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Do Migrants Improve Their Hometowns? Remittances and Access to Public Services in Mexico, 1995-2000

Claire L. Adida[1] and Desha M. Girod[2]

Abstract

How do citizens in developing countries access public services? Scholars study this question by emphasizing the role of government, measuring government performance as household access to public services, such as clean water and sanitation. However, the authors argue that the state does not hold a monopoly on provision of such utilities: Citizens in developing countries often turn to nonstate providers for basic utilities. In Mexico, the authors find that direct money transfers from migrants, known as re-mittances, are used to provide household access to public services. The statistical analysis across Mexico's 2,438 municipalities demonstrates that citizens improve their own access. The results also contribute new evidence to the literature on remittances and development by offering a micro-level explanation for how remittances affect both the availability and the source of basic utilities. The findings suggest that the measures scholars typically associate with government performance may in fact capture nonstate provision of basic utilities.

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How do citizens in developing countries access public services? Access to basic utilities has become a popular measure of good governance among social scientists (Adserá, Boix, & Payne, 2003; La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1999). In particular, scholars of Mexico evaluate government performance by measuring citizen access to water, sanitation, and electricity. Hiskey (2003) analyzes access to these three utilities as a measure of government accountability in two Mexican states, Michoacan and Jalisco. Diaz-Cayeros, Estevez, and Magaloni (in press) also analyze access to water and sanitation to study the impact of social service programs. Cleary (2007) evaluates improvements in water and sanitation access across Mexican municipal governments to study the impact of civic participation on government performance. However, governments are not the sole providers of basic utilities. Nonstate providers, including nongovernmental organizations (NGOs), for-profit organizations, and even revolutionary movements, have been offering access to water and drainage throughout the developing world in places as diverse as Bangladesh, India, South Africa, Kenya, and Ethiopia.[1]

We ask whether migrants, by sending money back to their communities, also facilitate "nonstate provision" of basic utilities. Migrants have been sending money to their hometowns for decades.[2] Since the mid-1990s, these direct money transfers, known as remittances, skyrocketed worldwide. In 2006, remittances globally totaled $204 billion, double the amount of development assistance and 62% more than in 2004 (World Bank, 2005, 2007). Remittances sometimes exceed *combined* official development assistance and foreign direct investment (Inter-American Development Bank, 2006). In 2005, remittances constituted 13% of GDP in the Philippines, nearly 20% of GDP in El Salvador, Jamaica, Honduras, Nicaragua, and Haiti, 10% of GDP in the Dominican Republic, Guatemala, Belize, and Bolivia, and 3% and 5% of GDP in Mexico and Colombia, respectively.[3] Remittances therefore represent a substantial influx of income to developing countries. In fact, they surpass even government spending in some localities. In the Mexican state of Guanajuato, which received $652.30 million in remittances in 1996, more than any other Mexican state that year, remittance income was 14 times greater than federal social spending (Zarate-Hoyos, 2004, pp. 556-557).

These large monetary flows and their potential impact on development and social outcomes have not escaped attention. For decades, scholars have been investigating the impact of remittances on economic development.[4] Initially,

scholars were skeptical of any positive long-term development impact of these flows and argued that remittances, at worst, increased recipients' dependency on a foreign source of income.[5] At best, recipients used them only toward consumption, such as home construction, food, clothing, cars, and so forth.[6] More recently, Durand, Parrado, and Massey (1996) argue that remittances could positively affect development despite being spent on consumption because they support local markets and because migrants might also invest them in productive activities, such as purchasing farm equipment and investing in local manufacturers. Consistent with Durand et al., research finds that remittances contribute to productive activities and social well-being in both cross-national and country-specific studies, ranging from Mexico and Central America to Turkey, Jordan, Egypt, Pakistan, India, the Philippines, and even Somaliland. Their results suggest that remittances increase investment, reduce poverty, improve school enrollment, reduce illiteracy, and reduce infant mortality.[7]

Most relevant for our analysis, researchers have found through primarily qualitative studies that remittances develop local infrastructure, especially projects typically associated with governmental service provision, such as road improvements and drainage systems. For example, Mexican migrant organizations in the United States, known as hometown associations, pool remittances, through dances, raffles, and so forth, explicitly to fund these types of services (Leiken, 2000; Orozco & Lapointe, 2004). The evidence from Mexico shows that pooled remittances fund everything from church improvements to road pavement, water systems, meeting halls, health clinics, and parks.[8] This phenomenon extends beyond Mexico. Chaudhry (1989) reports that in Yemen in the 1970s, "[a]part from guaranteeing the financial independence of the private sector, remittances generate local resources that enable rural communities to suspend reliance on the state for the provision of basic infrastructure, such as roads, electricity, water, clinics and schools" (p. 115). With remittance income, migrants and nonmigrants become "nonstate providers" of public services.

Our article offers statistical evidence that remittances fund household access to basic utilities. We disaggregate data on household access to clean water and drainage from the Mexican census to measure whether and how households access these utilities. We then test how nonmigrants spend remittances to improve their social well-being by separating out improvements in infrastructure that citizens are likely to build for themselves (household-driven methods of access) from infrastructure provided by the government (government-driven methods of access). We find that remittances empower households to develop technology to access public utilities.

Our findings call into question whether aggregate measures of access to public services used in existing work on government accountability in Mexico and beyond adequately capture government performance. The literature assumes that access to public services means access provided by the government and measures access without unpacking the technology linking households to public infrastructure. However, governments can "provide" public services to households either directly through public infrastructure or indirectly because households themselves compensate for insufficient government infrastructure. Disaggregating households' method of access allows us to unpack the technology linking households and public provision. By uncovering determinants of household-driven and government-driven access to public utilities, we demonstrate that aggregate measures obfuscate the complex infrastructure of access.

