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Why do indigenous municipalities in Mexico have worse piped water coverage?

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Why do indigenous municipalities in Mexico have worse piped water coverage?

Marcela González Rivas

Access to piped water is highly unequal in Mexico, and indigenous municipalities are particularly disadvantaged. The present article identifies the different factors that contribute to the unequal access to piped water across Mexican municipalities for the period 2000–2005, using regression analyses. The findings show that indigenous populations experience lower piped water coverage than non-indigenous populations, even when one accounts for population density (the main explanation that the government provides for indigenous populations' lack of progress) and other relevant factors. The present findings also show that one of the reasons for this lack of progress is that indigenous municipalities receive fewer per capita transfers from the central government non-indigenous municipalities, all else being equal.

Pourquoi les communautés autochtones du Mexique jouissent-elles d'une couverture inférieure en eau courante ?
L'accès à l'eau courante est extrêmement inégal au Mexique, et les municipalités autochtones sont tout particulièrement défavorisées. Le présent article met en évidence les différents facteurs qui contribuent à l'accès inégal à l'eau courante parmi les municipalités mexicaines pour la période 2000–2005, en utilisant des analyses de régression. Les conclusions indiquent que les populations autochtones bénéficient d'une couverture inférieure en eau courante, même si l'on tient compte de la densité démographique (laquelle est la principale raison donnée par le gouvernement pour expliquer le manque de progrès des populations autochtones) et d'autres facteurs pertinents. Les présentes conclusions montrent par ailleurs que l'une des raisons de ce manque de progrès est que, toutes choses égales par ailleurs, les communautés autochtones reçoivent moins de transferts par habitant de la part du gouvernement central.

Por que municipalidades indígenas no México tiveram uma piora na abrangência da oferta de água encanada?
O acesso a água encanada é altamente desigual no México e as municipalidades indígenas estão particularmente em desvantagem. Este artigo identifica os diferentes fatores que contribuem para o acesso desigual a água encanada entre os municípios mexicanos para o período de 2000–2005, utilizando análises de regressão. Os resultados mostram que as populações indígenas enfrentam uma menor abrangência da oferta de água encanada, mesmo quando levamos em conta a densidade populacional (principal explicação que o governo oferece para a falta de

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progresso das populações indígenas) e outros fatores relevantes. Estes resultados também mostram que uma das razões para esta falta de progresso é que as municipalidades indígenas recebem menos transferências per capita do governo central, tudo o mais mantendo-se igual.

¿Por qué los municipios indígenas de México tienen menos acceso al agua entubada? *El agua entubada tiene una cobertura muy desigual en México, siendo los municipios indígenas los más desfavorecidos. Este ensayo identifica tres factores que contribuyen al desigual acceso a agua entubada en los municipios de México durante el periodo de 2000 a 2005 empleando análisis de regresión. Las conclusiones muestran que el acceso a agua entubada es menor en las comunidades indígenas, aun tomando en cuenta la densidad poblacional (el principal factor para el gobierno tras "la falta de progreso" de la población indígena) y otras circunstancias. El ensayo concluye que una razón de la falta de progreso es que los municipios indígenas reciben menos fondos* per cápita *del gobierno central aun habiendo igualdad de condiciones.*

KEY WORDS: Governance and public policy; Social sector; Latin America and the Caribbean

Introduction

In Mexico there is a marked inequality of access to piped water. Only a few municipalities have close to universal coverage, while most municipalities have limited coverage. Specifically, in only 131 out of 2,454 municipalities (6 per cent) do more than 90 per cent of the households have direct access to piped water.[1] At the opposite extreme, in 531 municipalities (20 per cent of municipalities), less than 10 per cent of the population has direct access to piped water. While these stark differences reflect a variety of factors, they seem also to have an ethnic dimension. Data from the 1990, 1995, 2000, and 2005 population censuses demonstrate that municipalities that have larger indigenous shares of population tend to have less direct access to piped water on average. Figure 1 shows the average share of households in 2005 with direct access to water in municipalities by the share of indigenous population, reflecting that as the share of indigenous population in a municipality increases, the share of households with direct access to piped water decreases.

