

RESEARCH STATEMENT

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My research is on economic development, primarily testing predictions from microeconomic theory regarding labor markets and human capital. A second area in which I work is political economy. In this statement, I first describe my research on economic development and then turn to my work on political economy.

I. Testing basic microeconomic theory related to labor and human capital

My research tests core ideas from microeconomic theory related to health, education, and labor. My papers typically model a distinctive feature of developing countries, such as missing credit markets or limited access to modern contraception. The model shows how, given this feature, standard economic mechanisms (such as prices adjusting to clear markets or utility-maximizing parents making decisions) give rise to novel phenomena, and I then test the theoretical predictions using household data. For example, my research has explored how limited access to birth control leads to a gender gap in breastfeeding and how lack of credit causes wage volatility in developing countries.

Research on labor markets in developing countries

The limited ability of workers to smooth consumption because of imperfect credit markets or to smooth their labor productivity by migrating leads to the phenomenon I study in “**Selling Labor Low: Wage Responses to Productivity Shocks in Developing Countries**,” (*Journal of Political Economy*, 2006) [1]. The paper models a local agricultural labor market in which labor supply is endogenous and productivity is subject to exogenous shocks (due, for example, to drought or changes in world prices). I show that several characteristics of poor workers—their limited ability to borrow and save, their near-subsistence, and their difficulty migrating for work if their village is isolated—all make labor supply less elastic. Thus, the market-clearing wage is very sensitive to productivity shocks. Precisely when the wage is low, a poor worker supplies relatively more labor (“sells labor low”), imposing a negative pecuniary externality on other workers. A volatile wage represents a significant welfare cost to risk averse workers.

Landowners, meanwhile, benefit from the pecuniary externality as they pay lower wages during productivity downturns. I show that landowners might therefore prefer to keep access to credit limited in their village; they give up the benefit of being able to borrow to smooth their consumption, but the benefit may be outweighed by the fact that *workers’* inability to smooth consumption helps landowners by making land profits less volatile.

To test the model, I constructed a 30-year panel data set, combining administrative records and my own calculations from micro-data. The empirical analysis treats each district as an agricultural labor market and tests how responsive the equilibrium wage is to fluctuations in local productivity, proxied by the crop yield. I use abnormally high or low rainfall as a source of variation in agricultural productivity and find support for the model’s predictions. For example, workers’ ability to smooth consumption, as measured by the extent of rural banking, makes the local wage react less to fluctuations in agricultural productivity.

A key reason why local productivity shocks translate into large changes in the wage in India is that local labor markets are essentially closed. I examine another consequence of closed labor markets in “**Incentives to Teach Badly? After-School Tutoring in Developing Countries**” (working paper, 2008) [2]. A widespread phenomenon in many developing countries is that schools offer for-profit tutoring to their students, typically in group classes held in the afternoon. The following incentive problem often ensues: Teachers refrain from teaching some of the curriculum during school in order to generate demand for their tutoring classes. If a student needs to know X, Y, and Z to pass the exam, the teacher covers X and Y in class and teaches Z during the tutoring classes. My paper models the market for tutoring and this incentive problem facing teachers. I show that a ban on tutoring one’s own students or policies that reduce

entry barriers for third-party tutors could be welfare-enhancing for students, both those who do and do not take tutoring.

I then use survey data and test scores from secondary-school students in Nepal to empirically assess whether a school's offering of tutoring negatively affects student achievement. The identification strategy uses within-school variation since schools often offer tutoring in some subjects (e.g., math, science, or English) but not others. I find that the negative spillover from teacher-provided tutoring leads to a 0.1 standard deviation drop in test scores.

I also examine teachers' effort during the school day more directly. Students were asked to assess each of their teachers on several dimensions such as whether the teacher typically taught for the full class period. I find that when the teacher is offering tutoring classes, students are more likely to report he does not teach the entire period and does not complete the curriculum. However, teachers who tutor do not receive negative reviews with respect to their knowledge, suggesting that "bad" teachers selecting into tutoring does not drive the result. Instead, the drop in tests scores when tutoring is offered appears to be due to teachers reducing their effort in class to generate demand for their tutoring.

