

**Molly Lipscomb**  
**Research Statement**

*Overview*

My research focuses on the provision of public services and infrastructure in developing countries. In markets where one person's use of a good affects other peoples' welfare (that is, there are "externalities"), people purchase less than the optimal amount of the health, environmental or sanitation good. If individuals fail to adopt, benefits will not accrue to their neighbors, and communities can be caught in a socially inefficient equilibrium. In the long-run, this also depresses investment in supply in the market, since providers of the service will face a lower return than they would otherwise. In such cases, government intervention can be welfare-improving. Understanding the benefits to expanding public services and infrastructure, finding the sources of inefficiency in their management, and developing and testing market-based solutions to the under-provision of infrastructure is the focus of my research.

I am interested in understanding the causal effects of policy changes and the mechanisms through which they operate. Much of my research relies on collecting large datasets not previously available to researchers and taking advantage of natural variation in the data in order to answer new questions. A central innovation of my research is that it incorporates new designs of auctions to centralize markets, which provide us with administrative data on market transactions and allow us to analyze supply side questions that are otherwise difficult to examine. Finally, I collect survey data for large randomized controlled trials that allow us to observe household level changes when our treatments are implemented.

In a first line of research, I investigate the spillovers that result from local management of public goods and the extent to which expansion of infrastructure services can promote development. My research highlights the large spillovers that result when public goods are managed at a local level. Local politicians take advantage of the incentives to pollute across borders by placing more polluting activity near their downstream borders. Problematic incentives leading to spillovers across jurisdiction borders is a general problem affecting cities, counties, states and countries (Sigman 2002). Management, or at least negotiation, at a more central level allows planners to reduce spillovers; I show that centralizing the management of a public good neutralized spillovers that local government officials otherwise imposed on downstream jurisdictions.

Water and sanitation infrastructure has direct impacts on health while electricity infrastructure increases productivity. While these investments are incredibly important, it is difficult to credibly measure the economic returns to such large scale projects. The World Bank, USAID, and other development organizations must make trade-offs in determining whether to spend the marginal development dollar on electricity or other public services, and this is where my research provides important evidence. First, electricity access has strong development effects across a wide range of indicators, even for the agricultural sector. In addition, I show that farmers switch to increased-intensity farming when they have access to electricity, but deforestation does not increase on average.

In a second line of research, I investigate how market design can improve markets and lead to an increase in the use of positive externality-producing products. In many developing markets, a lack of competition can lead to an apparent paradox of unreasonably high prices and under-investment by firms. On the one hand, when markets are decentralized it is not a surprise that prices are high:

sellers have an advantage when they bargain with customers because both parties know that if negotiations break down, it will be inconvenient for the customer to find another seller. On the other hand, this means that many inefficient firms can make profits and survive despite the presence of more efficient competitors: work is mis-allocated from the best firms to the worst, which makes it difficult for firms to mature. Consequently, the market has a large number of participants, but high prices; many firms operate, but few grow. Centralizing markets can increase competition and improve productivity in the sector.

In a group of projects in Senegal, Burkina Faso, and Ghana, my research shows that centralizing markets for sanitation services and matching low cost suppliers to households can reduce prices and increase the take-up of improved sanitation services. By centralizing markets in Senegal through just-in-time procurement auctions, we reduce prices by 7%. This large decrease in price has the potential to substantially increase take-up of the improved service—we estimate by up to 37%.

While the reduction in prices helps households just at the margin of purchasing the services to switch into improved sanitation services, many governments and international organizations focus on the poorest households who may be farther from the threshold for switching. Governments often subsidize services that are accompanied by large externalities in order to increase take-up, but this is expensive; it typically requires the government to pay subsidies for households which would have purchased anyway. In Burkina Faso, we design, implement, and evaluate a targeted subsidy program; using limited information about households and a very small subsidy budget, we increase the market share of the improved service by 5.1 percentage points.

In a final line of research, I explore the development impact of the expansion of the service sectors, particularly banking. I show that liberalization in India's service sectors led to substantial productivity improvements in its manufacturing sectors. These productivity improvements were particularly large in sectors that use services intensively as inputs to their production processes.

Financial inclusion of the poorest is a continuing struggle. Current research shows that access to banking services has little impact on average (Angelucci et al, 2015; Banerjee et al, 2015a), but effects may be heterogeneous (Banerjee et al, 2015b). My research shows that households with access to loans specifically designated for assets are less likely to spend down their emergency savings funds than households with access to cash loans. Increased availability of credit in the economy is likely to create more growth if loans are committed to financing assets, pushing people to use them for investment purposes rather than transferring consumption between periods. The poorest households, often excluded from the banking sector, have few good places to save for large expenses. I show that access to savings vehicles for specific products can help the most vulnerable households to purchase them.

