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Electrification and Household Welfare

Evidence from Pakistan

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Abstract

As many as 50 million people in Pakistan may still live without connection to the electric grid. Pakistan also has some of the world's worst power outages. Using data from a nationally representative two-period panel survey, this paper presents the first empirical evidence on the cost of unreliable electricity supply to households in Pakistan. The results show that lack of connectivity and poor reliability may be costing the country at least $4.5 billion (1.7 percent of gross domestic product) a year. Addressing the problem requires energy sector reforms to correct regulatory and institutional distortions in the gas and electricity sectors.

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Electrification and Household Welfare: Evidence from Pakistan[1]

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Key Words: Rural electrification, benefits of electrification, Pakistan
JEL: D6 ,Q4, R2

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I. Introduction

Access to reliable electricity has long been recognized as a driver of social and economic development. A growing body of literature shows that low access to and poor quality of electricity affect households' living standards and social welfare (Chakravorty, Pelli, and Marchand 2014; Samad and Zhang 2016, 2017). Many studies examine the causal link between electricity and development in Bangladesh and India (Khandker, Barnes, and Samad 2012; Rud 2012; van de Walle et al. 2017). To the best of our knowledge, this is the first rigorous empirical study of Pakistan.

Previous analysis of Pakistan shows only correlation between electricity and income (Gellerson 1982; Yazdanie 2010; Majid 2013). Such correlations are often misleading, for at least two reasons. First, people with lower income either put off adopting electricity once it becomes available or are unable to afford the connection fees and other costs of electricity. Second, areas farther from urban centers and areas with limited access to roads and markets are more likely to stay off-grid. People in these areas are also more likely to be poor. Because it fails to address the endogeneity of program placement and household adoption of electricity, simple correlation analysis cannot explain the direction of causality.

This study uses econometric techniques to determine the net effects of rural electrification on various household and individual welfare outcomes in Pakistan, after controlling for endogeneity using the propensity score matching method. The analysis is based on data from two household surveys. The first—the Pakistan Social and Living Standard Measurement (PSLM) Survey—is a two-period panel household survey that was carried out in 2007/08 and 2010. It provides information on household demographic characteristics, income, expenditure, education, health, and electrification status. It did not collect information on the quality of electricity supply.

The second survey was conducted in 2014 under the Lighting Pakistan program of the International Finance Corporation (IFC 2015). It asked households to estimate the average duration of outages. Data from the IFC survey are used to gauge the impact of power outages on household welfare outcomes.

Based on a two-stage propensity score–weighted fixed-effects model, the analysis finds that electrification is associated with a broad range of social and economic benefits in Pakistan, including higher income and expenditures, better health and education outcomes for children, and increased women's labor force participation and decision-making power. Lack of reliable access to electricity is conservatively estimated to cost the economy $5.8 billion—2.6 percent of GDP—a year.

The rest of the paper is organized as follows. Section II reviews the status of electricity access in Pakistan and identifies factors contributing to the low quality of electricity supply in the country. Section III presents the data and the descriptive analysis. Section IV discusses the empirical strategy. Section V describes estimation results and findings. Section VI summarizes the paper's main conclusions.

II. Electricity Access in Pakistan

Pakistan has made remarkable progress in connecting its towns and villages to the electric grid over the past few decades. The *Global Tracking Framework* report issued jointly by the World Bank and the International Energy Agency ranked Pakistan fourth in the world in terms of the number of people who gained access to electricity between 1990 and 2010 (after India, China, and Indonesia) (SEforAll 2014). Over this period, roughly 91 million people in Pakistan received electrical services for the first time.

The actual access rate to electricity in Pakistan is very much up to debate, however—and by any measure a large share of the population continues to live without electricity 24/7. Pakistan's latest official household survey reported that 97.5 percent of the population had access to electricity in 2016 (99.7 percent in urban areas and 95.6 percent in rural areas). Estimates based on census data and the number of connections reported by utilities suggest that access to grid electricity was only about 74 percent in 2016 (90 percent in urban areas and 63 percent in rural areas in 2016) (IEA 2017). The household survey sponsored by IFC suggests that 35 percent of Pakistan's population lacked access to electricity in 2014 and that the access rate in parts of the country was still alarmingly low (almost half of the population in Sindh lived off-grid, for example).