Research on the determinants of human capital

My tutoring paper discusses a phenomenon that adversely affects students' human capital, and human capital is a topic that broadly interests me. In "**Life Expectancy and Human Capital Investments: Evidence from Maternal Mortality Declines in Sri Lanka**" (*Quarterly Journal of Economics*, 2009), Adriana Lleras-Muney and I test a classic prediction from economic theory: An increase in a person's time horizon raises her lifetime returns to education, and thus should increase the amount of schooling she chooses to obtain [3]. This mechanism has been hypothesized as one explanation for the large increase in education in the 20th century seen in several countries and as a potentially important benefit of reducing mortality in developing countries today. Measuring this effect is challenging, though, because one needs exogenous variation in children's *future* health that is uncorrelated with their *current* health; otherwise, the estimated life expectancy effect is confounded with the effects of current health on education. For example, improvements in water quality increase life expectancy but also improve children's health, which allows them to attend school more frequently.

Maternal mortality risk satisfies the criterion of being an important determinant of girls' future but not current health. We examine a 70 percent decline in maternal mortality that occurred in Sri Lanka between 1946 and 1953. This dramatic health improvement has several features that prove beneficial for empirical identification: it did not affect boys, providing us a natural control group; it had large effects on overall female mortality, increasing female life expectancy by 1.5 years, or 4 percent; it took place within a seven-year period, allowing us to separate its effects from secular changes in education; and it varied considerably across Sri Lanka's 19 districts.

Using variation across districts, time, and gender, we find that the reduction in maternal mortality risk caused a 2.5 percent (one percentage point) increase in female literacy and a 4.0 percent (0.2 year) increase in years of schooling. Our estimate of the increase in schooling per extra year of life is considerably smaller than most calibration results in the literature but larger than a recent instrumental-variables estimate that suggested there is no effect.

As the papers above indicate, my research does not focus on one country. My research approach has tended to be question-driven, and after choosing a research question, I have identified a good setting in which to study it. For example, to measure the effect of longevity on education, we first thought through the empirical suitability of different types of health improvements. We selected maternal mortality risk because it affects a girl's future but not current health and because boys can serve as a comparison group. We then examined the historical record for a decline in maternal mortality that was both rapid and large, allowing one to identify its effect. Based on these criteria, we selected the dramatic decrease in Sri Lanka in the 1940s as the best setting for the study above.

In reading about the history of maternal mortality, we learned about an episode in the U.S.—the drop in maternal mortality in the 1930s after the discovery of sulfa drugs—that was well-suited for exploring another important aspect of increased longevity, namely how much of it is due to medical innovation. Sulfa drugs were a major breakthrough, providing the first effective treatment for often-fatal

bacterial infections such as scarlet fever, puerperal sepsis, pneumonia, and meningitis. We examine the impact of sulfa drugs on U.S. mortality in **“Modern Medicine and the 20th-Century Decline in Mortality: Evidence on the Impact of Sulfa Drugs,”** which is co-authored with Adriana Lleras-Muney and Kim Smith (*American Economic Journal: Applied Economics*, forthcoming) [4].

There are no disaggregated data on the diffusion of sulfa drugs, so there had been little previous empirical work on their impact. Our paper tackles the question by taking advantage of the fact that (a) the discovery of sulfa drugs occurred when no other major factors are known to have affected mortality trends; (b) the drugs diffused rapidly; and (c) from clinical trials, we know they were only effective against certain diseases. First, we test for structural breaks in the U.S. mortality time series and find a sharp trend break in 1937, the year the drugs became widely available in the U.S. for infectious diseases that were treatable with sulfa drugs (“treated” diseases) but not for other infectious diseases (“control” diseases). Second, we make a difference-in-differences comparison of mortality between treated and control diseases, before and after 1937. We find that sulfa drugs were responsible for a 36 percent decline in maternal mortality, 32 percent decline in pneumonia mortality, and 65 percent decline in scarlet fever mortality between the pre- and post-1937 periods. Our paper contributes to the debate over the roots of the historic health improvements in the West in the 20th century by providing some of the first evidence that modern medicine and not just improved nutrition and sanitation caused the decrease in mortality rates.

