Aalto-yliopisto
Aalto-universitetet
Aalto University

Master’s Programme in Real Estate Economics

Housing market anticipation effect

The case of the West-Helsinki Light Rail investment

Anna Nurmes

Master’s thesis
2026

Aalto-yliopisto
Aalto-universitetet
Aalto University

Author Anna Nurmes

Title of thesis Housing market anticipation effect: The case of the West-Helsinki Light Rail investment

Programme Master's Programme in Real Estate Economics

Thesis supervisor Assistant Professor Oskari Harjunen

Thesis advisor(s) Assistant Professor Oskari Harjunen

Date 28.07.2026 **Number of pages** 72+4 **Language** English

Abstract

Urban rail transit systems have become an increasingly important part of urban development. By changing how easily people can reach jobs, services, and everyday destinations, transport infrastructure helps shape where households and activities locate within the city. Prior studies from Finland have found a positive relationship between public transport investments and housing prices. This thesis examines whether the West-Helsinki Light Rail investment decision was capitalized into apartment prices during the pre-construction phase. The aim is to provide further evidence on the timing of capitalization, the extent to which information about the investment affects apartment prices before construction, and whether the price effect depends on the initial level of accessibility.

This thesis consists of a literature review and an empirical case study. The literature review provides a theoretical and institutional background, covering the basic principles of housing price formation and hedonic modelling and an overview of the existing literature, the institutional setting and the project. In the empirical part, the housing market anticipation effect is estimated using KVKL transaction data from the years 2016-2025 and a hedonic difference-in-differences approach.

I find that there is no evidence of a clear or statistically significant anticipation effect related to the investment decision for the West-Helsinki Light Rail line. The main estimates remain close to zero and compared to earlier Finnish studies, the estimated effects are smaller than the positive anticipation effects found for the West metro and Jokeri light rail line.

The results suggest that rail investments do not always translate into clear or immediate anticipation effects in apartment prices, especially in areas where accessibility is already good. In this case study, the expected accessibility improvement may have been too limited to create a clear housing price response, or people may not have been widely aware of the project.

Keywords housing prices, difference-in-differences, hedonic pricing model, anticipation effect, capitalization, transport investment, West-Helsinki Light Rail

Tekijä Anna Nurmes

Työn nimi Asuntomarkkinoiden ennakointivaikutus: Tapaustutkimuksena Länsi-Helsingin pikaraitiotieinvestointi

Koulutusohjelma Kiinteistötalouden maisteriohjelma

Vastuuopettaja/valvoja Apulaisprofessori Oskari Harjunen

Työn ohjaaja(t) Apulaisprofessori Oskari Harjunen

Päivämäärä 28.07.2026 **Sivumäärä** 72+4 **Kieli** englanti

Tiivistelmä

Kaupunkien raideliikennejärjestelmistä on tullut yhä tärkeämpi osa kaupunkikehitystä. Vaikuttamalla työpaikkojen, palveluiden ja muiden arkipäiväisten kohteiden saavutettavuuteen, liikenneinfrastruktuuri määrittelee, mihin kotitaloudet ja yritykset sijoittuvat kaupungin sisällä. Aikaisemmat suomalaiset tutkimukset ovat löytäneet positiivisen yhteyden julkisen liikenteen investointien ja asuntojen hintojen välillä. Tässä diplomityössä tarkastellaan, kapitalisoituiko Länsi-Helsingin pikaraitiotien investointipäätös asuntojen hintoihin investointipäätöksen jälkeen. Työn tavoitteena on täydentää tutkimusnäyttöä kapitalisoitumisen ajoituksesta, missä määrin investointia koskeva tieto näkyy asuntojen hinnoissa ennen rakentamisen alkamista ja riippuuko hintavaikutus saavutettavuuden lähtötasosta.

Diplomityö koostuu kirjallisuuskatsauksesta sekä empiirisestä tapaustutkimuksesta. Kirjallisuuskatsaus tarjoaa teoreettisen ja instituutionaalisen viitekehyksen tutkimuksen empiiriselle osalle, pitäen sisällään asuntojen hintojen muodostuksen ja hedonisen mallintamisen perusperiaatteet sekä katsauksen alan tutkimukseen, instituutionaaliseen ympäristöön ja hankkeeseen. Empiirisessä osiossa asuntomarkkinoiden ennakointivaikutusta arvioidaan käyttäen KVKL kauppahintadataa vuosilta 2016–2025 sekä hedonista erotusten erotus -menetelmää.

Tulosten perusteella Länsi-Helsingin pikaraitiotien investointipäätökseen liittyvästä selvästä tai tilastollisesti merkitsevästä ennakointivaikutuksesta ei löydy näyttöä. Pääestimaatit ovat lähellä nollaa, ja aiempiin suomalaisiin tutkimuksiin verrattuna tulokset ovat pienempiä verrattuna Länsimetron ja Raide-Jokerin tapauksissa havaittuihin positiivisiin ennakointivaikutuksiin.

Tulokset viittaavat siihen, että raideinvestoinnit eivät aina johda selviin tai välittömiin ennakointivaikutuksiin asuntojen hinnoissa, erityisesti alueilla, joilla saavutettavuus on jo ennestään hyvä. Tässä tutkimustapauksessa odotettu saavutettavuuden paraneminen on voinut olla liian rajallinen synnyttääkseen selvän hintareaktion tai projekti ei ole ollut tarpeeksi yleisesti ihmisten tietoisuudessa.

Avainsanat asuntojen hinnat, erotusten erotus -menetelmä, hedoninen hintamalli, ennakointivaikutus, kapitalisoituminen, liikenneinvestointi, Länsiratikat

Table of contents

Preface and acknowledgements

I want to thank my thesis supervisor and advisor Assistant Professor Oskari Harjunen for valuable guidance and feedback during the thesis process. I am also grateful to the Federation of Real Estate Agency for making this study possible.

Finally, I want to thank my family, friends, and my partner for their support and encouragement throughout my studies and during the thesis process.

Helsinki, 28 July 2026
Anna Nurmes

The use of artificial intelligence in the master's thesis

I acknowledge the use of AI (ChatGPT, including GPT-5.2 Thinking, GPT-5.4 Thinking and GPT-5.5 Thinking) during the master's thesis project, approximately from January 2026 to June 2026. AI was used as a writing and analytical support tool during the preparation of the thesis. The use of AI was limited to proofreading, improving the clarity and flow of English academic writing, and reviewing the Stata code used for the empirical analysis.

The prompts used in the process included:

- Check for grammatical errors and improve the flow without changing the content.
- Reduce repetition and make the structure more coherent.
- Find synonyms for this term.
- Identify unclear or repetitive sentences in the following section and suggest improvements while preserving the original meaning.
- Improve the clarity of this paragraph without changing the content or meaning.
- Suggest improvements to the academic tone of the following paragraph.
- Suggest a clearer transition sentence between these two sections without adding new substantive content.
- Check whether the following text uses consistent terminology and grammatical forms.
- Review the following Stata code and identify potential syntax, variable definition, or model specification issues.

The output from these prompts was used to improve the clarity, grammar, structure, and academic style of the thesis text or the functionality of the Stata code. All AI-generated suggestions were reviewed and edited by the author before use.

1 Introduction

1.1 Background and motivation

Urbanization and rising housing demand are pushing cities to expand. Urban rail transit systems have become an increasingly important part of urban development, especially in cities aiming to support sustainable mobility and maintain accessibility as cities grow. Rail transit systems are often promoted as a way to provide an energy-efficient, high-capacity mode of transport as they are considered the most efficient form of passenger transport (Jaramillo *et al.*, 2023; EEA, 2021).

By changing how easily people can reach jobs, services, and everyday destinations, transport infrastructure helps shape where households and activities locate within the city. Public infrastructure investments usually increase the housing supply indirectly through city planning, but also by improving accessibility and therefore making the nearby area more attractive (Wessman, 2019). As a result, accessibility is not only a planning objective but also a key factor in residential location choice.

At the same time, housing prices reflect a bundle of attributes, and the value of an apartment can be broken into a vector of characteristics that includes for example dwelling characteristics, neighbourhood quality, public services, local amenities, and accessibility (Rosen, 1974). In recent years, public transport investments have therefore been increasingly discussed in connection with real estate values, as improvements in accessibility can change households' willingness to pay for specific locations. Changes in transport infrastructure and public transport services may be reflected in housing prices through a capitalization effect.

Scientifically, this thesis contributes to the broader literature on capitalization in housing prices and hedonic housing price models. Prior studies generally find that proximity to a new rail transit station is associated with higher housing prices or land values (Higgins & Kanaroglou, 2016; Harjunen, 2018; Kauria, 2021). The land Land-value uplift effects have typically been estimated at approximately 10 per cent, with greater effect associated with rapid transit lines and smaller effects associated with light rail transit systems (Higgins & Kanaroglou, 2016).

A key aspect is that housing markets can be forward-looking. As prior studies have found, if a transport investment becomes credible through political decisions, planning milestones, or project approvals, prices may adjust before construction begins and long before operations start (Harjunen, 2018; Kauria, 2021; McMillen & McDonald, 2004). This "anticipation effect" is relevant not only for understanding how accessibility is valued, but also for broader questions related to housing affordability and spatial equity. Early capitalization may benefit current owners through capital gains, while raising entry costs for new buyers.

Empirically identifying an anticipation effect is challenging because public rail investments are not randomly located and housing price dynamics may be affected by information frictions, shifting expectations, and broader market shocks. This thesis examines the housing market anticipation effect in the context of the West-Helsinki Light Rail investment by using multiple specifications to estimate how housing prices near the planned new light rail line stops evolve relative to comparable control areas over time. In the empirical analysis, I use KVKL transaction data from the years 2016-2025 and a hedonic difference-in-differences (DID) research design. This approach aims to account for common market-wide shocks and reduce omitted-variable bias by comparing changes within areas over time rather than relying solely on cross-sectional price differences.

The West-Helsinki Light Rail investment is also linked to a wider urban development project taking place in western Helsinki, including new housing, urban redevelopment, and new municipal infrastructure (City of Helsinki, 2025f). This linkage is important for interpretation, as observed price changes may reflect expected accessibility improvements, but also broader development expectations associated with corridor-level renewal. In this thesis, I do not distinguish the price effect impacted by the accessibility improvements from possible effects caused by the whole development project. Therefore, part of the price effect estimated in this thesis may, for example, reflect the broader corridor-level renewal.

Municipalities in the Helsinki metropolitan area have invested in multiple rail transit projects in recent years and investments are supposed to increase in the future (Pääkaupunkiseudun Kaupunkiliikenne Oy, 2025b). This underscores the topicality of this research, as public transport infrastructure investments are typically expensive and have long-lasting impacts. The official planning and appraisal process of the West-Helsinki Light Rail line also includes an assessment of urban-economic effects, but not an assessment of the direct impact on housing prices (Kaupunkiliikenne Oy, 2023). Therefore, this study can be seen as complementary evidence on the economic effects of the project.

