



**TURUN
YLIOPISTO**
UNIVERSITY
OF TURKU

ESSAYS IN URBAN ECONOMICS

Eetu Kauria



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ABSTRACT

This dissertation consists of three essays in urban economics, employing empirical econometric methods in each. The first and third essays utilize micro-level housing transaction data, while the second relies on registry data. Essays one and two evaluate a policy decision with difference-in-differences as the primary identification strategy, whereas a Bartik instrumental approach is applied in the third. All the essays consider the impact on the local construction industry.

The dissertation commences with an exploration of the impact of a new light rail transit line on the housing market in the Helsinki region. A notable increase in dwelling prices within 800 meters of the stops becomes evident more than five years before the planned commencement of operations. The anticipated benefits of the investment are projected to outweigh its costs.

The second essay assesses the influence of municipal mergers on local land use. The findings indicate that, on aggregate, mergers do not have a notable effect on sprawl as there is no significant change in the location of new housing units, at least concerning their proximity to the center of the post-merger municipality in the short term.

The dissertation concludes by investigating how the construction sector responds to fluctuations in the local business cycle. A reduction in construction activity during a building's development contributes to a lasting decline in structural quality. Buildings constructed during a downturn exhibit significantly higher future operating costs and an increased need for renovations.

KEYWORDS: transportation investment, housing market capitalization, municipal mergers, land use, construction industry, building quality

TURUN YLIOPISTO

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TIIVISTELMÄ

Tämä väitöskirja sisältää kolme esseetä kaupunkitaloustieteestä, joissa kaikissa käytetään empiirisiä, ekonometrisia menetelmiä. Ensimmäisessä ja kolmannessa esseessä hyödynnetään mikrotason asuntokauppa-aineistoa, kun taas toisessa on käytössä rekisteridataa. Esseet yksi ja kaksi tarkastelevat poliittisen päätöksen vaikutuksia pääasiassa ero-eroissa-identifikaatiostrategialla; kolmannessa esseessä käytetään Bartik-instrumenttimuuttujamenetelmää. Vaikutuksia paikalliseen rakennussektoriin tarkastellaan kaikissa esseissä.

Väitöskirja alkaa tarkastelulla, kuinka uusi pikaraitiotie kapitalisoituu Helsingin seudun asuntomarkkinoille. Asuntojen hintojen havaitaan olevan merkittävästi korkeammat 800 metrin etäisyydellä pysäkeistä yli viisi vuotta ennen liikennöinnin aloitusta. Lisäksi investoinnin hyötyjen estimoidaan olevan sen kustannuksia suuremmat.

Toisessa esseessä analysoidaan kuntaliitosten vaikutuksia kuntien maankäyttöön. Tulokset osoittavat, että kuntaliitoksilla ei keskimäärin ole merkittävää vaikutusta kaupunkirakenteen hajautumiseen, sillä uusien asuinrakennusten sijoittumisessa ei havaita merkittäviä lyhyen aikavälin muutoksia.

Väitöskirjan päättää tarkastelu, miten rakennussektori reagoi muutoksiin paikallisessa taloussuhdanteessa. Rakennusaikana koettu rakennusaktiivisuuden laskun havaitaan vaikuttavan rakenteelliseen laatuun pitkällä aikavälillä negatiivisesti. Matalasuhdanteen aikana rakennetuissa rakennuksissa havaitaan korkeammat ylläpitokustannukset sekä lisääntynyt tarve korjauksille.

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June 2024
Eetu Kauria

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List of Original Publications

This dissertation is based on the following original publications, which are referred to in the text by their Roman numerals:

- I Kauria, Eetu. 2021. The anticipation effect of a light rail transit line on housing prices in the Helsinki region. *Journal of the Finnish Economic Association*, 2(1), 49–73.
- II Kauria, Eetu & Harjunen, Oskari & Saarimaa, Tuukka & Tukiainen, Janne. Jurisdictional Fragmentation and Sprawl.
- III Kauria, Eetu & Mäkelä, Erik. Quality Cycles in the Construction Sector.

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1 Introduction

This dissertation contains three essays in urban economics. I study the property market impacts of transportation investment, jurisdictional boundaries' significance for urban sprawl, and how the construction quality responds to business cycle fluctuations. In this section, I describe the common themes, the core theoretical concepts, and insights from recent literature, which serve as the foundation for the essays. I start by presenting background information on the subjects of the essays to establish a thorough understanding of the topics covered.

1.1 Background

The construction sector holds a crucial position within the economy, as depicted in Figure 1, which illustrates its contribution to the GDP across OECD countries. In 2022, the construction sector's contribution was lowest in Ireland (1.5%), while it is the highest in Canada (7%). Despite a marginal decline in the aggregate weight of the construction sector from pre-pandemic levels, the average share across the OECD remains at 4.5%. In Finland, the construction sector constitutes around 5.5% of the GDP.

Given the substantial impact of the construction sector on the GDP, it concurrently constitutes a significant source of employment. Additionally, in numerous countries, real estate comprises a substantial portion of households' savings. A Finnish household's main residence encompasses nearly 50% of its total assets (median in 2019).¹ This figure hikes to approximately 65% when considering total housing assets.