The paper also finds that sulfa drugs benefited whites more than blacks. The result is consistent with medical innovation diffusing more rapidly among advantaged groups, at least initially, thus widening inequality across racial and socioeconomic groups. This finding is especially striking given that sulfa drugs were inexpensive, less than \$100 in current dollars for an often life-saving course of medicine.

I return to the theme of investments in children’s human capital in **“Why Do Mothers Breastfeed Girls Less than Boys? Evidence and Implications for Child Health in India”** with Ilyana Kuziemko (NBER working paper, 2009) [5]. The central idea of the paper is that because breastfeeding makes a woman temporarily infertile, she breastfeeds her child for a shorter duration if she wants to conceive another child, and for a longer time if she wants to avoid becoming pregnant but lacks access to modern contraception. This link between nursing and fertility is reinforced by the fact that a mother who becomes pregnant while still nursing often weans the first child sooner than she otherwise would have.

The paper develops a dynamic programming model of how breastfeeding depends on future fertility and provides support for its predictions using National Family Health Survey data from India. If parents have a preference for having sons, then mothers with few or no sons are more likely to want to conceive again, so they will wean their current child sooner. Therefore girls are breastfed less than boys. Moreover, the sex of older siblings affects how long a child is breastfed, one of several predictions that enable us to distinguish our hypothesis from the explanation that mothers breastfeed sons more than daughters because they care more about the health of their sons. In addition, the model predicts and the data show that the sex-composition effect is strongest for medium birth-order children: at sufficiently low birth order, a mother will want to have more children (and thus limit breastfeeding), and at sufficiently high birth order, she will want to stop having children, regardless of her children’s sex composition.

In unsanitary environments, breastfeeding can protect against water- and food-borne disease, and we indeed find that child survival has many of the same relationships with the gender and birth-order interactions as does breastfeeding. Moreover, these relationships are strongest in households without piped water, precisely where breastfeeding is hypothesized to be most beneficial to child health. Our results suggest that the gender gap in breastfeeding explains 14 percent of the gender gap in child mortality in India, or about 22,000 “missing girls” each year. Son preference is the underlying cause of these missing girls, but in a subtle way: Parents are not explicitly deciding to allocate more resources to sons; rather, the missing girls are an unintended consequence of parents’ desire to have more sons.

An additional implication is that access to modern birth control might cause mothers to substitute away from breastfeeding. Obviously, the benefits of modern contraception may well swamp this potential cost, but one policy implication would be that campaigns to introduce modern contraception may need to be coupled with campaigns to encourage breastfeeding if policy makers wish to prevent breastfeeding rates from falling. Improving water quality also may become a more urgent policy priority in communities with access to contraception, given the possible declines in nursing.

The finding above that early weaning increases mortality mainly when the family lacks clean water demonstrates the importance of environmental factors in determining child health. I study another link between the environment and child health in “**Air Quality and Early-Life Mortality: Evidence from Indonesia’s Wildfires**” (*Journal of Human Resources*, forthcoming) [6]. The paper examines the effect of air pollution on infant and child mortality. Widespread forest fires blanketed much of Indonesia in smoke in late 1997, and the paper’s identification comes from spatial and temporal variation in airborne particulate matter that the fires induced. Since Indonesia lacks reliable mortality records, the paper infers mortality from “missing children” in the 2000 Indonesian Census. I find that the spike in pollution led to a one percentage point decline in the surviving cohort size, or an 8 to 17 percent increase in mortality under age two. While counting missing children could introduce potential problems, I show that migration and other potential concerns do not seem to be driving the results.

One of the paper’s main contributions is that due to the sharp timing of the pollution event, I can identify the period of child development during which exposure to particulate matter is most harmful to health. I find the largest mortality effects for children exposed in utero, which suggests that protecting pregnant women should be a priority of public health efforts concerning air pollution.

