Peri-Urbanization in the México City Metropolitan Area

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August 21st, 2026

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1 Introduction

Urban areas are becoming increasingly important spaces for global commerce, hubs for cultural development, and dense networks of resources that make urban living an appealing prospect. The many advantages that are associated with urban living have resulted in an increasingly urbanized population. In 1950, 20 percent of the world's population lived in cities; now, 45 percent live in cities and 36 percent live in towns (United Nations, 2025). By 2050, cities are expected to account for two-thirds of the global population, followed largely by towns. Megacities, cities with populations of over 10 million inhabitants, have grown from eight in 1975 to 33 in 2025. The manner in which urban inhabitants are contributing to the urban landscape has been evolving. Urban land area growth is outpacing urban population growth, meaning that the population is taking up more space at a lower density: this process is often called *urban sprawl*. Throughout Latin America, the development of peri-urban areas has been increasing at a higher rate than urbanized and core areas, reflecting a regional trend towards sprawl (Inostroza et al., 2013). Growth in the urban population and land coverage have not been correlated for all countries: Mexico City (CDMX) suffered a 1.3-million-person population decline over the past decade (United Nations, 2025). Urbanization in medium-sized and large cities in developing countries has coincided with rapidly expanding peripheries, covering large swaths of land and disrupting social and environmental land patterns.

An issue of increasing salience is where and how people live in rapidly growing urbanized areas. The increasing rate of urbanization has raised the number of informal human settlements (IHSs). About 1.1 billion people globally live in IHSs (United Nations, 2025). As of 2022, Latin America is home to 93.4 million people who reside in IHSs with 19.6 million living in México (UN-HABITAT, 2024). Informal housing or settlements arise out of a nation's failure to resolve sources of informality and are indicative of its lacking understanding in tackling socioeconomic

vulnerabilities that push urban residents towards innovative solutions to satisfy their basic needs (Aguilar & Santos, 2011).

Instead of confronting sources of informality, governments are implementing urbanization frameworks that are often unsustainable. The inevitable expansion of the urban landscape requires governments to plan for continuing development, especially as urban density has decreased in favor of more spread-out cities (Angel, 2012). Growth in the urban peripheries has been aptly known as the *peri-urbanization* process and occurs in the liminal spaces between urban and rural environments (Aguilar et al., 2022). Processes of urban decentralization, a result of a decentralized economic model, push urban logic into the broader regional landscape through agglomeration economics, encouraging peri-urbanization (Inostroza et al., 2013; Storper, 1998). *Land use fragmentation* is a key result of peri-urbanization; the peripheries of metropolises transform into noncontiguous patches of settlements, green areas, and other land uses (Aguilar et al., 2022). Urban peripheries reinforce structural inequalities with middle- and upper-class groups having necessary infrastructure and connectivity while lower socioeconomic groups lack basic utilities. Traditionally, peripheral communities were characterized by indigenous and rural, agricultural towns (Aguilar, 2008; Aguilar & Ward, 2003). The transformation of the urban periphery has forced governments to become innovative their approach to governance.

There have been a wide array of policies implemented across Latin America to alleviate the issue of housing urban populations in peripheral settings. Often, these programs have not resolved the issue but perpetuate informal expansion. Some governments have extended public services to informal settlements. IHSs stretch the limits of public services by increasing the number of customers over an expanding land area. Regularization programs are preferred because they are often cheaper and politically optimal policies compared to eviction. Regularization is the process of giving titles to informal developments, expanding the formal

housing market. IHSs that permeate peripheral areas are occupied by people from various socioeconomic backgrounds. Informality can incur higher costs compared to formal living, as privatized services can cost many times more than public services, even if those services are more unreliable. The cost of informal developments on land can cost between the minimum provision of resources as determined by the formal sector, upwards, as informal developments happen with profit considerations in mind and inefficiencies. The regularization of informal settlements adds additional costs for governments that need to provide public services to newly regularized titles. Infrastructure improvements also incentivize informal settlements. Unfeasible regulations, low guardrails, lack of institutional capacity, bureaucratic inefficiencies, and the prevalence of clientelism are the products and perpetuators of dysfunctional land use policy that have produced the current housing landscape. Peri-urban informality, formerly viewed as transitory, becomes the expected outcome of the system (Smolka & Larangeira, 2008).

Governments often pursue multiple options when engaging informal developments, yet there is a dearth of quantitative analysis on how municipal actions impact the reported informal population. Similarly, research on how ejidos impact the informal population on a municipal level has prompted further quantitative analysis. Do government actions towards IHSs impact IHS populations, and do IHS prefer ejidal land? This question is nowhere more relevant than in the metropolitan area surrounding CDMX. The Mexican government has municipal-level data to help gain insight on this topic. Analyzing government decisions in this context could enhance further understandings on the drivers of informality and how government actions may propagate further developments.

The purpose of this paper is to analyze how government decisions and the presence of eidos affect the population of IHSs in the Mexico City Metropolitan Area (MCMA). Mexico's land property system consists of ejidos, so reviewing the creation and structure of ejidos is informative in understanding how ejidos fit into the larger issue of informal housing. The paper

goes on to outline the geographic scope of the study, followed by a review of peri-urban spaces, their categorization and development, and what the literature has highlighted as sources of informality thus far. Following is the data analysis detailing the data transformations and model specification process before analyzing the data. Finally, it analyzes the results, discusses the potential impact of government actions and ejidos on the IHS population along with the limitations of the study.

2 Background

2.1 Mexican Land Tenure System History

The historical basis of ejidos originates from *calpulli*, an indigenous communal land tenure structure fostered by the Aztecs (Barnes et al., 2015; Enrique Flores Rodríguez, 2008). As the Spanish began colonizing the Americas, the *encomienda*, and *repartimiento* systems joined large lots of land and gave them to colonizers that eventually transformed into the hacienda system. Before the revolution of 1910, elites sequestered land from indigenous communities, aggravating inequality in the face of a prospering agriculture sector. Land concentration worsened under the Porfirio Diaz regime (1877 to 1910) with 1.5 percent of the population owning 94 percent of the land area (Assies, 2008). Eventually, a revolution broke out from 1910 to 1917 that led to the Constitution of 1917. This constitution recognized ejidos but not the tenure within the ejido: that was explained by the National Agrarian Commission in Circular 51 (Barnes et al., 2015). The *Ley de Patrimonio Familiar Ejidal* (Law of Family Patrimony), passed in 1925, established that land titles given to ejidatarios were inalienable and unencumberable. Ejidos were land grants comprised of communities of 20 or more people and were a combination of communal lots, individual plots, and *solares* (urban lots). After the revolution, México's first land reform began. The regime redistributed land from elites to those without property, creating 32,000 *ejidos* within México, representing 52 percent of the land or 92 million hectacres (Barnes et al., 2015; Binder, 2015; Bonilla-Moheno et al., 2013). Titles to

communal lands were originally given to the leaders of indigenous or peasant groups; these leaders were called ejidatarios (Barnes et al., 2015).

The remainder of the century was dominated by the rise and subsequent fall of the import-substitution-industrialization (ISI) model in México (Beraud Macías et al., 2018). The industrialization of the economy was supported by the agricultural sector and by laws passed in the early 1940s that incentivized if not demanded production on agricultural land. By the end of the decade, legislation was passed to support the overexploitation of natural resources (i.e. aquifers and woodlands). ISI favored the development of urban environments, creating service inequalities and aggravating existing social ones. ISI began to collapse towards the end of the 1970s, and although policies aimed at rural and regional development were created, there still exist disparities between urban and rural areas. In 1973, the regularization of informal settlements on ejidal land became federal policy, and since then to 2018, about 150 thousand hectares have been requisitioned for titling (Varley & Salazar, 2021). In 1992, a poverty crisis emerged in rural areas, exacerbated by the liberalization of national trade policies, and the entrance of competitive prices into agricultural markets.

The passage of the Agrarian Law along with constitutional reform in 1992 ended México's first land reform era. By that point, over half of the rural population lived in ejidos (Binder, 2015). Access to land rights was contingent on productive use of the land which was determined by state-level Mixed Agrarian Commission within each ejido (Binder, 2015). If productivity fell short of these requirements, land was reassigned to those on a waitlist. The following year, the Program for the Certification of Ejido Rights and Titling of Urban Plots (Procede) was implemented with the goal of granting fuller property rights to ejidatarios, beginning the second land reform. Other aims of the program include reducing access barriers to ejidal lands to younger generations; enabling municipalities to buy ejidal land to accommodate urban growth, diminishing incentives to form informal settlements; and

increasing capital investments that bureaucratic processes were seen as stymieing (World Bank, 2001). Agrarian tribunals handled boundary disputes to help accelerate the implementation of land certificates to ejidatarios. Ejidatarios could then sell land to members within their same community. Land certificates allowed title holders to migrate to find job opportunities off their land without losing it, a shift from former productivity standards. The rise of expanded property assets among the population led to a rightward shift in the following congressional elections costing President Salinas's PRI party electoral success, what Binder (2015) says is in line with the "vested interest theory." This resulted in the rise of PAN, eventually winning the presidency. This transformation allowed for improved agricultural productivity because previously there was an overallocation of labor in the agriculture sector, and farmers could not benefit from economies of scales by buying other plots and transforming their agricultural enterprises into bigger operations: this shift allowed agricultural productivity to increase and allowed the poor to reap the benefits of the program as they obtained land tenure and wealth. The land certificate also allows landowners to turn their ejidial land into private land contingent on a two-third approval from voting members within the ejidos in a process called *dominio pleno* (Binder, 2015). Once private property, the land can be sold to non-ejidial members. The reforms that allowed privatization were thought to be the extinction of the ejido system but only a fraction of the ejidos have decided to privatize, with more privatizations being fueled but rising land values in increasingly urban areas with developing infrastructure and attractions (Barnes et al., 2015). By the latter half of 2017, 11.6% of the individual parcel land area had converted to full dominion (Varley & Salazar, 2021). Overall, ejidos have become a source of wealth and security for many agricultural workers and rural residents. The communal aspect of ejidos and their governmental structure emphasize how contingent consensus is within the ejidal regime.