In the context of Finland, the anticipation effect has not been widely studied, but interest in the topic has increased in recent years. Prior studies from the Helsinki region indicate that housing markets can react to rail investments well before operations start (Harjunen, 2018; Kauria, 2021). Harjunen

(2018) estimated the anticipation effect related to the West Metro investment, using hedonic housing price models and DID estimation methods. He found a positive 4% price premium on apartments within 800 metres of the new metro stations, five years before the operation of the metro started. Kauria (2021) also used a hedonic DID estimation to analyse the anticipation effect of Jokeri Light Rail and found a 5% price increase within 800 metres of the Jokeri Light Rail stops compared to apartments farther away. Laakso (1992) used a hedonic model and found a positive correlation between the Helsinki metro and the market price of privately owned dwellings.

This motivates studying whether a similar capitalization effect is present for the West-Helsinki Light Rail investment, how the initial level of accessibility affects the price effect and whether the investment decision is sufficient for capitalization into housing prices. For the West-Helsinki Light Rail, Helsinki City Council approved the general plan in January 2021, and the project has progressed to later planning phases with construction expected to start in 2026 and completion in the early 2030s (Infraohjelma Helsinki, 2026). In this research, I use the investment approval decision time as the cutoff time for pre- and post-treatment periods.

Another differentiating aspect of this study is the location of the West-Helsinki Light Rail line. Previous studies from the Helsinki metropolitan area have focused on areas where the initial level of accessibility has not been very high. In the case of West-Helsinki Light Rail line, approximately half of the line runs through inner-city areas, which already have rail-based public transport and the expected improvement is limited. I aim to evaluate whether the possible anticipation effect differs depending on the initial level of accessibility.

The analysis may be affected by timing and information issues. If households are not widely aware of the investment decision or do not perceive it as credible, capitalization may be delayed or muted. In addition, if the post-decision period includes relatively few transactions, statistical power can become a limitation. Finally, since the post-decision period overlaps with the COVID-19-related changes and interest-rate-driven downturn in the housing market, broader market shocks may influence prices, making it important to control for time effects and test for parallel pre-trends.

Therefore, the purpose of this thesis is to contribute to the research tradition that applies hedonic housing price frameworks to analyse how transport investments and accessibility changes are capitalized into housing prices. The aim is to extend the evidence on timing and credibility of information in the pre-construction phase and examine whether there is a threshold level of initial accessibility beyond which further improvements no longer translate into observable housing price effects.

1.2 Research questions and objectives

In this research, I study the housing market anticipation effect of transport investments in an urban setting. The focus is on the West-Helsinki Light Rail investment and its pre-construction phase. The goal of this research is to estimate how nearby housing prices respond to the investment decision to build a new light rail line, focusing on the period after the decision but before construction begins.

The study aims to determine whether and to what extent housing prices close to the new light rail stops are affected by the investment decision. In practical terms, the objective is to estimate price changes near the planned railway stops relative to comparable control areas over time.

This research answers the following questions:

1. Is there a price effect related to the West-Helsinki Light Rail investment?
2. Is the price effect capitalized into housing prices immediately after the investment decision?
3. How does the initial level of accessibility in the area influence the price effects?

In this research, I focus on the early stage of the project, assessing only the effect of the investment decision on the housing market before the start of construction. I examine whether the decision itself is sufficient for households to internalize the expected change in accessibility and whether this anticipation is capitalized into housing prices.

In addition, I consider how the initial level of accessibility moderates the price response. Parts of the planned light rail line run through areas that are already relatively well connected before the investment. I therefore assess whether there is a threshold in baseline accessibility beyond which further improvements no longer translate into measurable housing price effects.

1.3 Thesis structure

This research consists of a literature review and a quantitative case study that uses existing secondary data. The literature review is divided into two chapters, Theoretical background and Institutional background.

In Chapter 1, I introduce the topic and present background and motivation for the study. I also elaborate on the research questions, define the scope of the thesis, and provide an overview of the thesis structure.

Following the introduction, Chapters 2 and 3 present the theoretical and institutional background of the study. The purpose of the literature review is to provide a conceptual and empirical foundation for the study by analysing prior research and providing an overview of the state of the field. The literature review covers the relevant background from both theoretical and institutional perspectives. It synthesizes earlier theoretical and empirical work on the capitalization of accessibility into housing prices, as well as on anticipation effects related to transport investments. This positions the research questions within the existing research tradition and motivates the key modelling choices.

Chapter 4 presents the data and methodology used in the empirical analysis. It describes the KVKL transaction data and the modifications made to it, the spatial data sources, and the construction of the econometric models and the treatment and control areas. It also explains the model specifications, main choices made during the research, and the identification strategy.

Chapter 5 reports the empirical results. It presents the estimation results on the housing market anticipation effect of the West-Helsinki Light Rail investment and examines the model credibility of the empirical design through sensitivity checks and alternative model specifications.

Finally, Chapter 6 discusses the findings in relation to earlier literature, evaluates the limitations of the study, and considers the broader interpretation of the results. It concludes by summarizing the main findings and contributions of the thesis and suggests directions for further research.

2 Theoretical background

2.1 Housing price formation

In this chapter, I introduce the basic principles of housing price formation and explain the theory behind hedonic housing price models. I also assess the key characteristics and challenges related to hedonic modelling.

2.1.1 The basic principles in housing price formation

Apartments can be classified as a heterogeneous good. According to Rosen (1974), the price of an apartment can be understood in relation to its features. The apartment features can be presented as a vector x:

$$x = (x_1, x_2, \dots, x_i), \qquad \text{(E1)}$$

where x is a vector of the apartment characteristics and $x_i (i = [1, n])$ presents an apartment characteristic. Therefore, the apartment price can be presented as a hedonic price function:

$$P = P(x), \qquad \text{(E2)}$$

where the price P is presented as a function of its characteristics. The central idea of this model is that the market price of an apartment reflects a bundle of characteristics rather than one homogeneous product. This section outlines how these bundles can be analysed using hedonic pricing and how market prices emerge in equilibrium.

In hedonic price analysis, this relationship can be interpreted through "implicit markets". While the observed market transaction concerns the bundle itself, the bundle can be thought of as consisting of characteristics that are priced implicitly through the hedonic price function. Since attribute-specific prices are not directly observed, hedonic analysis relates the observed bundle price to the attributes embodied in the dwelling. (Sheppard, 1999). In the hedonic price function, the derivatives represent the marginal price of the characteristics. From the consumer's perspective, the marginal price for a feature is the cost of adding that feature. (Rosen, 1974).

From a demand–supply perspective, the market price is an equilibrium outcome that reconciles demand and supply for different bundles of characteristics (Rosen, 1974). This means that the relationship between apartment price and the apartment characteristics is not determined only by demand or supply, but by the combined effect of both.

In an urban setting, location is a key part of this bundle. Location affects housing costs through a trade-off between the cost of land or housing and the cost of commuting. Alonso (1964) describes how households balance these costs when choosing where to live. Housing and land costs generally decrease with distance from the city centre, whereas commuting costs increase (Alonso, 1964). Public transport investments can shift this trade-off by reducing commuting costs and improving accessibility, potentially increasing the willingness to pay for homes in areas where transport connections have improved as a result of the investment.

Rosen (1974) emphasizes that the observed hedonic price–attribute relationship does not, by itself, identify consumers' valuations or producers' conditions. Instead, the hedonic price function reflects the joint market equilibrium outcome. Therefore, while the observed price function is informative about equilibrium price differences across attribute bundles, it does not on its own reveal the underlying demand or supply structure. Overall, the Rosen (1974) framework provides the theoretical foundation for apartment price formation, and housing prices reflect the implicit prices formed in the market equilibrium. The empirical use of the modelling of the price function is presented in Section 2.1.2 below.

2.1.2 Hedonic difference-in-differences model

The hedonic price function reflects market equilibrium, so the observed $P(x)$ does not, by itself, identify underlying demand or causal effects. Even so, hedonic modelling provides a systematic way to estimate how housing prices vary across different attribute bundles. With carefully chosen controls and an explicit identification strategy, hedonic models can help address key empirical challenges.

A hedonic DID approach combines the hedonic price model with a quasi-experimental research design (Banzhaf, 2021). In this setting, the hedonic model controls for differences in dwelling characteristics, while the DID structure compares price changes in treated and control areas before and after the treatment (Angrist & Pischke, 2009). This makes the approach useful when the aim is not only to describe price differences, but to examine whether prices changed differently in areas exposed to the treatment.

The limitations of hedonic DID models are mainly related to the requirements concerning the data, the definition of treatment and control areas, and market conditions. First, the method requires sufficiently detailed transaction-level data from both treated and control areas before and after the treatment. (Rennert, 2022). Second, the treatment and control groups should be comparable, and in the absence of the investment their price trends should have followed a similar path (Abadie, 2005). This parallel trends assumption is central for the credibility of the DID estimate (Angrist & Pischke, 2009).

In transport investment studies, these requirements can be difficult to satisfy. New rail investments are often connected to broader changes in land use, local amenities, redevelopment expectations, and neighbourhood composition. These simultaneous changes may affect housing prices independently of the transport investment itself (Rojas, 2024). In addition, the definition of the control group is important because dwellings located just outside the treatment area may also benefit from improved accessibility. If the control area is partly affected by the investment, the estimated treatment effect may be biased towards zero. (Qiu & Tong, 2021).

For these reasons, the hedonic DID estimates should be interpreted as conditional changes in housing prices within the specified empirical setting, rather than direct measures of willingness to pay or full welfare effects (Banzhaf, 2021). The credibility of the results depends on whether the model controls for relevant housing characteristics, whether the treatment and control areas are defined in a reasonable way, and whether the pre-treatment trends support the identifying assumptions (Qiu & Tong, 2021; Rennert, 2022; Abadie, 2005).

2.2 Effects of public transport investments on housing prices

Location affects housing prices, since the location of an apartment cannot be changed (Lönnqvist, 2025). When public transport investment decisions are made, the characteristics of an environment can change significantly. Apartments closer to public transport have generally higher market value than otherwise similar apartments located farther away (Agostini & Palmucci, 2008). The benefits provided by a public transport system may include time and financial savings, option value, civic pride, a sense of belonging, comfort, and convenience (Rennert, 2022). Public transport investment can affect the accessibility of the location by offering better connections, but also the city structure and new investments in the area.

By influencing the accessibility level, travel times, attractiveness and land use expectations of an area, public transport investments can also affect housing prices. At the same time, the effects are not always unambiguous since the transport investments might also have negative impacts on the environment, for example traffic noise, congestion or disadvantages caused by construction.

2.2.1 General findings in the literature

Most of the research finds a positive relationship between public transport investments and housing prices (Mohammad *et al.*, 2013). In the Finnish context, this pattern is also supported by earlier empirical evidence. Harjunen (2018), for example, found a positive 4 % anticipation effect on housing prices related to the West Metro investment within 800 metres of the stations. He studied the geographic extent, timing and average magnitude of the anticipation effect and found that the housing market started to adjust to the information quickly after the construction began. Kajova (2015) also estimated a positive price effect related to the same project within one kilometre from the stations, but using the asking prices of the apartments. Earlier evidence by Laakso (1992) also suggests a positive impact of the Helsinki metro on property values.