Taken together, these estimates suggest that 5–54 million people in Pakistan may lack access to electricity (table 1).

Pakistan also has some of the worst power outages in the world. According to a 2013 World Bank Enterprise Survey, 81 percent of firms reported being affected by outages on average 75 times a month, with the average outage lasting 17 hours. The IFC survey suggests that Pakistani households typically face 16 hours a day of scheduled blackouts (also called load shedding) during the summer and 12 hours a day during the winter (IFC 2015). The latest *Global Competitiveness Report* ranks Pakistan 115th among 137 economies in the reliability of electricity supply (Schwab 2018). Largely as a result of unreliable electricity supply, per capita electricity consumption in Pakistan stayed flat for almost a decade, after peaking in 2006.

The electricity deficit in Pakistan is attributable to both lack of investment and inefficiencies in every link of electricity supply. Natural gas—the most important indigenous source of energy—was priced at roughly 36 percent of the international benchmark price in fiscal year 2016. Underpricing gas contributes to gas shortages, because it encourages wasteful energy consumption and reduces suppliers' interest in gas exploration and production. In fiscal year 2016, gas shortage reached about one-third of already constrained demand (Ministry of Finance 2016). On top of low gas supply, Pakistan lost more than 12 percent of gas to leakages and theft in 2016—many times more than the roughly 1–2 percent in OECD countries.

With domestic gas production faltering, in 2005 the government adopted a gas allocation policy that gives lower priority to the power sector (with gas going first to residential users and the fertilizer sector). To bridge the shortfall, power generators have increasingly turned to diesel and furnace oil. Liquid fuel–based power generation is much more expensive than gas-based generation: It accounts for 40 percent of total generation but about 70 percent of the total cost.

The high cost of generation has had a knock-on effect along the electricity supply chain. It increases the need for subsidies to keep prices low. When the government fails to pay subsidies on time, distribution companies cannot pay the generators, which in turn cannot pay oil and gas suppliers, forcing generators to shut down or run at low capacity, resulting in more load shedding.

By some estimates, all power plants in Pakistan were running below capacity in 2014 because of fuel shortages, with oil and gas shortages alone leading to 5,000 MW of idled capacity (World Bank 2015).

Pakistan started importing liquefied natural gas (LNG) in 2015. The increasing supply of imported LNG is expected to relieve fuel shortages and cut demand for furnace oil for power generation.

Inefficiencies in electricity generation, transmission, and distribution are widespread. Because generators are shielded from market competition and costs are passed through to consumers, incentives to improve efficiency remain weak, especially for publicly owned power plants. By one estimate, on average pubic power plants use 20 percent more fuel than private plants to generate the same amount of electricity (Zhang 2018). In addition, almost a fifth of the electricity produced in Pakistan is lost in transmission and distribution, as a result of technical and nontechnical problems (such as pilferage). Another important cause of power shortage is transmission constraints, which hinder evacuation of electric power. Transmission constraints are estimated to have accounted for 29 percent of the electricity shortfall in fiscal year 2015 (NEPRA 2016).

III. Data and Descriptive Analysis

Data for the analysis come from two sources. The first is the Pakistan Social and Living Standards Measurement (PSLM) Survey for 2007/08 and 2010. Both rounds included detailed questions on households' social and economic characteristics; income; expenditure; energy use patterns, such as monthly electricity consumption; and grid connection, education, health, water supply, and sanitation status.

The Pakistan Bureau of Statistics implemented the surveys in all urban and rural areas of the country's four provinces and Islamabad, excluding restricted military areas. The first round, conducted in July 2007–June 2008, covered 15,512 households. The follow-up round, conducted in January–July 2010, covered about half the households surveyed in the first round. The sample size was smaller in the follow-up round, because only households that could be interviewed in the same quarter of the year they were interviewed the first time were included.