Moreover, our results reveal that these public services are not "public goods," as the literature tends to claim (see, e.g., Diaz-Cayeros et al., in press; Habyarimana, Humphreys, Posner, & Weinstein, 2007).[9] By definition, public goods are nonexcludable and nonrivalrous. Access to water would represent access to a public good, for example, if the government could not exclude anyone from obtaining water and one citizen's access would not limit another's. However, if access to water depends on households' technology of access, then water is an excludable good and therefore not a public good.

In what follows, we offer a micro-level explanation for how nonmigrants use remittances to improve access to clean water and sanitation. In the third section, we test empirically whether remittances improve access to public services through private means of access by analyzing the impact of remittances on access to drainage and clean water across Mexican municipalities between 1995 and 2000. We find that remittances positively affect changes in household-driven access as well as changes at the aggregate level, suggesting that migrants are important "nonstate providers" of basic utilities and that aggregate improvements in coverage are driven in part by increases in household-driven methods of access.

Why Remittances Might Improve Access to Public Services

The literature on remittances and development demonstrates that remittances fuel economic development because recipients stimulate local markets by spending their income on consumption and because nonmigrants invest small amounts of their remittances in local productive activities. This research,

however, has yet to isolate the link between remittances and access to basic utilities.[10] We offer a micro-level explanation for how remittances promote access to clean water and sanitation.

We focus on clean water and sanitation for three reasons. First, recent studies on governmental accountability in Mexico explain variation in governmental provision of these two services. By investigating the impact of remittances on household access to clean water and sanitation, our study engages with leading scholarship on government performance in Mexico.

Second, the lack of clean water and the lack of sanitation constitute important attributes of poverty, and explaining variation in their provision could improve our understanding of how nongovernmental institutions affect community well-being. Dirty water kills 1.5 million children worldwide annually.[11] Since individuals become sick by drinking or touching water that touched waste, the combination of dirty water and poor drainage is lethal (World Health Organization, 2008). As Fry, Mihelcic, and Watkins (2008) report, efforts that improve both water systems and sanitation systems are best at reducing the incidence of waterborne illness. Explaining household access to clean water and drainage systems, therefore, is critical to explaining health and sanitation in a community.

Third, remittances *can* finance household needs such as clean water and drainage. The literature indicates that nonmigrants spend an important fraction of their remittance income on home construction and improvements (Durand & Massey, 2004). The impact of remittances on basic infrastructure is therefore more likely to manifest itself through household improvements than through improvements in roads, schools, and parks, which scholars also cite as services funded by remittance income. Even if such data existed at the subnational level, the impact of family remittances would likely be smaller and more difficult to detect.[12]

How do we expect remittances to improve access to clean water and sanitation? Cross-national surveys show that nonmigrants consume much of the remittance money they receive. In Mexico, they consume as much as 90% of their remittances on home improvements and basic necessities, such as food, medicine, or clothing.[13] According to Parrado (2004), Mexican households with greater links to the United States are "more likely to have tile or wooden floors (as opposed to dirt). They also tend to be larger, with four or five rooms instead of 1 to 3 and to have more appliances" (p. 73).

Although the literature demonstrates that nonmigrants spend remittances on home improvements, analyses so far have focused on bigger houses, more rooms, and better materials. These improvements could also include the building

of infrastructure for access to clean water and sanitation. In other words, remittances could affect the well-being of communities if they empower citizens to access cleaner water and better sanitation systems.

Households in Mexico access clean water mainly through indoor pipes or a communal tap. They eliminate sewerage mainly by draining it into septic tanks, the public sewerage system, or bodies of water or by dumping it on public lands.[14] We refer to these methods of access *as household driven*, *government driven*, or driven by a *combination of both*, based on household and government contributions to the technology of access to these utilities. Access is household driven if households contribute all or part of the infrastructure used to access the utility. It is government driven if households do not contribute any infrastructure to access the utility and use existing government infrastructure instead.[15] When the government offers some of the infrastructure and households complement it with their own technology, access depends on both the government and citizens.

Among these common methods of access to water and drainage in Mexico, only one method excludes government involvement altogether and is therefore entirely household driven. Citizens obtain access to sewerage without government involvement if they purchase septic tanks. When citizens use septic tanks, the government provides no infrastructure for the disposal of the household sewerage.

The analogous technology to septic tanks for water is wells, but few citizens use wells because wells have been drying up.[16] Instead, households invest in their own access to water by building pipes that connect their homes to the public system. Similarly, citizens can connect indoor pipes to the public sewerage system to complement government provision of sanitation. We consider these methods of access as complementary to government provision because the municipal government is responsible for the public system of water and sewerage pipes, including protection from floods and management of treatment plants. But for households to access water or sewerage from the public system, they need to build their own pipes.

A third mode of access is when public utilities are entirely provided by government infrastructure. In Mexico, access to water is entirely government driven when citizens access water through communal taps. Households that utilize this method of access do not invest in infrastructure to bring water into their homes. They use existing infrastructure provided by the government. There is no parallel method in drainage.

In sum, access to sanitation is either entirely household driven (septic tanks) or driven by a combination of household and government provision (connections to the public sewerage system). Access to water is either entirely

government driven (common taps) or driven by a combination of household and government provision (connections to the public water system). We expect that the additional household income from remittances improves household-driven access or access that complements government infrastructure. For access to sanitation, this means purchasing a septic tank or connecting to the municipal system of public pipes. For access to clean water in one's home, this means connecting to the municipal system of public pipes.[17]

In addition, we investigate whether the effect of remittances is observed on aggregate indicators of access to water and sanitation. Such an effect would suggest that remittances prompt greater household-driven access or increase complementary access where both government and citizens invest in improvements in the provision of public utilities. In either case, an effect of remittances on aggregate measures of access would indicate that remittances significantly empower households to improve their access to clean water and sanitation.

