



# The role of institutional entrepreneurs and informal land transactions in Mexico City's urban expansion



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## ABSTRACT

Informal urban expansion, or conversion of land to urban land uses, outpaces formal urbanization in the developing world. Understanding why this informality exists and persists is essential to counteract characterizations that it is chaotic and ungovernable. This research examines who shapes the informal arrangements developed to meet unmet housing needs that expand the urban footprint, from social housing projects to concentrated squatting in Mexico City metropolis from 2000 to 2016. Institutional analysis elucidates the distribution of payoffs in the "action situation" where decisions about urban land are made, and among "institutional entrepreneurs", actors that repeatedly evade or alter formal rules or create new rules of urban land regulation. We use interview data regarding the distribution of costs and benefits among 54 actors involved in recent informal urban expansion to provide low- and middle-income housing (2000–2016) to identify potential leverage points for institutional change. We describe four types of informal urban land transactions: i) urbanizing individual plots of land, ii) flipping or subdividing land into multiple parcels, iii) invading land, and iv) manipulating social and public housing developments. We find institutional entrepreneurs—intermediaries, developers, and politicians—disproportionately benefit from and reinforce unplanned urban expansion. These entrepreneurs provide housing for the urban poor, but with social and environmental costs, including exploitation of informal settlers and urbanization of conservation land and loss of environmental services. Disaggregating informality into its component pervasive institutions and analyzing the distribution of payoffs in and beyond Mexico City provides insights about governance for urban sustainability.

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## 1. Introduction

### 1.1. Informal urban growth

Urban area expansion grew 80% worldwide from 1985 to 2015 (Liu et al., 2020). Most urban growth occurred in the Global South, often in informal, unplanned settlements where inhabitants have little to no tenure security, lack basic services, and construct homes in areas disproportionately vulnerable to disaster and risk (Salami et al., 2017; UN Habitat, 2016). Understanding why informal urban settlements exist and persist is critical for effective urban studies, science, and planning, and for modeling trajectories of urban land

change. Nevertheless, distilling general rules and patterns that capture the dynamics of informal urban growth from context-rich and geographically specific case studies is challenging.

Despite a wealth of scholarship regarding informal urban growth, or urban informality, (Banks et al., 2020; McFarlane, 2012; Pradilla, 1995; Roy, 2009; Varley, 1998, and others), urban planners and government authorities often view informality as chaotic and ungovernable (Gilbert et al., 2016; Lerner et al., 2018; Roy, 2005). Researchers who model or map urban expansion often ignore informal urban expansion or presume it operates similarly to formal growth (Vermeiren et al., 2012). Most land change and urban resilience models fail to account for the socio-political dynamics shaping informal growth (Eakin et al., 2017; Roy et al., 2014, but see (Baeza, Bojorquez-Tapia, Janssen, & Eakin, 2019; Patel, Crooks, & Koizumi, 2012)). This omission is unsurprising, given that the political incentives governing informal urban expansion are either not well understood (Navarrete, 2016; Post, 2018)

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or sufficiently systematized to enable land system sciences to incorporate informal politics into models (Tellman et al., 2020). Here we aim to bridge part of this gap by using institutional analysis to systematize salient rules governing the complexity of informal urban expansion in Mexico City from 2000 to 2016.

For the most part, the literature identifies three main factors for the persistence of urban informality: i) socio-economic inequality, which creates structural conditions that increase demand for cheaper land amongst new and existing urban residents; ii) difficult or slow property formalization processes, and iii) political and economic incentives of actors with the authority and influence to shape urban expansion (the focus of this paper). Informal settlements are co-produced by action (and in-action) of formal governments (Fernandes & Smolka, 2004; McFarlane, 2012; Roy, 2005). Urban informality has been explained as a product of under-resourced governments unable to absorb the overwhelming rural–urban migration of impoverished populations priced out of formal housing in a neoliberal era (Iracheta Cenecorta & Smolka, 2000; Márquez López & Pradilla Cobos, 2016; Pradilla, 1995; Schteingart, 1989; Van Gelder, 2013). In contrast, De Soto (2000) argued informality flourishes because processes of legal urbanization are too slow and bureaucratic; yet, rapid titling programs have had mixed success across cities (Gilbert, 2002; Jaramillo, 2008) and may further exacerbate informality because titling inflates land prices and increases speculation (Eibenschutz Hartmann & Benlliure, 2009; Iracheta Cenecorta & Smolka, 2000). The political economy of urban informality provides opportunities to accumulate wealth and power for some groups (Banks et al., 2020). For example, economic profits motivate mafias to shape urban land uses in slums in Nairobi (Henderson et al., 2016), or government officials to clear slums for shopping malls in Mumbai (Weinstein, 2008). Rural populations moving to cities generate political capital—their vote—that political party-brokers seek to capture (Cornelius, 1972; Scott, 1969). Politicians achieve political support from informality by providing services, such as electricity and water (De Alba et al., 2014), ensuring slums are not evicted (Holland, 2016), promising to provide land titles (Connolly & Wigle, 2017; Varley, 1998), and other such strategies (Banks et al., 2020).

Mexico City is one of the largest cities in the world characterized by persistent informal growth, and the political economy of informal urban expansion and its social and environmental consequences has long been the focus of research (Aguilar, 2008; Aguilar & Guerrero, 2013; Legorreta, 1994; Pezzoli, 2000; Schteingart & Salazar, 2010; Ward, 1976, 1998). Government programs have attempted to regulate (or eliminate) informal growth across the metropolitan area (Azuela de la Cueva, 1987; Hiernaux & Lindón, 1996; Iracheta Cenecorta & Smolka, 2000; Pezzoli, 2000) and more recently (circa 2005) in conservation land specifically (Connolly & Wigle, 2017; Salazar, 2012a; Wigle, 2014, 2020). Minimal success in mitigating informal expansion is in part due to the diverse actors and politics shaping urbanization on Mexico City's periphery. Brokers or *caciques* (chiefs) deliver urban services (Cornelius, 1972), developers and politicians enter the informal land market (Legorreta, 1991), and political party operatives use land zoning and titling reforms to retain power (Hilgers, 2008; Varley, 1998).

Previous work recognizes three main types of informal urban expansion<sup>1</sup> in the 1980s-90s: i) land invasion, ii) informal purchase of single land parcels, and iii) informal development of many parcels in subdivisions (Azuela de la Cueva, 1987; Cymet, 1992; Ward, 1998). Politics and actors involved in urbanization 21st century in

Mexico City have changed due to decentralized land regulation, direct election of local officials (Davis, 2010), and mass scale social housing projects. New dynamics in housing and urban governance warrant revisiting prior typologies of informality to understand contemporary (years 2000–2016) informal settlement persistence across the metropolis. Recent political changes after 2016 may be shifting some of the dynamics analyzed in this study.

Using aforementioned typologies of informal settlement as a point of departure, we analyze 54 interviews with actors who sell, buy, and regulate land across Mexico City in 2016–2017. The analysis focuses on informal arrangements developed to meet unmet housing needs that expand the urban footprint, from social housing projects to concentrated squatting. We examine urban land institutions—the set of rules and norms that govern human interactions (North, 1990)—using The Institutional Analysis and Development Framework (IAD) (Ostrom, 2011). We analyze the payoff structures of “institutional entrepreneurs” or actors who repeatedly evaded or altered formal rules or created new rules of urban land regulation.

Three overarching questions guide this research:

1. What are the main types of informal land transactions and institutions involved in contemporary urban expansion to meet unmet housing needs in the Mexico City Metropolitan Area?
2. What incentives and constraints produce the entrepreneurs that drive these main types?
3. What is the distribution of benefits and losses to actors across outcomes of urban land use and regulation when these transactions take place?

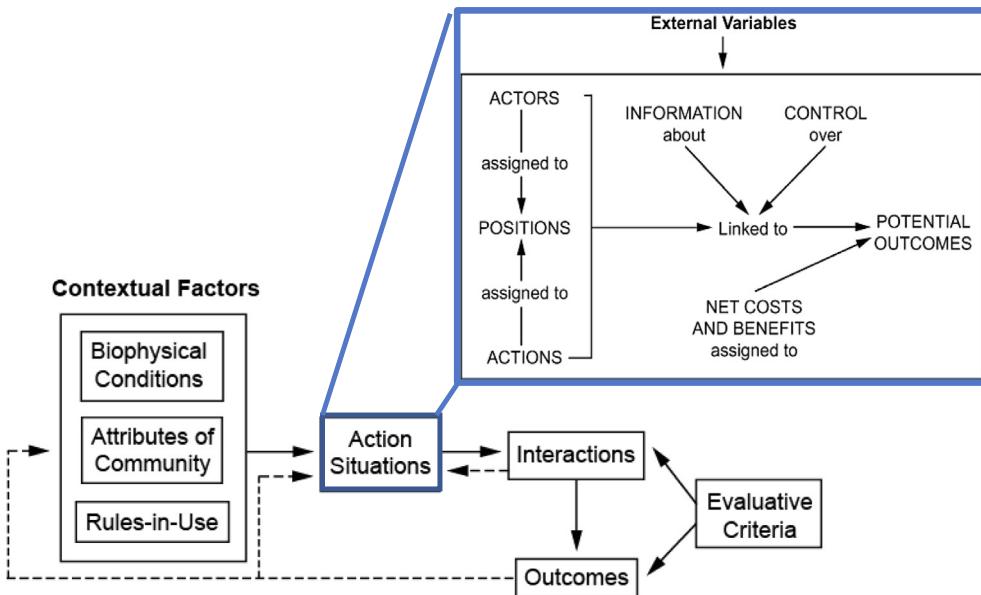
Results identify the surface of payoffs of actors shaping four types of urban expansion, achieving two contributions. The first contribution identifies actor interactions documented in the previous literature on informal urbanization in Mexico City that continue to govern informal urban expansion (up until 2016). Visualizing payoff schemes highlights who profits from persistent informality and helps to clarify the role and root causes of clientelism, corruption, and other clandestine practices affecting urban development in Mexico City and elsewhere. The second contribution systematizes the rules governing current modes of informal urban expansion to inform quantitative land change models, or to identify pixel-patterns of urbanization related to distinct social processes (Tellman et al., 2020).

## 2. Institutions, Entrepreneurs, and Informality

Institutional analysis focuses on both formal rules and informal norms (Helmke & Levitsky, 2004; Ostrom, 2005); both shape urban expansion in real estate across Mexico City. Formal urban developments shaped by informal transactions (e.g., a bribe to pay off an official to change zone regulations) are not classified as informal settlements in the majority of research. However, formal urban expansion generated with informal transactions may generate far greater changes in the urban footprint than informal settlements, and thus are included in our analysis. We study informal land transactions using the IAD (Fig. 1), and focus on the action situation, which encompasses the roles of actors and their interactions in decision situations (Ostrom, 2011).

The biophysical context (i.e., land), the rules in use, and the attributes of the community shape the action situation “... where individuals interact, exchange goods and services, solve problems, dominate one another, or fight” (Ostrom, 2011 pp:10). We assume actors have “bounded rationality”—lacking perfect information—and motivated by reciprocity and values beyond self-benefit (Camerer & Fehr, 2006; Lara, 2015; McGinnis, 2011; Ostrom,

<sup>1</sup> For broader typologies of urban expansion including informal settlements based on historical trajectory, location, and legal status (see Connolly, 2009; Connolly & Castro, 2016; Duhau, 1998; Ward, 1976) or dominant socio-cultural norms (see Duhau & Giglia, 2008).



