# The Impact of Road Infrastructure on Household Borrowing

PI: Abhiroop Mukherjee, HKUST,
Co-I: Prof. Sumit Agarwal, Georgetown University

Increasing infrastructure investments are a key component of growth strategy in many countries, and a particular focus now, given China's massive "One Belt One Road" investment project. Although it is typically assumed that financing to households will follow once roads are built, allowing them to make the best use of new productive opportunities, little is known about whether this really happens, especially in poor countries. Moreover, even if financing does follow infrastructure improvements, does it disproportionately benefit the rich who had assets prior to the infrastructure being built, and were in a better position to exploit the resultant opportunities? Or does it benefit the poor too who were excluded from formal finance before, but can now find a way in?

One reason behind the lack of research on this is the difficulty in accurately quantifying the impact of new infrastructure. This difficulty arises because it is hard to identify an appropriate counterfactual or comparison group. Although one can observe what happens before and after new infrastructure is constructed in "treated" areas, it is hard to attribute the change exclusively to the project and not to any other environmental or policy factors that may also be changing at the same time. If infrastructure were located randomly, a natural comparison group would be locations that did not (randomly) receive infrastructure. Then one could compare changes in the treated and untreated areas to estimate the impacts of the program. Unfortunately, infrastructure is not placed randomly in practice, making comparisons with untreated areas problematic.

Our proposed project will exploit a policy directive surrounding a major public road construction program in India, which created a nearly random comparison group for policy evaluation. The objective of this nationwide program was to provide all-weather road connectivity to unconnected villages. The program explicitly focused on building new roads to all villages above explicit population thresholds at a point in time. By doing so, program rules created discontinuities in the probability of treatment at multiple village population thresholds, which we will exploit using a fuzzy regression discontinuity design. For example, villages with populations just above a round figure, say 500, were to be prioritized under the program. Under the assumption that villages with populations just below the threshold (in our example, 500) are

very similar to those above, especially if they are located in close geographic proximity, the resultant variation in roads is quasi-random. The results of such an analysis will thus provide convincing estimates of the impact of connectivity on the access to, and productive utilization of, financial services.

**Methodology**

The project will employ methods designed to exploit discontinuities following Imbens and Lemieux (2008). Under the assumption of continuity of the outcome variable at the treatment threshold, we will estimate the local average treatment effect LATE of receiving a new road, for a village with population equal to the threshold as:

$$\tau = \frac{\lim_{pop \to N^+} E[Y_v | pop_v = N] - \lim_{pop \to N^-} E[Y_v | pop_v = N]}{\lim_{pop \to N^+} E[newroad_v | pop_v = N] - \lim_{pop \to N^-} E[newroad_v | pop_v = N]}$$

where $pop_v$ is the baseline village population, N is the threshold population, and $newroad_v$ is an indicator variable for whether village v received a new road in the sample period. The treatment effect can be interpreted as the discontinuous change in the outcome variable at the population threshold (numerator) divided by the discontinuous change in the probability of treatment (denominator). Since our population threshold does not perfectly predict road contruction, we will use a fuzzy regression discontinuity (RD) specification of the following form:

$$Y_{v,j} = \beta_0 + \beta_1 1\{pop_{v,j} \geq N\} + \beta_2 pop_{v,j} + \beta_3 pop_{v,j} * 1\{pop_{v,j} \geq N\} + \delta X_{v,j} + \eta_j + \varepsilon_{v,j}$$

where $Y_{v,j}$ is the outcome of interest, N is the population threshold, $pop_{v,j}$ is baseline village population, $X_{v,j}$ is a vector of village controls measured at baseline, and $\eta_j$ is a group fixed effect. The change in outcome $Y_{v,j}$ for a village at the population threshold N is captured by $\beta_0 + \beta_3 * N$. For ease of exposition, we subtract the threshold value N from the population variable, such that N = 0, and $\beta_1$ fully describes the change in outcome $Y_{v,j}$ at the treatment threshold. The fuzzy regression discontinuity approach identifies the treatment effect of road construction under the assumption that crossing the population threshold affects the probability of receiving a road, and nothing else of significance.

**Budget Request:**

**Total:** **US$ 16,000**

**Research Assistance:** **US$ 8,000**

**Justification:**

This project will require significant amount of data collection, merging, and statistical analysis. Data needs to be collected from Government of India websites, merged with bank-level data at the village level, cleaned, checked for accuracy, and then analysis has to be conducted.

**Travel:** **US$ 6000**

**Justification:**

Sumit and Abhiroop plan to travel to work in India. We will mostly communicate over the internet/phone, but being in the same physical location is important to understand the institutional context in more detail.

**Editing and Conference Fees:** **US$ 2000**

**Justification:**

Typical copy editing fee of US$600 is assumed, for two rounds of editing (once initially, once after revision). Copy editing will help improve the writing of the paper so that our ideas are communicated more clearly to a broader audience. We also intend to submit the paper, once it is written, to various conferences for feedback. Some of these conferences charge submission fees in the range of US$100 (for example, the European Economic Association Annual Conference has a fee of EUR 75).