Although we expect a positive relationship between remittances and access to services that improve communal well-being, remittances could instead have no effect, or even a negative effect, on access to these utilities. Remittances could decrease access to water and sanitation because their appeal induces mass migration.[18] In this case, remittances would be creating ghost towns where citizens and governments lack incentives to invest in local infrastructure.[19]

In sum, remittances could either positively or negatively affect access to basic household needs. We argue that they are likely to improve access because citizens use remittances to develop the infrastructure privately in their homes.

Empirical Analysis

We evaluate the impact of remittances on access to utilities in hometown communities by estimating a model that explains the change in access to clean water and sanitation between 1995 and 2000 across Mexico's 2,438 municipalities. We test a linear model using robust standard errors to correct for heteroscedasticity.

Mexico offers a propitious opportunity for analyzing the effect of remittances on household needs and public services. First, Mexico's National Council on Population (CONAPO) provides state- and municipal-level survey data on the proportion of households receiving remittances in 2000. Furthermore, CONAPO provides state- and municipal-level data on the proportion of households that, between 1995 and 2000, had an emigrant in the United States. This measure is highly correlated with remittances at both the

state level (r = .95) and the municipality level (r = .83) in 2000 and therefore allows us to analyze the impact of remittances over a 5-year period.

We use this measure of emigration as a proxy for remittances in this article, similar to Diaz-Cayeros, Magaloni, and Weingast (2003), for two reasons.[20] First, this variable measures emigration *between* 1995 and 2000 and not just in 2000. Given that we are estimating a change in access between 1995 and 2000, we need an indicator that spans the same time period rather than a measure that covers only 2000. Furthermore, by estimating a change in access from 1995 to 2000 with an indicator of remittances between 1995 and 2000, we avoid biasing our results with endogeneity. Change in access from 1995 to 2000 may affect the flow of remittances in 2000, but it cannot drive the flow of remittances (emigration) between 1995 and 2000.

Second, Mexico's federalist system allows for subnational empirical analyses at either the state or the municipal level. By sampling all Mexican municipalities, this analysis examines a cross-section of units within the same country that received different levels of remittance flows between 1995 and 2000. The most recent literature on government performance in Mexico uses a similar research design to exploit variations between subnational entities while maintaining country-level factors constant (Cleary, 2007; Diaz-Cayeros et al., in press). These studies use municipal governments as their unit of analysis instead of state governments because Mexico's more than 2,000 municipalities constitute a large sample size. Furthermore, Mexico's constitution calls on municipal governments to provide local public utilities.

Our analysis consists of 12 causal variables including our proxy for remittances. The dependent variables, Septic and IndoorDrainage, and IndoorWater represent the change between 1995 and 2000 in household access to drainage through a septic tank, household access to drainage through indoor pipes, and household access to clean water through indoor pipes, respectively. These methods of access require private investment: If remittances empower households to improve their own technologies of access, we would observe this effect on household access to sanitation through septic tanks or indoor drainage and to clean water through indoor pipes. Table 1 disaggregates access to water and drainage into their census categories for 1995 and 2000 and presents summary statistics for each category. It indicates that, between 1995 and 2000, the proportion of households accessing drainage through a septic tank increased by close to 1 percentage point, the proportion of households accessing drainage through indoor pipes increased by nearly 3 percentage points, and the proportion of households accessing clean water through indoor pipes increased by close to 5 percentage points.

Table 1. Summary Statistics for Access to Household Needs (%)

Dependent variable	1995 conteo		2000 censo		Mean change
	M	SD	M	SD	
Access to drain	45.35	30.14	49.30	28.76	4.23
Septic tank	14.23	15.93	14.97	14.98	0.79
Indoor drainage system	27.05	28.06	29.72	28.73	2.91
Drain into body of water	1.25	2.76	1.58	3.20	0.32
Drain into body of land	2.82	5.18	3.03	4.99	0.21
Access to drain not specified[a]	54.42	30.14	47.89	28.62	6.53
Access to clean water	75.02	21.98	76.41	19.99	1.64
Indoor pipes	26.68	25.78	31.03	25.00	4.58
Standpipe in compound	45.44	24.02	40.76	21.69	−4.68
Public standpipe	2.90	7.42	4.62	6.92	1.74
Access to clean water not specified	0.09	0.14	—	—	—
No access to clean water	24.66	21.94	—	—	—
Access to water from a neighbor	—	—	2.64	1.91	—
Access to water from a truck	—	—	0.95	2.81	—
Access to water from a body of water	—	—	17.19	19.5	—

Independent variable	M	SD	n
Proportion of households with an emigrant in the U.S. between 1995 and 2000 (%)	6.34	6.84	2,443
Change in literacy, 1995 to 2000 (%)	1.80	3.20	2,411
Change in turnout, mid-90s to late 90s (%)	5.38	10.55	1,920
Change in per capita public expenditures, 1995 to 2000 (pesos)	352.59	389.48	2,095
Change in per capita FISM expenditures, 1996 to 2000 (pesos)	78.1	231.28	2,387
Change in PRI vote share, mid-90s to late 90s (%)	−6.18	15.01	1,943
Change in population, 1995 to 2000	3,140.89	13,236.38	2,387
PRI dummy (%)	91.81	27.43	1,953
PRD dummy (%)	6.91	25.37	1,953
PAN dummy (%)	8.24	27.51	1,953
Percentage indigenous language, 1995	13.60	34.29	1,816

a. This represents the sum of two variables from the Mexican census: households that did not specify access to a drain (0.09% in 1995 and 0.36% in 2000) and households with no access to a drain (54.34% in 1995 and 47.53% in 2000).