**Fig. 1.** Institutional Analysis and Development Framework with a focus on the Action Situation (from Ostrom (2011)).

2011). Actors have differential positions, set of choices, access to information, and control over outcomes (or power). This power asymmetry is shaped by race, gender, ethnicity, and other structural factors influencing who has access to the benefits of outcomes (Ribot & Peluso, 2003) and how the distribution of payoffs shapes institutional change (change in sets of rules and norms governing human interactions) (Knight, 1992). The outcome of each decision made in the action situation affects land use, rules in use, and social arrangements which set up a subsequent action situations and decisions. This iterative process develops into institutional arrangements governing collective behavior.

The IAD is used to document the politics, or “the processes through which individuals and collectives cooperate and collude to order and govern everyday affairs” (p 524, Eriksen et al. 2015) of informal urban land transactions. Transactions include zoning, conversion, or purchases of land that occur outside of, or in opposition to, formal markets and governance processes. These transactions typically involve exchanges between marginalized urban residents who cannot afford formal urban land and services, and the actors with the power to fulfill these needs. Transactions may be enforced through reciprocity, trust, intimidation, or violence (Lambsdorff et al., 2005), characterized by clientelism, corruption, rent-seeking<sup>2</sup>, and other political exchanges or favors. Not all informal transactions are illegal. For example, politicians commonly provide cement to those building homes in urban conservation land in Mexico City to secure voter support (Hagene, 2015), sending the message that the informal construction is permissible,

authorities are likely to let it remain, and, perhaps, supply services (e.g., water and electricity).

In general, high rates of inequality and low transparency regarding the distribution of public goods makes the action situation favorable for actors with the ability to mobilize resources to affect outcomes (Avelino & Rotmans, 2009). These “institutional entrepreneurs” mobilize informational, economic, or political capital to create or transform institutions that favor their interest (Pacheco, York, Dean, & Sarasvathy, 2010), convincing marginalized actors to agree to their desired outcome (Knight, 1992).<sup>3</sup>

Institutional entrepreneurs abide by, evade, or alter existing institutions (Henrekson & Sanandaji, 2010). These actors abide when they leverage existing institutions to their benefit, potentially engaging in rent-seeking, clientelism, graft, or leveraging existing social and political networks to access goods or services. They evade when avoiding existing regulations, such as by holding profits in tax havens, bribing a government official to avert regulation, or threatening violence towards those who pursue legal sanctions against them. They alter existing institutions by creating new sets of rules or norms to distribute illegal goods and services.

Institutional entrepreneurs produce normatively “good” or “bad” outcomes for constituencies they serve, depending on the time scale analyzed. In Mexico City, entrepreneurs fulfill unmet housing demand for the urban poor in the short term, but reduce environmental services (e.g., for water provisioning) in the long term for the city at large where that housing expands on conservation land. These actors commonly create a “Faustian bargain” in which the urban poor accept a reduction in their present livelihood security, at the long-term cost of repeated unjust, risky, or even violent consequences (Wood, 2003). Entrepreneurs dominate the action situation because of their greater access to information, such as legal loopholes (e.g. to obtain ownership via paying cadastral taxes for a specified number of years), and greater control over outcomes, compared to other actors. These dynamics shape a “surface” of the distribution of payoffs.

<sup>2</sup> Clientelism is often defined as the contingent exchange of political support for goods or services from a person of social status (the patron) with someone of lower status (the patron) (Hicken, 2011; Stokes et al., 2012) (Hilgers, 2008). Vote-buying (one-shot exchange of goods for just a vote), patronage (giving jobs to supporters), and pork-barrel politics (distributing goods to a certain portion of population that does not involve relationships or personal exchange) are sometimes, but not always, clientelistic by this definition (Hilgers, 2008). Corruption is an unauthorized transaction between an elected or appointed official and a third party (Groenendijk, 1997). Rent-seeking is a special type of corruption. It occurs when regulation (e.g., laws against deforestation or urbanization) increases scarcity to a good (e.g. land), and a government actor facilitates access in exchange for an economic kick back (Krueger, 1974).

<sup>3</sup> Other explanations for why marginalized people participate in exploitation (not covered in this study) may reside in the “struggle for recognition” of informal settlers who feel ignored or invisible by formal actors but recognized by informal brokers and internalize their authority (Honneth, 1996).

### 3. Payoff Surfaces in the Action Situation

Formal transactions may have a third-party actor, such as a court of law, to adjudicate contracts or exchanges between actors. However, in informal transactions, payoffs are typically determined by the exchange between two actors and their power differential. We propose a visualization of this distribution of payoffs among actors (Fig. 2) to demonstrate how power influences outcomes. Actors are placed around the action situation, with larger circles representing more power. In a given outcome of a decision, actors with benefits have a vertex in the green zone, while actors with costs have a vertex in the red zone. Relative costs or benefits are determined by the power of each actor. Payoff surfaces are produced by connecting the vertices among actors. This qualitative visualization highlights which actors receive the largest cost and benefits and influence the land use outcome.

Payoff surfaces can be used to analyze the incentives and constraints shaping decisions and subsequent outcomes. The actors with higher costs or benefits shape the payoff surface, representing leverage points. Decisions and relations where payoff surfaces benefit either a majority of actors or a few powerful actors tend to prevail, even if they are not legally sanctioned. Ultimately, institutions, both formal and informal, emerge as the repeated interactions among actors regularize the payoff surface overtime. Shifting rules in use, biophysical conditions, or power will change the level of control for each actor, perceived costs and benefits, and the payoff surface. More powerful actors and entrepreneurs with high political or economic capital savings can consider payoffs aggregated across larger spatial scales and longer timelines relative to other actors. Entrepreneurs access larger payoffs and have an outsized influence on the action situation and institutional change.

We use the IAD to visualize and compare dominant patterns of actor interaction. We aim to make these politics, documented in rich literature on Mexico City, more visible and accessible to research employing quantitative approaches to social-environmental problems. This aim axiomatically generalizes and simplifies important politics, diversity of actors, and decision-making processes about urban land<sup>4</sup>. Nevertheless, synthesis and generalization of dominant social interactions shaping land use are important to further land system science, the direction to which this research is invested (Magliocca et al., 2014). Payoff surfaces could be used, for example, to develop "stylized facts" of actor interaction for empirically based agent-based models (Janssen & Ostrom, 2006) to better incorporate political dimensions of informal urban growth and vulnerability (Baeza et al., 2019).

### 4. Informal Urbanization in Mexico City

Urban expansion in Mexico City has been and continues to be largely informal and driven by insufficient affordable housing options for the nearly 9 million people in Mexico City proper (hereafter, CDMX) and over 21 million in the metropolitan area extending into the State of Mexico (hereafter MCMA, Mexico City Metro Area, including CDMX). Research on urban expansion across MCMA city-regions (using Census Block data) estimates that 60% of new housing constructed from 1930 to 2016 was either self-built in violation of existing urban zoning, or involved

<sup>4</sup> A complex web of social relations including gender (Haraway et al., 2007; Rocheleau, 2008), racism, emotions, the struggle for recognition or legitimacy (Honneth, 1996) may be underrepresented in this IAD analysis; we also do not delve into the political-economic histories and complexities at broader organizational levels that give rise to the specific political interactions represented in the action situations we explore.

informal property transactions (sometimes illegal, other times, unregistered) (Connolly, 2009; Connolly & Castro, 2016). These studies indicate 65% of total urban housing and land use was built in this way, the highest in Latin America. From 1990 to 2010, an estimated 1,318,000 new "informal" homes were added to the city, some of whose property titles or zoning have been formalized.

Informal settlement growth continues because of the high cost of land, paucity of access to credit for the poor to purchase, and insufficient affordable housing (hereafter, social housing, referring to homes with publicly subsidized construction or mortgages) (Fig. 3). This housing deficit is estimated at 250,000 and 650,000 units for CDMX and MCMA, respectively, despite 50,000 and 770,000 social housing units built in

CDMX and MCMA, respectively, over the past 15 years (INVI (Housing Institute of Mexico City) 2017, Instituto Mexiquense de la Vivienda Social 2017).

In addition to informal arrangements in the social housing sector, we analyzed land transactions in informal settlements which currently occupy land not zoned for residential urbanization and constructed from ~2000–2016. Informal settlements occur on one of four distinct property regimes: federal land, such as a National Protected Areas, private lands, and two types of social property or land held in communal title, collectively termed agrarian land. Agrarian land includes *ejidos* (commonly owned properties designated in Agrarian Reforms between 1917 and 1992) and community land (commonly owned indigenous properties dating to the 1600s).<sup>5</sup> The tenure of some community land remains in dispute because some communities have been unable to achieve official recognition. *Ejido* land includes communal use areas and plots designated for individual members to use or rent, or sell if it is removed from social property.<sup>6</sup>

Legal mechanisms to convert social property to private property have evolved since *ejido* establishment (see Cymet, 1992). At the time of this study in 2016, converting social property to private property occurred through government expropriation and subsequent titling to informal settlers<sup>7</sup> or decommissioning parcels from the *ejido*<sup>8</sup>. Decommissioning or "privatizing" *ejido* land in urban areas (Jones & Ward, 1998) has attracted entrepreneurs offering services to aid in complex paper work, sometimes generating confusion and conflict (Salazar, 2012b).

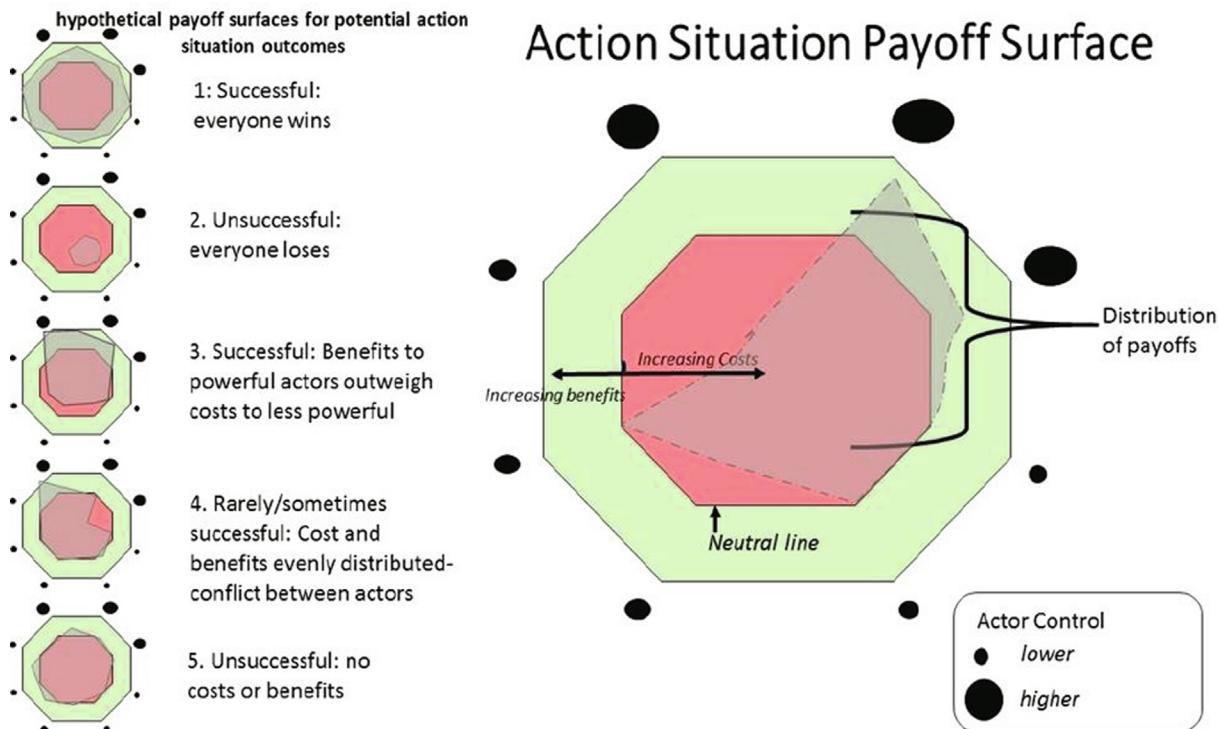
Formal private property titles are only given to parcels located on land zoned as urban. Titling informal settlements in CDMX is challenging because most informal homes built since 2000 are on conservation land not zoned for urban development (Fig 4). This conservation land is largely in the south of the city, established in 1987 (Sheinbaum Pardo, 2008), with permitted uses for pasture, agricultural, forest, and rural agricultural homes. As of 2016, there were an estimated 859 informal settlements in CDMX on conservation land, holding 480,000 people, and covering 3,200 ha (Santos,

<sup>5</sup> Both the Spanish Crown post-conquest (known as communal titles) and the Mexican revolution granted social property land titles (known as *ejido* titles) which could not be bought or sold until the Mexican agrarian reform in 1992. Considerable dispute remains over overlapping claims between communal and *ejido* land claims, which remains unresolved in Tribunal Agrarian Courts to this day. The term agrarian land is used to refer to include both.