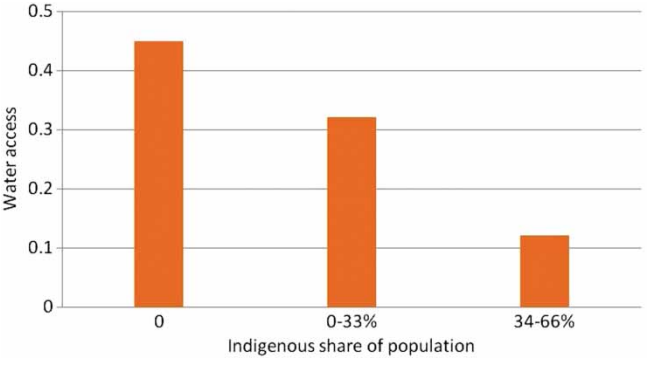

Figure 1: Municipalities' average share of households with direct access to water, by share of total population that speak an indigenous language, in 2005
Source: INEGI (2005)

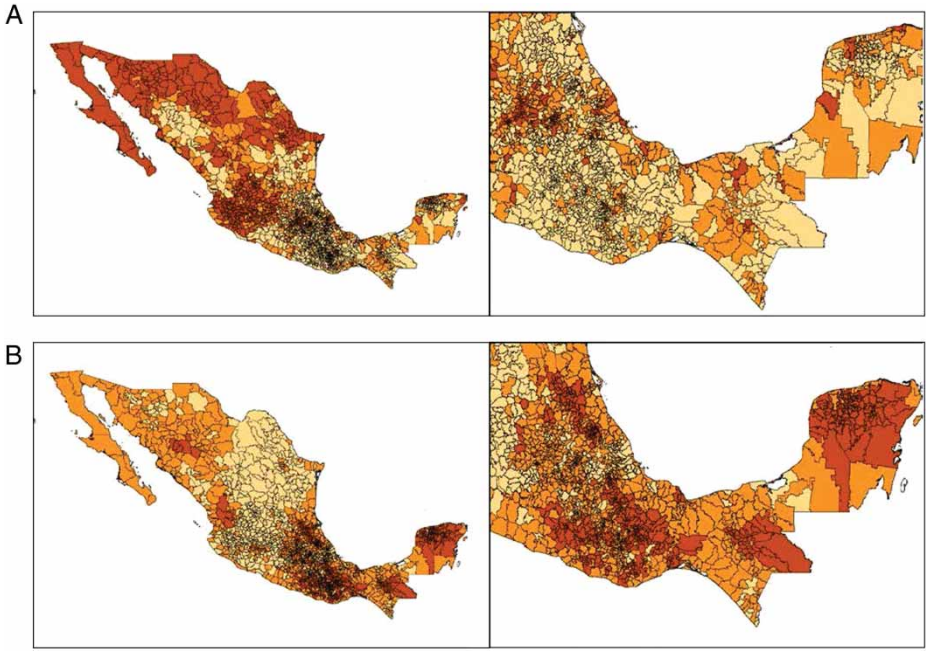

Figure 2: Maps of municipalities' direct piped water coverage (A) and share of the indigenous population (B) in 2000
Notes: Darker shades indicate higher levels of coverage; maps on the right enlarge the areas in the maps on the left that are harder to see, given the size of the municipalities
Source: INEGI (2000)

Figure 2 provides more detail regarding this trend by showing two sets of maps. Figure 2A contains maps indicating the different levels of piped water coverage by municipality in Mexico. Figure 2B presents maps indicating the share of indigenous population in municipalities in Mexico. The maps tend to be mirror-images of one another: municipalities with darker shades in the piped water coverage maps (Figure 2A) tend to be lighter in the indigenous population maps (Figure 2B).

The level of piped water coverage by municipality in Mexico is also directly correlated with the level of per capita income in the state, which accords with the known positive relationship between income level and piped water coverage across nations (Briceño-Garmendia *et al.* 2004: 12). For example, the municipalities with the most widespread provision of water (i.e. municipalities where 90 per cent or more of the households have direct access to water) are located in the richest states of the country, namely Distrito Federal, Jalisco, and Nuevo León. Moreover, in the municipalities with the highest average manufacturing income per capita, 61 per cent of the population has direct access to water on average, whereas in the municipalities with no manufacturing income reported, this drops to 13 per cent (see Table 1). However, it is difficult to separate out the effects of income and ethnicity: in the richest municipalities (the ones with highest water provision) the indigenous population constitutes only 2 per cent of the population on average, while in municipalities with no manufacturing income reported (and very low water service provision), the indigenous population is 33 per cent of the population on average.