Similarly, Kauria (2021) estimated an average 5 % increase in apartment prices within 800 metres of Jokeri Light Rail stops relative to apartments farther away. Also, the first phase of the Tampere light rail investment was associated with a price premium of approximately 2.7–2.8 % after the investment decision, which increased to around 6.0–7.9 % near the time of opening (Kangas & Viippola, 2023; Laakkonen, 2023; Valaja, 2018).

International evidence provides further support for the capitalization of public transport accessibility into housing prices. Gupta, Van Nieuwerburgh, et al. (2022) studied the Second Avenue Subway extension in New York City and found an approximate 8 % increase in apartment prices along Second Avenue. They used a hedonic DID setting also to assess the effect on commuting times and found a substantial reduction in commuting times for subway users, offering a plausible mechanism for the estimated price increase (Gupta, Van Nieuwerburgh, *et al.*, 2022). Agostini & Palmucci (2008) studied the anticipated capitalization of the new metro line 4 in Santiago, using hedonic regressions with an average treatment effects estimation. They found an average increase of 4,2–7,9 % in housing prices after the project announcement and 3,1–5,5 % after the station locations were identified, depending on the distance from the stations (Agostini & Palmucci, 2008).

Rojas (2024) studied the value of the accessibility improvement in Malmö, as a result of railway investments concerning two new train stations. She aimed to distinguish the total price effect from the transport-related effect and found a total price effect of 17 % and 8 % and transport-related effect of 7.2-10.4 % and 5.5-6.2 % higher within 1,000 metres of the new stations (Rojas, 2024). Diao et al. (2017) studied the opening of the new Circle Line in Singapore using a DID method. They found an approximately 8.6 % positive price effect on non-landed private housing within 600 metres of the stations compared with housing over 600 metres of the stations (Diao et al., 2017).

The magnitude of the results varies considerably between different projects and studies. In Section 2.2.2, I will discuss the possible reasons for this variability in more detail. In addition to the large variability in magnitude, the significance and direction of the effect also vary. Mohammad et al. (2017) studied the effect of the Dubai Metro on residential and commercial property values with multiple different models. They found that the direction of the effect on residential properties was negative in the immediate vicinity, within 0.5 kilometres of the stations, but turned positive for the 0,5 to 1 kilometre distance band (Mohammad *et al.*, 2017).

Several studies also find effects that are close to zero. For example, Ransom (2018) studied the price effect of the construction of new light rail stations on the surrounding properties in Seattle using a DID regression design. He found that the effect was small and statistically insignificant on the property values surrounding most of the stations (Ransom, 2018). Camins-Esakov & Vandegrift (2018) used a repeat sales method to examine the value of an extension of a light rail line on house values. They also found that there was no statistically significant impact on house prices.

2.2.2 Sources of variation in the results

Although the public transport investments usually have a positive effect on housing prices, the results vary between studies. The variation can be explained by both the research design choices and the case under consideration. This variation reflects not only differences in findings, but also differences in what is being examined. Key factors affecting the results include, for example, the mode of transport, the location and initial level of accessibility, the timing of the study, and the methodological choices, among other things.

The capitalization effect of a transport investment depends not only on the fact that an investment is made, but also on the nature of the investment itself. The mode of transport targeted by the investment is one important factor in the estimation. The effects may differ between metro, commuter rail, light rail, tram, and bus investments. For example, according to Higgins & Kanaroglou (2016) and Mohammad et al. (2013) rapid transit lines are usually related to greater price effects than light rail transit systems. Rennert (2022) also found that commuter rail investments and heavy rail investments have respectively 9,6 % and 4,0 % higher price effects than light rail investments.

Similarly, the expected impact may vary depending on whether the project is a completely new line or an extension of an existing system. The scale of the project also matters, as a major strategic investment is more likely to have a great impact than a local improvement. This helps explain why some investments have stronger housing price effects than others. For example, in the study of new light rail stations in Seattle, Ransom (2018) argued that the new light rail connection did not necessarily constitute a sufficiently large improvement relative to the bus lines that had served the area before. In contrast, investments such as the construction of a new metro line usually involve a more substantial change in accessibility. On the other hand, different transport modes do not only differ in the accessibility improvements they provide, but also in the negative externalities they may create. For example, Mohammad et al. (2017) speculated that the negative price effect related to the Dubai metro within a half kilometre distance band may be explained by increased noise levels and pollution.

The location of the project is also a defining factor. For example, Camins-Esakov & Vandegrift (2018) suggested that the absence of an effect in their research may be explained by the location being farther from the CBD, where car use is relatively more valuable and the costs of driving and parking are lower. On the other hand, the initial level of accessibility in more central locations can influence how strongly the investment is valued. In an area that is already well-connected, even a large-scale investment may have little effect on housing prices if the existing level of accessibility is already so high that further improvements do not generate substantial additional value. For example, Kim & Lahr (2014) studied the impact of the Hudson-Bergen light rail line in New Jersey on residential property prices, using a repeat sales method. They found that the largest housing price appreciation was in areas where the initial level of accessibility was lower and in contrary, little or no appreciation in areas already well-served by public transport (Kim & Lahr, 2014).

Also, the development potential of an area may differ. In areas where the investment is linked to broader urban development opportunities, its effects may be stronger than in areas where the surrounding urban structure is already largely established. As Rojas (2024) suggests, the post-treatment increase in residential property prices is significantly higher when the effect of newly built dwellings is not separated from it. On the other hand, previous research shows that in markets with constrained or inelastic housing supply, demand shocks are more likely to translate into stronger price increases (Glaeser *et al.*, 2008). In areas already fully built, the housing supply side can be very inelastic, which may lead to a stronger increase in housing prices, as demand increases.

On a broader scale, around the world, different characteristics are valued differently related to transportation. For example, in the US and Australia areas might be more car-centric than in Europe or Asia, where people can be more dependent and familiar with public transport systems (Rennert, 2022). The housing price effects are found to be higher in European and Asian cities in comparison to cities in North America (Mohammad *et al.*, 2013). On the other hand, Rennert (2022) found that premiums in East Asia are, an average, of 7.4 % lower than those in North America.

The timing of the analysis is also an important factor shaping the results. The estimated effects may vary depending on whether the study focuses on the announcement, the investment decision, the construction phase, or the opening of the service. At earlier stages, the estimated effects typically reflect anticipation effects, as housing markets respond to expected future improvements. By contrast, studies focusing on the period after the service begins to operate are more likely to capture realized accessibility changes and the capitalization of already implemented accessibility improvements into housing prices.

The property and data type is also a major factor when interpreting the results. The magnitude of the effect can vary depending on whether the analysis uses rental versus sale prices, single versus multifamily housing, transaction versus asking price or owned versus rented plots. (Rennert, 2022). Mohammad et al. (2013) reported that on average land value changes tend to be higher than property value changes. Even when considering the same property type, the type of data is also significant. For example, using sale or asking prices may shift the effect substantially. Harjunen (2018) and Kajova (2015) studied the same anticipation effect of metro extension in Espoo. Harjunen used transaction-price data, whereas Kajova used asking-price data. The anticipation effect Kajova (2015) found, was approximately twice as great as the effect (Harjunen, 2018) found later with real sale prices.

Methodological choices also affect the results. Even in studies considering similar or even same cases, the results are not automatically the same but depend on the choices made in the research. For example, the control group selection plays a significant role. Diao et al. (2017) found that capitalization effects may be overestimated if the spatial interdependence between treated and control neighbourhoods is not considered.

Also, the model used has a great impact on the results. Mohammad et al. (2013) found that panel and time-series data produce higher estimates compared to cross-sectional data. DID models, on the other hand, have been found to estimate lower access premiums, in comparison to hedonic price models (Mohammad *et al.*, 2017; Trojanek & Gluszak, 2018; Rennert, 2022).

The functional form of the model may also influence the estimated magnitude of the effect. Mohammad et al. (2013) suggest that semi-log and double-log models tend to produce lower estimates than linear models.

Finally, the comparison of previous findings should also account for possible publication bias. Previous literature may not provide a fully neutral picture of the price effects of public transport investments, as statistically significant results may be overrepresented. Mohammad et al. (2013) also tested for publication bias in the literature and found that both published articles and working papers tend to be biased towards statistically significant results. This is important to consider when comparing results, since small or statistically insignificant effects can also be relevant from a research perspective, even if they do not always receive as much attention in the literature.

3 Institutional background

3.1 Urbanization development in Helsinki

Urbanization in Finland is predicted to continue over the next decades (Valtioneuvosto, 2022). The population of Helsinki has been growing throughout the 21st century and the growth has been especially strong during the last ten years (City of Helsinki, 2024). The population growth consists mainly of migration, the largest share being immigration (City of Helsinki, 2025c). According to the population forecast, Helsinki's population is expected to increase from 675 000 residents in 2024 to approximately 700 000 residents by 2026 (City of Helsinki, 2024).

This population growth increases pressure for new housing production (City of Helsinki, 2025a; City of Helsinki, 2024). Housing production in Helsinki has not been able to meet the demand created by the city's population growth for several years (City of Helsinki, 2025a). At the same time, it is important to avoid unnecessary urban sprawl, as it is commonly associated with inefficient land use, higher infrastructure costs and increased car dependency (Dieleman & Wegener, 2004).

The City's strategy is to enable sustainable growth by increasing housing production while directing new development mainly to the existing urban structure and areas well served by public transport (City of Helsinki, 2025e; City of Helsinki, 2024). This reflects a broader aim to limit outward urban expansion and support a more compact, transit-oriented city structure (Liu *et al.*, 2022; Dieleman & Wegener, 2004). In line with this, Helsinki aims to strengthen a sustainable transport system based on public transport, walking and cycling, while coordinating future urban growth with investments in rail-based public transport (City of Helsinki, 2025e).

This strategic direction is implemented especially through infill development. Infill development is one of the central tools in Helsinki's urban development strategy. The city aims to develop the urban structure sustainably, primarily by renewing and complementing the existing built environment while considering the specific characteristics of different areas. (City of Helsinki, 2024). Infill development is especially promoted along rail-based public transport corridors and around stations, where accessibility is strong or expected to improve (City of Helsinki, 2025a; City of Helsinki, 2024). This is consistent with the idea of transit-oriented development, where housing, services and workplaces are concentrated near high-capacity public transport (Cervero *et al.*, 2004). In recent years, 55–60 per cent of new apartments built in Helsinki have been delivered through infill development and the strategy is to keep the share above 55 % also in the future (City of Helsinki, 2024). In Figure 1, the most important housing development areas in Helsinki are presented according to the form of urban development.

