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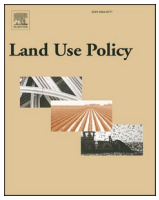

Advancing understanding of the linkages between local land policy interventions and the responsiveness of housing supply: Intervention mechanisms in the Finnish context

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ABSTRACT

Land policy interventions are important ways for municipalities to implement their spatial development objectives. Such interventions may, however, generate both intended and unintended effects to housing supply and its responsiveness. It is therefore essential to better understand how and through what kind of mechanisms local land policy interventions can influence the quantity of housing supply. This paper addresses these questions. First, we develop a conceptual classification of so-called intervention mechanisms that describes the linkages between local land policy interventions and the quantity and responsiveness of housing supply. The intervention mechanisms build on a review of the urban economics literature and are further developed empirically using extensive expert interview data on local land policy interventions and practices in 30 Finnish municipalities. Based on the understanding that such intervention primarily influences housing supply through either direct or indirect costs on development, we conceptualize seven intervention mechanisms in the Finnish land policy context. Second, we demonstrate the variation in the application of land policy interventions that contribute to the (in)responsiveness of housing supply at the municipal level. Our findings highlight significant variation in the application of such interventions, potentially leading to different outcomes in housing supply restrictiveness. The findings contribute to a deeper understanding of the mechanisms by which land policy interventions operate to affect the (in)responsiveness of housing supply.

1. Introduction

Land policy interventions, the deliberate actions and measures initiated by local governments (often municipalities) to shape, influence, or direct land use and housing development, are important ways for achieving various environmental, social, and economic goals (see e.g., Debrunner and Hartmann, 2020; Gerber et al., 2018b; Hartmann and Spit, 2015; Shahab et al., 2021; Vejchodská et al., 2022). These interventions encompass – besides classic planning measures – all different types of regulatory measures and incentives related particularly to the implementation process of spatial development objectives (Debrunner and Hartmann, 2020; Gerber et al., 2018b; Vejchodská et al., 2022).[1]

Land policy interventions serve an important public purpose by reducing negative externalities (e.g., congestion, noise, and environmental impacts) that would occur in an unregulated market (Hilber and Vermeulen, 2016; Schill, 2005). They can also be used to advance different positive externalities, such as the provision of open space and building safety (e.g., May, 2003; Wang, 2014; McFarlane et al., 2021), as well as to facilitate plan implementation (e.g., Turnbull, 1988; McFarlane, 1999; Ihlanfeldt, 2004; Lyytikäinen, 2009). However, these interventions may also create undesirable subsidiary effects that are unanticipated by policymakers (Brueckner, 2009; Shahab et al., 2019). Sometimes these subsidiary effects may even generate costs that offset the benefits originally intended (Turner et al., 2014). For instance, interventions aimed to preserve open space have been found to contribute to a more sprawled development pattern (Irwin and Bockstael, 2004),

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[1] Following Alexander (2014), land policy interventions exclude thus, for example, fiscal policies and banking regulation that are not directly involved with and affected by planning and plan implementation.

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whereas the imposition of inclusionary housing has been found to reduce housing supply and increase the price of market-rate housing (Powell and Stringham, 2004; Bento et al., 2009; Schuetz et al., 2011).

While policymakers should carefully consider the potential subsidiary effects of their interventions to minimize negative consequences, the inherent complexity and interconnectedness of different interventions and their outcomes make this a challenging task. This challenge seems particularly relevant when considering the effects of land policy interventions on housing supply and its responsiveness. The responsiveness of housing supply reflects how quickly and effectively the supply responds to demand, and it thereby plays a pivotal role in determining the resulting quantity of housing supply – a key focus of this paper. Delving into the linkages between land policy interventions and the supply-side of housing is important for various reasons. Foremost, the size of housing stock significantly influences housing prices and rents (Cheshire and Vermeulen, 2009; Hilber and Vermeulen, 2016; Albouy and Ehrlich, 2018; Anthony, 2006; 2017). Supply constraints on housing markets may cause a higher house price-income ratio, and thus contribute to housing unaffordability (Oikarinen et al., 2023). Moreover, the responsiveness of (quantity of) housing supply has been found to influence, for instance, regional growth dynamics, labour market flexibility, migration, and income levels (Glaeser et al., 2006; Saks, 2008; Zabel, 2012; Diamond, 2017; Ganong and Shoag, 2017; Hsieh and Moretti, 2019; Accetturo et al., 2021).

Despite the growing recognition of the profound effects of the supply-side factors in housing markets, there remains a lack of clarity on the linkages between land policy interventions and the quantity of housing supply at the local government level. Earlier studies have mainly focused on categorizing planning-related regulatory barriers and examining their influence on housing construction and prices in the US and UK contexts (e.g., Bramley and Watkins, 2014; Glaeser and Ward, 2009; Gyourko et al., 2008; Ihlanfeldt, 2007; Jackson, 2016; Anthony, 2006; 2017). Much less attention has been devoted to examining the linkages of other types of land policy interventions, including those related to plan implementation, i.e., the way land is distributed for future (residential) development and how this development process is enforced (see e.g., Krigsholm et al., 2022). Such interventions are particularly relevant in countries where both the spatial planning and the land development process are strongly controlled by local public authorities, as is the case in many European countries (Valtonen et al., 2017a).

The aim of this paper is to advance understanding of the interrelations between land policy interventions and the quantity of market-rate housing supply.[2] In this context, we refer to *land policy interventions* as all those actions and measures initiated by local governments to shape, influence, or direct land use and future housing development to advance the (politically defined) spatial development objectives. Specifically, such interventions encompass a variety of (regulatory) measures and incentives including, for instance, strategic land banking and land acquisition practices, local planning requirements, and conveyance stipulations of buildable plots.

The first objective is to develop a conceptual classification that outlines various mechanisms through which land policy interventions may influence the quantity of housing supply at the housing market level. To that end, we draw on the economic principles within the context of urban economics literature to demonstrate the potential linkages between such interventions and the size and growth of housing stock. According to this strand of the literature, local public authorities may essentially influence the quantity of housing supply either directly through land availability, restrictions on housing supply, and development costs, or indirectly through time-related indirect costs (e.g., Mayer and Somerville, 2000; Paciorek, 2013; Skidmore and Peddle, 1998). These two linkages enable us to identify various interventions and practices of local land policy that contribute to the (in)responsiveness– and thereby to the quantity – of housing supply. Further, we utilize extensive interview data on land policy interventions and practices from the 30 most populated municipalities in Finland, a country with a tradition of strong interventions by local public authorities on the land market (see e.g., Krigsholm et al., 2022; Valtonen et al., 2017a). This empirical approach allows us to provide more detailed insights into these two linkages. Specifically, by identifying and grouping together those interventions and practices with an identified influence either directly or indirectly on the costs of development, we conceptualize a total of seven intervention mechanisms.

As the ways in which municipalities activate different land policy instruments vary greatly (Shahab et al., 2021; Krigsholm et al., 2022), also the prevalence and intensity of interventions influencing the quantity of housing supply is likely to be heterogenous at local government level. Hence, the second objective of the study is to identify and demonstrate the variations in the application of housing-supply relevant land policy interventions at the local government level. Furthermore, we qualitatively rank the alternative applications of these interventions from the vantage-point of market-rate housing supply. By doing so, this study does not attempt to evaluate or judge the public objectives of land policy interventions, nor does it aim to quantify the effect of land policy choices on the (in)responsiveness of housing supply. Instead, the focus is to explore how the quantity of housing supply is influenced by local land policy interventions. Ultimately, our methodology showcases a structured way to capture how the different choices of municipalities can pile up into different degrees of housing supply restrictiveness of local land policy.

The paper is structured as follows. Section 2 reviews the existing literature that links land policy interventions to the quantity of housing supply and its responsiveness to lay the basis for conceptualizing intervention mechanisms. Section 3 describes the research process, the institutional framework, and the methods of data collection and analysis. In Section 4 we present the intervention mechanisms and the variation in the application of those land policy interventions that contribute to the (in)responsiveness of housing supply in the Finnish context. Section 5 discusses the findings and Section 6 concludes.

2. Linking land policy interventions and housing supply

In this section, we review the theoretical and empirical literature to develop an understanding of the linkages between land policy interventions and the quantity of housing supply. Specifically, our focus is on the urban economics literature that addresses land policy interventions influencing the size and growth of housing stock. Given that the extant empirical literature on land policy interventions has mainly concentrated on planning-related interventions, the review of the literature is strongly guided by this subset. While not exhaustive, the review establishes an understanding of the basic mechanisms through which land policy interventions influence the quantity of housing supply (henceforth referred to as 'housing supply' unless mentioned otherwise). We start by presenting theoretical considerations of housing supply-related effects from such interventions, after which we present empirical evidence on the topic.

2.1. Theoretical considerations

Economic theory suggests that the quantity of housing supply and the price of housing are dependent on the interaction between supply and demand components of the market. In a competitive market, supply and demand intersect at an equilibrium. When either demand or supply schedule shifts, for example due to land policy interventions, the

[2] We refer to market-rate housing as non-subsidized housing. While we acknowledge that market-rate housing will not necessarily address the housing needs of all households, it is most likely to also benefit lower-income households (see e.g., Bratu et al., 2023; Mast, 2021; Been et al., 2019), making it an important factor to consider.

equilibrium will likewise change. On the demand side, these interventions can provide amenities that lead to increased local housing demand and, consequently, higher house prices (Anthony, 2017; Quigley and Rosenthal, 2005). Conversely, they can also create disamenities, resulting in a decrease in housing demand and lower prices.

On the supply-side, land policy interventions can influence, for instance, the permitted development intensity, the cost of development, or the amount of land available for housing development. Whether these interventions are regarded as planning-related or fall into other types of land policy interventions can depend on the institutional context. Hence, the classification of these interventions may vary based on the prevailing institutional framework, making the distinction sensitive to the specific context in which they are applied. Regardless of whether an intervention falls under planning or under other land policy intervention, the basic mechanisms remain the same. Ultimately such interventions impact the housing supply-schedule and thus the equilibrium outcome (Gyourko et al., 2008; Mayo and Sheppard, 1996).

The supply-side effect can be modelled in two different ways. The first way is to consider an underlying supply curve, and model land policy interventions as items that shift the supply curve up (down) through increased (decreased) development costs. When these interventions increase the developers (marginal) costs for housing development, the effect on new housing supply follows the basic idea of economic theory: based on the assumption of a competitive market, a cost imposed by the public authorities will shift up the supply curve of housing (from the $Supply_0$ curve to the dashed $Supply_1$ curve presented in Fig. 1), resulting in a lower quantity of new housing built and hence a lower housing supply and a higher price level (point B vs. point A) (Evans, 2004; Huffman et al., 1988; Been, 2005).