The fact that indigenous populations have lower levels of socio-economic indicators is not news, unfortunately. With respect to the gap in water provision, there is official recognition in Mexico of the disadvantaged situation of indigenous populations in the country.[2] It is also

Table 1: Households direct access to piped water and share of indigenous population by level of per capita income.

Income level, 1999	Average share of households with direct access to water, 2000 (%)	Average share of indigenous population, 2000 (%)
All municipalities (2434 observations)	32	16
High income		
Three standard deviations above the mean	92	2
Between two and three standard deviations above the mean	70	2
Between one and two standard deviations above the mean	54	3
Between the mean and one standard deviation above mean	38	8
Low income		
Between the mean and one standard deviation below mean	24	20
Between one and two standard deviations below the mean	11	36
Below two standard deviations of the mean	4	36

Source: INEGI (2000); data for income are from the economic census of 1999 (INEGI 1999).

Table 2: Per capita investments on water infrastructure in urban and rural areas in 1997, 2000, and 2005.

Year	Urban	Rural	Total
Investments in current pesos			
1997	1,975,000,000	435,000,000	2,410,000,000
2000	2,788,000,000	1,123,000,001	3,911,000,001
2005	19,599,000,000	2,007,000,001	21,607,000,000
Population			
1997	67,003,515	24,154,775	91,158,290
2000	72,759,822	24,723,590	97,483,412
2005	78,987,743	24,275,645	103,263,388
Per capita investments			
1997	29.5	18.0	26.4
2000	38.3	45.4	40.1
2005	248.1	82.7	209.2

Note: It is important to note that the amount of investment reported after 2000 includes other agencies aside from CNA and explains the substantial increase in investment.
Source: Author's own calculation. Data are from INEGI (2009: table 1.5); data for investment are from CONAGUA (2009: 7, table 1.3), in current pesos.

recognised that the resources destined to address the problem are not sufficient.[3] Therefore, it is no surprise that progress in improving the situation has been slow. The explanation the government offers is that remote areas – where indigenous people tend to live – are difficult to reach, making water infrastructure unfeasible (Comisión Nacional del Agua [CNA] 2010: 10).[4] The majority of the population of the country (76 per cent) lives in urban areas and, therefore, it is more efficient to invest in urban areas *vis-à-vis* rural areas (CNA 2010: 96).[5] This approach by the government is reflected in Table 2, which shows the per capita allocation of capital investments in piped water infrastructure in 2000 and 2005. It is important to note that in 2005 urban areas receive more funds – even on a per capita basis – than rural areas.

There is indeed a general tendency for indigenous people to live in municipalities with low levels of population density. However, this explanation ignores the possibility that these populations are the subject of discrimination, which many studies have argued has resulted in the poverty and exclusion of indigenous groups (PNUD 2010; Bello and Rangel 2002; Stavenhagen 2002; Psacharopoulos and Patrinos 1994). According to Castro (2004), who analysed piped water coverage in the Mexico City metropolitan area, the exclusion of groups from full access to water and sanitation is largely determined by their lack of power to exercise their citizenship rights. Moreover, Castro argues, this fact tends to be obscured by mainstream economic and technical explanations that helped justify the privatisation of water services since the 1990s.[6]

The plausibility of such arguments is increased by reflecting on the words of the Secretary of Environment and Natural Resources for Mexico, who said:

> *Even though the government works tirelessly in public works in order to provide water, I have seen it at the state and federal governments, people continue to be born everywhere. We are still having more Mexicans in all the country, and that is a cultural problem. How to relocate population centres with more efficient schemes instead of isolated houses in the desert or jungle, where everyone says 'I want the service'? There was a lot of investment in the water area, but there are still births. It is a race without a finish line* (Enciso 2007).[7]

The present article aims to shed some light on this debate by identifying the different factors that contribute to the unequal access to water infrastructure in Mexico. Specifically, the article seeks to answer the following questions:

(1) What accounts for progress in piped water coverage? I specifically examined the enlargement of the water network that was made in municipalities in Mexico from 2000 to 2005, looking at factors put forward by the government (such as population density) as well as the impact of having a population that is largely indigenous.[8] I will demonstrate that even when one accounts for other factors, indigenous municipalities have experienced worse progress in piped water coverage.
(2) What is the mechanism by which the indigenousness of municipalities affects outcome of piped water coverage? I will provide evidence that having a larger indigenous population systematically reduces the per capita transfers municipalities receive from the federal government, which are the primary source of funding for piped water expansion.
(3) Finally, do these transfers really have an effect on improvements on piped water expansion? If they do not, the causal mechanism I propose cannot be valid. However, I will demonstrate that these transfers did, in fact, have a positive effect on improvements in water infrastructure access during this period.