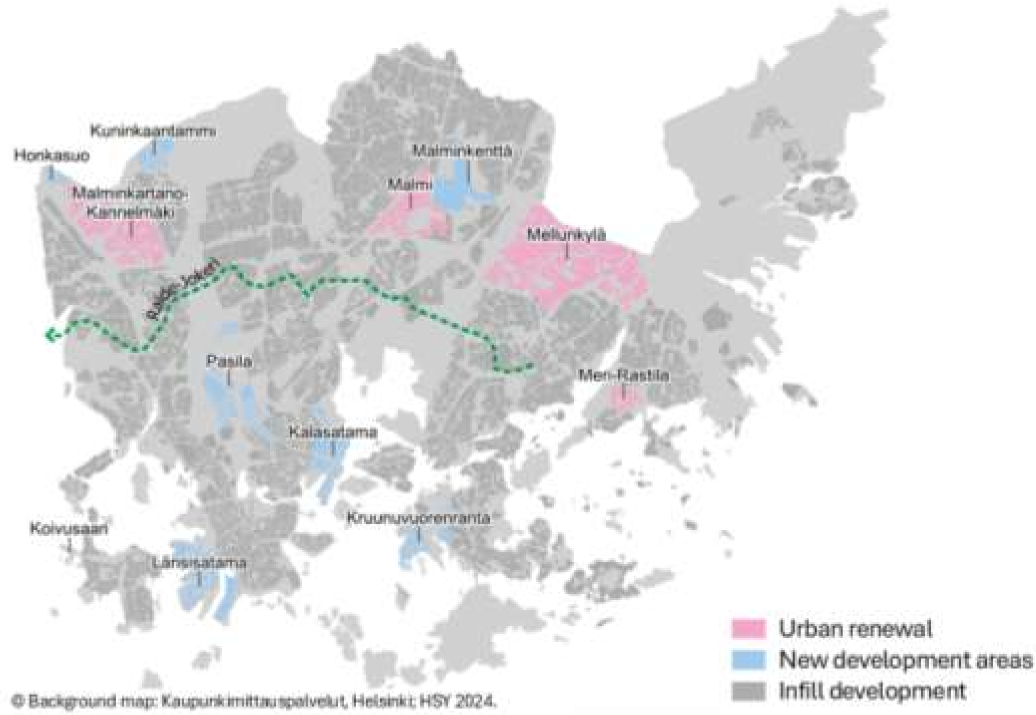

Figure 1. Housing development areas for the years 2024–2027. Modified from City of Helsinki (2024)

The West-Helsinki Light Rail line is one example of this development logic. The urban structure surrounding the planned West-Helsinki Light Rail line is also expected to become denser, particularly along Huopalahdentie and Vihdintie, in accordance with the master plan (Pääkaupunkiseudun Kaupunkiliikenne Oy, 2025a). The project can therefore be seen as part of a broader urban development strategy, where rail investments support housing production, infill development and the renewal of existing urban corridors (Pääkaupunkiseudun Kaupunkiliikenne Oy, 2025a; City of Helsinki, 2024).

3.2 The housing market in the Helsinki Metropolitan Area

The housing market context of the Helsinki Metropolitan Area is important for interpreting the empirical results of this study. The capitalization of a planned light rail investment does not take place in isolation, but within a broader market environment shaped by housing demand and supply conditions, financing costs and transaction activity. In hedonic housing market theory, apartment prices reflect the implicit value of different housing and location attributes, including accessibility (Rosen, 1974). However, the extent to which location-specific changes in demand are capitalized into prices also depends on the supply side of the market. As mentioned in Section 2.2.2, housing prices tend to respond more strongly to demand shocks in markets where housing supply is constrained or slow to adjust (Glaeser *et al.*, 2008).

The Helsinki Metropolitan Area differs from many other parts of Finland because its long-term housing demand is supported by population growth, employment concentration, educational institutions and urban amenities. According to KTI Finland (2026), residential properties remain the largest sector in the Finnish investment property market, and the attractiveness of rental residential investments is supported by population growth in the largest cities and the decrease on average household size. Similarly, Rakli & Taaleri (2026) argue that long-term residential demand is expected to remain strongest in the Helsinki Metropolitan Area, Tampere and Turku, with the Helsinki Metropolitan Area accounting for nearly half of the forecasted population growth between 2025 and 2045.

Although Helsinki has continued to support housing production through land-use planning, the supply response is not immediate (City of Helsinki, 2025d). New housing production depends, for example, on zoning, permitting and infrastructure capacity, but also on market conditions, prices, interest rates and the profitability of construction. KTI Finland (2026) shows that recent housing construction volumes have been constrained by weaker market conditions, lower housing prices, interest rates and reduced construction profitability. This is relevant for the present study because relatively inelastic short-run housing supply may allow expected accessibility improvements to be reflected in housing prices rather than being fully absorbed through new supply.

The Helsinki housing market consists of both owner-occupied and rental segments, and both private households and professional investors participate in the market. This distinction is relevant because the expected benefits of a new light rail investment may be valued through different channels. Owner-occupiers may value improved accessibility directly through shorter travel times, easier commuting and better access to services, whereas investors may respond through expected rental returns, liquidity and future resale values. KTI Finland (2026) highlights the importance of the professional rental residential market, as residential properties represented 35 per cent of the total invested property market in Finland at the end of 2025. However, as the transaction data used in this study do not directly identify buyer type, the empirical analysis captures the average market response across different buyer groups.

The timing of the study period is particularly important. Figure 2 presents the quarterly transaction volumes for apartments in apartment buildings and terraced housing in Helsinki over the period between 2016 and 2025, based on the KVKL transaction data. The post-2021 period captures the planning and decision phase of the West-Helsinki Light Rail investment, but it also coincides with broader housing market shocks. COVID-19 affected housing preferences, commuting behaviour and therefore also the value attached to public transport accessibility. Yang et al. (2022), for example, find that the pandemic decreased the implicit price of metro accessibility in Chengdu, suggesting that the value of public transport accessibility may vary across market conditions. I discuss the use of these years in research in more detail in Section 3.2.1. In 2020 and 2021 housing sales in Helsinki increased strongly at the same time as population growth slowed markedly (City of Helsinki, 2024). This trend can also be seen in Figure 2 below.

Figure 2. Quarterly number of transactions for apartments in apartment buildings and terraced housing in Helsinki, based on the KVKL (2026) transaction data.

In Finland, the period after 2022 has also been shaped by rising interest rates, inflation, higher living costs and weaker consumer confidence. The Bank of Finland (2025) reports that prices of existing dwellings in housing companies declined substantially between mid-2022 and the end of 2023 together with the transaction volumes, especially in the Helsinki Metropolitan Area. In 2024, the decline levelled off. KTI Finland (2026) gives a similar picture of the residential market. Also, the housing construction volumes had decreased markedly since 2022, and less than 20,000 new dwellings were started annually in 2023–2025. According to KTI Finland's (2026) report, prices of old dwellings had decreased by about 17 per cent from their mid-2022 prices in the Helsinki Metropolitan Area by the end of September 2025.

Transaction volumes started to increase slightly towards the end of 2025, indicating a modest improvement in market activity. (KTI Finland, 2026). A similar pattern can be observed in the KVKL data presented in Figure 2. However, construction activity remained weak, as construction profitability has been further challenged by rising energy and building material costs, while housing prices have remained low (City of Helsinki, 2024). Therefore, the post-2021 period includes three important market changes: falling housing prices, lower transaction activity followed by a slight recovery, and a strong decline in new housing construction.

For these reasons, the empirical analysis controls for common time effects and compares treated areas with selected control areas rather than interpreting price changes near planned light rail stops in isolation.

3.2.1 Exceptional housing market conditions in the study period

As described above, the sample period includes years affected by broad COVID-19-related shocks, followed by an interest-rate-driven downturn in the housing market. Both periods are included in the sample since they overlap with the treatment period. However, these years should be treated as an exceptional period that may affect the identification and interpretation of changes in housing prices.

During these years, housing preferences changed. For example, remote work became more common, people increased their demand for larger dwellings, and central urban locations became relatively less attractive due to reduced use of city-centre amenities and lower levels of local services. Liu & Su (2021), for example, found evidence of a movement away from denser areas in the United States, partly due to remote work and the declining value of proximity to services. Gupta, Mittal, et al. (2022) found similar patterns, with apartment prices and rents decreasing in central locations and increasing in areas farther from city centres. Ahrend et al. (2022) also found evidence of a housing demand shift from centres to the outskirts of cities, but they also emphasize that the change was neither universal nor consistent across cities (Ahrend *et al.*, 2022).

International studies have often linked the pandemic to a flattening of urban price gradients, suggesting a shift in demand away from central areas (Ala-Viikari, 2025; Ahrend *et al.*, 2022; Liu & Su, 2021; Gupta, Mittal, *et al.*, 2022). Ala-Viikari (2025) finds that Helsinki's urban price premium strengthened before the pandemic and continued to rise steeply during the early pandemic period, while only showing weak signs of later recovery toward the pre-pandemic level. This suggests that the housing market effects of COVID-19 are context-dependent and that the inclusion of COVID-19 years does not automatically imply a uniform bias away from central locations.

The COVID-19 period was followed by another exceptional phase in the housing market. From 2022 onwards, the rapid increase in interest rates and the broader weakening of housing demand contributed to declining housing prices, lower transaction volumes and a contraction in residential construction (The Bank of Finland, 2025). This downturn differs from the pandemic-related change in housing preferences, as it operated more directly through financing conditions, households' borrowing capacity and the overall market activity. However, its effects may also have varied across locations and dwelling types since sensitivity to financing conditions and changes in buyer demand are not necessarily spatially uniform.

These considerations are relevant for the DID setting, since, if the treatment and control areas differ in terms of density, the availability of services and urban character, the market shocks may have had different effects on the areas. Year fixed effects control for the common market-wide shocks, but they do not eliminate the problem if shocks affected the treatment and control areas differently. In addition, the substantial reduction in transaction volumes may have changed the composition of observed transactions over time, as the dwellings sold during a weak market may differ systematically from those sold under more typical market conditions.

Since the West-Helsinki Light Rail investment decision overlaps with both the COVID-19 period and the interest-rate-driven housing market downturn, the results of this study must be interpreted with caution. Dynamic DID models and robustness checks can help assess whether the observed development is due to the investment or to broader market shocks. However, these approaches cannot fully rule out the possibility that exceptional market conditions affected the treatment and control areas differently.

3.3 The public transport system in the Helsinki Metropolitan Area

Helsinki Region Transport (Helsingin seudun liikenne, HSL) is responsible for the public transport system in the Helsinki region, and it plans and operates public transport in the area (Helsingin seudun liikenne, 2026a). The transport system consists of different modes of transport, such as metro, train, bus, tram and ferry services, as well as cycling and walking paths and city bikes.

The system is based on a trunk route network that includes rail services and trunk bus routes (Helsingin seudun liikenne, 2026b). Currently, there are 13 commuter train lines, two metro lines, 13 trunk bus routes and one light rail line (Helsingin seudun liikenne, 2026b). The main idea is that the trunk routes operate in high-demand areas, providing frequent connections between key hubs. The role of other buses and tram line sections that serve a continuous urban structure is to complement these trunk lines and provide connections to transport hubs. (City of Helsinki, 2025e).

In the Helsinki City strategy, one of the goals is to increase the number of residents choosing public transport for their main mode of transport (City of Helsinki, 2025a). In recent years the public transport system strategy in the Helsinki metropolitan area has included light rail lines as one of the most important development directions to increase the capacity and ensure sustainable city development with lower climate emissions. The purpose is to expand the rail network with large investments and replace some bus lines with light rail lines. (Pääkaupunkiseudun Kaupunkiliikenne Oy, 2025b). The West-Helsinki Light Rail will complement the existing public transport system, by laying the foundation for a new city boulevard structure and a rail-based public transport solution in western Helsinki (Pääkaupunkiseudun Kaupunkiliikenne Oy, 2025a).