**SUMIT AGARWAL**
ushakri@yahoo.com, www.ushakrisna.com

## EMPLOYMENT

### Academic Positions

| | |
|---|---|
| Georgetown University | 2016-Present |
| Professor of Finance, McDonough School of Business | 2016-Present |
| Professor of Economics (courtesy), Department of Economics | 2016-Present |
| National University of Singapore | 2012 - 2016 |
| Vice-Dean of Research and PhD Program, School of Business | 2015 - 2016 |
| Low Tuck Kwong Professor | 2014 - 2016 |

### Editorial Positions

| | |
|---|---|
| Editor, *Real Estate Economics* | 2015 - Present |
| Associate Editor, *Management Science* (Finance Department) | 2014 - Present |
| Associate Editor, *Journal of Financial Services Research* | 2014 - Present |

## RESEARCH

### Impact

Over 500 citations in published papers (Source: Web of Science, July, 2016)
Over 4500 citations in published and working papers (Source: Google Scholar, July, 2016)
Over 35,000 downloads of my papers (Source: SSRN, July, 2016)

### Book

1. *Household Credit Usage: Personal Debt and Mortgages*, (with Ambrose, B), Palgrave-Macmillan Publishing, October, 2007 (edited volume)

### Selected Publications and Forthcoming Papers

2. "Consumption Response to State Sales Tax Holidays" (with Marvell, N., and L. McGranahan), forthcoming *American Economic Journal – Economic Policy*
3. "Access to Home Equity and Consumption: Evidence from a Policy Experiment" (with Qian, W), forthcoming *Review of Economics and Statistics*
4. "Systematic Mistakes of Borrowers in the Mortgage Markets" (with Ben-David, Z., and V. Yao), forthcoming *Journal of Finance Economics*
5. "Policy Intervention in Debt Renegotiation: Evidence from Home Affordability Modification Program" (with Amromin, G., I. Ben-David, S. Chomsisengphet, A. Seru and T. Piskorski), forthcoming *Journal of Political Economy*
6. "Rushing into the American Dream? House Prices Growth and the Timing of Homeownership" (with Hu, L., and X. Huang), forthcoming *Review of Finance*
7. "Why do Borrowers Make Mortgage Refinancing Mistakes?" (with Rosen, R., and V. Yao), forthcoming *Management Science,*
8. "Gender and Household Financial Decision: Evidence from Personal Bankrutpcy" (with Jia, H., T. Sing, and J. Zhang), forthcoming *Review of Finance*
9. "The Information Value of Credit Rating Action Reports: A Textual Analysis" (with Chen, V., and W. Zhang), *Management Science,* 2016, Vol (62), Pp. 2218-40
10. "Playing the Boys Game: Golf Buddies and Board Diversity" (Qian, W., D. Reeb and S. Tien-Foo), *American Economic Review – Papers and Proceedings,* 2016, Vol. 106(5), Pp. 272-76

11. "Regulating Consumer Financial Products: Evidence from the Card Act" (with, Chomsisengphet, S., N. Mahoney and J. Stroebel), *Quarterly Journal of Economics*, 2015, Vol. 130(1), Pp. 111-164
12. "The Composition Effect of Consumption Around Retirement: Evidence from Singapore" (with Pan, J., and W. Qian), *American Economic Review – Papers and Proceedings*, 2015, Vol. 105(5), Pp. 426-431
13. "Collateral Valuation and Institutional Pressures: Evidence from the Residential Real-Estate Market" (with Ben-David, Z., and V. Yao), *Management Science,* 2015, Vol. 61(9), Pp.2220-2240
14. "Consumption and Debt Response to Unanticipated Income Shocks: Evidence from a Natural Experiment in Singapore" (with Qian, W), *American Economic Review,* 2014, Vol. 104(12), Pp. 4205-4230
15. "Predatory Lending and the Subprime Crisis?" (with Amromin, G., I. Ben-David, S. Chomsisengphet, and D. Evanoff), *Journal of Financial Economics,* 2014, Vol. 113(1), Pp. 29-52
16. "Inconsistent Regulators: Evidence from Banking" (with Lucca, D., A. Seru and F. Trebbi), *Quarterly Journal of Economics*, 2014, Vol. 129(2), Pp.889-938
17. "Consumption and Debt Response to Minimum Wage Increases" (with Aaronson, D., and E. French), *American Economic Review,* 2012, Vol. 102(7), Pp. 3111-39 (Lead Article)
18. "Adverse Selection in Mortgage Securitization" (with Chang, Y. and A. Yavas), *Journal of Financial Economics,* 2012, Vol. 105(3), Pp.640-660
19. "The Role of Securitization in Mortgages Renegotiation" (with Amromin, G., I. Ben-David, S. Chomsisengphet and D. Evanoff), *Journal of Financial Economics,* 2011, Vol. 102(3), Pp.559-578
20. "Distance and Private Information in Lending" (with Hauswald, R), *Review of Financial Studies,* 2010, Vol. 23(7), Pp. 2757-2788
21. "Learning to Cope: Voluntary Financial Education Programs and the Housing Crisis" (with Amromin, G., I. Ben-David, S. Chomsisengphet, and D. Evanoff), *American Economic Review – Papers and Proceedings*, 2010, Vol. 100(2), Pp. 495-500
22. "The Age of Reason: Financial Decisions over the Life Cycle and Implications for Regulation" (with Driscoll, J., X. Gabaix, and D. Laibson), NBER Working Paper #1319, *Brookings Papers on Economic Activity,* 2009, Vol. Fall, Pp. 51-117
23. "Payday Loans and Credit Cards: New Liquidity and Credit Scoring Puzzles?" (with Skiba, P., and J. Tobacman), NBER Working Paper #14659, *American Economic Review – Papers and Proceedings,* 2009, Vol. 99(2), Pp. 412-417
24. "Reaction of Consumer Spending and Debt to Tax Rebates - Evidence from Consumer Credit Data" (with Liu, C., and N. Souleles), NBER Working Paper #13694, *Journal of Political Economy,* 2007, Vol. 115(6), Pp. 986-1019

