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Private Cities

Implications for Urban Policy in Developing Countries

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Abstract

Institutional weaknesses limit the capacity of local governments to support efficient urbanization in developing countries. They also lead to the emergence of large developers with the clout to build entire cities. This paper analyzes the urbanization process when local governments are weak and large developers are powerful. Results from a non-cooperative game setting with minimal assumptions show that multiple equilibria can emerge depending on key institutional parameters of the model and the nature of the game, but all of them are inefficient. In this simple setting, increasing the capacity of the local government may not lead to better outcomes, because it may crowd out urban land development by the more effective private investor. Subsidizing the large investor can ensure efficiency, but it makes the rest of society worse off. Selling the rights to the city can be Pareto efficient, but only provided that the price at which the rights are sold are sufficiently high. However, more analytical and empirical work is needed before these analyses can be deemed relevant in practice. Competition among jurisdictions, time consistency challenges, and the social implications of private cities deserve special attention.

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Private Cities:

Implications for Urban Policy in Developing Countries

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1. Introduction

The urbanization process is efficient when land can be assembled for urban development at no cost and both capital and labor can move freely across local jurisdictions. This well-known proposition from the literature on city formation stems from the assumption that entrepreneurial local governments can compete to attract the number of firms and workers that maximizes the local surplus. Through land zoning and incentives, they overcome the coordination failures that would arise if firms and workers gathered spontaneously across locations (Henderson 1974, Henderson and Venables 2009).

However, the necessary conditions for the efficiency of the urbanization process may not be met in developing countries. For starters, the assembly of relatively unencumbered land with clear titles can be challenging. Property rights are not always well defined, and they may involve a high degree of state ownership. Cadastral records and titling are incomplete, and regulations cumbersome.

Local governments in these countries are also less capable to maximize local surplus than their counterparts in advanced economies. In the words of Henderson and Becker (2000): “not all agglomerations have single pro-active autonomous local governments. Local autonomy may not be part of the national constitution; many local governments may not or cannot be pro-active; and not all agglomerations are governed by a single local government or by a set of township governments that coordinate well.”

With the availability of urban land and the capacity of local governments being constrained, there may not be enough cities. And a few of those that emerge – capital cities in particular – may become oversized. Consistent with this distorted spatial equilibrium, a majority of the megacities of the world can by now be found in developing countries (United Nations 2018). Instead of efficiency, there tends to be excessive primacy combined with overall under-urbanization.

Not surprisingly, cities in developing countries are often described as messy, crowded and disconnected. In South Asia, the widespread existence of slums and sprawl constrains the potential of agglomeration forces to bring about faster improvements in prosperity (Ellis and Roberts 2016). In Sub-Saharan Africa, investments in infrastructure have not kept pace with the concentration of people, with cities developing as collections of small and fragmented neighborhoods that limit job opportunities and prevent reaping agglomeration benefits (Lall et al. 2017). In Latin America and the Caribbean, the productivity of cities seems to be driven by the attraction of more qualified households rather than by agglomeration effects

(Ferreyra and Roberts, 2018). And in parts of East Asia the elasticity of income per capita to the urbanization rate can be substantially lower than the global average (Roberts et al. 2019).

The flip side of land assembly constraints and weak government capacity is the greater role played by private actors in the urbanization process. Privately built or run cities are not a new phenomenon, as there are important precedents in the history of nowadays advanced economies. For example, medieval Paris was run by the River Seine boatmen's corporation. Florence, one of the most extraordinary urban agglomerations of the Renaissance, was arguably the city of the Medici family. And during the Industrial Revolution, company towns were pervasive in the US, in Britain and in other parts of Europe.

However, private actors play an even bigger role in the developing world nowadays. Beyond increasingly common gated communities, what is remarkable is the emergence of urban agglomerations planned and built by private developers, on a scale without historic precedents. These agglomerations include company towns, as in advanced countries during the Industrial Revolution, but also full-fledged cities. Some of them are managed by business or citizen associations, reminiscent of the trade guilds that used to run urban centers in medieval Europe. Others involve a complex interplay of local governments and large developers. And some are the result of deliberate outsourcing by local urban authorities.

These unusual urban agglomerations have occasionally been dubbed private cities (Lutter 2014, Tabarrok and Rajagopalan 2015). Such term is used in what follows to designate significant urban areas whose development was associated with at least one large private actor.

An inventory of private cities in developing countries, together with detailed case studies of the most outstanding ones, is currently under preparation (Li and Rama, 2021). As it progresses, this review of experiences reveals two striking facts. First is the ubiquity of large private cities across multiple parts of the developing world (map 1). The countries where these outstanding examples are located have different political systems, they range from low- to middle-income in economic terms, and their legal and cultural traditions are very diverse.

The second striking fact is the large size of these cities, relative to other urban agglomerations in their countries. A telling comparison is relative to the US, a market-oriented economy which has more than 300 cities with a population of at least 100 thousands and whose largest privately-built city is Reston, in the Washington DC metropolitan area. This benchmarking exercise shows that developing country cities associated with large private investors are much bigger than Reston, and are (or will be, if built as planned) among the largest urban agglomerations in their own countries (table 1).

Map 1. Significant private cities in developing countries

Note: Names in standard fonts correspond to private cities, names in bold fonts to the closest large urban agglomerations.
Source: Authors, based on Google Maps.

Table 1. The size of significant private cities in developing countries

Country	City	Land area (sq. km)	Population (thousands)		Population (percent of city with)		
			Current	Planned	Rank 1	Rank 10	Rank 20
Bangladesh	Bashundhara Residential Area	7	274		1.4	89.2	148.0
Bolivia	El Alto	370	975		71.5	1095.5	3482.1
China	Gu'An	26		1,000	4.5	14.0	23.5
Egypt	Festival City	173		52	0.6	10.9	21.2
Honduras	San Pedro Sula	840	876		80.6	1536.8	5475.0
India	Gurgaon	406	1,308		6.6	42.9	77.6
	Jamshedpur	244	1,373		6.9	45.1	81.5
Indonesia	Batam Island	1,600	1,283		13.4	99.6	201.5
	Kota Jababeka Cikarang	56	172		1.8	13.4	27.0
Nigeria	Eko Atlantic	11		250	1.7	18.9	38.8
Pakistan	Bahria Town – Karachi	134		1,000	6.7	99.9	256.1
	Sialkot	32	928		6.2	92.7	237.7
Senegal	Damniadio	23		300	9.8	380.7	1139.5
South Africa	Waterfall City	3		100	2.9	20.9	32.7
Sri Lanka	Port City	3		80	10.6	80.0	123.1
Vietnam	Phu My Hung	36	278		3.1	132.0	182.8
All	Median	34	588		6.4	84.6	135.5
US	Reston	41	60		0.7	5.8	9.0

Source: Authors, based on background studies for Li and Rama (2021), master plans, cities' websites, LandScan™ 2018 and World Population Review.

The ubiquity of private cities across countries with very diverse characteristics implies that the economic forces at play transcend local specificities. Their large size, in relative terms, suggests that private cities could be a significant tool to support the urbanization of the developing world.

And yet, standard urban policy recommendations are predicated on the assumption that cities are planned, built and managed by local governments (Sullivan, 2007). This assumption is understandable, given that modern constitutions typically subject each jurisdiction to one level of government. This is so in developing countries as well, and therefore the policy messages are very similar to those for advanced economies (World Bank 2019). The received wisdom, in both cases, is to strengthen the capacity of local governments to assemble land, conduct urban planning, build infrastructure, and provide services.

However, empowering urban authorities often requires constitutional changes that may not be supported by political economy forces. And building administrative capacity and removing institutional obstacles to the assembly and development of urban land can take decades.

Meanwhile urbanization is proceeding at an unabated pace, especially in relatively poor countries. Between 1960 and 2000, the number of metropolitan areas with a population above 100 thousand inhabitants almost tripled in the developing world. Going forward, Asia's urban population is expected to increase by 1,359 million between 2015 and 2050, that of the Middle East and North Africa by 224 million, and that of Sub-Saharan Africa by 883 million (United Nations 2018). With these developing regions needing to accommodate almost 2.5 billion additional urban dwellers in barely three decades, insisting on standard urban policy recommendations on how to plan, build and manage cities could be insufficient. Given the contribution cities make to economic development, this conceptually ideal approach could slow down economic growth and poverty reduction. Alternatives may need to be considered, and an adequate framework for the development of private cities could be one of them.

The goal of this paper is to analyze urban policy when the local government may struggle to assemble and develop a vast track of urban land while an unusually large private investor has the capacity to do so. In the proposed framework, the large developer may not only build residential or commercial structures. It may also assemble land on a sizeable scale, draw plans for its use, build transport infrastructure, preserve land for public space and other non-revenue generating uses, attract businesses and potentially provide services to residents, much the same as a local government would do.

With two major actors involved, the analysis is built on a game-theoretical framework, with multiple possible equilibria depending on the institutional parameters of the model and the nature of the game played by the local government and the large developer. The paper shows that when the players move simultaneously, a conventional city is more likely to emerge if the capacity of the government is relatively high, a developer city in the spirit of a company town if the private investor has considerable clout, and a mixed city in between. The nature of the equilibrium is tilted when the game is sequential, but always in the direction of a greater role for the private developer, regardless of which player is the first mover. However, there is insufficient urbanization in all cases, implying that the potential of the locality is never fully tapped. At odds with the literature on city formation, urbanization is intrinsically inefficient.

In the simple setting in this paper, increasing the capacity of the local government – the standard policy recommendation for developing countries – does not necessarily lead to a higher surplus of the locality. This is because it can encourage wasteful land development, crowding out the more effective private investor. Banning the large developer may not improve matters, because in a context of low government capacity it may simply stall the urbanization process, potentially keeping the locality rural.

On the other hand, efficient city size and maximum local surplus can be attained if the private investor fully internalizes the surplus from urban development. In a Pigouvian spirit, this can be accomplished through subsidies that bridge the gap between the private and the social value of land. Efficiency can also be attained in a Coasian way, through the transfer of the ownership rights to the city. However, the outcome may not be Pareto-efficient, as it could make the rest of society worse off.

Ensuring that there are no losers – a possible prerequisite for urban outsourcing to be politically viable – would require transferring resources from the large developer through taxation, or through the price at which the rights to the city are allocated. And the extent of land value capture needed to engineer such redistribution is very significant, especially when it also needs to recoup the fiscal cost of the subsidies provided to the large developer.

The paper concludes with a brief discussion of alternative mechanisms that could make urban outsourcing both efficient and equitable. These alternatives are more Coasian than Pigouvian in nature, in the sense of involving property rights on the city, rather than subsidies and taxes. Public-private partnerships, in which both risks and returns are clearly allocated to the parties involved, are an obvious example. But the case studies of outstanding private cities currently under preparation reveal that other creative mechanisms have also been used to make private cities viable. Among them are the licensing of land development permits, the preservation of traditional villages in the new agglomeration, and the conversion of original residents into shareholders of the private city (Li and Rama, 2021).

Discussing these unorthodox policy recommendations should not be interpreted as advocating for the privatization of the urbanization process in developing countries. The paper only aims to sketch a research agenda that goes beyond improving the capacity of local governments and explores what these local governments should do (and not do) in relation to private investors with considerable clout. The model in the paper is deliberately simple, as it aims to gain new insights relying on minimal assumptions. But the emerging agenda is both conceptually rich and empirically relevant.

2. Relationship to the literature

The term private cities seems to clash with the generally accepted division of roles between government and markets in a modern economy, according to which the production of goods and services is better left to the private sector, whereas the government should play a broader coordinating role. Cities undoubtedly coordinate economic activity in a specific area, a typical government role. But they are not very different in nature from a large firm. As noted by Stiglitz (1977), a large developer can in principle do anything that a centralized government can do and hence, if there are inefficiencies, it can eliminate them.

In a world of imperfect tax incentives, insufficient managerial capacity and weak judiciary enforcement, few resource allocation mechanisms inevitably belong in the polar extremes of the public-private gradation. Coase (1974) illustrated this point with his study of lighthouses, which seem ideally suited to the public sphere, given the externalities involved. Yet, in 19th century Britain – the greatest maritime power of the time – they were managed by the offspring of a medieval seamen's guild and funded through the collection of fees from ships docking at British ports.

How public and private resource allocation mechanisms interact has also been pointed out as an important analytical agenda in the case of cities. In the words of Coase (1960, p. 18): "economists need to study the work of the broker in bringing parties together, the effectiveness of restrictive covenants, the problems of the large-scale real-estate development company, the operation of government zoning and other regulating activities." However, this proposed agenda has not had many takers.