One of the most important drivers behind the development of public transport is climate change and the related emission reduction targets. This supports the City's strategy of moving public transport toward emission-free, high-quality, and accessible rail services (City of Helsinki, 2026b). Similarly, in the West-Helsinki Light Rail project, the master plan mentions promoting transport emission reduction targets as one of the project's goals (City of Helsinki, 2020).

Previous projects have shown significant potential regarding emission reduction targets. For example, the Jokeri light rail line, completed in 2023, was estimated to significantly reduce greenhouse gas emissions. Compared to bus line 550, which the light rail replaced, carbon dioxide emissions are estimated to have decreased by 85%, nitrogen oxide (NOx) emissions by 95%, and particulate matter (PM) emissions by 70%. In addition, public transport passenger numbers increased, reducing passenger car traffic and therefore also pollution from private cars. (Raide-Jokeri, 2026).

In addition to the West-Helsinki Light Rail line, there are multiple rail projects ongoing in the Helsinki metropolitan area (City of Helsinki, 2025e). The Crown Bridges will connect Laajasalo, Korkeasaari and Kalasatama to the city centre, with operations scheduled to start in 2027 (Kruunusillat, 2022). The project will include 10 kilometres of light rail line and three new bridges: Kruunuvuorensilta, Finkensilta and Merihaansilta (Kruunusillat, 2022). The Vantaa Light Rail project will connect many new areas in the eastern part of the metropolitan area to the tram network. The construction began in 2025, and the services are scheduled to start in 2029. The Viikki-Malmi light rail will run from the Kumpula campus to Malmi Airport and split into two branches ending near Malmi Hospital and in Jakomäki. The Tuusulanväylä Boulevard will add a three-kilometre section of track from the junction of Pohjolankatu and Mäkelänkatu streets to Pakila and Patola. (Pääkaupunkiseudun Kaupunkiliikenne Oy, 2026b). Together, these projects are part of the City's strategy of developing public transport infrastructure toward emission-free, high-quality, and accessible rail services.

3.4 West-Helsinki Light Rail line

The West-Helsinki Light Rail line is the planned light rail line 14, planned to run from the Helsinki city centre to Kannelmäki along Mannerheimintie via Meilahti, Munkkiniemi, Haaga and Lassila. Travel time between the terminal stops, from Kolmikulma to Kantelettarentie, will be around 30 minutes. (City of Helsinki, 2020). The new light rail line will connect existing residential and employment areas with major transport hubs and the wider public transport network. It will provide an interchange with light rail line 15 in Haaga and connections to commuter rail services at Valimo and Pohjois-Haaga stations. (City of Helsinki, 2026b). The route of the upcoming West-Helsinki Light Rail line and the stops along the line are shown in Figure 3.

Figure 3. The West-Helsinki Light Rail line. Modified from City of Helsinki (2020).

Helsinki City Council (2021) decided on the implementation of the project in early 2021 and a project plan was approved in 2024 by the Urban Environment Committee (City of Helsinki, 2026b). The 2021 decision signalled a political commitment to proceed, while the 2024 project plan further specified the investment and its design. Following these decisions, the development phase of the project began at the beginning of 2025, and the construction began in phases during spring 2026 (Pääkaupunkiseudun Kaupunkiliikenne Oy, 2025a; Destia, 2024).

The construction of the West-Helsinki Light Rail line is part of a wider urban development project called the Western Boulevard City (City of Helsinki, 2026a). The project includes new housing for 14 000 people, new services, public transport infrastructure and overhauls of municipal infrastructure and the creation of a new urban environment (City of Helsinki, 2026a; City of Helsinki, 2025f). Under the plan Huopalahdentie and Vihdintie will become urban boulevards with two car lanes in each direction and new high-quality walking and cycling paths (City of Helsinki, 2026a). In addition to the West-Helsinki Light Rail line, the new public transport infrastructure built as part of the project also includes new tram lines in the western inner city on Fredrikinkatu and Topeliuksenkatu (City of Helsinki, 2026b).

The light rail section south of Munkkiniemi runs along the existing tram line. The new section of the line is divided into suburban light rail and boulevard light rail according to the area characteristics and the design choices. This classification is presented in Figure 4. The southern part of the route runs through the inner city, where the urban structure is dense and the existing tram network is already extensive. As shown in Figure 4, the boulevard light rail section continues northwards from Munkkiniemi, and the suburban light rail section covers the northernmost section of the line north of Meijeritie.

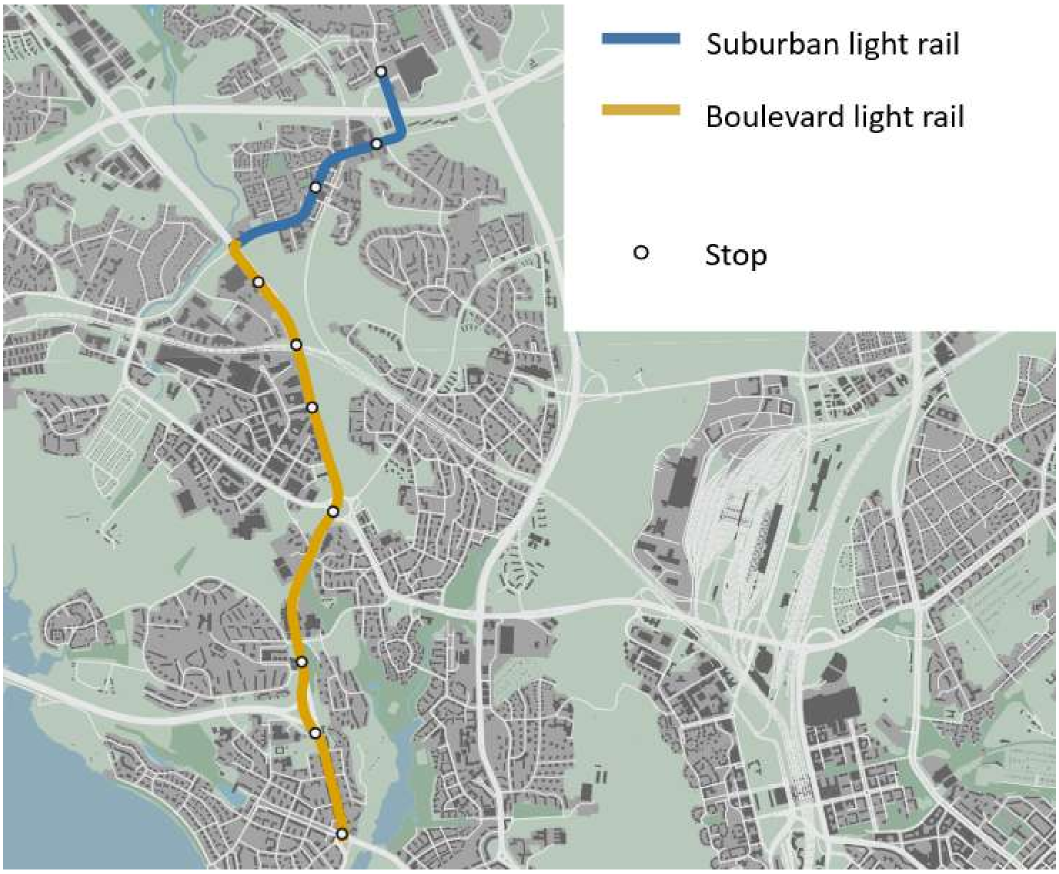

Figure 4. Classification of the West-Helsinki Light Rail line. Modified from City of Helsinki (2022).

The plan for new services in the area is to create street-level facilities and space for an urban, inner-city-like environment. The plan includes a family centre, providing services for children and families and a health and well-being centre, providing health and social services mainly for the adult population. The need for new schools and day-care facilities will be examined as part of the Boulevard City planning. (City of Helsinki, 2026a).

One of the main themes of the project is climate-smart urban development. The Western Boulevard City project aims to create an environment where sustainable living is easy by providing strong public transport connections, a high-quality environment for walking and cycling, and services located close to residential and employment areas. (City of Helsinki, 2026a). However, some of the land required for the project is currently green space, and implementation will involve tree felling. These works are planned to take place outside the bird nesting season and with attention to wooded areas that are important for flying squirrels (Pääkaupunkiseudun Kaupunkiliikenne Oy, 2026a). To reach the project's climate and environmental goals, it is essential to ensure green infrastructure, stormwater management and biodiversity as the area becomes more heavily built up (City of Helsinki, 2026a).

3.4.1 Expected accessibility and urban development effects

The investment decision does not only refer to the physical construction of a new light rail line, but also to the broader expected changes associated with the West-Helsinki Light Rail investment. In the treated areas, dwellings are exposed to an anticipated improvement in public transport accessibility, stronger integration with the rail-based transport network, changes in the street environment, and wider urban development along the corridor (City of Helsinki, 2020). These changes may affect housing prices because households may value shorter and more reliable travel, better connections, improved local amenities, and the expected future development of the area.

However, the focus of this study remains on the new light rail line and its expected accessibility effects. Figure 5 presents the estimated travel times between selected points along the West-Helsinki Light Rail line after the new line becomes operational. The route map illustrates that the West-Helsinki Light Rail is expected to improve not only access to individual stops, but also the overall network position of several neighbourhoods along the corridor. The planned line creates a continuous north–south light rail connection between the city centre and Kantelettarentie, passing through areas such as Töölö, Munkkiniemi, Munkkivuori, Vihdintie, Valimo and Pohjois-Haaga.

The travel times shown in Figure 5 indicate that the line would provide relatively short connections between key segments of the corridor, including 14 minutes between Lasipalatsi and Munkkiniemi, 5 minutes between Munkkiniemi and Vihdintie, and 9 minutes between Vihdintie and Kantelettarentie. Compared with the current connections, the most directly comparable improvement is the Lasipalatsi–Munkkiniemi section, which is already served by an existing tram line, where the current travel time is approximately 17 minutes, while the planned light rail line is expected to reduce the travel time to 14 minutes.