**Selected Grants**

| | | |
|---|---|---|
| 1. | NUS FRC Tier 1 Research Grant, Ministry of Education, SGD 92,975 | Jan 2016 |
| 2. | NUS FRC Tier 1 Research Grant, Ministry of Education, SGD 63,000 | Sep 2015 |
| 3. | NUS FRC Tier 1 Masim Mas Research Grant, Ministry of Education, SGD 36,072 | March 2015 |
| 4. | HHS Seed Funding Grant, NUS, SGD 40,000 | Oct 2014 |
| 5. | NBER Household Finance Group/Sloan Foundation Research Grant, USD 16,000 | Feb 2013 |

# Abhiroop Mukherjee

Room 5057, Department of Finance,
HKUST Business School,
Clear Water Bay, Kowloon, Hong Kong.

Phone: +852 2358-7682
e-mail: amukherjee@ust.hk
http://sites.google.com/site/abhiroopmukherjee

## Academic Qualifications:

Ph.D., Economics, Yale University, December 2010

## Present Academic Position:

Assistant Professor, Finance, Hong Kong University of Science and Technology

## Publications:

"Do Debt Contract Enforcement Costs Affect Financing and Asset Structure?" (with Radhakrishnan Gopalan & Manpreet Singh)

***Review of Financial Studies (2016)*** *29 (10):2774-281.3*

"Do Corporate Taxes Hinder Innovation?" (with Manpreet Singh and Alminas Zaldokas)

***Journal of Financial Economics,*** *forthcoming*

"Learning About Mutual Fund Managers" (with Darwin Choi & Bige Kahraman)

***Journal of Finance,*** *forthcoming*

"Prospect Theory and Stock Returns: An Empirical Test" (with Nicholas Barberis & Baolian Wang)

***Review of Financial Studies,*** *forthcoming*

## Working Papers:

"Inside Brokers" (with Frank Weikai Li and Rik Sen)

"Salience and Education Choice" (with Darwin Choi and Dong Lou)

"Are Control Rights Less Valuable When Shareholders Lack Information?"

## PhD Student Advising:

Baolian Wang (2014), First placement: Fordham University, New York.

Manpreet Singh (2016), First placement: Georgia Tech, Atlanta.

Frank Weikai Li (currently a 5th year PhD Student at HKUST)

## Grants, Awards and Fellowships:

- The Chinese Finance Association Best Paper Award in Asset Pricing, 2014
- Hong Kong RGC GRF Grant (Project No. 16504215, PI), 2015
- Hong Kong RGC GRF Grant (Project No. 692313), 2013
- Hong Kong RGC GRF Grant (Project No. 644011), 2011
- Hong Kong RGC GRF Grant (Project No. 642712, co-I), 2012
- HKUST Institute for Emerging Market Studies (IEMS) Research Grants, 2013 & 2015
- HKUST RPC Grant, Research Project Competition, HKUST, 2011
- Whitebox Advisors Fellowship, Yale School of Management, 2008
- Besen and Dublirer Fellowship, Yale University, 2006-2009
- Cowles Prize, Cowles Foundation for Research in Economics at Yale University, 2005-09
- Yale University Doctoral Fellowship, 2005-2010
- Prime Minister Manmohan Singh Scholarship, Delhi School of Economics, 2002-04
- Ranked First in the M.A. Economics graduating class, Delhi School of Economics, 2004
- Ranked First in the B.Sc. Economics Honours graduating class, University of Calcutta, 2002

*Ad-hoc Refereeing:*

Review of Financial Studies, Management Science, Review of Finance, Journal of Accounting Research, Journal of Banking and Finance, Journal of Empirical Finance, International Review of Finance, & Journal of Applied Finance.

*Conference Program Committee Memberships:*

European Finance Association (EFA) Annual Conference, 2014-
Asian Finance Association Annual Meetings, 2013-