<sup>6</sup> In article 48 of Mexican Agrarian Law, any one who uses land "peacefully" (that is, in "good faith", meaning the person does so with the permission of the land owner) gains *ejido* rights to the land in five years. In order to prove this "posesion pacifica", the *ejido* governing board will often charge informal settlers a yearly fee and a slip of paper they can use to prove their "peaceful" and "good faith" possession. Though selling *ejido* parcels is illegal, extending a "peaceful possession" grant, is not. This is a common informal way *ejido* members sell land to outsiders.

<sup>7</sup> Mostly handled by CORETT, the Commission of Regularization and Land Tenure, and recently, INSUS, The National Institute of Sustainable Land Use.

<sup>8</sup> Available through the PROCEDE certification program by the National Agrarian Registry in the State of Mexico but not Mexico City proper, since 1992.



**Fig. 2.** Hypothetical payoff surface of potential outcomes of the action situation. Distribution of payoffs is a surface (grey) shaped by the costs and benefits to each actor (black circles) arranged around the radial action surface. More powerful actors, with larger circles, have more to lose and gain in outcomes. The degree of cost (red shaded area) or benefit (green shaded area) for each actor is measured by the distance of their vertex to the neutral line. The edge of the cost and benefits area represents neutral or no payoff (e.g., actors with no stake in the outcome have their vertex at or near the neutral line). Connecting the vertices results in a polygon representing the distribution of payoffs among actors. Payoffs surfaces 1–5 are examples of potential distribution of payoffs given the degree of control, cost, and benefit of the potential outcome to each actor. An outcome is successful if the green shaded area is larger than the red unshaded area (e.g. 1 and 3), and only sometimes occurs when the costs and benefits are similar (e.g. 4). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

2013; SEDEMA, 2016).<sup>9</sup> These settlements are economically and socially marginalized (Aguilar, 2008; Aguilar & Guerrero, 2013; Aguilar & Lopez, 2015; Aguilar & Santos, 2011) and have been historically embedded in social and political relations that exploit their vulnerability (Cornelius, 1972; Lomnitz, 1982), circumstances that continue today (Pezzoli, 2000; Schteingart & Salazar, 2010; Vite, 2001). Paradoxically, residents in informal settlements across the MCMA pay higher prices for informal service provision of water and electricity than city residents in the formal “urban” land use zone (Iracheta Cenecorta & Smolka, 2000; Legorreta, 1991).

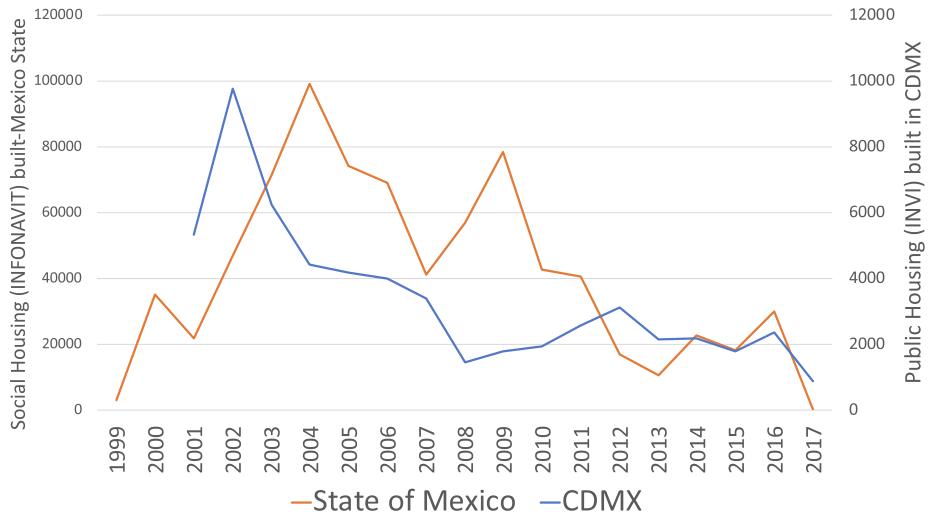
The city has attempted to control informal urban growth on conservation land amid growing concern regarding environmental impacts of land change on flooding and aquifer recharge (Santos, 2013; Schteingart & Salazar, 2010). Programs designed to reduce urban expansion include the CDMX “Zero-Growth” plan forbidding urbanization on conservation land, eviction of settlers (Pezzoli, 2000), and support for farmers in the Basin of Mexico via payments for environmental services (PES) (Caro-borrero et al., 2015; Perevochtchikova & Vasquez Beltran, 2010). These programs have not stopped informal growth, and impact evaluation of PES programs shows no significant impact slowing informal growth (Bausch et al., 2019). While just over half of informally settled urban area was constructed before 2000 (~1700 ha, or 56%), informal urbanization has continued to expand (by 560 ha from 2000 to

2005, another 266 ha from 2005 to 2010, and an additional 474 ha from 2010 to 2015, calculated by authors from data from SEDEMA, 2016).

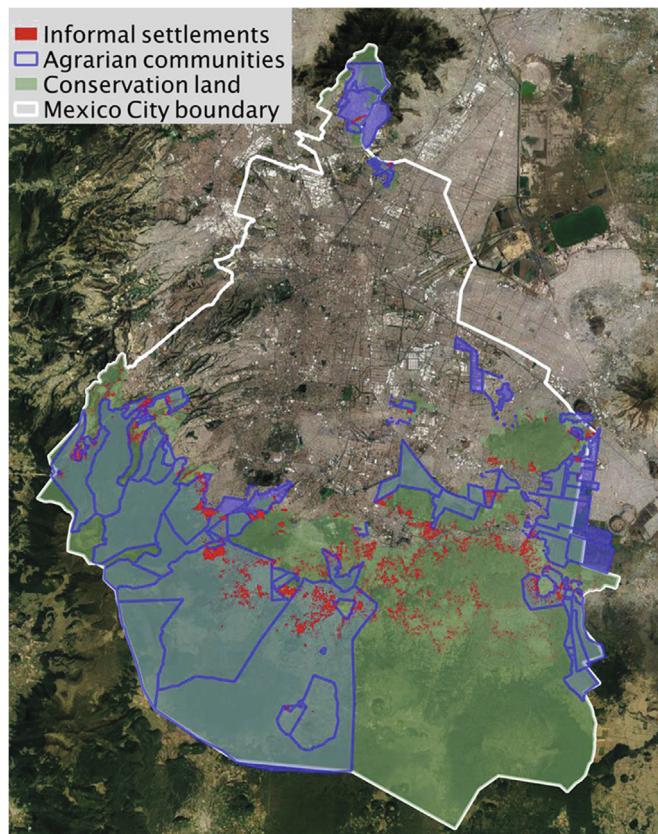
Regularization, or efforts to accommodate irregular settlements into formal urban planning and property titling, constitutes a problematic solution to the crisis in conservation lands in CDMX (Connolly & Wigle, 2017; Iracheta Cenecorta & Smolka, 2000; Varley, 1998; Wigle, 2010, 2014) and elsewhere in the MCMA (Hierna & Lindón, 1996; Iracheta Cenecorta & Smolka, 2000; Salazar, 2012a). Regularization guarantees residents access to urban services and the ability to sell and rent land legally (Cruz Rodriguez, 2000). Regularization is a complex, multi-institutional process, dependent on land tenure type and location, taking anywhere from 5 to 20 years (Connolly & Wigle, 2017; Lerner et al., 2018; Schteingart & Salazar, 2010; Wigle, 2014). For example, for private properties in the conservation zone, a Special Commission on Regularization—composed of representatives of environment, housing, and local government—reviews the impacts of proposed land zone changes from conservation to residential, approves or denies changes, and sets environmental damage fees residents must pay. Many communities are never regularized due to this long and convoluted process. Informal urbanization has outpaced regularization. Note that recent programs, such as the PRAH (Programme for Regularization of Human Settlements), implemented in 2020 (after our field work in 2016–2017) could now be changing regularization dynamics, but did not affect our interview results.

Government actors blame informal settlements for environmental damage in the conservation zone (Connolly & Wigle, 2017; Lerner et al., 2018), while ignoring the key role (and responsibility) of formal public policy and clientelism on urbanization

<sup>9</sup> The population estimates are generated by the authors of this study, combined electoral and census data with the 2017 data on informal settlements from SEDEMA—see <http://patung.lancis.ecologia.unam.mx/tellman/>. These figures represent the population living on conservation land, which is not zoned for urban use, and does not include the thousands of squatters in buildings and urban lots in the city center, homes with private title issues, and the many other ways that characterize some type of “irregular” legal situation with respect to land use or tenure (Connolly, 2014).



**Fig. 3.** Social housing units built in the State of Mexico by Infonavit (National Housing Fund for Workers) (blue line) and Mexico City by INVI (National Institute of Housing) (red line) since ~ 2000. Two axes are used since housing in the State of Mexico is 10x that of Mexico City. Data to reproduce this graph are available at: <http://patung.lancis.ecologia.unam.mx/tellman/tellman/Vivienda/> (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)



**Fig. 4.** Current informal settlements (SEDEMA, 2016) and agrarian communities (inclusive of both *ejido* and communal land) in Mexico City (compiled for this study from RAN (National Agrarian Registry), SEDEMA (Mexico City Ministry of the Environment)).

patterns (Azuela de la Cueva, 1987; Duhau & Giglia, 2008; Hagene, 2010; Varley, 1998). Clientelism, used historically by the Institutional Revolutionary Party (PRI) (Legorreta, 1991; Ward, 1998) and reproduced in contemporary Mexico City by the Party of the Democratic Revolution (PRD) (Hagene, 2010; Hilgers, 2008), is one of the few mechanisms to access housing and services for the poor, despite the political obligations this transaction engenders (Eakin et al., 2016).

Informal land transactions pervade urban development in the MCMA, from downtown real estate projects with “fast-track” regulations where legality can be bought (Wigle, 2020) to the disputed urban spaces in the city center (Duhau & Giglia, 2008). Informal rules and transactions also shape social housing, the purported solution to meet low- and middle-income housing needs. Social housing projects are responsible for a large portion of urban expansion in the MCMA, representing up to 11,000 ha of new urban growth (Salazar, 2014).