There is admittedly a literature on private developments such as gated communities and business improvement districts (Helsley and Strange 2000, Helsley 2003, Glasze et. al 2006, Moroni 2014, Webster et al. 2006). The former are voluntary, exclusive organizations that offer their residents supplemental services, relative to those provided by the local government; the latter exist to further the interests of member firms located in a specific area. But these units tend to be too small to drive urbanization, understood as a process of spatial rearrangement that brings together people, jobs and amenities.

There are also various studies of large agglomerations in whose development private investors played a disproportionate role. This scholarship has led to the emergence of new concepts. In advanced economies, such agglomerations have been called edge cities (Garreau 1992, Jonas 2003, Stanback 1991). In developing countries, they have been called new cities (Jo and Zheng 2020, Percival and Waley 2012). But these insightful new concepts have not been incorporated in significant ways into standard urban policy recommendations.

Without downplaying these important precedents, a more comprehensive analytical framework is needed to interpret the experience with private cities in developing countries, and to draw rigorous urban policy inferences. Such framework should identity the key economic and institutional features underlying the emergence of private cities. It should also lead to a meaningful typology of private cities, based on the different roles played by local governments and large developers, and on the diversity of local outcomes. And it should characterize the relationship between such outcomes and the key economic and institutional features of the locality, in a way that sheds light on the potential tradeoffs.

The analytical framework in this paper can be understood as the blend of two different bodies of literature. In the urban economics tradition, city formation is driven by entrepreneurial local governments that compete to attract firms and workers in a way that maximizes the local surplus. Private developers, when explicitly considered, tend to be relatively small and act as followers. The resulting urbanization is shown to be efficient when land can be assembled for urban development at no cost and when both capital and labor can move freely across jurisdictions (Henderson 1974, Henderson and Venables 2009).

In contrast with the urban economics tradition, urban political science has long stressed the important role played by the private sector in urban development and emphasized the limitations from viewing the local governments as the only, or even the main decision maker. A city is instead seen as the spatial expression of the interests of the local business community, which seeks to profit through the intensification of land use (Molotch 1976; Logan and Molotch 1987; Stoker 1998). The urban political science literature thus highlights the role of power, predicting that "to be effective, governments must blend their capacities with those of various non-governmental actors” (Stone 1989, 1993).

These two analytical traditions are brought together here through a political economy approach. While game theory has not been frequently applied to urban policy issues, there are a few important precedents. This paper builds on the work by Helsley (2004) and Helsley and Strange (1994, 2000) to analyze city formation as a non-cooperative game between the local government and a private investor, both with the capacity to supply urban land. This game is played in a geographically defined jurisdiction that is small relative to the size of the country (Scotchmer 2002). And it can be played in different ways depending on whether the players' decisions are made simultaneously or sequentially.

An equilibrium emerges when each player's best response is consistent with the strategy pursued by the other player (Nash 2016). In practice, the modeling approach adopted here is very similar to that of oligopoly theory, with the simultaneous model corresponding to the Cournot solution and the sequential model to the Stackelberg solution (Hamilton and Slutzky 1990). In the simultaneous model both players are reactive in their behavior, whereas in the sequential model one of the players behaves strategically and the other reactively.

Game-theoretical models often lead to multiple equilibria. For tractability, the multiplicity of outcomes is analyzed here using the diagrammatic tools introduced by fix-price macroeconomic theory to discuss the conditions under which Classical or Keynesian Unemployment emerge (Barro and Grossman 1971). In this case, which type of city emerges – if any – depends on the economic and institutional features of the locality. Key among them are two parameters capturing the capacity of the local government and the clout of the large developer. The combinations of parameter values that separate the various equilibria can be interpreted as "frontiers", similar in spirit to the divide between unemployment regimes in macroeconomic fix-price theory.

3. A simple analytical framework

Following the urban economics tradition, entrepreneurial spatial coordinators can provide public goods such as urban land, transport infrastructure and social services in each jurisdiction. But in line with the urban political science tradition, those spatial coordinators can be either a local government (g) or a large developer (p). Jurisdictions are defined geographically, with given boundaries, so that space is not fungible across them. The local government and the large developer interact, and the game can be played differently, potentially resulting in diverse degrees and forms of urbanization.

3.1. The players and the locality

Each of the two players decides how much agricultural land it would like to convert and can also choose not to convert any. With obvious notation, this implies that $L_g \geq 0$ and $L_p \geq 0$. The two major players also have in common their disregard for the impact of their urban development actions on other localities. This assumption, common in the literature on city formation, is equivalent to saying that the locality is not too large relative to the rest of the country.

The players differ in their valuation of the returns to urban land development in the locality. The local government is supposed to be benevolent, which means that it cares about the surplus (Y) generated by the locality, regardless of who appropriates it and regardless of who develops the land. But for the large developer only the surplus it can directly appropriate, called rent for short (R), matters.

The players also differ in their land development costs. Because of the multiple institutional constraints they face, the local governments of developing countries may end up developing less urban land than their budgeted resources would have allowed, or land of poorer quality than was possible given the resources mobilized. The capacity of the local government to effectively develop urban land is captured by parameter θ, with $0 < \theta < 1$. The upper end of this range can be interpreted as the capacity of local governments in advanced economies.

As for the private developer, its unit cost increases with the expenses it incurs to obtain the necessary land conversion and assembly clearances, and with the payments it makes to acquire the land from the original residents of the locality. However, a private investor with considerable clout may enjoy the privileged access required to secure expeditious government clearances – formally or informally. It may also have the means to acquire land below market price. The clout of the large developer is captured by parameter μ, with $0 < \mu < 1$. At the upper end of this range, the large developer can acquire the land it intends to develop at no cost.

The surplus of the locality and the rent of the large developer do not necessarily coincide. The difference between them, which will be shown to be positive, is the windfall for the rest of society (H):

$$Y = H + R \tag{1}$$

This windfall may benefit the original owners of the land; in a developing country context these may be the farmers who used to live and work in the agricultural land being converted to urban uses. When the surplus generated by the locality is at least partially redistributed among its inhabitants, formally or informally, the beneficiaries of the windfall may also include others in the local population. And when inter-fiscal transfers redistribute resources across jurisdictions, as is generally the case, the windfall accrues to society at large, including taxpayers, recipients of public services, government employees and public sector contractors across the country.

The more urban land the two players develop, the larger is the city that emerges in the locality. The size of the city (L) verifies:

$$L = L_g + L_p \quad (2)$$

The level of economic activity in the locality is the result of decisions made by large numbers of households and firms who may choose to migrate to the new city from across the country. Decisions by individual households and firms are not explicitly modeled here. Instead, their joint outcome is captured through a reduced-form expression for the output $F(L)$ of the locality. This simplification aims at ensuring unambiguous results that are easy to interpret.

In line with the urban economics tradition, the output of the locality is seen as the joint outcome of agglomeration and congestion effects. As city size increases, the combination of these effects leads to a growing output ($F'(L) > 0$), but at declining rates ($F"(L) < 0$).

The surplus of the locality is the difference between this output and the resources devoted to developing the land. Given the investments needed, the cost of land development critically depends on the real interest rate. Represented by parameter i, the interest rate is assumed to be constant and the same for the two players.

Unit costs are even higher for the land developed by the local government, because of the institutional constraints it faces. It would seem natural to consider them higher too in the case of land developed by the private investor, given the expenses it incurs to secure clearances and purchase the land. However, such expenses translate into income for local authorities – officially or unofficially – and for the original occupants of the land. From a social point of view, the land assembly and acquisition costs of the large developer and the land-related incomes of others cancel out.

The following specification of the surplus Y satisfies the properties above:

$$Y = F(L) - \frac{i}{\theta} L_g - i L_p \quad (3)$$

If the local government was fully effective ($\theta = 1$), the cost of building the city would just be equal to the cost of capital, regardless of who develops the land.

In the general case, however, the cost is higher. From equations (2) and (3), the surplus of the locality can be rewritten as follows:

$$Y = F(L) - i\,L - \frac{1-\theta}{\theta}\,i\,L_g = F(L) - i\,L - W\left(L_g\right) \tag{3'}$$

The surplus of the locality Y is thus a concave function of city size L, adjusted for $W\left(L_g\right)$, a term capturing the waste of resources that arises from the local government being an ineffective planner, builder and manager of cities. The lower its capacity θ, the larger the share of the resources mobilized that never lead to the development of urban land, or that result in the development of low-quality urban land. For a given θ, waste increases with the amount of land developed by the local government.

The rent of the private investor, in turn, increases with the price at which it can sell or rent out the land it develops. The small size of the locality and the mobility of households and firms across localities ensure that the price of urban land is equal to its marginal product $F'(L)$. The rent is thus:

$$R = \left[F'(L) - \frac{i}{\mu}\right] L_p \tag{4}$$

The amount of urban land each of the two players decides to develop depends on the nature of the game that connects them. The local government and the large developer can make their choices simultaneously, or one of them can commit to a provision level prior to its rival's choice. In the former case, each of the two players takes the land development decisions of the other as given. In the latter, the player who moves first can internalize the way the other player reacts. As a result, it may choose a high level of public good provision to deter entry by other player, or it may choose a low level to crowd-in provision by the other player. In both cases, a pair of values $\left(L_g, L_p\right)$ emerges, determining the level of aggregate outcomes, including L, Y and R.

The windfall for the rest of society H is also an outcome of the game played by the local government and the large developer. However, it emerges as a residual and not as the result of an explicit optimization. From equations (1) and (3'), the windfall can be expressed as:

$$H = F(L) - i\,L - W\left(L_g\right) - R \tag{1'}$$

Society at large benefits from the part of the surplus that is not wasted by the local government through ineffective land development or appropriated as rent by the private investor.

For tractability, it is assumed that the output of the locality is such that:

$$F(L) = \alpha L - \frac{\alpha\gamma}{2} L^2 \quad (5)$$

which in turn implies $F'(L) = \alpha(1 - \gamma L)$ and $F"(L) = -\alpha\gamma$. In this expression, parameter α (with $\alpha > 0$) captures the strength of agglomeration effects in the locality, which presumably depend on its geographical location, its connecting infrastructure, its initial human capital, its weather conditions, and the like. Similarly, parameter γ (with $\gamma > 0$) measures the strength of congestion effects. The topography of the locality and its weather conditions could be relevant factors in this respect.

3.2. A diagrammatic representation

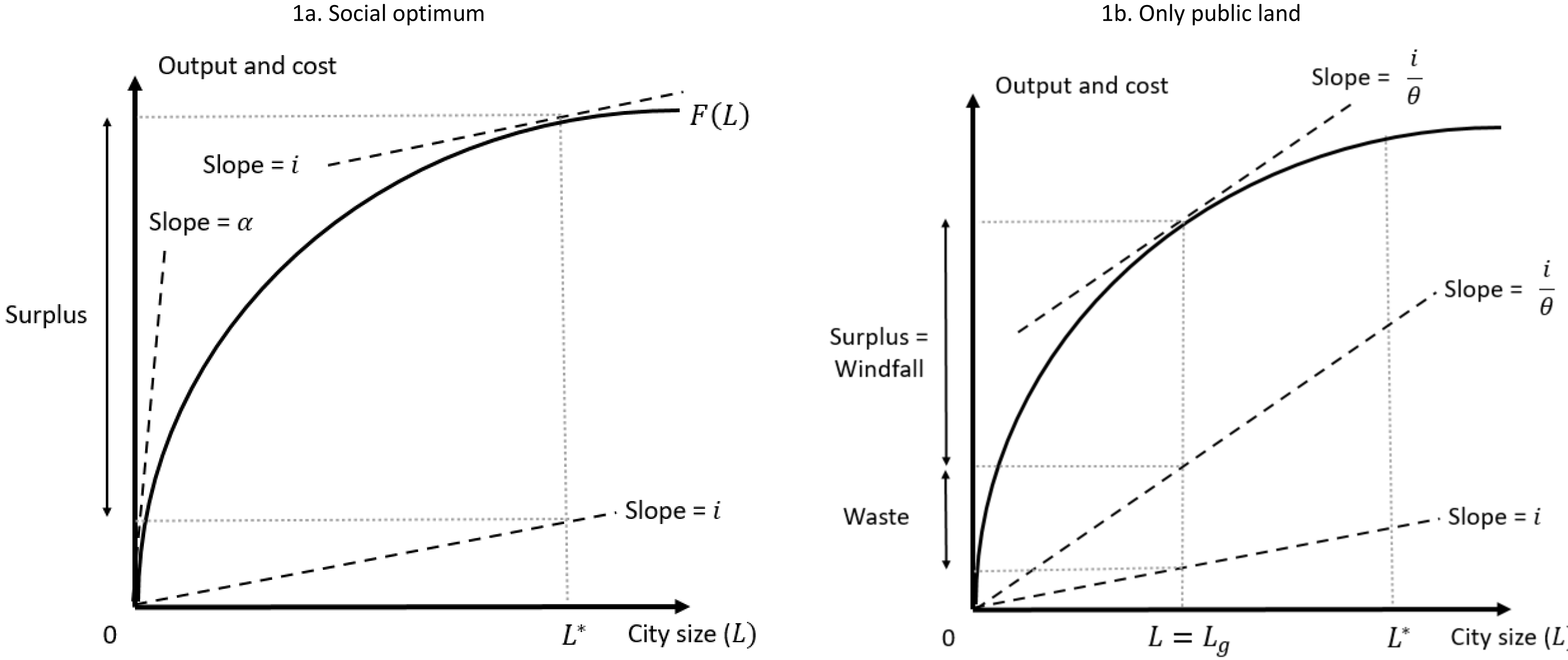
Before solving the model analytically, which can be tedious, a simple diagrammatic representation may help grasp its basic properties. In line with the welfare economics tradition, the starting point is the first-best solution, which provides a useful benchmark against which other equilibria can be assessed.