### ***The Management of Public Goods and Infrastructure***

Infrastructure networks are expensive, and governments weigh the benefits of various spending priorities when determining how much to invest in them. Preferences may differ substantially across locations, so one possibility is to devolve decision-making authority to the local level. This is attractive in that it allows local governments to tailor decisions to the needs and preferences of their own citizens. However, many resources extend beyond local boundaries, and it can be problematic when costs are delegated to other jurisdictions.

I measure the spillovers which result from the local management of a public good in [“Decentralization and Pollution Spillovers: Evidence from the Re-drawing of County Borders in Brazil,”](#) with Ahmed Mushfiq Mobarak (*Review of Economic Studies*, 2017, one of the top five general interest journals in economics). In this paper, we examine the nature and size of water pollution externalities as rivers flow across jurisdictions. The paper is informed by theory: we elaborate a simple theory of externalities that generates predictions about the path of pollution under strategic behavior by politicians, and find support for the predictions in the data.

Rivers provide us with a unique opportunity to measure the strategic decision of local authorities to locate polluting activities near downstream borders because they flow in only one direction. The measurement of the causal effect of distance to borders is difficult, however, as border areas are unlike areas farther from the border. Measuring the correlation between water pollution and distance to border would yield biased estimates. Instead, we exploit natural variation caused by Brazil’s creation of counties every four years between 1994 and 2008. Our estimates are based on the change in the distance to the border over time controlling for factors related to the location of each station.

In order to better elaborate the mechanisms through which local leaders are able to allow increased pollution at their downstream borders, we also collected satellite data on night-time lights from 1992 to 2012 which provides us with an estimate of changes in population density in different parts of the counties. We find that local authorities allow more settlements to develop close to rivers in the downstream portions of counties. Many of these informal settlements are not properly equipped to handle sanitation, which is the likely underlying mechanism for the steep increase in pollution at county borders.

We test the extent to which these border effects are mitigated by the opportunity for politicians to negotiate. Water basin committees, commonly advocated by environmentalists, reduce the strategic pollution levels to levels insignificantly different from zero. Similarly, when upstream and downstream mayors are of the same political affiliation, strategic pollution levels decrease. When mayors are able to negotiate, they may collaborate on infrastructure projects, and sanitation networks have strong impacts on pollution in waterways.

Governments must juggle a host of infrastructure priorities. While water and sanitation have important health consequences, electricity has strong impacts on productivity and growth. Expansion of the electricity network is currently a priority, particularly in Sub-Saharan Africa where only 37.5% of the population is connected to the electricity network. Measuring the benefits of infrastructure services is difficult, since infrastructure typically is expanded to areas that are either expected to have the highest demand or generate the largest political benefits for the government. I generate causal estimates of the development effects of electrification, and then estimate the indirect impacts of electrification on deforestation.

In [“Development Effects of Electrification: Evidence from the Topographic Placement of Hydropower plants in Brazil,”](#) with Mushfiq Mobarak and Tania Barham (*American Economic Journal: Applied Economics*, 2013), we estimate the impact of electrification across Brazil over the period 1960–2000 using an instrumental variables technique. We collected archival data on the placement of hydropower plants and electricity lines from 1960-2000. We use variation based only on geographic factors and the path of government spending over time that are unrelated to the demand for electricity to predict the growth in the generation and transmission lines. Using

this variation, we document large positive effects of electrification on development, which are larger than previous estimates.

Increased productivity from electrification is not limited to the manufacturing sector: agriculture depends on electricity for irrigation and for processing. This increase in productivity could increase demand for agricultural land and increase deforestation in the frontier, or it could increase intensification of agriculture in areas already being cultivated, with no net change, or even a net decrease in deforestation. In "[Agricultural Productivity and Deforestation in Brazil](#)," with Juliano Assunção, Ahmed Mushfiq Mobarak, and Dimitri Szerman (Working Paper), we use the same geographic and time variation in order to estimate the impact of electrification on agricultural productivity and deforestation. We find that electrification leads to increased crop productivity. Following electrification, farmers shift away from land-intensive activities and into capital- and labor-intensive activities. The net effect depends on the county's land use prior to the increase in agricultural productivity, but on average electrification does not increase the rate of deforestation. We presented this paper in the NBER 2017 summer workshop.