¹ Statistics Finland: Households' assets

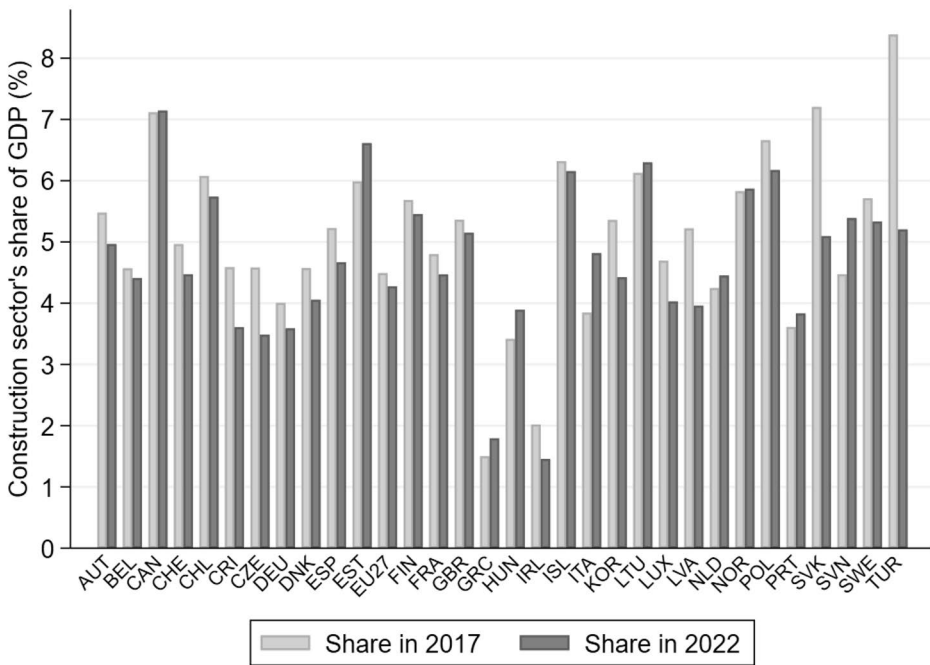


Figure 1. Construction sector's share of the GDP in OECD countries.

Note: Data are from the OECD (National Accounts: GDP). Shown are the percentages in 2017 and 2022 for 38 OECD countries and the EU-27 average.

In 2020, around 4.4 billion individuals lived in urban areas, which represents 56 percent of the global population. Yet, urbanization is expected to increase, with nearly two-thirds (6.3 billion) of the world's population projected to live in urban areas by 2045. The growth is particularly strong in less developed regions of the world, especially in Africa.² This raises concerns for the policy-makers regarding sustainability, the environment, and public welfare.

Urban planning is the process of determining land development and includes both political and technical aspects (Levy 2016). The utilization of land for various purposes, such as for infrastructure, residential, commercial, and industrial functions is a key part of urban planning. One of the main objectives is to guide economic, social, and environmental development.

The determination of urban planning is rooted in public policy and adopts a top-down approach with various layers. Local jurisdictions, such as municipalities, typically lay out the most detailed plans. Zoning, a critical element of urban planning, dictates the location, nature, and manner of construction, thereby exerting

² United Nations: World Cities Report 2022

significant influence on the construction sector. Similarly, urban planning delineates the positioning of transportation networks and work establishments.

Ultimately, urban planning and land use have a substantial impact on various topics. Additional topics include climate change (Hurlimann et al. 2021), economic growth (Lei et al. 2021), emissions (Murtagh et al. 2020), nature preservation (Lacerda et al. 2021), quality of life (Mouratidis 2021), and urban resilience (Bush & Doyon 2019).

1.2 Voting with their feet

Common for all the essays in this dissertation is the spatial distribution of agents. Next, I present models describing both the inter-regional and the intra-regional location choices. Furthermore, I explore the implications of these choices for both the agents and the broader economy.

1.2.1 Tiebout's model

Tiebout (1956) identified information asymmetry as a primary source of market inefficiencies in the provision of local public goods. Consequently, Tiebout introduced a model wherein local public goods are efficiently supplied, as households make location choices based on the costs and benefits associated with each area. This model is grounded in the theory of general equilibrium, aligning the demand for public goods with their corresponding supply.

Tiebout outlines several prerequisites for the model to function effectively. Firstly, households are assumed to be rational, seeking to maximize their utility despite having diverse preferences. Secondly, they enjoy the freedom to relocate without facing any associated moving costs. Thirdly, all individuals possess complete information regarding the utility of local public goods and the associated costs. Fourthly, there is a substantial array of local jurisdictions available for selection. Fifthly, there are no constraints imposed by the job market. Sixthly, there are no spillover effects linked to public goods. Seventhly, each jurisdiction is assumed to have an optimal size. Lastly, jurisdictions are assumed to actively pursue and strive for their optimal size.

Following these assumptions, households make optimal location choices. Consequently, households express their preferences through a *vote with their feet* mechanism: when they identify a jurisdiction better suited to their preferences, they relocate. This process inevitably results in jurisdictions that vary in terms of taxation and the provision of local public goods, reflecting the diverse preferences of households.

In the initial model, jurisdictions compete primarily based on local tax rates. However, expanded versions of the model explore alternative forms of competition, especially in terms of local government expenditure (Agrawal 2022). Alongside tax and fiscal competition, jurisdictions may also engage in competition involving firm subsidies, regulations, and urban planning.

Tiebout's model lies at the heart of fiscal federalism.³ If the conditions of the original model are not met, the provision of public goods may fall short of optimality. This shortfall could result from spillovers or externalities associated with the provided goods, imperfect competition due to a restricted number of jurisdictions, or excessively small jurisdictional units (Stiglitz 2000). Furthermore, local jurisdictions seldom engage in income redistribution among households or other jurisdictions.