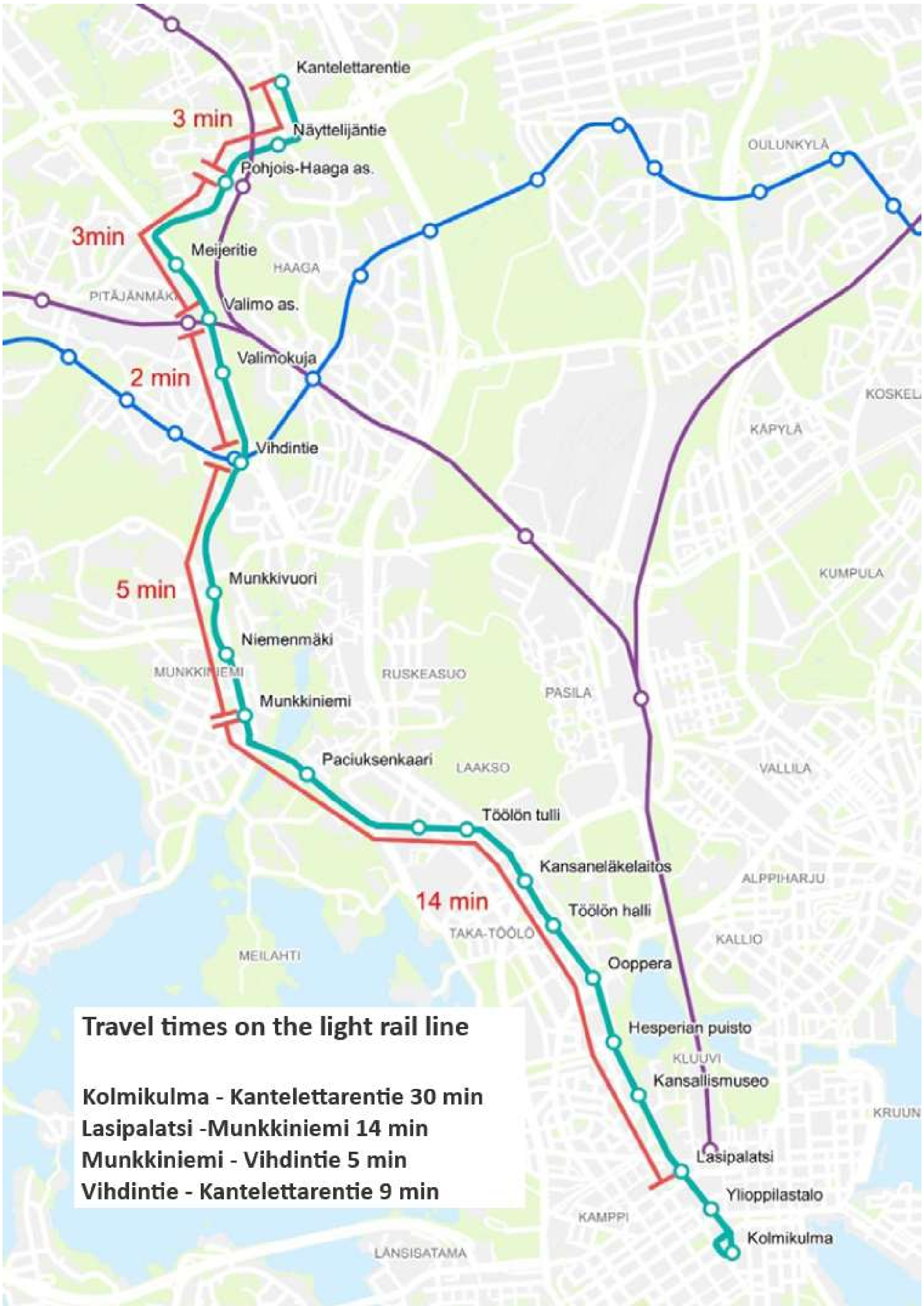

Figure 5. Travel times with the new West-Helsinki Light Rail line. Modified from City of Helsinki (2020).

For the northern parts of the corridor, especially between Munkkiniemi, Vihdintie and Kantelettarentie, the main change is not only a reduction in travel time, but also the creation of a new direct rail-based connection. Therefore, the treatment can be interpreted as exposure to an anticipated improvement in rail-based accessibility, travel-time reliability and connectivity within the urban transport network. The line will have frequent services and extended operating hours, presented in Table 1, improving accessibility in the northern parts of the corridor. (City of Helsinki, 2020). This means that the investment may improve not only the speed of individual trips, but also the overall convenience and predictability of public transport use in these areas.

Table 1. West-Helsinki Light Rail line operating times and service intervals. Modified from City of Helsinki (2020).

	Weekday							Saturday					Sunday		
	5.30–7.00	7.00–9.00	9.00–15.00	15.00–18.00	18.00–21.00	21.00–23.00	23.00–1.30	6.00–9.00	9.00–10.00	10.00–18.00	18.00–23.00	23.00–1.30	7.00–10.00	10.00–23.00	23.00–1.30
Service intervals	12	6	7-8	6	7-8	10	20	12	10	7-8	10	20	15	12	20

At the corridor level, the impacts of the investment can be examined through changes in public transport accessibility. Figure 6 illustrates the estimated percentage change in public transport accessibility within a 30-minute morning-peak travel-time threshold after the implementation of the West-Helsinki Light Rail project. The expected improvements vary across the corridor, with the largest gains concentrated around Huopalahdentie and the areas surrounding Munkkivuori and Niemenmäki. Improvements are also expected along Vihdintie and in Lassila and Kannelmäki. In contrast, accessibility is expected to decrease in some areas due to changes in the public transport network. (City of Helsinki, 2020). Overall, the changes vary across the corridor, with the largest improvements being relatively localised and concentrated in the central and northern sections, while the overall improvements remain modest.

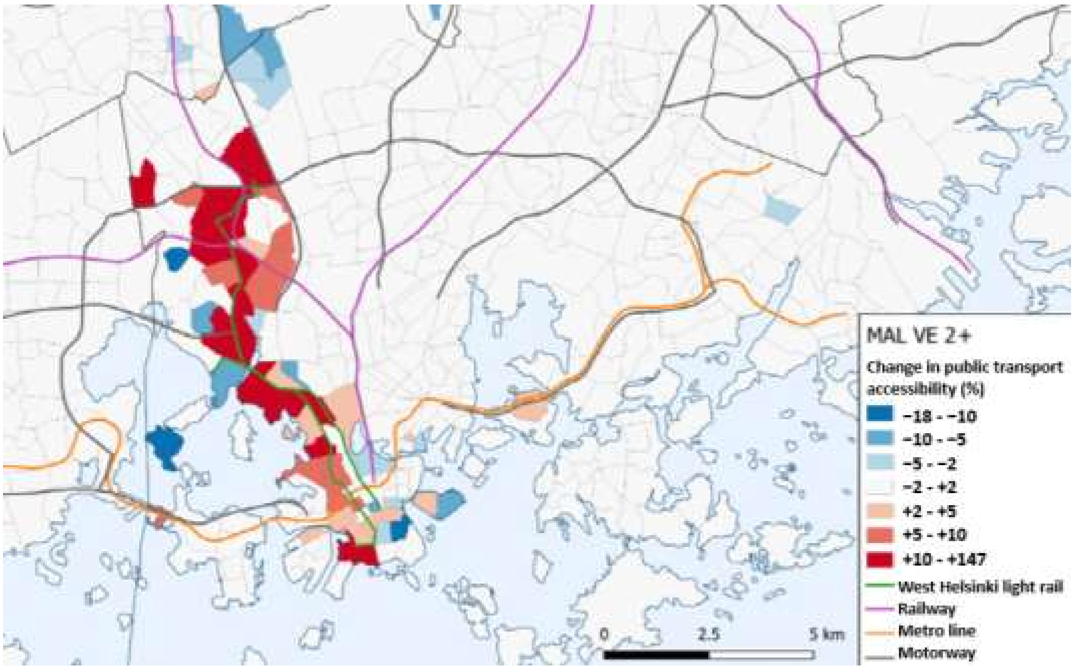

Figure 6. Percentage change in public transport accessibility within a 30-minute morning peak travel time after the implementation of the West-Helsinki Light Rail project. Modified from City of Helsinki (2020)

The new light rail line also connects the whole corridor to other major rail lines. At Vihdintie, the line will intersect Jokeri light rail line 15, while the stops at Valimo and Pohjois-Haaga will provide connections to commuter rail services. Taking this into account, the line not only improves connections from more distant areas to the city centre, but also from locations along the line to the broader public transport network.

In addition, the potential value of the project is related to the wider land-use changes planned along the corridor. The plan includes the transformation of Huopalahdentie and Vihdintie into boulevard streets and the densification of the urban structure around them. This is expected to create a more urban environment with new housing, workplaces, greener street spaces and better local connections for walking, cycling and public transport. Therefore, the investment may affect housing prices not only through improved rail accessibility, but also through the broader improvement of the surrounding urban environment.

3.4.2 Assessment of project impacts

The impacts of the West-Helsinki Light Rail project have been assessed as part of the official planning and appraisal process. The assessment focuses not only on the physical construction of the line, but also on the wider light rail, street and urban development project. In the official planning documents, the assessment covers the project scope, the public transport network, costs, environmental effects, urban structure and broader urban-economic effects (City of Helsinki, 2020; Kaupunkiliikenne Oy, 2023).

As part of the project planning, the City of Helsinki has prepared an environmental impact assessment, an updated project appraisal and an assessment of urban-economic effects. The assessment also considers effects related to traffic, noise, vibration, air quality, climate, nature, surface and groundwater, landscape, cityscape and social impacts. In this sense, the official assessment is broad and mainly supports planning, decision-making, risk management and the mitigation of adverse effects during further project development. (Kaupunkiliikenne Oy, 2023).

In the transport and urban economics literature, housing prices are often interpreted as one channel through which households' valuation of improved accessibility and local amenities may become visible. This is relevant also from a public finance point of view, since part of the value created by transport infrastructure may be captured by the public sector through land revenues, development-related income and property taxation. In their study, Gupta, Van Nieuwerburgh, et al. (2022) linked the estimated housing price effect to this form of value capture and found that in the case of the Second Avenue Subway extension in New York the share of the value captured through property taxes was only 30 per cent of the private value created and it was not sufficient to cover the cost of the subway. However, in the Finnish context, this link should be interpreted cautiously, as property tax is based on the taxable value of real estate, not directly on apartment transaction prices (Tax Administration, 2026).

The official project appraisal includes a broader urban-economic assessment, which evaluates the expected effects of the project on property markets, construction volumes, land values, city revenues from land assets, agglomeration benefits, labour demand and regional multiplier effects. The assessment is based mainly on forecasted accessibility changes, land-use assumptions and economic modelling, rather than on observed apartment transaction prices (Kaupunkiliikenne Oy, 2023). Therefore, it provides an estimate of wider urban-economic effects.

This study can be seen as complementary research examining whether the 2021 investment decision was capitalized into apartment prices near the planned stops, creating a clear motivation for the empirical approach used in this thesis. Therefore, the purpose of this study is not to provide a full cost-benefit assessment of the West-Helsinki Light Rail project, but to analyse one specific potential effect of whether the 2021 investment decision was capitalized in apartment prices in the areas surrounding the planned light rail stops.

4 Data and methodology

4.1 Data

The dataset consists of housing transaction data, provided by the Finnish Federation of Real Estate Agency (Kiinteistönvälitysalan Keskusliitto ry, KVKL), combined with spatial data on the planned West-Helsinki Light Rail stops and existing public transport stations. The analysis relies on spatial data processing to geocode transactions and construct distance-based treatment measures and control variables.

Data quality plays a significant role in assessing the credibility of the model. The KVKL transaction data are from a private database that covers transactions made by Finnish real estate agents since 1999 (KVKL, 2026). The data include a wide range of variables describing, for example, the construction year, selling price, living area, address and number of floors. The full list of the KVKL data variables can be found in Table A1 in Appendix A.

