The Dark Side of Election Reform*

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How do electoral rules affect the geographic distribution of public goods? Theory suggests that splitting a multi-member district into multiple single-member ones should increase politicians' incentives to cater to voters in peripheral areas at the expense of those living in more densely populated regions. We examine this claim with data from Mexico, where municipal councillors are mostly elected in multi-member districts, except in the state of Nayarit, that switched to SMDs in 2008. We exploit this fact to conduct a difference-in-differences matching design to determine how the reform affected the geographic distribution of public services (water, electricity and sewerage) within municipalities.

Keywords: electoral rules – electoral reform – public goods provision – representation – Mexico

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(please inquire for new version)

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How do electoral rules affect government performance and public goods provision? This question has long captured the attention of political scientists. A large formal and empirical literature examines how majoritarian or proportional electoral rules induce politicians to provide different kinds of policy, to different constituencies, in different amounts. Outcomes as broad as corruption, fiscal policies, real prices or the amount of redistribution induced by the political system have been attributed to the preponderance of one kind of electoral system or the other (Chang 2005, Chang, Kayser and Rogowski 2008, Chang and Golden 2007, Gehlbach 2007, Iversen and Soskice 2006, Lizzeri and Persico 2001, Persson, Roland and Tabellini 2007, Persson and Tabellini 2003; 2006, Rogowski and Kayser 2002). At a lower level of aggregation, other authors have examined in detail how the spatial distribution of political power induced by electoral rules shapes politicians' incentives to deliver targeted benefits to specific *geographic* constituencies (Shachar and Nalebuff 1999, Weingast, Shepsle and Johnsen 1981). Among the most recent examples, Jusko (2015) shows theoretically how the interaction between electoral rules and the size and distribution of electoral districts affects politicians' incentives to cater to poor voters, while Beramendi and Jensen (2015) show how malapportionment drove public good distribution in the early US, with consequences felt in present day.

The intuition behind these claims is straightforward: electoral rules count votes and translate them into seats, but in so doing they often weight some votes more heavily than others (Monroe and Rose 2002, Samuels and Snyder 2001). Unless candidates are elected in a single electionwide district—a rare occurrence outside of presidential elections—voters located in some districts have more political clout than others, either because they are over-represented in the legislature or because the level of competition in their districts is such that their vote is more likely to influence overall outcomes. Ambitious politicians thus have strong incentives to propose policies that such voters find specially appealing and/or to target discretionary benefits to them, inducing a systematic geographic bias in the provision of government services.

Even then, this does not necessarily imply that the *voters* living in such districts will become better off. The literature has long interpreted malapportionment—the over-representation of some regions or states at the expense of others—as a conservative ploy to diminish the political influence of progressive urban areas (Bruhn, Gallego and Onorato 2010, Samuels and Snyder 2001, Snyder and Samuels 2004). The mechanisms behind this association are not entirely clear—over-represented districts tend to be poorer and more rural than average, which should make them more likely to support pro-poor policies—but the empirical evidence shows a cross-national association between malapportionment and inequality (Horiuchi 2004) or lower income taxation rates (Ardanaz and Scartascini 2013). The evidence also shows that smaller districts (usually, though not necessarily, over-represented) tend to be more favorable to right-wing parties, even within the same country (Kedar, Harsgor and Sheinerman 2016).

There are two potential explanations for this association. One is ideology. More sparsely populated districts are more likely to have low magnitudes and be over-represented in the legislature. They also tend to be more conservative, and thus more likely to favor right-wing candidates. But even then, such voters should prefer government to perform well and deliver local benefits, for example in the form of infrastructure. The other explanation is elite capture. In many developing countries, local elites have too much clout *vis-à-vis* ordinary voters. Where voters are

poor, uneducated and/or lack connections outside their hometown, local elites may control information and financial flows from the center and use them to dominate voters rather than the other way round (Baland and Robinson 2012, Gibson 2005). Evidence from countries as diverse as Uganda (Reinikka and Svensson 2004), Indonesia (Banerjee, Hanna, Kyle, Olken and Sumarto 2017, Martínez-Bravo, Mukherjee and Stegmann 2017), Brazil (Brollo, Nannicini, Perotti and Tabellini 2013, Caselli and Michaels 2013), China (Mattingly 2016), India (Dasgupta and Rizzo 2018) or Mexico (Rizzo 2018) show that local elites in rural villages often manage to seize control of social programs and financial transfers from the center at the expense of their intended beneficiaries.

In sum, the theoretical connection between geographic (over-)representation is ambiguous: more geographic representation should mean more political clout, but not necessarily for voters; to the extent that elite capture is rampant, such representation should benefit local elites at the expense of individual voters. Empirically, the association between electoral rules and policy outcomes is well documented, but the myriad omitted factors that may affect both electoral rules and policy outcomes means that we cannot determine a causal relationship Rodden (2009). The fact that electoral rules vary only rarely and usually at the country level is an obstacle to study changes over time. Some studies of elite capture are well identified, but they exploit variation in the characteristics of the elites themselves rather than the political clout granted to them by electoral rules.

In this paper, we study how electoral rules affect the provision of government services at the local level. To deal with the empirical challenges mentioned above, we exploit an election reform that divorced the election of municipal authorities in the state of Nayarit, in Western Mexico, from the rest of the country. Reformers pulled Nayarit away from electing local executives and council members with fused ballots, as done elsewhere, and adopted single-member districts instead. This set up incentives to build electoral coalitions by spreading policy more evenly across the municipality's geography. Until the reform, securing vote pluralities in densely-populated urban centers sufficed to win municipal office. Since then, majority status in the council also requires winning votes in several municipal districts too. We investigate changes in public services in rural areas in Nayarit since the reform, comparing them to the urbal/rural divide in the rest of Mexico.

In this paper we leverage census and geographic data disaggregated at the level of the electoral *sección* (precinct) for 2006, 2009 and 2012, as well as data on satellite lights for 2006-2013 to examine whether this electoral reform increased the provision of government services, infrastructure, and economic activities in Nayarit. We are not interested in absolute improvements—which, as Figures 5 and 6, increased over time for most states—nor to improvements in Nayarit in particular—which may reflect statewide trends unrelated to the 2008 reform. Nor do we look at the rural-urban gap in itself, which may have increased all over the country for a variety of reasons. Rather, we are interested in how the the zones of Nayarit that should have benefitted most from the reform—rural areas—improved relative to those that lost political clout—urban *secciones*. The counterfactual are rural areas in other states that did not experience a change in electoral rules, and their relative standing *vis-à-vis* urban areas in their own states. Specifically, we compare the relative standing of rural *secciones* in Nayarit—or the rural fraction of a municipality's area—relative to urban *secciones* in the state, with that of rural secciones in other states.

The results are somewhat ambiguous, and sensitive to the type of specification used. When we employ a difference-in-differences analysis at the level of the *sección*, we find a negative and statistically significant effect of the reform on nine out of fifteen measures of government services and economic activity that we look at, but only in rural areas; in urban *secciones*, the effect of the reform was mostly positive, and indeed the rural-urban gap increased in Nayarit relative to other states. This is consistent with a local capture story, driven by the fact that Mexico's former authoritarian party, the *Partido Revolucionario Institucional* or PRI, is especially strong in the state's rural areas. Aggregating the data at the municipality level—that is, creating two observations for each municipality, one urban and the other rural—produces few if any changes. But using entropy balancing (Hainmueller 2012) to match Nayarit's *secciones* produces quite weaker results: some negative effects disappear, and a handful of positive ones how up. The differences between rural and urban areas become less stark as well. This is not necessarily contradictory with a state capture story: the PRI's vote share in 2006 is one of the covariates that we use in the matching, and thus we may be comparing Nayarit's *secciones* with those captured by PRI politicians in other states, but more research is needed; in particular, we need to see if the effect is conditional on the extent of electoral competition in a *sección*. We are also collecting data to determine whether the reform induced politicians to mobilize voters in those *secciones* that gained electoral clout after 2008.

Motivation

In spatial terms, how do parties build electoral coalitions? By spatial we are literal, in the geographic terrain of some district or municipality, and not, as in spatial models of voting, as an analogy of ideology.

By looking at the geographic distribution of policy, we delve into the question of how to achieve government investment in remote, rural areas. As in telecom infrastructure, the absence of a critical mass renders the marginal profit diminutive relative to the size of the investment. Inclusion typically demands government intervention in the form of subsidies and incentives for investment (National Research Council 1995). Political logic may similarly constrain governments and parties to serve urban constituents more lavishly, and delivery to the rural requires incentives—such as malapportionment (Beramendi and Jensen 2015, Thies 1998).

Municipal elections

Mexican states elect local authorities using fused ballots. Voters cast a single vote for a slate of candidates to municipal office. At the top of the ticket are candidates for mayor (*presidente municipal*) and deputy mayor (*síndico*). Below is a list of candidates to fill municipal council seats (*regidores*, the number varies according to populations). The most voted ticket gets the mayor, the deputy mayor, and a number of council (bonus) seats that varies from state to state. The remaining seats are allocated by proportional representation. Bonus seats in twenty-five state constitutions surveyed by Gil Ramírez (2010) represent a council majority per se, ranging from 53 percent in the Gulf state of Veracruz to 81 percent in the Southern state of Tabasco. In municipalities in this

Electoral system	Number of municipalities	Cases	Vote needed for council majority
SP-SMD	20	Nayarit post-reform	(varies)
Proportional	46	Guanajuato	~ 40
	132	Durango, Morelos, Tlaxcala	~ 35
	57	San Luis Potosí	~ 25
Winner-gets-bonus	1,624	Rest	(plurality)
Total	1,879	Thirty states	

Table 1: Municipal electoral institutions across Mexican States in 2010. We approximate the threshold for council majority in proportional systems by giving the winner every bonus seat available plus the relative part corresponding to her vote share. Mexico City and Oaxaca excluded. Prepared with data from Gil Ramírez 2010.

group of states, the winning mayor is guaranteed a working council majority. We refer to this as the "winner-get-bonus" group in Table 1, comprising more than 1,600 municipalities.