The paper also finds a steep socioeconomic gradient in the mortality effects of pollution. The effect size is twice as large in districts with below-median average consumption compared to districts with above-median consumption. I find suggestive evidence that the heterogeneity is because people in poorer areas are more likely to use wood-burning stoves and face compounded health damage from indoor plus outdoor air pollution.

I am working on several new projects related to human capital. Here I will briefly describe one of them. With Mohammed Al Shafae and Erica Field, I am researching “**The Costs and Benefits of Cousin Marriage**” (work in progress). Cousin marriage is widely practiced in Muslim societies, e.g., 27% of women in our sample in Oman married a first cousin. The project aims to answer two questions: (1) What are the social and economic benefits of cousin marriage? and (2) What are the health consequences for offspring? These two questions together test the hypothesis that in the presence of market imperfections (e.g., missing credit markets, incomplete information about potential spouses), marrying within the family confers economic and social benefits that might outweigh the deleterious health effects of inbreeding.

We designed and fielded a household survey in Oman that allows us to test for various economic, social, and health correlates of cousin marriage. For example, one potential benefit of cousin marriage is that there is less abuse of wives; within an extended family, repeated interactions and better information might make it easier to punish an abusive husband. Another hypothesized benefit is that the groom does not need to pay the bride-price upfront; an informal credit contract through which he pays over time is enforceable within the family. In terms of the health effects of cousin marriage, we will be able to examine miscarriages, stillbirths, and child health outcomes such as mortality and genetic disorders.

People who marry family members and people who do not are likely to differ in important unobserved ways, such as their health or wealth. Our analysis develops an instrumental variable for whether a woman marries her cousin that is based on her supply of “marriageable” first cousins. A woman typically marries a man a few years older than her, so our instrument is the number of male cousins in the appropriate age range, which strongly predicts cousin marriage. The first stage regression controls for the respondent’s total number of cousins, their sex composition, her number of brothers and sisters, her number of *female* cousins somewhat older than her, and other variables so that the remaining variation in “male cousins the right age to marry” is plausibly exogenous to our outcomes of interest.

II. Political economy of firms and government

Weak institutions underlie many phenomena in developing countries, including several of those described above. For example, in my tutoring paper, lack of oversight enables teachers to rent-seek and in my air pollution paper, the forest fires that ravaged Indonesia were made possible by corruption in the timber industry. Another part of my research agenda is to examine political economy issues more directly. In particular, I have studied ways in which firms enable the rent-seeking activity of top government officials.

In “**Odious Debt**” (*American Economic Review*, 2006), Michael Kremer and I use simple economic theory to illustrate an important problem facing poor countries and to suggest potential policy solutions [7]. We model the sovereign debt market where some governments borrow and use the money in the interest of the people (e.g., to build infrastructure), but others loot the money or use it to repress the people. The status quo in the debt market today is that successor governments repay the debt of previous regimes, no matter how reprehensible the predecessor was. As such, many poor countries are saddled with “odious debt” incurred by past corrupt or repressive governments. For example, South Africa today is repaying its apartheid debt, arguing that repudiating the debt would scare off future foreign investors.

In a debt market where countries repay debt to maintain a good reputation, a profit-minded bank will lend to even “odious” regimes if the bank expects to be repaid. Our paper argues that there exists another equilibrium of the debt market in which there is common knowledge that certain regimes are odious, and successor governments do not repay debt incurred by odious regimes. Hence, profit-minded creditors do not lend to such regimes. Simply an announcement by the international community that a certain regime is odious could shift the equilibrium to one in which creditors do not lend to the regime. We also discuss ways that an equilibrium without odious debt could become the only type of equilibrium, for example, if foreign aid to successor regimes were contingent on their not turning the money over to banks who had lent to regimes deemed odious.

One of the paper’s most important insights is that if the international community’s decisions about which regimes are odious are biased in favor of borrowers or creditors, then there is a time consistency problem if decisions are made after the loans are issued. The international community might falsely brand a legitimate government as odious so that a poor country does not have to repay its debt or might fail to brand a regime odious so as not to hurt the profits of the creditor. However if the decisions are made *ex ante*—that is, if they apply to future borrowing by a regime—then these biases are kept in check.

