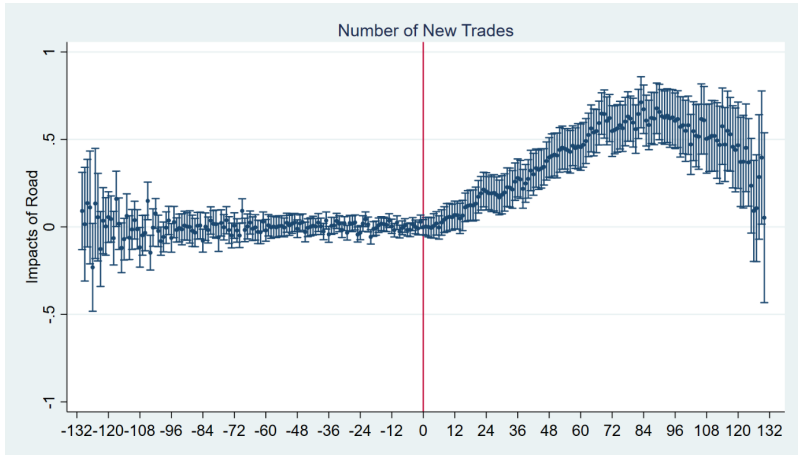
Robustness: Use other regional development measure

back

	1	2	3	4
	Number of Trades (New Investors)		Number of Investors (New Investors)	
Connect	-0.143** (0.056)	0.549*** (0.028)	0.064** (0.030)	0.195*** (0.013)
Connect X Rural	0.870*** (0.058)		0.280*** (0.031)	
Connect X Intermediate Development		0.114*** (0.038)		0.016*** (0.017)
Connect X Least Development		0.015 (0.061)		-0.017 (0.030)
Pincode FE	Y	Y	Y	Y
Year-Month FE	Y	Y	Y	Y
District-Year FE	Y	Y	Y	Y
N	592195	592193	592204	592202
Adj. R-sq	0.773	0.802	0.875	0.899

Callaway & Sant'Anna (2020) DiD Estimation

Number of New Trades



Callaway & Sant'Anna (2020) DiD Estimation

Number of New Investors