Proportional seats in a group of five other states outnumber bonus seats. The share of PR seats ranges between two-thirds of the council in Northeastern San Luis Potosí and four-fifths in central Guanajuato. Mayors in this group of "proportional" systems will enjoy council majorities so long as opposition tickets don't get too many seats. If they wish to avoid minority status, winners therefore need to secure larger than mere plurality margins of victory. The table approximates the vote percentage above which winning tickets will earn a council majority. The approach is crude (it ignores thresholds for representation) but should be accurate: it assumes that winners get the number of non-bonus seats proportional to their vote share (plus all available bonus seats). Winners with less than 40 percent of votes in the state of Guanajuato will fail to achieve a council majority. The same happens with less than 35 percent of votes in the states of Durango, Morelos, and Tlaxcala, and with less than 25 percent of votes in the state of San Luis Potosí.

With 75 percent of bonus seats, Nayarit up to 2005 belonged in the winner-gets-bonus camp. The state then abandoned fused ballots. Municipal elections since 2008 give voters two votes. One vote elects the mayor and deputy mayor in a municipal-wide race. The other vote elects a municipal councilor in a single-member district. Both elections are concurrent and employ plurality rule, so the candidates receiving most votes in each race get elected. Three-quarters of council seats in each municipality are single-member district, the remainder are allocated by PR.

The groups in the table can be arranged in a continuum measuring the size of the margin of victory required for council majority status in multiparty races. At one end are municipalities in winner-gets-bonus states, where a one-vote margin suffices. The 57 Potosian municipalities, where winning with 25 percent of votes is enough, are not far from this end of the continuum—the average winner since 1997 in the state's municipalities got 47 percent and 9 percent standard deviation. Following the ame logic puts the 46 Guanajuatan municipalities at the other end of the continuum, and the 132 municipalities in the other three states somewhere in between.

Nayarita municipalities, where winners need to spread the vote geographically in order to achieve pluralities in a majority of single-member districts, are less easy to locate in the continuum. To the extent that geographic spread and larger margins are analogous efforts, Nayarit will fall closer to Guanajuato.

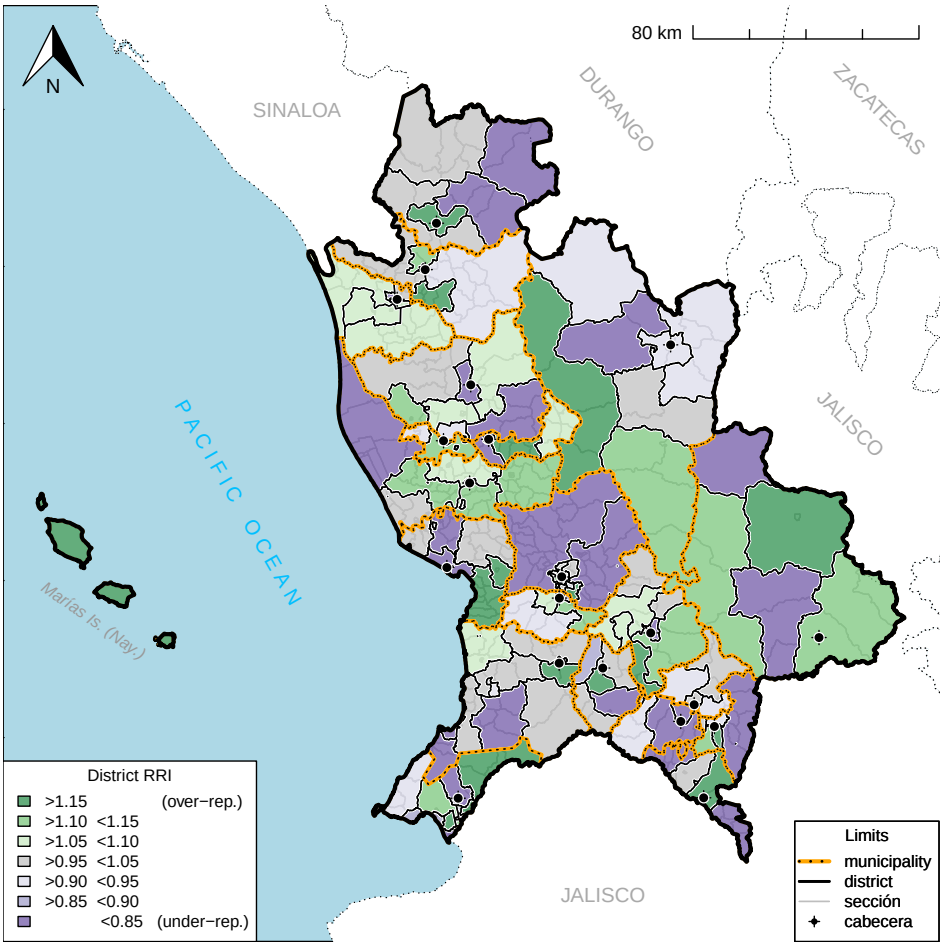

Figure 1: Nayarit state electoral boundaries. Council districts, subdividing municipalities since 2008, are colored by direction and degree of malapportionment. Shades of green indicate over-representation (fewer registered voters than municipality's average district, see text), shades of purple under-representation (more voters than average).

Figure 1 portrays Nayarit's post-reform electoral geography. Its twenty municipalities split into mutually-exclusive and exhaustive single-member districts (called *demarcaciones*). Small municipalities have five districts, the largest has eleven.[1] Districts further subdivide into *secciones electorales*, the basic building blocks for redistricting and election management—and our units of

[1]Six municipalities have five districts: Ahuacatlán, Amatlán de Cañas, Bahía de Banderas, Ixtlán del Río, San Pedro Lagunillas, and Xalisco; ten have seven districts: Acaponeta, El Nayar, Jala, La Yesca, Rosamorada, Ruiz, San Blas, Santa María del Oro, Tecuala, and Tuxpan; three have nine districts: Compostela, Huajicori, and Santiago Ixluintla; and the state capital, Tepic, has eleven.

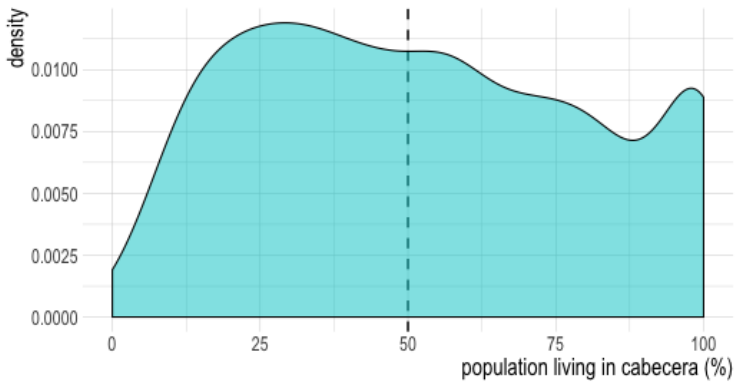

Figure 2: Percentage of the municipality's population who lives in the *cabecera*, 2006.

analysis. *Secciones* are analogous to U.S. census tracts (median *sección* population in the 2010 census was 1,280, with a maximum at 79,232; median tract population in the 2010 census was 3,995, with a maximum at 37,452).

Also reported in the map is malapportionment. Following Ansolabehere, Gerber and Snyder (2002) we compare a district's seats per person (the numerator in the next equation) to the number of seats per person in the municipality the district belongs to (the denominator). We thus measure a district's relative representation index as $RRI = \frac{1/\text{district size}}{N \text{ districts}/\text{municipal population}}$, where N is the municipality's number of single-member districts. A district with an index value of one is well apportioned, its representation matching the 'one person, one vote' ideal. Values above one indicate overrepresentation, values below one underrepresentation, and the measure is continuous. An example shows how the index is interpreted. The 3rd district of Bahía de Banderas in 2012 had 1,831 registered voters[2] or .0005 seats per person; and $N = 5$ divided by the municipality's registered voters returns about .0007 seats per person. This district had 21% less representation than the municipal average, for an index value of .79. (We plan to exploit this source of heterogeneity in future interations of the analysis, cf. Beramendi and Jensen 2015, Magar, Trelles, Altman and McDonald 2016).

The fused vote system has been criticized for giving too much clout to municipal heads or *cabeceras*—where municipal powers formally reside. Over and above being the seat of the city Hall (*Palacio Municipal*), a substantial fraction of the municipal population lives in cabeceras (see Figure 2). Winning cabecera voters is more often than not enough for municipal office, and thus parties have few incentives to court voters in rural areas (Díaz Cayeros 2006). Indeed, it was citing precisely these considerations that state legislators in Nayarit decided to replace the fused ballot *cum* FPTP with single-member districts since 2008, municipalities in Nayarit are divided into multiple SMDs, each of which elects a councillor (mayors are still elected by municipality-

[2]We rely on registered voters in 2012 to estimate populations. While municipal populations are readily available from the census, obtaining district populations requires aggregating sección level data. Changes in Nayarit's base geography (splitting over-populated secciones) after the 2010 census prevent such computations. Future versions will attempt to project populations to 2006.

wide FPTP; see Lecona Esteban 2016). As the map in Figure 1 shows, many of such SMDs are located far away from *cabeceras*, increasing in principle the political influence of rural areas.

We investigate whether or not reform is associated with changes in municipal service provision in peripheral municipal areas. Even if they are responsible for a wider range of infrastructure projects, most spending by Mexican municipalities falls in three main categories: running water, sewage and sanitation, and electricity (Díaz Cayeros, Estévez and Magaloni 2016, ch. 5). Municipalities have authority to raise revenue through local taxes, but few do it beyond negligible levels. So municipal government funding is mostly through federal earmarks for infrastructure investment. Municipalities retain discretion on how to priorize different infrastructure needs.

The general argument

(Under construction)

A skim version of the likely argument runs thus.