For sampling in urban areas, each town (or city) was divided into enumeration blocks consisting of 200–250 households. Each enumeration block was classified as belonging to one of three income groups (low, middle, and high), based on the living standard of the majority of the people in the block. In rural areas, the list of villages from the Population Census 1998 was used as the sample frame. Urban blocks and villages were the primary sampling units for the survey. Sixteen households were selected from each sample village and 12 from each enumeration block, using a systematic sampling scheme with a random start. Because the PSLM survey reports an electrification rate close to 100 percent in urban areas, the analysis was restricted to the rural sample, which included about 4,300 households.

Data from a second survey, conducted in 2014 under the IFC's Pakistan Off-Grid Lighting Consumer Perceptions Study (IFC 2015), were used to gauge the impact of power outages on households. This survey explored the market potential for off-grid solar lighting in Pakistan. It included 6,000 households, both on and off grid, across all four of the country's provinces. This cross-sectional survey lacks the multifaceted measurement of welfare used in the PSLM, but it provides important information on the quality of electricity supply, because it asked on-grid households to report the average duration of outages.

Table 2 shows the geographic distribution and electricity access rate of the population surveyed by the PSLM. Punjab accounts for the largest share of the sample, followed by Sindh and Khyber Pakhtunkhwa. Balochistan has the lowest electrification rate and the smallest number of households surveyed. Sindh and Balochistan have the lowest access rates, at less than 75 percent in 2010.

The average electrification rate rose by just 2 percentage points between 2008 and 2010. It rose by about 17 percentage points in Balochistan and 4 percentage points in Sindh.

Table 3 compares mean outcomes of households and individuals by electrification status. It shows that on average, households with access to grid electricity consume less kerosene than off-grid households in both survey years, with the differences statistically significant. Grid-connected households also have higher income and expenditure than off-grid households.

Relative to households without access to electricity, households with access had per capita income that was 49 percent higher in 2007/08 and 43 percent higher in 2010 and per capita expenditure that was 32 percent higher in 2007/08 and 37 percent higher in 2010. The poverty rate of grid-connected households was 41 percent lower in 2008 and 44 percent lower in 2010 than it was for households that were not connected to the grid. All differences are statistically significant.

At the individual level, children under the age of five in grid-connected households were less likely to experience diarrhea or malaria during the 30 days before the survey, and both girls and boys had higher school enrollment and educational attainment based on the simple mean comparison.

In 2010, for example, 56 percent of girls in households with access to electricity but just 21 percent of girls who lived off-grid were enrolled in school.

In both survey years, employment rates were lower in households with access to electricity than in off-grid households, among both men and women. This correlation is counterintuitive.

Evidence on the correlation between electrification and women's empowerment is mixed. Women with access to electricity were more likely than women in off-grid households to make their own decisions alone about their education and the purchase of clothing and shoes but less likely to make their own decisions about their own employment or the purchase of food.

IV. Empirical Strategy

To what extent does access to electricity cause the above differences between grid-connected and off-grid households? We conducted an econometric analysis while taking into account the potential for simultaneous causality between electrification and welfare outcomes. This potential might arise, for example, because a government may electrify areas that are easier to access or have greater growth potential—or because when electricity becomes available in a village, households that are better able to afford it may connect to the grid earlier. Over time, households that are in more developed areas or that were better-off in the first place would achieve higher incomes even without electrification.

The outcome equation for electrification impacts can be expressed as

$$Y_{it} = \beta X_{it} + \gamma E_{it} + \delta T_t + \mu_i + \varepsilon_{it} \tag{1}$$

where Y_{it} denotes the outcome variables of interest, such as income of household *i.* $\mathrm{X_{it}}$ is a vector of household- and village-level observable characteristics, including the age, gender, and education of the household head; the number of household members; the amount of household agricultural land; measures of household sanitation status, such as access to running water and a flush toilet; and the village prices of alternative fuels (firewood, kerosene) and essential food items (staples, meat, fish, vegetables). E_{it} is a dummy variable measuring the electricity connection status of the *i*th household in year *t* (E_{it} = 1 if there is an electricity connection and 0 otherwise). μ_i represents time-invariant unobserved household- and village-level determinants of the outcomes. T_t is a variable capturing common yearly shocks (*t* = 0 for 2008 and 1 for 2010). ε_{it} is a randomly distributed error. β, γ, and δ are unknown parameters to be estimated.