In the social optimum, urban land can be developed at unit cost i. This is what the local government would do if it were an effective planner, builder and manager of cities. The urbanization process would then proceed up to the point where the output of the last unit of urban land $F'(L)$ equals its development cost. This optimal city size is called L^* in what follows, and the output associated with it is $F(L^*)$. Subtracting the total cost of urban land development iL^* yields the optimal surplus of the locality Y^* (figure 1a).

In the setting considered above, however, urban land can be developed by an ineffective local government, by the private investor, by both or by none. When none of the two players is active, the locality remains rural and there is no surplus, rent or windfall, making a diagrammatic representation superfluous. That leaves three other equilibria to be analyzed, in addition to the social optimum.

When only the local government is active, the unit cost of developing urban land is i/θ. Because this cost is higher than in the social optimum and the output function $F(L)$ is concave, a smaller city emerges. This under-urbanization is one of the reasons why the surplus of the locality is smaller than in the optimum. The other reason is the waste of resources $W(L_g)$ associated with the development of more costly land, or land of poorer quality for the same cost (figure 1b). However, this smaller surplus accrues entirely to society at large, as there is not private land development in this case, hence no rent.

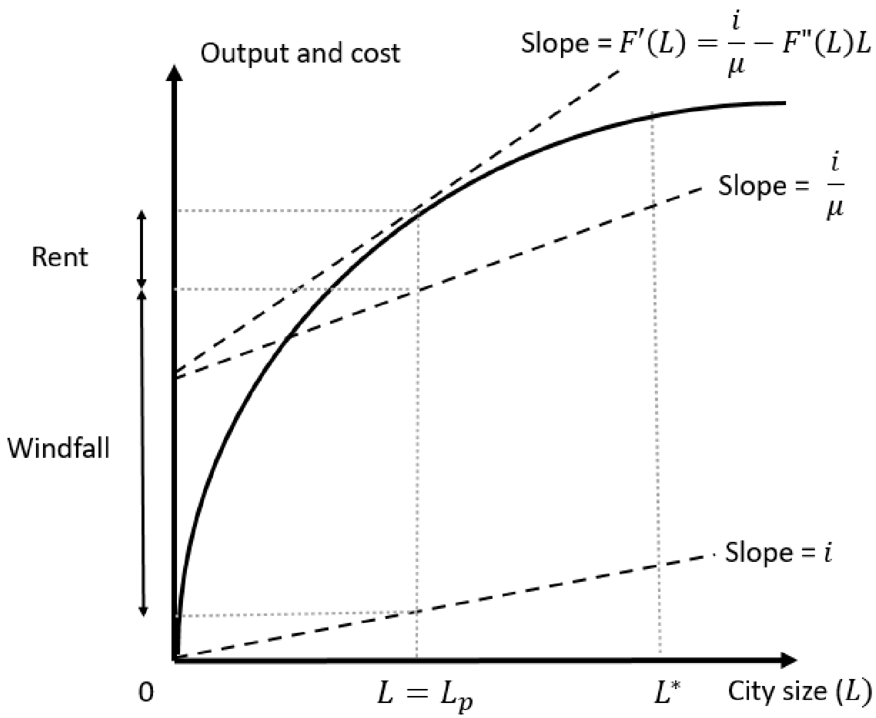
Figure 1. Aggregate outcomes in equilibrium



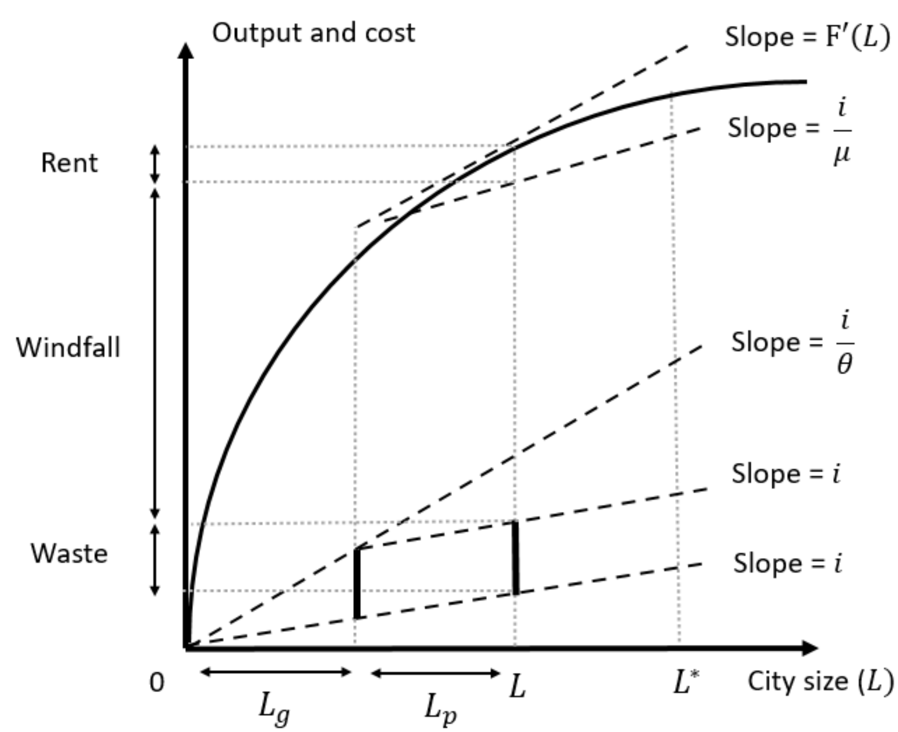
(Continued)

Figure 1. Aggregate outcomes in equilibrium (continued)

1c. Only private land



1d. Both public and private land



The analysis is similar when only the private investor develops urban land. From its perspective, the marginal cost of developing urban land is i/μ. Again, this cost is higher than the social optimum, which should result in a smaller city emerging in the locality. But in addition, the concavity of the output function creates an incentive for the private investor to develop even fewer units of land. This is because every additional unit reduces the marginal output $F'(L)$, hence the price at which privately developed land can be sold. Replacing $L = L_p$ in equation (4), the rent is maximized for $F'(L) = i/\mu - F"(L)L$, with this condition determining the size of the city (figure 1c).

Despite the resulting under-urbanization, the surplus of the locality is positive in this case, because the output function is concave and the marginal output from urban land $F'(L)$ exceeds its development cost i/μ. The windfall H is positive as well, for two reasons. First, the rest of society appropriates the difference $F(L) - (i/\mu)$ on each unit of urban land developed. But in addition, there is a gap between the private cost i/μ and the social cost, which remains i because the private investor is an effective developer of land. This gap corresponds to the payments the private investor needs to make to secure clearances and purchase land, and those payments are part of the windfall.

The analysis is slightly more cumbersome when both players develop land. How the size of the city is determined in this case requires going through the model in more detail. In principle the possibility that $L > L^*$ cannot be ruled out, although it is shown below that the locality always remains under-urbanized. But this time there is both waste and rent. Their representation follows the same criteria as in the previous equilibria, except that the waste is now shown to the right of the figure rather than on the vertical axis, as shown by the vertical bars in bold, to facilitate the comparison with the surplus (figure 1d).

4. Equilibria in the simultaneous game

When the game is played simultaneously, the decision rule of each of the two players is determined by the maximization of its own objective (Y or R) conditional on the amount of urban land developed by the other player. The decision rules of the two players – or reaction functions – amount to a system of two equations with two unknowns (L_g and L_p). However, the system can have corner solutions in which at least one of the two players decides not to develop urban land in the locality.

4.1. Nash equilibria

The decision rule of the local government is obtained by maximizing the expression of Y in equation (3) with respect to L_g. This reaction function verifies:

$$L_g = \frac{\alpha\theta - i}{\alpha\gamma\theta} - L_p \quad (6)$$

From the government's point of view, there is perfect substitutability between units of urban land, regardless of who develops them. If the private investor develops one extra unit of land, the local government cuts its supply by one unit.

The reaction function of the large developer, in turn, is obtained by maximizing the expression of the rent R in equation (4) with respect to L_p, which yields:

$$L_p = \frac{\alpha\mu - i}{2\alpha\gamma\mu} - \frac{1}{2} L_g \quad (7)$$

From the viewpoint of the large developer, the substitutability between types of urban land is only partial. If the local government develops one additional unit of urban land, the optimal response of the private investor is to decrease its own development of urban land by half a unit.

The system represented by equations (6) and (7) has four qualitatively different solutions depending on whether both players develop urban land in the location, only one of them does, or none of them does. The internal solution of the system above, where both players develop urban land in the locality, is designated as a *mixed city* (M) in what follows. In this equilibrium:

$$L_g^M = \frac{\alpha\theta\mu + (\theta - 2\mu)\, i}{\alpha\gamma\theta\mu} \qquad L_p^M = \frac{(\mu - \theta)\, i}{\alpha\gamma\theta\mu} \quad (8)$$

The case where only the local government develops urban land corresponds to the *conventional city* (C) setting. To solve for this equilibrium, the urban land developed by the private investor is set equal to zero in the reaction function of the government, given by equation (6):

$$L_g^C = \frac{\alpha\theta - i}{\alpha\gamma\theta} \qquad L_p^C = 0 \quad (9)$$

In the symmetric solution, where only the large private investor develops urban land, a *developer city* (D) emerges. In this case, the amount of urban land developed by the local government is set equal to zero in the reaction function of the private investor, represented by equation (7):

$$L_g^D = 0 \qquad\qquad L_p^D = \frac{\alpha\mu - i}{2\alpha\gamma\mu} \tag{10}$$

Finally, if none of the players develops urban land the locality remains a *rural area* (A):

$$L_g^A = 0 \qquad\qquad L_p^A = 0 \tag{11}$$

4.2 Mapping equilibria to institutions

The nature of the equilibrium that emerges in the locality critically depends on the values of the five parameters of the model. Three of these parameters (α, γ and i) are shaped by the context – from geography to weather to finance. While they may evolve over time, there is relatively little that urban policy can do about them in the short to medium term. The other two parameters (θ and μ), on the other hand, are institutional in nature, and can be influenced by policy choices. Therefore, the focus in what follows is on the capacity of the local government and the clout of the large developer.

Assume that for a given level of the context parameters α, γ and i, each pair of values of the institutional parameters θ and μ is associated with only one type of equilibrium. If so, the institutional space (θ, μ) can be divided into non-overlapping "regions", each corresponding to a mixed city, a conventional city, a developer city or a rural area. The lines separating two contiguous regions in this space can be interpreted as "frontiers" between equilibria. Crossing those frontiers, by modifying government capacity or developer clout, amounts to switching from one Nash equilibrium to another.