Hence, a higher level of government intervention may be necessary to address these challenges. Yet, as Mills (2006) contends, governmental controls have the potential to undermine welfare. For example, residents relinquish authority to decision-makers who subsequently regulate housing supply in specific regions through zoning laws, usually in favor of high-income households.

The Tiebout hypothesis has undergone multiple tests yielding diverse outcomes. Gramlich & Rubinfeld (1982) analyze Michigan households and note a lesser degree of variation within jurisdictions compared to the variations observed between jurisdictions. Rhode & Strumpf (2003) contend that as mobility costs decrease, inter-jurisdictional differences may slightly rise. However, they also find that this diversity among jurisdictions has diminished over time. They suggest that employment opportunities, a factor assumed to be irrelevant in Tiebout's model, play a more substantial role.

Grossman et al. (2017) argue that increasing the number of local governments is advantageous for promoting equality, as it enables more efficient resource allocation to underserved localities. However, this may also heighten the incentives for detrimental tax competition among local governments. On a related note, Jia et al. (2021) present evidence suggesting that empowering local officials could yield positive effects on the economic development of a region.

1.2.2 Housing market capitalization

Alonso (1964), Mills (1967), and Muth (1969) depicted a famous model of bid rent theory. In a simplified scenario of a monocentric city with a constant population and a given income level, workers commute to the central business district (CBD) for employment. Commuting expenses rise in proportion to the distance from the CBD,

³ Fiscal federalism discusses the structure of government: which functions should be centralized and which decentralized (see Oates 1999).

leading to an inverse relationship between land value and distance. The model is illustrated in Figure 2.

Here, the retail sector is located in the city center to optimize customer traffic, with manufacturing facilities situated progressively farther away. Simultaneously, the inverse correlation between land value and distance from the center drives the development of tall structures with compact housing units near the city center (high-density residential). Conversely, more spacious housing units are erected on the outskirts (low-density residential).

A consequence of bid rent theory and Tiebout's model is that the choices households make regarding their jurisdiction result in the capitalization effect on the housing market – manifested as a surge in property prices in areas offering abundant public goods (Oates 1969). For instance, prospective homebuyers may assign greater value to residences near a transportation hub compared to those without equivalent transportation accessibility.

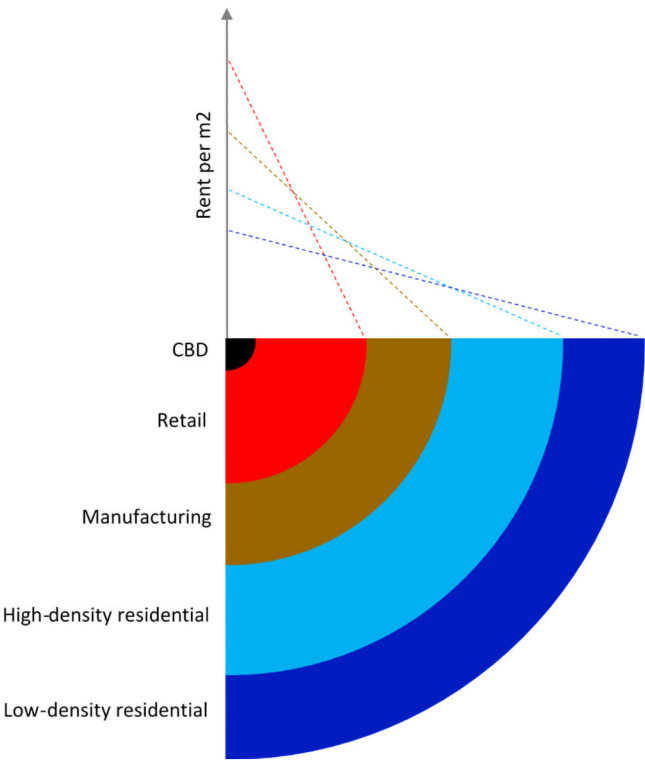


Figure 2: Bid-rent model.
Note: Adapted from Alonso (1964).

Rosen (1974) contends that the value of a good can be conceptualized as the sum of its individual characteristics. This model is commonly employed within the realm of housing market capitalization. In addition to physical attributes like a building's age or a dwelling's size, various factors have been identified as influencing housing prices. These factors include congestion charges (Tang 2021), energy efficiency (Myers 2019), property taxes (Giertz et al. 2021), school quality (Turnbull & Zheng 2019), sea level rise (Filippova et al. 2020), views (Hamilton & Johnson 2023), and zoning (Freemark 2020).

Yet, one of the most important factors influencing the value of a residence, aside from its location, is its accessibility and connectivity. Numerous studies explore how transportation investments impact housing prices. Many of these studies reveal a positive correlation between rail investments and housing prices, as demonstrated by Song et al. (2019) and Abidoye et al. (2022) in the case of light rail transit (LRT).

However, the effect's magnitude usually increases with the level of investment capacity. Li et al. (2019) identify significant gains from a metro investment and Huang & Du (2021) report positive outcomes from a high-speed rail project. Yet, some studies report heterogeneous impacts (Keeler & Stephens 2023) or even negative effects (Qiu & Tong 2021). Consequently, the results exhibit diversity, showing variations based on location; hence, further research is warranted.