## 5. Methods

### 5.1. Four types of contemporary informal urban expansion

Preliminary fieldwork to understand informal urban expansion occurring from 2000 to 2106 was conducted from June–October 2016, undertaken in Spanish by the lead author. It included 10 interviews with academic experts on CDMX and MCMA urbanization and 10 actors shaping and regulating informal urbanization, including government officials, residents, and political leaders. These interviews and previous literature cited (Connolly, 2009; Cymet, 1992; Ward, 1998) shaped our typology of informal urbanization in the MCMA.

Preliminary interviews confirmed three types of informal urbanization prevalent in contemporary urban expansion, identified previously in the literature (Cymet, 1992), as well as a fourth not recognized in previous assessments: i) ant urbanization (direct sale of one plot to one settler), ii) illegal subdivision (one actor buys and sells many plots of land), iii) land invasion (a group of settlers illegally squat on land), and, the added type, iv) social housing (subsidized for low or middle income populations).

#### 5.1.1. Ant urbanization

Ant urbanization, or locally “urbanización hormiga”, is the direct sale of a small plot of land between two parties, resulting in incremental settlement growth (Aguilar & Lopez, 2015; Aguilar & Santos, 2011; Ruiz-Gómez, 2006). Typically, a member of an agrarian community advertises a parcel for sale on a sign or light poles, in the newspaper, or in a local store. Parties interested in purchasing land arrange a price and sign a “compra-venta”, or buy-sell contract with a notary. Often the seller offers credit to the buyer, who pays in installments. This informal sale is not illegal, but the contract has no legal standing in court because the plot is either social

property or of uncertain tenure.<sup>10</sup> We interviewed residents, intermediaries, housing and environment government officials at local and city levels, and political party leaders (from both the PRD and PRI) involved in ant urbanization on conservation land in Southern Mexico City. Residents indicated land was purchased primarily between 2000 and 2015, with informal water or electricity services installed by an intermediary in the months to years after construction. All residents interviewed were seeking formal land titles. Several residents had experienced an eviction from conservation land in 2015. Regularization for recent ant urbanization (~2008) in conservation land in Mexico City is a particularly bureaucratic and slow processes (Connolly & Wigle, 2017).

### 5.1.2. Illegal subdivision

Illegal subdivisions especially occur on *ejido* lands in the eastern side of the State of Mexico (from 2000 to 2016) and on conservation land belonging to agrarian communities in Southern Mexico City (in the 1980s-1990s). Most subdivisions occur exclusively on social property, unlike ant urbanization, which includes private land. In this arrangement, an intermediary typically purchases a large area with many plots, sometimes obtained through bribery, violence (Ruiz-Gómez, 2006), or by exploiting legal uncertainties in ownership. These institutional entrepreneurs are locally referred to as “fraccionadores”, subdividers or land flippers. Large-scale subdivisioning (>100 lots) is common in the MCMA, with smaller-scale subdivisioning on conservation land prevalent in CDMX. Previous studies recognized three modes of illegal subdivision during the 1980s—clandestine occupation, permitted occupation, and permitted/supported occupation—and the socio-political power structures enabling this informal land market (Legorreta, 1991). Together, ant urbanization and subdivision account for the 3,200 ha of informal urban growth in conservation land in CDMX (Connolly & Castro, 2016).<sup>11</sup> Actor interviews included i) residents who purchased land from or were forced to “sell” land to illegal subdividers, ii) members and leaders of *ejidos*, iii) municipal government officials in housing and environment ministries in CDMX and State of Mexico, and iv) federal government politicians currently or formally involved in *ejido* property regularization in CDMX and the State of Mexico.

### 5.1.3. Land invasion

Land invasion is colloquially referred to as *paracaidismo*, or parachuting, indicating the arrival of many people descending onto a plot of land and constructing homes. Invasions are typically directed by a political leader and occur on public or federal land, such as parks, trash dumps, small urban plots, or buildings with uncertain legal status. This form of urbanization was prevalent in Mexico City during the 1940s-1970s (Moctezuma, 1984; Ward, 1976), and immediately after the 1985 earthquake, but has since declined. New invasions continue to occur in CDMX and the MCMA, however, under the auspices of two groups, *Antorcha Campesina* (associated with the PRI (Padgett, 2014)), and *Frente Popular Francisco Villa* (FPFV, associated with the PRD). We interviewed residents, political leaders, and civic organizations involved in recent invasions that took place in Southeastern and Northern Mexico City (in 2004 and 2010) and the State of Mexico (in 2003, 2010, 2012). Interviews with city and local government actors in

<sup>10</sup> Only parcels registered in the Public Property Registry have institutional backing for individual ownership. Some settlers may have “*posesión pacífica*”, which does not guarantee legal ownership rights, but may be useful supporting documentation to “regularize” the property (give a private land title) if the settler seeks to gain legal title.

<sup>11</sup> While exact numbers of informal urbanization are unavailable for the greater metropolitan area, census districts with at least 50% of their population in “*colonias populares*”, which include both ant urbanization and subdivision, represented 66,000 ha (Connolly & Castro, 2016). The actual amount of urbanized land within these 66,000 ha is unknown.

housing and environment ministries also commented on invasion urbanization.

### 5.1.4. Social housing

Social housing is commonly ignored in studies of informal urbanization, perhaps due to its mostly “formal” nature. Social housing warrants analysis because it is designed to meet low- and middle-income housing demand, represents a large portion of the growing urban footprint, and is shaped by illegal transactions. Most government investment in social housing goes to the Infonavit (National Housing Fund for Workers) program. Access to such housing, however, is limited to those with jobs in the formal sector and incomes five times the Mexican minimum wage (Flores Peña and Soto Alva, 2010). Infonavit homes are built in the State of Mexico on the MCMA urban fringe by development construction companies on cheap agricultural, often *ejido* land. Developers leverage their political or economic capital to re-zone the land from agricultural to urban, sometimes privatizing *ejidos* (Salazar, 2014), and build housing units sold to the government, which, in turn, offers subsidized housing credit to eligible citizens. Municipalities are required to provide urban services to Infonavit homes built in their region, even though developers make the profit from the capital gain this infrastructure generates. Federally subsidized mortgages (over 70% of which are from Infonavit or FOVISSSTE (Housing fund for social security and state workers, Reis, 2017), in approved zones reduces uncertainty for the developers, keeps their profit margins high, and encourages construction in cheap land far from urban amenities.

Social housing in Mexico City (CDMX) is developed by INVI (The National Institute of Housing), which rebuilds housing complexes in vacant lots or derelict buildings and offers loans for housing projects. Homes are almost entirely accessed (>99.5% from 2000 to 2012) by residents through participation in political networks via the municipal governing party (PRD, from 2000 to 2018, and then MORENA, from 2018 on, which the PRD base supports, Reyes, 2018). INVI represents a smaller portion of urban land expansion than Infonavit, but remains one of the only options for formal housing for low-income residents. Clientelism plays a role in social housing access in Mexico City, and INVI houses were primarily given to groups of residents organized with the PRD (Hilgers, 2008).

We interviewed i) residents in social housing in the northern portion of the State of Mexico (built 2007–2010), ii) developers constructing social housing (2000–2015), iii) land use planning authorities in the State of Mexico involving in permitting approval at municipal and State scales, iv) social housing officials in Mexico City (INVI), and v) members of political groups involved in social housing in Southeastern portions of Mexico City (built ~ 2006). Interviews with *ejido* leaders and members also commented on social housing projects in the State of Mexico.

## 5.2. Interviews with actors and participant observation

Interviews were selected for actors in each informal urbanization type (Table 1) primarily based on snowball sampling (Bernard, 2006). Resident actors (N = 12) are those that purchased informal land to build a home or resided in social housing. Landowners and land “flippers” (those who resell many plots), private construction developers of social housing, and “intermediaries” (brokers of urban services to residents) were also interviewed (N = 12). Other actors included leaders of political and civil society groups distributing urban services and titles (N = 9). Formal governance actors included officials at ministries regulating land use and title, urban services, and the environment at local and city scales (N = 21).

Due to the sensitive nature of the topic, an introduction from a trusted, existing contact facilitated interviewee participation. In

**Table 1**

Categories of interviewees by urbanization type (described above), actors involved in regularization/regulation\* and simplified actor “types.” The action situation for each urbanization type involves more than the four actors listed here (e.g. government officials include those at ministry of environment which hold different interest and incentives than local political). These distinctions are represented below in the action situation for each type.

Urbanization type	Civil society, political party	Government official	Landowner, flipper, developer, or intermediary	Resident	Total
Ant urbanization	2	10	8	7	27
Invasion	4	1		1	6
Illegal subdivision	1		3	2	6
Social housing	1	2	1	1	5
Regularization*	1	8			9
Total	9	21	12	12	54

\*Many government actors are involved in land titling across urbanization type. Of the 21 government actors interviewed, 4 regulate the environment and mitigate urbanization (PAOT: Procuraduría Ambiental y del Ordenamiento Territorial de la Ciudad de México/The Environmental and Regional Planning Attorney General's Office, AZP or Area de Zona Patrimonial, SEDEMA: Secretaría de Medio Ambiente de la Ciudad de México/ Secretariat of Environment of Mexico City), 7 are involved in titling (CORETT: Comisión para la Regularización de la Tenencia de la Tierra/ Commission of Regularization and Land Tenure, DGRT: Dirección General de Regularización Territorial/Ministry of Land Regularization), RAN: Registro Agrario Nacional/National Agrarian Registry, FIFONAFE: Fondo Nacional de Fomento Ejidal/National Ejido Growth Fund, INSUS: Instituto Nacional de Suelo Sustentable/ National Institute of Sustainable Land), 3 in urban service provision (CFE: Comisión to, CFE: Comisión Federal de Electricidad/ Federal Electricity Commission, SACMEX: Sistema de Agua de la Ciudad de México/ Water System of Mexico City: city legislators), and 6 with urbanization directly (local government, SEDUVI: Secretaría de Desarrollo Urbano y Vivienda de la Ciudad de México/Secretariat of Urban Development and Housing for Mexico City, INVVI: Instituto de Vivienda de la CDMX/ Institute for Housing, Mexico City).

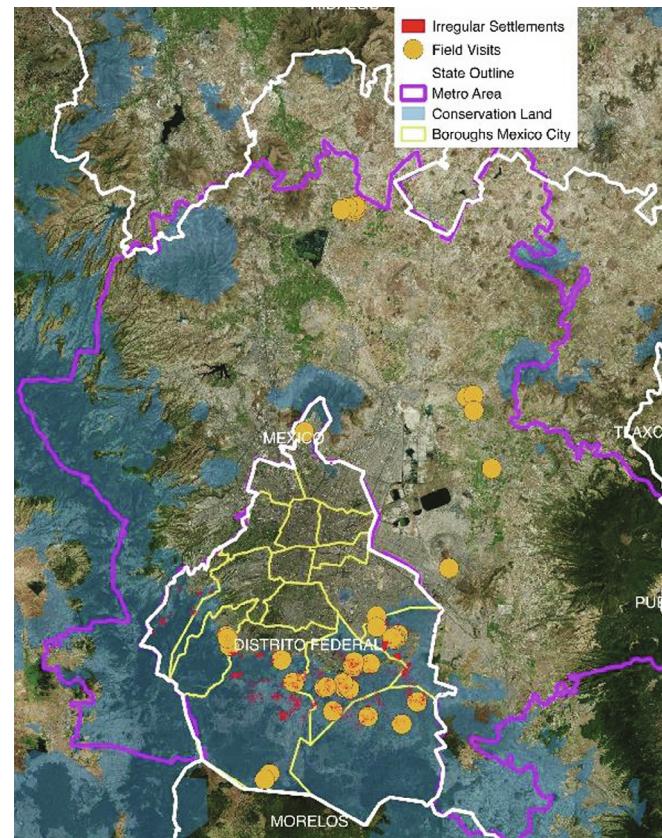
general, interviewees provided rich detail about corruption, clientelistic exchange, and the nature of land transactions. Developers of social housing, however, were reluctant to grant interviews, save one. In settlements controlled by political brokers (especially land invasions), these entrepreneurs permitted interviews with select residents, potentially biasing results. Interpretations thus required triangulation among interviewees, media, and additional academic research published by local scholars (Flores Peña & Soto Alva, 2010; Schteingart & Salazar, 2010). Information gaps were addressed through consultation with experts and published literature.