Consider the frontiers of the mixed city equilibrium first. The locality switches from mixed city to conventional city if the urban land development by private investor becomes nil. Solving for $L_p^M = 0$ in equation (8) therefore yields the level of developer clout separating the mixed city and the conventional city regions. This frontier, called $\mu^{M=C}$ in what follows, verifies:

$$\mu^{M=C} = \theta \tag{12}$$

Similarly, a mixed city becomes a developer city when urban land development by the local government falls to zero. From equation (7), the condition $L_g^M = 0$ holds when the clout of the large developer equals $\mu^{D=M}$, with:

$$\mu^{D=M} = \frac{\theta i}{2i - \alpha\theta} \tag{13}$$

Consider next the frontiers of the rural area. This equilibrium arises when none of the two players develops urban land in the locality. The analytical expression assumed for $F'(L)$ is such that the maximum return of a unit of land is α. The local government would not develop any urban land if this maximum return was not sufficient to cover the associated resource cost i/θ. This condition yields the minimum level of government capacity $\theta^{\,L_g=0}$, below which public investment is nil:

$$\theta^{\,L_g=0} = \frac{i}{\alpha} \tag{14}$$

Similarly, the private investor does not develop urban land in the locality if the maximum return α to its investment is not higher than the opportunity cost i/μ. From equation (4), there is a minimum level of developer clout $\mu^{\,L_p=0}$ below which the private investor does not invest in the locality, with:

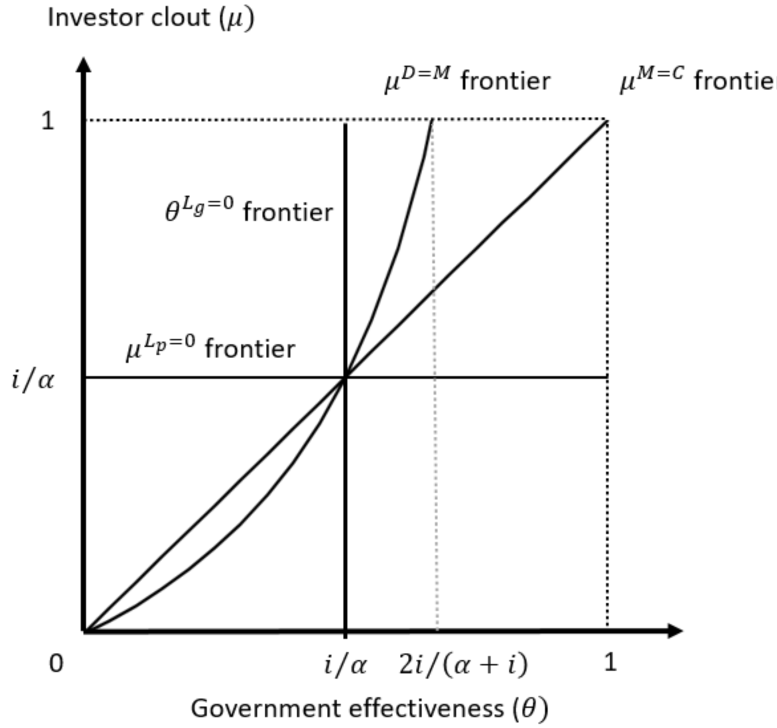
$$\mu^{\,L_p=0} = \frac{i}{\alpha} \tag{15}$$

These four frontiers partition the institutional space (θ, μ). Equations (12) and (13) set the limits of the mixed city, while equations (14) and (15) delineate the rural area, with the conventional city and the developer city lying in between. All the frontiers are linear except for $\mu^{D=M}$, whose properties are straightforward to analyze (annex A). In each of the four regions these frontiers delimit, one Nash equilibrium arises. Therefore, there is a clear mapping from every pair of values of parameters θ and μ to the type of urbanization that emerges in the locality, if any (figure 2). The relationship between the value of the institutional parameters of the model and the Nash equilibria is intuitive.

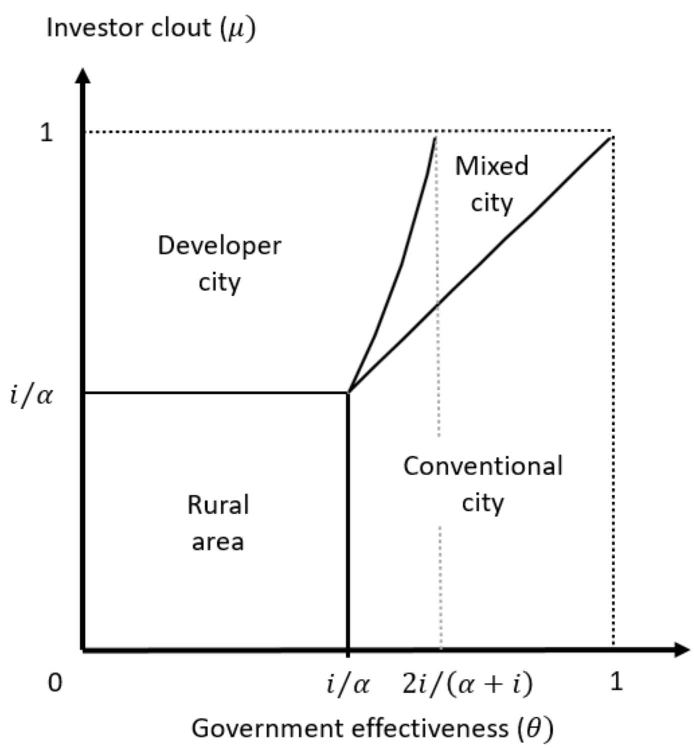
Proposition 1: When the game is played simultaneously, there is a unique Nash equilibrium associated with each pair of values of the institutional parameters of the model. A conventional city emerges when government capacity is high, a developer city when the clout of the large developer is sizeable, and a mixed city in between. The locality remains rural when both capacity and clout are weak.

Figure 2. Equilibria in the simultaneous game

2a. Frontiers between equilibria



2b. The nature of the equilibrium



5. Equilibria with a first mover

The local government and the large developer can aim for better results, from their perspective, if they influence the decisions of the other player to their advantage. To accomplish this, they commit to a level of urban land development in the locality before the other player makes its own decisions. For the outcome to be a subgame perfect Nash equilibrium, the level chosen by the first mover needs to be an optimal reaction to the preferred choice by the other player.

5.1. The local government as the first mover

The amount of urban land a local government that moves first would like to develop is obtained by maximizing the local surplus Y in equation (3) with respect to L_g, after replacing L_p by the reaction function of the large developer, represented by equation (7). If the private investor also develops urban land, the resulting equilibrium resembles a mixed city, except that the overall size and public-private composition of the city are different. This new equilibrium is labeled *strategic city* (S) in recognition of the local government integrating the other player's behavior in its own decisions.

The amount of urban land developed by the local government in a strategic city verifies:

$$L_g^S = \frac{\alpha\theta\mu - (4\mu - 2\theta\mu - \theta)\, i}{\alpha\gamma\theta\mu} \tag{16}$$

The associated urban land development by the private player is obtained by replacing into its own reaction function the expression above. This replacement yields:

$$L_p^S = \frac{(2\mu - \theta\mu - \theta)}{\alpha\gamma\theta\mu}\, i \tag{17}$$

As before, a simple diagrammatic representation can be obtained by deriving the analytical expressions of the frontiers delimiting the various equilibria in the institutional space (θ, μ).

The strategic city turns into a conventional city when urban investment by the large developer falls to zero. From equation (17), private urban development L_p^S is strictly positive only for values of parameter μ above the threshold $\mu^{S=C}$, with:

$$\mu^{S=C} = \frac{\theta}{2-\theta} \tag{18}$$

Conversely, the strategic city turns into a developer city when urban investment by the local government falls to zero. From equation (16), public urban land development L_g^S is strictly positive only for values of parameter μ below the threshold $\mu^{D=S}$, with:

$$\mu^{D=S} = \frac{\theta i}{(4-2\theta)\, i - \alpha\theta} \tag{19}$$

Meanwhile, the frontiers defined by equations (14) and (15) also remain relevant in the equilibria with a first mover. As before, if the maximum possible return to public urban land development α falls short of the opportunity cost of resources i/θ, it is not in the interest of the local government to spend in the locality. Similarly, the private player has no interest in developing urban land in the locality if the maximum return α is less than the associated investment cost i/μ.

With a strategic local government, therefore, the institutional space (θ, μ) is partitioned by the frontiers represented by equations (14), (15), (18) and (19). The last two are not linear, but their properties are once again straightforward to analyze (annex A). As in the simultaneous game, four equilibria are possible, and they are unique for any combination of government capacity and investor clout (figure 3).

Compared to the simultaneous game, this new partition expands the scope for a developer city while reducing the likelihood that a conventional city will emerge. Indeed, equations (13) and (19) imply $\mu^{D=S} < \mu^{D=M}$, whereas from equations (12) and (28) it follows that $\mu^{S=C} < \mu^{M=C}$.

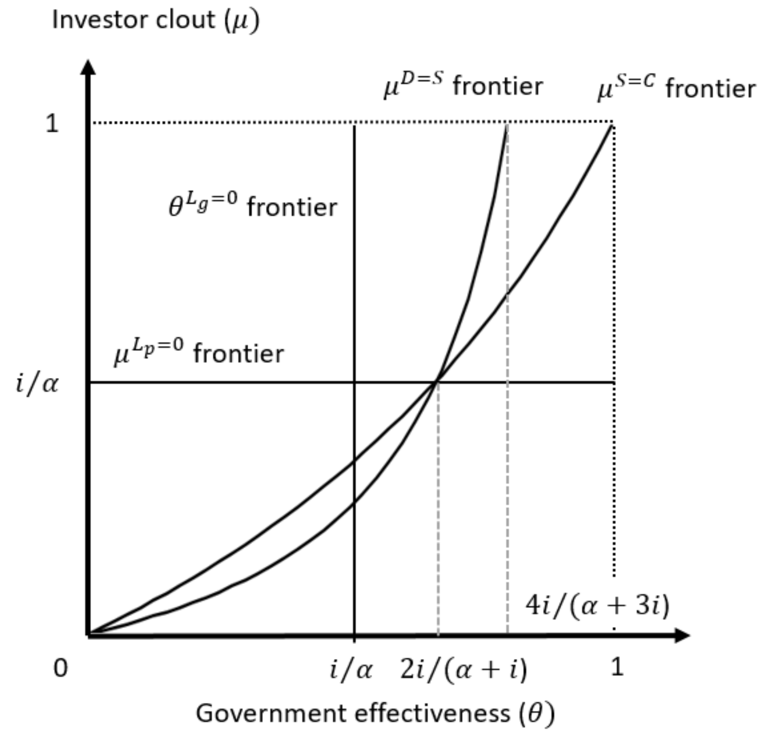
The private investor also plays a bigger role in the Nash equilibrium between the two polar cases. The amount developed by the two players is given by equation (8) in the mixed city and by equations (17) and (18) in the strategic city. These equations imply that:

$$L_g^M > L_g^S \quad \text{and} \quad L_p^M < L_g^S \tag{20}$$

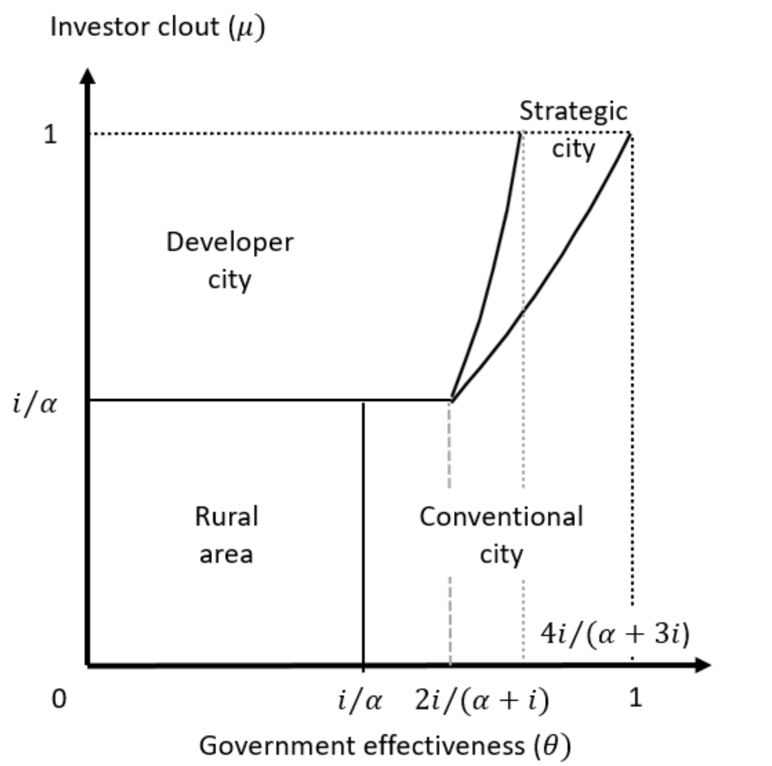
The explanation for this bias toward greater private participation in urban development is that a local government that moves first can take advantage of the greater effectiveness of the private investor. By investing less, the local government makes it profitable for the private investor to develop a bigger share of the city, thus reducing the associated waste of resources.

Figure 3. Equilibria with the local government as the first mover

3a. Frontiers between equilibria



3b. The nature of the equilibrium



5.2. The large developer as the first mover

The optimal level of urban land development by a private investor that moves first is obtained by maximizing its rent R in equation (4) with respect to public urban land development L_p, but only after having replaced L_g by the decision rule of the local government, represented by equation (6).