The ultimate effect of land policy interventions on housing supply will, however, depend not only on the actual cost imposed by such interventions but also on the likelihood that some of the cost will be capitalized into house prices or the price of residential land. If the intervention simultaneously creates a benefit for the homebuyer, we would expect it to be reflected in a higher house price (see e.g., Anthony, 2017). Consequently, if the cost imposed by land policy interventions is fully reflected in the house price, developers would not experience any burden from the increased costs, and there would be no decrease in the number of homes.[3]

However, if homebuyers value the benefits of land policy interventions less than the cost imposed, the increase in the house price would be insufficient to cover the cost. In such cases, the higher marginal cost of development would reduce the price developers are willing to pay for the land (see e.g., Brueckner, 2009). Also, the uncertainties faced by developers regarding the capitalization of costs into the house price could similarly reduce the price of land. By doing so, land policy interventions lower the opportunity cost of using the land for alternative purposes. This "reservation price" problem (see, for example, Nelson, 1994; Huffman et al., 1988) may result in land being withheld from residential use for more extended periods. After all, land has a variety of uses beyond housing, including not only agricultural purposes but also other urban purposes that already generate income or benefit to its owner (Metcalf, 2018).

Consequently, when landowners reduce the rate at which they supply residential land, the housing development process is slowed down, leading to a reduced number of homes (Powell and Stringham, 2004; Brueckner, 2000). The capitalization of the costs and the subsequent impact of interventions on housing supply vary not only depending on the type of intervention but also on the specific context, such as the institutional context that affects the structure of the land market (Needham, 2000). Addressing this, though valuable, is an empirical question which falls outside the scope of this paper.

While some land policy interventions might decrease housing supply, they can naturally also work in the opposite direction by supporting or even enhancing it. For example, public authorities can employ these interventions to plan and supply more land for residential development than what an unregulated market would provide (Ihlanfeldt, 2004). This would reduce the marginal cost of development, shift the supply curve downwards, and thereby increase the overall supply of housing at any given price. Public authorities can also increase housing supply by introducing various supply subsidies, such as economic incentives or allowances, to impact the timing decisions of developers and thus encourage them to provide housing (McFarlane, 1999; Turnbull, 1988).

The second way to model the influence of land policy interventions on the supply side is through their influence on the (in)responsiveness of housing supply to price changes, i.e., on the price elasticity of housing supply, which defines the slope of the supply curve (see Fig. 1). By influencing the marginal cost of development, land policy interventions can thereby affect the elasticity of housing supply. This applies, for example, to interventions that influence the costs of building materials, impose height restrictions, or affect the time required to obtain a building permit (Henderson, 2009). Assuming all other things equal, we would expect a municipality with relatively low levels of housing supply restrictions through land policy interventions to have a relatively elastic housing supply. A positive shift in demand would therefore result in a notable increase in the housing stock and relatively modest increase in housing costs (point A in Fig. 1). In contrast, if a municipality has higher levels of housing supply restrictions, the housing supply can increase less when faced with a positive demand shift. Instead, the positive shift in demand would lead to a greater increase in housing prices (point B in Fig. 1).

Regardless of whether we approach the influence of land policy interventions through changes in development costs or price elasticity of housing supply, we would often expect an increase in the marginal cost of housing development to result in a reduction in the quantity of housing supply.[4] Henceforth, we refer to this effect resulting from changes in the (marginal) cost of development as *(in)responsiveness of housing supply*.

There are various forms of land policy interventions that influence housing development and the use of land, ranging from planning and development restrictions to different interventions related to the implementation process of plans, including those interventions targeting the strategic acquisition and public management of land. From the perspective of marginal costs, they can ultimately be collapsed into two main categories (Mayer and Somerville, 2000; Henderson, 2009). The first includes those interventions that directly affect development costs, such as interventions that require more expensive building components, impose exactions, or restrict buildable land supplies. The second category involves various time-related interventions in the decision-making and development process. These interventions implicitly influence development costs, for example, by introducing multiple reviews in obtaining a building permit or prolonging the conveyance processes of publicly owned land.

2.2. Direct effects of land policy interventions

One way for local governments to influence the (in)responsiveness of housing supply is by affecting the amount of land available for housing

[3] It is relevant to note that even in these cases, if developers are required to pay the cost upfront, it could burden some smaller developers. This could potentially lead to those developers to exit the market, thereby making it less competitive (Anthony, 2003).

[4] Although the cost can in some cases affect land prices, it will in many cases ultimately exert downward pressure on the quantity of (new) housing (see, for example, Brueckner, 2009). Moreover, in some cases, these interventions may also affect the timing decisions of development, which may lead to a (temporary) increase in the responsiveness of housing supply (see e.g., Titman, 1985). Such effects are addressed in the following subsections.

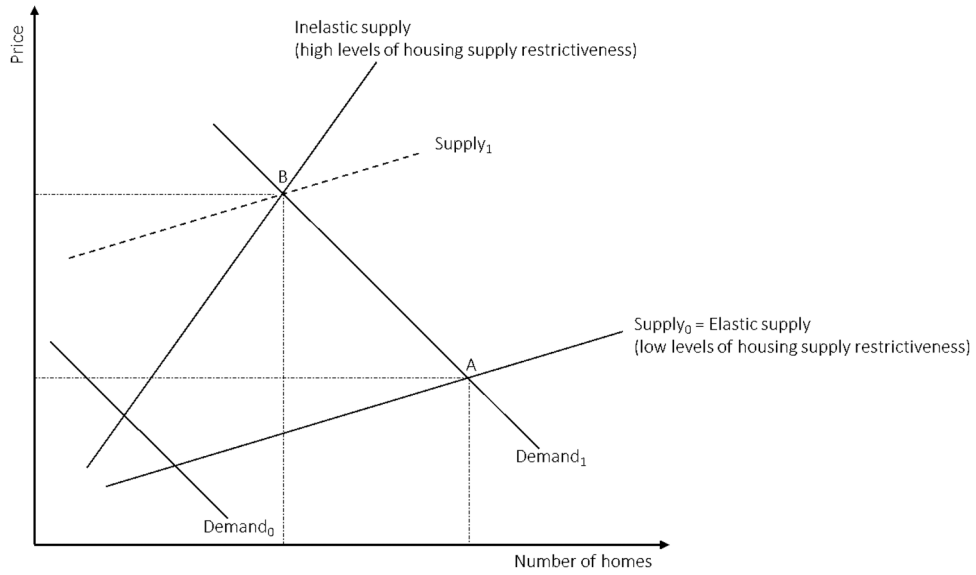

Fig. 1. The effect of land policy interventions on housing supply and prices. *Note*: The figure illustrates the effect of land policy interventions that increase the (marginal) cost of development on housing supply and prices (adapted from Henderson,2009). It is important to note that the magnitude and effect of the cost imposed by land policy interventions on the quantity of housing supply may vary depending on the specific intervention type. In some cases, the cost may be capitalized into land prices, thus lowering the price developers are willing to pay for residential land. The cost would therefore affect the supply of residential land, and through land supply ultimately the number of homes.

construction through greenbelts, urban growth boundaries or other land use enactments that hinder residential land supply (e.g., Gerber et al., 2018a).[5] Numerous studies have shown that interventions to restrict land supply from development lead to higher land costs and thus impact the responsiveness of housing supply (Barlow, 1993; Caesar, 2016; Hannah et al., 1993; Levine, 1999; Monk and Whitehead, 1996; Pollakowski and Wachter, 1990; Kok et al., 2014). In the short run such interventions can, however, increase housing supply by reducing the uncertainty related to development (see e.g., Cunningham, 2007; Titman, 1985). It is relevant to note that restricted land supply may also diminish opportunities for spatial competition between developers and thus lead to monopoly power (Ball, 2003). Non-competitive market conditions allow developers greater scope to influence both housing output levels and land prices.

In contrast to land supply constraints that effectively increase the price of land, a variety of land policy interventions can also influence the (in)responsiveness of housing supply directly through impacts on the (marginal) cost of development. Such interventions are expected to reduce the quantity of housing supply unless the increased costs can be capitalized into decreased values of land (Kok et al., 2014; Schuetz et al., 2011). However, when land values decrease, it alters the opportunity cost of keeping the land for an alternative use (e.g., Brueckner, 2009; Metcalf, 2018; Ihlanfeldt and Shaughnessy, 2004). At lower prices, fewer landowners are thus willing to sell their land which imply lower levels of residential land supply and, consequently, reduced housing production (Powell and Stringham, 2004).

The most direct way of imposing costs on housing development is presumably through the imposition of different fees or exactions. Examining the effects of impact fees, Skidmore and Peddle (1998) found that housing development is significantly reduced in fee areas compared to similar municipalities with no such fees. On the other hand, while the imposition of impact fees increases development costs, it may at the same time (indirectly) reduce other costs related to project approval as well as reduce uncertainty through increased rates of project approval (Burge and Ihlanfeldt, 2006; Mayer and Somerville, 2000). Hence, the net effect of impact fees on costs can be negative, thus increasing housing supply. Moreover, impact fees may enable development that would not occur in an unregulated market. This might happen in situations where impact fees levied on developers enable the provision of infrastructure that would otherwise be stalled by the public authorities (Been, 2005).

Also, public interventions that affect the costs of development could influence the option value of waiting and thus incentivize building activity (Murray, 2022; Capozza and Li, 1994). For example, the Finnish three-rate property tax system allows, and in some areas even necessitates, undeveloped residential land to be taxed at a higher rate than developed land. The introduction of the tax was found to increase initial single-family housing starts by an average of 12% (Lyytikäinen, 2009). Similarly, Murray (2018) found that the announcement of changes in development costs affected the timing decisions of development, where higher costs encourage faster development. These findings signify developers' increased willingness to exercise their development options, although it should be noted that the long-run effects are likely smaller than the initial ones (e.g., Lyytikäinen, 2009).

Other types of land policy interventions that increase development costs, such as building codes that require the use of more expensive building components, may also act as constraints on housing supply (e.g., Listokin and Hattis, 2005; McFarlane et al., 2021). Different forms of development requirements, such as inclusionary housing obligations that require developers to either build or cede land for affordable housing (Muñoz Gielen et al., 2017), have likewise been found to contribute to lower rates of housing development (e.g., Bento et al., 2009; Powell and Stringham, 2004; Schuetz et al., 2011). Although such obligations may be politically attractive ways of promoting housing affordability, (see, for example, Bento et al., 2009), these housing units are in general sold at a price below market price implying that developers will receive lower revenues on those units. In response, developers may reduce the price they are willing to pay for residential land and therefore also the quantity of housing to be supplied (Schuetz et al., 2011). Moreover, inclusionary housing obligations also represent a tax

[5] This by no means implies that such interventions are outright harmful. For example, green spaces may contribute to positive externalities and thus have benefits that mitigate their costs (see, for example, Cheshire and Sheppard, 2002). However, in this paper our focus is on linkages between land policy interventions and quantity of housing supply, and so we do not discuss such benefits further.

on the construction of market-rate housing (Glaeser, 2019) and just as with any other taxes, the cost is borne by some combination of market-rate homebuyers, landowners, and developers (Powell and Stringham, 2004). Hence, ultimately, economic theory suggests that inclusionary housing obligations act to decrease the total supply of housing (Bento et al., 2009). Another form of development requirements that has become increasingly prominent during the past decades is environmental regulations (see e.g., Schill, 2005). Examining the imposition of critical habitat designations, Zabel and Paterson (2006) found that such regulations result in significant decreases in the supply of housing permits. Their findings suggest that the proposal of critical habitat designations acts as a signal that development will be more costly and thus adversely impacts building activity.