1. Candidates vie for municipal office.
2. As a minimum, candidates need a vote plurality to win municipal office.
3. Voters value goods from government.
4. Voters with homogeneous preferences form groups.
5. Groups choose the candidate proposing more goods.
6. Candidates therefore propose distributions of finite goods to groups in society that serve their electoral objectives (cf. Cox and McCubbins 1986).
7. Some groups live in urban, densely-populated areas, others in rural, sparsely-populated areas.
8. It is much costlier to deliver to rural than to urban groups.
9. Delivery to urban groups is therefore more attractive than to rural groups, as the vote return per unit of spending is much larger.

Conclusion: Absent constraints, candidates prefer public spending in the denser-populated urban rather than the sparser-populated rural portions of municipalities.

When constraints arise

Factors exogenous to the current exchange of goods may render a group more/less likely to support some candidate (such as reputation for the previous distribution, ascriptive characteristics, ideology, or other idiosyncrasies). For instance, a candidate could face a formidable obstacle to earn a group's support when the other candidate belongs to that group.

One constraint to the general distributive argument arises when groups in denser areas are already taken—i.e., "cheaper" urban groups predominantly form the opposition core. As in Cox and McCubbins (1986), spending in such groups is suboptimal, so vote-winning requires mobilizing fringe groups (or to somehow break the opposition coalition, not considered here).

Adding more detail to municipal office offers another family of constraints. Municipal government consists of a mayor (executive officer) and a municipal council. Electoral rules acquire relevance.

1.1 Candidates obviously prefer executive office than not. But they also prefer majority status in the municipal council than not. In net benefits, parties rank executive office with majority status first; executive office with minority status second; and no executive office with minority status third. (We exclude consideration of unlikely majority status with no executive office.)

2.1 Majority status in the council depends on votes received and the electoral system.

2.2 There are three electoral systems:

- Winner-gets-bonus -> a vote plurality suffices to earn a council majority
- Proportional -> a vote above a threshold required to earn a council majority
- SP-SMDs -> vote pluralities required in more districts than not

Empirical implications follow from the distributive electoral logic. Office-motivated candidates need to determine the vote threshold required and, where applicable, the geographic vote spread needed. Candidates should keep the flow of goodies towards their core groups (from past experience) while identifying swing groups with vote potential (avoiding opposition core groups in the fringe, if any). If these votes are needed to secure office, swing groups will enter candidates' distributive calculus.

- We expect rural areas in post-reform Nayarit to experience substantial increases in infrastructure spending.
- Proportional systems with higher thresholds should manifest better coverage of rural areas than winner-gets-bonus and lower-threshold proportional systems.
- The geographic population distribution matters: infrastructure investment is more evenly distributed in municipalities with larger pockets of non-cabecera voters than otherwise.

Data and research design

Data. We combine data from four sources. First, we have data for the 2005 and 2010 censuses disaggregated and interpolated at the *sección* level for the 2006, 2009 and 2012 federal elections.[3] This includes a wealth of information on household and population characteristics, such as the proportion of households with running water, sewerage and electricity in every *sección*. Second, and related, we have shapefiles with the boundaries of every *sección*, as well as a wealth of geographic information on the location of roads, schools, hospitals, and other buildings (including markets, bus stations, government offices and churches) all over the country for 2006, 2009 and 2012, from Mexico's national electoral institute (INE, after its Spanish initials). Third, INE also provides official electoral returns at the *sección* level for all federal elections since 1991.[4] Lastly, for a more fine-grained measure of economic performance at the *sección* level, we employ satellite data on the intensity of lights at night between 2006 and 2013. Specifically, we rely on the "Stable Lights" dataset developed by Elvidge and coauthors (1997, 2003; see also Doll 2008),[5] in which every 30 arc-second pixel (≈ 0.86 square kilometers at the Equator) around the world is represented by a digital number (DN) that measures the (cloud-free) average amount of luminosity captured by the satellite sensor during a year. DNs range between 0—meaning that a cell was unlit—and 63—indicating that a cell was so bright that the exact amount of luminosity could not be ascertained and had to be censored.[6] Henderson, Storeygard and Weil (2012) show that data from satellite lights correlates highly with economic activity at the country level, and especially with economic growth. This data is particularly valuable for researchers who need to measure economic activity at high levels of spatial disaggregation, and indeed several recent papers have used it to track economic activity at the subnational level (see Alesina, Michalopoulos and Papaioannou 2012, Hodler and Raschky 2014, Michalopoulos and Papaioannou 2014, Pinkovskiy 2017).

Unit of analysis. We aggregated all this data by *sección*-year, imputing values (assuming a constante rate of growth) when not available between two election years. For electoral purposes, Mexico's territory is divided into $\approx 65,000$ *secciones*. These are the basic unit of state and federal electoral cartography: *secciones* never cross state, municipal, or district boundaries, therefore letting analysts aggregate demographic and other information at different levels of interest. All *sección* boundaries are drawn and updated at the national level by INE; states may organize their

[3] "Estadísticas Censales a Escalas Geoelectorales—II Conteo de Población y Vivienda 2005" and "Estadísticas Censales a Escalas Geoelectorales—Censo de Población y Vivienda 2010" . This data is product of a joint partnership between Mexico's national electoral institute (INE) and its statistical institute (INEGI). We relied on the inter-census 2005–2010 sección rate of change to project yearly indicators linearly.

[4] http://siceef.ine.mx/vothistoric.html.

[5] Global Defense Meteorological Satellite Program-Operational Linescan System Nighttime Lights Time Series 1992-2013, v. 4 (DMSP-OLS). Image and data processing are by NOAA's National Geophysical Data Center, while DMSP data is collected by the US Air Force Weather Agency. Available at http://ngdc.noaa.gov/eog/dmsp/downloadV4composites.html. The "Stable Lights" version only contains lights from cities, towns, and other sites with persistent lighting.

[6] This is not a problem because such pixels are few in number and tend to be concentrated in heavily urbanized areas.

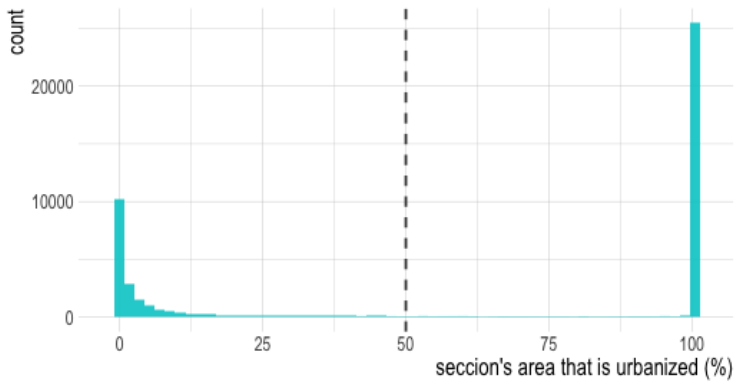

Figure 3: Percentage of the *sección*'s area that is urbanized, 2006.

own elections according to their own rules, but cannot create their own *secciones*. Furthermore, since each voter is registered in a given *sección*, the list of registered voters in federal, state and municipal elections is identical.

Given the nature of Nayarit's electoral reform, the ideal approach would have been to compare outcomes at the level of the municipal single-member district before and after the change in electoral rules. Since each SMDs encompass multiple *secciones*, we can easily create counterfactual pre-reform SMD boundaries from post-reforms districts. Unfortunately, however, this would not work for other states; in these, each municipality serves a single district, and thus we cannot know how sub-municipal boundaries would look like. For this reason, we report our results at the level of either the *sección* or the municipality, but no intermediate unit.

Our argument distinguishes between rural and urban areas; since the latter often coincide with the municipality's *cabecera*, we expect the reform to "bite" in the former but not the latter. Thus, we first classify each *sección* as either urban or rural depending. Specifically, we combine data on *sección* boundaries with polygons indicating the extension of *manchas urbanas* (urban sprawl) across the country to measure the proportion of a *sección*'s area that is urbanized. Since a *sección*'s population was capped at 2,500 in the period, *secciones* in urban areas tend to be very small in size—and entirely covered by urban sprawl—while rural ones are much larger but have few, if any, urbanized areas. In practice, the variable indicating the proportion of a *sección*'s area that is urbanized is distributed in a highly bimodal fashion, with most secciones being either entirely urban or (almost) entirely rural (see Figure 3). We thus code a *sección* as urban if more than half of its area is covered by urban sprawl, and as rural otherwise. To avoid complications from the fact that a rural *sección* may become urbanized or viceversa, we keep a *sección*'s status in 2006 fixed throughout the analysis. We then exploit the fact that *secciones* are nested within municipalities to create two municipal-level datasets, covering respectively the rural and urban *secciones* of every municipality.[7]

[7]Specifically, we aggregate the *sección*-level values at the rural (urban) municipal level, weighting each *sección* according to its share of the rural (urban) municipal population (or area or number of households, when applicable).

Electoral calendar. Mexico has a complicated electoral calendar. Presidents, governors and senators serve six-year terms, while other federal and state legislators as well as local mayors serve three-year periods.[8] However, while in several states local and federal elections are concurrent, others hold elections one or two years ahead of the federal calendar (see Figure 4).[9] Since the electoral calendar may induce coattail effects that affect politicians' chances of winning (Magar 2012) and thus their incentives to deliver benefits to voters, we must take this possibility into account. Thus, based on their electoral calendar, we classify Mexico's states into three mutually exclusive groups:

1. The *federal* group comprises those states that held most state and local elections in the same year as federal ones (2006, 2009 and 2012): Campeche, Colima, Jalisco, State of México, Nuevo León, Querétaro, Sonora and Tabasco (see Figure 4).

2. The *nayarita* group comprises Nayarit—which held state and local elections in 2005, 2008 and 2011—plus four other states that employed a similar—though not necessarily identical—calendar during this period: Baja California Sur, Guerrero, Hidalgo and Quintana Roo.

3. The remaining group comprises those states that held elections mainly in 2004, 2007 and 2010: Aguascalientes, Baja California, Chiapas, Chihuahua, Michoacán, Puebla, Sinaloa, Tamaulipas, Veracruz, Yucatán and Zacatecas.