Unit of analysis, data and methodology

Municipalities are an appropriate unit of analysis for this study because Mexican municipalities manage their own water services, as stipulated in Article 115 of the Mexican constitution

(Castro 2004). Nevertheless, municipalities (and states) depend greatly on the financial resources of the federal government – even after the decentralisation reform that started in the 1980s. This is because municipalities (and to a great extent states too) have low administrative and fiscal capacity. Federal transfers aimed at promoting development, including infrastructure of water and sanitation, are distributed to the municipality level, and they constitute one of the major resources that municipalities have to expand the water network (Hernández Tellez and Villagómez 2000). According to the 2005 OECD economic survey, the Mexican federal government contributes up to 45 per cent of total investment of water infrastructure in municipalities (Joumard 2005: 134).

These municipalities were analysed with three different statistical models, since, as stated previously, the paper seeks to answer three questions. To answer the first question – regarding the determinants of progress in piped water coverage – I analysed the following model:

$$water\ 2005_i = \ln\ indigenous_i + \ln\ water\ 2000_i + \ln\ density_i + \ln\ income_i + \ln\ migration_i + \varepsilon_i$$

where *i* denotes the municipality. The dependent variable was the level of piped water coverage in 2005. The independent variables were:

- *indigenous*: the indigenous share of population in the municipality in 2000, and is measured by the share of municipal population that speaks an indigenous language. This was the key independent variable, as it identified the extent to which municipalities with larger indigenous populations were somehow different than the rest. Although one would hope that this were not true, the expectation was that they had made less progress than the rest of municipalities, even when controlling for other relevant factors.
- *water*: the share of households in a municipality directly connected to the water network in 2000. I was interested in analysing the extent to which the level of piped water coverage in the initial period (2000) had an effect on the level of piped water coverage in the municipality in 2005. This was potentially an important factor for two reasons. First, this variable captured a diminishing marginal returns effect. That is, the households already connected to the water network in municipalities were presumably the easiest to connect. Therefore, as municipalities increase the share of the population connected, connecting additional people might become relatively more difficult. If this were true, then one would expect the coefficient to be negative and statistically significant. However, this variable also captured a political/sociological effect, namely that in a municipality where some of the households have direct access to piped water, the expectation for those without water is to have access. If this were the case, improvements in coverage might have a snowball effect, and improvements in already covered areas would be more plausible than in areas where most of the population does not have piped water coverage. If this were true, the coefficient would be positive and significant. Of course, these two effects may also cancel each other out.
- *density*: measured using total population in 2000 divided by the area of the municipality in square kilometres. Following the earlier discussion about the difficulty that the government faces in providing piped water coverage to remote areas, it was important to include a variable that captured the effect that population density has on the progress in coverage. Municipalities with higher population density will tend to have better piped water coverage and, therefore, the coefficient was expected to be positive and significant.
- *income*: the municipality's average per capita income in 1999, measured using the remunerations of all the economic activities captured by the economic censuses divided

by total population.[9] There is generally a correlation between levels of income and infrastructure availability (Briceño-Garmendia *et al.* 2004). Thus, the coefficient of the income variable was expected to be positive and significant, indicating that the higher the income in a municipality, the higher the piped water coverage would be, all else being equal.

- *migration*: the share of the 2000 population in a municipality who in 1995 lived in a different country. Following the literature on migration (World Bank 2009: ch. 5), this variable aimed to capture two potential effects. A negative coefficient would refer to the negative effect that municipalities experience as the share of people migrating from the municipality increased, since this would lower growth potential. On the other hand, this loss could be compensated by migrants remaining tightly linked to their home and sending back remittances, information, technology, and good business practices. In addition, if and when they eventually return, migrants bring back expectations of better service provision because they often have been in places with higher development levels. If this is true, then the coefficient would be expected to be positive and statistically significant.