The above discussion has mainly focused on land policy interventions and costs impacting housing development. The most extreme way of affecting new housing supply, however, is through concrete constraints on building. These can prohibit building altogether or impose caps on the number of permits or building volumes. When such constraints are binding, they lower the responsiveness of housing supply by effectively making the marginal cost of housing development infinite (Gyourko and Molloy, 2015). It should be noted, however, that while constraining housing supply, such interventions can also reduce market uncertainty and, consequently, the option value of land. This reduction in uncertainty can make immediate development relatively more attractive, thereby increasing the optimal rate of supply in the short run (see e.g., Murray, 2022).

2.3. Indirect effects of land policy interventions

Moving on to less tangible cost-influencing interventions, one empirically widely recognized determinant of housing supply is the implicit costs associated with delays in the planning and development process, which may be even more harmful to new housing supply than the direct cost-impacting regulations (Mayer and Somerville, 2000; Ball, 2011; Paciorek, 2013; Wong et al., 2011). Any interventions that extend the approval times for development projects will reduce the probability of development (Wrenn and Irwin, 2015). Delays in the land policy system may, consequently, lead to a mismatch between demand and new housing development and reduce the housing stock available in all future points in time (Skidmore and Peddle, 1998).

The findings on the detrimental impacts of drawn-out development processes are supported by Ball (2011), who found that the overall time to receive planning permission in the UK is substantial and may play a significant role in generating low housing supply responsiveness. Paciorek (2013) documented a strong negative relationship between the permitting lags and the responsiveness of housing supply in the US. Furthermore, additional costs associated with bureaucratic uncertainty in the approval process have been found to be substantial enough to significantly reduce or displace new construction (Staley, 2001).

Next to public authorities, private landowners and developers themselves may also induce delays in the development process. Private landowners, for example, may delay or block land assembly by resisting to sell their land, thereby creating a holdout problem (Grossman et al., 2019; Miceli and Sirmans, 2007). To address and mitigate such market failures, public authorities may have the option to employ various interventions, such as expropriation, to facilitate a more efficient development process (Miceli and Sirmans, 2007). Correspondingly developers may voluntarily delay housing production and withhold land from the market through land banking in anticipation of future gains (Murray, 2020), with adverse effects on the relationship between land supply and housing supply (Tse, 1998). In a public land development context (see e.g., Needham, 1997), where the public authorities are heavily involved in the land market and where the bulk of housing development occurs on publicly supplied land, such speculative behaviour is, however, less prominent. Conversely, the land banking behaviour by public authorities may enable a closer match-up between supply and demand changes, as the public authorities may assign and release land for development purposes and thus alleviate delays (Barlow, 1993).

In summary, the reviewed literature suggests that land policy interventions may influence the (in)responsiveness of housing supply, and thereby the size of housing stock, by affecting the marginal cost of development (see Fig. 2). However, there is no single defining form of such interventions, and their impacts may arise through several different channels depending on the institutional arrangements. The notion that government interventions may influence housing development by affecting the (marginal) cost of development either through direct costs or time-related indirect costs is supported by the extant theoretical and empirical literature. This suggests that while there may be different costs from, for example, creating and using institutions (Buitelaar, 2004), the basic avenues linking land policy interventions and housing supply are often the same. These notions provide a basis for formulating different empirically driven mechanisms through which land policy interventions may influence the (in)responsiveness of housing supply.

3. Research process and data collection

3.1. Conceptualizing intervention mechanisms and exploring variation in land policy interventions

Our empirical analysis consisted of two main phases (see Fig. 3). The first phase focused on the formulation of intervention mechanisms and involved two steps of analysis. In the first step, we focused on mapping the Finnish land policy environment. To that end, we employed extensive data collected in interviews with municipal representatives responsible for local land policy in the 30 most populated municipalities in the country. This resulted in a general list of 43 land policy instruments and practices (see Appendix A).

The second step of Phase 1 was based on a combination of deductive and inductive reasoning. Prior theoretical knowledge was used to refine the general list to cover only those instruments and practices with relevance to the responsiveness of housing supply (henceforth called land policy indicators). As explained in Section 2, public interventions may either aid or constrain the responsiveness housing supply by influencing the marginal costs of development (e.g., Glaeser and Gyourko, 2003; Brueckner, 2009; Ihlanfeldt, 2004). These can essentially be grouped into two avenues of basic mechanisms: direct cost-impacting measures, such as restrictions, requirements or allowances, and time-related indirect cost impacts, which can be materialized through delays or uncertainties in the development process. For the Finnish case, we identify a total of 25 indicators with either indirect or direct effects on the (in)responsiveness of supply.[6] These land policy indicators were further grouped together based on their distinctive cost-influencing features to formulate seven intervention mechanisms (see Fig. 4).

In Phase 2 of the research process, the objective was to identify differences in the application of land policy interventions across municipalities and to assess the variation from the perspective of housing supply restrictiveness. This phase of the analysis focused on developing a scaling scheme that reflects the current spectrum of local land policy practices for each of the identified indicators. The empirical data was analysed one indicator at a time, on the basis of which we developed an empirically grounded scaling scheme that qualitatively ranked the alternatives from the vantage-point of housing supply. Each scaling scheme is based on ordinal variables (three-point Likert scale), where lower score connotes a stricter intervention, i.e., the most

[6] Some land policy instruments and practices were merged under one land policy indicator to reflect the data and the variation across municipalities in the best way possible. Thus, a selected indicator is not necessarily equivalent to a single land policy instrument or practice.

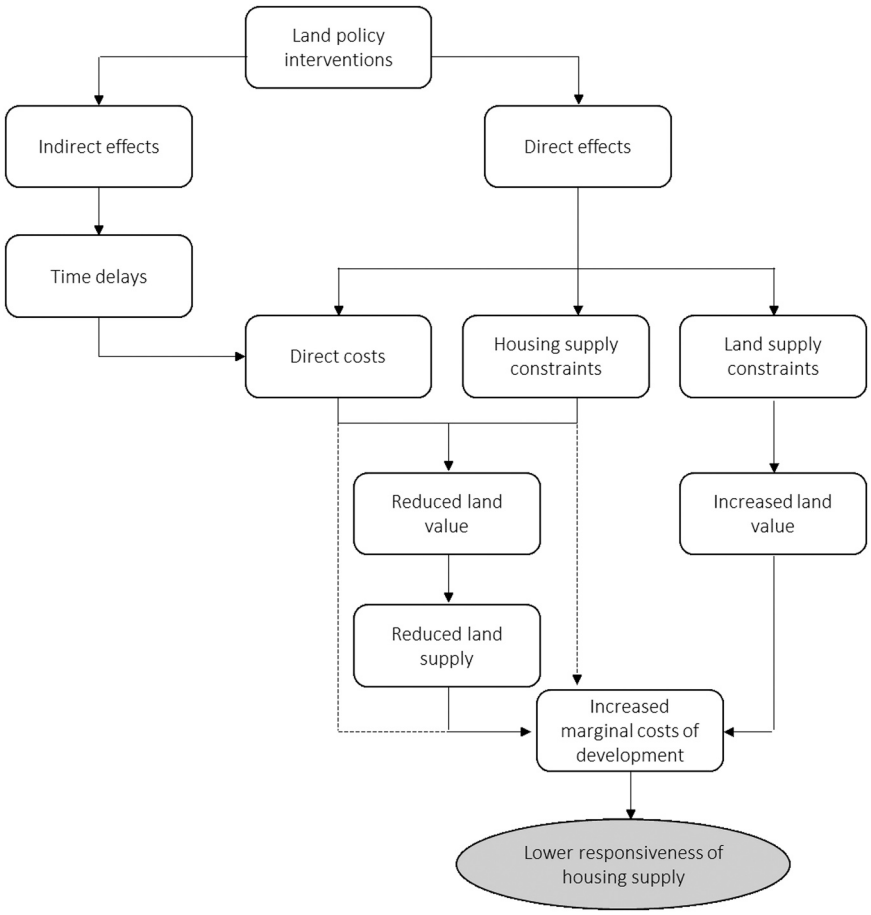

Fig. 2. Overview of the main linkages between land policy interventions and housing supply responsiveness. *Note*: The figure summarizes the effects through which various land policy interventions, including different types of regulatory measures, incentives, process delays, and planning tools, can influence the (in)responsiveness of housing supply. Note that while the figure describes the linkages between cost-inducing interventions and housing supply, land policy interventions may also work in the other direction by reducing the (marginal) costs of development. Additionally, it should be noted that certain types of land policy interventions, like impact fees, may benefit homebuyers without necessarily impacting housing supply responsiveness. Such effects are associated with the demand-side of the framework, and not modelled here. For a discussion on demand-side effects, see e.g., Anthony (2006); (2017).

disadvantageous or least beneficial mode of intervention from the perspective of supply responsiveness, depending on the type of land policy indicator and its expected way of influence. At this stage of the process, indicators with no variation were excluded from further analysis. As a result, the total number of land policy indicators with either direct or indirect effects was refined to 23.

3.2. Institutional framework and data collection

This study focuses on the Finnish land use planning and policy system. The Finnish planning system is a statutory framework defined by the Land Use and Building Act (1999), which sets out general regulations and objectives for land use planning and policy. Municipalities are charged with creating and updating plans that allow building development within their jurisdictions. While landowners have the discretion to initiate land use plans, municipalities ultimately have the power to independently decide when and where planning processes are commenced. All such legally binding detailed plans are also approved by the municipalities. The development of a property requires a building permit issued by the municipality, and in general, permits can only be granted if there exists a legally binding plan that allows for the proposed development. However, the municipality has the right to decide not only on the content of the legally binding detailed plans, but also on any deviations from those plans.[7]

In Finland, local public interventions through land policy are extensive. Since 2015, the Land Use and Building Act has included a definition of land policy, which it specifies as one of the duties of municipalities (Land Use and Building Act, 1999, amendment 204/2015). As is the case in countries such as Sweden, the Netherlands and China, Finnish municipalities often engage in public land development (Needham, 1997; Valtonen et al., 2018; van der Krabben and Jacobs, 2013). Hence, municipal authorities are heavily involved in the land market by acquiring land, controlling the land development process, and acting as a main supplier of buildable land next to their role as a planning regulator (Buitelaar, 2010; Krigsholm et al., 2022; Needham, 1997). Municipalities also have the statutory right to use compulsory instruments, such as expropriation and pre-emption rights, to steer and facilitate land use and development within their jurisdiction (Buitelaar, 2010; Hartmann and Spit, 2015). However, the Finnish legislative framework provides for flexibility in the use of the available land policy instruments, depending on the spatial development objectives of the municipality.