Understanding who benefits most from electrification and what the potential demand may be from an expansion in access to poor households in rural areas is important. Lee, Miguel and Wolfram, 2017 find a very low willingness to pay and limited impacts of electrification for a poor rural population in Kenya. One potential explanation may be the high per-unit cost of electricity. Some homes with free connections in Uganda fall off the grid over time, even when they had free connections, as they are unable to pay the monthly fees. I am working on a new project: "Barriers to Demand for Electricity: Measuring the Impacts of Connection Costs and Tariff Structures," with Kelsey Jack to understand the extent to which the additional costs of wiring and monthly fees dampen demand for electricity connections and reduce the benefit of connecting additional homes to the grid. We currently have pilot funding from the International Growth Centre, and we are applying for scale-up funding.

### ***Using Market Design to Improve Markets for Sanitation***

Whether governments are procuring goods or allocating subsidies, they face a targeting problem in finding the ideal suppliers or beneficiaries. In procurement, matching the lowest cost service provider to a job will increase competition, reduce costs, and lower prices. Offering the job to too many suppliers at once will mean that some firms with the best outside options will refuse to compete because the probability of winning is not high enough and firms will expend too much effort or capital trying to get government contracts. Inaccurate targeting can mean that jobs do not go to the low cost supplier, raising procurement costs and reducing overall productivity in the market. Targeting is particularly difficult on the supply side as firms want to hide their true costs in order to maintain higher markups.

Failure to target demand-side programs to the intended beneficiaries means that transfers or subsidies are spread too diffusely across a wide range of beneficiaries. Programs become expensive, and budgets are higher than necessary as subsidies go to households that would have purchased anyway. Inaccurate targeting can mean the exclusion of households that should have had access to a program. Targeting of subsidies is difficult because wealthy households will want to appear poor in order to gain access to transfers or subsidies.

Finding incentive-compatible ways to solicit the information needed to target procurement programs and subsidies and then designing and testing market solutions making use of optimized targeting is the focus of a group of my field projects in Senegal, Burkina Faso, and Ghana. We

developed and tested market solutions to the lack of competition in the sanitation market, and analyzed the best criteria for inviting suppliers to bid and providing households with subsidies.

In peri-urban Dakar, Senegal, we increased competition by instituting just-in-time procurement auctions for latrine desludging jobs. In “[Using Market Mechanisms to Increase the Take-up of Improved Sanitation in Senegal](#),” with Jean-François Houde, Terence Johnson, and Laura Schechter (Working Paper), we estimate that the auctions reduced prices by 7%. Because we randomized invitations to the auctions and have administrative data on who was invited, we are able to use supplier bids to estimate costs and markups. While current take-up through the platform is 23%, we simulate the effect of revised auctions with different sets of invitation criteria, and show that theoretically under perfect competition (not implementable) take-up would increase to 73%, and under the second-best policy of optimal invitations (which is implementable), take-up would be 37%. I presented this paper at the GSE Barcelona workshop in June, 2017, and it was presented at the NBER mechanism design meetings in October 2017.

A supplier’s bids on past jobs provides information on his cost for future jobs. In Ghana and Burkina Faso, we test alternative auction designs that take advantage of the information the supplier reveals in his pricing decision for one job when choosing the suppliers for the next job. In Burkina Faso, structured negotiations in which we target the lowest cost suppliers and offer them the opportunity to undercut each other led to a decrease in price of up to 33% in some neighborhoods relative to first and second price auctions.

These auction results generalize to markets other than sanitation. Many markets in developing countries, particularly those focused on public services, are marked by inefficiencies stemming from mismatches between demand and supply. To the extent that the markets can be centralized and competition can be encouraged through a central marketplace, this will push more business toward lower cost suppliers and reduce supplier margins. Matching jobs to the low-cost suppliers pushes prices down even further.

While reducing prices through increased competition will increase the number of jobs done overall, we may also be concerned about the ability of the poorest households to take up the more expensive improved sanitation services. Subsidies are a common public policy tool when governments are concerned about households’ ability to pay, but they can be expensive due to the difficulty of screening those who should receive the program from those who would have purchased the good anyway. Targeting subsidies toward households that are unlikely to purchase without them can increase the overall take-up at a lower budgetary cost, thereby covering more households.

In “[Pricing People into the Market: Targeting through Mechanism Design](#),” with Terence Johnson (Working Paper), we design and implement a platform intended to increase the take-up of improved sanitation services in Burkina Faso by targeting the poorest households with elastic demand for mechanized desludging for subsidies. We presented this paper at the 2017 NBER summer workshop. We first created a demand model based on market data and a demand elicitation experiment. We then maximized take-up of the improved service subject to a budget constraint. A unique feature of this project is that we not only use market data to design the optimal tariff rates across households, we also test the subsidy program and observe the extent to which take-up changes and the budget constraints are met.