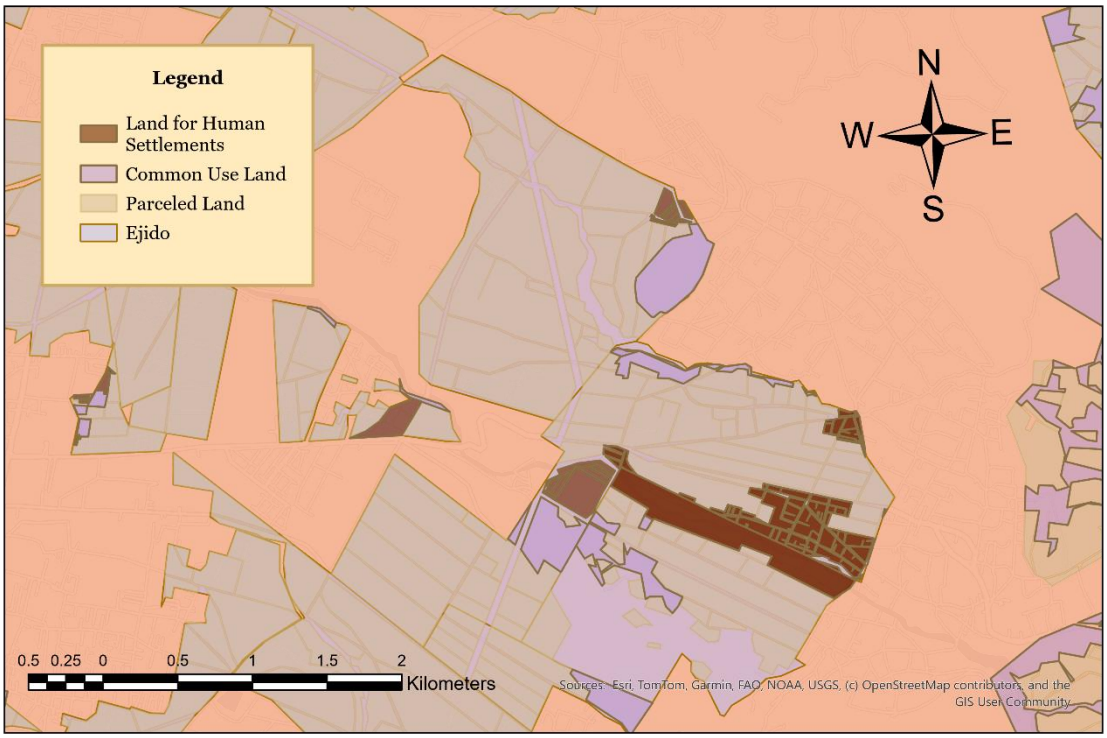
The political structure of each ejido is comprised of the *Asamblea General* (General Assembly), the *Comisariado Ejidal* (Ejidal Council), and the *Consejo de Vigilancia* (Supervisory Council) (Barnes et al., 2015; Binder, 2015). Within the Asamblea General, only ejidatarios have

the ability to vote and approve decisions by majority vote. They are largely responsible for creating and updating regulations, allowing for variation among ejidos. The President, Secretary and Treasurer form the Comisariado Ejidal: the Comisariado keeps a registry of all ejidatarios, sales of usufruct rights, and allows the lease of land although it is not legally permissible. *Consejo de Vigilancia* (Supervisory Council is comprised of two elected members and two secretaries who act as a check on the Comisariado and Asamblea to ensure that the two bodies are fulfilling their obligations and roles in accordance with the law. The National Agrarian Registry (RAN), *Procuraderia Agraria* (Agrarian Attorney's Office), and the Agrarian Tribunal are state-level agencies that work in conjunction with ejidos and support ejido communities with services that are mostly free of charge. RAN helps ejidatarios and familial members with inheritances, issues involving usufruct rights, certificates of registration, titling issues, assembly agreements, and delineation and allotment of ejidal land. The Procuraderia was formed to defend the rights of ejidatarios, small famers, farm workers, and members of ejidos. CORRETT is a state-level agency that is involved in addressing land tenure issues within informal settlements with the aim of securing formal property rights within ejidal communities. CORRETT focuses on urban plots of ejidos, specifically urban zones that are rapidly expanding.

2.2 The Anatomy of an Ejido

Figure 1

Structure of an Ejido



Note. Self-created map using ArcGIS Pro using Mexican governmental geospatial data. From RAN-PHINA. (2024). *2.2.1 Núcleos agrarios en México (2024)*. GeoComunes.

Land tenure within ejidos is divided into individual-use, common-use, and property rights (Barnes et al., 2015; Binder, 2015; Bonilla-Moheno et al., 2013). Agricultural plots are apportioned out for individual-use rights, and ejidatarios are assigned common-use areas. The 1993 Agrarian Law allowed for the creation of urban areas within ejidos for individual plots. This urban area encompasses the urban zone and the *fundo legal* (original village) and has a *reserva de crecimiento* (land for human settlement), an area set aside for future growth. Individual plots can change into private property. Many urban ejidos have an official urban area with their own reserves, although this distinction dissipates as these reserves are unofficially occupied; therefore, certifications often regularize established settlements. Regularized settlements are expansions of established localities. An urban patchwork merges, a composite of

urban zones and ejido land, infilled by informal settlements. Although individual lots within divided areas can receive titles, many do not hold any title (Varley & Salazar, 2021). Ejidatarios also receive housing lots within the urban zones of the ejido. A voluntary land registration process was rolled out free of charge, and about 94 percent of ejidos have been registered. Illicit land markets exist among non-privatized ejidos including leases, sharecropping, and non-ejido members. In certain instances, the General Assembly has allowed these actions to occur. Obtaining plots of land without RAN or the use of certificates continues to occur. Barnes et al. (2015) point to the large number of transactions that happen outside the formal system as a signal that the state is possibly overexerting control within ejido-level markets. Urban zones have also established regulations that incentivize the existence of informal structures. Only ejidos with *parcelas* (holdings) can convert the lots into private ownership, and common-use areas may be subdivided, increasing the land area eligible for privatization (Varley & Salazar, 2021). Ejidos have become an essential aspect in understanding the development of the formal and informal periphery. The processes and politics of ejidos allow for the informal development of housing, complicating government initiatives and policies aimed at combating IHSs.

2.3 Environmental and Administrative Geography of the MCMA

The Mexico City Metropolitan Area is nested within the Valley of México. Mexico City itself was built on top of Tenochtitlan, the former capital of the Aztec empire that was formed on a man-made island in Lake Texcoco. The lake was eventually drained by the Spanish in planning the construction of the new city. The Valley of México is created by the confluence of the Sierra Madre Mountains. The MCMA is bordered on the southwest by the Parque Nacional Cumbres del Ajusco, to the south by El Tepozteco, and to the west by the Parque Nacional Iztaccíhuatl-Popocatépetl. The parks are all mountainous and form a natural barrier to urban expansion. There is more room for growth towards the northern half of the MCMA, in the State of México. The MCMA encompasses 75 municipalities and boroughs from the State of México and México

City. There are other cities within the region that have their own metropolitan areas that abut the MCMA including Toluca and Puebla.

Figure 2

Administrative Boundaries of the Study Area



Note. Self-created map using ArcGIS Pro using Mexican governmental geospatial data. From INEGI. (2025). *Marco Geoestadístico 2025*. Instituto Nacional de Estadística y Geografía. https://www.inegi.org.mx/app/biblioteca/ficha.html?upc=794551163061

3 Literature Review

Research describing peripheral areas has touched on their land-use transitions, subsequent categorization, sources of their urbanization. These types of analyzes offer insight into the mechanisms at work behind moves toward the development of the periphery of the MCMA into an ever-changing environment. More pointedly, it can reveal motivations surrounding the movement of individuals into IHSs and reveal gaps in the current

understanding about the incentives of moving to peripheral areas. Additionally, the literature reveals much via qualitative analysis by review policy attempts and the involvement of ejidos in the housing process to highlight deficits in the urbanization process.

3.1 Peripheral Categorization

Peripheral categorization has been helpful in attempting to identify the different land uses that describe peripheral development patterns. Aguilar et al. (2022) dissects peripheries into *modern peripheries, green peripheries,* and *informal poor peripheries*. The *modern periphery* is characterized by intentional investment into peri-urban sub-centers with higher global connectivity, diversified local economies, and highly skilled workers. These hubs for development become centers for the exchange and accumulation of goods and services (Coq-Huelva & Asián-Chaves, 2019). The *green periphery* are sections of the peri-urban that are of high ecological importance, are nature conservation areas, and serve as environmental assets. The *informal poor periphery* stems from the state's inability to produce an adequate housing supply, shifting the responsibility onto local governments who often regularize land, further encouraging informal housing (Smolka & Larangeira, 2008). Cruz-Bello et al. (2023) categorized urban areas into urban, rural, and peri-urban areas from 2005 and measured their land use change periodically until 2014. There were increases in urban land use among urban, peri-urban, and rural areas, with urban areas and peri-urban areas gaining 21 percent and 19 percent urban land coverage, respectively. Between 2005 and 2014, 90 percent of urban development was concentrated in infill expansion. Average urban expansion development among AGEBs was more prevalent in peripheral zones of the MCMA, and average urban infill development was prevalent among peripheral urban AGEBs. Urban, peripheral, and rural zones differ significantly in their urban developmental expansion, with urban expansion being significantly different from peripheral and rural expansion. Varley & Salazar (2021) found that certified MCMA ejidos with urban zones saw 45 percent of individual parcels privatized

compared to 33 percent without urban zones. There have also been governmental efforts to compartmentalize the periphery according to governmental policy objectives. The General Program for Ecological Management in the Federal District (*Programa General de Ordenamiento Ecológico del Distrito Federal* 2000-2003) main objective was to establish land uses within the rural areas of the Federal District (DOF, 2012). The program outlines six types of land uses within the conservation zone: Forest for Conservation, Forest under Protection, Agroforestry, Agroecology, Protected Natural Areas, and Rural Towns and Villages. These three schemes for categorizing the peripheries hint the consequence of fragmented land use when attempting to understand peripheral development. They are each focused on different aspects of the issue and highlight different objects of analysis.

Categorization efforts are relevant when studying the rise of the informal periphery, where development can defy or construe categorization. Rural farmland (sometimes ejidos) exists in the same areas where conservation efforts are occurring; meanwhile, fringe developments, modern and poor alike, grow and raise the cost of living for the poor. Urban peripheries offer increased opportunities to cheaper land, labor, and other services compared to urban centers. Housing solutions found by the urban poor involve illegally occupying land, regardless of access to public services. The environmental nature and importance of peripheral spaces intersect with the infrastructure needs for informal and poor settlements to create complex planning processes due to the mixed land use of the area. The urbanization process becomes an interplay between social dynamics and the territorial context that negatively affects vulnerable social groups, while advantaging others (Heynen et al., 2006). The disjuncted tapestry of land uses accumulates to demonstrate a lack of cohesive policy towards planning the peripheral areas of urban metropolitan areas. This has led scholars to analyze the vegetation that arises out of an expanding, semi-planned periphery.

3.2 Vegetation Change in México

Scholars have pointed to forest renewal or expansion that has been occurring in the developed world to explain periphery land use transitions (Mather, 1992). The forest-area transition temporally varies across countries, with countries with centralized governments realizing a slow forest expansion. The needs of advanced economies have been changing, slowing the need for resources collected from forested areas, specifically the diminishing land need from the agricultural sector. Concurrently, the value of forests as an environmental and urban resource has increased. The transition from forest deforestation to forest renewal generally cannot occur until population growth rates have slowed and stabilized, but forests could be lost if that does not occur fast enough. Across México, biome recovery has varied, but coniferous forests have shown great strides in recouping growth (Bonilla-Moheno et al., 2013). From 2001 to 2010, municipalities seen as predominantly communal have seen the largest increase in woodland landcover. Bonilla-Moheno et al. (2013) studied biome recovery across four biomes, moist forest, dry forest, coniferous forest, and deserts, and found statistically significant woody vegetation increases (reforestation) among municipalities with large plots of communal and private lands in the moist forest environment and decreases in vegetation (deforestation) in municipalities with largely ejidal lands. Reforestation occurred in the dry and coniferous forest biomes across all municipality types. In desert biomes, private municipalities experienced reforestation while ejido municipalities saw deforestation. Agricultural and herbaceous land cover declined across all categories, but there were increases in these vegetation types in moist forest and desert ejidal municipalities possibly due to agricultural or pasturage. Bonilla-Moheno et al. (2013) found little explanatory power concerning woody vegetation changes in their models; however, they found that vegetation changes in communal and private settings were influenced by elevation and topographic factors, while ejidal changes were driven by population density and population change. They highlight that communal-land and private-land dominated municipalities shared similar vegetation changes; a possibly

unexpected result considering communal and ejidal lands are common-pool systems while private lands rely on individual ownership. Communal municipalities seem adept at limiting deforestation and facilitating reforestation, which seems to stem from higher levels of social commonality between members and enforceable rules. This research also highlights how ejidos are unique in affecting land use changes, particularly those influenced by population changes.