Given the paucity of states with a calendar similar to Nayarit's, we report two set of results, one for groups (2) and (3) exclusively, and the other for all observations. Also, note that due to different reasons we dropped 8 of Mexico's 32 states for the analysis entirely. Mexico City is almost entirely urbanized, and thus hardly comparable to Nayarit or any other state. Most of Oaxaca's municipalities follow indigenous customs—including nonpartisan elections and public ballots—for electing local authorities Benton (2012). In Coahuila, mayors and local councillors have served four-year instead of three-year terms since 2005, which both disrupted the electoral calendar and may provide differential incentives for local politicians. Finally, we discard Durango, Guanajuato, Morelos, San Luis Posotí and Tlaxcala because they employ proportional electoral rules for electing local councillors (see Table 1), which makes them different from the rest of the country.[10]

Variables. Our main explanatory variable is a dummy that takes the value of 1 for Nayarit since 2008—the first election after the reform was adopted—and 0 otherwise. We evaluate the effect of this change on a set of fifteen outcome variables that measure (a) household and population characteristics such as the presence of running water, sewerage, electricity, refrigerators, dirt floors

[8]The exception is Coahuila, where mayors have served four-year terms since 2005. For this reason, we drop this state from the sample.

[9]See Rosas and Langston (2011) and Magar (2012) for examples of papers that exploit this feature for identification.

[10]As Table 1 shows, in San Luis Potosí the threshold for employing majoritarian rules is very low—just 25 percent of the vote for the largest party—but this state is also different in that it employed a runoff rule for electing mayors between 1997 and 2006.

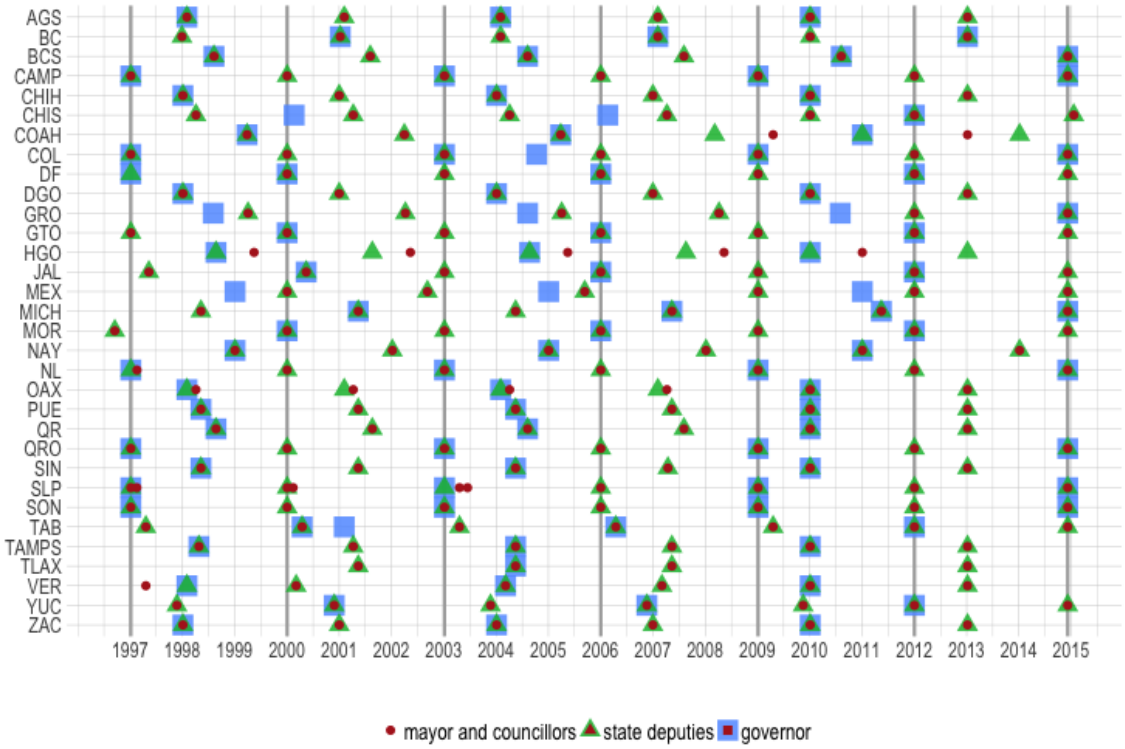

Figure 4: Electoral calendars in the Mexican states, 1997-2015. Vertical lines indicate federal elections; concurrent presidential and legislative elections took place in 2000, 2006 and 2012.

or access to the *Seguro Popular*, a health program for the uninsured; (b) the provision of public goods such as hospitals, schools and paved roads (measured either directly with a dummy or, given the small size of most *secciones*, as the distance from the *sección*'s centroid to the closest school, hospital or road in the municipality); and (c) economic activity as measured by satellite lights at night, including average luminosity, the light density per square kilometer, or the % of cells that are lit or have a digital number of 20 or more. See Table 2 for a brief description of each; note that census and public works data is available for three years (2006, 2009 and 2012), while data on satellite lights is available yearly between 2006 and 2013. As mentioned above, these indicators are originally measured at the level of the *sección*; for the municipal-level analysis, we aggregate them separately for the rural and urban fractions of each municipality, weighting *secciones* by their share of households, population or area of a municipality's rural (urban) part.[11]

Table 2: List of outcome variables at the *sección* level

outcome	**description**	**years**
(a) *Household and population characteristics*		
Running water (%)	% of households with running water	2006, 2009, 2012
Sewerage (%)	% of households with sewerage	2006, 2009, 2012
Electricity (%)	% of households with electricity	2006, 2009, 2012
Refrigerator (%)	% of households that have a refrigerator	2006, 2009, 2012
Dirt floor (%)	% of households with dirt floors	2006, 2009, 2012
Seguro Popular (%)	% of population enrolled in *Seguro Popular*	2006, 2009, 2012
(b) *Public works*		
Hospital (0/100)	100 if there is a health center in the *sección*, 0 if there isn't	2006, 2009, 2012
Nearest hospital (km)	km from *sección*'s centroid to closest health center in municipality	2006, 2009, 2012
School (0/100)	100 if there is a school in the *sección*, 0 if there isn't	2006, 2009, 2012
Nearest school (km)	km from *sección*'s centroid to closest school in municipality	2006, 2009, 2012
Nearest paved road (km)	km from *sección*'s centroid to closest paved road in municipality	2006, 2009, 2012
(c) *Satellite lights*		
Average luminosity	mean digital number value for all cells within a *sección*	2006 to 2013
Light density (km^2)	sum of digital number values within *sección* divided by its area	2006 to 2013
Lit cells (%)	% of cells with a digital number value of 1 or more in *sección*	2006 to 2013
Bright cells (20+) (%)	% of cells in *sección* with a digital number of 20 or higher	2006 to 2013

[11] The only difference between the *sección*-level and municipality-level outcome variables is that for the latter we do not use a hospital or school dummy—unlike most *secciones*, most municipalities have at least one hospital or school—but rather the (logged) number of hospitals or schools per 100,000 inhabitants.

Results

Data visualization. We begin by showing the evolution of the outcome variables over time between 2006 and 2013. Figure 5 displays the data for rural *secciones*. Specifically, for three group of states—Nayarit; those states with a *nayarita* calendar; and the remaining states with a non-concurrent electoral calendar—we show the unweighted values of the dependent variable(s) for all rural *secciones* in every year for which we have data. The vertical line indicates the date of the adoption of the electoral reform.

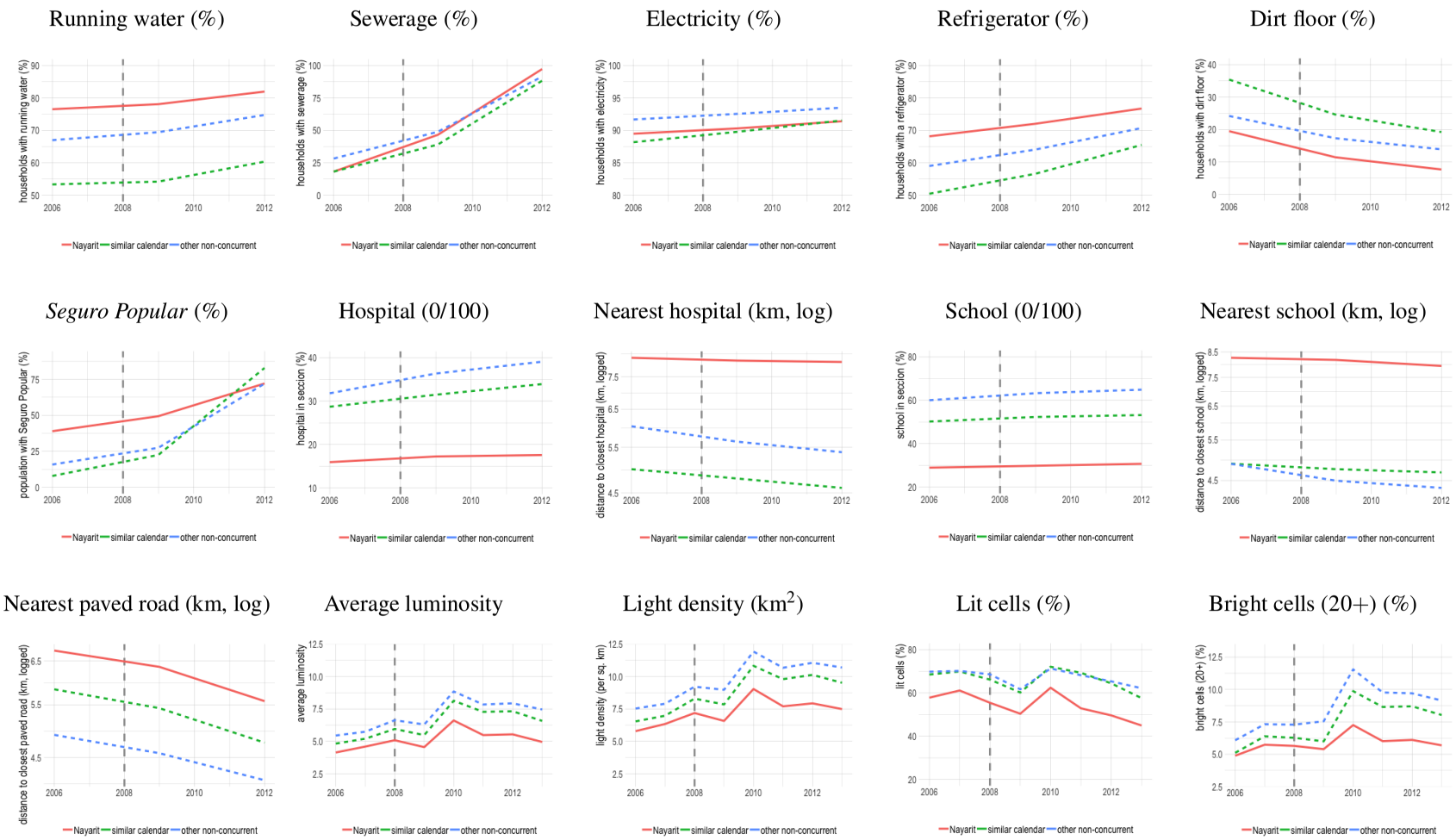

Figure 5: Evolution of the dependent variables over time (1) – Rural areas. For each group of states, lines indicate the average values of the dependent variables over time among *secciones* classified as rural in 2006.