1.3 Product quality

Akerlof (1970) explores the concept of asymmetric information concerning effort and product quality. In the seminal model, sellers of used cars possess more information than buyers. This results in adverse selection because buyers cannot ascertain whether the used car they purchase is of high or low quality. Consequently, they are only willing to pay a price that averages the value of high-quality and low-quality products. However, sellers are aware of this dynamic, and, armed with knowledge about the quality of their cars, only sellers of low-quality cars decide to enter the market. In the end, all the used cars available in the market end up being of low quality, a fact that buyers eventually discern. Despite the initial application of the model to the used car market, numerous applications have since emerged in various other fields.⁴

Relatedly, several studies examine the importance of effort such as Holmström (1979) and Holmström & Milgrom (1991) concerning future career outcomes. Milgrom & Roberts (1986) propose a model where advertising expenses are

⁴ Some studies inspired by Akerlof's model are Gibbons & Katz (1991) in the context of the labor market, Kaplan et al. (2007) in the audit market, DeGennaro & Robotti (2007) in the financial market, and Ooi et al. (2014) in the housing market.

considered signals of unobservable output quality. The choice of effort by firms and its impact on corporate success has been extensively examined within the realm of game theory (e.g., Mailath & Samuelson 2001; Höner 2002). In a related vein, Board & Meyer-ter-Vehn (2022) advocate for the importance of firm reputation.

Yet, despite the extensive theoretical contributions, the empirical domain remains incomplete. One primary challenge to address is the measure of quality as in many applications the quality may only be subjectively quantified rather than expressed in raw numerical outputs. Additionally, the measures may exhibit significant variation, impeding efforts toward standardization and compromising external validity.

The limited empirical research suggests that the reputation of a firm significantly influences its profitability. Jovanovic (2021) illustrates the negative impact of product recalls on a firm's value. Relatedly, Azoulay et al. (2017) highlight that a researcher whose article is retracted faces significant penalties, experiencing a notable decline in citations. Furthermore, Bai et al. (2022) reveal that a scandal in the dairy industry negatively impacts all firms within that industry. To the best of my knowledge, there is no related research addressing the construction sector.

1.4 Causal inference

In the realm of modern applied economics, the exploration of mechanisms behind outcomes involves two distinct approaches. The first involves structural models, where the empirical setup is closely aligned with theoretical frameworks. Structural models unveil the fundamental economic behavior underlying specific assumptions, with parameters of interest estimated (or *calibrated*) simultaneously and subsequently utilized in simulating alternative scenarios. The second approach involves reduced-form models, which focus on discerning the authentic relationship between inputs and outputs (Low & Meghir 2017). The chosen path for this dissertation aligns with the latter approach.

The essays of the dissertation consider a transportation investment's impact on the housing market, municipal mergers' significance for land development, and the construction sector's responses to business cycle fluctuations. However, to identify a causal impact for any of these inquiries, estimating a simple regression is likely inadequate. Instead, a more sophisticated reduced-form approach is required.

In reduced-form analysis, causal inference involves revealing the cause and its corresponding effect. For example, determining how a policy change impacts behavior requires understanding what would transpire in an alternative universe without the change, or what is the *counterfactual*. However, criticism of the reduced-form approach arises from its tendency to estimate parameters that are dependent on the policy and, thus, lack relevance and external validity (Chetty 2009).

For causal inference, the randomized controlled trial (RCT) stands as the gold standard, involving the random assignment of interventions before measuring outcomes (Athey & Imbens 2017). Yet, despite its ability to yield unbiased predictions, the applicability of this approach is constrained. Its external validity may be ambiguous and ethical, legal, technological, or economic limitations, depending on the context, often arise. Consequently, economists often have to content themselves with observational data.

The primary obstacle associated with observational data often revolves around endogeneity (Angrist & Pischke 2008).⁵ Consider the scenario where municipalities engage in a merger with other municipalities, which in econometric jargon is typically referred to as *treatment*. The challenge lies in the fact that these municipalities are selected in some way. Consequently, identifying a suitable *control* for them proves to be difficult. To illustrate, let Y_{1it} and Y_{0it} be the potential outcomes for unit i with (1) and without (0) the treatment D_{it} at time t . The observed outcome Y_{it} , urban sprawl in the example given, can be expressed as

$$Y_{it} = Y_{0it} + (Y_{1it} - Y_{0it})D_{it}. \quad (1)$$

One observes either Y_{1it} or Y_{0it} but not both. The goal is to quantify the effect for the municipalities undergoing a merger, denoted as $Y_{1it} - Y_{0it}$, which can equally be written as $\mathbb{E}[Y_{1it} - Y_{0it} | D_{it} = 1]$. However, municipalities that abstain from participating in a merger may not serve as an adequate counterfactual for the merging ones due to differences in municipal structure, for instance.

The left-hand side of Equation (2) illustrates the observed difference in sprawl between merging and non-merging municipalities. The first component on the right-hand side signifies the average treatment effect in the treated group, while the second component accounts for the unobservable selection bias, which could potentially distort the estimated impact, were it correlated with the error term.

$$\begin{aligned} \mathbb{E}[Y_{it} | D_{it} = 1] - \mathbb{E}[Y_{it} | D_{it} = 0] &= \mathbb{E}[Y_{1it} - Y_{0it} | D_{it} = 1] \\ &+ \mathbb{E}[Y_{0it} | D_{it} = 1] - \mathbb{E}[Y_{0it} | D_{it} = 0] \end{aligned} \quad (2)$$

Fortunately, econometricians have devised various tools known as identification strategies to obtain an unbiased estimate. One widely applied strategy for addressing endogeneity involves the utilization of natural quasi-experiments. For instance, consider a situation where, in a continuum of municipalities, only those with a population below a specified threshold undergo a merger. Assuming the units are randomly placed on either side of the threshold, a comparison of units just below and just above the threshold results in a causal estimate of the impact. This exemplifies

⁵ Broadly speaking, endogeneity occurs when the explanatory variable is correlated with the error term.

a regression discontinuity (RD) design (Athey & Imbens 2017). However, this method is not applied in the essays and, therefore, I refrain from further discussions.