There has also been researched that has shown increased in vegetation expansion due to economic shifts in job sectors. Lorenzen et al. (2020) found that woodlands in the Mixteca Alta region experienced perceived growth in the last three decades: these observations were based on participant observation. In Mixteca Alta, farmland decreased, although it was still the largest land use; forest cover increased significantly; and grassland increased in 2007 before decreasing slightly by 2014. Employment within the study area population shifted towards non-agricultural occupations. The ebbs and flows of population and occupation changes were influenced by shifts in international policy: job diversification and advanced agricultural technologies also influenced these sectors. The economic development path to the forest transition path is influenced by the convergence of technological advancements, decrease in livestock, consumption changed in building materials and fuel sources, and a decline in farm workers. Forest scarcity path to forest transition is linked to the creation of ecological preservation and expansion by the government and non-governmental organizations as well as the establishment of local grazing and forestry regulations. Within the Mixteca Alta area, woodland expansion was associated with natural growth and supplemented by human initiatives towards reforestation. Human forestation targeted eroded areas stemming from agricultural activities. Overall, the reforestation of the Mixteca Alta region began with forest growth on grassland and farmland. Migration to urban centers and the diversification of occupations in rural settings led to the underutilization of land, causing the forest to retake it. Environmental and aesthetic reasons have also fueled forest expansion, but forest expansion is largely due to natural factors.

The local prevalence of differing land tenure regimes and a shift away from agricultural production towards urban manufacturing jobs were both indicators of vegetation within México. In the Lorenzen et al. (2020) piece, there was coordination between actors towards forest restoration, although policy coordination in peripheral areas is consistent. Additionally, the prevalence of ejidos within municipalities seems to be an indicator of the decrease of vegetation and an increase in population.

3.3 Fragmented Governance

The confluence of environmental and urban planning has been studied in other urban centers, including the Metropolitan Zone of Queretaro (Soria et al., 2020). The paper highlights the lack of vertical governmental alignment of goals and capabilities. There also exists fragmented policy coordination across land-use zoning, urban development, and environmental conservation, with the aforementioned policy circles failing to include each other in their policy construction process. Private actors dominate the land-use process in the MZQ because of the wealth of resources that companies have at their disposal that deal with the different aspects of the planning process. Siloed land use decisions become very impactful as private actors leverage these settings to build on low-cost land in the urban peripheries. These changes adversely affecting the environment stem from deficits in diverse policy goals, lack of policy collaboration horizontally or vertically, and deficits stemming from the land-use change process.

3.4 Social Stratification in Mexican Metropolitan Areas

As policies have affected informal developments, leading to changes in vegetation patterns, social influences have also played a role in the formation of the peri-urban periphery. From 1990 to 2010, segregation generally increased across 100 cities in México (Monkkonen et al., 2018). Urban area growth has been seen as significantly correlated with increased segregation, and self-segregation of high-income households is a leading force behind cumulative segregation. Cities increased their land area through centralized expansion saw

increases in socioeconomic segregation through the self-segregation of high-income households. As cities become centralized, the scale of segregation increases and neighborhood homogeneity increases. Historically, middle-to-high income urban areas are becoming more homogenous, moving low-income residents towards the periphery. Education is not necessarily associated with segregation in the same manner and magnitude that income is. More compact cities saw small pockets of segregation of low-education individuals. Urban area expansion and segregation was fueled by low-education segregation, however; urban expansion decreases the scale of segregation.

3.5 Conservation and Land Changes in the MCMA

Many people settling in the periphery of the MCMA are low-income and reside in IHSs (Aguilar, 2008). The land is often not zoned or suitable for urban development and is reflective of the urgent need for public services and infrastructure for the urban vulnerable. The development of housing in the MCMA is caused by a dysfunctional housing construction system, which pushes people from urban areas into the periphery, including environmentally significant areas.

As mentioned above, there have been significant efforts to certify ejidos across México. Since 2018, 87% of the 377 ejidos in the MCMA have taken up certification (Varley & Salazar, 2021). There have also been attempts to increase the housing stock through the development on ejidal land. *Sociedad mercantile inmobiliaria* are joint ventures between ejidos and investors that were supposed to incentivize housing, although ejidatarios have not seen the benefits of this policy approach. There have also been cases of ejidatarios losing their plots because the agricultural valuation of their plots results in a lower appreciation compared to the investments made by developers (Jones & Pisa, 2000). The construction of development across parcels seems to be influenced by privatization, proximity to urban zones, and individualized parcels. 58 percent of agrarian properties and 26 percent of certified urban zones in the developed peri-

urban fringe of the MCMA were once parcels (Varley & Salazar, 2021). A full range of housing options, catering to different socioeconomic levels, have been found on ejido land within the MCMA. Investors have come to ejidal neighborhoods paying large sums for privatized parcels before selling to developers for even larger sums. Privatized parcels for housing have been ripe sites for investing and developing, signaling that the community has settled on a deal with investors. Developers looking to construct on ejido land may have to confront a tapestry of privatized and non-privatized parcels held by individuals to complete a project. Social housing seems to solicit the expansion of informal settlements in ejidal environments (Connolly, 2019). Conjuntos on ejido land incentivize informal developments. Informal developments are three times larger than formal urbanization on ejido land. Viewing development through a corporatist lens demystifies the preference of private developers for private land and the persistent development of informal housing. The construction of low-income developments in peripheral areas showcases the ability of housing initiatives financed through government-backed mortgage programs to fill gaps in the housing stock (Janoschka & Salinas Arreortua, 2017). Housing policies that focus on one stage of the housing process can fail to foster urban communities because the development of a peripheral housing supply requires the coordination of multi-level housing policies and decentralized economic development. Conflict between federal policy and local planning policy fight against each other and fail to produce a cohesive landscape, resulting in an unorganized urban patchwork (Janoschka & Salinas Arreortua, 2017). The focus of housing policies that cater to higher-income residents increases the cost of living in central urban areas, pushing lower-income residents to peripheral regions to the North and East of the MCMA. The dispersion of residents to the outer edges of the MCMA increases the rate of urbanization is higher than the rate of population growth, leading to a reduction in urban density and more dispersed cities (Angel, 2012).

People have migrated to areas of the periphery where the environmental and urban areas converge. Illegal encroachment into conservation land (SC) has resulted in ecologically

significant land being lost. IHSs also causes soil and aquifer pollution because of a lack of sanitary services. The SC has been considered over regulated (Aguilar & Santos, 2011), leading to miscoordination and disconnection among government agencies and weakening government effectiveness in executing land-use policy. Urban and environmental zoning are two areas in which these salient incongruences make effective planning for both settings extremely hard in the periphery. The SC has become a land area where the urban poor form IHSs and where government policy has fallen short of redensifying the current urban areas of the city. There do exist peri-urban settlements with the necessary infrastructure, but those settlements exist for middle- and low-income workers in the formal sector. Currently, properties on IHSs are part of ejidal and communal land (Aguilar & Santos, 2011). Land consumption has held constant along the urban periphery as traditional and irregular settlements have become denser, emerging as fragmented urban areas and separate from the urban core. The preference for development has been geared towards flatter land and access to drainage and transportation (Martínez-Jiménez et al., 2017). The expansion of informal developments in agricultural and environmental settings has led municipal governments to find solutions to solve the expansion of IHSs.

3.6 Land Regularization in the MCMA

Land regularization has been a common strategy for converting informal settlements to formal settlements whose residents have land titles. Governments often tolerate informal settlements, turning to land tenure regularization as a solution to informal housing. This has led to increases in land prices and inconsistency in land occupation (Aguilar & Santos, 2011). Land regularization often involves having the informal occupants pay for the title and the acquisition of the land from its original owners, although the exact process with vary depending on the state and federal agencies involved. The longer regularization proceedings have been ongoing, the greater the portion of plots that have begun and completed the regularization process (Monkkonen, 2012). The further away lots are from the city, the more likely they are to be

contracted. Houses that were larger and more solidly constructed were significant predictors of having a title. Household education was the single household characteristic that was significant in its interaction with full title, as educated households report higher house values. Households with more education see more value in obtaining and holding a deed, specifically those in houses that were recently constructed. Cities with larger proportions of people with college degrees, electoral competition, and civic engagement significantly influence the value of having a title. Many of these influencing factors are better understood in a political context where civically engaged voters can use their influence at the ballot box. These political pressures influence the construction and regularization of informal settlements.

3.7 Political Reluctance Towards Informal Settlements

Informal urbanization and illicit land sales have been tolerated in the MCMA by municipal governments because illicit sales offer an unsanctioned solution for the lack of sufficient housing supply in the formal market. Other avenues such as eviction or reloction would still have to contend with a housing shortage, perpetuating the problem without a sustainable housing solution. Ejidos and communal properties have become prominent targets for the illegal sale and division of land since stemming from past regularization of land as an incentive to continue illegal land sales. Clientelistic relationships between local politicians and communities have halted the advancement of urban sustainability, perpetuating informal, illegal expansion within the SC that eventually transforms into formal occupation. Historically, housing production has been influenced by corporatism via public financial housing agencies issuing mortgages to politically affiliated unions for properties constructed by union-affiliated companies (Varley & Salazar, 2021). Land expropriation was leveraged by the government to assign land titles to residents who acquired land via extralegal ejido land sales, although it had not been used in recent decades because of ejidatario opposition (Varley, 1985). The urban complexities of creating sufficient housing to curtail informal developments paired with

difficulties developing on ejidal land create incentives for governments to turn to solutions that require lower financial and political costs, although policies to stop the construction of IHSs have been implemented.

3.8 Efforts to Stop Informal Settlements

For decades, there have bene efforts to curb the construction of new settlements and stop the expansion of existing ones. The Tlalpan Delegation devised a policy in which they analyzed all IHSs within the delegation's territory the ecological value the settlement was residing on, feasibility of incorporation within the urban landscape, and legal tenure issues that rose within the lot. The IHSs were either part of a Territorial Management Model for those who were allowed to stay in their settlement and were committed to curb construction and mitigate environmental damage, or they were Proposed for Relocation, where they were relocated to an alternative location (Aguilar & Santos, 2011). Although communication with communities improved, construction and extralegal sale of lots persisted; authorities were unable to halt construction. The emerging plots came from "socially owned" agricultural land that was being underutilized and were attractive to buyers priced out of the formal market (Aguilar & Santos, 2011). To evict people from informal settlements, local governments must complete a 7-month process that falls behind the rate of areas experiencing construction or redensification. Municipalities often turn to land regularization because previous methods are not effective solutions for controlling settlements. A combination of financial constraints, political costs, and bureaucratic red tape make evicting inhabitants of informal developments a difficult task and makes other avenues to solve informal development more appealing.

Municipal governments have often turned to eviction, relocation, regularization, and municipalization as ways to formalize and tackle the expansion of informal settlements in the urban periphery. Environmental factors, like ecologically salient areas and ejidos, complicate policies aimed at tackling IHSs as municipalities then have to confront a whole array of actors

that may slow down or obstruct policies. Analyzing actions taken by municipalities will highlight the impact that governmental action have on the population of informal developments.

4 Methodology

The development and growth of urban populations has required the use of nationally collected data from the Instituto Nacional de Estadística y Geografía (National Institute of Statistics and Geography, INEGI). To gather information on other factors that related to the impact of ejido and public services on the expansion and growth of informal settlements, data was obtained from the Comisión Nacional del Agua (National Water Commission, CONAGUA) and from the Padrón e Historial de Núcleos Agrarios (Registry and History of Agrarian Nuclei, PHINA), an information repository housed within the Registro Agrario Nacional (National Agrarian Registry, RAN) that I will now reference by RAN-PHINA. Combined, these institutions house the information necessary for analyzing how public services and ejidos affect informal settlements.