If the United Nations or the U.S. government announced that a government is odious and that future loans to the government would not be recognized, they are in effect imposing a “loan sanction.” We show that loan sanctions have two attractive features relative to typical trade sanctions. First, trade sanctions are criticized as hurting the citizens and not just the ruler because economic activity dries up. Economic activity might also dry up under loan sanctions, but this cost to the citizens is likely outweighed by the large benefit to them of not being saddled with odious debt in the future. Second, trade sanctions are often ineffective because third parties have incentives to break them. Loan sanctions, in contrast, are self-enforcing; a profit-minded bank will not want to lend to a regime if it does not expect to be repaid.

I remain active on this project in a policy role. I am co-chairing a working group sponsored by the Center for Global Development that is bringing together experts on law, finance, government, human rights, and economics to draft a policy proposal based on the ideas in the paper. The group is taking up important implementation issues that were beyond the scope of the academic paper, such as the pros and cons of an international organization like the United Nations versus individual nations imposing loan sanctions, and possible unintended consequences on global debt markets if loan sanctions were introduced.

“**The Jeffords Effect**” (*Journal of Law and Economics*, 2006) studies another type of potentially harmful codependence between firms and government leaders—corporate campaign contributions in the United States [8]. In May 2001 Senator Jim Jeffords abruptly left the Republican Party and became an Independent. Because the Senate had been so balanced, Jeffords’ decision tipped the Senate from Republican to Democratic control. I use this surprise event to demonstrate that shifts in political power have a large effect on the market value of firms.

The paper conducts an event study of the Jeffords defection and uses corporate soft-money donations (unregulated contributions to the political parties) to explain the cross-sectional variation in stock market responses. A firm that had donated \$250,000 to the Republicans in the previous election cycle (the average among Republican donors in the sample) lost 0.8 percent of market capitalization the week of Jeffords’s switch. The same level of Democratic donations is associated with a gain in market value that is smaller in magnitude (0.4 percent), although the confidence intervals are consistent with the coefficients being equal and opposite.

One interpretation of the results is that firms make donations to help elect like-minded politicians. A second interpretation is that they contribute to influence politicians' behavior once elected. To shed light on this issue, the paper uses its estimate of the stock market change per dollar of donations along with additional assumptions to calculate a return on investment (ROI) in politicians under two sets of assumptions, one in which the purpose of donations is to affect elections (which is legal) and one in which they are half of a quid pro quo (which is illegal). I show that donations have an unprofitably low ROI if their purpose is to influence elections and an extremely high ROI if they are intended as a quid pro quo. If firms act rationally, then given their cost of capital, the return on donations must be a weighted average of these two ROIs. In other words, to make sense of firms' decision to donate in the first place, yet to not donate considerably more, most of the Jeffords effect would have to be due to firms targeting their donations at politicians aligned with them, but some of the effect would have to be due to donations causing politicians to be helpful to their donor firms.

Research described above

- [1] Jayachandran, Seema, "Selling Labor Low: Wage Responses to Productivity Shocks in Developing Countries," *Journal of Political Economy*, 114(3), (2006), 538-575.
- [2] Jayachandran, Seema, "Incentives to Teach Badly? After-School Tutoring in Developing Countries," September 2008.
- [3] Jayachandran, Seema and Adriana Lleras-Muney, "Life Expectancy and Human Capital Investments: Evidence from Maternal Mortality Declines", *Quarterly Journal of Economics*, 124(1), (2009), 349-397.
- [4] Jayachandran, Seema, Adriana Lleras-Muney and Kim V. Smith, "Modern Medicine and the 20th-Century Decline in Mortality: Evidence on the Impact of Sulfa Drugs," *American Economic Journal: Applied Economics* (forthcoming).
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- [8] Jayachandran, Seema, "The Jeffords Effect," *Journal of Law and Economics*, 49(2), (2006), 397-425.