To prepare the data for the analysis, I added variables age and exponential and logarithmic versions of variables age, sale price, maintenance costs and living area. To construct the treatment and control groups, I geocoded coordinates for the dwellings, the upcoming West-Helsinki Light Rail stops, existing train stations and calculated the distance to the nearest West-Helsinki Light Rail stop and train station for each dwelling.

Table 2 presents descriptive statistics for the data in treatment and control areas used in the main specifications. These specifications are defined in Section 4.2.2. The descriptive statistics show that the baseline treatment and control groups are broadly comparable in several observed housing characteristics, although some differences remain. The treatment area has a slightly lower average sale price, while apartments are on average slightly larger, older and located on higher floors than in the control area. The treatment area also has a slightly higher share of apartments on owned plots. The condition distribution is relatively similar across the two groups and overall, the observed differences are moderate.

The control group (2) is used to examine whether the results are sensitive to excluding dwellings located just outside the treatment area. This control group is also very similar to the treatment group. In terms of age and plot ownership, there are more differences, but the average sale price is very close to the treatment group. The new line section sample has a lower overall price level in both the treatment (3) and control (3) areas, likely because these areas are located farther from the city centre. The treatment and control groups are broadly similar, especially in terms of average floor area, age, number of rooms, maintenance charges, and condition. Finally, the train station control group (4) differs more clearly from the main treatment group, especially in terms of age, plot ownership, sauna, and average sale price. These differences are controlled for in the hedonic DID models using control variables and area fixed effects.

Table 2. Descriptive statistics for the treatment and control groups.

Sample	Treated	Control (1)	Control (2)	Treated (3)	Control (3)	Control (4)
	400 m	400–1000 m	600–1000 m	new line section	new line section	train
N	5,972	11,863	7,794	2,265	3,945	9,179
Sale price	453,397	461,927	452,651	347,568	313,823	304,225
	(273,787)	(291,188)	(293,788)	(157,059)	(176,993)	(169,400)
Area	64.01	61.67	60.82	61.44	58.63	61.83
	(33.20)	(33.28)	(32.52)	(24.70)	(28.16)	(25.68)
Age	74.67	72.57	70.08	55.86	54.01	47.19
	(23.51)	(27.79)	(28.74)	(17.59)	(16.03)	(24.70)
Rooms	2.44	2.32	2.29	2.54	2.42	2.49
	(1.14)	(1.10)	(1.07)	(1.18)	(1.12)	(1.02)
Maintenance charge	5.23	5.21	5.22	5.14	5.36	5.27
	(1.28)	(1.39)	(1.42)	(0.95)	(1.14)	(1.15)
Floor number	3.37	3.08	3.10	3.09	2.53	2.57
	(1.77)	(1.63)	(1.64)	(1.76)	(1.39)	(1.56)
Own lot	88.4%	84.9%	81.7%	72.5%	64.1%	60.6%
Sauna	12.3%	12.7%	13.1%	15.0%	11.7%	29.2%
Condition						
-Poor	4.7%	4.1%	3.9%	3.7%	3.1%	3.1%
-Decent	33.6%	31.7%	32.2%	38.2%	36.6%	34.8%
-Good	57.8%	60.3%	59.7%	54.7%	57.7%	59.3%
-Excellent	1.5%	1.5%	1.5%	1.1%	1.1%	1.4%
-New	1.1%	1.2%	1.5%	0.8%	0.5%	0.5%
-Unknown	1.4%	1.2%	1.1%	1.5%	1.0%	0.9%

Notes: All prices are deflated to 2025 using the consumer price index. Standard deviations are reported in parentheses below the means. For dummy variables, the reported values are shares of observations.

4.2 Research design

In the quantitative case study, I estimate the housing market anticipation effect of the West-Helsinki Light Rail investment using a hedonic DID approach. The treatment group consists of dwellings located within 400 metres of planned light rail stops, while the control groups comprise areas outside the treatment zone with a maximum distance of one kilometre or areas near existing train stations. The study period is defined relative to the investment decision date, including five years before and after the investment decision.

Empirically, I compare price developments in areas close to the planned stops (treatment areas) with price developments in comparable areas not exposed to the same investment decision (control areas), while controlling for dwelling characteristics and common time effects. To assess the credibility of the design, I conduct sensitivity analyses using alternative distance thresholds and alternative modelling approaches, and test for parallel pre-trends using a dynamic DID model.

4.2.1 Treatment area

The spatial definition of the treatment area is based on public transport service area standards. According to the West-Helsinki Light Rail general plan, the target primary service area for tram stops is defined as 400 metres, while 600 metres is considered an acceptable distance (City of Helsinki, 2020). Based on this, I defined the main treatment area as apartments located within 400 metres of the planned stops and I use a 600-metre treatment radius as a robustness check. Figure 7 shows the housing transaction observations in treatment and control areas, used in the baseline specification (1).

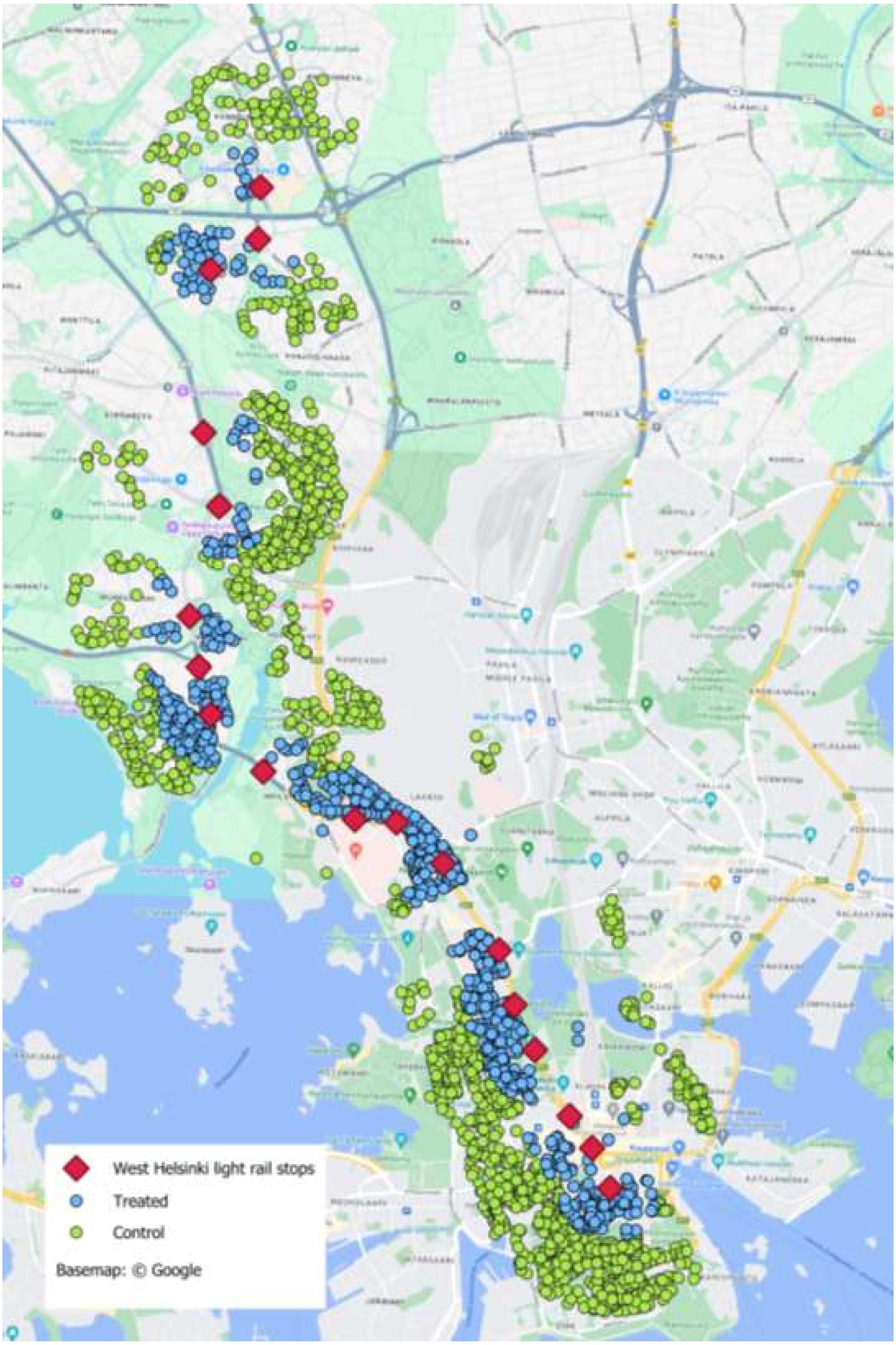

Figure 7. Treatment and control observations in specification (1).

4.2.2 Control groups

An appropriate control group is a key methodological choice in the empirical design. In a DID setting, the control group should capture the price development that the treatment area would have experienced in the absence of the investment. For this reason, the control areas should be comparable to the treatment area in terms of location, urban structure, and housing market characteristics, while remaining outside the direct influence of the West-Helsinki Light Rail investment.

In Chapter 5, I present the main DID estimations using four different control groups. In specification (1) the control group consists of dwellings located just outside the treatment area, but within 1,000 metres of the West-Helsinki Light Rail stops. The main benefit of using a nearby control area is its similarity to the treatment area, which is one key requirement in the DID setting.

If the expected accessibility improvements also extend to dwellings located just outside the treatment area, the closest parts of the control areas may partly be affected by the investment. This could affect the estimated treatment effect. To examine whether the results are sensitive to this possibility, in specification (2), I excluded observations located between 400 and 600 metres of the planned stops and re-estimated the model using dwellings located between 600 and 1,000 metres as the control group. This distance band choice is based on the acceptable walking distance defined by City of Helsinki (2020).

Since the West-Helsinki Light Rail goes through different areas with different urban structures and initial levels of accessibility, the estimated effect may also vary along the line. For this reason, in specification (3), I estimated the model separately for the part of the corridor, where the West-Helsinki Light Rail line creates a completely new rail connection. This specification includes the observations surrounding the stops north of Munkkiniemi. With this specification, I aim to assess whether the inner-city section pulls the overall estimate towards zero.

In specification (4), I use dwellings located near existing train stations in Helsinki as a control group. With this definition, I aim to reduce the risk that the control group is indirectly affected by the investment. However, this approach also has limitations. A control group from another rail corridor may differ from the treated areas in terms of neighbourhood characteristics and local housing market trends.

4.2.3 Econometric models

For each treatment and control group specification, I first estimate a dynamic model that presents yearly estimates for the treatment term. The dynamic model estimates treatment effects separately for each year. With this model, I evaluate the suitability of the empirical settings by comparing the pre-trends of the treatment and control groups.

I follow the dynamic model with a classic 2 × 2 DID model, capturing the interaction between the treatment and after terms. This interaction term estimates the anticipation effect that the study aims to identify.