4.1 INGEI Data Limitations and the Censo Nacional de Gobiernos Municipales y Demarcaciones Territoriales de la Ciudad de México

Surveys conducted by INEGI vary by time and topic, so gathering yearly data on urban phenomena is often not possible. Additionally, INEGI has created geographic area units called Áreas Geoestadísticas Básicas (AGEB) that offer granular data and are smaller than municipal units. These units offer a profound level of insight into geographic phenomena occurring in México but were avoided because of several limitations. First, AGEB data is not consistently available within the INGEI census database nor for the survey that collected information on informal settlements. This limited the granularity of data that was available to conduct analysis on a smaller, more-detailed level. Additionally, AGEB data was available for certain years within surveys and not others, limiting the usefulness of the geographic area unit. The sparse nature of

the granular data meant that finding AGEB data on other government websites and databases was unlikely. Municipal-level data was often more widely available across census years.

INEGI conducted a biannual survey called the Censo Nacional de Gobiernos Municipales y Demarcaciones Territoriales de Ciudad de México (National Census of Municipal Governments and Territorial Demarcations of Mexico City, CNGMD). The CNGMD is conducted on even-numbered years, and it has publicly available data that dates back to 2010. The CNGMD touches on the topics of municipal governance, public administration, public security, civil protection, civil justice, and public utilities. The census structure and construction vary with the most recent census having a different structure than the previous iterations. Additionally, the number of topics covered by the census varies by year. The data collection method consists of sending out questionnaires that, once completed, become validated twice before revision and receiving approval of completion. Data on *asentamientos humanos irregulars* (irregular human settlements) has been collected for the last five iterations of the CNGMD under the *Planeación y gestion territorial* section of the census (INEGI, 2017, 2019, 2021, 2023, 2025).

Data used in the analysis included information related to the informal population, government actions, and services provided to informal developments. Municipalities reported the informal population, the amount of area that the informal population covered in terms of hectares, and the number of informal lots; however, the informal population was chosen as the dependent variable of analysis. The government actions that were recorded in the data were relocation, regularization, eviction, and municipalization; measured in manzanas and polygons. The services provided through municipalization included the installation of public lighting, the construction of sidewalks, the installation of drainage systems, access to water, and the paving of roadways, measured in polygons. The size of the area was not specified, so a conservative approach was taken to their interpretation. Each polygon was to be interpreted as an instance of that action occurring (i.e. three polygons of eviction would mean three instances of eviction

occurring) without referencing the size or scope of that instance. This ensured that the variable was not used to exaggerate the effect of an action towards the informal population.

4.2 Ejidal Data from GeoComunes and RAN-PHINA

Data on ejidos is kept and maintained by RAN-PHINA on their website hosted by the national Mexican government. They store ejidal data separate from INEGI although INEGI does maintain some ejidal data within certain agricultural censuses that the organization has conducted in the past. Limitations arose when accessing data concerning Ejidos. Mexican state and national websites linked to open data were inactive, although they were perceived to be active websites, limiting downloads of data that contained historical data. This limitation was able to be partially overcome because the Geografía Colaborativa en Defensa de los Bienes Comunes (Geographic Collaborative in the Defense of the Common Good, GeoComunes) published ejido data from RAN-PHINA. Ejido data from the GeoComunes only contains the most recent year of data, so data pulled from this file was focused on extracting variables that showed littile to no movement (RAN-PHINA, 2024).

4.3 Data Reorganization and Transformation

Data that was collected from two separate governmental agencies over 16 files were merged into a single table. The files were loaded into DB Browser which is an SQL program that uses SQLite. A summarized version of the master code will be available in APPENDIX A. Tables were created to extract necessary data into a more concise and restricted format. Null observations for municipalities for missing municipalities were created to allow the data to merge more smoothly. Yearly data was entered for observations since it was missing. For the first four observational years of the CNGMD, new variables had to be created for actions taken by municipalities toward IHSs and for possible public services provided to IHSs. Meaning that CNGMD years for 2016, 2018, 2020, and 2022 store actions taken by municipalities towards IHSs (e.g. relocation, eviction, etc) as a single variable whereas CNGMD 2024 store that data as

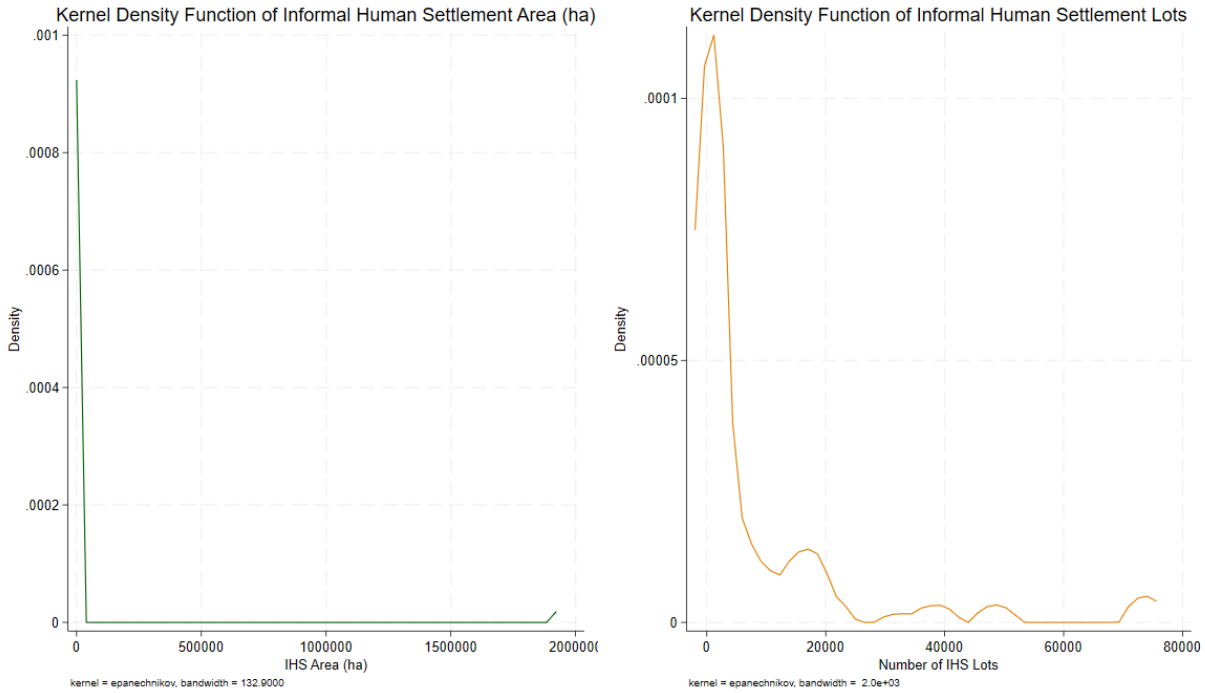
four separate variables, so the first four years of data were converted into the format of the most recent year of data. Data points from the original sources were merged together by municipality and action type since the tables had them as separate observations. Many municipalities had many observations by year to account for the original construction of the variable. The same process was done to the public services rendered. Missing data in the instances where municipalities did have statistics on IHSs but not figures for actions taken by municipalities towards IHSs or services provided to them were assumed to be zero. This assumption was made because there is only the choice of taking action or not towards IHSs, leading to the conclusion that most municipalities would report actions taken towards IHSs if they had decided to act. Ejidal data on the surface area for the whole ejido, the common-use area, the reserve settlement area, and the parceled land area, measured in hectares, were aggregated by municipality and appended to the dataset. Data on the square kilometers of each municipality was obtained from a geopackage file from the selection of municipalities selected in the study (see Figure 2). Additionally, the table data was originally exported as an excel from a shapefile and was then converted into a comma delimited (CSV) file before importing the file into another program. The result was a single table that contained data from all sources of information. This data was then exported as a CSV file into Stata.

Stata was used for creating additional variables that required mathematical transformation of existing variables, generating temporal and geographic dummy variables, and conducting statistical analysis. A summary of the Stata code will be provided in APPENDIX B. There were many large differences across municipalities in terms of area, IHSs, the population of IHSs, number of IHS lots, and quantity of IHS in hectares (ha). All data that was measured in non-polygon units were transformed into the natural log version of their original variable, including the dependent variable, variables measured in manzanas, and variables measured in hectares. These variables were used in the analysis because their distribution was closer to a normal distribution.

4.4 Data Considerations and Model Specification

Figure 3

Kernal Density Graphs of Dependent Variables



Note. Self-created graphs using Stata/SE 18.0 using CNGMD census data. From INEGI. (2017, 2019, 2021, 2023, 2025). *Censo Nacional de Gobiernos Municipales y Demarcaciones Territoriales de la Ciudad de México*. Instituto Nacional de Estadística y Geografía.

When specifying a model to conduct data analysis, it was important to the construction of the data. This data was randomly selected as the MCMA is predefined, the observation were temporally related since the study relies on time series panel data, and observations that lacked data on the informal population were dropped from the dataset, so a linear regression model was not able to be leveraged in this scenario. In the time series dataset, some municipalities only have one year of observation in some of the submodels. This stems from the fact that there are inconsistencies in reporting the data. Some municipalities may report data for the number of IHS lots or IHS coverage in hectares, then follow by reporting an informal population of zero if not missing. These two numbers or realities cannot be reconciled and limit the use of

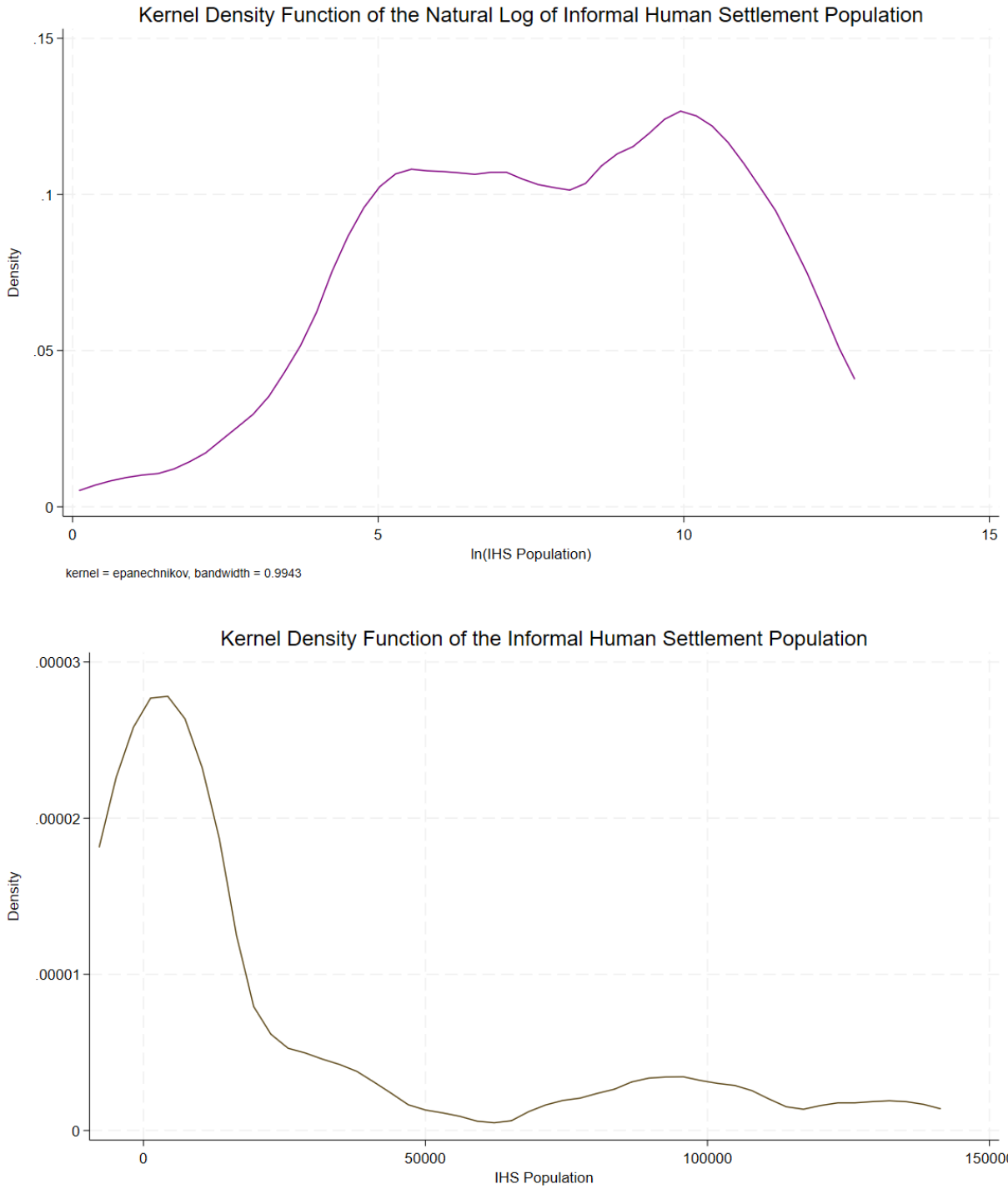
observation. Additionally, there may be gaps in observation where municipalities report their statistics in some years but fail to do so in others, resulting in an incomplete picture of the data.