We transform our dependent variables into first differences because improvements in access, rather than levels of access, account for both initial conditions as well as other omitted variables. For example, any given level of coverage reflects a host of previous decisions made at the household level and at the government level (Diaz-Cayeros et al., in press). We therefore follow Diaz-Cayeros et al. (in press), Diaz-Cayeros et al. (2003), and Hiskey (2003) by estimating variations in change in coverage rather than level of coverage.[21] Also following Diaz-Cayeros et al. (in press), we transform the dependent variables into differences in the log likelihood ratios to avoid making unrealistic predictions from a linear model.

The model controls for economic, political, and social factors.[22] First, we account for a municipality's socioeconomic development with a measure of change in the proportion of the population that is literate between 1995 and 2000. This control is particularly important for the time period analyzed because Mexico experienced an economic crisis in 1995 and different localities may have recovered at different paces (Hiskey, 2005). Ideally, we would control for changes in a municipality's per capita gross domestic product. However, the census does not offer data at the municipal level for 1995. Instead, we use literacy rates, one of the components of the Human Development Index, as a measure of development. If wealthier municipalities enjoy better access to basic household needs, we expect that increases in literacy rates, or Literate, will positively affect the change in household access to clean water through indoor pipes and to drainage through septic tanks and indoor pipes.

We also control for two indicators of democratic institutions to account for the possibility that more democratic municipalities enjoy greater access to drainage and clean water because they hold their governments more accountable. For example, Hiskey (2003) argues that greater electoral competitiveness increases rates of coverage. Cleary (2007) argues that greater voter turnout positively affects rates of coverage. We control for the former with PRIShare, which captures the difference in vote share for the ruling Institutional Revolutionary Party (PRI) between local elections in the mid-1990s and local elections in the late-1990s: the greater the vote share, the greater the PRI monopoly, the less competitive the municipal election.[23] We control for the latter with Turnout, which captures the difference in voter turnout between local elections in the mid-1990s and local elections in the late-1990s. If better democratic institutions improve government performance and responsiveness, and thus the coverage of public utilities, we expect PRIShare to negatively affect access to public utilities and Turnout to positively affect access to public utilities.[24]

Third, we account for a municipality's financial capacity by controlling for government spending and transfers. PublicExpenditures measures the difference between 1995 and 2000 in per capita municipal government spending on public works and services. FISM (social development municipal funds) measures the change in financial transfers from central to municipal government under the national Solidarity program launched in the late 1980s.[25] Furthermore, we include dummy variables for the three main political parties in Mexico. Some scholars argue that the dominant PRI used financial transfers to reward municipalities that supported it and to punish municipalities that opposed it during elections (Diaz-Cayeros et al., in press; Magaloni, 2006). Yet others have found instead that opposition municipalities benefited from campaign pork from a central government attempting to buy their political support (Diaz-Cayeros et al., in press).[26] We control for both effects with party dummies that take the value of 1 if the municipality was controlled by, respectively, the PRI, the National Action Party (PAN), or the Party of the Democratic Revolution (PRD) for at least 6 years during the 1990s, and 0 otherwise.

Fourth, we account for social determinants of coverage in basic household needs using a measure of demographic change and a measure for the presence of indigenous populations. Population measures the change in a municipality's population between 1995 and 2000 and captures the demographic pressure for coverage during that time period. If demographic pressures outweigh the rate of coverage, population growth should negatively affect access to basic utilities. We further control for the presence of indigenous populations with Indigenous, a dummy variable that takes the value 1 if more than 50% of the municipality's population speaks an indigenous language and 0 otherwise. Scholars of Mexico have used indicators of indigenous populations to control for poverty as well as for the possibility that a community's indigenous character might facilitate access to utilities through greater collective action. If Indigenous captures poverty levels, we expect this variable to negatively affect coverage. If, however, Indigenous captures the tightness of a community, we expect this variable to positively affect coverage.[27]

Fifth, we include the initial level of the household access to the utility to account for the fact that a percentage-point increase in access may be easier when a municipality has a lower baseline level of coverage because localities might catch up to one another socioeconomically over time. We therefore control for a conditional convergence effect (Diaz-Cayeros et al., in press). If it exists, municipalities with higher initial rates of coverage will experience less change in coverage in the 5 years we study.[28]

Finally, we perform three robustness checks to verify the consistency of our results. First, we add state fixed effects to account for state-specific factors that we may not capture with our controls or observe otherwise. For example, some state governments are more involved in the provision of clean water for their municipalities than others (World Bank, 2005). The second test accounts for the influence of outliers using Hadi's (1994) method for identifying multiple outliers in multivariate data. Models that study the impact of remittances are particularly vulnerable to outliers since remittances tend to concentrate geographically in a few states (Zarate-Hoyos, 2004, p. 557). Finally, we perform all of our tests again on *levels* of access rather than *changes* in access. Since our measure of remittances, which is the proportion of households with an emigrant in the United States between 1995 and 2000, is a level rather than a change, an alternative specification of the model might assess the impact of remittance levels between 1995 and 2000 on the *level* of coverage in 2000.[29]