All data were from the national population census of 2000 (INEGI 2000) except *income*, which was from the economic census of 1999 (INEGI 1999), and the dependent variable, which was also calculated using data from the population survey of 2005 (INEGI 2005).[10] All data were produced by INEGI, Mexico's national statistical agency.

To answer the second question – regarding the mechanism by which the indigenousness of municipalities has contributed to less expansion in piped water coverage – I examined a second statistical model:

$$\ln transferspc_i = \ln indigenous_i + \ln water_i + \ln density_i + \ln income_i + \ln migration_i + \ln votesharepresident_i + \varepsilon_i$$

where i again denotes municipality. The dependent variable was the cumulative federal transfers to municipalities (*Aportaciones Federales*) from 2000 to 2005, divided by municipal population. Data were from the 'Public Finances' dataset published by the national statistical agency (INEGI) and converted to constant 2002 pesos. It should be noted that this indicator aggregated a set of transfers that included ones for infrastructure as well as for heath, education, and other programmes, but its specific link to piped water coverage is established in the third regression model. The independent variables here were the same as in the previous model, with one exception. However, since the dependent variable was different, the expectations for the results changed as follows:

- *indigenous.* The lower piped water coverage that indigenous municipalities have might be explained by the possibility that these municipalities receive fewer transfers from the federal government, all else being equal. If this were the case, the coefficient would be negative and significant.
- *water, density, and income.* Federal transfers to municipalities were expected to increase as levels of piped water coverage, population density, and income decrease, as the goal of the transfers is ostensibly to reduce inequalities across municipalities by improving infrastructure in the most marginalised areas (Joumard 2005). Thus, the coefficients of these variables were expected to be negative and significant.
- *migration.* Federal transfers to municipalities with larger shares of international migrants were expected to be larger, following the argument discussed previously that international migrants have higher expectations of good governance, including better service provision

from the government upon returning to their homes. Thus, the coefficient was expected to be positive and statistically significant.

The one new independent variable was *vote share for president.* This variable was measured by the share of total votes that went to the winning party in the federal election for president in 2000 and captured the extent to which municipalities that were supporters of the president elected in 2000 benefited more than the ones that did not vote in favour of the president, following the political science literature on clientelist governments and patronage dynamics in distributing resources across localities (Kitschelt and Wilkinson 2007). Specifically, the hypothesis was that federal transfers were distributed favourably to politically loyal municipalities (Diaz Cayeros *et al.* forthcoming), and thus the coefficient was expected to be positive and significant.

Finally, to answer the third question – regarding the link between transfers and piped water expansion – I examined a third statistical model, which was the same as the first one but included the sum of federal transfers as an independent variable:

$$water\ 2005_i = \ln indigenous_i + \ln water\ 2000_i + \ln density_i + \ln income_i + \ln migration_i + \ln transfersp\ c_i + \varepsilon_i$$

This model was important for establishing the validity of the causal mechanism, particularly because (as mentioned previously) the transfers indicator aggregated several types of transfers, some of which are not related to infrastructure.

Using ordinary least squares (OLS) estimation with a dependent variable specified as a share can be problematic because of the assumption in OLS that the dependent variable can take any value. Given that in the first and third analyses the dependent variables were bounded between the values of 0 and 1, I estimated them using a generalised linear model (GLM) with a logit link function, specifying that the dependent variable was bounded between 0 and 1.[11] Because I did not have this problem for the second model (where the dependent variable was the sum of per capita transfers) I used OLS estimation in that regression. To control for spatial autocorrelation in the data, I included a spatial lag variable of the form ρ(Wy), where ρ is the coefficient, W is a matrix of weights based on the population of neighbouring states, and y is a vector of the dependent variables of neighbouring states.[12] I also included state dummies in each of the regressions, to capture potential effects from state policies and other factors that might be shared by municipalities within a state.

Table 3: Generalised linear model regression analysis of the level of piped water coverage in municipalities in 2005.

Variable	Coefficient	Robust standard error	*z*	P > |*z*|
Indigenous	−0.0310	0.0126	−2.4500	0.0140
Water	0.9316	0.0385	24.2000	0.0000
Density	0.1411	0.0176	8.0000	0.0000
Income	0.0294	0.0091	3.2200	0.0010
Migration	0.3092	0.0621	4.9800	0.0000
Spatial lag	0.0392	0.0089	4.3900	0.0000
Observations	2372			

Table 4: Ordinary least squares regression analysis of the per capita sum of transfers in 2000–2005.