Some variables were constructed in a way that naturally gave the variable data asymmetric distributions. There are many variables based on the number of polygons affected by decisions, separated by action. For example, municipalities could begin serving informal populations with drainage. If that municipality chose not to serve any household or area, then the result would be zero. Since most municipalities are not providing services (i.e. laying down pavement, installing streetlights, creating sidewalks, providing water services, or connecting an area to the drainage network), they put down zero "polygons" or instances of services provided. This creates a large number of zeros in the sample, which cannot be corrected by transforming the value logarithmically, so when choose a model to run regression, it was important to choose a model that was able to properly weight many instances of zeros. A similar issue occurs with dependent variables related to informal populations (i.e. IHS lots, IHS population, IHS area in hectares). Figure 3 shows how there were a large number of small values while there we a varying number of other values, skewing the distribution. Their distributions were skewed but were able to be smoothed through the logarithmic transformation of the variables. Figure 3 shows the transformation of a variable to its logarithmic form moves.

Given these data constraints, the decision was made to use a mixed-effects model. The `mixed` Stata package uses a multilevel mixed-effects model to create estimates, with random-effects and fixed-effect options. It also allows the data to be fitted via restricted maximum likelihood which is shown to be preferred when using fixed-effects with small sample sizes (Kenward & Roger, 1997). These models have also performed adequately when approximating test statistics with small sample sizes (Schaalje et al., 2002). This mixed-effects model was optimal for considering the many limitations that the data imposed.

Figure 4

Kernal Density Graphs of Dependent Variables



Note. Self-created graphs using Stata/SE 18.0 using CNGMD census data. From INEGI. (2017, 2019, 2021, 2023, 2025). *Censo Nacional de Gobiernos Municipales y Demarcaciones Territoriales de la Ciudad de México*. Instituto Nacional de Estadística y Geografía.

5 Results

There are seven models that were run with observations and grouped at the municipal level. The log of IHS population was regressed against the log of municipal actions against IHSs in terms of manzanas or polygons, a state dummy variable where state two is the state of Mexico, services extended to IHSs, the log of the square area of each municipality, and the log of the square surface of ejidal area. In models (2) (6), and (7), the log of eviction manzanas has a statistically negative impact (-0.526 percent, -0.553 percent, -0.532 percent in IHS population per percent increase in manzana, respectively) at the five percent significance level on the informal population. This can be expected as evictions will decrease the population of IHSs. This effect is not apparent when controlling the polygon version of eviction. Titling in terms of manzanas is only slightly significant in model (7) and increases the population of IHS by about a quarter of a percent for every percent increase in titling. Controlling for the state the municipality is in reflects the biggest and most consistent influence on the log of the IHS population. The State dummy variable is statistically significant in five of the seven models run. It is apparent to note that no services or municipalization, which is the provision of any public service, was significant. Public services seemed to have the largest impact on the model although they were not statistically significant. Ejidal land, whether is the composite (ln(spg)) or the different areas within ejidos (ln(GASP), ln(GASRC), ln(GASEC)), seem to have no impact on the population percentage of IHS population.

6 Discussion

A significant finding of this study was the lack of impact that regularization had on IHS population. The literature seems to suggest that regularization of IHSs is the solution to the problem of informality, but this study suggests that the impact on informality is limited. The titling coefficient is positive but small, point to the idea that people may occupy land with the

expectation that it may one day become regularized. A majority of IHS inhabitants may also not see

Another point of inspection is the lack of significant coefficients when it comes to service provision. Martínez-Jiménez et al. (2017) has indicated that drainage if often sought after when developing settlements, yet the study did not necessarily confirm that result. One reason for this divergence may be the format of the data. Other literature confirms that services public and private are in mind when development decisions are made. Most people in Mexico City rely on *colectivos*, private minibus or minivan transportation companies, to commute to work (Guerra, 2014). When Metro B was first launched, it ran through Ecatepec from México City. The rise of Metro B line coincided with a decrease in colectivo usage, including in Ecatepec to a significantly significant extent. Line B has increased the share of people living around metro stations by about five times, in line with population density changes among other metro stations. Line B's land-use influence was most prominent in northeast housing patterns and in central commercial districts. Mean household income decreased near Line B relative to the rest of the municipality. There could be local alternatives to many of the public services offered by informal vendors or the private sector, so a switch to publicly rendered services is a cheaper substitute rather than an incentive to move there.

Municipalization was also not significant when it was measured in log manzanas. This could reflect that services generally are not sought after by people who live in IHSs. Rather, there are salient provisions that take preference over services that are viewed as less pressing. Finally, the dummy for Mexican states was the only variable that was significant in a majority of the models. This is in line with the research broadly since the peripheral areas of the MCMA are in the State of Mexico.

Table 1

Regression Model Output

	(1) Model_(1	(2) Model_(2	(3) Model_(3	(4) Model_(4	(5) Model_(5	(6) Model_(6	(7) Model_(7
ln(Relocation) Manzanas	-.156	-.182		-.132	-.139	-.164	-.15
	(.511)	(.404)		(.52)	(.511)	(.41)	(.384)
ln(Titling) Manzanas	.149	.213		.138	.13	.235	.242*
	(.125)	(.141)		(.132)	(.127)	(.155)	(.143)
ln(Eviction) Manzanas	-.388	-.526**		-.382	-.356	-.553**	-.532**
	(.295)	(.257)		(.3)	(.298)	(.264)	(.246)
ln(Municipalization) Manzanas	-.012			-.02	-.03		
	(.261)			(.264)	(.262)		
1bn.State							
State of Mexico	1.893**	2.134**	1.697	1.812*	1.557	2.338**	2.22**
	(.955)	(1.003)	(1.684)	(1.057)	(1.02)	(1.162)	(1.074)
ln(sqkm)	.473	.498	.389	.48	.444	.554	.552
	(.455)	(.464)	(.572)	(.471)	(.456)	(.485)	(.437)
Public Lighting		.097	-2.635			.104	.083
		(.119)	(1.975)			(.123)	(.116)
Water Access		-.126	-.153			-.156	-.143
		(.191)	(.269)			(.207)	(.191)
Drainage		.189	.775			.218	.201
		(.31)	(1.437)			(.318)	(.297)
Sidewalks		-.485	-28.204			-.516	-.471
		(.316)	(20.387)			(.327)	(.311)
Pavement		.325	30.097			.35	.329
		(.321)	(21.204)			(.329)	(.309)
Relocation Instances			-.592				
			(1.123)				
Titling Instances			-.014				
			(.048)				
Eviction Instances			-.142				
			(.349)				
Municipalization Instances			.264				
			(.275)				

ln(GASP)				-.044		.06	.139
				(.178)		(.195)	(.216)
ln(GASRC)				-.151		-.249	-.286
				(.471)		(.488)	(.443)
ln(GASEC)							
ln(spg)					-.272		-.226
					(.287)		(.362)
_cons	5.212**	5**	5.438**	5.474**	7.078**	4.474*	5.487*
	(2.092)	(2.131)	(2.645)	(2.466)	(2.874)	(2.622)	(2.892)
lns1_1_1:_cons	.745***	.765***	.815***	.773***	.747***	.789***	.675***
	(.151)	(.153)	(.242)	(.154)	(.153)	(.156)	(.15)
lnsig_e:_cons	.322***	.322***	.522**	.323***	.322***	.325***	.264**
	(.111)	(.114)	(.244)	(.111)	(.111)	(.115)	(.109)
Observations	89	89	48	89	89	89	89
Pseudo R^2	.z	.z	.z	.z	.z	.z	.z

Standard errors are in parentheses
**** p<.01, ** p<.05, * p<.1*

Note. Regression models using Stata/SE 18.0 using CNGMD census data. From INEGI. (2017, 2019, 2021, 2023, 2025). *Censo Nacional de Gobiernos Municipales y Demarcaciones Territoriales de la Ciudad de México*. Instituto Nacional de Estadística y Geografía.

7 Limitations

The lack of extensive data was a strong limiting factor in analyzing the impact of ejidos and services on IHS populations. Many of the variables were measures in polygons; although that can be informative in certain ways, polygon-measured variables do not reflect the size area of the impact or the portion of IHS lots, hectares, or people that are affected, possibly muting the effect of service provision. Additionally other covariates that could be insightful to the changes in IHS populations are housed in other surveys that occur at different intervals that he CNGMD. The lack of access to AGEB data is also limiting since it forces the use of larger unit sizes.

Another barrier in studying peri-urbanization and IHSs in the MCMA is access to data. There are many websites that are supposed to be available and house temporal data that is simply inaccessible. Website links to not work, or if they do, their performance can be inconsistent.

8 Conclusion

As the peripheral areas of the MCMA expand, IHSs are becoming more prevalent. The state of Mexico, which surrounds the northern half of Mexico City, is now at the center for dealing with the growing expanse of the informal population. Future studies should begin looking more granularly at the effects of service provision within the state. Additionally, the state of Mexico has larger quantities of ejidos, which makes it a prime area for informal development.

Eviction of people from informal settlements may also be a tactic that becomes increasingly relevant but may be limited by diverging policies on different government levels. A unified government response and policy coordination across government levels may make eviction easier for municipalities, especially those near or containing ecologically sensitive areas. Eviction has not be a prevalent action taken by municipalities as show in the literature, possibly

reflecting a high financial and political cost faced by pursuing this option. The impact of public services on the prevalence of IHSs should not be overstated. Although certain services may be sought after, these services will not be the deciding factor for most people in informal settlements, especially if they can obtain those services through the private market.

The size of ejidos nor the areas that make them up may not have the impact on informal populations as seen in the literature. This could be in part due to the lack of information regarding ejidal populations, ejidatarios, ejidal workers, and information on government bodies that was not available. These factors, not necessarily the amount of land available within ejidos may be more impactful in determining IHS populations. Overall, the development of the MCMA will have to hold the provision of services and prevalence of ejidos all within the state of Mexico as relevant factors as they contend with development of informal settlements and the population that they hold.