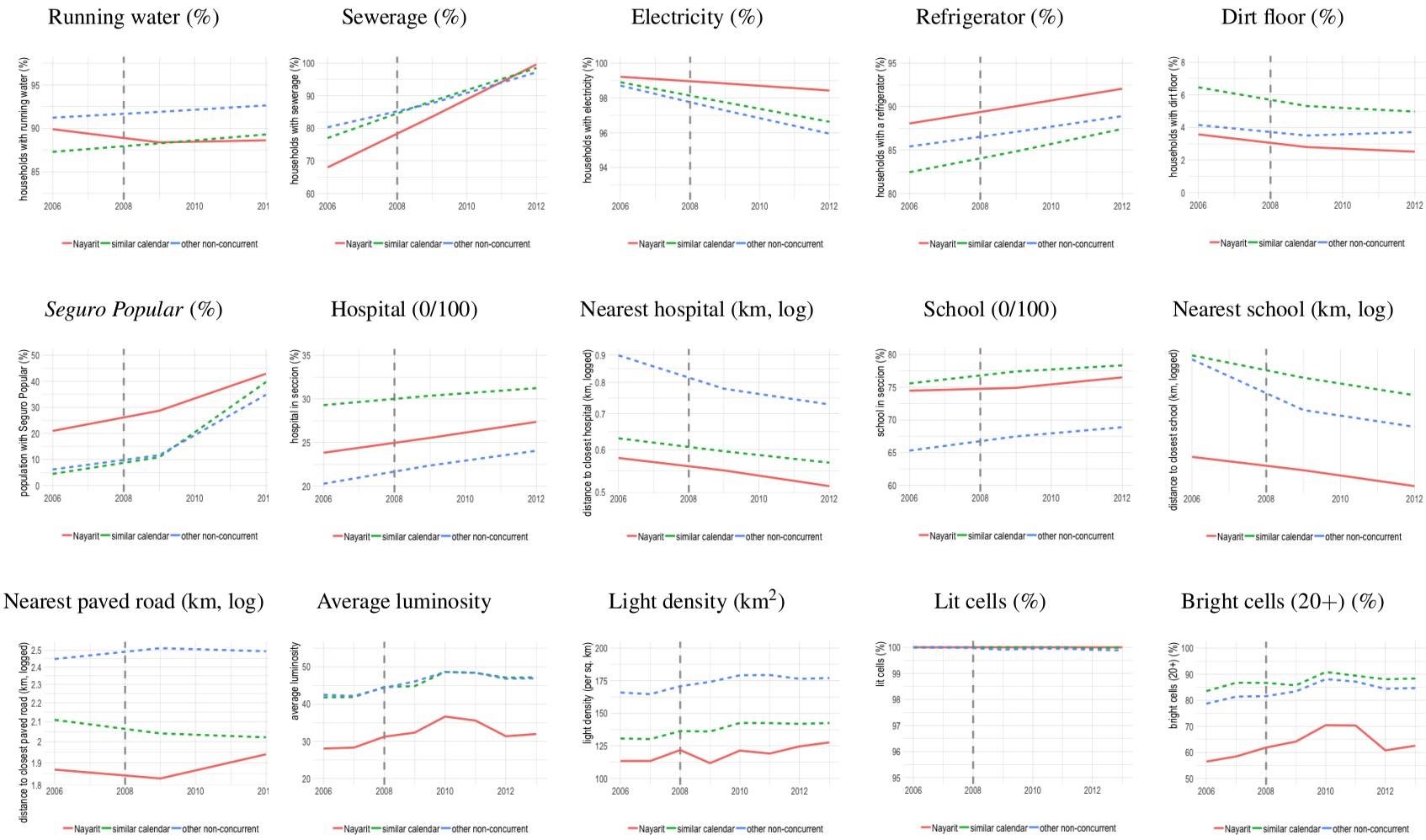

Figure 6: Evolution of the dependent variables over time (2) – Urban areas. For each group of states, lines indicate the average values of the dependent variables over time among *secciones* classified as urban in 2006.

We see some systematic differences between states; in particular, rural areas in Nayarit fare somewhat better than the rest in terms of household characteristics and *Seguro Popular* coverage, but worse in terms of accessibility to hospital and health centers, schools or paved roads; the state also appears lower than the rest in the four outcomes constructed from satellite lights. States with a non-concurrent non-*nayarita* calendar tend to fare better than the *nayarita* group. In terms of variation over time, all variables except the proportion of lit cells show an improvement between 2006 and 2012/2013, but there is little evidence that outcomes improved in Nayarit *vis-à-vis* other states after the adoption of the electoral reform. On the contrary, the figure suggest that the effect of the reform may have been negative, meaning that outcomes improved more slowly in rural *secciones* in Nayarit than in other states with a non-concurrent electoral calendar. The pattern is especially marked for the luminosity data and *Seguro Popular* coverage: regarding the latter, Nayarit was well ahead of the pack in 2006, but ended tied or slightly behind by 2012. The only exception is sewerage, where Nayarit had slightly surpassed the other states by 2012. However, we can observe a similar pattern in urban *secciones* (see Figure 6), implying that this increase is hardly attributable to the electoral reform; it probably has more to do with a statewide change that is concomitant with, but different from, the electoral reform studied in this paper.

As one would expect, Figure 6 shows that urban *secciones* fared much better than the rest on average (note the scales on the *y*-axes), plus a general improvement over time—though with some surprising declines, e.g. in the % of households with electricity. In this case, however, there is no group of states that is systematically better than the rest in most outcomes, though again Nayarit is a clear laggard in the luminosity measures, and its 2006 lead in *Seguro Popular* coverage had been almost completely eroded by 2012.

In sum, Figures 5 and 6 highlight the importance of making two kinds of comparisons. On the one hand, the upwards trend characteristic of most variables underscores the importance of comparing Nayarit with other states: if we simply looked at what happened in Nayarit before and after the reform, we would misleadingly conclude that the reform improved outcomes, when actually outcomes improved in all groups of states. On the other, even if outcomes improved faster in Nayarit than in other states—as seems to be case with sewerage—this may reflect a *statewide* trend, i.e. one that is similar in rural and urban areas. Thus, we must examine whether post-reform, rural areas in Nayarit fared relatively better than urban *secciones* in the same state, *relative to rural areas in other states*. At first sight, this does not seem to be the case. To this we now turn.

Difference-in-differences. We begin by fitting difference-in-differences models of the form

$$y_{s,t} \quad = \quad \beta \cdot \text{reform}_{s,t} + \mu_s + \delta_t + \varepsilon_{s,t},$$

where $y_{s,t}$ is the outcome measured in *sección s* in year t, $\text{reform}_{s,t}$ is a dummy that takes the value of 1 for all *secciones* in Nayarit since 2008 and 0 otherwise, and μ_s and δ_t are *sección* and year fixed effects, respectively. That is, we compare the evolution of the dependent variable within each *sección* before and after the reform. Since the explanatory variable was implemented at the state level, we cluster the standard errors by state. For each outcome, we estimate a separate model for rural and urban secciones. Since values between urban and rural *secciones* within the same

Table 3: The effect of Nayarit's electoral reform on government services and public goods provision – Difference-in-Differences estimates, by *sección*

	Non-concurrent w/federal only			**All observations**		
outcome	rural *secciones*	urban *secciones*	bootstrapped diff.	rural *secciones*	urban *secciones*	bootstrapped diff.
Running water (%)	-1.51	-2.49	0.48	-1.56	-2.64	0.62
	(0.84)	(0.65)	(0.90)	(0.74)	(0.44)	(0.96)
Sewerage (%)	10.93	10.99	1.78	11.49	12.96	0.30
	(2.08)	(3.57)	(1.66)	(1.93)	(2.49)	(1.60)
Electricity (%)	-0.27	1.47	-1.57	-0.05	1.40	-1.27
	(0.45)	(0.50)	(0.43)	(0.39)	(0.30)	(0.44)
Refrigerator (%)	-2.96	0.28	-2.95	-2.61	0.57	-2.90
	(1.04)	(0.62)	(0.40)	(0.89)	(0.45)	(0.39)
Dirt floor (%)	-0.03	-0.31	0.35	-1.09	-0.54	-0.30
	(1.95)	(0.33)	(0.52)	(1.65)	(0.23)	(0.53)
Seguro Popular (%)	-14.86	-2.64	-12.62	-13.27	-1.18	-12.15
	(3.77)	(2.55)	(1.07)	(3.26)	(1.67)	(1.03)
Hospital (0/100)	-3.74	-0.09	-3.58	-4.28	-1.44	-2.93
	(1.28)	(0.74)	(1.02)	(1.16)	(1.28)	(1.05)
Nearest hospital (km, log)	0.04	0.04	0.01	0.05	0.08	-0.03
	(0.03)	(0.04)	(0.02)	(0.02)	(0.05)	(0.02)
School (0/100)	-2.02	-1.41	-0.63	-2.03	-2.91	0.82
	(0.90)	(0.64)	(1.08)	(0.69)	(1.59)	(1.06)
Nearest school (km, log)	0.06	0.03	0.03	0.06	0.04	0.01
	(0.02)	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)
Nearest paved road (km, log)	-0.01	-0.01	0.01	-0.00	0.07	-0.07
	(0.03)	(0.04)	(0.03)	(0.03)	(0.11)	(0.03)
median N_{obs}	46384	48014		60291	81222	
median $N_{\text{secciones}}$	15520	16014		20173	27087	
Average luminosity	-0.83	0.14	-0.98	-1.08	0.49	-1.56
	(0.20)	(0.39)	(0.30)	(0.25)	(0.36)	(0.29)
Light density (km^2)	-1.15	1.94	-3.18	-1.46	3.24	-4.61
	(0.23)	(1.44)	(1.45)	(0.31)	(1.16)	(1.41)
Lit cells (%)	-2.90	0.06	-2.99	-3.16	0.05	-3.22
	(0.41)	(0.03)	(0.49)	(0.35)	(0.02)	(0.48)
Bright cells (20+) (%)	-1.58	1.79	-3.39	-1.96	2.58	-4.58
	(0.35)	(0.70)	(1.32)	(0.37)	(0.67)	(1.38)
median N_{obs}	123442	50635		160476	83459	
median $N_{\text{secciones}}$	15526	9167		20197	15153	