Variable	Coefficient	Standard error	*t*	P > |*z*|
Indigenous	−0.003	0.001	−2.800	0.005
Water	0.009	0.003	3.520	0.000
Density	−0.022	0.002	−10.820	0.000
Income	−0.043	0.001	−39.790	0.000
Vote for president	0.063	0.019	3.340	0.001
Migration	0.022	0.007	3.240	0.001
Spatial lag	−0.002	0.001	−3.160	0.002
Observations	2342			
Adjusted R^2	0.72			

Results

What accounts for progress in piped water coverage?

The results of the regression regarding the level of piped water coverage in 2005, in Table 3, indicate that municipalities with higher shares of indigenous population (which generally have lower piped water coverage) experienced slower improvements in piped water coverage, all else being equal, as the coefficient of the *indigenous* variable was negative and statistically significant.

The coefficient of the level of *water* in 2000 was positive and significant, providing evidence that improvements in water coverage in areas with higher coverage are more plausible than in areas where most of the population does not have piped water coverage. The coefficient of the population *density* variable was, as expected, positive and significant, consistent with the government's explanations discussed previously, which argue that low population density is a factor that determines piped water coverage. The coefficient of the *income* variable was as expected, positive and significant, reflecting the fact that better-off municipalities have higher water coverage. The coefficient of the *migration* variable was also positive and significant, providing evidence of the benefits associated with large migrant populations discussed previously. The coefficient of the spatial lag variable showed the existence of positive spatial autocorrelation.

Thus, this first set of results demonstrate that even when one accounts for other factors – such as the government's explanations for the unequal access to piped water, per capita income levels, and migration – indigenous municipalities experienced worse progress in piped water coverage during this period.

What is the mechanism by which the indigenousness of municipalities affects water outcomes?

The results of the second model (shown in Table 4) indicate that the disadvantage indigenous municipalities have in piped water coverage may partly be because of the fact that the amount of transfers they receive per capita from the federal government is lower, controlling for other factors, as the coefficient on the *indigenous* share of population in a municipality was negative and statistically significant. In terms of substantive effects, the negative coefficient implies that, for example, a 1 per cent increase in the share of indigenous population in a municipality *reduces* the amount that the federal government transfers to such municipality by 0.01 percentage points, all else being equal.

Table 5: Generalised linear model regression analysis of the level of piped water coverage in municipalities in 2005

Variable	Coefficient	Robust standard error	*z*	P > |*z*|
Indigenous	−0.0305	0.0127	−2.4000	0.0170
Water	0.9239	0.0383	24.1300	0.0000
Density	0.1531	0.0180	8.4900	0.0000
Income	0.0530	0.0122	4.3300	0.0000
Migration	0.2962	0.0634	4.6700	0.0000
Transfers pc	0.5713	0.2437	2.3400	0.0190
Spatial lag	0.0399	0.0090	4.4100	0.0000
Observations	2342			

Municipalities' population *density* and average *income* had negative and statistically significant coefficients, indicating a tendency for transfers to reduce the gap that exists across municipalities, as municipalities with denser populations and with higher income receive smaller amounts of transfers, all else being constant. However, the coefficient of the *water* variable was positive and significant, contrary to expectation, indicating that municipalities with better access to piped water receive higher per capita transfers than municipalities with less access to piped water. If these transfers help in improving piped water coverage (examined in the third model), this last finding indicates that the allocation of transfers contributes to the gap that exists in piped water coverage.

The coefficients of the variables *migration* and *support for president* were, as expected, positive and significant. And the coefficient of the spatial lag variable showed the existence of spatial autocorrelation.

Do federal transfers improve access to piped water in municipalities?

The final set of results (in Table 5) shows evidence of a positive link between federal transfers and the change of piped water coverage in municipalities, as the coefficient on the sum of transfers during 2000–2005 was positive and statistically significant. The significance of the other variables did not change. In this regard, it is important to note that while the coefficient on the *indigenous* variable dropped slightly, indicating that part of the effect was because of fewer transfers, it was still negative and significant. This suggests that the negative effect of indigenous population is not exclusively accounted for by its effect on transfers from the federal government. (González Rivas 2010).