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Appendix A – SQLite Code

```
/* //// Master Code //// */
/* /// Ejidal Code /// */
CREATE TABLE Ejido_FE
	(ubicageo numeric,
	Sup_Plano_ha numeric,
	SGA_ha numeric,
	GASP numeric,
	GASRC numeric,
	GASEC numeric,
	ST_ha numeric,
	Sup_Actual numeric,
	SPG numeric,
	SAP numeric);
INSERT INTO Ejido_FE (
	ubicageo,
	Sup_Plano_ha,
	SGA_ha,
	GASP,
	GASRC,
	GASEC,
	ST_ha,
	Sup_Actual,
	SPG,
	SAP)
SELECT
	cve_geomun,
	CER_Sup_PI,
	CER_Sup_GA,
	GA_Sup_PA,
	GA_Sup_RE,
	GA_Sup_EX,
	GA_Sup_UC,
	TOT_Sup_Ac,
	TOT_Sup_PG,
	TOT_Sup_PA
FROM NAP2024
GROUP BY cve_geomun;

/* /// Municipality Area Code /// */
CREATE TABLE municipality_area
	(area_km real,
	ubicageo integer);
INSERT INTO
	municipality_area as m1
	(area_km,
	ubicageo)
SELECT
	area_sqkm,
	adm2_name
FROM Municipality_area_xls as m2;
INSERT INTO municipality_area (ubicageo)
SELECT CVEGEO
FROM y24_cngmd_gest_terr_2_14_14 as e
WHERE NOT EXISTS
	(SELECT ubicageo FROM
municipality_area as m WHERE m.ubicageo =
e.CVEGEO);

/* /// Year Code /// */
UPDATE y16_acat_ahi AS acat
SET Year = 2016;
UPDATE y16_ahi_serv AS serv
SET Year = 2016;
UPDATE y16_as_hu_ir
SET Year = 2016;
UPDATE y18_airr_acc_cngmd AS acc
SET Year = 2018;
UPDATE y18_airr_ttl_cngmd AS ttl
SET Year = 2018;
```

```
UPDATE y18_dser_air_cngmd AS air
SET Year = 2018;
UPDATE y20_m2s13p21_cngmd AS m2s13p21
SET Year = 2020;
UPDATE y20_m2s13p22_cngmd AS m2s13p22
SET Year = 2020;
UPDATE y20_m2s13p23_cngmd AS m2s13p23
SET Year = 2020;
UPDATE y22_m2s13p20_cngmd AS y22p20
SET Year = 2022;
UPDATE y22_m2s13p21_cngmd AS y22p21
SET Year = 2022;
UPDATE y22_m2s13p22_cngmd AS y22p22
SET Year = 2022;
UPDATE y24_cngmd_gest_terr_2_14_12 AS
y24f12
SET Year = 2024;
UPDATE y24_cngmd_gest_terr_2_14_13 AS
y24f13
SET Year = 2024;
UPDATE y24_cngmd_gest_terr_2_14_14 AS
y24f14
SET Year = 2024;

/* /// Chlorination Code /// */
/* // Water Chlorination // */
-- CDMX 2016
CREATE TABLE Water_Chlorination_CDMX_y16
       (entidad_federativa text,
       municipio text,
       chlorination_efficiency numeric,
       year integer);
INSERT INTO Water_Chlorination_CDMX_y16
       (entidad_federativa,
       municipio,
       chlorination_efficiency,
       year)
SELECT
       nombreestado,
       nombremunicipio,
       eficienciacloracion,
       anio
FROM
       chlor_CDMX_2016 AS chlor_CDMX_y16;
       chlor_CDMX_y23;
-- MX 2016
CREATE TABLE Water_Chlorination_MX_y16 (
       entidad_federativa text,
       municipio text,
       chlorination_efficiency numeric,
       year integer);
INSERT INTO Water_Chlorination_MX_y16 (
       entidad_federativa,
       municipio,
       chlorination_efficiency,
       year)
SELECT
       nombreestado,
       nombremunicipio,
       eficienciacloracion,
       anio
FROM chlor_MX_2016 AS chlor_MX_y16;

/* / Water Chlorination 2016 Composite / */
CREATE TABLE y16_Water_chlor
       (ubicageo integer,
       entidad_federativa text,
       municipio text,
       chlorination_efficiency numeric,
       year integer);
INSERT INTO y16_Water_chlor
```

```
	(ubicageo,
	entidad_federativa,
	municipio,
	chlorination_efficiency,
	year)
SELECT
	y2414.CVEGEO,
	y16.nombreestado,
	y16.nombremunicipio,
	y16.eficienciacloracion,
	y16.anio
FROM
	y24_cngmd_gest_terr_2_14_14 as
y2414,
	chlor_CDMX_2016 as y16
WHERE y16.nombremunicipio =
y2414."Municipio o demarcación territorial"
	AND y16.nombreestado =
y2414.entidad_federativa;
INSERT INTO y16_Water_chlor
	(ubicageo,
	entidad_federativa,
	municipio,
	chlorination_efficiency,
	year)
SELECT
	y2414.CVEGEO,
	y16.nombreestado,
	y16.nombremunicipio,
	y16.eficienciacloracion,
	y16.anio
FROM
	y24_cngmd_gest_terr_2_14_14 as
y2414,
	chlor_MX_2016 as y16
WHERE y16.nombremunicipio =
y2414."Municipio o demarcación territorial"
	AND y16.nombreestado =
y2414.entidad_federativa;


/* /// Composition of Actions Taken by the
Government Towards Informal Human
Settlements Code /// */
/* // Rehousing 2016 // */
-- Poligonos
CREATE TABLE y16_reubicacion_poligonos
	(reubicacion_poligonos real,
	ubicageo integer);
INSERT INTO
	y16_reubicacion_poligonos
	(reubicacion_poligonos,
	ubicageo)
SELECT (SELECT TOTAL (accatahi_poligonos)),
ubicageo
	 FROM y16_acat_ahi
	 WHERE accatahi = 1
	 GROUP BY ubicageo;
INSERT INTO y16_reubicacion_poligonos
(ubicageo)
SELECT CVEGEO
FROM y24_cngmd_gest_terr_2_14_14 as e
WHERE NOT EXISTS
	(SELECT ubicageo FROM
y16_reubicacion_poligonos as m WHERE
m.ubicageo = e.CVEGEO);
-- Manzanas
CREATE TABLE y16_reubicacion_manzanas (
	reubicacion_manzanas real,
	ubicageo integer);
INSERT INTO
	y16_reubicacion_manzanas
	(reubicacion_manzanas,
	ubicageo)
SELECT (SELECT TOTAL (accatahi_manzanas)),
ubicageo
```

```
        FROM y16_acat_ahi
        WHERE accatahi = 1
        GROUP BY ubicageo;
INSERT INTO y16_reubicacion_manzanas
(ubicageo)
SELECT CVEGEO
FROM y24_cngmd_gest_terr_2_14_14 as e
WHERE NOT EXISTS
       (SELECT ubicageo FROM
y16_reubicacion_manzanas as m WHERE
m.ubicageo = e.CVEGEO);


/* // Regularizacion (Titling) 2016 // */
-- Poligonos
CREATE TABLE y16_regularizacion_poligonos (
       regularizacion_poligonos real,
       ubicageo integer);
INSERT INTO y16_regularizacion_poligonos
       (regularizacion_poligonos,
       ubicageo)
SELECT (SELECT TOTAL (accatahi_poligonos)),
ubicageo
        FROM y16_acat_ahi
        WHERE accatahi = 2
        GROUP BY ubicageo;
INSERT INTO y16_regularizacion_poligonos
(ubicageo)
SELECT CVEGEO
FROM y24_cngmd_gest_terr_2_14_14 as e
WHERE NOT EXISTS
       (SELECT ubicageo FROM
y16_regularizacion_poligonos as m WHERE
m.ubicageo = e.CVEGEO);
--      Manzanas
CREATE TABLE y16_regularizacion_manzanas
       (regularizacion_manzanas real,
       ubicageo integer);
INSERT INTO
       y16_regularizacion_manzanas
       (regularizacion_manzanas,
       ubicageo)
SELECT (SELECT TOTAL (accatahi_manzanas)),
ubicageo
        FROM y16_acat_ahi
        WHERE accatahi = 2
        GROUP BY ubicageo;
INSERT INTO y16_regularizacion_manzanas
(ubicageo)
SELECT CVEGEO
FROM y24_cngmd_gest_terr_2_14_14 as e
WHERE NOT EXISTS
       (SELECT ubicageo FROM
y16_regularizacion_manzanas as m WHERE
m.ubicageo = e.CVEGEO);


        /* // Eviction 2016 // */
-- Poligonos
CREATE TABLE y16_desalojo_poligonoS
       (desalojo_poligonos real,
       ubicageo integer);
INSERT INTO
       y16_desalojo_poligonos
       (desalojo_poligonos,
       ubicageo)
SELECT (SELECT TOTAL (accatahi_poligonos)),
ubicageo
        FROM y16_acat_ahi
        WHERE accatahi = 3
        GROUP BY ubicageo;
INSERT INTO y16_desalojo_poligonos
(ubicageo)
SELECT CVEGEO
FROM y24_cngmd_gest_terr_2_14_14 as e
WHERE NOT EXISTS
```

```
       (SELECT ubicageo FROM
y16_desalojo_poligonos as m WHERE
m.ubicageo = e.CVEGEO);

--      Manzanas

CREATE TABLE y16_desalojo_manzanas

       (desalojo_manzanas real,

       ubicageo integer);

INSERT INTO

       y16_desalojo_manzanas

       (desalojo_manzanas,

       ubicageo)

SELECT (SELECT TOTAL (accatahi_manzanas)),
ubicageo

        FROM y16_acat_ahi

        WHERE accatahi = 3

        GROUP BY ubicageo;

INSERT INTO y16_desalojo_manzanas
(ubicageo)

SELECT CVEGEO

FROM y24_cngmd_gest_terr_2_14_14 as e

WHERE NOT EXISTS

       (SELECT ubicageo FROM
y16_desalojo_manzanas as m WHERE m.ubicageo
= e.CVEGEO);


/* // Municipalizacion (Municipalizacion)
2016 // */

-- Poligonos

CREATE TABLE y16_municipalizacion_poligonos
       (municipalizacion_poligonos real,

       ubicageo integer);

INSERT INTO y16_municipalizacion_poligonos

       (municipalizacion_poligonos,

       ubicageo)

SELECT (SELECT TOTAL (accatahi_poligonos)),
ubicageo

        FROM y16_acat_ahi

        WHERE accatahi = 4

        GROUP BY ubicageo;

INSERT INTO y16_municipalizacion_poligonos
(ubicageo)

SELECT CVEGEO

FROM y24_cngmd_gest_terr_2_14_14 as e

WHERE NOT EXISTS

       (SELECT ubicageo FROM
y16_municipalizacion_poligonos as m WHERE
m.ubicageo = e.CVEGEO);

--      Manzanas

CREATE TABLE y16_municipalizacion_manzanas
        (municipalizacion_manzanas real,

       ubicageo integer);

INSERT INTO y16_municipalizacion_manzanas

       (municipalizacion_manzanas,

       ubicageo)

SELECT (SELECT TOTAL (accatahi_manzanas)),
ubicageo

        FROM y16_acat_ahi

        WHERE accatahi = 4

        GROUP BY ubicageo;

INSERT INTO y16_municipalizacion_manzanas
(ubicageo)

SELECT CVEGEO

FROM y24_cngmd_gest_terr_2_14_14 as e

WHERE NOT EXISTS

       (SELECT ubicageo FROM
y16_municipalizacion_manzanas as m WHERE
m.ubicageo = e.CVEGEO);


/* / Actions Composite 2016 / */

CREATE TABLE y16_Actions_poligonos

       (ubicageo text,

       reubicacion_poligonos numeric,

       regularizacion_poligonos numeric,

       desalojo_poligonos numeric,

       municipalizacion_poligonos numeric,

       year integer);

INSERT INTO y16_Actions_poligonos
```

```
        (ubicageo,
        reubicacion_poligonos,
        regularizacion_poligonos,
        desalojo_poligonos,
        municipalizacion_poligonos,
        year)
SELECT
        y16ReubP.ubicageo,
        y16ReubP.reubicacion_poligonos,
        y16RegP.regularizacion_poligonos,
        y16DesP.desalojo_poligonos,
        y16MuniP.municipalizacion_poligonos,
        2016
FROM
        y16_reubicacion_poligonos AS
y16ReubP,
        y16_regularizacion_poligonos AS
y16RegP,
        y16_desalojo_poligonos AS y16DesP,
        y16_municipalizacion_poligonos AS
y16MuniP
WHERE
        y16RegP.ubicageo = y16ReubP.ubicageo
AND
        y16DesP.ubicageo = y16ReubP.ubicageo
AND
        y16MuniP.ubicageo =
y16ReubP.ubicageo;
CREATE TABLE y16_Actions_manzanas
        (ubicageo text,
        reubicacion_manzanas numeric,
        regularizacion_manzanas numeric,
        desalojo_manzanas numeric,
        municipalizacion_manzanas numeric,
        year integer);
INSERT INTO y16_Actions_manzanas
        (ubicageo,
        reubicacion_manzanas,
        regularizacion_manzanas,
        desalojo_manzanas,
        municipalizacion_manzanas,
        year)
SELECT
        y16ReubM.ubicageo,
        y16ReubM.reubicacion_manzanas,
        y16RegM.regularizacion_manzanas,
        y16DesM.desalojo_manzanas,
        y16MuniM.municipalizacion_manzanas,
        2016
FROM
        y16_reubicacion_manzanas AS
y16ReubM,
        y16_regularizacion_manzanas AS
y16RegM,
        y16_desalojo_manzanas AS y16DesM,
        y16_municipalizacion_manzanas AS
y16MuniM
WHERE
        y16RegM.ubicageo = y16ReubM.ubicageo
AND
        y16DesM.ubicageo = y16ReubM.ubicageo
AND
        y16MuniM.ubicageo =
y16ReubM.ubicageo;


/* /// Services Provided Code /// */
/* // Drinkable Water 2016 // */
-- Poligonos
CREATE TABLE y16_agua_potable_poligonos
        (agua_potable_poligonos real,
        ubicageo integer);
INSERT INTO y16_agua_potable_poligonos
        (agua_potable_poligonos,
        ubicageo)
```

```
SELECT (SELECT TOTAL
(servpub_AHI_poligonos)), ubicageo

        FROM y16_ahi_serv

        WHERE serv_pub = 1

        GROUP BY ubicageo;

INSERT INTO y16_agua_potable_poligonos
(ubicageo)

SELECT CVEGEO

FROM y24_cngmd_gest_terr_2_14_14 as e

WHERE NOT EXISTS

       (SELECT ubicageo FROM
y16_agua_potable_poligonos as m WHERE
m.ubicageo = e.CVEGEO);


/* // Drainage 2016 // */

-- Poligonos

CREATE TABLE y16_drenaje_poligonos (

       drenaje_poligonos real,