The resulting derivative of the rent R with respect to L_p verifies:

$$\frac{dR}{dL_p} = \frac{1}{\theta} - \frac{1}{\mu} \qquad (21)$$

This derivative is independent of the amount of urban land the government develops in the locality. When the derivative is negative, it is not in the interest of the private investor to develop urban land and a conventional city emerges. When it is positive, the private player develops as much land as possible, preempting urban land development by the local government. With $L_g = 0$ the locality is a developer city.

The cutoff between positive and negative returns to private investment in the locality is thus the frontier $\mu^{M=C}$ between a mixed city and a conventional city. From equation (21), this frontier verifies:

$$\mu^{D=C} = \theta \qquad (22)$$

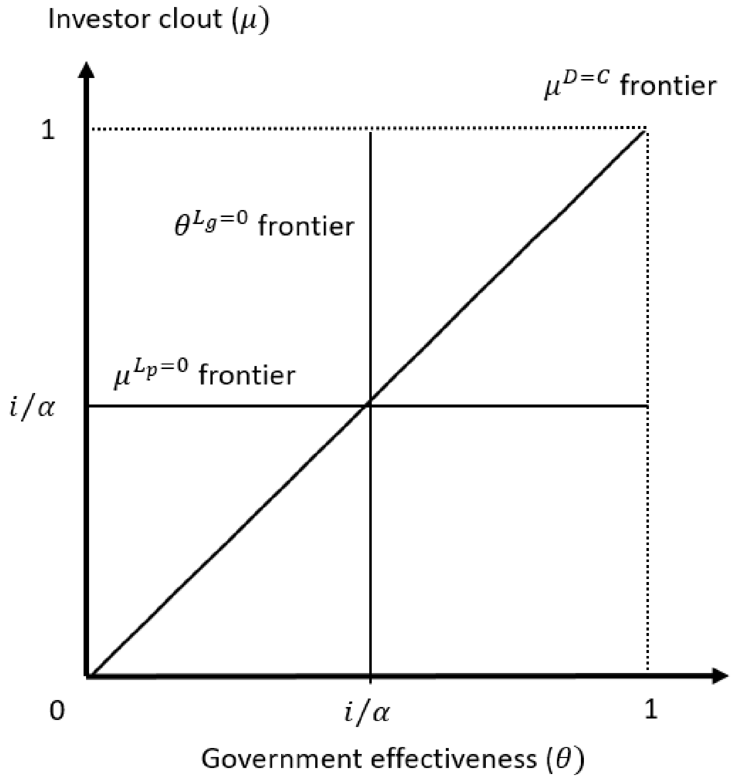
The frontiers for nil investment in equations (14) and (15) remain relevant with a strategic private player. Together with equation (22), they yield a partition of the institutional space (θ, μ) in which the Nash equilibria are unique (figure 4). But this time there are only three of them.

Once again, there is greater scope for private participation in urban development compared to the simultaneous game. The region of the parameter space (θ, μ) supporting the conventional city equilibrium remains the same, but the mixed city equilibrium disappears with a developer city emerging in its place. Much the same as a strategic local government crowded in the large developer, a strategic large developer crowds out the local government.

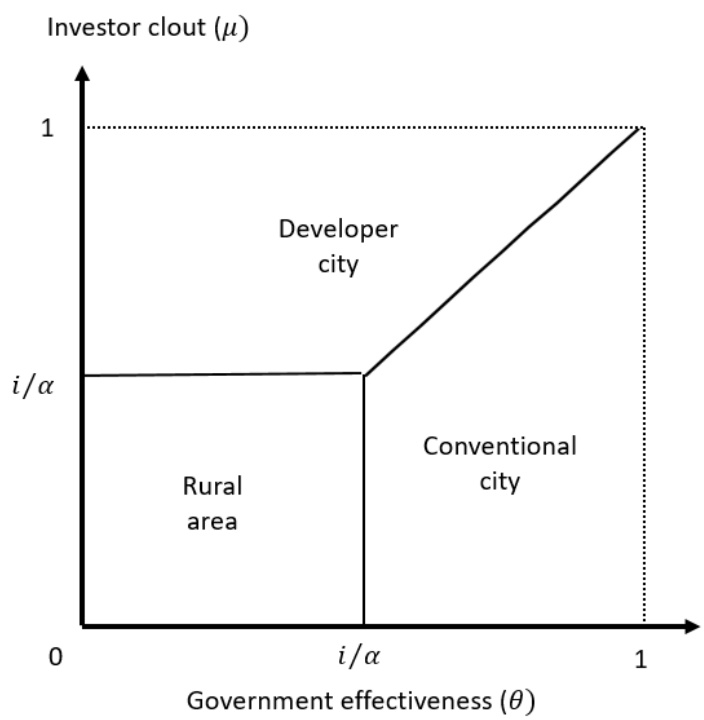
Proposition 2. The equilibrium associated with a pair of values of the institutional parameters remains unique when any of the players behaves strategically. Compared to the simultaneous game, the scope for a developer city increases whereas that for a conventional city decreases. Regardless of which player moves first, a greater share of urban land is developed by the private investor.

Figure 4. Equilibria with the large developer as the first mover

4a. Frontiers between equilibria



4b. The nature of the equilibrium



6. Inefficient urbanization

The various equilibria analyzed so far differ in their aggregate outcomes. The size of the city receives considerable attention in the urban literature, as it supposedly provides a summary measure of the strength of the agglomeration and congestion forces at play. However, from an efficiency perspective the most important outcome is not the size of the city but rather the surplus of the locality, after discounting the cost of urban land development. And from an equity perspective, the way this surplus is shared between the large developer and the rest of society matters as well.

6.1. The surplus of the locality

In line with the traditional approach to city development, the first-best equilibrium would be attained if the local government was a fully effective planner, builder, and manager of cities. From equations (3) and (5), for $\theta = 1$ and $L = L_g$ the surplus of the locality would be maximized if:

$$L^* = \frac{\alpha - i}{\alpha\gamma} \geq 0 \tag{23}$$

Provided that $\alpha > i$, as has been assumed, $L^* > 0$, implying that urbanization is economically viable in the locality. Equation (23) can be used to assess how urbanized the locality ends up being, depending on the parameters of the model and nature of the game.

The degree of urbanization in each of the equilibria can be computed by adding the amounts of urban land developed by the local government and the private player. The analytical expressions of L_g and L_p are given by equations (8) for the mixed city, (9) for the conventional city, (10) for the developer city, (11) for the rural area, and (16) and (17) for the strategic city. Replacing them into equation (2):

$$L^D = \frac{\alpha\mu - i}{2\alpha\gamma\mu} \qquad L^M = L^C = \frac{\alpha\theta - i}{\alpha\gamma\theta} \qquad L^S = \frac{\alpha\theta - (2-\theta)\, i}{\alpha\gamma\theta} \qquad L^A = 0 \tag{24}$$

These city sizes, together with the social optimum in equation (23) and the output function $F(L)$ can be used compute the marginal output of land in each case:

$$F'(L^*) = i \qquad F'(L^D) = \frac{\alpha\mu + i}{2\mu} \qquad F'(L^M) = F'(L^C) = \frac{i}{\theta} \tag{25}$$

$$F'(L^S) = \frac{(2-\theta)\, i}{\theta} \qquad\qquad F'(L^A) = \alpha$$

From equations (23) and (24), all equilibria are characterized by under-urbanization ($L^j < L^*$ for all j). The insufficiency of urban land development is most blatant when the locality remains rural, despite the output α supported by the first unit of urban land being by assumption higher than its development cost i. But to different degrees the other equilibria also lead to suboptimal city sizes.

The surplus of the locality associated with the optimal city size can be computed by replacing equations (5) and (23) into equation (3), under the assumption that $\theta = 1$, which yields:

$$Y^* = \frac{(\alpha - i)^2}{2\alpha\gamma} \tag{26}$$

Predictably, Y^* increases with the potential of the locality and its agglomeration effects α; it decreases with the strength of its congestion effects γ, and with the unit cost of land development i.

From equation (3') it can be noted that the surplus of the locality is maximized when city size attains L^* and the waste of resources $W(L_g)$ from ineffective land development is nil. The analysis of city size showed that $L^j < L^*$ in all equilibria. And in some of them the local government develops urban land, implying $L_g^j \geq 0$ and hence $W(L_g^j) \geq 0$. Replacing these two inequalities in equation (3') proves that the optimal local surplus is never attained ($Y^j < Y^*$ for all j).

6.2. The distribution of the surplus

Not only is the surplus of the locality smaller than would be possible, but also a share of it may be appropriated by the large developer. The analytical expression of R^j associated with Nash equilibrium j can be derived by replacing in equation (4) the formulas determining the amount of land L_p^j developed by the private investor and the size of the city L^j. These formulas are given by equations (8), (9), (10), (11) and (17) in the case of L_p^j, and by equation (24) in that of L^j. Taking equation (5) into account:

$$R^D = \frac{(\alpha\mu - i)^2}{4\alpha\gamma\mu^2} \qquad\qquad R^M = \frac{(\mu - \theta)^2 i^2}{\alpha\gamma\theta^2\mu^2}$$
$$R^S = \frac{(2\mu - \theta\mu - \theta)^2 i^2}{\alpha\gamma\theta^2\mu^2} \qquad\qquad R^C = R^A = 0 \tag{27}$$

Because $\mu > \mu^{L_p=0}$ in the developer city, $\mu > \mu^{M=C}$ in the mixed city and $\mu > \mu^{S=C}$ in the strategic city, equations (12), (15) and (18) imply that the terms in parentheses in equation (27) are all strictly positive. So is thus the rent of the private investor when it develops urban land, as could be expected.

On the surface, the larger the rent enjoyed by the large developer is, the smaller should be the windfall from urbanization for the rest of society. From equation (1), other things equal $dH/dR = -1$. However, other things are not necessarily equal. Equations (1) and (3') imply:

$$H^j = F(L^j) - iL^j - \frac{1-\theta}{\theta} iL_g^j - R^j \qquad (28)$$

Changes in the parameters of the model leading to an increase in R could also lead to changes in L, or in L_g. Therefore, the relationship between the rent of the large developer and the windfall from urbanization for the rest of society depends on how private participation in the urbanization process affects the size of the city and the waste of resources from inefficient urban land development by the local government.

Two examples can be used to show that R and H can be complements as well as substitutes. Both examples are from Nash equilibria in which urban land is developed by the two players, raising the prospect of one of them crowding in or crowding out the other. The examples build on a comparison between high and low values of developer clout for a given value of government capacity.

Taking equations (2) and (4) into account, equation (28) can be rewritten as:

$$H^j = F(L^j) - \frac{i}{\theta} L^j - \left[F'(L^j) - \frac{i}{\mu} - \frac{1-\theta}{\theta} i\right] L_p^j \qquad (29)$$

In both the mixed city and the strategic city equilibria, equation (24) implies that the size of the city L^j is independent from the clout of the large developer. Therefore, for a given value of parameter θ the first two terms in the right-hand side of equation (29) are constant. But L_p^j is not, varying from $L_p^j \approx 0$ for low values of parameter μ to $L_p^j \approx L^j$ for high values. The rent of the large developer is close to zero in the first case, and strictly positive in the second case.

The key difference between the two Nash equilibria considered lies in the sign of the expression in brackets in equation (29). Taking equation (25) into account, this expression is equal to $i - (i/\mu)$ in the mixed city equilibrium, implying that the last term in equation (29) is strictly positive when $L_p^M \approx L^M$, whereas it is nil for $L_p^M \approx 0$. The windfall to the rest of society is thus larger when the rent of the large developer is sizable than when it is negligible. On the other hand, in the strategic city equilibrium the expression in brackets negative if $\mu < \theta.$ meaning that rent and windfall become complements when the capacity of the local government is relatively high. the last term in equation (29) is strictly negative when $L_p^S \approx L^S$. Given that it is nil when $L_p^S \approx 0$. The windfall to the rest of society is smaller when the rent of the large developer is sizable than when it is negligible

Proposition 3. The size of the city is suboptimal in all equilibria and so is the surplus of the locality, due to both under-urbanization and wasteful land development by the local government. The windfall for the rest of society may be further reduced by the rent of the large developer, but it can also increase as the private investor develops urban land more efficiently than the local government.

7. Increasing local government capacity

With urbanization being inefficient a relevant question is whether urban policy options exist that could lead to better outcomes. The standard recommendation in the urban economics literature is to increase the capacity of local authorities to plan, build and manage cities. The analysis above confirms that a fully capable government is associated with the optimal city size and the maximum surplus for the locality. However, it does not follow that increasing government capacity from a low level would always lead to better outcomes. The interaction with the large developer gives rise to pecuniary externalities, creating a second-best environment in which first-best policies may have unintended consequences.