In Tables 2 and 3, Models 1 through 8 present results from estimations of the variation in the change in household access to drainage through septic tanks (Table 2, Models 1-4) and through indoor piping (Table 2, Models 5-8) and the variation in the change in household access to clean water through indoor piping (Table 3, Models 1-8). Tables 2 and 3 indicate that those municipalities with more remittances between 1995 and 2000 experience larger improvements in household access to drainage through a septic tank and in household access to clean water through indoor pipes. The impact of remittances on these methods of access is robust to alternative model specifications and to the presence of outliers and state fixed effects. However, remittances have no significant effect on improvements in household access to drainage through indoor pipes, suggesting that the impact of remittances on general household access to drainage occurs largely through septic tanks, the more household driven of the two methods of access. In sum, consistent with the literature on remittances, recipients of remittances spend their income on home improvements, which includes access to basic household needs, such as clean water and drainage (Figures 1a and 1b).[30]

The results in Tables 2 and 3 further indicate that improvements in development levels, captured through Literate, positively affect household-driven access to utilities. The significant impacts of FISM and political allegiance vary with the type of utility, an interesting result beyond the scope of this article. Finally, Tables 2 and 3 indicate that conditional convergence occurs: Municipalities with higher initial levels of coverage improve less.[31]

The analysis so far suggests that remittances increase households' private access to drainage and clean water controlling for economic, political, and social variables. When remittance recipients improve their homes, they invest

Table 2. Change in Household Access to Drainage Through Septic Tanks and Through Indoor Drainage, 1995–2000

	Septic tanks: Ordinary least squares				Indoor drainage: Ordinary least squares			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittances	0.005	0.021***	0.023***	0.008**	0.004	0.003	0.003	0.003
	(0.004)	(0.005)	(0.005)	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)
Literate	6.252***	6.295***	6.498***	6.535***	-2.659*	-1.337	-1.335	-2.674*
	(1.455)	(1.473)	(1.476)	(1.461)	(1.368)	(1.282)	(1.280)	(1.368)
Turnout	-0.119 (0.225)	-0.233 (0.257)	-0.170 (0.260)	-0.001 (0.228)	0.240 (0.195)	0.391* (0.201)	0.382* (0.201)	0.219 (0.195)
PRIShare	0.107 (0.152)	0.135 (0.192)	0.142 (0.193)	0.132 (0.154)	0.378*** (0.129)	0.188 (0.157)	0.186 (0.157)	0.375*** (0.129)
PublicExpenditures	0.0002***	0.0003***	0.0003***	0.0002***	-0.00004	-0.00008*	-0.00008*	-0.00004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FISM	0.0004**	0.0007***	0.0007***	0.0004**	-0.0002	0.00003	0.00004	-0.0002
	(0.0001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PRI dummy	-0.128 (0.100)	-0.114 (0.103)	-0.091 (0.104)	-0.116 (0.100)	0.037 (0.063)	-0.019 (0.067)	-0.023 (0.067)	0.034 (0.063)
PRD dummy	-0.504*** (0.102)	-0.181* (0.111)	-0.159 (0.111)	-0.495*** (0.102)	-0.002 (0.064)	0.094 (0.068)	0.090 (0.068)	-0.006 (0.064)
PAN dummy	-0.347*** (0.079)	-0.194** (0.080)	-0.254*** (0.081)	-0.434*** (0.080)	0.073 (0.049)	0.041 (0.050)	0.046 (0.050)	0.085* (0.049)
Population	-7.7e-6*** (1.43e-6)	-7.3e-6*** (1.3e-6)			1.6e-6** (6.4e-7)	1.1e-6 (9.5e-7)		
Indigenous	0.093 (0.098)	-0.037 (0.110)	-0.016 (0.111)	0.122 (0.099)	0.035 (0.095)	-0.014 (0.096)	-0.014 (0.095)	0.035 (0.095)
1995 level of access to the utility	-2.076***	-2.476***	-2.427***	-2.023***	-1.023***	-0.927***	-0.907***	-0.998***
	(0.164)	(0.179)	(0.177)	(0.161)	(0.090)	(0.096)	(0.092)	(0.087)
Constant	0.507***	0.375***	0.280***	0.425***	0.694***	0.673***	0.677***	0.699***
	(0.119)	(0.121)	(0.121)	(0.119)	(0.086)	(0.095)	(0.095)	(0.086)
State fixed effects	No	Yes	Yes	No	No	Yes	Yes	No
R^2	.215			.201	.136			.135
Observations	1,586	1,586	1,586	1,586	1,497	1,497	1,497	1,497

Robust standard errors are in parentheses.
*$p \leq .10$. **$p \leq .05$. ***$p \leq .01$. ****$p \leq .001$.

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Table 3. Change in Household Access to Clean Water Through Indoor Pipes, 1995–2000