OLS regression estimates of Nayarit's electoral reform on the dependent variable (listed on the left). Robust standard errors clustered by state ($N = 16$ and $N = 24$, respectively) in parentheses. The unit of observation is the *sección*. All specifications include *sección* and year fixed effects. Columns (3) and (6) report the bootstrapped estimate and standard error of the difference between rural and urban *secciones*, based on 799 bootstrap replications at the *sección* level.

state and/or municipality cannot be assumed to be independent, for each outcome we calculate the difference between the coefficients—and the standard errors of the difference—by bootstrapping.[12]

Table 3 presents the results. The first three columns show the results for the set of states whose electoral calendar is non-concurrent with federal elections—chiefly, the list of states included in Figures 5 and 6—while the last three add the states with a concurrent calendar. In contrast with the claim that increased electoral prominence should indice politicians to deliver more benefits, but in line with what Figures 5 and 6 suggested, the first column of the table shows a negative and statistically significant effect for 9 of the 15 outcomes of interest. Specifically, following the passage of the 2008 electoral reform, rural *secciones* in Nayarit fared comparatively worse than rural *secciones* in other states in terms of % of households with a refrigerator, population with *Seguro Popular* coverage, accessibility to hospital/health centers and schools, as well as the four measures of luminosity. For only one variable—% of households with sewerage—is the effect positive and statistically significant at conventional levels. At 11 pp., the effect is substantively large in size, but the magnitude of the estimate is almost identical to that for urban *secciones*, suggesting that the increase in sewerage coverage was a statewide phenomenon rather than a differential effect of the electoral reform.

A comparison of the first and second columns of Table 3 reinforces this point: among all 15 outcomes, only two—the percentage of households with running water and the percentage of *secciones* with at least one school—worsened in urban areas in Nayarit *vis-à-vis* other states, while three besides sewerage coverage—% of households with electricity, % of lit cells, and % of bright cells—showed statistically significant improvements, even if admittedly modest ones. Still, it is worth remembering that these estimates do not reflect absolute improvements but *relative* changes with respect to urban *secciones* in other states. The bootstrapped differences shown in the third column of the table confirm this pattern: compared with other states, post-reform indicators in rural *secciones* in Nayarit *worsened* relative to those in urban ones. Far from promoting catch-up, the 2008 reform increased the urban-rural gap in the state. The last three columns of Table 3 shows that including states with a concurrent calendar into the sample leaves these results almost unchanged.

Table 4 shows that aggregating the data at the level of the municipality does little, if anything, to change these results. Specifically, we run the same difference-in-differences specifications than previously, but aggregating all rural (respectively, urban) *secciones* belonging to the same municipality into a single observation. That is, for every municipality-year we have two observations, one with the weighted average of all rural *secciones*, the other with that of urban *secciones*. The first column of Table 4 shows that after the reform, the number of households with sewerage increased by around 7 pp. in Nayarit *vis-à-vis* other states, but for other nine outcomes—the same as before: households with a refrigerator, *Seguro Popular* coverage, accessibility to hospitals and schools, and the luminosity indicators—the situation worsened relative to pre-reform levels. The next column shows that in urban areas there were few improvements, but also few relative decreases; as before, the bootstrapped differences between the coefficients suggest that rural areas in Nayarit worsened

[12] Specifically, we sampled with replacement a number of *secciones* equal to the number of *secciones* in the main sample, estimated the coefficients of interest for rural and urban areas separately, and stored the difference between the two. We repeated this process 799 times. Note that we sampled by *sección* rather than *sección*-year, i.e. whenever we sampled a *sección* we included it for all years it appears in the data.

Table 4: The effect of Nayarit's electoral reform on government services and public goods provision – Difference-in-Differences estimates, by municipality

	Non-concurrent w/federal only			**All observations**		
outcome	rural *secciones*	urban *secciones*	bootstrapped diff.	rural areas	urban areas	bootstrapped diff.
Running water (%)	-0.41	-1.26	0.82	-0.52	-1.57	0.86
	(1.20)	(0.51)	(1.93)	(0.93)	(0.40)	(1.88)
Sewerage (%)	7.11	5.12	3.73	9.58	7.56	3.86
	(3.32)	(6.31)	(5.69)	(3.15)	(4.92)	(6.12)
Electricity (%)	-0.19	0.16	-0.26	0.04	0.28	-0.14
	(0.38)	(0.15)	(0.58)	(0.33)	(0.14)	(0.60)
Refrigerator (%)	-3.12	-2.51	-0.45	-2.05	-1.65	-0.30
	(0.94)	(0.98)	(0.98)	(1.01)	(0.88)	(0.96)
Dirt floor (%)	0.25	1.77	-1.22	-1.05	1.16	-1.72
	(1.91)	(0.99)	(1.90)	(1.61)	(0.78)	(1.85)
Seguro Popular (%)	-12.74	-14.57	1.57	-11.18	-13.13	1.81
	(3.62)	(3.17)	(3.91)	(2.85)	(2.66)	(3.83)
Hospitals (per 100,000, log)	-0.15	-0.08	0.13	-0.19	-0.11	0.12
	(0.04)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)
Nearest hospital (km, log)	-0.00	-0.02	0.01	0.01	0.01	0.00
	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
Schools (per 100,000 log)	-0.11	-0.10	0.12	-0.11	-0.12	0.14
	(0.03)	(0.02)	(0.04)	(0.03)	(0.03)	(0.04)
Nearest school (km, log)	0.06	0.08	-0.03	0.06	0.08	-0.02
	(0.03)	(0.04)	(0.02)	(0.02)	(0.03)	(0.02)
Nearest paved road (km, log)	-0.01	-0.06	0.05	-0.01	-0.07	0.06
	(0.04)	(0.02)	(0.11)	(0.03)	(0.03)	(0.10)
median N_{obs}	3437	2337		4680	3313	
median $N_{\text{secciones}}$	1148	779		1563	1105	
Average luminosity	-0.92	-0.22	-0.71	-1.08	-0.48	-0.61
	(0.24)	(0.25)	(0.72)	(0.27)	(0.29)	(0.73)
Light density (km^2)	-1.13	-0.29	-0.85	-1.36	-0.47	-0.87
	(0.30)	(0.34)	(1.06)	(0.36)	(0.31)	(1.11)
Lit cells (%)	-2.05	0.34	-2.42	-2.50	0.38	-2.92
	(0.56)	(0.18)	(1.06)	(0.49)	(0.17)	(0.97)
Bright cells (20+) (%)	-1.17	-1.81	0.75	-1.45	-1.64	0.21
	(0.34)	(1.08)	(2.47)	(0.36)	(1.08)	(2.45)
median N_{obs}	9163	5938		12477	8415	
median $N_{\text{secciones}}$	1148	770		1563	1092	

OLS regression estimates of Nayarit's electoral reform on the dependent variable (listed on the left). Robust standard errors clustered by state ($N = 16$ and $N = 24$, respectively) in parentheses. The unit of observation is the municipality. All specifications include municipality and year fixed effects. Columns (3) and (6) report the bootstrapped estimate and standard error of the difference between rural and urban *secciones*, based on 799 bootstrap replications at the municipality level.

rather than improve relative to urban ones. And again, the last three columns of the table indicate that the results do not change by adding states that hold local elections concurrently with federal ones.

Matching with Entropy Balancing. These results indicate that when comparing a given *sección* with itself over time, those in Nayarit improved less after 2008 than those in other states, especially in rural areas. But if rural *secciones* in Nayarit are not generally comparable to those in other states, the estimates may be biased, as it may be the pre-existing differences between *nayarita* and non-*nayarita secciones*, rather than the reform itself, that is driving the results. For example, Mexico's former ruling party, the Institutional Revolutionary Party or PRI, remains stronger in Nayarit than in the rest of the country, while the Partido Acción Nacional or PAN, which controlled the presidency between 2000 and 2012, is much weaker. If *priísta* politicians are dominant in rural areas and govern differently than their counterparts from other parties, or if *panista* officials in the federal government were more likely to direct resources to urban areas—where their party is stronger—it could be this rather than the change in electoral rules that is driving the results.

To account for this possibility, we match rural and urban *secciones* in Nayarit with similar counterparts in other states, thus ensuring that we are only comparing observations that were similar across a broad range of dimensions before the reform was enacted. Specifically, we employ the entropy balancing procedure proposed by Hainmueller (2012), which weights observation in the control group to ensure that the treatment and control group are perfectly balanced across a desired set of moments. Specifically, we balance the mean values[13] of the treatment and control groups across all 15 outcome variables, plus total population, area (in km^2), distance to the municipality's *cabecera* (in km), and the vote share of the PAN and PRI in the 2006 federal elections.[14] We matched separately for rural and urban *secciones*, and also distinguished between states with a *nayarita* calendar and the full set of control states.