Starting with the size of the city, the consequences of greater government capacity can be assessed by computing the value of $dL/d\theta$. The analysis is conducted for parameters values such that $\theta > \theta^{L_g=0}$ and $\mu > \mu^{L_p=0}$, as this ensures that the locality does not remain rural.

Within each Nash equilibrium, city size is a non-decreasing function of local government capacity. Differentiating the analytical expressions of L in equation (24) with respect to θ yields:

$$\frac{dL^D}{d\theta} = 0 \qquad\qquad \frac{dL^j}{d\theta} > 0 \quad \text{for} \quad j \in \{M, S, C\} \qquad (30)$$

However, it does not follow that $dL/d\theta \geq 0$, because a greater government capacity can also trigger a change in the Nash equilibrium that prevails. A thorough characterization of the relationship between city size and the institutional parameters of the model therefore requires analyzing whether L varies continuously when crossing a frontier.

From equations (12), (13), (18), (19) and (22), the following rankings of city sizes obtain:

$$
\begin{aligned}
&L^D = L^M \quad \text{if} \quad \mu = \mu^{D=M} && L^M = L^C \quad \text{if} \quad \mu = \mu^{M=C} \\
&L^D = L^S \quad \text{if} \quad \mu = \mu^{D=S} && L^S < L^C \quad \text{if} \quad \mu = \mu^{S=C} \\
&\qquad\qquad L^D < L^C \quad \text{if} \quad \mu = \mu^{D=C}
\end{aligned}
\tag{31}
$$

A simple representation of equations (30) and (31) shows that city size is a non-decreasing function of the capacity of the local government. Regardless of the nature of the game, L is stable or increases with parameter θ in all Nash equilibria, as well as when crossing any of the frontiers between them (figure 5).

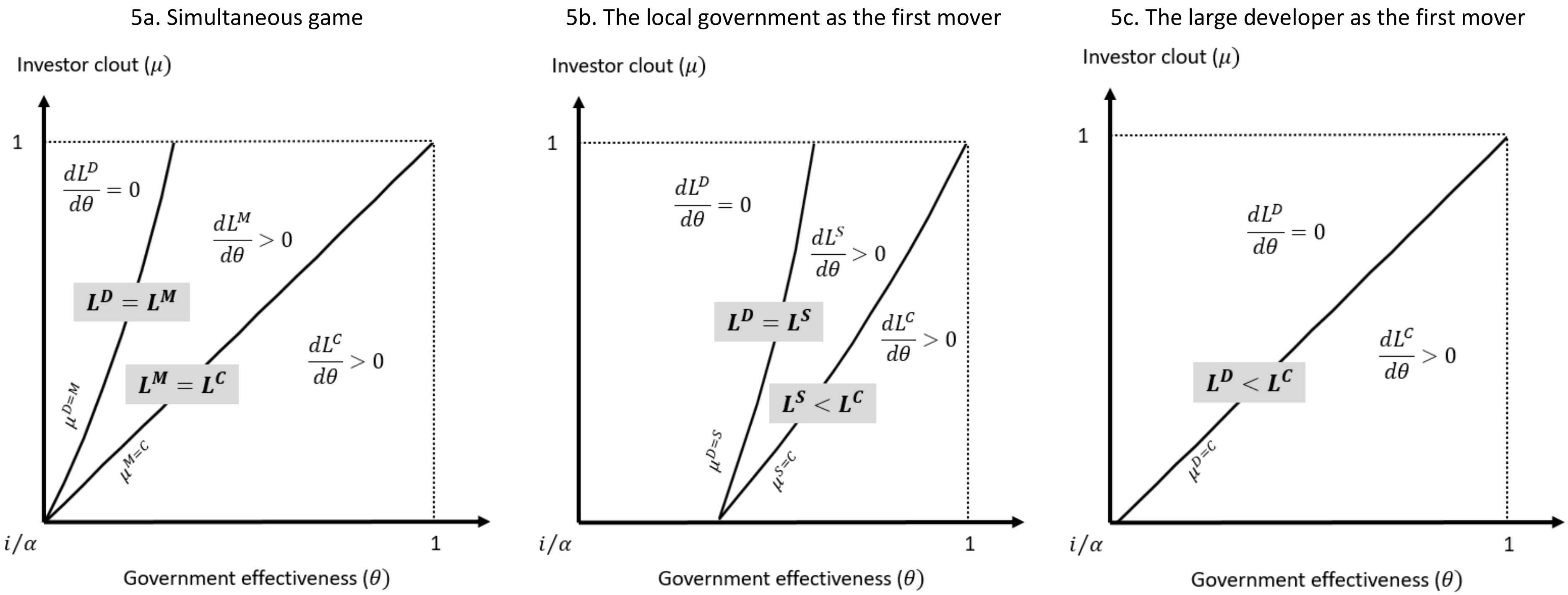
Whether the surplus of the locality also increases with local government capacity depends on the waste of resources from the additional urban land development. In terms of equation (3'), the question is whether $F(L) - iL$ increases more than $W(L_g)$ as parameter θ increases. The ambivalence stems from $W(L_g)$ being the product of two terms: the amount of urban land L_g developed by the local government and the waste of resources per each such unit, $(1-\theta)/\theta$. Because the former increases with local government capacity whereas the latter decreases, the product of the two may vary in either direction.

The ambivalence of the sign of $dY^j/d\theta$ can be lifted in all but one of the Nash equilibria (annex B). The sign of this partial derivative is unambiguous when one of the two players develops urban land, and when the local government is the first mover. But in the mixed city, the surplus of the locality may increase or decrease depending on the portion of the institutional space (ϑ, μ) considered:

$$
\begin{aligned}
&\frac{dY^D}{d\theta} = 0 && \frac{dY^j}{d\theta} > 0 \quad \text{for} \quad j \in \{S, C\} \\
&\frac{dY^M}{d\theta} < 0 \quad \text{if} \quad \mu^{D=M} && \frac{dY^M}{d\theta} > 0 \quad \text{if} \quad \mu = \mu^{M=C}
\end{aligned}
\tag{32}
$$

Again, a thorough analysis also requires assessing whether the surplus of the locality varies continuously when changes in the institutional parameters of the model trigger a shift in the prevailing Nash equilibrium. Annex B shows that the following relationships hold:

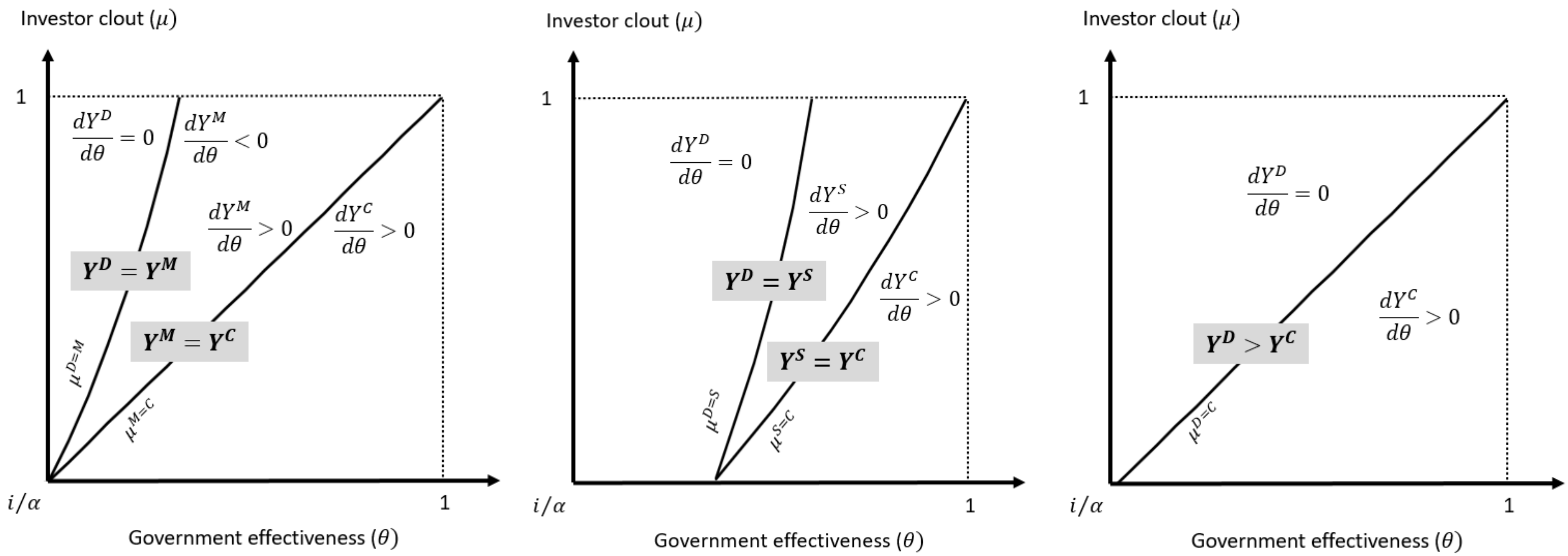
Figure 5. Local government capacity and the size of the city



Note: All figures are enlargements of the upper right portion of the institutional space (θ,μ).

Figure 6. Local government capacity and the surplus of the locality

6a. Simultaneous game | 6b. The local government as the first mover | 6c. The large developer as the first mover



Note: All figures are enlargements of the upper right portion of the institutional space (θ,μ).

$$Y^D = Y^M \text{ if } \mu = \mu^{D=M} \qquad Y^M = Y^C \text{ if } \mu = \mu^{M=C}$$
$$Y^D = Y^S \text{ if } \mu = \mu^{D=S} \qquad Y^S = Y^C \text{ if } \mu = \mu^{S=C} \qquad (33)$$
$$Y^D > Y^C \text{ if } \mu = \mu^{D=C}$$

From equations (32) and (33), the surplus of the locality can decrease with the capacity of the local government. This may happen when both players develop urban land. It also happens when the large developer moves first, if a greater value of parameter θ makes the locality shift from being a developer city into becoming a conventional city (figure 6).

Proposition 4. Greater local government capacity leads to a bigger city size, but the impact on the surplus of the locality is ambiguous. In the mixed city equilibrium, it may crowd out the large developer, resulting in more wasteful land development. And it may trigger a switch from a developer city to a bigger but more inefficient conventional city when the large developer is the first mover.

8. Dealing with the large developer

The simple analytical model above allows exploring the consequences of interventions targeted to the private investor on both the efficiency of the urbanization process and the way the surplus of the locality is distributed. In line with standard normative analyses, three types of interventions are considered. The first one, coercive in nature, bans urban land development by the private investor so that the responsibility for urbanization is exclusively in the hands the local government. The second one, in the spirit of welfare economics, relies on fiscal instruments to incentivize the large developer and redistribute the resulting surplus to the rest of society. The last one, in line with the law and economics approach, allocates the property rights to the city, with the local government collecting a fee in exchange.

8.1. Banning the large developer

The non-cooperative nature of the game played by the local government and the large developer is one of the reasons why urbanization is inefficient in the setting considered here. Non-cooperative interactions of this sort lead to pecuniary externalities, creating a second-best environment. Banning the large developer could address this source of inefficiency. Given the potentially large rent the private investor appropriates, a ban on its activities could also be popular, making coercive regulation politically appealing.

If the private investor is not allowed to develop land, the locality can only be a conventional city or a rural area. The properties of these two equilibria remain the same as before. But the ban on the large developer modifies the partition of the institutional space (θ, μ). Maximizing the surplus of the locality in equation (2) now leads to the city size L^C in equation (24) for all levels of local government capacity satisfying equation (14). Therefore, the locality remains a rural area if $\theta < \theta^{L_g=0}$ and becomes a conventional city otherwise (figure 7a).

This partition of the institutional space (θ, μ) facilitates comparisons with the Nash equilibria j analyzed above, summarized in figures 2b and 3b. The outcomes are the same as before if $\mu < \mu^{L_p=0}$, with the expression of this frontier given by equation (15). In this region of the institutional space, the private investor would not have found it profitable to develop urban land, and therefore the ban does not modify the degree of urbanization, the surplus of the locality, or the windfall for the rest of society.

On the other hand, if $\mu > i/\alpha$ and $\theta < i/\alpha$ the locality remains rural, whereas it could have been a developer city, generating a positive surplus and delivering a windfall for society at large. In this case the ban leads to unambiguously worse equilibrium outcomes.