The first author conducted fifty-four interviews from October 2016–August 2017 in the MCMA in government offices and communities where urbanization was taking place (Fig. 5 identifies the approximate locations of 18 communities). A larger number of actors were interviewed for ant urbanization because it took longer to reach saturation (the point where no new evidence was obtained) due to the high amount of variance in transactions and actors involved.

Semi-structured interviews were employed, aimed at understanding the perceived costs and benefits to each actor from four possible land-use outcomes: urbanization, regularization, eviction, or service provision. Urbanization is an outcome of the decision to change land use from forest or agriculture to build a residential home. Regularization includes land tenure (e.g., granting property titles) and zone changes (e.g., regulation change from agricultural to urban). Note including both zoning and property titling, each of which may involve distinct actors, we are oversimplifying the action situation for regularization outcomes, but payoffs are similar. Eviction or “mitigating” urbanization involves the removal of homes to prevent urban growth. Providing services includes informal or formal development of utilities such as water, electricity, or drainage services.

Interviews involved questions about buying or selling land, the motivations for exchange, conditions of transaction, the price, the time and process to access services and titles, and government agencies that hindered or facilitated the process (see *Supplementary Materials* for the survey instrument). Government regulators were questioned regarding their role in regularization, eviction, and service provision, and other agencies that facilitated or obfuscated their mission. Selected quotes from the interviewees illustrate the results. Pseudonyms replace actual names.

Participant observation in field sites and government meetings allowed for collection of additional information on institutional entrepreneurs, such as intermediaries. Government meetings attended include the CREX (Special Commission for Regularization, where representatives of government agencies consider regulation



**Fig. 5.** Map of field sites (approximate location) to informal urbanization sites across The Mexico City Metropolitan Area.

of conservation land) and meetings to plan evictions. Interviews were conducted with leaders of political groups well known for organizing land invasions, namely *Antorcha Campesina* and the *Frente Popular Francisco Villa Independiente* (FPFVI). We employed participatory mapping to delineate the territories the organizations were responsible for urbanizing, using a GIS.

### 5.3. Interview coding and analysis

All interviews were recorded and the transcribed notes thereof were analyzed using the qualitative analysis software *Dedoose* (version .80 35-Dedoose, 2018). Codes were based on the action

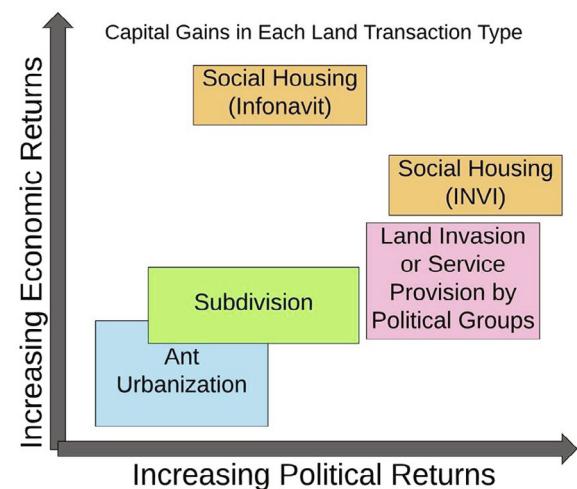
situation variables (Fig. 1), including access to information (high, medium, or low), control (high, medium, or low), and payoffs (positive, neutral, or negative) to each actor in the four aforementioned outcomes: urbanizing, regularizing, evicting, or providing services. We coded interviews for four types of payoffs: i) political (e.g., gaining votes, climbing the party ladder), ii) economic (earning money from kickbacks, bribes, sale of land, or money for taxes or budgets), iii) land (and access to a title), and iv) social (exclusion, violence, prestige, control). Categories for payoffs (positive = 1, negative = -1, and neutral = 0), access to information (high = 3, medium = 2, or low = 1), and control (high = 3, medium = 2, or low = 1) for each actor were qualitatively assigned based on interviewee responses. For example, a resident's comment that they had no knowledge of land zoning or regulation processes would be categorized as "low information". An actor's report that they cut electricity from residents who stopped participating politically would be labeled "high control." In contrast, an actor noting their intended eviction was blocked by another actor or hindered by budgetary problems was labeled as "low control."

Payoff degree and type, information, and control per actor in each action situation were recorded in an institutional matrix for the four urbanization types studied. Academic literature, media, or government reports was used to supplement missing information in the institutional matrix ( $n = 10$  marked with a \* in the [Tables 1-4 in Supplementary Materials](#)), and in some cases no evidence was available ( $n = 9$ , marked as "no evidence" in the table. Actors with insufficient evidence are either not displayed in the action situation diagrams, or marked as "NA" or with no vertex placed on the payoff surface). The payoff surfaces (Fig. 2) for each outcome are displayed by multiplying the level of control by the payoff (to plot the vertex of each actor) and drawing a polygon connecting all vertices. Thus, the most powerful actors (control = 3, blue font for emphasis) shape the payoff distribution surface three times that of the least powerful actors (control = 1, in lighter grey font). Payoffs types (social, political, economic, and land-based costs and benefits) are detailed in the institutional matrices and indicated on payoff surface radial plots.

We aimed to capture the essential structure of contemporary informal urban land transactions, focusing on two axes of variation: urbanization and actor type. This simplification aids comparison of distributional outcomes and payoff surfaces among actors at the expense of "flattening" difference in political payoffs, resident perspectives, or social housing in distinct locations (State of Mexico and CDMX respectively), which future work could address. We analyze social housing as one "type" of urban land transaction to formally meet low income housing needs, recognizing the payoffs to institutional entrepreneurs may differ between the State of Mexico and CDMX. Political returns to actors could differ spatially across differences in ruling party, histories of electoral competition, and land titling and regularization processes in public and private land (see [Albertus et al., 2016](#); [Castañeda Dower & Pfutze, 2015](#); [de Janvry et al., 2014](#); [Larreguy et al., 2015](#)) for studies of land titling and electoral competition in Mexico). Qualitative interviews limited the number of resident interviews and perspectives captured ( $n = 12$ ). While a survey would increase sample size, it may not capture the nature of informal transactions we aimed to understand.

## 6. Results

We summarize four types of urbanization by the degree of political and economic payoffs to institutional entrepreneurs (Fig. 6). Ant urbanization generates the smallest concentration of economic and political capital relative to other types, and was common in conservation land in CDMX. The direct seller of land makes a modest amount of money, but the returns are distributed



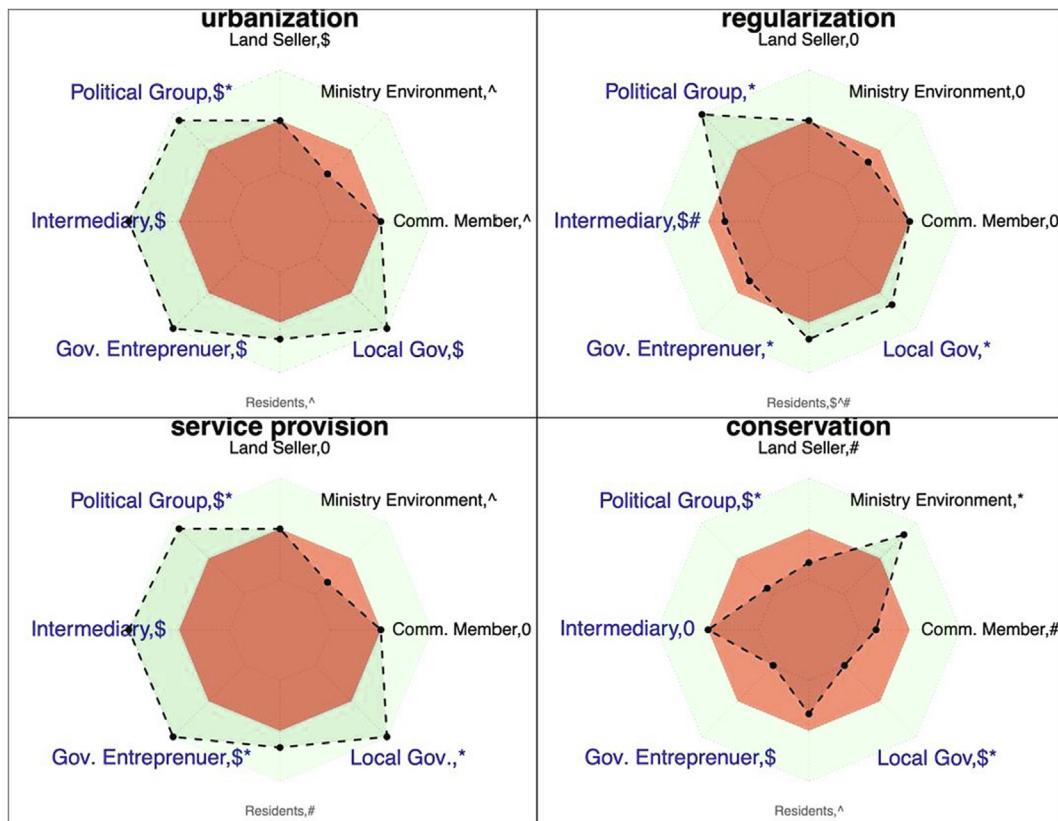
**Fig. 6.** The main types of payoffs for the four urbanization types (one color for each) studied in the Mexico Metropolitan Area. Social housing in CDMX (INVI) and State of Mexico (Infonavit) are socio are separated here due to different types of capital returns for actors in each location. Political returns include votes, political power used to climb position in one's political party, or ability to convene mass mobilization. Economic returns include money received through bribes, taxes, profits, or land sales.

through the various landowners. Subdivision generates larger economic returns than ant urbanization and returns are concentrated in one actor, and was more common in the State of Mexico than CDMX. The political returns (including, but not limited to votes, ability to climb party ranks, and capacity to convene protests) may be somewhat higher but are similar to ant urbanization. Land invasion generates large political returns. The economic returns can be higher than subdivision, or similar, depending on the size of the invasion. Participatory mapping with two invasion groups revealed they claim 37 communities on 600 ha, less than 2% of the area of urban land growth in the MCMA. Social housing in the State of Mexico through Infonavit generates the highest economic returns, concentrated in one developer. It is the largest and most concentrated set of economic returns to the developer and, potentially, the *ejido* or municipality involved via taxes or kickbacks. In contrast, social housing in Mexico City through INVI involves a political instead of economic payoff, accumulated by housing groups associated with one political party ([Reyes, 2018](#)).