       ubicageo integer);

INSERT INTO y16_drenaje_poligonos

       (drenaje_poligonos,

       ubicageo)

SELECT (SELECT TOTAL
(servpub_AHI_poligonos)), ubicageo

        FROM y16_ahi_serv

        WHERE serv_pub = 2

        GROUP BY ubicageo;

INSERT INTO y16_drenaje_poligonos
(ubicageo)

SELECT CVEGEO

FROM y24_cngmd_gest_terr_2_14_14 as e

WHERE NOT EXISTS

       (SELECT ubicageo FROM
y16_drenaje_poligonos as m WHERE m.ubicageo
= e.CVEGEO);


/* // Public Lighting 2016 // */

-- Poligonos

CREATE TABLE
y16_alumbrado_publico_poligonos

       (alumbrado_publico_poligonos real,

       ubicageo integer);

INSERT INTO y16_alumbrado_publico_poligonos

       (alumbrado_publico_poligonos,

       ubicageo)

SELECT (SELECT TOTAL
(servpub_AHI_poligonos)), ubicageo

        FROM y16_ahi_serv

        WHERE serv_pub = 3

        GROUP BY ubicageo;

INSERT INTO y16_alumbrado_publico_poligonos
(ubicageo)

SELECT CVEGEO

FROM y24_cngmd_gest_terr_2_14_14 as e

WHERE NOT EXISTS

       (SELECT ubicageo FROM
y16_alumbrado_publico_poligonos as m WHERE
m.ubicageo = e.CVEGEO);


        /* // Sidewalks 2016 // */

-- Poligonos

CREATE TABLE y16_banquetas_poligonos

       (banquetas_poligonos real,

       ubicageo integer);

INSERT INTO y16_banquetas_poligonos

       (banquetas_poligonos,

       ubicageo)

SELECT (SELECT TOTAL
(servpub_AHI_poligonos)), ubicageo

        FROM y16_ahi_serv

        WHERE serv_pub = 4

        GROUP BY ubicageo;

INSERT INTO y16_banquetas_poligonos
(ubicageo)

SELECT CVEGEO

FROM y24_cngmd_gest_terr_2_14_14 as e
```

```
WHERE NOT EXISTS
	(SELECT ubicageo FROM
y16_banquetas_poligonos as m WHERE
m.ubicageo = e.CVEGEO);


 /* // Pavement // 2016 */
-- Poligonos
CREATE TABLE y16_pavimento_poligonos
	(pavimento_poligonos real,
	ubicageo integer);
INSERT INTO
	y16_pavimento_poligonos
	(pavimento_poligonos,
	ubicageo)
SELECT (SELECT TOTAL
(servpub_AHI_poligonos)), ubicageo
	 FROM y16_ahi_serv
	 WHERE serv_pub = 5
	 GROUP BY ubicageo;
INSERT INTO y16_pavimento_poligonos
(ubicageo)
SELECT CVEGEO
FROM y24_cngmd_gest_terr_2_14_14 as e
WHERE NOT EXISTS
	(SELECT ubicageo FROM
y16_pavimento_poligonos as m WHERE
m.ubicageo = e.CVEGEO);


/* / Services Composite 2016 / */
CREATE TABLE y16_Services
	(ubicageo text,
	agua_potable_poligonos integer,
	drenaje_poligonos integer,
	alumbrado_publico_poligonos integer,
	banquetas_poligonos integer,
	pavimento_poligonos integer,
	year integer);
INSERT INTO
	y16_Services AS m
	(ubicageo,
	agua_potable_poligonos,
	drenaje_poligonos,
	alumbrado_publico_poligonos,
	banquetas_poligonos,
	pavimento_poligonos,
	year)
SELECT
	y16app.ubicageo,
	y16app.agua_potable_poligonos,
	y16dren.drenaje_poligonos,
	y16alp.alumbrado_publico_poligonos,
	y16banq.banquetas_poligonos,
	y16pav.pavimento_poligonos,
	2016
FROM
	y16_agua_potable_poligonos AS
y16app,
	y16_drenaje_poligonos AS y16dren,
	y16_alumbrado_publico_poligonos AS
y16alp,
	y16_banquetas_poligonos AS y16banq,
	y16_pavimento_poligonos as y16pav
WHERE
	y16app.ubicageo = y16dren.ubicageo
AND
	y16alp.ubicageo = y16dren.ubicageo
AND
	y16banq.ubicageo = y16dren.ubicageo
AND
	y16pav.ubicageo = y16dren.ubicageo;
/* /// Yearly Master Table Code /// */
CREATE TABLE Master_Table_y24
	(ubicageo numeric,
	entidad_federativa text,
```

```
        municipio text,
        ahi integer,
        ahi_poligonos integer,
        ahi_ha integer,
        ahi_lotes integer,
        ahi_poblacion integer,
        reubicacion_poligonos integer,
        reubicacion_manzanas integer,
        regularizacion_poligonos integer,
        regularizacion_manzanas integer,
        desalojo_poligonos integer,
        desalojo_manzanas integer,
        municipalizacion_poligonos integer,
        municipalizacion_manzanas integer,
        total_acciones integer,
        agua_potable_poligonos integer,
        drenaje_poligonos integer,
        alumbrado_publico_poligonos integer,
        banquetas_poligonos integer,
        pavimento_poligono integer,
        chlorination integer,
        Sup_Plano_ha numeric,
        SGA_ha numeric,
        GASP numeric,
        GASRC numeric,
        GASEC numeric,
        ST_ha numeric,
        Sup_Actual numeric,
        SPG numeric,
        SAP numeric,
        km_area numeric,
        year integer);
INSERT INTO
        Master_Table_y24 AS m24
        (ubicageo,
        entidad_federativa,
        municipio,
        ahi,
        ahi_poligonos,
        ahi_ha,
        ahi_lotes,
        ahi_poblacion,
        reubicacion_poligonos,
        reubicacion_manzanas,
        regularizacion_poligonos,
        regularizacion_manzanas,
        desalojo_poligonos,
        desalojo_manzanas,
        municipalizacion_poligonos,
        municipalizacion_manzanas,
        total_acciones,
        agua_potable_poligonos,
        drenaje_poligonos,
        alumbrado_publico_poligonos,
        banquetas_poligonos,
        pavimento_poligono,
        chlorination,
        Sup_Plano_ha,
        SGA_ha,
        GASP,
        GASRC,
        GASEC,
        ST_ha,
        Sup_Actual,
        SPG,
        SAP,
        km_area,
        year)
SELECT
        y2414.CVEGEO,
```

```
	y2414.Entidad_federativa,
	y2414."Municipio o demarcación territorial",
	y2412.AHI,
	y2412.AHI_poligonos,
	y2412.AHI_ha,
	y2412.AHI_lotes,
	y2412.AHI_poblacion,
	y2413."Cantidad de polígonos 1",
	y2413."Cantidad de manzanas 1",
	y2413."Cantidad de polígonos 2",
	y2413."Cantidad de manzanas 2",
	y2413."Cantidad de polígonos 3",
	y2413."Cantidad de manzanas 3",
	y2413."Cantidad de polígonos 4",
	y2413."Cantidad de manzanas 4",
	y2414."Total con acciones de municipalización para atender asentamientos humanos irregulares",
	y2414."Cantidad de polígonos beneficiados 1",
	y2414."Cantidad de polígonos beneficiados 2",
	y2414."Cantidad de polígonos beneficiados 3",
	y2414."Cantidad de polígonos beneficiados 4",
	y2414."Cantidad de polígonos beneficiados 5",
	y23chlor.chlorination_efficiency,
	FE.Sup_Plano_ha,
	FE.SGA_ha,
	FE.GASP,
	FE.GASRC,
	FE.GASEC,
	FE.ST_ha,
	FE.Sup_Actual,
	FE.SPG,
	FE.SAP,
	muniKM.area_sqkm,
	y2412.Year
FROM
	y24_cngmd_gest_terr_2_14_14 AS y2414,
	y24_cngmd_gest_terr_2_14_13 AS y2413,
	y24_cngmd_gest_terr_2_14_12 AS y2412,
	y23_Water_chlor AS y23chlor,
	Ejido_FE AS FE,
	Municipality_area_xls AS muniKM
WHERE
	y2412.ubicageo = y2414.CVEGEO AND
	y2413.CVEGEO = y2414.CVEGEO AND
	y23chlor.ubicageo = y2414.CVEGEO AND
	FE.ubicageo = y2414.CVEGEO AND
	muniKM.adm2_pcode = y2414.CVEGEO;


	/* | Table 2016 | */
CREATE TABLE Master_Table_y16
	(ubicageo numeric,
	entidad_federativa text,
	municipio text,
	ahi integer,
	ahi_poligonos integer,
	ahi_ha integer,
	ahi_lotes integer,
	ahi_poblacion integer,
	reubicacion_poligonos integer,
	reubicacion_manzanas integer,
	regularizacion_poligonos integer,
	regularizacion_manzanas integer,
	desalojo_poligonos integer,
	desalojo_manzanas integer,
```

```
        municipalizacion_poligonos integer,
        municipalizacion_manzanas integer,
        total_acciones integer,
        agua_potable_poligonos integer,
        drenaje_poligonos integer,
        alumbrado_publico_poligonos integer,
        banquetas_poligonos integer,
        pavimento_poligono integer,
        chlorination integer,
        Sup_Plano_ha numeric,
        SGA_ha numeric,
        GASP numeric,
        GASRC numeric,
        GASEC numeric,
        ST_ha numeric,
        Sup_Actual numeric,
        SPG numeric,
        SAP numeric,
        km_area numeric,
        year integer);
DELETE FROM Master_Table_y16;
INSERT INTO Master_Table_y16 AS m16
        (ubicageo,
        entidad_federativa,
        municipio,
        ahi,
        ahi_poligonos,
        ahi_ha,
        ahi_lotes,
        ahi_poblacion,
        reubicacion_poligonos,
        reubicacion_manzanas,
        regularizacion_poligonos,
        regularizacion_manzanas,
        desalojo_poligonos,
        desalojo_manzanas,
        municipalizacion_poligonos,
        municipalizacion_manzanas,
        total_acciones,
        agua_potable_poligonos,
        drenaje_poligonos,
        alumbrado_publico_poligonos,
        banquetas_poligonos,
        pavimento_poligono,
        chlorination,
        Sup_Plano_ha,
        SGA_ha,
        GASP,
        GASRC,
        GASEC,
        ST_ha,
        Sup_Actual,
        SPG,
        SAP,
        km_area,
        year)
SELECT
        FE.ubicageo,
        y16chlor.entidad_federativa,
        y16chlor.municipio,
        y16ahi.AHI,
        y16ahi.AHI_poligonos,
        NULL,
        y16ahi.AHI_lotes,
        y16ahi.AHI_poblacion,
        y16ap.reubicacion_poligonos,
        y16ma.reubicacion_manzanas,
        y16ap.regularizacion_poligonos,
        y16ma.regularizacion_manzanas,
        y16ap.desalojo_poligonos,
```

```
        y16ma.desalojo_manzanas,
        y16ap.municipalizacion_poligonos,
        y16ma.municipalizacion_manzanas,
        NULL,
        y16s.agua_potable_poligonos,
        y16s.drenaje_poligonos,
        y16s.alumbrado_publico_poligonos,
        y16s.banquetas_poligonos,
        y16s.pavimento_poligonos,
        y16chlor.chlorination_efficiency,
        FE.Sup_Plano_ha,
        FE.SGA_ha,
        FE.GASP,
        FE.GASRC,
        FE.GASEC,
        FE.ST_ha,
        FE.Sup_Actual,
        FE.SPG,
        FE.SAP,
        muniKM.area_sqkm,
        y16ahi.Year
FROM
        Ejido_FE as FE,
        y16_Water_chlor as y16chlor,
        y16_as_hu_ir as y16ahi,
        y16_Actions_poligonos as y16ap,
        y16_Actions_manzanas as y16ma,
        y16_Services as y16s,
        Municipality_area_xls AS muniKM

WHERE
        FE.ubicageo = y16ahi.ubicageo AND
        y16chlor.ubicageo = y16ahi.ubicageo
AND
        y16ap.ubicageo = y16ahi.ubicageo AND
        y16ma.ubicageo = y16ahi.ubicageo AND
        y16s.ubicageo = y16ahi.ubicageo AND
        muniKM.adm2_pcode = y16ahi.ubicageo;

/* /// Master Table Code /// */
CREATE TABLE Master_Table
        (ubicageo numeric,
        entidad_federativa text,
        municipio text,
        ahi integer,
        ahi_poligonos integer,
        ahi_ha integer,
        ahi_lotes integer,
        ahi_poblacion integer,
        reubicacion_poligonos integer,
        reubicacion_manzanas integer,
        regularizacion_poligonos integer,
        regularizacion_manzanas integer,
        desalojo_poligonos integer,
        desalojo_manzanas integer,
        municipalizacion_poligonos integer,
        municipalizacion_manzanas integer,
        total_acciones integer,
        agua_potable_poligonos integer,
        drenaje_poligonos integer,
        alumbrado_publico_poligonos integer,
        banquetas_poligonos integer,
        pavimento_poligono integer,
        chlorination integer,
        Sup_Plano_ha numeric,
        SGA_ha numeric,
        GASP numeric,
        GASRC numeric,
        GASEC numeric,
        ST_ha numeric,
```

```
        Sup_Actual numeric,
        SPG numeric,
        SAP numeric,
        km_area numeric,
        year integer);
INSERT INTO Master_Table
SELECT *
FROM Master_Table_y24;
INSERT INTO Master_Table
SELECT *
FROM Master_Table_y22;
INSERT INTO Master_Table
SELECT *
FROM Master_Table_y20;
INSERT INTO Master_Table
SELECT *
FROM Master_Table_y18;
INSERT INTO Master_Table
SELECT *
FROM Master_Table_y16;
```