Another crucial tool in the arsenal for revealing causal relationships is fixed effects estimation (Angrist & Pischke 2009). Revisiting the instance of municipal mergers, let's assume there are persistent disparities in municipal structures between the merging and non-merging municipalities, leading to selection bias. Let α_i be the time-invariant but unobservable confounders and γ_t the time effect. β is the treatment effect of interest, or explanatory variable, and ε_{it} is the error term. Given the panel data structure of the data, and omitting the intercept for now, the model can be written as⁶

$$Y_{it} = \alpha_i + \gamma_t + \beta D_{it} + \varepsilon_{it}. \quad (3)$$

The α_i and γ_t may be considered as parameters to be estimated, or alternatively as deviations from the mean. By first obtaining municipal-level averages

$$\bar{Y}_t = \alpha_i + \bar{\gamma} + \beta \bar{D}_t + \bar{\varepsilon}_t \quad (4)$$

and then subtracting Equation (4) from Equation (3) eradicates the unobservable municipal-level effects, and the selection bias, as shown in Equation (5)

$$Y_{it} - \bar{Y}_t = \alpha_i - \alpha_i + \gamma_t - \bar{\gamma} + \beta(D_{it} - \bar{D}_t) + \varepsilon_{it} - \bar{\varepsilon}_t. \quad (5)$$

Difference-in-differences (DID) approach, an extension of the fixed effects estimation, is frequently used in estimating causal impact (Athey & Imbens 2017). DID involves a comparison of the treated ($D=1$) and control ($D=0$) units across periods ($T=0$ and $T=1$) as shown in Equation (6)

$$\begin{aligned} \beta = & (\mathbb{E}[Y_{it}|D_{it} = 1, T = 1] - \mathbb{E}[Y_{it}|D_{it} = 1, T = 0]) \\ & - (\mathbb{E}[Y_{it}|D_{it} = 0, T = 1] - \mathbb{E}[Y_{it}|D_{it} = 0, T = 0]) \end{aligned} \quad (6)$$

Nonetheless, for this method to be viable, specific essential conditions must be met. Firstly, the control and treatment groups must exhibit parallel trends in the outcome of interest in the absence of treatment. Secondly, there ought to be a lack of spillovers among these groups. Thirdly, no concurrent events or reforms should be causing the observed impact. If there exists an appropriate control group for the treated municipalities, the DID model can be formulated as follows

$$Y_{it} = c + \delta D_i + \theta T_t + \beta(D_i \cdot T_t) + \varepsilon_{it} \quad (7)$$

, where D_i is a dummy that takes a value one for treated municipalities and T_t is a time dummy that is off before the mergers and switches on after the mergers take

⁶ Assuming constant treatment effect, Equation (1) is identical to $Y_{it} = c + \beta D_{it} + \varepsilon_{it}$.

place. The parameter of interest here is β . In this dissertation, the DID identification strategy is applied in the first two essays.

Nevertheless, in the absence of an appropriate control group, an alternative identification strategy may involve employing an instrumental variable (IV) approach, particularly when the explanatory variable is endogenous (Imbens 2014). By using a valid instrument, this correlation can be eliminated, leading to causal estimates. However, the instrument must satisfy two crucial conditions for validity. Firstly, it must meet the relevance condition, demonstrating correlation with the explanatory variable. Secondly, the instrument should not be correlated with the error term; this condition is known as the exclusion restriction.

Typically, IV estimation is conducted in two stages. The first stage is shown in Equation (8), where the endogenous explanatory variable is marked with X_{it} , the instrument with Z_{it} , and the error term with μ_{it} .

$$X_{it} = c + \varphi Z_{it} + \mu_{it} \quad (8)$$

After obtaining the fitted values of $\widehat{X}_{it}$ from the first stage, the second stage can be estimated using Equation (9).

$$Y_{it} = c + \rho \widehat{X}_{it} + \varepsilon_{it} \quad (9)$$

An extension of the IV approach, Bartik IV, is constructed by interacting local industry share with national industry volume (Goldsmith-Pinkham et al. 2020). This approach assumes differential exposure in the regional industry shares. The identification is built upon the exogeneity of the industry shares. The third essay of this dissertation employs the Bartik IV method in conjunction with fixed effects estimation.

2 Summary of the Essays

This section provides summaries of the three essays comprising this dissertation, emphasizing the econometric approach, key findings, and contributions to the existing literature.

2.1 The anticipation effect of a light rail transit line on housing prices in the Helsinki region

In essay I, I investigate how the housing market responds to the decision to build a new light rail transit line in the Helsinki region. I employ housing prices as a gauge of citizens' readiness to invest in access to a new transportation project. Drawing on foundational theories of spatial equilibrium, an elevated service level should capitalize into housing valuations by stimulating demand (Alonso 1964; Muth 1969).

However, the timing and effectiveness of this capitalization are uncertain. Quantifying the influence of an investment on housing prices is not necessarily a straightforward task. As outlined in Rosen's (1974) influential study, the elements constituting a dwelling's value are not independently purchasable, leading to ambiguity in assessing each component's contribution. To address this challenge, Rosen suggests employing a hedonic pricing model to capture the impact of each observable factor.

Despite the complexity, a majority of previous studies report a positive effect on the housing market following transportation investments. Gibbons & Machin (2005), Zhou et al. (2021), and Gupta et al. (2022) observe a price increase in areas serviced by a new rail investment. However, there are exceptions, such as the findings of Camins-Esakov & Vandegrift (2018), who provide evidence of zero impact. Additionally, Papon et al. (2015) identify a negative effect on real estate values near the stations.