	Ordinary least squares				Ordinary least squares without outliers			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Remittances	0.012****	0.007**	0.006*	0.011****	0.009***	0.006*	0.007**	0.009***
	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Literate	1.695	2.590**	2.621**	1.69	0.315 (0.993)	0.985	1.615*	0.834 (0.901)
	(1.071)	(1.074)	(1.076)	(1.071)		(1.003)	(0.899)	
Turnout	0.218	0.092	0.060	0.188	0.392**	0.306	0.235	0.338**
	(0.167)	(0.184)	(0.184)	(0.167)	(0.179)	(0.208)	(0.190)	(0.164)
PRIShare	0.112	−0.096	−0.104	0.102	0.171*	0.057	0.036	0.157*
	(0.099)	(0.123)	(0.123)	(0.099)	(0.101)	(0.121)	(0.113)	(0.093)
PublicExpenditures	0.00005	−2.5e-6	−0.00001	0.00004	5.87e-6	−0.00003	−0.00005	−0.00001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FISM	−0.0003****	−0.0004****	−0.0004****	−0.0003****	−0.0004****	−0.0006****	−0.0006****	−0.0004****
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
PRI dummy	−0.030	−0.034	−0.046	−0.035	0.119 (0.096)	0.041	0.041	0.132 (0.098)
	(0.065)	(0.067)	(0.067)	(0.065)		(0.086)	(0.088)	
PRD dummy	0.159**	0.196***	0.186**	0.156**	0.384**	0.368****	Dropped	Dropped
	(0.073)	(0.077)	(0.076)	(0.073)	(0.173)	(0.092)		
PAN dummy	0.113**	0.132**	0.152***	0.135**	Dropped	Dropped	0.08 (0.051)	0.139****
	(0.056)	(0.055)	(0.055)	(0.055)				(0.026)
Population	2.6e-6****	3.6e-6****			5.7e-6	0.00001**	Dropped	Dropped
	(6.9e-7)	(8.2e-7)			(4.01e-6)	(4.9e-6)		
Indigenous	0.010	0.049 (0.075)	0.048	0.007	−0.053	−0.005	0.004	−0.056
	(0.074)		(0.075)	(0.074)	(0.060)	(0.063)	(0.062)	(0.060)
1995 level of access to the utility	−1.406****	−1.606****	−1.534****	−1.370****	−1.322****	−1.564****	−1.368****	−1.232****
	(0.077)	(0.094)	(0.091)	(0.075)	(0.076)	(0.106)	(0.092)	(0.072)
Constant	0.698****	0.783****	0.796****	0.710****	0.566****	0.722****	0.681****	0.537****
	(0.079)	(0.087)	(0.087)	(0.080)	(0.102)	(0.100)	(0.100)	(0.103)
State fixed effects	No	Yes	Yes	No	No	Yes	Yes	No
R^2	.251			.248	.248			.253
Observations	1,597	1,597	1,597	1,597	1,232	1,232	1,270	1,270

Robust standard errors are in parentheses. $N = 1,270$.

*$p \leq .10$. **$p \leq .05$. ***$p \leq .01$. ****$p \leq .001$.

(a) Household access to drainage through a septic tank 1995 to 2000
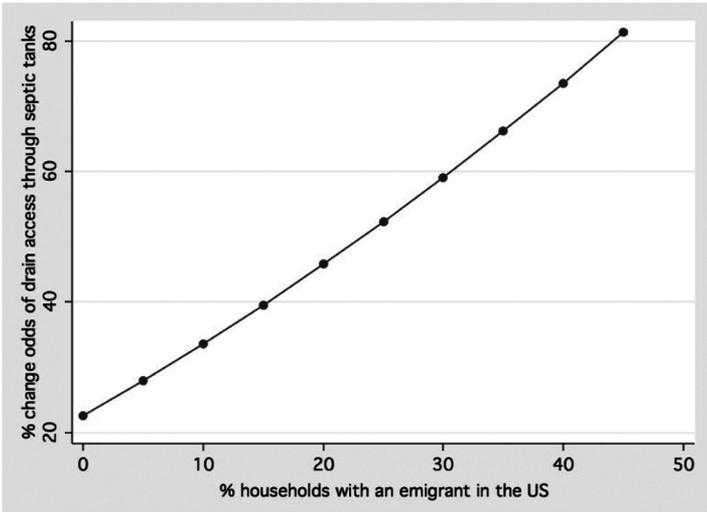
(b) Household access to water through indoor pipes 1995 to 2000
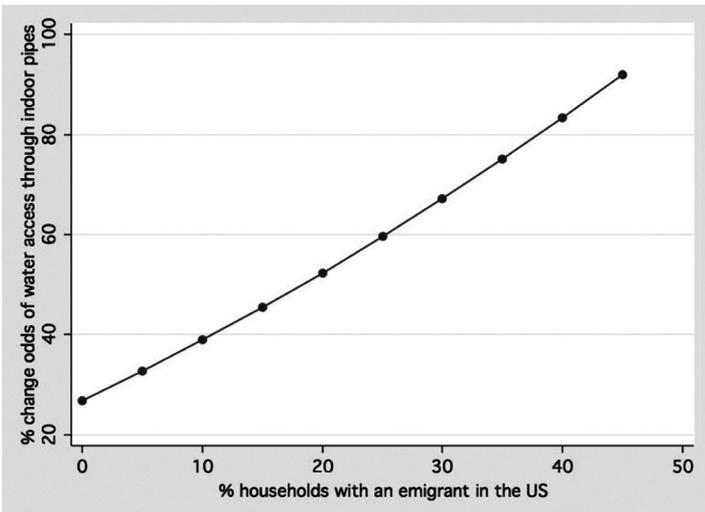

Figure 1. Household-driven access to utilities between 1995 and 2000

in utilities that promote their health, which may have positive externalities on the community at large. But to what extent does improvement in households' technology of access drive aggregate access in a municipality?

To investigate the breadth of remittances' effect, we estimate a model that analyzes the impact of remittances on improvements in access to the *aggregate* indicators for drainage and clean water. Approximately 40% of household access to drainage occurs through septic tanks and about one third of household access to clean water occurs through indoor pipes. More importantly, this type of access increases as a proportion of all sanitation and clean water coverage between 1995 and 2000, suggesting that the impact of remittances on these methods of access may also drive changes in the aggregate measures.

We test this claim by estimating the change between 1995 and 2000 in aggregate household access to drainage and in aggregate household access to clean water. We use the same model, include the same controls, and perform the same robustness checks as our initial estimations. Our results indicate that those municipalities receiving more remittances between 1995 and 2000 experience larger improvements in aggregate access to drainage. We find, however, no significant impact of remittances on improvements in clean water coverage between 1995 and 2000. The interpretation of the result on drainage is straightforward: Remittances increase aggregate household access to drainage because more households turn to septic tanks for their drainage when remittances increase.