[13] We wanted to balance the standard deviations of the samples as well, but could not due it because of collinearity issues.

[14] Mexico had an essentially three-party system in 2006, and thus in practical terms balancing the vote shares of the PRI and PAN ensured balancing for the vote share of the PRD as well.

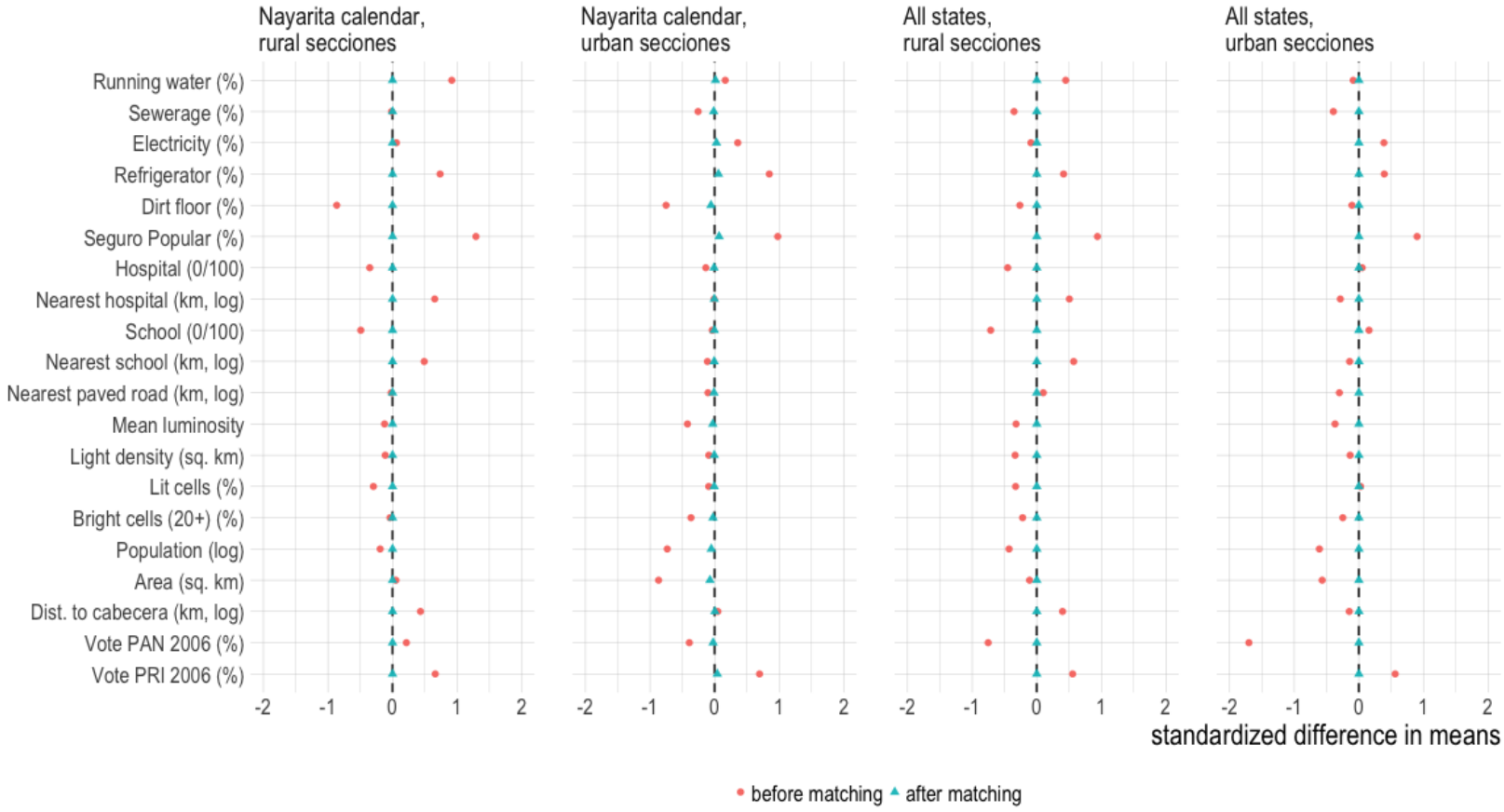

Figure 7: Covariate balance for the Entropy Balancing at the *sección* level. Points show the difference in means between the treatment and control group, standardized by the standard deviation of the treatment group, both before and after matching.

For all covariates included in the matching, Figure 7 shows the difference in means between the treatment and control groups both before and after the matching, expressed in standard deviation units in the treatment group. We report four sets of comparisons, for the full set of combinations between states included in the matching (*nayarita* calendar vs. the rest), and the rural/urban status of the *sección*. Clearly, the entropy balancing procedure does a great job at finding (weighting) matches in the control group: after the matching, the difference between them disappear almost completely.

We then estimated the effect of the electoral reform on the *change* in each of the outcome variables between 2006 and 2012. We measure the outcomes in changes rather than levels to compensate for (potential) minor differences between the treatment and control groups—i.e., we do not want small post-matching differences to be reflected in the results. Nonetheless, given the small differences between the groups, this should not affect the results. We examine changes between 2006 and 2012 because this is the longest time window for which we have data for all outcome variables.[15] We estimate the models by WLS, weighting observations by their matching weights.[16] As before, we cluster standard errors by state.

Table 5 presents the results, which are quite different from the previous ones. Most obviously, the first column shows that when the comparison is restricted to rural *secciones* in states that follow the *nayarita* calendar, only two variables show a statistically significant worsening after the reform—the % of *Seguro Popular* recipients and the percentage of list cells—but four—the % of households with running water, electricity and dirt floors, as well as the distance to the nearest paved road—that show improvements. Moreover, the difference between the rural and urban estimates reported in the third column of the table tends to show a relative improvement of rural *vis-à-vis* urban areas for several variables, though the statistical significance of these differences is open to question. The last three columns of the table show that expanding the matching to *secciones* from all states flips some results—notably the estimate for the percentage of households with electricity becomes negative—and introduces a negative effect for the availability of schools and health centers; at the same time, the negative effects on the %of lit cells and *Seguro Popular* coverage disappears. At the same time, the raw difference in estimates between rural and urban *secciones* tends to worsen. To sum up, while matching attenuates the negative effects reported in Table 3 and reduces the reliability of the estimates—unsurprising, given the reduction in sample size—Table 5 suggests that the overall gist of the results does not change, especially when al states are included in the sample: on average, the 2008 electoral reform made rural *secciones* in Nayarit worse relative to their counterparts in other states, and generally—though not always—increased the rural-urban gap, which was the opposite of what it was supposed to achieve.

[15] In future iterations of this paper, we intend to estimate the effect separately for every post-treatment year for which we have data.

[16] This only affects control observations. All treatment—i.e., *nayarita*—observations have a weight of 1.

Table 5: The effect of Nayarit's electoral reform on government services and public goods provision – Entropy Balanced Matching estimates, by *sección*

	Non-concurrent w/federal only			**All observations**		
outcome	rural *secciones*	urban *secciones*	diff.	rural *secciones*	urban *secciones*	diff.
$\Delta_{06\to12}$ *Running water* (%)	2.78	-6.28	9.06	1.90	-0.50	2.40
	(0.47)	(4.41)		(0.75)	(0.83)	
$\Delta_{06\to12}$ *Sewerage* (%)	2.41	1.66	0.74	2.66	1.10	1.57
	(1.92)	(9.48)		(3.05)	(6.01)	
$\Delta_{06\to12}$ *Electricity* (%)	1.03	0.03	0.99	-2.21	0.81	-3.02
	(0.19)	(0.30)		(0.68)	(0.21)	
$\Delta_{06\to12}$ *Refrigerator* (%)	0.33	0.06	0.27	-2.80	1.05	-3.84
	(1.78)	(0.79)		(1.34)	(0.26)	
$\Delta_{06\to12}$ *Dirt floor* (%)	-7.11	-2.17	-4.94	-3.71	-0.96	-2.76
	(2.58)	(2.97)		(1.07)	(0.20)	
$\Delta_{06\to12}$ Seguro Popular (%)	-5.09	11.05	-16.14	-3.12	2.65	-5.76
	(2.01)	(12.49)		(6.26)	(3.21)	
$\Delta_{06\to12}$ *Hospital* (0/100)	-3.04	2.54	-5.58	-4.21	-0.97	-3.23
	(4.63)	(1.24)		(1.11)	(0.79)	
$\Delta_{06\to12}$ *Nearest hospital* (km, log)	0.02	-0.09	0.12	0.05	0.04	0.01
	(0.06)	(0.02)		(0.03)	(0.04)	
$\Delta_{06\to12}$ *School* (0/100)	-0.43	-0.63	0.20	-4.23	1.21	-5.44
	(1.75)	(3.19)		(0.87)	(1.34)	
$\Delta_{06\to12}$ *Nearest school* (km, log)	-0.02	-0.19	0.17	0.08	-0.02	0.10
	(0.02)	(0.06)		(0.02)	(0.02)	
$\Delta_{06\to12}$ *Nearest paved road* (km, log)	-0.14	0.01	-0.16	-0.04	0.13	-0.16
	(0.04)	(0.09)		(0.04)	(0.08)	
$\Delta_{06\to12}$ *Average luminosity*	-0.91	-0.94	0.03	-0.44	-0.44	-0.00
	(0.64)	(1.84)		(0.39)	(0.33)	
$\Delta_{06\to12}$ *Light density* (km^2)	-1.13	-3.90	2.77	-0.56	-1.57	1.01
	(0.80)	(4.29)		(0.48)	(0.55)	
$\Delta_{06\to12}$ *Lit cells* (%)	-9.61	0.65	-10.26	-3.17	0.01	-3.18
	(5.24)	(0.00)		(1.77)	(0.36)	
$\Delta_{06\to12}$ *Bright cells* (20+) (%)	-1.47	0.28	-1.75	-1.45	-1.42	-0.03
	(0.71)	(1.59)		(0.94)	(1.02)	
N_{treated}	394	463		394	463	
N_{control}	3376	1669		19063	24346	
$N_{\text{control (weighted)}}$	394	480		394	463	
N_{states}	5	5		24	24	

WLS regression estimates of Nayarit's electoral reform on the change in dependent variable (listed on the left) between 2006 and 2012. The unit of observation is the *sección*. All treatment *secciones* have a weight of 1; the weights of control *secciones* were determined by the entropy balanced matching procedure proposed by Hainmueller (2012). Covariates included in the matching are all the outcome variables plus total population (logged), total area, distance from the *sección's* centroid to the municipality *cabecera* (in km, logged), and the vote share of the PAN and the PRI in the 2006 federal election. Robust standard errors clustered by state in parentheses.