As μ_i is unobserved, its effect on the outcome variables cannot be determined, and the estimated impact of electrification would be biased because of the omission of relevant explanatory variables. With panel data, it is possible to control for the unobserved factors if they are time invariant. Specifically, we can estimate a household-level fixed-effects regression by taking the difference in equation (1) between the two periods (period 0 for 2008 and 1 for 2010):

$$Y_{i1} - Y_{i0} = \beta(X_{i1} - X_{i1}) + \gamma(E_{i1} - E_{i0}) + \delta(T_1 - T_0) + (\mu_i - \mu_i) + (\varepsilon_{i1} - \varepsilon_{i0})$$

or

$$\Delta Y_i = \beta \Delta X_i + \gamma \Delta E_i + \delta \Delta T + \Delta \varepsilon_i \tag{2}$$

As there is no unobserved component, equation (2) gives an unbiased estimate of the impact of electrification.

It is possible, however, that the unobserved factors are not fixed over time. Changes in the perceived benefits of electrification could affect both households' decision about whether to be connected to the grid and the outcome variables.

Taking into account the existence of time-varying heterogeneity, we can rewrite equation (1) as follows:

$$Y_{it} = \beta X_{it} + \gamma E_{it} + \delta T_t + \mu_i + \eta_{it} + \varepsilon_{it} \tag{3}$$

where the additional term η_{it} represents time-varying unobserved household- and village-level determinants of the outcomes of interest. Taking the difference in equation (3) between the two periods yields

$$\Delta Y_i = \beta \Delta X_i + \gamma \Delta E_i + \delta \Delta T + \Delta \eta_i + \Delta \varepsilon_i. \tag{4}$$

The unobserved factor is not eliminated. Hence, a simple fixed-effects estimation of equation (4) would be biased.

We use propensity score matching with fixed effects to control for the potential endogeneity concern. A fixed-effects model controls for time-invariant unobserved factors, as shown in equation (2); propensity score matching based on observables in the first-round survey can be used to control for time-varying unobserved factors by balancing treated and untreated units (see Angelucci and Attanasio 2013). Applied this way, propensity score matching exploits the fact that unobserved heterogeneity is often correlated with initial conditions (Heckman 1981; Chamberlain 1984; Arulampalam, Booth, and Taylor 2000), which are assumed to be captured by the base-year survey.

Propensity score matching can be applied to the sample data in two ways. First, matching can be performed based on the base-year data, to create matched observations of treated and untreated households; a fixed-effects regression can then be applied to the panel of matched households (see, for example, Drichoutis et al. 2015). Alternately, a weight variable can be created based on the estimated probability of a household being connected to the grid (propensity score), conditional on a range of village- and household-level characteristics observed in 2008. The weight variable is given a value of $1/p$ for households with electricity and $1/(1-p)$ for households without electricity, where p is the propensity score. In the second stage, the weight is applied to all observations for fixed-effects estimation. A propensity score–weighted estimation (also called Inverse Probability of Treatment Weighting [IPTW]) gives consistent estimates of the average treatment effects (Hirano, Imbens, and Ridder 2003). Both matching and p-weighting can control for time-varying unobserved factors. We use the latter approach, because the former approach can drop too many observations in the process of matching treatment and control households.

V. Results

Both simple fixed-effects and propensity score–weighted fixed effects estimation are reported (table 4), with the latter our preferred specification. An immediate benefit of household electrification is the reduction of kerosene consumption. A major motivation for rural households to adopt electricity is to obtain better light from electric bulbs, which would replace the dim flickering light provided mostly by kerosene lamps. The analysis shows that gaining access to electricity led to a reduction in kerosene consumption of up to 88 percent in rural Pakistan.