This study predominantly relies on data sourced from the Central Federation of Finnish Real Estate Agencies, offering detailed micro-level information on the majority of housing transactions spanning from 2003 to 2019. Alongside prices, I capture data on floor area, age, maintenance charge, building type, lot ownership, and the condition of dwellings. Furthermore, I geographically map the transactions and incorporate the public transportation travel time to the Helsinki central business

district for each transaction. The primary sample encompasses a substantial 77,000 housing transactions.

Essay I focuses on the Jokeri Light Rail, a transit line encircling the Helsinki central business district and spanning 25 kilometers from eastern Espoo to eastern Helsinki. The preliminary principal plan was published in 2009 and the city councils of Espoo and Helsinki gave the green light for the project in 2016. Jokeri Light Rail's cost estimate was 386 million euros and the projected start of operations was in 2024.⁷ This study marks the first examination, to my knowledge, of the Jokeri Light Rail's influence on the property market.⁸

I employ the investment as a quasi-experiment and utilize difference-in-differences (DID) models to ascertain the causal anticipation impact of the investment on the property market, following methodologies outlined by Billings (2011) and Dubé et al. (2018). The primary treatment group for this study comprises properties located within 800 meters of the Jokeri Light Rail stops, while the control group consists of units sold at greater distances. The groups seem comparable regarding several key characteristics, including the price trends, at least until 2012. In estimating the investment's impact, I account for housing unit characteristics and introduce postal code fixed effects. Standard errors are clustered at the postal code level.

I contend that pinpointing the precise timing of capitalization is challenging. Therefore, I employ the Google search index as an indicator of public awareness about the investment, alongside significant dates like the councils' decisions, to identify potential periods of capitalization. I observe that housing prices between the treatment and control groups began to diverge before the councils' decisions. However, the disparity becomes distinctly apparent after 2016. Consequently, households appear to anticipate the heightened service level several years in advance.

The primary finding indicates that residences within 800 meters of the Jokeri Light Rail stop saw an approximately 5 percent increase in prices after 2016 compared to units situated at a greater distance. I also analyze yearly effects and identify the most pronounced impact starting from 2017. Additionally, I assess the selected distance bandwidth by segmenting the observations into 200-meter bands, identifying the most significant effect within 800 meters of the stops.

⁷ In actuality, the Jokeri Light Rail finished ahead of schedule, commencing operations in October 2023, 10 months earlier than planned. Moreover, the total cost of the investment was 4 million less than the budgeted amount of 386 million.

⁸ An earlier analysis ordered by the operator considered the investment's impact on traffic flows, emissions, and accident rate (FLOU Ltd 2019).

Certainly, it's important to approach the interpretation of the results with caution, acknowledging some inherent limitations. The primary treatment group of 800 meters has its imperfections. First, the impact is unlikely to be confined strictly to the boundary, and second, there could be underlying differences between the groups. The information asymmetry regarding the timing of the investment might also influence the results. Additionally, concerns may arise about potential shifts in supply from the control to the treatment areas, although I demonstrate that there are no discernible changes in transaction volumes.

Further, I evaluate the feasibility of the investment by examining its impact on the overall housing stock and comparing it to the investment's cost. To estimate the total value of capitalization, I gather data from Statistics Finland on the total floor area of housing within the 800-meter zones around the stops, which amounts to 2.2 million square meters. Consequently, my approximate calculation for the total windfall is 396 million euros. However, this calculation doesn't account for the 0.85 million square meters of commercial real estate near the stops. Nevertheless, the windfall estimate surpasses the investment's costs several years before the planned commencement of operations.

This research offers valuable insights for decision-makers evaluating prospective rail investments, particularly within the Finnish context.⁹ Additionally, it underscores the significance of considering anticipation timing in the analysis of comparable investments. The study reveals that Jokeri Light Rail demonstrates relative efficiency, with the windfall for residential properties serving as an indicator of citizens' willingness to pay for proximity to the investment.

2.2 Jurisdictional Fragmentation and Sprawl

The consolidation of jurisdictions is commonly recommended as a policy strategy to address financial challenges in administrative units. Typically, the rationale for eliminating jurisdictional boundaries involves cutting the costs of local governance and enhancing efficiency in providing public goods. However, critics often cite the diversity in citizens' preferences as a counterargument. The efficiency of jurisdictional mergers has been studied widely, though the results show some disparity (see, e.g., Lassen & Serritzlew 2011; Reingewertz 2012; Blom-Hansen et al. 2016).

Jurisdictions generally hold authority over local land use. However, the correlation between jurisdictional fragmentation and urban sprawl lacks clarity, with Cappelli et al. (2021) identifying a positive relationship, whereas Burchfield et al.

⁹ The cities of Vantaa and Helsinki decided to construct a light rail line resembling the Jokeri Light Rail in 2023.

(2006) find no such connection. Similarly, findings on the relationship between jurisdictional fragmentation and housing supply are somewhat inconsistent, although Greenaway-McGrevy & Phillips (2023) discover that reducing the number of jurisdictions enhances housing supply. However, there is a scarcity of research examining the impact of jurisdictional reform on the spatial distribution of new housing.

In Finland, municipalities represent the smallest self-governing entities. They shoulder various responsibilities, including the provision of elementary education and public transportation to citizens.¹⁰ Additionally, municipalities play a key role in urban planning and land use decisions. The primary funding for these tasks typically comes from a flat income tax, supplemented by a central government grant scheme and a property tax. Municipalities are overseen by municipal councils, consisting of elected representatives.