Appendix B – Stata Code

```
// Importing Data //

import delimited
"C:\ \Desktop\Thesis\Data\Master_Table.
csv", stringcols(1 4 5 6)


// Cleaning Data //

keep if ahi != "NA"

keep if ahi != "NSS"

keep if ahi != "NS"


tostring year, replace

destring ahi_lotes, replace force

destring ahi_ha, replace force

destring ubicageo, replace

destring ahi, replace force

destring ahi_poligonos, replace force

destring ahi_poblacion, replace force

destring regularizacion_poligonos,
replace force

destring regularizacion_manzanas,
replace force

destring municipalizacion_poligonos,
replace force

destring municipalizacion_manzanas,
replace force

destring agua_potable_poligonos,
replace force

destring drenaje_poligonos, replace
force

destring alumbrado_publico_poligonos,
replace force

destring banquetas_poligonos, replace
force

destring pavimento_poligono, replace
force

replace ahi = . if ahi == 0

replace ahi_poligonos = . if
ahi_poligonos == 0

replace ahi_ha = . if ahi_ha == 0

replace ahi_lotes = . if ahi_lotes == 0

replace ahi_poblacion = . if
ahi_poblacion == 0


// Variable Construction //

replace regularizacion_manzanas = 0 if
regularizacion_manzanas == .

replace reubicacion_manzanas = 0 if
reubicacion_manzanas == .

replace desalojo_manzanas = 0 if
desalojo_manzanas == .

replace municipalizacion_manzanas = 0
if municipalizacion_manzanas == .

replace agua_potable_poligonos = 0 if
agua_potable_poligonos == .

replace drenaje_poligonos = 0 if
drenaje_poligonos == .

replace alumbrado_publico_poligonos = 0
if alumbrado_publico_poligonos == .

replace banquetas_poligonos = 0 if
banquetas_poligonos == .

replace pavimento_poligono = 0 if
pavimento_poligono == .


      gen lnAHIpob = ln(ahi_poblacion)

      gen lnAHIlotes = ln(ahi_lotes)

      gen lnAHIHA = ln(ahi_ha)
```

```
	gen lnregMan = ln(regularizacion_manzanas)

		replace lnregMan = 0 if lnregMan == .

	gen lnreubMan = ln(reubicacion_manzanas)

		replace lnreubMan = 0 if lnreubMan == .

	gen lndesalojoMan = ln(desalojo_manzanas)

		replace lndesalojoMan = 0 if lndesalojoMan == .

	gen lnmuniMan = ln(municipalizacion_manzanas)

		replace lnmuniMan = 0 if lnmuniMan == .

	gen lnGASP = ln(gasp)

		replace lnGASP = 0 if lnGASP == .

	gen lnGASRC = ln(gasrc)

		replace lnGASP = 0 if lnGASP == .

	gen lnGASEC = ln(gasec)

		replace lnGASP = 0 if lnGASP == .

	gen lnSPha = ln(sup_plano_ha)

		replace lnSPha = 0 if lnSPha == .

	gen lnSTha = ln(st_ha)

	gen lnspg = ln(spg)

	gen lnSGAha = ln(sga_ha)

	gen lnSupActual = ln(sup_actual)

	gen lnsqkm = ln(km_area)

	gen id = _n

	gen State = 0

	replace State = 1 if entidad_federativa == "México"

	replace State = 2 if entidad_federativa == "Ciudad de México"

	gen AHIpobsqkm = ahi_poblacion/km_area



// Analyzing Data //

kdensity ahi_ha

kdensity ahi_lotes

kdensity lnAHIpob,

kdensity ahi_poblacion


graph twoway scatter ahi_lotes ahi_poblacion

graph twoway scatter lnAHIHA lnAHIpob

graph twoway scatter lnAHIpob lnSPha


	// Model #1 //

	mixed lnAHIpob lnreubMan lnregMan lndesalojoMan lnmuniMan i.State lnsqkm || ubicageo: , reml


	// Model #2 //

	mixed lnAHIpob lnreubMan lnregMan lndesalojoMan alumbrado_publico_poligonos agua_potable_poligonos drenaje_poligonos banquetas_poligonos pavimento_poligono i.State lnsqkm || ubicageo:, reml
```

```
      // Model #3 //

      asdoc mixed lnAHIpob
reubicacion_poligonos
regularizacion_poligonos
desalojo_poligonos
municipalizacion_poligonos
alumbrado_publico_poligonos
agua_potable_poligonos
banquetas_poligonos pavimento_poligono
drenaje_poligonos i.State lnsqkm ||
ubicageo:, reml


      // Model #4 //

      asdoc mixed lnAHIpob lnreubMan
lnregMan lndesalojoMan lnmuniMan lnGASP
lnGASRC lnGASEC i.State lnsqkm ||
ubicageo:, reml


      // Model #5 //

      asdoc mixed lnAHIpob lnreubMan
lnregMan lndesalojoMan lnmuniMan lnspg
i.State lnsqkm || ubicageo:, reml


      // Model #6 //

      asdoc mixed lnAHIpob lnreubMan
lnregMan lndesalojoMan
alumbrado_publico_poligonos
agua_potable_poligonos
drenaje_poligonos banquetas_poligonos
pavimento_poligono i.State lnsqkm ||
ubicageo:, reml


      // Model #7 //

      asdoc mixed lnAHIpob lnreubMan
lnregMan lndesalojoMan
alumbrado_publico_poligonos
agua_potable_poligonos
drenaje_poligonos banquetas_poligonos
pavimento_poligono lnGASP lnGASRC
lnGASEC lnspg i.State lnsqkm ||
ubicageo:, reml
```