[7] See, for example, Valtonen et al. (2017b) for more on the Finnish planning system.

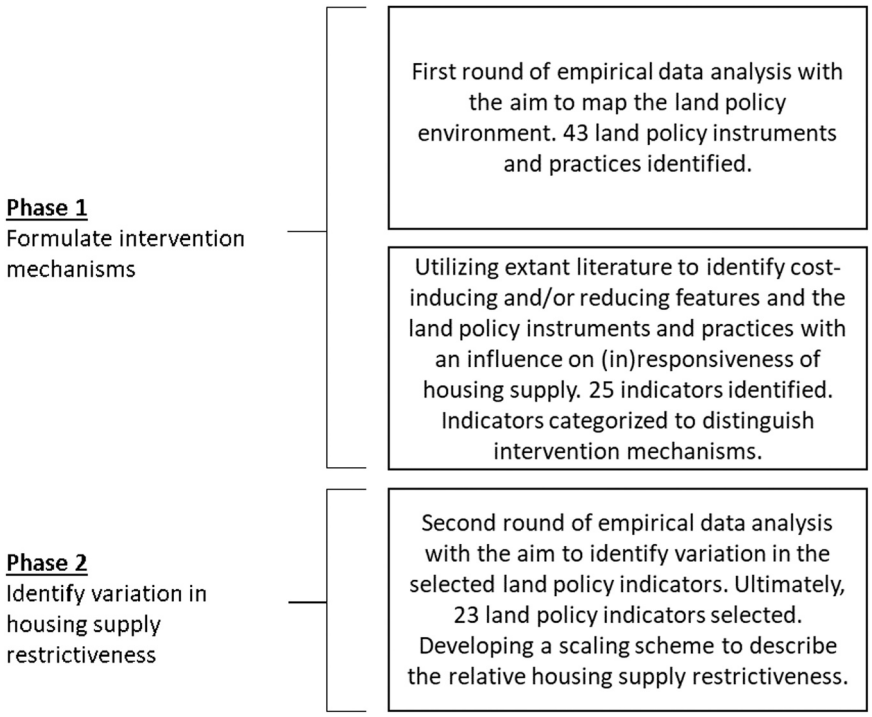

Fig. 3. The different phases and steps of the research process.

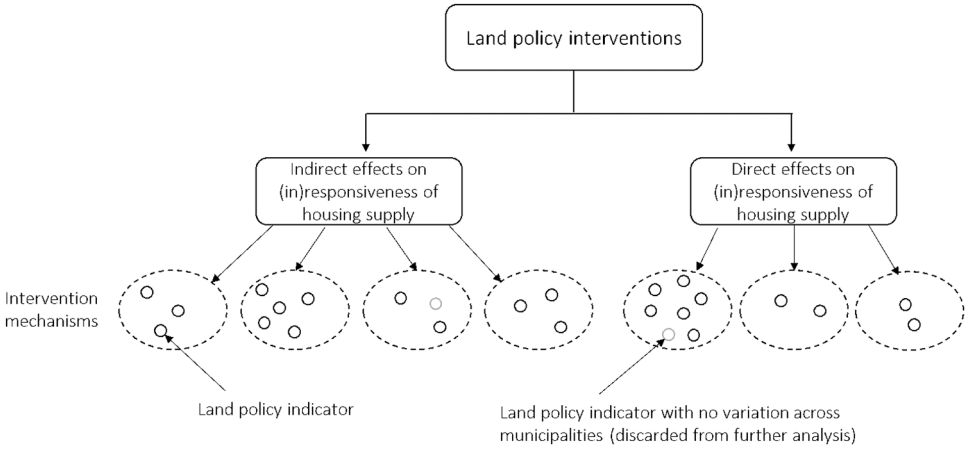

Fig. 4. Overview of the conceptual classification of intervention mechanisms.

To examine the ways in which Finnish municipalities intervene in land markets and housing construction, data was collected mainly through extensive interviews. The interview questions were constructed and chosen with a view to gaining a comprehensive insight into land policy decision-making and current practices in Finnish municipalities. The semi-structured interviews (e.g., Robson, 2002) covered more general themes such as approaches to land policy as well as more detailed questions on different land policy instruments and their implementation. The sample includes 30 of the 31 most populated Finnish municipalities with populations ranging from 37,000 to 650,000 in 2020.[8] The sample accounts for 61% of the 2020 Finnish population and over 70% of the number of housing units constructed in the period 2014–2020, making it highly representative of the land policy interventions and practices in Finnish urban municipalities. The municipalities represented in the sample also provide comprehensive geographic coverage and demographic heterogeneity.

The interviews were carried out from March 2020 to August 2020 via remote connection. They targeted key personnel responsible for land policy actions in each municipality, such as the head of land surveying and land use unit, land use experts, or similar. These interviewees were expected to possess the best knowledge on local land policies and practices in their municipality. For the most part interviews were conducted with one person from each municipality, but in eight cases two or three persons were interviewed to secure answers to all questions. All interviews were recorded with the permission of the interviewees. The interviews ranged in length from 60 to 210 minutes, and all interviews were transcribed and manually coded using an inductive coding technique (e.g., Miles and Huberman, 1994). In the analysis stage, we identified missing data related to specific questions from nine municipalities. To complement our interview data with this regard, we recontacted the interviewees via email or phone and asked for necessary additional information. The interview data was further complemented

[8] In total 31 municipalities were contacted, of which one declined the interview request.

with available municipal documents, such as land policy agendas and land use agreements.

4. Intervention mechanisms and related land policy indicators

Building on the two main avenues of (marginal) cost-impacting factors discussed in Section 2, this paper formulated intervention mechanisms to aid the conceptual understanding of how land policy interventions may influence the (in)responsiveness of housing supply.

Table 1
Intervention mechanisms and related land policy indicators influencing the (in) responsiveness of housing supply.

	Intervention mechanisms	Land policy indicators	Expected way of influence on responsiveness and quantity of housing supply (+/-)
Time-related indirect effects	Municipal land reserve building	Land acquisition activity and land holdings	+
		Pre-emption of land	+
		Expropriation	+
	Delay in planning	Stakeholder involvement	-
		Stakeholder pressure	+/-
		Planning delay (incl. new plans and alterations)	-
		Plan appeals	-
		(Weak) State of municipal finance	-
	Delay in availability of buildable land	Conveyance process delay	-
		Planning of privately owned land for new residential areas	+/-
	Delay in plan implementation	Post-planning process	-
		Conveyance stipulation of building obligation (extensions)	-
		Reminder to build	+
Direct effects	Production costs and impact on profit margin	Land value capture practices	+/-
		Incentives in land use agreements	+
		Inclusionary housing requirements	-
		Residential structure requirements	-
		Requirements of local detailed plans	-
		Objects of protection	-
	Market competition	Developer steering	+/-
		Land market constraints	-
	Builders' cost of option to delay	Applicability of contractual penalties	+
		Vacant urban land tax	+

(+) Increasing effect
(-) Decreasing effect
(+/-) Increasing or decreasing effect depending on implementation of intervention.

As outlined in Table 1, we suggest that the interventions influencing the supply (in)responsiveness can be categorized into seven intervention mechanisms: 1) Municipal land reserve building, 2) Delay in planning, 3) Delay in availability of buildable land, 4) Delay in plan implementation, 5) Production costs and impact on profit margin, 6) Market competition and 7) Builders' cost of option to delay. Based on the theoretical and empirical linkages between land policy interventions and housing supply outlined in Section 2, Table 1 also reports whether the land policy intervention or practice is expected to have an increasing or decreasing effect on the responsiveness of housing supply.

The formulation of intervention mechanisms emanates from 23 land policy indicators in the Finnish land policy context, and each intervention mechanism is portrayed by two to six identified land policy indicators. In the following sections, we describe in more detail the intervention mechanisms, the related land policy indicators, and their scale of variation and distribution in the context of Finnish land policy. Tables 2–8 at the end of each section summarize the indicators in each intervention mechanism.[9] To preserve the chronological order of different interventions, we start the discussion with intervention mechanisms related to time-related indirect effects in e.g., the land acquisition and planning processes, followed by those related to direct effects on the (marginal) cost of development.

4.1. *Indirect effects through time-related interventions in the development process*

The first group of intervention mechanisms relates to less tangible impacts on marginal cost of development caused by development uncertainty and various delays. The delays may relate to different stages of the development process, such as planning (e.g., Ball, 2011), the permitting process (e.g., Mayer and Somerville, 2000) or the implementation of plans (e.g., Alexander, 1998). We identify four intervention mechanisms that relate to indirect impacts on marginal costs caused by process delays or uncertainty.

4.1.1. *Municipal land reserve building*

Municipal land reserve building describes the land acquisition and land banking behaviour of municipalities. The possession of land, and subsequently the supply of buildable land, has a crucial role in facilitating housing development in the context of countries where municipalities are closely involved in land development and where a large proportion of housing development occurs on public (municipal) land. An adequate holding of public land for development purposes enables municipalities to respond more flexibly and timely to changes in local housing demand (Barlow, 1993), because of which we would in general also expect a more responsive housing supply. However, it should be noted that in other institutional contexts of land policy, where, for example, private land development is the dominant approach, municipal land reserve building may have much more limited influence on housing development. In such contexts, land reserve building may be done to a much larger extent by private actors for speculative purposes (see e.g., Triantafyllopoulos, 2017; Wang et al., 2019; Murray; 2020), although it can also provide the municipalities with a tool to, for instance, foster redevelopment (e.g., Tappendorf and Denzin, 2011; Alexander, 2008). In the Finnish context, three indicators measure municipalities' land reserve building.

4.1.1.1. Land acquisition activity and land holdings. Although public land acquisition and land ownership generally play a major role in the Finnish land market, local conditions do vary. The indicator captures two things: how actively and systematically a municipality acquires land from private landowners for public land banking purposes; and the

[9] To demonstrate more carefully how the land policy interventions work, we use the indicator *Reminder to build* as an illustrative example in Appendix B.

extent of existing land holdings. Typically, municipalities acquire so-called raw land that is mainly unbuilt but expected to be planned for development in the near future (e.g., Viitanen et al., 2003). It is to note, that the price paid in such transactions, both voluntary and compulsory, is set to reflect land values before planning. In 2020, there were in total 180 voluntary transactions of raw land in the market with an average area of 6,0 ha and an average price of 1,63€/m^2 (NLS, 2020). Due to the strong public planning control (see Section 3.2. in this paper), municipalities are nearly the only purchasers of raw land. The most common approach for the studied municipalities (70% of the sample) is to practice land acquisition very actively and systematically; if they don't, they already have extensive public land banks to secure development.[10] Only one municipality (3%) can be considered to display the other end of the scale, adopting a clearly inactive role on the land market yet having only limited public land ownership. The rest of the municipalities (27%) fall somewhere in-between: their land acquisition is systematic, but there is no direct pressure because they have adequate land banks.