Comparisons are less straightforward in the upper right quadrant of the institutional space (θ, μ). Because multiple Nash equilibria may emerge depending on the nature of the game, the size of the city and the values of the parameters, the surplus of the locality may increase, decrease, or remain the same when banning the large developer. This ambiguity of results only reinforces the conclusion that coercive regulation does not consistently lead to better outcomes.

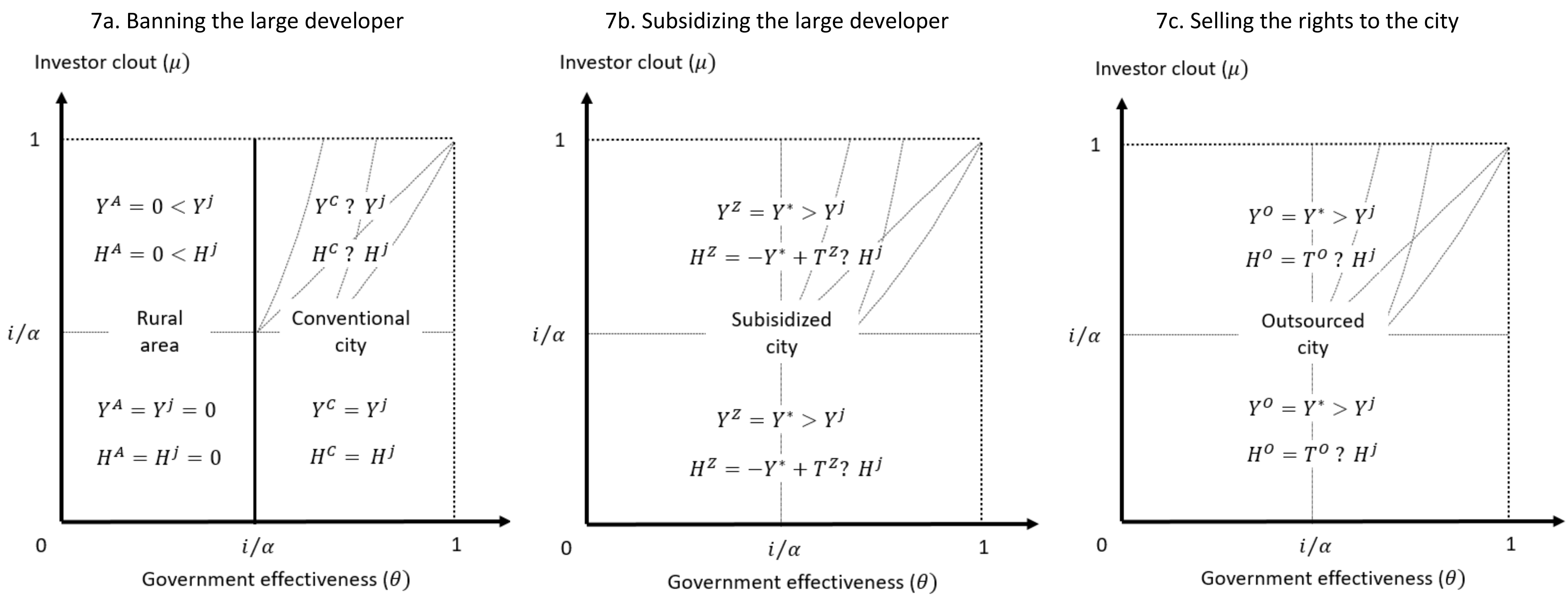
8.2. Subsidizing the large developer

The size of the city is a non-decreasing function of the clout of the large developer. Indeed, differentiating equation (24) with respect to μ yields:

$$\frac{dL^D}{d\mu} > 0 \qquad\qquad \frac{dL^j}{d\mu} = 0 \quad \text{for } j \in \{M, S, C\} \tag{34}$$

Conversely, the waste of resources from ineffective land development by the local government is a non-increasing function of the developer's clout. Equations (3'), (8), (9), (10) and (16) imply:

Figure 7. Policy interventions targeted to the large developer



$$\frac{dW(L_g^j)}{d\mu} = 0 \quad \text{for } j \in \{D, C\} \qquad\qquad \frac{dW(L_g^j)}{d\mu} < 0 \quad \text{for } j \in \{M, S\} \tag{35}$$

From equation (3'), the surplus of the locality increases with the size of the city and decreases with the waste of resources by the local government. From equations (34) and (35), it follows that:

$$\frac{dY^j}{d\mu} > 0 \quad \text{for } j \in \{D, M, S\} \qquad\qquad \frac{dY^C}{d\mu} = 0 \tag{36}$$

Moreover, equation (33) implies that the surplus of the locality remains the same, or even increases, when a greater clout of the large developer triggers a change in the nature of the Nash equilibrium. This is so regardless of whether the players move simultaneously or sequentially. Therefore, it is always the case that $dY/d\mu \geq 0$.

This positive relationship between Y and μ suggests that the local government could choose not to develop land in the locality, and instead support the private investor in a way that mimics an increase in its clout. If the rent from an additional unit of land could be boosted until it equals the surplus that unit of land generates, it would be in the interest of the large developer to build a city of socially optimal size. Subsidizing the private developer raises equity concerns, but these can be addressed by clawing back some of its rent and distributing it to the rest society. In this setting, called the *subsidized city* (Z) in what follows, urbanization would be efficient, and potentially Pareto-efficient, despite the local government not being involved in planning the city, building it, or delivering services for it.

Let i/μ^Z be the cost of land development for the private investor after support by local government is factored in, and T^Z the tax used to claw back resources from it and redistribute them to the rest of society. To avoid undermining the incentives for the private investor to develop urban land, a lump-sum tax needs to be used. Taking these two fiscal instruments into account, the rent of the large developer becomes:

$$R = \left[F'(L) - \frac{i}{\mu^Z}\right] L_p - T^Z \tag{4'}$$

Building on the developer city equilibrium described in equation (24), the amount of urban land developed by the private investor satisfies:

$$L^Z = \frac{\alpha\mu^Z - i}{2\alpha\gamma\mu^Z} \tag{37}$$

For the subsidized city to ensure efficient urbanization, μ^Z should be such that $L^Z = L^*$. From equations (23) and (37), this happens when:

$$\frac{i}{\mu^Z} = 2i - \alpha \tag{38}$$

With $\alpha > i$ by assumption, equation (38) implies that $i/\mu^Z < i$. Offering land at no cost to the large developer would not be enough to attain the social optimum. The local government would need to go farther and bear some of the land development cost faced by the private investor. Equation (38) also implies that the extent of subsidization needed would be independent from the capacity of the local government and the clout of the large developer. Therefore, adequately subsidizing the large developer allows attaining the social optimum across the entire institutional space (θ, μ) (figure 7b).

Replacing equation (38) into equations (1), (3) and (5), and taking equation (26) into account, the subsidized city equilibrium is such that:

$$Y^Z = Y^* \qquad R^Z = \frac{(\alpha - i)^2}{\alpha\gamma} = 2Y^* - T^Z \qquad H^Z = -Y^* + T^Z \tag{39}$$

Pareto efficiency would require that $H^Z \geq H^j$, with j indicating the Nash equilibrium that would otherwise have prevailed. At the same time, the large developer would only be interested in the subsidization deal if $R^Z \geq R^j$. From equations (1) and (39), for the lump-sum tax T^Z to be consistent with Pareto efficiency, it would have to satisfy:

$$Y^* + H^j \leq T^Z \leq 2Y^* - Y^j + H^j \tag{40}$$

Because $Y^j < Y^*$, the range of T^Z values in equation (40) is not empty. This result can be interpreted as a variant of the Henry George theorem, which states that spending in public goods by the local government increases land rent by at least that amount (Stiglitz 1977).

Subsidizing the large developer can thus support optimal urbanization in a Pareto-efficient way, and this for any levels of local government capacity and large developer clout. However, the lump-sum tax needed for this approach to succeed would have to exceed the maximum surplus of the locality. Even spreading out tax collection over many years, it may be challenging for a local government with low capacity to redistribute resources on such a large scale.

8.3. Selling the rights to the city

If the property rights on the jurisdiction were reallocated to the large developer, it would be in its interest to maximize the surplus of the locality. By relinquishing its own rights, the local government would allow the private investor to fully internalize the potential gains from land development. In this setting, called the *outsourced city* (O) in what follows, the large developer can in principle do anything a government would do, as suggested by Stiglitz (1977).

The rent of a large developer who owns the right to the city would depend on the full output generated by the land it develops, and not only on its marginal output. Also, having acquired the locality, the private investor would not need to secure conversion and assembly clearances anymore, or to purchase land plots from original residents. As a result, the marginal cost of urban land development would fall from i/μ to i. The flip side is that the large developer would need to incur a cost T^O to be granted the rights to the city. This amount could be interpreted as the winning bid in an auction, or the government-set price for the concession of the jurisdiction over a very long-time horizon.

Incorporating these changes into equation (4), the rent of the large developer becomes:

$$R^O = F(L_p) - iL_p - T^O \qquad (4'')$$

From equations (3), (4”) and (23), the solution to the optimization problem of the private investor is $L^O = L^*$. Taking equations (1) and (26) into account, the outsourced city equilibrium satisfies:

$$Y^O = Y^* \qquad R^O = Y^* - T^O \qquad H^O = T^O \qquad (41)$$

Given that the private investor can do anything a local government would do, and in addition it is an efficient developer of land, the social optimum is attained. And once again, urbanization is efficient regardless of the values of the institutional parameters of the model (figure 7c).

A benevolent government interested in maximizing the surplus of the locality would support urban outsourcing, as the surplus would unambiguously increase from Y^j in the alternative Nash equilibrium j to Y^*. And it would do so regardless of the price at which the rights to the city are allocated, because T^O is a transfer between the large developer and the rest of society, without implications for aggregate income. However, a local government that also cares about equity would want to sell the rights to the city to the large developer at a price that does not make the rest of society worse-off.

For the large developer to be interested in the outsourcing deal, its rent should be such $R^O \geq R^j$, while the rest of society would benefit from urban outsourcing only if $T^O \geq H^j$. From equations (1) and (41), meeting these two conditions requires that:

$$H^j \leq T^O \leq Y^* - Y^j + H^j \tag{43}$$

Because $Y^j < Y^*$, the range of prices T^O supporting optimal urbanization in a Pareto-efficient way is not empty, regardless of the capacity of the local government and the clout of the large developer.

While ensuring Pareto-efficiency is in principle possible in both the subsidized city and the outsourced city, implementing the latter could be less challenging in practice. In both cases the minimum windfall consistent with the rest of society not being worse off is H^j. Equation (43) implies that the minimum price at which the rights to the city should be sold to attain this threshold is $T^O = H^j$, whereas from equation (40) the minimum lump-sum tax needed to reach the same outcome in the subsidized city is $T^Z = Y^* + H^j$. Put differently, the taxation needed for the subsidized city to be Pareto-efficient is much higher, because in addition to securing a net transfer to the rest of society, it needs to recoup the cost of the subsidy provided to the large developer.

Proposition 5. Banning the large developer reduces both the surplus of the locality and the windfall for the rest of society when the local government has low capacity. Subsidizing the large developer and selling the rights of the city can both ensure efficient urbanization. But a very significant claw back of resources from the large developer is needed to avoid making the rest of society worse off.

9. Conclusion

Private cities are a reality in developing countries. In the absence of capable and empowered local governments, as is the case in many of them, large private investors have become key actors on the urbanization process, with land value capture as their tool to capitalize on rapid economic transformation. Private cities were common in the history of today's advanced economies, where they nowadays exist under the form of so-called edge cities or new cities. But they are unusually large in developing countries, where they can be found across a range of income levels, legal traditions, and political systems. They also tend to be more productive, or more livable than other cities in the same countries (Li and Rama 2021).

And yet, private cities have not received much attention in urban economics. Large developers, and their ability to shape the urbanization process, are more central in urban political science. But none of these two strands of literature offers much guidance on what governments should do about these unusual urban entities and their powerful backers.

The standard policy recommendation to accelerate urbanization and support the emergence of more productive and livable cities is to empower local governments and to increase their capacity. While this is an eminently sensible approach, building capacity takes time and empowering local governments may require constitutional changes with limited support among the elites. In the meantime, developing countries are rapidly urbanizing, consolidating inefficient city structures that will be costly to retrofit in the future. The key question is whether, and under which circumstances, private cities could lead to better urbanization outcomes.

This paper proposes a very simple analytical model to think about city formation and development when local authorities have low capacity, and a large developer has sizeable clout. The model combines insights from both the urban economics tradition and the political science tradition, taking the form of a non-cooperative game in a given jurisdiction. Political economy models are not common in urban economics, but there are precedents to build upon in relation to private developments such as gated communities and business improvement districts.