Four types of informal urbanization and their corresponding payoff surfaces identify the institutional entrepreneurs (with larger and blue colored font) and distribution of losses and benefits in each of four potential land-use outcomes (Figs 7-11). Land outcomes are more persistent when payoff surfaces shade a larger portion of green area (benefits) compared to a revealed red area (costs). Details about the types of payoffs are summarized in the institutional matrix for each urbanization type in the [Supplementary Materials](#) (SI Tables 1-4).

### 6.1. Ant urbanization

Ant urbanization payoff surfaces illustrate the motivation for continued urbanization and service provision, as opposed to regularization or environmental mitigation. Most actors gained when land was urbanized or services provided, only some gained when land was regularized, and only one actor, the Ministry of the Environment, gained when urbanization was mitigated via conservation efforts. City residents may gain from ecosystem services when urban growth is prevented, but had no agency in this action situation (except indirectly, via their vote in local elections).



**Fig. 7.** Payoff surfaces for ant urbanization. Relative power indicated by larger font size and blue coloring, with medium power in black font and less power in grey font. Benefits are in green and losses in red. Payoff types for capitals in the following symbols: \* = political (e.g. votes, climbing party ladder), \$ = economic (pesos, taxes, budgets), ^ = land, # = social (exclusion, violence, prestige, control), 0 = no stake, no payoff. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Urban services were provided by intermediary actors. Intermediaries are either residents with higher political capital than their neighbors or political party brokers who profit by collecting fees from residents (~10,000 pesos [\$500 USD] for enabling illegal services), a portion of which is paid to government utility employees that make the service connections. Intermediaries reportedly used violence and threats to enforce informal contracts with residents, especially in the case of non-payment or complaints about fees. As one resident reported:

*“Darla comes and she sells the electricity. And she passes the money to CFE [the federal electricity company]. She charged 10,000 pesos for electricity and another 10,500 for water and we must pay in cash. She is violent... one woman from a nearby community came and informally added her cable into our system, and she received threats [from Darla].”*

In some cases, political brokers, often borough leaders or local legislators, provided services like electricity in exchange for political support in campaigns, “Jones [a city legislator] helped with the electricity, but the local government put in the other 50%. We had to sign a promise to support his campaign.” High need, fear of losing services, and low access to information regarding rights lead to residents’ compliance with these conditions of exchange.

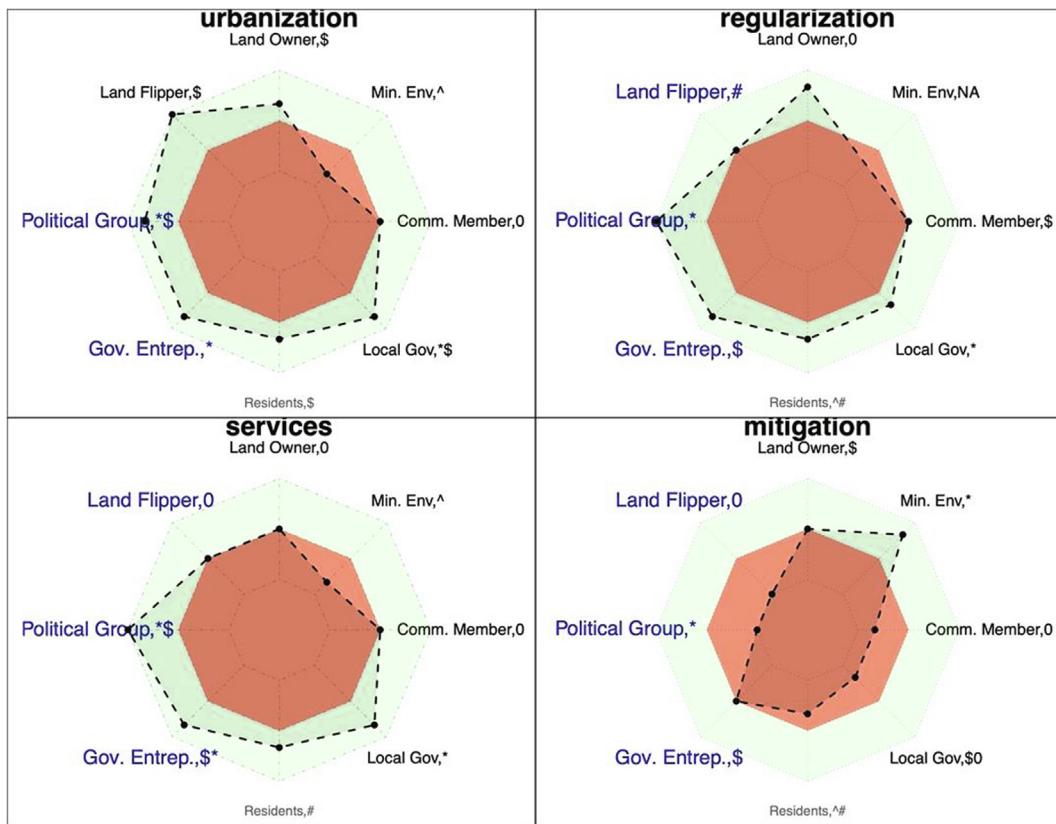
Regularization rarely occurred, especially in Mexico City. It is rare because of competing interests among actors (Fig. 7) and the complexity of conservation land regulation introduced in 2008. Regularization benefitted residents who gain certainty over land tenure and access to affordable legal, urban services, but provided mixed payoffs to landowners. Interviewees mentioned regularization enabled legal landowners to “sell the land twice,” first on the

informal land market to the resident, and second to the government who compensated them (but far below market land value) for land expropriation to “formalize” the sale. Losing land to expropriation is an opportunity cost because that parcel can no longer benefit from use for tourism, agriculture, or environmental services.

In contrast, regularization represented a cost to institutional entrepreneurs (Fig. 7) who lose opportunities to profit from “selling” informal services. Political actors attempted to capture votes and political support through the promise of regularization in campaigns, but ultimately were unable or unwilling to grant title. Regularization may also be blocked by environmental and civil protection agencies because it contradicts their institutional mandates to protect conservation land or to ensure residents do not live on land at risk of flooding.

Actions to mitigate urbanization seldom occurred because the costs largely outweigh the benefits. Only the Ministry of Environment benefitted from preventing urbanization on conservation land, which is part of its mission. While it is the most informed actor regarding the rate and location of informal urbanization, it was under-resourced to enforce regulations or enact eviction of informal settlements.

Institutional entrepreneurs, especially government officials, stood to gain both politically and economically from thwarting urbanization mitigation strategies. Interviewees explained that evictions were often blocked by *ejido* presidents, local borough leaders, or mayors, all who have legal jurisdiction to prevent an eviction. Evictions were prevented at inconvenient political periods (e.g., immediately before elections) or when entrepreneurs are profiting from urban services or charging “right to stay” fees.



**Fig. 8.** Payoff surfaces for subdivision. Relative power indicated by larger font size and blue coloring, with medium power in black font and less power in grey font. Payoff types for capitals in the following symbols: \* = political (e.g. votes, climbing party ladder), \$ = economic (pesos, taxes, budgets), ^ = land, # = social (exclusion, violence, prestige, control), 0 = no stake, no payoff. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Even when evictions occurred, some residents often returned and rebuilt.

Those who sold conservation land rarely experienced consequences. Interviewees claimed they did not report land-use violations unless they had a bad relationship with their neighbor: “Unless your neighbor really does not like you, they won’t report you.”

Even if the neighbor reports, government officials are easily bribed by residents to avoid sanctions. *Ejido* or community members rarely sanctioned the member who sold land. Importantly, the sale of conservation land resides in an “a-legal” grey area. Construction by residents on conservation land, however, is a punishable crime. The cost of regulating urbanization was highest for residents, even though they gained less relative to other actors in the informal land market (Fig. 7).

Financial incentives to landowners to increase the value of land for non-urban uses was lower than the potential benefits from selling land informally (Fig. 7, in mitigation, the land seller vertex is close to the neutral line, but in urbanization, the vertex moves out into the green benefits space). Both *ejido* members and the Environment Ministry employees agreed that environmental service payments (~1 peso/ha) were too far below opportunity costs of agricultural production (6 pesos/ha) or selling land on the informal urban market (50 pesos/m<sup>2</sup>).

## 6.2. Subdivision

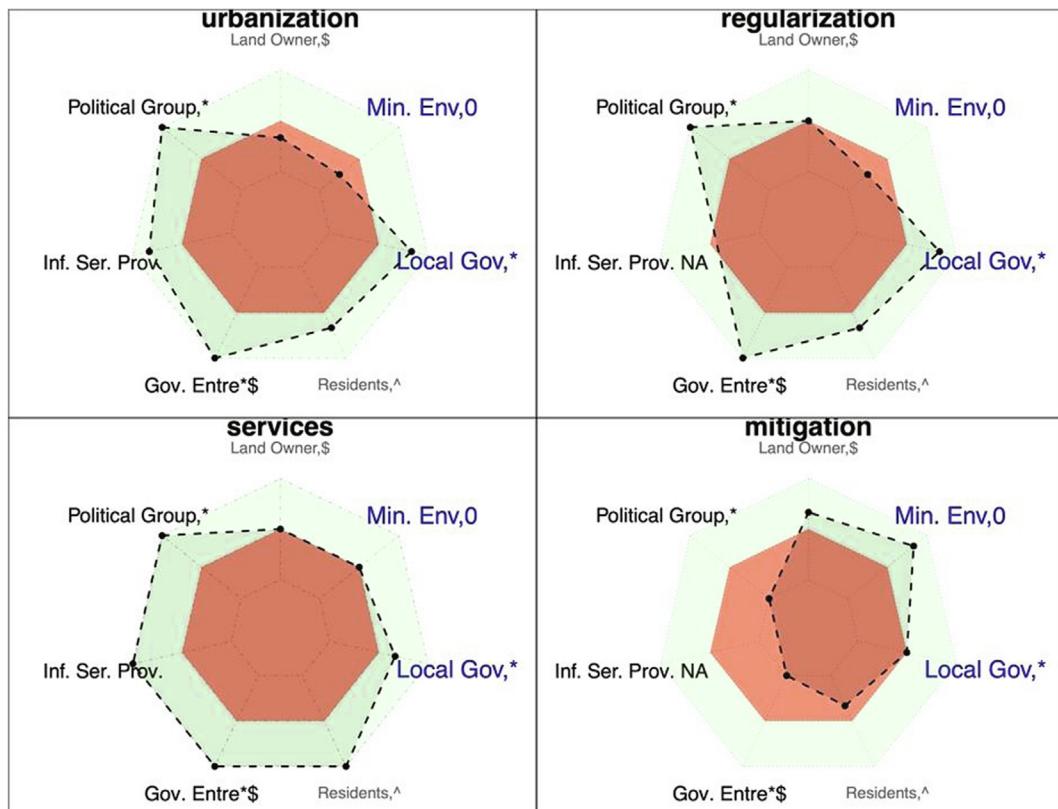
Payoffs for subdivision are similar to ant urbanization but profits are more concentrated in the “land flipper” (Fig. 8). In this case, payoffs promoted regularization, and there were no independent intermediaries providing services. Rather, services were provided

by a political party or group, a government official, or an *ejido* leader facilitating the transaction.

Subdividers included a diversity of powerful actors whose political and economic gains increased in accordance with their institutional influence and area of land they transacted. Subdividers included “corredores” who facilitated land subdivision for a fee at 10% interest to the landowners (see also Cruz Rodriguez, 2000), and entrepreneurial *ejido* or community members who bought land from extended family and resold lots through a lawyer (typically 10–50 lots). *Ejido* presidents may sell large tracts of land or facilitate sales for other members, and other illegal subdividers may sell land they do not own (>100 lots). The most influential subdividers were political parties that brokered large deals with agrarian leaders and resold to poor residents with credit (100s–1000s of lots).