Electrification also has a significant positive impact on households' income and expenditure. Gaining access to electricity is associated with a 37 percent increase in per capita income and an 11 percent increase in expenditure (15 percent for food, 9 percent for nonfood).

Connecting to electricity is also associated with better health outcomes, probably as a result of access to electronic media that improves knowledge of hygiene and healthy lifestyles and the reduction in indoor air pollution from the reduced use of kerosene. Among children under age five, the incidence of diarrhea was 10 percent lower and the incidence of malaria 5 percent lower in households that gained access to electricity relative to households that did not.

Electrification of households also improved education outcomes for children and employment opportunities for adults, although the effects were not widespread. Gaining access to electricity increased boys' enrollment in schools by up to 3.1 percentage points and boys' completed years of schooling by 0.32 years; it had no effect on girls' enrollment or years of schooling.

On average electrification increased labor force participation for women by 2 percentage points but reduced it by 4.8 percentage points for men. The negative effect on men's labor force participation could be related to the effect of higher income on leisure.

There is also evidence that electrification increases women's decision-making power. In households gaining access to electricity, the probability of women making their own decisions rose by 16.3 percentage points for decisions on purchasing food items, 9.5 percentage points for decisions on purchases of clothing and shoes, 2.6 percentage points for decisions on education, and 1.7 percentage point for decisions on employment. The explanation may lie in women's increased participation in the labor force (and thus greater economic empowerment) and their increased access to electronic media, which broadened their horizons on opportunities for social and market participation and raised their awareness of gender equality.

Another important dimension of electrification is the reliability of supply. A basic regression analysis using household-level data from the IFC survey shows that each additional hour of daily outages is associated with an income loss of roughly 1.6 percent. The regression model is

$$Y_{it} = \beta X_{it} + \gamma E_{it} + \pi D_{it} \times E_{it} + \delta T_t + \mu_i + \eta_{it} + \varepsilon_{it} \tag{5}$$

where D_{it} denotes average daily duration of power outages, and all other variables are as defined in equation (1).

VI. Conclusions

Using a panel survey data set from the Pakistan Social and Living Standard Measurement Survey conducted in 2007/08 and 2010 and data from a household survey administered by IFC, this paper presents the first empirical evidence on the benefits of reliable electricity on households in Pakistan. The study uses a two-stage propensity score–weighted fixed-effects model to control for unobserved village- and individual-specific effects that may simultaneously affect electrification status and the welfare outcomes of interest. The results show that electrification is associated with a broad range of social and economic benefits in Pakistan, including income and expenditure, better health outcomes for children, improved school enrollment and school completion for boys (but not girls), and increased women's labor force participation and decision-making power.

All these benefits from expanding and improving electricity supply are important, although not all of them can be quantified in monetary terms. The potential gains in income growth alone are substantial. According to the 2014 Household Integrated Economic Survey, the average rural household in Pakistan earned PRs 26,452 ($253) a month in fiscal 2014. With estimated average income gains of 37 percent a year, the increase in monthly household income would be about PRs 9,787 ($93). Assuming the marginal cost associated with electricity generation and transmission is about PRs 12.2 ($0.12) per kWh, annual average per capita electricity consumption is 471 kWh, and the average household includes 6.7 people, the net per capita gain from gaining access to electricity is estimated at PRs 11,782 ($113) a year.

There is no consensus on the access rate of electricity in Pakistan. The official estimate based on household surveys suggests that about 5 million people remained off-grid in 2016. Data from the 2017 census and utility connections lead to an estimate that is almost 10 times as high: almost 50 million people (36 percent of the population). Based on the more conservative figure of 5 million, connecting the entire off-grid population would raise income by $565 million a year. Based on the higher figure, the annual income gain could reach $5.7 billion.