Why do we not see the same improvement with water? We investigate this result by estimating the variation in access to clean water through a communal tap, for which the government is the sole provider. Although access to clean water through communal taps actually decreased from 62% in 1995 to 55% in 2000, it nonetheless constituted nearly two thirds of all access to clean water. We follow the same model, include the same controls, and perform the same robustness checks from our original estimations.

Our results indicate that remittances have a significant *negative* effect on improvements in household access to clean water through a communal tap between 1995 and 2000. This effect is significant in six of the eight specifications (and in 22 of our 24 alternative specification tests) and is interesting for two reasons. First, it explains the nonfinding on the aggregate measure of household access to clean water: If remittances are associated with increases in access to clean water through indoor pipes but with decreases in access to clean water through a communal tap (the two most common methods of household access to clean water), then the effect of remittances on the aggregate variable should be null. Second, the findings on indoor pipes and communal taps suggest a possible substitution effect between the

two methods. The data we present are consistent with a story of remittances financing a transition from household access to clean water from a standpipe in a shared compound to household access to clean water privately through pipes within the home.[32]

In sum, at an aggregate level, remittances positively affect access to drainage because they raise household-driven access to septic tanks, and households increasingly turn to septic tanks for access to sanitation. However, remittances have no significant effect on access to clean water because they divert access away from purely government-driven access toward a method of access where government and households both contribute to the provision of clean water. Migrants, therefore, not only fund access to water and sanitation but also change the way these utilities are accessed in Mexican municipalities.

Conclusion

In this article, we disaggregated municipal-level data on access to clean water and sanitation to test systematically the effect of remittances on the well-being of Mexican households. We therefore build on the literature on the development impact of remittances by providing evidence of a micro-level mechanism between remittances and factors that improve health. Municipalities that receive more remittances improve their household-driven technologies of access to clean water and drainage. Moreover, because households play an increasing role in building their own technology of access, we demonstrate that the breadth of remittances' impact on the well-being of hometown communities is significant and increasing.

Our results further indicate that political and social effects on coverage are sensitive to the type of utility as well as to the method of access. For example, public expenditures through municipal government spending and through FISM have a positive effect on clean water coverage, but a more complicated impact on sanitation, depending on the method of access to drainage. These divergent results suggest that access to basic household needs involves strategies that vary with the type of utility. Disaggregated analyses, like the one in this article, can yield a greater understanding of the strategies used by local governments, migrants, and minorities for improving the well-being of hometown communities.

Disaggregated analyses can also advance existing studies of government performance that assume the government is the sole or primary provider of access to basic utilities. If improvements in access to water and drainage reflect citizen action more than governmental action, then analyses of aggregate

access to water and sanitation may inadequately measure government performance. They may instead be capturing a dynamic between state and nonstate providers of utilities. Our findings therefore raise a critical question for future research: If remittances empower households to gain their own access to clean water and sanitation, do they provide a disincentive for governments to deliver these public services? Our results on access to drainage indicate that this may be the case. On the other hand, our results on access to clean water suggest that household and government contributions may complement one another. Future research should address how remittances influence government accountability by developing a model of how government behavior changes as remittances increase. This research can take advantage of the recent expansion of the Mexican government's partnership with migrants through its matching program, Tres por Uno, where the federal, state, and municipal governments match remittances pooled by migrants in the United States.[33] Remittances pooled in the United States and formally delivered to Mexico constitute only a small proportion, $14.2 million out of a total $20.5 billion in 2004, of known remittance flows.[34] Nevertheless, analyzing whether remittances substitute or complement governance is a promising avenue for future research.

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Declaration of Conflicting Interests

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Notes

1. See "NGO Major Group Discussion Paper on Water, Sanitation and Human Settlements," retrieved August 15, 2008, from http://www.un-ngls.org/cso/

NGOWater.doc. Also see Water Aid, retrieved August 15, 2008, from http://www.wateraid.org/ and "Service Delivery," retrieved August 15, 2008, from http://www.gsdrc.org/go/topic-guides/service-delivery/non-state-providers.

2. On remittances to Mexico, see Riding (1980). On remittances to Africa, see Cerstin and Maimbo (2005).

3. See World Bank (2006b) and Inter-American Development Bank (2006).

4. See World Bank (2006a), Lipton (1980), Mines (1981), Russell (1992), Ozden and Schiff (2006), Cohen and Rodriguez (2005), Zarate-Hoyos (2004), Woodruff and Zenteno (2001), Ahmed (2002), and Adams (1998).

5. See Cohen (2005) for a review.

6. See Durand and Massey (2004), Russell (1992), Mines (1981), Lipton (1980). For a review, see Durand and Massey (1992).

7. For examples of remittances' impact on productive activities, see Note 6. See Cox and Ureta (2003) on their impact on school enrollment, see Lopez-Cordova (2006) on their impact on illiteracy, and see Hildebrandt and McKenzie (2005) and Frank and Hummer (2002) on their impact on infant mortality. For a review of remittances' impact on development, see Lopez-Cordova and Olmedo (2006), and also see Ozden and Schiff (2006), Lopez-Cordova (2006), Hildebrandt and McKenzie (2005), Adams and Page (2005), Chimhowu, Piesse, and Pinder (2005), Cohen and Rodriguez (2005), Cox and Ureta (2003), Frank and Hummer (2002), Ahmed (2002), Adams (1998), and Woodruff and Zenteno (2001).

8. See Orozco and Lapointe (2004), Alarcon (2002), Goldring (2002), and Leiken (2000).

9. We thank an anonymous reviewer for this insight.

10. Hildebrandt and McKenzie (2005) propose that migration reduces infant mortality by increasing remittances and migrants' knowledge about health. They find that migration increases knowledge about health, but they do not test the mechanism linking remittance income to food and health needs. Our study builds on their work.