4.1.1.2. Pre-emption of land. Pre-emption of land gives municipalities the right of first refusal when private property is sold, and it can provide them with an efficient tool for pursuing their land policy objectives (Nahrath, 2018). The indicator describes the prevalence and alignment towards the use of pre-emption of land. Half of the municipalities find the use of pre-emption viable even though they rarely use it, whereas it is considered viable and is fairly regularly used in 37% of the municipalities. The remaining municipalities (13%) use the instrument rarely or not at all.

4.1.1.3. Expropriation. The land policy indicator of *Expropriation* reflects the use and attitude towards the use of compulsory instruments that allow municipalities to expropriate land 'when the general need so demands' (Land Use and Building Act, 1999). Expropriation plays a different role in different municipalities: for most it is either not considered viable (53%) or considered viable yet very rarely used (40%), whereas in a few municipalities (7%) it is considered a standard instrument of land policy and used rather actively. Although the instrument is in general rarely used, the mere credible threat of its use may support municipalities in implementing their land development strategies, as it can also help to effectuate voluntary land sales (Buitelaar, 2010; van der Krabben and Jacobs, 2013).

4.1.2. Delay in planning

Delay in planning describes different types of time-related (marginal) costs in the plan-making process that influence housing development. If the planning system is not working efficiently, the ability of new housing supply to respond effectively to changes in demand will be reduced (Ball, 2011; Mayer and Somerville, 2000). Here, delay in planning is characterized through five indicators.

4.1.2.1. Stakeholder involvement. The indicator *Stakeholder involvement* captures the degree of stakeholder involvement in the plan making process, which may emerge through a multi-staged decision-making process within the municipality or through structured deliberation, for example. A higher degree of involvement in the planning process, and thus a higher number of potential veto points in the process, can be understood to reflect a higher level of existing restrictiveness (Gyourko et al., 2021, 2008). Consequently, we would expect this to lower the responsiveness of housing supply. While most municipalities (57%) experience moderate stakeholder involvement in the planning process, there are a number of municipalities (27%) where several stakeholders are involved and/or involvement in the process is substantial. Just less than one-fifth of the municipalities do not feel that stakeholder involvement notably hampers the planning process and/or feel that stakeholder involvement in the process is minor.

Table 2
Summary of land policy indicators related to municipal land reserve building and their variation.

Indicator	Indicator scale	Share of municipalities
Land acquisition activity and land holdings	1 = Land acquisition is not systematic, and municipality has low land ownership	3%
	2 = Land acquisition is systematic, and municipality is a major landowner (no direct pressure on land acquisition)	27%
	3 = Land acquisition is considered highly important, and it is done actively and systematically, and/or municipality has a high degree of (relevant) land ownership	70%
Pre-emption of land	1 = Pre-emption is not used or very rarely used	13%
	2 = Pre-emption is rarely used but viable	50%
	3 = Pre-emption is used fairly regularly when the municipality has the option	37%
Expropriation	1 = Expropriation has not been used or it is not viable	53%
	2 = Expropriation is rarely used but viable	40%
	3 = Expropriation is used rather actively	7%

4.1.2.2. Stakeholder pressure. The implicit strategic behaviour of local authorities and stakeholders participating in the planning process may, however, also be of importance for the planning delay and thus also for the housing supply (in)responsiveness. This aspect of planning delay is captured by the indicator *Stakeholder pressure.* In some municipalities, local planning authorities may feel under pressure to step up housing development and growth (30%), which may be regarded as a positive trait from the perspective of supply responsiveness. However, a larger share of the municipalities (43%) experiences stakeholder pressure mainly geared to opposing growth, which is conversely expected to lower the responsiveness of housing supply.

4.1.2.3. Planning delay. The indicator captures the delay in the development process caused by the planning process. It describes the typical length of the detailed planning process in the urban area from initiation to approval, where a longer process is expected to cause a lower responsiveness of housing supply. The indicator combines the municipal authorities' estimated typical time for preparing new detailed plans and for making alterations to existing detailed plans, and it aims to reflect the average planning delay. Although the planning delay may vary systematically with plan size, there is clear variation between municipalities in *typical* planning times. These vary from less than a year (20%) to well over a year (47%).

4.1.2.4. Plan appeals. The indicator *Plan appeals* captures the experienced prevalence of appeals to local detailed plans in the municipality. As local detailed plans have statutory force, they are subject to rights of appeal by residents, organizations or authorities, which may further delay the planning process and thus lower the responsiveness of housing supply. While many of the municipalities (47%) do not experience considerable resistance towards planning decisions through appeals, more than one-fifth (23%) say that plans are often appealed.

[10] It is noteworthy that historical factors play a significant role in the diversity of extant landownership patterns. Some municipalities have received substantial land allocations from the state in the past, which is still today reflected in high landownership shares in those municipalities.

4.1.2.5. (Weak) State of municipal finances. This indicator captures whether the municipality's financial status negatively affects their possibilities to carry out planning and development of residential areas and thus has an impact on planning delay and thereby on the housing supply (in)responsiveness. In Finland, municipalities are charged with providing statutory public services and service infrastructure, and therefore the state of municipal finances has an important role in securing land development. Across the municipalities, 50% experience that financial situation adversely impacts planning and housing development. The remaining municipalities do not experience any significant impact (17%) or face no impact at all (33%).

4.1.3. Delay in availability of buildable land

Delay in availability of buildable land describes how efficiently the building plots are supplied for construction. The intervention mechanism follows the notion that releasing more building land increases housing supply (e.g., White and Allmendinger, 2003). This type of intervention mechanism is particularly imperative in the context of public land development, such as in Finland, where the public authority ultimately transfers serviced building plots for housing development (see e.g., Valtonen et al., 2017a). In other country contexts, delay in availability of buildable land may to a greater extent be subject to, for example, private land reserves and building plots that are withheld in anticipation of future gains (see e.g., Murray, 2020). In the Finnish context, the mechanism is featured through two indicators.

Table 3
Summary of land policy indicators related to delay in planning and their variation.

Indicator	Indicator scale	Share of municipalities
Stakeholder involvement	1 = Several stakeholders participate actively in the planning process, or involvement is substantial	27%
	2 = Different stakeholders participate moderately in the planning process	57%
	3 = Stakeholder involvement is minor; stakeholder involvement does not notably hamper the planning process	17%
Stakeholder pressure	1 = Stakeholder pressure is mainly opposed to growth	43%
	2 = Stakeholder pressure is both opposed to growth and supportive of growth	27%
	3 = Stakeholder pressure is mainly supportive of growth	30%
Planning delay (incl. new detailed plans and alterations)	1 = Planning process is typically rather time consuming (more than a year)	47%
	2 = Planning process typically takes a moderate amount of time (approx. 1 year)	33%
	3 = Planning process is typically relatively prompt (below 1 year)	20%
Plan appeals	1 = There are often appeals to the plans	23%
	2 = There are sometimes appeals to the plans, affecting development somewhat	30%
	3 = Appeals do not considerably affect planning and development	47%
(Weak) State of municipal finance	1 = Financial status hinders the planning of residential areas and/or affects development	50%
	2 = Financial status might have some impact but does not significantly hinder planning and/or development	17%
	3 =Financial status is adequate or good and does not affect planning and/or development	33%

4.1.3.1. Conveyance process delay. The conveyance process delay is an inevitable part of the development process as public land development is a standard approach. The indicator describes the delay in building plot sales (or leases) by combining the experienced average delay of conveyance processes from initiation to agreement, thus also including extension periods to reservation times. While reservation times could be regarded to reflect more the delay in plan implementation rather than the delay in the availability of buildable land, it is included here for two reasons. First, many municipalities regard reservation times as part of the conveyance process delay, which complicates the task of extracting information on reservation times from the data. Second, final agreements of conveyance are in some cases only signed after approval of the detailed plan, making it a municipal decision. In general, any delays in the development process are expected to lower the responsiveness of housing supply. In almost half (47%) of the municipalities, the process typically takes less than a year and extensions are rarely granted, whereas in 10% of the municipalities the conveyance processes typically last more than a year and/or there are more flexible attitudes towards extensions of reservation times.

4.1.3.2. Planning of privately owned land for new residential areas. The indicator captures the municipality's strategic position towards the allocation of buildable plots on privately owned land. While the Finnish planning system is known for its widespread use of public land development, it provides for discretionary room through the planning and development of privately owned land and through the involvement of private property developers in the process (Valtonen et al., 2017b). While the landowners do have the right to initiate local detailed plans, it is ultimately at the municipalities discretion to decide whether a planning process is started or not. Also, while the time from start to completion is generally longer for local detailed plans on privately owned land than for plans on publicly owned land (Rinkinen and Kinnunen, 2017), the strategic decision to allocate buildable plots on privately owned land may restrain the total process delay – and thus increase the responsiveness of housing supply – as it is necessary neither to acquire nor to convey the land beforehand. Virtually all Finnish municipalities commonly carry out redevelopment and infill development of privately owned land, resulting in limited variation in this practice across municipalities. Therefore, the focus here is particularly on the position towards the allocation of plots on privately owned greenfield sites, which displays more variation across municipalities. The most common approach for municipalities is to plan new residential areas on publicly owned land only – 47% of the municipalities employ this approach. This suggests that the municipality often obtains ownership of the land or utilizes land from its landbanks before initiating the planning process. However, 17% of the municipalities allocate a large share of their buildable plots on privately owned land at the agreement with the landowners. Alternatively, the municipality has no restrictions on planning privately owned land as well.

4.1.4. Delay in plan implementation

While the planning process can be seen as a form of 'frame setting' (Alexander, 1998, p. 304), the plan itself cannot secure any implementation. To facilitate the implementation of land use plans, municipalities may apply different types of land policy interventions. *Delay in plan implementation* in the Finnish context describes the time-related interventions influencing the actual realization of legally-binding local detailed plans, which can be materialized through the permitting and

Table 4
Summary of land policy indicators related to delay in the availability of buildable land and their variation.

Indicator	Indicator scale	Share of municipalities
Conveyance process delay	1 = Average duration of conveyance process is more than a year, and/or extensions of reservations are readily granted	10%
	2 = Average duration of conveyance process is approx. one year; extensions of reservations are sometimes granted	43%
	3 = Average duration of conveyance process is less than a year, and/or extensions of reservations are rarely granted	47%
Planning of privately owned land for new residential areas	1 = Only on publicly owned land, in some special cases on privately owned land	47%
	2 = Mainly on publicly owned land, occasionally on privately owned land	37%
	3 = Mainly on privately owned land; no negative stance towards planning privately owned land	17%

development control processes.[11] Here, the mechanism is featured through three indicators.