Conclusion

The objective of the present article was to identify different factors that have contributed to the unequal access to piped water across municipalities in Mexico. Official responses from the government regarding the disadvantaged situation of indigenous municipalities centre on the fact that they tend to have highly dispersed populations, which makes it unfeasible to build the water infrastructure necessary to provide the service. However, existing literature highlights the possibility that indigenous populations may face discrimination by virtue of less access to channels of power (PNUD 2010; Bello and Rangel 2002: Stavenhagen 2002). In my first set of findings, the statistical analysis showed that, even when controlling for population

density and other factors, indigenous populations experience lower levels of piped water coverage than non-indigenous areas.

In my second and third sets of findings, I showed that one of the reasons for this lack of progress is that indigenous municipalities receive fewer transfers per capita from the central government, all else being equal. These transfers make up the majority of the resources that municipalities have to improve infrastructure and other public goods, and I showed that the transfers have a positive impact on piped water coverage. It is, therefore, highly damaging to indigenous municipalities that they receive fewer transfers than other municipalities, even when accounting for factors like income, migration, and political support for the president. The policy implications of this finding are clear: the government should take measures to ensure that indigenous municipalities receive the extra transfers they need.

Nevertheless, the third set of results also showed that the lower levels of access to piped water that indigenous municipalities face is not *solely* explained by the fact that they receive fewer transfers from the federal government (or that they have lower population density or lower income levels). Even when controlling for all these factors, indigenous municipalities still have made significantly less progress than their non-indigenous counterparts. Further study is necessary to continue to explore the mechanisms that explain the disturbing lack of progress by indigenous municipalities in terms of piped water coverage.

Notes

1. Households' direct access to piped water refers to households having a connection to the water network inside the dwelling.
2. See the transcript of the presentation by the Director of the National Commission for the Development of Indigenous People, during the fourth World Water Forum that took place in March 2006 in Mexico City, available at: http://www.cdi.gob.mx/index.php?id_seccion=1480.
3. Again, see http://www.cdi.gob.mx/index.php?id_seccion=1480.
4. This idea – that the dispersion of population is a key explanatory factor of marginalisation and lagging development in Mexico – is reflected in the recent Law of Sustainable Rural Cities for Chiapas State. This law has among its objectives the goal of regulating land use and combating population dispersion, and thus prohibits the creation of new settlements (i.e. they need government approval). See Gobierno de Chiapas (XXXX: 337–50).
5. Specifically, the document states that there is a difference in the growth of coverage of access to water depending on the size of the locality or place. The expansion of coverage of water infrastructure in larger areas (i.e. more than 100,000 people) is faster than in smaller ones (CNA 2010: 96). Therefore, the justification in favouring investment in urban areas – where coverage is higher – as opposed to rural ones is that the population growth in urban areas is much higher.
6. Castro (2006) argues that the reforms carried out in Mexico in the 1990s that related to water service provision (as part of the neo-liberal decentralisation process that was taking place in Mexico) aimed at changing the culture of water from an *'ingrained dependency culture'*, in which water was free of charge, to one in which *'society must pay for it'* (CNA 1990: 16; 1993: 11). The formalisation of the new way of water and sanitation service provision are stated in the rules of operation for water and sanitation services published in 1999, stating the need to incorporate the private sector in the provision of these services, as part of the decentralisation reform (Diario Oficial de la Federación 1999). Private management of water is supported not only on the basis of increased efficiency, but also on the basis of expanding services and attaining sustainability. Following this argument and the recommendations of the World Bank (2004) and Inter American Development Bank (2003), there has been in Mexico a general trend toward privatisation of water services since 1990. However, evidence regarding the benefits of privatisation in Mexico shows that it has not led to improvement in service provision (Wilder and Romero Lankao 2006).
7. Translation is mine.
8. The author is grateful to an anonymous reviewer's suggestions on clarifying this definition.

9. The economic census of 1999 (INEGI 1999) includes the following economic activities: fishing; mining; water management related activities; manufacturing; commerce; information; and services.
10. The population census and the population survey are comparable.
11. I have also specified the dependent variable as the growth in piped water coverage, and the results are essentially the same.
12. The adjacency that I used is *queen* type (i.e. municipalities that share a border or a point). This spatial specification aims at capturing the potential contagion effect of neighbouring states depending on their population, rather than just taking the average value of all neighbouring states.

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