11. See World Health Organization, 2008.

12. When migrants pool remittances in hometown associations and fund parks, roads, and so forth, they directly provide public infrastructure. In contrast, migrants sending remittances to their households are empowering nonmigrants to provide access to public infrastructure for themselves. We refer to migrants as providers in both cases.

13. See Cohen (2005) for a review and Durand and Massey (2004).

14. We draw information on the methods and costs of access to water and sanitation from interviews with CONAGUA's hydraulic specialist for the management of research and projects on water and sanitation, March 4, 2009, and March 27, 2009.

15. Access to water and sanitation could also be NGO driven. However, there is little evidence that this occurs on a large scale in Mexico.

16. Interview with CONAGUA's hydraulic specialist for the management of research and projects on water and sanitation, March 27, 2009.

17. Some scholars argue that remittances encourage lavish spending on consumption for social status (Lipton, 1980). Alternatively, migrants could leave their hometowns to improve their own livelihoods as well as those of their families and communities back home, and migrants could use migrant networks to monitor how recipients spend the remittances they send. For reviews of motivations, see Chimhowu et al. (2005), Rapoport (2005), and Mooney (2004). Also see Wong (2006) for a study of transnational relationships between migrants and remittance recipients. Using evidence from Botswana, Lucas and Stark (1985, p. 902) report that migrants give out of "enlightened self-interest" or "tempered altruism," meaning that migrants give because it maximizes the income of the household of which they are still part (even if living abroad) or because they hope to return "in dignity."

18. Kapur (2003) and McKenzie (2006) find that remittances sponsor further migration.

19. In addition, the positive relationship between remittances and access to utilities might be subject to an alternative explanation: If remittances create ghost towns, citizens who stay behind in Mexico may move into the better homes of those who left. We account for the ghost town effect by controlling for changes in population.

20. Diaz-Cayeros, Magaloni, and Weingast (2003, p. 27) argue that the percentage of people residing in the United States is closely correlated with capital flows in the form of remittances sent by migrant workers back home.

21. By using a first-difference model, we also allay concerns of spatial correlation.

22. Some of these variables, namely, government spending on public works, may have no impact on access to septic tanks, which is purely household driven. However, we include these controls in all our models to ensure our results are consistent with findings in the literature on government performance in Mexico.

23. Cleary (2007, p. 290) demonstrates that PRI vote share closely tracks the margin of victory. He considers both to be measures of electoral competitiveness.

24. Variables such as PRIShare and Turnout, which are drawn from official electoral returns, may be susceptible to fraud through ballot stuffing. This problem, however, is likely to be more salient in the early 1990s than in the second half of the decade when the PRI was more entrenched. These variables nevertheless remain viable indicators of competitiveness because, as Cleary (2007) argues, "a lopsided vote, fraudulent or not, indicates a noncompetitive election" (p. 287).

25. These data are for 1996, the year the new FISM program began, to 2000. Some municipalities accounted for FISM expenditures as public works expenditures

in the first years of the FISM program, creating a possible double accounting in the data. Although the correlation between these two variables is low, at –.2, we ran the regressions with only Public Expenditures on the right-hand side and the results survive. Excluding FISM also allows us to avoid potential endogeneity between the FISM measure and our dependent variables (see Diaz-Cayeros, Estevez, & Magaloni, in press).

26. We thank an anonymous reviewer for pointing out that the bias could also reward opposition municipalities.

27. We have no priors for how this variable might affect coverage empirically. Cleary (2007) finds a negative effect, whereas Diaz-Cayeros et al. (in press) find no effect.

28. Septic, Indoor, Literate (retrieved May 26, 2008); PublicExpenditures, Septic95, Indoor95 (retrieved May 8, 2008); and Population (retrieved May 20, 2008) come from the Mexican 1995 midcensus and 2000 census, available from http:/// www.inegi.org.mx. FISM comes from Diaz-Cayeros et al. (in press). Turnout, PRIShare, PRI, PRD, PAN, and Indigenous come from Cleary (2007). Remittances comes from the Council on National Population (Retrieved May 23, 2008) at http://www.conapo.gob.mx.

29. Whether we specify a change-on-change, level-on-level, or change-on-level model, our results hold. Results are available on request.

30. We calculated values on the dependent variables for different values of Remittances using Clarify (King, Tomz, and Wittenberg, 2000) and holding all other control variables at their mean or median. We then transformed the values on the dependent variables back to odds ratios. The values on the vertical axis are therefore percentage changes, between 1995 and 2000, in the odds of accessing drainage through a septic tank (1a) or clean water through indoor pipes (1b).

31. We also specified a model with a squared Indigenous variable to test whether the impact of an indigenous presence in a municipality might be curvilinear. We find that this curvilinear effect exists only for access to sanitation through septic tanks: Municipalities with very low and very high proportions of indigenous populations see lower access to sanitation through septic tanks. Furthermore, this specification does not change our main results on remittances.

    Although there are 2,438 municipalities in Mexico, our sample sizes range from 1,232 to 1,597. Similar to Cleary's (2007) analysis, we exclude a number of municipalities because they are missing data on some of our control variables, including public finance, electoral, and indigenous population variables. When we estimate the full model with robust standard errors, state fixed effects, and imputed data, our results hold.

32. The disaggregated water and drainage variables on which we performed our regressions add up to the aggregate measures of household access to clean water

and sanitation, meaning that the equations we estimate may not be independent of one another. To control for the possibility that the errors may be correlated across each regression, we estimate a seemingly unrelated regression model. We find that our results hold for water and weaken for drainage.

33. The program was initially launched in 1993 but limited to Zacatecas between 1995 and 1999. In 1999, the program was relaunched nationally (Goldring, 1998).
34. See Thompson (2005).

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