Of all actors in subdivisions, the subdividers received the largest benefits for urbanizing land, gaining up to 1000% profit in some cases, by our calculation. They reportedly used part of their earnings to pay off government officials to avoid sanctions: “... if you each give me 10,000 pesos, nothing happened here.” These institutional entrepreneurs exploited legal uncertainty in communal property systems by falsifying property documents from other states outside CDMX through political connections, sold social property in communities awaiting legal title, and paid property taxes on lots they did not yet own to establish ownership.

*Ejido* members preferred informal land sale to land flippers because legally selling the land required disincorporation from the *ejido*, representing a high transaction cost. In other cases, *ejido* members were exploited when faced with significant pressure to sell. *Ejido* members also reported being tricked by subdividers who disappear before full payment is received.



**Fig. 9.** Payoff surfaces for invasion. Inf. Ser. Prov. = Informal service providers, such as the Mexican Electrician's Union. Relative power indicated by larger font size and blue coloring, with medium power in black font and less power in grey font. NA is marked for outcomes in which they have no stake. Payoff types for capitals in the following symbols: \* = political (e.g. votes, climbing party ladder), \$ = economic (pesos, taxes, budgets), ^ = land, # = social (exclusion, violence, prestige, control), 0 = no stake, no payoff. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

Regularization was more common in subdivisions, especially in the State of Mexico outside conservation land, than for ant urbanization. Beneficiaries of regularization included residents who received title and government officials facilitating the transaction who gained politically and economically. Regularization represented an opportunity for graft in the centralized federal agency that regularized *ejido* land, where reportedly "...expropriation is a business of corruption." Regularization represented a relatively small benefit to *ejido* members because expropriation compensation was small.

Only the Ministry of Environment benefits from preventing subdivision, and there were rarely consequences for subdividers. Our interviewee revealed how *ejidos* struggled to sanction members because of uncertain legal boundaries, social norms, threat of violence and even death. Non-*ejido* family members who are often the entrepreneurs selling land, could be sanctioned by members. Agrarian communities could not afford to pay the legal fees in agrarian courts to obtain the rights to sanction subdividers. Strong social norms, however, prevented sanctioning: "We don't get involved in people's inheritances. How do we sanction someone's grandson?"

Local governments were incentivized to protect subdividers, due to increasing tax revenue new settlers generate. One government official explained that his supervisor told him not to sanction a subdivider because his settlements brought more than two million pesos (~100,000 \$USD) to the municipality annually. Subdividers exploited residents who did not understand formal property rights. In one court case, "... the people [residents] showed their contracts on a napkin." Evictions, requested by local governments and carried out by the Ministry of the Environment, represented high costs to residents who lost their home. Sometimes

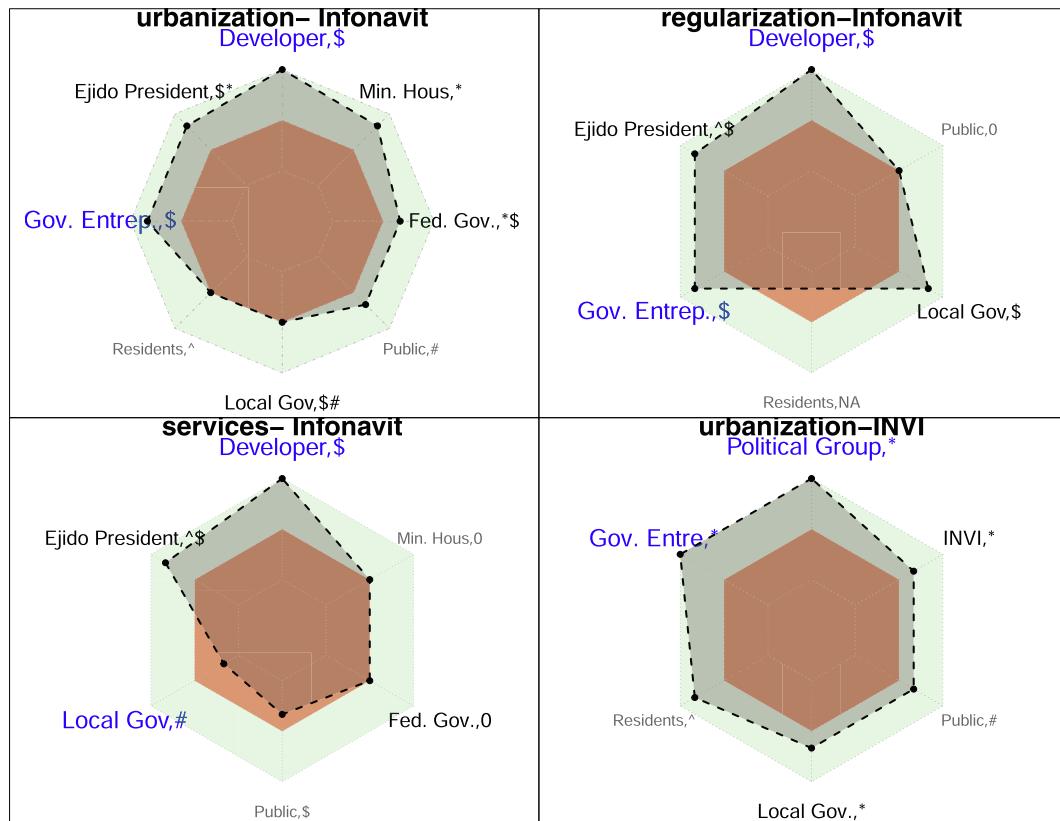
other institutional entrepreneurs reportedly used threat of eviction to punish bad voting behavior or extort residents for money.

### 6.3. Invasion

The payoff surface of urbanization, service provision, and regularization in land invasions generated political benefits to three entrepreneurs—informal service providers, political groups, and government actors—with little cost to other actors with influence (Fig. 9). As a result, all three of these land outcomes happened frequently and rapidly in land invasions. The information asymmetry between residents and the political groups offering land was smaller for land invasion than that for subdivision and ant urbanization.

The distribution of costs and benefits between landowners and "invading" groups was unclear and sometimes the process of invasion and subdivision became fused, depending on the degree of consent attributed to actors in the process. While political groups like *Antorcha Campesina* were typically associated with land invasion in media and academic discourse (e.g., [Hiernaux and Lindón, 1996](#)), interviews revealed a more complex picture. *Antorcha* leadership and some public officials reported sales were always done with the consent of *ejido* leadership, and should not be considered invasions. Nevertheless, some *ejido* members characterized "consent" as coercion, "Members of *Antorcha* steal crops, beat, or kill other members, so it's just better to sell [to *Antorcha*]." A government official confirmed the use of violence to gain consent: "Antorcha...they make deals with the *ejido* members...with a pistol!"

For the resident, land and services were more cheaply acquired through these political organizations than through intermediaries in subdivision or ant urbanization. The organizations relied on political power, not bribes, to enforce contracts. Invading organiza-



**Fig. 10.** Payoff surfaces for outcomes for social housing (Infonavit and INVI). Relative power indicated by larger font size and blue coloring, with medium power in black font and less power in grey font. The only payoff surface for INVI social housing (in CDMX) is its construction, because services and regularization are already formal and this not a possible outcome of that action situation to consider. Payoff types for capitals in the following symbols: \* = political (e.g. votes, climbing party ladder), \$ = economic (pesos, taxes, budgets), ^ = land, # = social (exclusion, violence, prestige, control), 0 = no stake, no payoff. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

tions sometimes had prearranged contracts for service provisioning, for example, with the Federal Electricity Agency (CFE) or the Union of Mexican Electricians. In other cases, invading organizations successfully brokered services with local governments through mass mobilization. As one government official in the borough of Iztapalapa noted, "...they take what they need. They don't ask for things, they demand them." Local governments facilitated informal service provision, for example, by "... allowing a water pipe to lay around nearby so that someone can connect to it magically in the middle of the night." Invading organizations solved the problem of service provision for informal settlements and in return, the government official enjoyed political support from these groups and their residents.

Residents paid the cost of urban service access through this political participation. *Antorcha* required a minimum of two years of participation in protests and meetings for the right to purchase a plot at relatively low prices. Control over electric service provision was used to enforce participation with the politics of the organization, although the rates for utilities is also relatively low: "They each pay 800 pesos, but we [land invasion leaders] cut their electricity if they don't participate---if they don't go to the protests. Cutting electricity is our control." Yet for other residents, the transaction costs of political participation were too high:

*"We go to marches, and meetings each Sunday. We have to sign records of our attendance at protests and marches [when requested by the political party]. We can't miss three events or they kick us out! ... We have no secure life.... We can't even go to work!"*

Despite the burden of time, residents entered the exchange because they had few alternatives, or perceived these terms to be better than ant urbanization or buying in a subdivision.

The political transactions between residents and entrepreneurs facilitated regularization and impeded evictions. Politicians, often former invasion leaders, used their invasion constituencies to climb the political ladder: *"That legislator put names on housing lists because there were electoral clients. She did not do it to keep her existing position, but to gain power in the same party."* One politician changed the boundary of a protected area to grant titles to her supporters. Former land-invasion leaders were appointed to environmental regulatory agencies and used their position to prevent evictions for the groups who brought them to power. In one notorious case, an interviewee explained a politically powerful institutional entrepreneur successfully blocked eviction in a protected area for 10 years.

#### 6.4. Social housing

Fewer actors constitute the action situation for social housing compared to other types of informal urbanization (Fig. 10). As no actors worked to mitigate social housing, it was not an outcome in the action situation and has no payoff surface. Benefits were largely distributed to developers and the government actors receiving their kickbacks.

The power of the primary institutional entrepreneur, the developer, resides in their access to regulatory information and their influence over local land zoning plans in the State of Mexico. Insuf-

ficient planning capacity in local governments made it easy for developers to manipulate land-use zoning to favor their interests. This control allowed them to ensure profits from purchasing agricultural land and selling homes on land newly zoned for urbanization with services supplied by the local government. Interviewees reported that the "external" audits of these transactions were often done by the developers themselves. These political and economic arrangements allowed the developer to secure significant payoffs:

*"The State and local government have been our silent business partner...there are prearranged deals. They never oppose us. The developer says, 'how do we get this done,'...manages the environmental impact study...and pays for the new altered land zoning plan."*

Ejidatario land sellers capture relatively low profits (Fig. 10). *Ejido* land sales must be offered to members at a lower price before being sold to an outside entity (*derecho al tanto* in Mexican agrarian law). Interviewees asserted that developers took advantage of this law by becoming an *ejido* member to purchase this discounted land, but then sold it for market value.

The benefits to municipalities of building social housing in the State of Mexico were mixed. Municipalities already struggled to provide urban services due to inadequate resources, but were required to extend services to new social housing units. Municipalities benefitted from increased tax revenue; however, some politicians enjoyed kickbacks or even formal profit shares as investors in some development companies.

Paradoxically, the distribution of costs from social housing in the State of Mexico fell on the actors whom social housing was intended to benefit, residents and the public. Due to poor construction and distance from urban amenities, many social homes were either abandoned or remain unoccupied<sup>12</sup> (Salazar, 2014). Developers attempted to recover and resell abandoned homes. In a bizarre overlap with land invasion, one architect reported developers made deals with *Antorcha Campesina* to invade abandoned social homes. This process brought the case to court, where the judge annulled ownership of the missing homeowners, and developers resold.