Improving the reliability of electricity supply would add to these gains. Anecdotal evidence suggests that power cuts have been reduced over the past few years, thanks to additions of generation capacity and low global oil prices. Lacking official estimates of load-shedding hours, the analysis assumes that average load shedding was reduced to six hours a day in fiscal 2015. With an estimated income loss of 1.6 percent associated with every hour of daily outage, rural households would reap another $3.9 billion in annual income gains if electricity were provided 24/7.

The net income loss from the lack of reliable access to electricity for households in Pakistan is therefore conservatively estimated at $4.5 billion (about 1.7 percent of GDP) a year. This estimate is likely to grossly understate the actual loss, because it does not capture the impact of lack of reliable access to electricity on health and education outcomes and because access rates could be much lower than the officially reported 97.5 percent.

These results suggest that increasing reliable access to electricity would yield huge gains. Pakistan could do so by both continuing to expand the electric grid and by developing alternatives to grid electricity, especially given that Pakistan has large potential for renewable energy from wind, solar, and hydro power (IRENA 2018).

It is also important to improve the quality of electricity supply. A recent World Bank report (Zhang 2018) shows that reducing power shortages in Pakistan requires adopting energy sector reforms to address inefficiencies in the allocation and distribution of natural gas, increasing fuel efficiency in electricity generation, reducing losses in the transmission and distribution of electricity, and correcting pricing problems in the electricity market.

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Table 1 Electricity access rate in Pakistan (percent of population)

Source	Total	Urban areas	Rural areas
Official household survey (2016)	98	100	96
International Energy Agency (IEA 2017)	74	90	63
International Finance Corporation survey (IFC 2015)	65	—	—

Source: The official estimate is from the World Development Indicators database, which is based on the official government household survey in 2016. The IEA estimates are based on the 2017 census and the number of total connected domestic customers, as reported by the National Electric Power Regulatory Authority (NEPRA) (IEA 2017). The IFC estimate is based on a household survey sponsored by IFC in 2014 (IFC 2015).

Note: — Not available.

Table 2 Geographic distribution of survey sample, by year

		Electrification rate (percent)	
Province	**Number of households**	**2008**	**2010**
Punjab	1,785	91.8	92.9
Sindh	992	70.9	74.9
Khyber Pakhtunkhwa	900	94.5	94.4
Balochistan	649	53.5	70.7
Total	4,326	86.8	88.9

Source: Pakistan Social and Living Standard Measurement Survey 2008 and 2010.

Table 3 Descriptive statistics of welfare outcomes in households with and without electricity

	2008		2010	
Outcome variable	**Households with electricity**	**Households without electricity**	**Households with electricity**	**Households without electricity**
Consumption of alternate fuel				
Kerosene consumption (liters/month)	0.12	1.57	0.15	1.08
	(−45.88)		(−28.14)	
Income, expenditure, and poverty				
Per capita income (Prs/month)	1,461.5	980.0	12,92.5	904.7
	(5.81)		(3.85)	
Per capita food expenditure (Prs/month)	793.2	728.4	900.4	775.1
	(3.64)		(5.56)	
Per capita nonfood expenditure (Prs/month)	900.0	552.2	931.5	560.2
	(10.80)		(10.11)	
Per capita total expenditure (Prs/month)	1,693.2	1,280.6	1,831.8	1,335.3
	(9.14)		(9.36)	
Moderate poverty (percent of population)	25.7	43.2	32.9	58.5
	(−8.72)		(−11.18)	
Health outcomes (children under five)				
Incidence of diarrhea in previous 30 days (percent)	9.2	9.6	10.2	8.5
	(−0.34)		(1.23)	
Incidence of malaria in previous 30 days (percent)	1.1	2.9	2.3	1.8
	(−3.40)		(0.62)	
Education outcomes (children 5–18)				
Boys' current enrollment (*N* = 6,297)	0.689	0.426	0.733	0.390
	(14.65)		(18.47)	
Girls' current enrollment (*N* = 5,953)	0.535	0.212	0.565	0.207
	(16.15)		(17.21)	
Boys' completed grade (*N* = 6,297)	2.29	1.13	2.46	0.98
	(10.15)		(12.00)	
Girls' completed grade (*N* = 5,953)	1.64	0.35	1.66	0.32
	(12.00)		(12.12)	
Labor force participation (people 15–65)				
Men	0.764	0.865	0.760	0.854
	(−6.92)		(−5.94)	
Women	0.134	0.215	0.141	0.248
	(−7.43)		(−8.54)	