During the early 2000s, the Finnish central government, prompted by apprehensions about financial and demographic structures, urged municipalities to consider merging. Nevertheless, the merging process was voluntary and required approval from the councils of all involved municipalities. In 2009, a significant wave of mergers occurred, involving nearly a hundred municipalities. This wave serves as a plausible quasi-experimental setting.

Essay II aims to explore the impact of municipal mergers on land use and sprawl. However, it's important to acknowledge that municipalities opting for a merger may constitute a distinct group, potentially leading to selection bias in the models. To address this, a control group is established by simulating all potential contiguous mergers and identifying appropriate placebos for the actual mergers using the nearest neighbor matching technique on several municipality-level characteristics obtained from Statistics Finland. In total, the main sample encompasses 25 mergers and 25 matched placebos.

Comprehensive registry data encompassing all Finnish residents are obtained from Statistics Finland. These data contain the precise location of the individuals along with a unique building identifier and building type, spanning the years 2005 to 2022. The Euclidean distance from each building to the center of the post-merger municipality is calculated. The analysis specifically focuses on new buildings, as broader changes to the building stock would necessitate an extended timeframe. The primary sample comprises over 400,000 observations.

¹⁰ Before 2023, Finnish municipalities held the responsibility for health and social care, tasks that were subsequently shifted to a new intermediate level of governance situated between the municipalities and the state. However, the timeframe under consideration for this study predates this particular reform.

The employed identification strategy is a difference-in-differences (DID) approach, utilized to gauge the influence of mergers on the proximity of new residential housing to the center of the post-merger municipality. Event study style models reveal no significant reduction in this distance for residential buildings in municipalities undergoing mergers. A similar result is found when scrutinizing solely detached and row houses. In general, no significant changes in the proximity to the post-merger municipal center are observed in a subgroup analysis of the large and small pre-merger municipalities.

Additionally, pooled models featuring three post-merger intervals overlapping with the municipal council terms (2009–2012, 2013–2016, and 2017–2022) demonstrate no substantial overall changes. The same holds for the large pre-merging municipalities as well. However, the small pre-merging municipalities exhibit a statistically significant decrease in sprawl during the last period: new detached and row houses are, on average, built 9.8% closer to the center of the post-merger municipality after the mergers. This translates to a 2-kilometer reduction in sprawl.

Post-merger municipalities exhibit significant disparities, including variations in population size and geographic features, leading to potential heterogeneous effects. Consequently, a distinct analysis is undertaken for post-merger municipalities categorized by high population, low population, low density, and high density. The results remain quantitatively similar. Yet, the analysis reveals that the effect observed in the small pre-merger municipalities is mainly driven by the most populous and the most spatially compact mergers.

Essay II presents evidence that the Finnish municipal mergers in 2009 did not affect the sprawl of residential housing on the post-merger municipal level. However, it is important to note that this analysis focuses solely on sprawl and does not encompass the broader implications of the mergers. Finally, this study may be the first to investigate the influence of jurisdictional fragmentation on the location of new housing.

2.3 Quality Cycles in the Construction Sector

Detecting construction defects is usually challenging, yet their repercussions on the economy and residents' well-being are evident, with numerous studies highlighting their adverse effects on health.¹¹ What remains uncertain is the underlying cause of these defects. Theoretical frameworks propose a connection between output quality and the business cycle. It is possible that during an economic upswing, a scarcity of

¹¹ See, e.g., Adamkiewicz et al. (2011); Foster et al. (2022).

skilled workers and time constraints may result in subpar construction quality. Conversely, economic downturns could create incentives that lead to compromised quality. Essay III empirically investigates this question within the context of the Finnish construction sector.

The current body of literature examining the connection between product quality and the business cycle is predominantly theoretical.¹² Nevertheless, Jovanovic (2021) examines the question empirically and contends that product recalls can detrimentally affect a company's reputation, leading to a decline in its overall valuation. Thus, firms have incentives to build and maintain a positive reputation. Further, Jaimovich et al. (2019) argue that consumers tend to demand lower-quality products during economic recessions. Additionally, research suggests that shifts in the competitive landscape influence output quality, as seen in studies by Matsa (2011) and Gil & Kim (2021).

Before commencing a construction project, the developer must obtain a permit from the local authority. The construction process is further constrained by the strict regulatory framework in addition to the land use planning stipulated by the local jurisdiction. Consequently, the construction methods and material choices in the Finnish building stock show limited rapid changes. However, the developer's ability to influence the quality of the finished building decreases over time. When agreements are established for planning, materials, and workforce, it is the construction contractor whose decisions significantly impact the overall quality.

Following the completion of construction, the obligation to maintain the building falls on the owner. A significant portion of the Finnish housing stock is owned by housing companies, where all shareholders share collective liability. Every shareholder has the right to participate in the housing company's decision-making process. The most pivotal decisions involve determining the monthly maintenance charge, which funds minor repairs and property maintenance, as well as debt, which is used for larger renovations.

In essay III, construction sector value added serves as a gauge for construction activity, with data sourced from Statistics Finland at the commuting zone level spanning from 1980 to 2008. Throughout this period, the Finnish construction sector witnessed significant events that led to considerable fluctuations in regional construction activity. These events encompass the liberalization of credit markets in the late 1980s, the collapse of the USSR in the early 1990s, a profound recession in the early-to-mid 1990s, and the subsequent recovery marked by the emergence of the ICT cluster.