4.1.4.1. Post-planning process. The indicator describing the post-planning process summarizes the typical delay time in cadastral procedures. This includes activities such as plot parcelling and plot subdivisions according to local detailed plans, of which plot subdivisions appeared to be the most significant factor influencing the variation in process duration. A building permit can only be granted to a registered plot with a plot subdivision, and a delay in this stage of the process is therefore expected to lower the responsiveness of housing supply. In many municipalities (53%) the plot subdivision can be approved as part of the local detailed plan, which can compress the post-planning process to less than a month on average. In more than one-fifth (23%) of the municipalities, however, the plot subdivision is typically done as a separate process, which may suggest a delay time of several months in post-planning processes.

4.1.4.2. Conveyance stipulation of building obligation. The indicator measures the applicability and strictness of building obligations in the municipality's conveyance stipulations as well as the prevalence of extensions to the obligations. In general, we would expect a stricter conveyance stipulation to yield in a higher housing supply responsiveness. The majority of municipalities (70%) will in certain situations grant extensions to building obligations for legitimate reasons, whereas 17% of the municipalities employ obligations to which extensions are readily granted – indicating rather flexible processes with likely delays. The obligations regime is stricter in 13% of the municipalities: in these cases, extensions are granted only judiciously.

4.1.4.3. Reminder to build. The indicator *Reminder to build* summarizes the municipality's alignment towards the use of the corresponding instrument. It entitles the municipality to issue an owner or titleholder of a plot with a reminder to build if less than half of the gross floor area permitted for the plot has been used. If the building plot is not developed within three years, the municipality is entitled to expropriate it without special permission. Municipalities can use a reminder to build to facilitate housing development and thus to contribute to a higher responsiveness of housing supply. This tool is systematically used in 10% of the municipalities, whereas the majority (70%) find the instrument rather ineffective for securing coordinated development and hence do not currently use it.

[11] Ultimately, the implementation of land use plans is also dependent on decisions made by developers, for instance. Public regulatory interventions intended to impact the decision-making of others than the municipality itself are also included in mechanism VII (*Builders' cost of option to delay*).

4.2. Direct effects on the development process

The second avenue of intervention mechanisms are interventions with direct effects, which we define as ones that directly influence the cost of construction. Direct cost effects can arise, among other things, through fees or restrictions on land use. These cost-effects can make new development or redevelopment unfeasible in areas where market values are below construction costs (Gyourko and Saiz, 2004) and thus lower the responsiveness of housing supply. While in certain scenarios the cost burden can be shifted to landowners – thereby driving down the price developers are willing to pay for land – it would ultimately lead to a decrease in land supply. This could further diminish the responsiveness of housing supply. Following this notion, we will not differentiate between these two channels in the subsequent sections. However, it should be noted that local authorities can also encourage housing development through financial incentives, such as reductions or allowances, which may increase project viability and thus make development attainable or larger scale. We identify three intervention mechanisms that relate to direct construction cost-impacts caused by land policy interventions.

4.2.1. Production costs and impacts on profit margin

Production costs and impacts on profit margin describes the use of land policy interventions that may impact the cost of development and profit margins of development projects. Taking the stance of economic theory, housing supply will be increased if the (marginal) cost of development declines as a result of land policy interventions (McFarlane et al., 2021). Equally, such interventions that increase the (marginal) development costs will influence the supply of housing negatively. Here, we have identified six indicators.

4.2.1.1. Land value capture practices. The land value capture is a tool with which the municipalities may reap some of the increment value attributable to planning decisions (Alterman, 2012). When privately owned land is (re)developed, the municipality and private landowner

Table 5
Summary of land policy indicators related to delay in plan implementation and their variation.

Indicator	Indicator scale	Share of municipalities
Post-planning process	1 = Post-planning process is typically rather time consuming (more than 2 months)	23%
	2 = Post-planning process typically takes a moderate amount of time (approx. 1–2 months)	23%
	3 = Post-planning process is typically relatively prompt (less than 1 month)	53%
Conveyance stipulation of building obligation	1 = Municipality has an obligation to which extensions are readily granted	17%
	2 = Municipality has an obligation to which extensions are granted for legitimate reasons	70%
	3 = Municipality has a strict obligation regime, extensions are only judiciously granted	13%
Reminder to build	1 = Reminders to build are not currently used	70%
	2 = Reminders to build have been used, expropriation has not been used	20%
	3 = Reminders to build have been used, expropriation has been used	10%

agree upon their respective rights and obligations related to the development by signing a land use agreement. Municipalities have the discretion to decide on the terms and conditions of land use agreements and, for example, on how to define the threshold level of considerable financial gain for the property owner, below which land use fees are not imposed. The indicator *Land value capture practices* describes how a municipality determines the land development fee in land use agreements in comparison to the compulsory fee, where a lower fee is expected to reduce the marginal cost of development and thus increase the responsiveness of housing supply.[12] More specifically, the indicator describes how municipalities have set their threshold levels of considerable financial gain for the property owner, below which land use fees are not imposed. Almost one-third (30%) of the municipalities have no threshold levels for considerable financial gain, or the level is unfavourable to the landowner compared to a compulsory land development fee. However, most municipalities (57%) apply a similar threshold as defined for the compulsory land development fee. A small proportion of municipalities (13%) have threshold levels that are higher compared to the compulsory land development fee and can thus be viewed as providing an incentive to the landowner.

4.2.1.2. Incentives in land use agreements. To facilitate redevelopment on privately owned plots, municipalities can at their own discretion decide to offer economic incentives in land use agreements, such as discounts on the land development fee when development takes place on a plot owned by a residential housing company. Such incentives are expected to lower the marginal cost of development and thus increase the housing supply responsiveness. 37% of the municipalities have no clear incentives to support the development of privately owned land, while some municipalities (17%) apply several or particularly favourable incentives in order to increase the supply of new housing. The remaining municipalities (47%) have some incentives to support housing development on privately owned land.

4.2.1.3. Inclusionary housing requirements. The indicator of *Inclusionary housing requirements* describes how widely the municipality uses developer obligations on affordable housing, such as different quotas steering the provision of affordable housing, which are expected to increase the marginal cost of development and thus lower the housing supply responsiveness. Some municipalities (27%) actively use inclusionary housing requirements, while many (33%) do not generally apply such requirements. The remaining municipalities (40%) may have some area-specific requirements or apply them moderately.

4.2.1.4. Residential structure requirements. The indicator *Residential structure requirements* captures the prevalence of constraints on developers' decisions related to housing structure, such as family apartment requirements or minimum area requirements on housing units. The application of binding requirements is expected to lower the responsiveness of housing supply. 23% of the municipalities actively use residential structure requirements, while 43% do not generally apply such requirements. The remaining 33% may use some area-specific requirements or apply them moderately.

4.2.1.5. Requirements in detailed plans. The indicator depicts the pervasiveness of planning-related requirements on housing, such as density, design and quality ordinances, which may impact development costs through the need for more expensive building materials or loss of flexibility in product design, for example. Close to one-third or 30% of the municipalities have rather detailed plans, while 13% can be considered to have rather flexible plans. The remaining 57% have mixed requirements with flexible plans in some areas and stricter plans in others.

4.2.1.6. Objects of protection. The indicator *Objects of protection* summarizes the prevalence of local interventions that aim to protect environmental sites, landscapes or buildings. While such interventions may be needed from, for example, an environmental perspective, they may induce costs or restrain the housing development potential. 27% of the municipalities can be considered to have an abundance of designations of protection, which hinders housing development, whereas 13% do not experience such designations to affect development.

4.2.2. Market competition

Market competition relates to competition in land and housing development markets and the ways through which the municipality may interfere in that competition by the means of land policy interventions. This intervention mechanism stems from the notion that regulation and municipal decision-making which harm competition in the market, and thus increase the market power of some actors, may impact the costs and output of new housing (Coiacetto, 2009). Depending on the institutional

Table 6
Summary of land policy indicators related to cost of development and impacts on profit margin and their variation.

Indicator	Indicator scale	Share of municipalities
Land value capturing practices	1 = No threshold in development fee or unfavourable to landowner	30%
	2 = Threshold set at medium range (similar to development compensation 500 sqm)	57%
	3 = Threshold favourable to landowner	13%
Incentives in land use agreements	1 = No clear incentives supporting development of privately owned land	37%
	2 = Some incentives supporting development of privately owned land	47%
	3 = Multiple/particularly favourable incentives	17%
Inclusionary housing requirements	1 = Municipality actively uses requirements on affordable housing	27%
	2 = Municipality has some area-specific requirements/uses requirements (moderately)	40%
	3 = Municipality has no general requirements on affordable housing	33%
Residential structure requirements	1 = Municipality actively uses requirements on residential structure	23%
	2 = Municipality has some area-specific requirements/uses (moderately)	33%
	3 = Municipality has no general requirements on residential structure	43%
Requirements of local detailed plans	1 = The municipality has quite detailed plans overall	30%
	2 = The municipality might have rather detailed plans in some areas but more flexible in others	57%
	3 = The municipality has relatively flexible plans overall	13%
Objects of protection	1 = The municipality has a lot of objects of protection, which hinders development and growth	27%
	2 = The municipality has some objects of protection and they might sometimes hinder development and growth	60%
	3 = The municipality has few objects of protection and/or they do not affect development and growth	13%

[12] A municipality may collect a compulsory land development fee if an agreement is not reached with the landowner. The maximum fee is 60% of the increase in the plot value. If the amount of building rights or increase in building rights does not exceed 500 m2 in gross floor area, the landowner cannot be required to pay a fee.

arrangements in place, such interventions can occur in several different stages of the development process. In the Finnish context, the mechanism is described through two indicators.

4.2.2.1. Developer steering. The indicator *Developer steering* describes the ways in which the municipalities may intervene in market competition – whether they actively advocate competition among developers on the market by actively advertising development opportunities, for example, or whether they constrain competition by imposing developer-specific development caps or other artificial measures. The latter is the custom in 20% of the municipalities, where the most common way is to restrict the number of parallel development projects. Competition is actively advocated in 7% of the municipalities.

4.2.2.2. Land market constraints. Land market constraints relate to public interventions on the land market that may limit the functions of private actors on the market and thus serve as anti-competitive practices. Ultimately, such practices can reduce the responsiveness of housing supply. It aims more specifically to capture whether the municipality has adopted any restrictive policies on private actors in the land market by refusing to convey buildable plots, for example. In Finland, the most common type of such restrictions is targeted towards land investment funds, who acquire land and lease it to (typically) multi-family housing projects. Some municipalities do not convey buildable plots to these funds at all (17%), while others convey rarely and judiciously (47%). Several municipalities (37%) have no restrictions towards land investment funds.