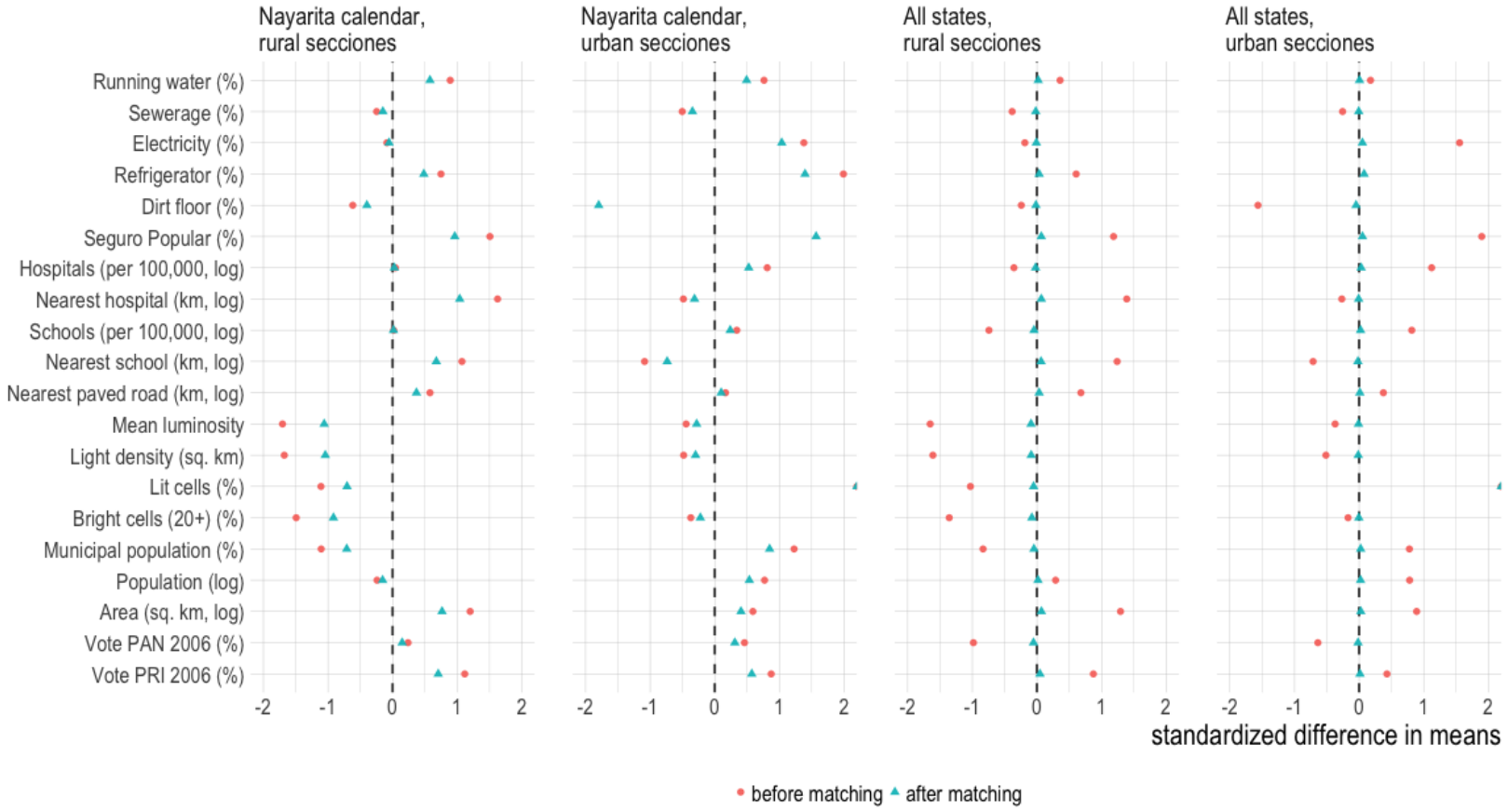

Figure 8: Covariate balance for the Entropy Balancing at the municipality level. Points show the difference in means between the treatment and control group, standardized by the standard deviation of the treatment group, both before and after matching.

We also conduct a matching analysis at the municipality level, though the results must be interpreted with caution. On the one hand, we have much less statistical power. Nayarit has only 20 municipalities, of which twohave no urban *secciones* within them. We also lose two municipalitees due to lack of data. On the other, the smaller number of observations results in less satisfactory matches: as Figure 8 shows, when we look for matches among municipalities in states that follow a *nayarita* calendar, covariate balance improves but remains less than perfect. Including all states in the sample does result in much better matches (see the two rightwards panels of Figure 8), but the problem of low power remains.

Indeed, most estimates reported in Table 6 have large standard errors and are statistically significant. Those that *are* significant do show a positive effect of the reform in rural areas, both relative to rural areas in other states and to urban areas in Nayarit. The estimates in the first three columns of the table are suspect because of the low quality of the matches, but matching on all states indicates that the reform both improved access to running water and sewerage in rural areas, and increased average luminosity, light density, and the proportion of bright cells in them. In contrast, the urban areas of Nayarit's municipalities either worsened or increased less starkly, resulting in a reduced urban-rural gap post-reform. Since we are matching on the electoral strength of both the PRI and the PAN in 2006, this is not entirely inconsistent with a local capture story; perhaps the reform gave *priístas some* incentives to perform, or the effect was driven by more competitive municipalities. We plan to explore this issue further, though the small number of municipalities makes the inclusion of an interaction term problematic.

Conclusion

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Table 6: The effect of Nayarit's electoral reform on government services and public goods provision – Entropy Balanced Matching estimates, by municipality

	Non-concurrent w/federal only			**All observations**		
outcome	rural *secciones*	urban *secciones*	diff.	rural areas	urban areas	diff.
$\Delta_{06\to12}$ *Running water* (%)	10.95	-17.99	28.94	5.71	-14.86	20.57
	(5.41)	(6.04)		(1.72)	(5.25)	
$\Delta_{06\to12}$ *Sewerage* (%)	4.37	-3.36	7.74	20.69	-3.05	23.74
	(4.70)	(1.80)		(8.97)	(2.25)	
$\Delta_{06\to12}$ *Electricity* (%)	2.46	-1.67	4.13	2.50	-0.36	2.86
	(2.03)	(0.89)		(2.15)	(0.93)	
$\Delta_{06\to12}$ *Refrigerator* (%)	0.28	-5.43	5.71	2.65	-6.26	8.91
	(2.90)	(1.06)		(2.51)	(4.79)	
$\Delta_{06\to12}$ *Dirt floor* (%)	-4.18	7.08	-11.26	-3.62	8.69	-12.31
	(1.28)	(4.75)		(2.09)	(4.92)	
$\Delta_{06\to12}$ Seguro Popular (%)	-24.56	3.14	-27.70	-4.16	4.81	-8.97
	(7.59)	(0.69)		(4.97)	(3.18)	
$\Delta_{06\to12}$ *Hospitals* (per 100,000, log)	-0.27	0.34	-0.60	-0.08	0.08	-0.16
	(0.88)	(1.24)		(0.19)	(0.44)	
$\Delta_{06\to12}$ *Nearest hospital* (km, log)	0.93	-1.00	1.93	0.15	-0.50	0.65
	(0.31)	(0.18)		(0.37)	(0.22)	
$\Delta_{06\to12}$ *Schools* (per 100,000, log)	-0.13	0.25	-0.38	-0.09	-0.14	0.05
	(0.47)	(0.81)		(0.27)	(0.62)	
$\Delta_{06\to12}$ *Nearest school* (km, log)	0.93	-0.91	1.84	0.00	-0.36	0.36
	(0.42)	(0.18)		(0.37)	(0.24)	
$\Delta_{06\to12}$ *Nearest paved road* (km, log)	0.39	-0.38	0.77	-0.30	-0.22	-0.08
	(0.26)	(0.68)		(0.21)	(0.31)	
$\Delta_{06\to12}$ *Average luminosity*	0.04	0.29	-0.25	8.61	1.94	6.67
	(6.64)	(3.20)		(3.83)	(2.77)	
$\Delta_{06\to12}$ *Light density* (km^2)	1.75	0.22	1.53	13.68	2.65	11.03
	(8.94)	(3.92)		(5.99)	(3.67)	
$\Delta_{06\to12}$ *Lit cells* (%)	-22.77	34.20	-56.97	1.55	15.85	-14.29
	(14.00)	(14.98)		(9.21)	(7.63)	
$\Delta_{06\to12}$ *Bright cells* (20+) (%)	-0.32	-5.13	4.82	24.63	1.02	23.61
	(14.30)	(2.56)		(9.60)	(10.48)	
N_{treated}	18	16		18	16	
N_{control}	139	105		1305	1014	
$N_{\text{control (weighted)}}$	19	18		19	16	
N_{states}	5	5		24	24	

WLS regression estimates of Nayarit's electoral reform on the change in dependent variable (listed on the left) between 2006 and 2012. The unit of observation is the municipality. All treatment municipalities have a weight of 1; the weights of control municipalities were determined by the entropy balanced matching procedure proposed by Hainmueller (2012). Covariates included in the matching are all the outcome variables plus percentage of the municipality's total population, total population (logged), total area (logged), and the vote share of the PAN and the PRI in the 2006 federal election. Robust standard errors clustered by state in parentheses.

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