Women's decision-making (women 15–49) (*N* = 9,739)						
Can decide alone on her education	0.079		0.033	0.080		0.040
		(5.17)			(4.00)	
Can decide alone on her employment	0.078		0.085	0.074		0.067
		(–0.72)			(0.70)	
Can decide alone on purchase of food	0.184		0.199	0.202		0.228
		(–1.12)			(–1.68)	
Can decide alone on purchase of clothing and shoes	0.218		0.187	0.252		0.221
		(2.21)			(1.90)	

Note: Figures in parentheses are *t*-statistics of the difference between grid-connected and off-grid households. Income and expenditure values are adjusted by the Consumer Price Index (2008 = 100). Income is the sum of receipts from earning activities only; it does not include receipts from interest, rent, pensions, dividends, remittances, safety net programs, charities, or any other transfer income.

Source: Pakistan Social and Living Standard Measurement Survey 2008 and 2010.

Table 4 Effects of electrification on household and individual outcomes

Outcome variable	Simple fixed effects	Propensity score–weighted fixed effects
Consumption of alternate fuel		
Household kerosene consumption (liter/month)	–0.808**	–0.879**
(*N* = 4,326)	(–7.53)	(–7.11)
Income, expenditure, and poverty (*N* = 4,326)		
Per capita income (Prs/month)	0.162*	0.370**
	(1.61)	(2.50)
Per capita food expenditure (Prs/month)	0.053**	0.146**
	(2.42)	(4.76)
Per capita nonfood expenditure (Prs/month)	0.090**	0.088**
	(2.97)	(2.05)
Per capita total expenditure (Prs/month)	0.069**	0.107**
	(3.37)	(4.32)
Moderate poverty (percent of population)	–0.068**	–0.057
	(–2.13)	(–0.92)
Health outcomes (children under five) (*N* = 4,326) f		
Incidence of diarrhea in previous 30 days	0.040	–0.101*
(percent)	(1.62)	(–1.90)
Incidence of malaria in previous 30 days	0.002	–0.054**
(percent)	(0.15)	(–2.43)
Education outcomes (children 5–18)		
Boys' current enrollment (*N* = 6,297)	0.047*	0.031*
	(1.82)	(1.84)
Girls' current enrollment (*N* = 5,953)	0.025	0.009
	(0.98)	(0.71)
Schooling years completed by boys (*N* = 6,297)	–0.111	0.321**
	(–0.72)	(3.37)
Schooling years completed by girls (*N* = 5,953)	0.093	0.089
	(0.66)	(1.14)
Labor force participation (adults 15–65)		
Men (*N* = 8,393)	–0.026	–0.048**
	(–1.17)	(–3.97)
Women (*N* = 11,179)	0.048**	0.020**
	(2.71)	(2.59)
Women's decision-making (women 15-49) (*N* = 9,739)		
Can decide alone on her education	–0.034**	0.026**

	(–2.25)	(3.51)
Can decide on her employment	–0.022	0.017**
	(–1.44)	(2.26)
Can decide alone on purchase of food	–0.019	0.163**
	(–0.93)	(15.83)
Can decide alone on purchase of clothing and shoes	0.002	0.095**
	(0.09)	(8.82)

Note: Figures in parentheses are *t*-statistics based on robust standard error clustered at the village level. Regression controls for survey rounds (2010 = 1, 2008 = 0); household characteristics (age, gender, and education of the head); number of adult men and number of adult women; agricultural land holdings; access to piped water, tube well, or flush toilet; and village price of fuels (firewood and kerosene) and essential food items (staples, meat, fish, vegetables, and so on).
** Statistically significant at the 5 percent level or smaller.