4.2.3. Builders' cost of option to delay

Builder's cost of option to delay describes the presence and use of land policy instruments and practices that financially incentivize development activity by increasing the cost of option to delay and thus the responsiveness of housing supply. In contrast to the intervention mechanism measuring delays in plan implementation, builders' cost of option to delay measures the enforcement of direct negative cost impacts if development is delayed by the choice of the landowner or developer. The mechanism is featured through two indicators.

4.2.3.1. Applicability of contractual penalties. The indicator portrays the monitoring of the fulfilment of contractual building obligations and the applicability of economic sanctions in case of non-compliance. While some municipalities do not enforce economic sanctions in practice or charge them only rarely (17%), others are more active in both monitoring and charging sanctions (37%).

Table 7
Summary of land policy indicators related to market competition and their variation.

Indicator	Indicator scale	Share of municipalities
Developer steering	1 = Municipality has restricted the number of developer projects or clearly limits competition	20%
	2 = Municipality may have some ways of promoting developers/companies on the market or has a neutral stance to competition	73%
	3 = Municipality actively promotes/ contacts developers	7%
Land market constraints	1 = Municipality does not convey to property funds	17%
	2 = Municipality rarely/judiciously conveys to property funds/property funds not on the market	47%
	3 = Municipality conveys to property funds/has no negative position towards land property funds	37%

4.2.3.2. Vacant urban land tax. The indicator describes the use of vacant urban land tax in municipalities. A vacant urban land tax allows municipalities to apply a higher tax rate (2%-6%) on undeveloped buildable plots, and it may thus be used to encourage housing construction. The current Finnish property tax system obliges certain municipalities in the Helsinki region to apply a vacant urban land tax of at least 3 percentage points above the general real estate tax rate, but in all other municipalities the applicability and chosen level of a vacant urban land tax is optional. Taking these legislative directives into account, the results show that 17% of the municipalities have not applied any vacant urban tax, while the same proportion (17%) has a tax set at or close to the maximum range.

5. Discussion

Despite the rapid growth of research on different types of land policy interventions, particularly land use regulations, and their impacts on housing development and housing supply (e.g., Gyourko and Molloy, 2015; Quigley and Rosenthal, 2005; White and Allmendinger, 2003), the complexities of this relationship still remain inadequately understood. To bring clarity to this relationship and to help disentangle the many ways in which local public authorities may and *de facto* intervene in land markets and housing construction, this paper set out to conceptualize intervention mechanisms. Essentially, these intervention mechanisms distinguish seven paths through which local land policy interventions may influence the (in)responsiveness – and thereby the quantity – of housing supply.

Methodologically our study combines prior theoretical knowledge, particularly from urban economics literature, with empirical data from the Finnish land policy context. Therefore, while land policy interventions vary between different institutional regimes and operational contexts, the proposed intervention mechanisms should not be very context-specific considering that they are grounded in economic theory and the idea of two basic impact channels (i.e., direct effects and indirect effects). We note, however, that in different environments the degree of prevalence of different intervention mechanisms may vary substantially. For example, in country contexts where the local public authority does not control the supply of buildable land to the same extent as many Finnish municipalities do, the intervention mechanism called *Market competition* might have less importance from the perspective of (in) responsiveness of housing supply. Therefore, some adjustment is necessary when applying the approach in other country contexts, particularly regarding the indicators as they stem from the empirical context.

In line with previous studies on the use of different land policy instruments (e.g., Krigsholm et al., 2022), we observe both variation and uniformity in the ways the instruments are applied across municipalities. Our findings imply, for example, that Finnish municipalities do not

Table 8
Summary of land policy indicators related to builder's cost of option to delay and their variation.

Indicator	Indicator scale	Share of municipalities
Applicability of contractual penalties	1 = Obligations sporadically monitored, no economic sanctions charged or rarely charged	17%
	2 = Obligations monitored; economic sanctions rarely charged	47%
	3 = Obligations monitored actively; economic sanctions charged	37%
Vacant urban land tax	1 = Municipality does not have a tax on unbuilt sites	17%
	2 = Municipality has tax set at low to "medium range"	67%
	3 = Municipality has tax set at or close to maximum	17%

differ very much in their practices concerning contractual building obligations in public land allocations, whereas we observe much more variation in some other contractual stipulations between a municipality and a developer and/or a landowner, such as residential structure requirements. Interestingly, we observe that some municipalities have established practices that promote competition in the market for housing development, whereas others may (unintentionally) restrain competition.

Although the significance of different interventions on the supply (in)responsiveness is an empirical question, the variation in the deployment of 'housing supply relevant' land policy interventions suggests that their cumulative influence on the responsiveness of housing supply also varies at the municipal level. Earlier studies quantifying the extent and strength of local land use regulation, particularly in the context of the US and UK, have made similar observations (e.g., Ball, 2011; Bramley, 1998; Bramley and Watkins, 2014; Gyourko et al., 2021, 2008; Jackson, 2016, 2018).

To illustrate this variation in how the different choices of municipalities can pile up into different degrees of influence on the housing supply responsiveness, there is, however, a need to move beyond purely descriptive analysis of the ways municipalities apply housing supply relevant instruments and practices. One option is to rate the municipalities in a way that describes their relative degree of *housing supply restrictiveness*. In this context, housing supply restrictiveness refers to the extent or degree to which municipalities apply housing supply-relevant land policy interventions, influencing the responsiveness of housing supply. Therefore, it reflects how the implementation of these interventions may create conditions that either facilitate or impede the effective and timely provision of housing within a municipality. For this illustrative purpose, we can make use of the scaling schemes and the combination of individual scores assigned to each municipality.

To achieve this, we summarize the land policy indicator scores for each municipality, where a lower (higher) value reflects a relatively more (less) housing supply restrictive land policy regime.[13] Although the scaling scheme presented in this paper indicates only an ordered structure and not numerical values in a mathematical sense, it offers a way to group the municipalities and give insight into the structures of the underlying data. Therefore, we use these aggregate scores to categorize the municipalities into three quantiles (i.e., terciles) describing their relative intensity of applying interventions that may restrict housing supply (see Table 9). Here, the most restrictive municipalities account for the tercile with the lowest aggregate scores, and the least restrictive municipalities account for the tercile with the highest aggregate scores. Consequently, the mid-tercile account for a moderate level of restrictiveness.

The categorization can further be utilized to examine how municipalities differ in terms of the relative restrictiveness across intervention mechanisms. By summarizing the scores of the land policy indicators pertaining to each intervention mechanism, we can in a similar vein categorize the municipalities into terciles that describe the relative restrictiveness across different intervention mechanisms (see the checkmark indications in Table 9). These categorizations demonstrate that municipalities that intervene in a relatively more restrictive way overall do so generally through both indirect and direct intervention mechanisms. The same applies to the other end of the spectrum: less restrictive municipalities tend to intervene in less restrictive ways across both the indirect and direct intervention mechanisms. Less restrictive municipalities also tend to be more generous in applying interventions that incentivize housing supply. While there are no evident patterns describing these relations, the illustration suggests that there is an apparent risk that the choices of land policy interventions may (unknowingly) pile up into a more housing supply restrictive environment in some municipalities compared with others. We note, however, that the variations observed in the application of different land policy interventions across municipalities and, consequently, the differences in the degree of housing supply restrictiveness, may be influenced by differences in local market environments rather than solely by the deliberate choices made by policymakers. For instance, municipalities facing a declining population trend and lower demand might have different opportunities to employ distinct interventions compared to those municipalities with increasing population trend and high demand. This suggests the need to consider also external factors when examining and evaluating how municipalities can alleviate the housing supply restrictiveness.

Moreover, it should be noted that this study does not intend to develop exact measures of housing supply restrictiveness of local land policy but rather showcase an approach that can be used to identify and compare the supply restrictiveness of different land policy decision-making processes and practices. Therefore, weightings of different intervention mechanisms and land policy indicators are not used. This is done for simplicity, although we acknowledge that the different indicators and intervention mechanisms are unlikely to have equal impacts on housing supply (see e.g., Cheshire and Vermeulen, 2009; Gyourko and Molloy, 2015). For example, land policy indicators with either positive or negative influence on housing supply could be of different importance for the overall restrictiveness. Land policy indicators associated with different intervention mechanisms can also be interrelated. This suggests that land policy interventions incurring greater influence in the early stages of the housing development process might affect the outcomes of interventions in later stages of the process (Mettepenningen et al., 2011). It remains a question for future research to quantify empirically reliable measures of housing supply restrictiveness of local land policy and examine their impacts on housing supply outcomes.

The construction of measures aimed at summarizing complex concepts, such as the housing supply restrictiveness of local land policy interventions, is always a subjective process shaped by the quality of the underlying data (OECD, 2008). In contrast to many extant studies using mainly questionnaires and official documents (see e.g., Ball, 2011; Bramley, 1998; Bramley and Watkins, 2014; Gyourko et al., 2008, 2021), this study set out to examine the variation in land policy practices primarily using interview data. Recently, some scholars have made the criticism that objective questions about local land policy interventions in questionnaires might yield strikingly different responses even in the same municipalities when asked just months apart (Lewis and Marantz, 2019). Others have responded that careful questionnaire design can mitigate such issues (Pendall, 2020). While the use of interview data presents its own challenges, such as concerns of errors arising from individual biases or heuristics (Maestas et al., 2014), it does offer some clear benefits too. The use of interviews provides access to more in-depth information and tacit knowledge about land policy decision-making and current practices that surveys may not effectively address (Robson, 2002; Lewis and Marantz, 2019). Interviews may also reveal land use enactments that set permissible regimes and thresholds in municipal land policy agendas and other council-approved documents that are not binding in practice (e.g., Quigley and Rosenthal, 2005). Moreover, while our interview data is based on subjective interpretations by municipal land policy officials, such responses may help to characterize important elements of the local decision-making environment (Lewis and Marantz, 2019).

Finally, while we believe that it is of importance to advance our understanding of the influence of land policy interventions on the quantity of housing supply, it is important to acknowledge that it is not sufficient to judge the overall quality of different land policy practices and decision-making processes based on this view only. For example, a land policy intervention may considerably constrain the quantity of

[13] Here, the indicators have been scored in such a way that the most disadvantageous or least beneficial mode of intervention from the perspective of supply responsiveness receives the lowest score, whereas the least disadvantageous and most beneficial receives the highest score.

Table 9
Illustration of the relative housing supply restrictiveness of local land policy in Finnish municipalities.