In contrast, social housing in CDMX was accessible to low-income residents and with less interference from developers. However, the high transaction costs of paperwork to get one's name on a list meant a resident must join a political group to access a home. Government officials described that economies of scale for political returns meant that only large groups of political organized applicants could gain access in this program:

*"They [political groups] buy their housing projects from the workers in the housing ministry [e.g. via bribes]. All the housing projects are distributed to the PRD [ruling left] party. Then the leaders offer their members' [of their local political organization] homes. The political and social benefits get mixed up."*

Similar to invasion access to social housing in CDMX costs residents required political participation.

## 7. Discussion

### 7.1. Informality influences urban expansion with environmental consequences beyond informal settlements

Informal transactions shape urban expansion in Mexico City, from formal to informal settlements (Duhau & Giglia, 2008; Wigle, 2020), but social housing merits special attention. In CDMX

and the MCMA, social housing has been an inefficient solution to the problem of housing access for populations living in informal settlements. Social housing represents a significant portion of MCMA's land use change from agricultural to urban land-uses over the past 15 years, although other informal settlements types (e.g. ant urbanization, invasions, or illegal subdivisions) are typically blamed for environmental degradation (Eakin et al., 2019; Lerner et al., 2018). Powerful rent-seeking actors accrue benefits from publicly funded social housing in the State of Mexico that put pressure on under-resourced municipalities for services. The social and environmental costs of this "formal" solution to low- and middle-income housing indicate that these transactions require as much or more scrutiny than more tangible informal settlements. Our findings echo recent perspectives calling for greater attention to powerful institutional actors in urban informality research who accumulate capital via informal transactions and politics (Banks et al., 2020).

### 7.2. Payoff surfaces highlight how actors and their incentives shape persistent land-use outcomes

Urban expansion persists in Mexico City because "everybody wins" (Flores Peña & Soto Alva, 2010), but our results emphasize some actors benefit more than others and in different urbanization types (Fig. 6). From developers to the *corredores*, to the political broker, to the *ejido* member, it is the person directly selling land, homes, or urban services to the poor that captured the majority of benefits from informal exchange. The most powerful actors aggregated benefits across large spatial and temporal scales, either by selling multiple plots in many locations, or with speculative investment where they waited for gains to accrue over time (e.g., by developing on agricultural land and capturing capital gains with subsequent urban zone changes). These persistent power dynamics have been documented in research on informal urbanization in Mexico City for the past 50 years (Cornelius, 1972; Iracheta, 1984; Legorreta, 1991; Ward, 1976).

Payoff surfaces tended to favor urbanization, disfavor conservation, and either stagnate or accelerate regularization (e.g., in ant urbanization or invasion, respectively). "Inaction" toward informality in Mexico City (Azuela de la Cueva, 1987; Connolly & Wigle, 2017; Iracheta Cenecorta & Smolka, 2000) and elsewhere (Roy, 2005; Van Gelder, 2013) is not due to ineffective bureaucracy, but rather is shaped by payoffs to intermediaries and political groups. Government officials may receive bribes from intermediaries, residents, or land flippers who seek to avoid sanctions. Actors preventing eviction and facilitating social housing in Mexico City gather clienteles of residents and receive promotion within their political party, but more work is needed to understand how political history or electoral competition shape outcomes. Payoffs were not just personal but also institutional; local governments received increasing budgets, tax revenues, and new votes to capture with informal expansion and ensuing population growth. Efforts to eliminate informality (e.g., through eviction) or reduce it by rendering it legal (e.g., through regularization) are unlikely to succeed if they run counter to political and economic incentives promoting expansion.

Acceleration of land titling or land zoning changes was favored for invasions, social housing in the State of Mexico, and subdivisions because political and economic returns concentrated among institutional entrepreneurs with power to affect outcomes. Cost and benefits of regularization were diffused among a diversity of actors in ant urbanization, however (Fig. 7). Regularization represented a cost to intermediaries who distribute public goods informal residents cannot access, and to the Ministry of Environment who feared it incentivized urban growth. Regularization benefitted local governments and political parties with informal residents' votes and political sup-

<sup>12</sup> over 500,000 across the country are unoccupied ("Infonavit, dispuesto a demoler viviendas abandonadas," 2019; INFONAVIT, 2015), and only 20% of the social homes built in 2012–2013 were sold (Alcantara, 2014)).

port. These conflicting incentives generated inertia in land titling and perpetuated informality in ant urbanization.

### 7.3. Consequences and benefits of informal urban expansion

Ultimately, this research raises questions not only about the effectiveness of current policies to control informal urban growth, but also why it is considered a problem in the first place. We suggest the problem lies in the negative externalities associated with informal land transactions, and how these shape housing for the urban poor, degradation of conservation land, social exploitation of informal settlers, and rent-seeking of public officials.

Our analysis illustrates that until housing needs for the urban poor are addressed sufficiently, informal settlements will continue to represent political and economic rent to capture. Ant, subdivision, and invasion emerged to fill this unmet demand and together provided housing for nearly twice as many residents (~100,000) as the social housing ministry (~54,000) from 2000 to 2015 in CDMX (INVI). The “success” of urban expansion was made possible by the institutional innovation of entrepreneurs and the functional role of clientelism, corruption, and rent-seeking.

Reliance on informal settlements to meet housing needs has environmental costs (Aguilar & Santos, 2011; Santos, 2013). MCMA has urbanized over 73,000 ha of land from 2000 to 2015, an estimated 11,000 ha (15% of urban growth) of which is inefficient, and often vacant, social housing constructed in ejido lands (Lincoln Institute of Land Policy, 2016; Salazar, 2014). Yet, the public discourse regarding the root causes of water insecurity (potable water supply) focus on ant urbanization (Eakin et al., 2019; Lerner et al., 2018), which only represents 3,200 ha (4% of urban growth). If environmental disservices, such as reducing aquifer recharge, are the issue of concern, subsequent research should compare the impact of ant urbanization with social housing, and consider which plays a larger role in reducing infiltration to the aquifer reducing.

Social costs of informality included exploitation and corruption. Corruption is a concern because it is a non-transparent distribution of public resources. There are two types of corruption: an adaptive response to evade high transaction costs and an opportunity for economic gain (rent-seeking). The latter is of larger concern. Institutional entrepreneurs took advantage of residents' information asymmetry, legal vulnerability, already meager paychecks, and votes. The degree of exploitation differed by urbanization type, and is experienced differently by residents. Contrary to some academic discourse, which has accused land invasion groups like *Antorcha Campesina* of “lack of transparent interests, violent action, and fascist tendencies” (Hiernaux & Lindón, 1996), residents were more exploited in land invasions than in the alternative informal processes. Research on political groups like the FPFV demonstrates some residents accessing housing and services through clientelism feel exploited, while others see clientelism as the mechanism to hold politicians accountable and build community (Hilgers, 2008).

### 7.4. Leverage points to mitigate negative outcomes of informal urban growth

Existing policies could be reexamined based on their ability to address the aforementioned issues of concern, instead of their ability to eliminate informality. Once a negative externality is identified, payoff surfaces locate the associated actor and the leverage point that advances undesirable outcomes. Initiatives to mitigate urban growth on conservation land include both carrots (environmental incentives to agrarian communities) and sticks (eviction). A growing set of land regulation instruments and “politics of containment” (Pezzoli, 2000) were implemented in the 1990s but has failed to mitigate growth. Local governments “regulate” urbanization through forgiveness rather than planning, updating land

plans to reflect the most recent illegal urban expansion (Lerner et al., 2018). Eviction policies blame residents as the engines of environmental destruction instead of the actors who largely drive these processes.

Potential strategies include regulating people, not (only) land, working with (rather than against) local institutions, and improving transparency and sanctioning of public actors. Land-use regulation policies will fail to achieve their aims unless they realign incentives of people who make decisions to change land use. As an example, Mexico City's Bando Dos policy (2000–2005) to prevent informal growth on conservation land and densify the urban core backfired because it increased land values in the city center, induced gentrification, and pushed residents to the urban periphery (Celis & Villaruel, 2013; Delgadillo, 2016; Gilbert et al., 2016; Tamayo, 2007; Wigle, 2020). Alternatively, regulating people implies developing policies to shift incentives and encourage different land-use outcomes in the action situation. Examples include providing access to affordable housing at prices competitive with the informal land market, sanctioning actors who sell land, or accelerating regularization to reduce the political capital involved. Regularization offers government resources, social status, and more power to residents (Banks et al., 2020). However, scholars raise concerns that regularization could promote further informal urban expansion (Eibenschutz Hartmann & Benlliure, 2009; Iracheta Cenecorta & Smolka, 2000), but empirical, quantitative studies have yet to test this hypothesis in Mexico City.

Increasing payments for environmental services or developing long-term conservation easements could disincentivize owners from selling conservation lands. The entrepreneurship of existing intermediaries and government officials could be leveraged to provide environmental-friendly urban services. Local governments could offer subsidized rainwater capture, solar power system, or compost-based sewage. Residents themselves could become institutional entrepreneurs. Decades of research in urban planning support examples of institutional entrepreneurs in informal settlements in Mexico City and elsewhere who demonstrate the agency and ability to transform social environmental conditions (e.g (Charli-Joseph et al., 2018; Jane Jacobs, 1965). In Mexico City and elsewhere in Latin America, local politicians block evictions to gain political capital with settlers (aka “forgiveness” (Holland, 2016)). Increasing transparency via improved efforts to monitor and sanction public actors to combat rent-seeking, exploitation, and impunity.

## 8. Conclusion

Despite a wealth of scholarship on informal urbanization (McFarlane, 2012; Pradilla, 1995; Roy, 2009; Varley, 1998 and others), informality is still discussed as external to the norm by urban planners (Lerner et al., 2018), in studies of urban expansion (Henderson et al., 2016), and absent from quantitative analysis of land-use change (Tellman et al., 2020) and urban resilience (Eakin et al., 2017). Informal rules are the norm in the urbanizing Global South, however. Framing informality as normatively bad or immoral can obscure the function these transactions perform in cities. Analyzing informality by their associated institutions (set of rules and norms), rather than as a set of complex and changing relations through which power is negotiated (McFarlane, 2012; Roy, 2009) proves useful. Institutional analysis identifies generalizable sets of actors, rules, degrees of control, and structures of incentives responsible for patterns of informal urban expansion. Payoff surfaces visualize salient dimensions of urban informal expansion to facilitate their incorporation in quantitative models of urban land change and resilience (Eakin et al., 2017) and to aid efforts to govern what is perceived as elusively complex.

We illustrate that informality is not an unpredictable, unusual, or even merely a “material” part of the urban growth process. Cities are constructed by people, and incentives and rules are formed by the conditions in which people make decisions. Urban sustainability relies on the ability to analyze the patterns and consequences of these decisions, and to reshape institutions to improve social environmental outcomes. This study identified regulation of incentives and constraints to institutional entrepreneurs, which in turn provide insights about the leverage points to mitigate the social and environmental harm arising from existing informal urban expansion.

## CRediT authorship contribution statement

**Beth Tellman:** Conceptualization, Methodology, Investigation, Formal analysis, Writing - original draft, Writing - review & editing, Visualization, Funding acquisition, Project administration. **Hallie Eakin:** Conceptualization, Methodology, Writing - review & editing, Funding acquisition. **Marco A. Janssen:** Conceptualization, Writing - review & editing, Methodology. **Felipe Alba:** Writing - review & editing, Project administration. **B.L. Turner II:** Writing - review & editing, Funding acquisition.

## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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## Appendix A. Supplementary data

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