¹² Some theoretical studies on the subject are Mailath & Samuelson (2001) and Board & Meyer-ter-Vehn (2022).

The primary data depicting construction quality are derived from the Central Federation of Finnish Real Estate Agents. This dataset comprises micro-level details about housing transactions involving apartment buildings and semi-detached houses constructed from 1980 to 2008, amounting to approximately 168,000 observations. Of particular significance is the inclusion of monthly maintenance charges and debt at the housing unit level. Additionally, this information is supplemented by internationally novel data on major renovations at the building level, collected from Finnish municipal authorities. This panel data encompasses 2.1 million building-year observations.

The identification strategy relies on plausibly exogenous variations in sub-regional construction sector activity. The first model incorporates time-invariant sub-regional components and time trends as controls. The second approach employs a Bartik instrument, as outlined by Goldsmith-Pinkham et al. (2020). In this method, identification is based on the sub-regional disparities in exposure to shocks. In both setups, housing characteristics are included as additional covariates.

The main findings are threefold. Firstly, for every 1 percent decrease in the construction sector value added, the maintenance charge and housing unit-level debt increase by 0.14 percent and 1.12 percent, respectively. Likewise, there is a 0.002 percent increase in the probability of a major renovation. To contextualize these results, a one standard deviation drop in construction sector activity corresponds to an 11% higher average monthly maintenance charge, a 91% percent hike in average debt, and a 65% increase in the occurrence of major renovations.

A battery of robustness tests confirms the findings. Additionally, potential confounding factors are examined. Firstly, no evidence of household sorting is observed, addressing concerns related to households influencing the level of maintenance charge and debt in a housing company. Secondly, the results remain quantitatively consistent when excluding state-subsidized housing from the sample. Thirdly, the 2000s witnessed an increase in the use of housing company loans for financing construction costs, which could potentially impact the results. Nevertheless, the main findings are stable when omitting buildings constructed in the 2000s.

The findings have implications for various stakeholders in the construction sector, including legislators, households, and developers. Lastly, an analysis is carried out to assess how these construction defects impact housing prices. The evidence indicates that construction sector activity during the building phase significantly enhances dwelling values. However, it appears that households gradually become aware of the structural quality over time.

The main hypothesis postulates that construction contractors' motivations shift with the business cycle, leading them to produce lower quality. Another potential factor is the reduced competitive pressure in the industry during a recession.

However, the analysis cannot definitively exclude all other potential scenarios, including reactions from the demand side. Finally, it is important to highlight that the study is conducted within the framework of a stringent Finnish regulatory environment; in a less rigorous setting, the outcomes could potentially be more pronounced.

3 Synthesis

In this dissertation, I investigate the responses of the housing market and construction industry to significant external disruptions. In the first essay, the shock comes from the decision to construct a new rail connection. Secondly, I analyze the land use implications of municipal mergers. In the third essay, I explore how the regional construction sectors react to widespread economic shocks.

The essays make use of extensive micro-level datasets with hundreds of thousands or millions of observations. Primary data sources include Statistics Finland, Finnish municipal authorities, and the Central Federation of Finnish Real Estate Agencies. In addition, a shared characteristic across the essays in this dissertation is the incorporation of quasi-experiments and credible econometric identification methods. Difference-in-differences strategies are applied in essays I and II, while the instrumental variable approach is adopted in essay III.

In the first essay, I study the housing market capitalization and am first to observe that dwellings located close to the new rail connection increased in value already several years before the start of the operations. Similar effects have been noted in the existing literature, as demonstrated by studies like Li et al. (2019) and Zhou et al. (2021), although conflicting evidence, exemplified by Camins-Esakov & Vandegrift (2018), has also been identified. Thus, it is crucial to thoroughly assess each investment's efficiency as it may be context-dependent. Essay I suggests that the examined rail investment was indeed cost-efficient, potentially influencing the policy decision to construct another rail line in the same region.

In essay II, I examine the municipal mergers' impact on sprawl. The main finding is that the sprawl of residential housing was on average unaffected by the mergers. This study adds to the existing literature that scrutinizes the optimal number of jurisdictions, as exemplified by works such as Blom-Hansen et al. (2016), and delves into the importance of housing regulations, as highlighted by Greenaway-McGrevy & Phillips (2023). Cappelli et al. (2021) contend that, at a macro-level, the number of jurisdictions and the extent of urban sprawl are positively correlated, though there are also contradicting findings. Nevertheless, essay II may be the first to explore this important relationship with a quasi-experimental set-up and micro-level data. While

municipal mergers remain a contentious subject, this study implies such reforms might not have a substantial impact on residential sprawl on the whole.

The connection between construction sector activity and building quality is inspected in essay III. The key discovery indicates that buildings constructed during economic downturns tend to have lower quality: those exhibit higher operating costs and an increased need for renovations. This is likely the first exploration of this vital subject in the construction sector. However, Jovanovic (2021) and Bai et al. (2022) offer some benchmarks from the manufacturing and agricultural sectors, respectively. For policymakers, essay III provides evidence advocating for more stringent regulations and increased oversight, especially during recessions.

A common moral across all three essays underscores the significance of urban planning and land use. Urban planning should play a pivotal role in guiding the placement of new developments, considering factors such as the preference of households to reside near amenities like rail transport. Additionally, jurisdictional reforms might not have a substantial impact on residential sprawl, at least in the short term. The quality of buildings and the well-being of households are also contingent on robust building regulations and effective industry oversight. In conclusion, the dissertation strongly advocates for a decisive stance by policymakers and urban planners in the face of our rapidly urbanizing world.

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