In the simple setting in this paper, the Nash equilibrium that emerges in the locality varies with the capacity of the local government and the clout of the large developer. It also depends on whether the two players move simultaneously or sequentially. But urbanization is inefficient in all cases. This is so because the local government is not an effective planner, builder and manager of cities, the private investor cannot internalize all the gains from urban land development, and pecuniary externalities from the interaction between the local government and the large developer compound the effects.

This inefficiency of the urbanization process is at odds with the standard prediction in the literature, where the ability of local governments or private investors to develop urban land ensures that capital and labor are attracted to the locality up to the point where its surplus is maximized (Henderson 1974, Henderson and Venables 2009). The presumed efficiency of the urbanization process has also justified skepticism about place-based policies being welfare-improving (Glaeser and Gottlieb 2008).

In the proposed model, a fully capable local government leads to the first-best too. However, increasing government capacity from low levels may not ensure better local outcomes. An improved ability to plan, build and manage the city potentially crowds out investments by the large developer. The local government may be able to develop more urban land, and to do it better than before, but as long as the quality of public urban land is much lower than that of private urban land, the net outcome could be a lower surplus of the locality – despite a potentially bigger city.

The paper explores alternative urban policy interventions targeting the large developer. It shows that banning its activities may lead to worse outcomes, especially when the capacity of the local government is very low. There is more promise in interventions that shift its role from planner, builder and manager of cities to steward of an urbanization process implemented by the private sector.

Two such alternatives are considered. One of them, in line with the Pigouvian approach to policy making, explores the use of subsidies to align the incentives of the large developer to social goals. The other, in the spirit of the Coasian approach, considers selling the rights to the city to the private investor. The paper shows that the outcome is efficient in both cases and can also be made Pareto-efficient. But doing so requires a considerable redistribution of resources from the large developer to the rest of society, on a scale that local governments with limited capacity may find difficult to implement.

On the surface, these two alternative interventions may look similar to initiatives such as charter cities and place-based policies. Charter cities would allow to experiment with local governance arrangements that support contract enforcement and the ease of doing business to a greater extent than national laws and institutions (Fuller and Romer 2012). Place-based policies would offset the inefficient spatial allocation of resources resulting from stringent land-use restrictions in richer localities through employment subsidies in poorer localities (Austin et al. 2018). However, the interventions considered in this paper do not refer to the way business is conducted in the locality, and do not try to affect firm profitability. They rather focus on the process through which land is assembled for urban development, local infrastructure is built, and social services are provided.

The analyses in this paper are admittedly based on an analytical model that is deliberately simple, if not directly simplistic. Their goal is just to provide intuitions on how weak capacity by local governments affects urban policy recommendations. Theoretical research based on richer analytical models and an indepth review of the experience of outstanding private cities are needed before the intuitions from this simple model can be considered as robust guidance in practice.

Two areas deserve special attention. First, the model needs to be extended from a partial equilibrium setting involving only one locality and two players to a broader setting. It was assumed that the jurisdiction considered was too small to have general equilibrium implications, but in several developing countries private cities are big enough to be nationally relevant. In this context, private cities that engage in cream-skimming – by discriminating between firms and households when selecting their residents – could erode the economic dynamism and tax base of conventional cities, exacerbating spatial inequality. It was also assumed that there is only one large developer with sizeable clout, but the review of experience shows that there often are several of them, operating across multiple localities (Li and Rama, 2021).

The time dimension is important as well. The proposed model is static, but building a city is an irreversible investment, exposed to time-inconsistent decisions. The local government could attract large developers and later seize their assets. Large developers could promise to build infrastructure and deliver social services but eventually fail to do so and shift the burden to the local government. As private cities grow, their inhabitants represent an increasingly important political constituency, and inevitably they become conventional cities. Urban outsourcing may be seen as the ultimate public-private partnership, but the enforcement of their terms poses unprecedented challenges.

These challenges may explain why, despite private cities being ubiquitous in the developing world, there are not as many of them as could be expected, given the untapped urbanization potential. But there may be useful insights into how to address time inconsistencies from the experience of some of the most outstanding private cities in the developing world. Among them are the protection of land ownership rights for preexisting villages, and the conversion of the original residents of the locality into shareholders of the private city to emerge (Li and Rama 2021).

There could also be gains from the creation of an international architecture for urban outsourcing, with reputable urban authorities such as the cities of Dubai and Singapore as the large developers, and international financial institutions as the enforcement agencies.

However, the most controversial aspect of private cities is their potential impact on governance and inclusion. While a more efficient urbanization process may be at hand, there is a risk of drifting into a separate set of rules that could amount to a form of secession (Garreau 1992). Some of the private cities of the developing world have their own police forces, and their own security criteria (Bird et al. 2018). Others display a sharp contrast between the orderly and prosperous urban functioning on one side of their boundary and the dysfunctional setting on the other side (Li and Rama, 2021). Depending on which aspects of urban governance are under private control – from the management of public spaces to law and order to citizens' participation – civic rights and democratic accountability could be at risk.

The simple analytical model proposed in this paper was built in the urban economics tradition, leading to rigorous conclusions on the surplus of the locality and its distribution. But it may not be possible to address some of the most sensitive institutional and social aspects of private cities without resorting to the political science tradition.

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Annex A – Frontiers between Nash equilibria

Equation (15) implies that the frontier $\mu^{D=M}$ has the following properties:

$$\frac{d\mu^{D=M}}{d\theta} > 0 \qquad Sign\left(\frac{d^2\mu^{D=M}}{d\theta^2}\right) > 0 \quad \text{if} \quad \theta < \frac{2i}{\alpha}$$

$$\mu^{D=M} = 0 \quad \text{if} \quad \theta = 0 \qquad \mu^{D=M} = \frac{i}{\alpha} \quad \text{if} \quad \theta = \frac{i}{\alpha} \qquad \mu^{D=M} = 1 \quad \text{if} \quad \theta = \frac{2i}{\alpha + i}$$

From equation (18), the frontier $\mu^{S=C}$ is such that:

$$\frac{d\mu^{S=C}}{d\theta} > 0 \qquad \frac{d^2\mu^{S=C}}{d\theta^2} > 0$$

$$\mu^{S=C} = 0 \quad \text{if} \quad \theta = 0 \qquad \mu^{S=C} = \frac{i}{\alpha} \quad \text{if} \quad \theta = \frac{2i}{\alpha + i} \qquad \mu^{S=C} = 1 \quad \text{if} \quad \theta = 1$$

Regarding the frontier $\mu^{D=S}$, equation (19) implies:

$$\frac{d\mu^{D=S}}{d\theta} > 0 \qquad Sign\left(\frac{d^2\mu^{D=S}}{d\theta^2}\right) > 0 \quad \text{if} \quad \theta < \frac{4i}{\alpha + 2i}$$

$$\mu^{D=S} = 0 \quad \text{if} \quad \theta = 0 \qquad \mu^{D=S} = \frac{i}{\alpha} \quad \text{if} \quad \theta = \frac{2i}{\alpha + i} \qquad \mu^{D=S} = 1 \quad \text{if} \quad \theta = \frac{4i}{\alpha + 3i}$$

Annex B – Local government capacity and the surplus of the locality

A thorough analysis of the relationship between the surplus of the locality and the capacity of the local government requires assessing both the sign of $dY/d\theta$ within each Nash equilibrium, as well as the continuity of Y across contiguous equilibria.

B.1. Within each Nash equilibrium

Differentiating the analytical expression of Y in equation (3') with respect to θ yields:

$$\frac{dY^j}{d\theta} = \left\{ \left[F'(L^j) - i\right] \frac{\partial L^j}{\partial L_g^j} - \frac{1-\theta}{\theta} i \right\} \frac{\partial L_g^j}{\partial \theta} + \frac{i}{\theta^2} L_g^j \tag{B1}$$

The last term in the right-hand side of this expression cannot be negative, as $L_g^j \geq 0$ in all Nash equilibria. Similarly, equations (8), (9), (10) and (16) imply that $\partial L_g^j/\partial\theta \geq 0$. Therefore, the sign of $dY^j/d\theta$ critically depends on the sign of the term in curly brackets in equation (B1), and the expression of this term varies depending on the Nash equilibrium considered.

The sign of $dY^j/d\theta$ is non-negative when only one of the two players develops urban land. In the conventional city equilibrium, that player is the local government only, implying $\partial L^C/\partial L_g^C = 1$. The expression in curly brackets then becomes equivalent to dY/dL_g, which the first-order condition of the optimization problem faced by the local government sets equal to zero. Given that $L_g^C > 0$, it follows that $dY^C/d\theta > 0$. Similarly, when only the private investor develops urban land, $L_g^D = 0$, and therefore $dL_g^D/d\theta = 0$. Replacing into equation (B1) implies $dY^D/d\theta = 0$.

The sign of $dY^j/d\theta$ is also positive in the strategic city equilibrium. Equations (5) and (24) imply $F'(L^S) - i = 2(1-\theta)i/\theta$. Given that the local government maximizes the surplus of the locality by choosing a point in the reaction function of the large developer, equation (7) holds. Taking equation (2) into account, this implies that $dL^S/dL_g^S = 1/2$. The term in curly brackets in equation (B1) is therefore nil. Because $L_g^S > 0$ in the strategic city equilibrium, it can be concluded that $dY^S/d\theta > 0$.

In the mixed city equilibrium, on the other hand, $dY^j/d\theta$ is both positive and negative. Equations (5) and (24) imply $F'(L^M) - i = (1-\theta)i/\theta$, whereas from equations (8) and (24) $\partial L^M/\partial L_g^M = 1/2$. Therefore, the term in curly brackets in equation (B1) is negative, and because it is multiplied by $\partial L_g^M/\partial\theta > 0$, the first term in equation (B1) is negative as well. Given that $L_g^M > 0$, equation (B1) boils down to the sum of a negative first term and a positive second term, and that the outcome is in principle undetermined.

However, this ambiguity can be lifted near the frontiers that separate the mixed city from other Nash equilibria. On the frontier with the developer city, equations (8) and (13) imply that $\partial L_g^M/\partial\theta = 1/\gamma\theta$ and $L_g^M = 0$ when $\mu = \mu^{D=M}$. On the frontier with the conventional city, equations (10) and (12) imply that $\partial L_g^M/\partial\theta = 1/\alpha\gamma\theta^2$ and $L_g^M = (\alpha - i)/\alpha\gamma\theta^2$ when $\mu = \mu^{M=C}$. Replacing these results into equation (B1) and keeping in mind that $\theta > \theta^{L_g=0}$, as per equation (14), yields:

$$\frac{dY^M}{d\theta} = -\frac{(1-\theta)i}{2\gamma\theta^2} < 0 \quad \text{If} \quad \mu = \mu^{D=M} \qquad \frac{dY^M}{d\theta} = \frac{(2\alpha + i)\theta - 2i}{2\alpha\gamma\theta^3} > 0 \quad \text{If} \quad \mu = \mu^{M=C} \qquad \text{(B2)}$$

B.2. Across contiguous equilibria

The sign of $dY^j/d\theta$ could be the same in all Nash equilibria and yet the sign of $dY/d\theta$ could still be ambiguous. This is what would happen if Y changed in the opposite direction when increases in parameter θ trigger a shift from one equilibrium to another. It is therefore necessary to assess the continuity of Y over the relevant frontiers, depending on the nature of the game.

If both players move simultaneously, equations (8), (10), (13) and (24) imply that $L^D = L^M$ and $L_g^D = L_g^M$ over the frontier $\mu^{D=M}$. From equation (3'), it follows that the surplus of the locality remains unchanged when crossing that frontier. A similar reasoning applies in the of case frontier $\mu^{M=C}$, where equations (8), (9), (12) and (24) imply that $L^M = L^C$ and $L_g^M = L_g^C$. Once again, the surplus is the same on both sides of the frontier.

There is also continuity when the local government moves first. Because the local government internalizes the behavior of the large developer and aims to maximize the surplus of the locality, the outcome is a second-best equilibrium. If shifting to a developer city or a conventional city led to a larger surplus, then the local government would have already adjusted the amount of land it develops accordingly.

On the other hand, there is discontinuity when the large developer moves first. Equations (22) and (24) imply $L^C = 2L^D$ over the frontier $\mu^{D=C}$, and because the $f(L)$ function is concave, $F(L^C) < 2F(L^D)$. At the same time, the cost for society of building the developer city is iL^D, whereas the cost of building the conventional city is $2(i/\theta)L^D > 2iL^D$. Therefore, the conventional city on one side of the frontier $\mu^{D=C}$ generates less than half as much output as the developer city on the other side, but it costs more than twice as much to build. It follows that $Y^D > Y^C$.