A main feature of the platform is that prices are designed to raise revenue from households that would have purchased the improved service even in the absence of the program, while channeling

subsidies to households that might otherwise be unable to pay. Our targeting strategy successfully identified households who would otherwise have failed to purchase improved services; there was a large treatment effect on the households, but no statistically significant treatment effect on the wealthy households that received the higher prices.

Subsidies are important for expanding the use of products whose value households already understand, but households do not know the benefits of many new health products. Information campaigns can work well in urban areas where travel for project staff is relatively inexpensive, but many of the households most in need of the information are located in isolated rural areas. Projects hoping to expand to these areas must choose between the available local leaders (typically a local secular government leader and at least one religious leader) with whom to collaborate on their project, but little evidence exists on the tradeoffs between religious and secular leaders.

In [“Leader Networks and Targeting: A Randomized Controlled Trial Testing the Effectiveness of Local Religious and Governmental Leaders”](#) with Robert Dowd and Danila Pankov (Working Paper), we test the relative effectiveness of religious versus secular leaders in promoting health products in developing countries. We find that secular leaders more effective than religious leaders at increasing the purchase of water-purifying tablets. Protestant and Muslim leaders did increase the take-up of the tablets, but there was no increase in use of the tablets in villages randomly assigned to have the intervention lead by Catholic leaders. We develop a simple theoretical model which shows that leaders focusing on poorer populations may end up with lower overall take-up rates for a given effort level and project budget. We investigate several mechanisms through which the impacts of the leaders differ including effort level, marketing ability, monetary incentives, and targeting.

### ***The Impacts of Expansion of Service Sectors***

While manufacturing and agriculture are classic focuses of development economics, the services sector is an under-studied and increasingly important aspect of growing economies. The services sector currently accounts for 70% of value-added across the world, and in India, for example, 53% of value added (World Bank National Accounts Data, 2017). Financial services, in particular, are an economic necessity for growing firms and increasingly prosperous households, and I make significant contributions by providing causal estimates of the impact of more readily available and more complex financial products.

In [“Services Reform and Manufacturing Performance: Evidence from India,”](#) with Jens Arnold, Beata Javorcik, and Aaditya Mattoo (*Economic Journal*, 2016), we demonstrate the powerful contribution of India’s policy reforms in services such as banking, telecommunications, insurance and transport to growth in the manufacturing sector. Services reforms benefited both foreign and locally-owned manufacturing firms, but the effects on foreign firms tended to be stronger.

The expansion of access to financial services had an un-ambiguously positive effect on manufacturing firms, but one might be concerned about the impact of increased availability of consumer credit. With access to consumption loans, consumers may misuse credit and get caught in debt cycles. In [“Timing to the Statement: Understanding Fluctuations in Consumer Credit Use,”](#) with Sumit Agarwal and Amit Bubna (*R&R, Management Science*), we show that following the expansion of access to credit cards in India, new consumers were quite savvy. We use unique transaction-level data from 5,800 credit card holders to show that consumers optimize the use of their credit cards: they spend early in each credit cycle in order to maximize the use of the free float that the card provides.

While the expansion of consumer credit has been significant, particularly in urban and wealthy areas, many poor households continue to have little access to credit. Understanding how households would react to an increase in credit and the potential growth that would result from credit expansion is important in determining policy surrounding the banking sector in developing countries. In “[The Aggregate Impact of Household Saving and Borrowing Constraints: Designing a Field Experiment in Uganda](#),” with Joe Kaboski and Virgiliu Midrigan (*American Economic Review Papers & Proceedings*, 2014), we show that theoretically, the impact of cash loans and asset loans is different: while cash loans are likely to lead to large increases in consumption, investment and entrepreneurship in the short run, in the long run they may lead to more debt and a decrease in overall saving. Asset loans, on the other hand, are likely to lead to smaller initial impacts on consumption, but larger long run increases in investment, output, and consumption. We finished the field work for this project in August, and we are currently working on analyzing the data for this paper.

High prices for desludging services mean that many households need to save funds to purchase desludging services. A lack of available financial services means that many households are unable to purchase products requiring a large cash outlay because they have trouble saving. In “[Mobile Payment Systems: The Impact of Earmarked Savings on Sanitation Purchases](#)” with Laura Schechter (R&R, *Journal of Development Economics*), we test whether access to a mobile money savings vehicle increases the propensity of households to purchase an improved sanitation service. We find that the ability to save through the mobile money program whenever the household has funds available increases the probability that households purchase the sanitation service from our program by 5.7 percentage points. This effect is strongest among the most vulnerable households with fluctuating incomes and those who were unable to save previously.