Category	Municipality	Population	Indirect intervention mechanisms				Direct intervention mechanisms		
			I.	II.	III.	IV.	V.	VI.	VII.
Most restrictive	Vantaa	237,200	✓✓✓	✓	✓	✓✓	✓	✓✓	✓
(✓)	Joensuu	76,900	✓	✓✓	✓✓	✓✓	✓	✓	✓
	Hämeenlinna	67,800	✓	✓	✓✓✓	✓✓	✓	✓✓✓	✓
	Helsinki	656,900	✓✓	✓✓	✓	✓✓	✓	✓✓✓	✓✓
	Espoo	292,800	✓	✓✓	✓✓✓	✓	✓	✓✓✓	✓✓
	Tampere	241,000	✓✓✓	✓	✓✓✓	✓	✓	✓✓✓	✓✓
	Jyväskylä	143,400	✓✓✓	✓✓	✓✓✓	✓✓	✓	✓	✓
	Vaasa	67,600	✓✓✓	✓	✓	✓✓✓	✓✓	✓✓	✓✓
	Kirkkonummi	40,100	✓	✓✓	✓✓✓	✓	✓	✓✓	✓✓
	Kerava	37,100	✓	✓✓	✓✓	✓✓	✓	✓	✓✓✓
	Turku	194,400	✓✓✓	✓	✓✓✓	✓	✓	✓✓✓	✓✓
	Kokkola	47,800	✓✓	✓✓	✓✓	✓✓	✓✓✓	✓	✓✓
Moderate	Salo	51,600	✓✓	✓✓	✓✓	✓	✓✓✓	✓✓	✓✓
(✓✓)	Lohja	45,900	✓✓✓	✓	✓	✓✓✓	✓✓	✓✓	✓✓
	Nurmijärvi	43,700	✓✓✓	✓✓	✓✓✓	✓	✓	✓✓✓	✓✓
	Pori	83,700	✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓	✓✓
	Lappeenranta	72,700	✓✓✓	✓✓	✓	✓✓✓	✓✓	✓	✓✓
	Kotka	51,700	✓	✓✓✓	✓✓	✓✓	✓✓✓	✓✓	✓
	Kuopio	120,200	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✓	✓✓
	Seinäjoki	64,100	✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓	✓✓
	Rovaniemi	63,500	✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓	✓✓
	Rauma	39,000	✓✓	✓✓	✓	✓✓	✓✓✓	✓✓	✓✓
	Tuusula	38,800	✓✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓
Least restrictive	Oulu	207,300	✓✓✓	✓✓	✓✓	✓✓✓	✓✓✓	✓	✓
(✓✓✓)	Kouvola	81,200	✓	✓✓✓	✓	✓✓	✓✓✓	✓✓✓	✓
	Porvoo	50,600	✓✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓✓	✓✓
	Hyvinkää	46,600	✓✓✓	✓✓✓	✓	✓✓	✓✓	✓✓✓	✓✓
	Kajaani	36,600	✓✓	✓✓	✓✓	✓✓	✓✓✓	✓✓	✓✓
	Lahti	120,00	✓✓	✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓
	Järvenpää	44,500	✓✓✓	✓✓	✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓

Notes: The key ✓ denotes most restrictive and/or least beneficial, ✓✓ denotes moderately restrictive and/or moderately beneficial, and ✓✓✓ denotes least restrictive and/or most beneficial tercile of the municipalities. The categorization is based on the individual indicator scores assigned to each municipality, where the overall restrictiveness is assessed based on the total of all land policy indicator-scores. The mechanisms-specific rating is based on the sum of the indicator scores pertaining to a mechanism. The intervention mechanisms refer to I. Municipal land reserve building, II. Delay in planning, III. Delay in availability of buildable land, IV. Delay in plan implementation, V. Production costs and impact on profit margin, VI. Market competition and VII. Builders' cost of option to delay. The population represents the total population in the municipality in 2020, rounded to the nearest 100.

housing supply, but still be necessary to advance other policy goals, such as environmental sustainability (e.g., Bovet et al., 2018), social inclusion (e.g., Nelson et al., 2004; Bento et al., 2009), or the quality of housing stock (e.g., May, 2003; Wang, 2014). Taking into account the influence of land policy interventions on quantity of housing supply can, however, improve the comparative analysis of different practices. As municipalities can deliberately make choices of which interventions to apply to advance their public planning (and land policy) objectives, our findings suggest that by paying attention to the land policy practices that contribute to housing supply restrictiveness, municipalities may be able to identify such processes that secure their policy goals but minimize the negative subsidiary effects on the responsiveness of housing supply. The results can thus help policymakers to realize the influence of land policy interventions on the quantity of housing supply and shed light over the trade-offs of different interventions. Ultimately, this may promote the design and implementation of (better) land policies.

6. Conclusions

This paper set out to address two main objectives. The first objective was to contribute to a better understanding of how local authorities may influence the (in)responsiveness of housing supply and, ultimately, the quantity of housing supply through land policy interventions. To that end we drew on the extant literature and empirical data in the Finnish land policy context to distinguish different conceptual categories of land policy interventions contributing to the (in)responsiveness of housing supply. We formulated seven *intervention mechanisms*: 1) Municipal land reserve building, 2) Delay in planning, 3) Delay in availability of buildable land, 4) Delay in plan implementation, 5) Production costs and impact on profit margin, 6) Market competition and 7) Builders' cost of option to delay. The intervention mechanisms provide a structured view of the linkages between land policy interventions and the (in)responsiveness of housing supply and help to disentangle the myriad ways in which these interventions affect housing markets.

Second, this paper sought to use the intervention mechanisms to examine the *variation in local land policy interventions that can be associated with housing supply restrictiveness*. Our findings demonstrate that there are notable heterogeneities in the application of different interventions at the local level. While these findings showcase the variation in the application of individual indicators, the diversity may also have implications for the local housing supply restrictiveness. Moreover, these findings suggest that by paying attention to the land policy practices that contribute to the (in)responsiveness of housing supply, municipalities may alleviate negative subsidiary effects on the quantity of (market-rate) housing supply.

Our paper contributes to the literature on the influences of land policy interventions on housing markets. The intervention mechanisms formulated provide a higher degree of analytical clarity on the linkages between land policy interventions and housing supply, whereas the variation identified in the application of different interventions provides a structured way to examine the variation in the degree to which municipalities' land policies may constrain the housing supply responsiveness. Our findings can also provide certain benefits for municipal land policy experts and politicians in acknowledging the subsidiary effects that such interventions may cause and reflecting on their trade-offs. This may help them move towards more welfare-increasing outcomes.

The results of this study suggest many avenues for further research. Potential topics include empirical analysis of the relative importance of the intervention mechanisms and the further development of housing supply restrictiveness measures at the municipal level. Not only can restrictiveness measures be used to identify the most and least restrictive municipalities, but they also offer plenty of scope for identifying the drivers behind the variation between these municipalities. Such measures can further be used to analyse the economics of land policy interventions, for example housing affordability, and to gain a better understanding of how to manage urban growth through land policies. Furthermore, the findings of this study serve as an opening to make assessments and comparisons of the implications and roles of the intervention mechanisms in different institutional regimes and land policy contexts.

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Declaration of Competing Interest

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

Data Availability

The authors do not have permission to share data.

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Appendix A. General list of identified land policy instruments and practices in the Finnish context

Category	Land policy instrument or practice	Final selection[a]
Land policy	Main goal or objective for land policy	
	Degree of land holdings	x
	Land acquisition activity	x
	Voluntary land acquisition	
	Pre-emption of land	x
	Expropriation	x
	Pricing of undeveloped land	
	Planning of privately owned land for new residential areas	x
	Planning of privately owned land through alterations of plans	
	Use of land use agreements	
	Land use development compensation	
	Land value capture practices	x
	Incentives in land use agreements	x
	Compulsory land development fee	
	Special development areas	
	Conveyance practices of building plots	
	Lease or sell decisions of building plots	
	Conveyance process delay	x
	Conveyance decisions	
	Reservation of sites	x
	Conveyance stipulation of building obligation	x
	Applicability of contractual penalties	x
	Pricing of residential building right	
	Follow up on building permits	
	Stipulations of land use agreements	
	Vacant urban land tax	x
	Reminder to build	x
	Land market constraints	x
	Developer steering	x
	Inclusionary housing requirements	x
	Practices of curbing housing price increases	
	Residential structure requirements	x
Land use planning	Stakeholder involvement	x
	Stakeholder pressure	x
	State of municipal finance	x
	Requirements of local detailed plans	x
	Alterations of plans	
	Use of exceptional permits	
	Objects of protection	x
	Planning delay (incl. new plans and alterations)	x
	Plan appeals	x
	Post-planning process	x
	Approval of building of dispersed settlements	

[a]Some land policy instruments and practices were merged under one land policy indicator to reflect the data and the variation across municipalities in the best way possible

Appendix B. Finnish institutional framework: Reminder to build as an illustrative example of a land policy indicator

In Finland, the creating, updating, and approving of plans that allow building development is under the jurisdiction of municipalities. The municipalities have a so-called planning monopoly, which means that they can also independently decide when and where planning is started. This suggests that while the landowners or titleholders of a plot have the discretion to initiate land use plans, they have no real instrument that can secure the development of their land in urban areas. Moreover, the development of a property requires a building permit issued by the municipality, and in general, permits can only be granted if there exists a legally binding plan that allows the proposed development.

When a local detailed plan exists, the landowner is not in general obliged to build its plot (unless otherwise specified in e.g., conveyance contracts). To advance the implementation of the local detailed plan, the municipality has the right to issue an owner with a reminder to build when the plan has been in force for at least two years (Land Use and Building Act, 1999/32 §97). A reminder to build can only be issued if less than half of the allowed gross area is used, or the plot has been developed against the actual detailed plan. If the plot has not been built within three years after a reminder to build has been issued, the municipality is entitled to expropriate the plot without special permission. If the municipality expropriates the property, the landowner will receive full compensation (see e.g., Viitanen et al., 2003, p.61–62).

A reminder to build can be used to facilitate development and as a tool to reduce the landowner's possibility to withhold building land from the market. From a housing supply perspective, the reminder to build affects the delays in the development process. It aims to overcome the passivity of plan implementation by setting a time limit for the landowner to develop its plot. A reminder to build can therefore be understood as a similar public intervention as, for example, the building obligation that can be applied in the course of action of local land policy (see e.g., Hengstermann, 2018). By issuing reminders to build, the municipality may alleviate the delays of plan implementation and decrease the option value to wait to develop, and thus ultimately affect the time-related indirect costs. Moreover, a reminder to build can also be understood to promote the availability of building land in the municipality.

Numerous studies have shown that land policy interventions that restrict land supply from development lead to higher land costs (e.g., Pollakowski and Wachter, 1990; Barlow, 1993; Monk and Whitehead, 1996). Moreover, this can be argued to results in a lower supply of housing (Glaeser and Gyourko, 2003; Jackson, 2016). This finding is compatible with the basic idea of economic theory, which predicts that an imposition of a cost shifts the supply curve up by the amount of the cost, resulting in a lower quantity of new homes and a higher price paid by new homebuyers (e.g., Brueckner, 2009). Conversely, this implies that higher land supply results in higher housing supply (Grimes and Aitken, 2010; White and Allmendinger, 2003). This provides the understanding of the basic mechanism of how a land policy intervention in the form of a reminder to build is linked to the (in) responsiveness of housing supply and ultimately the quantity of housing supply (see also Fig. 2 in Section 2).

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