The DID model used in this research is:

$$\begin{aligned} \ln(P_{ist}) = \; & \alpha + \beta \cdot Treated_i + \gamma \, After_t + \delta(Treated_i \times After_t) \\ & + \theta x_i + \mu_t + \lambda_s + \varepsilon_{it} \end{aligned} \qquad \text{E3}$$

where P_{ist} denotes the sale price P for apartment i, sold in year t, and located near stop s. $Treated_i$ indicates whether dwelling i is located within treatment area, and $After_t$ indicates whether the sale year t is in the period after the investment decision. The interaction term $Treated_i \times After_t$ is the coefficient of interest and captures the estimated average treatment effect. x_i is a vector of apartment characteristics, including the logarithm of the room area, age, age in second power, number of rooms, condition dummies, an own lot dummy, floor number, a sauna dummy and the logarithm of the maintenance fee. μ_t denotes sale-year fixed effects, and λ_s denotes stop fixed effects, unless otherwise stated. Standard errors, ε_{it} are clustered at small district level.

Standard errors are clustered at the small city district level to allow correlation in the error terms within local areas. The information for this regional division is from the Helsinki City Survey Services (City of Helsinki, 2025b). Observations located within the same area may share unobserved local housing market shocks and neighbourhood-specific price trends. Without clustering, the model could treat spatially related transactions as independent observations and therefore underestimate the uncertainty of the estimated treatment effect (Bertrand *et al.*, 2004; Cameron & Miller, 2015).

Clustered standard errors rely on asymptotic approximations with a sufficiently large number of clusters (Cameron *et al.*, 2008). Since the number of clusters is limited, especially in the new line section specification, wild cluster bootstrap p-values and confidence intervals are also estimated, in addition to clustered standard errors, to avoid overstating the precision of the estimates. The bootstrap values are implemented using Rademacher weights and a studentized test statistic following the recommendation of Canay et al. (2021).

Apartment size is included in logarithmic form to account for the non-linear relationship between apartment size and price per square metre. Building age is included in levels and in second power to allow for a non-linear age-price relationship. The choice of these functional forms is supported by descriptive plots presented in Figures 8 and 9, and robustness checks using alternative specifications. Across these specifications, the estimated treatment effect remains close to zero and statistically insignificant, suggesting that the results are not driven by the chosen functional form for apartment size or building age.

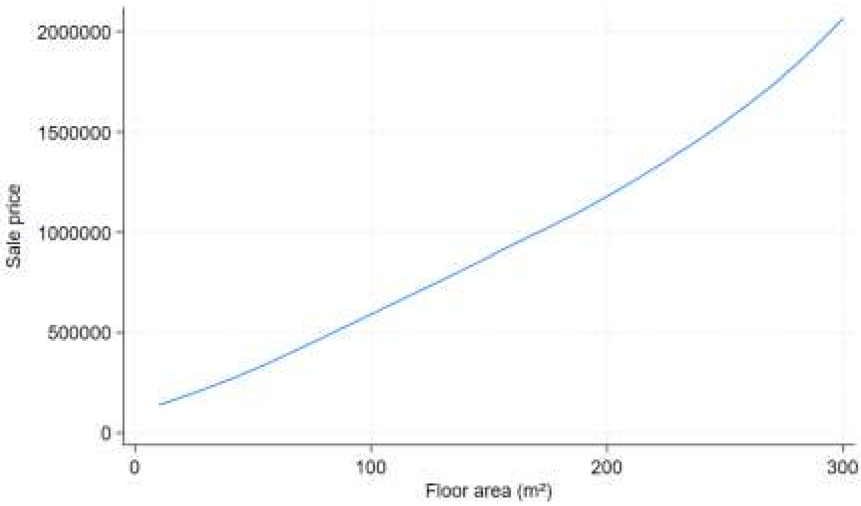

Figure 8. Smoothed relationship between apartment size and sale price.

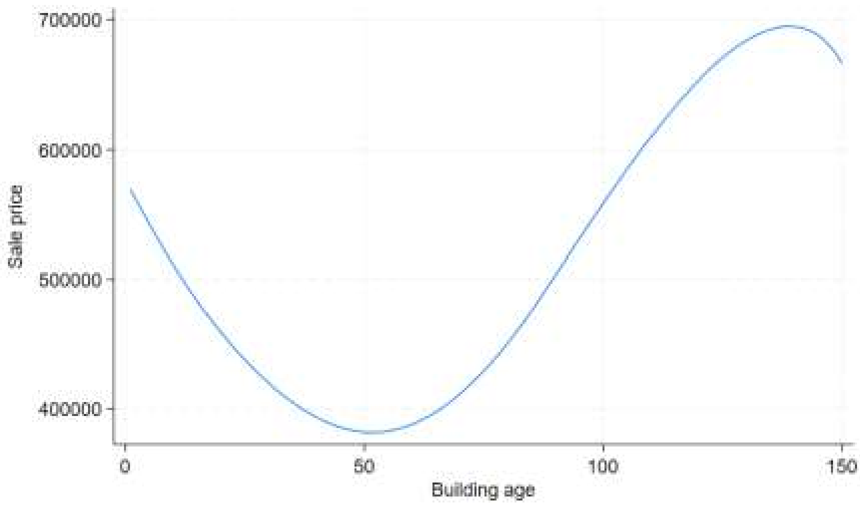

Figure 9. Smoothed relationship between building age and sale price.

I include stop fixed effects to control for permanent differences between the planned stop areas. These fixed effects capture local characteristics, such as location within the corridor, surrounding urban structure, existing accessibility and neighbourhood-specific price levels. As a result, the treatment effect is identified from differences between apartments within the same planned stop area.

The number of observations in the treatment and control areas for each planned stop is reported in Table A2 in the Appendix B. Each observation is assigned to its nearest stop. Therefore, a dwelling located within 400 metres of one stop is not classified as part of the control group simply because it also falls within the control-distance band of another stop. Based on the observation numbers, stops with only a few observations in either the treatment or control group are excluded from the main specifications presented in Section 5.1. In particular, stops Meijeritie and Valimo asema with almost no observations within the 400-metre treatment area and Töölön halli with no observations within the control group (2), are not suitable for the research, because they provide insufficient information for a reliable local treatment–control comparison. This is important because very small sample sizes may make the within-station comparison unreliable and overly sensitive to individual transactions.

5 Results

5.1 Housing market anticipation effect

Before interpreting the treatment effect estimates, the dynamic specifications are used to assess whether the treated and control areas followed similar price trends before the investment decision. The visual presentations of the dynamic models for the four main specifications are presented in Figure 10.

In the baseline specification (1), where dwellings within 400 metres of the planned stops are compared with dwellings located between 400 to 1,000 metres of the same stops, the pre-treatment estimates are slightly positive mainly in 2016–2018. This indicates that treated dwellings were somewhat more expensive relative to the control group in the earlier pre-treatment years, although the confidence intervals include zero. The yearly estimates are similar when dwellings located 400–600 metres of the planned stops are excluded from the control group in specification (2). After the investment decision year, in specifications (1) and (2), the coefficients remain close to zero. This suggests that the price development of dwellings within 400 metres of the planned stops did not clearly diverge from the nearby control areas after the decision.

In specification (3), which includes only the new light rail line section, the positive pre-treatment estimates are not visible, suggesting that this pattern may be driven by the inner-city observations. The coefficients are more volatile and imprecise, reflecting the smaller sample size and fewer clusters. The post-treatment point estimates are somewhat more positive in the later years, suggesting that the inner-city section might have slightly pushed the results towards zero in specifications (1) and (2). However, the estimates for specification (3) are imprecise and the confidence intervals are wide.

In specification (4), where dwellings near train stations are used as the control group, the pre-treatment coefficients are close to zero and do not show a clear systematic trend, especially between 2017 and 2019. Specification (4) also produces somewhat more positive post-treatment point estimates, but these estimates remain statistically uncertain. Overall, the dynamic results suggest that any post-decision price response is small and not robust across specifications.

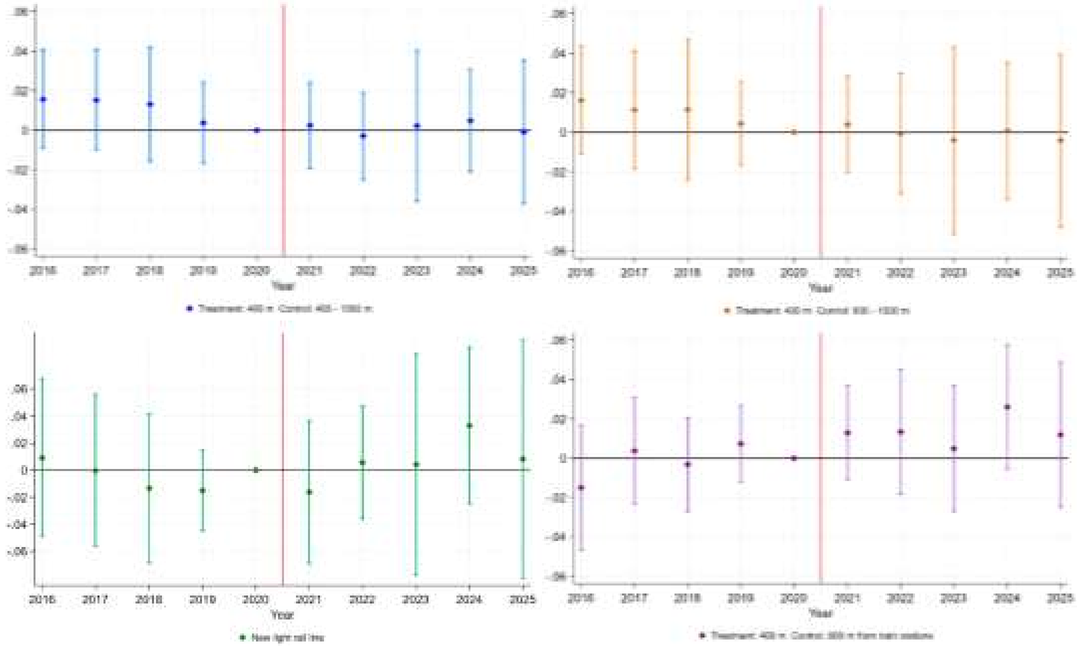

Figure 10. Yearly coefficient estimates for specifications (1)–(4).

Overall, the pre-treatment estimates provide mixed but not strongly contradictory evidence for the parallel trends assumption. In specifications (1) and (2), the treated areas have slightly positive coefficients in the earlier pre-treatment years, which suggests that the treated and control areas were not perfectly aligned throughout the full pre-period. The coefficients decline towards the investment decision year. If this downward trend had continued in the absence of the treatment, it could have biased the post-treatment estimates downward, making them small or negative. Therefore, part of the estimated zero effect may reflect the continuation of the pre-treatment trend rather than the complete absence of an anticipation effect. However, the differences are statistically insignificant. The dynamic models therefore do not show a clear or statistically strong violation of parallel trends.

The dynamic estimates provide useful information on the timing and pattern of the estimated effects, but the overall treatment effect is summarized more directly by the 2 × 2 DID estimates. Table 3 reports these estimation results for the four main specifications. The dependent variable is the logarithm of sale price, so the coefficients can be interpreted approximately as percentage changes in apartment prices.

In the baseline specification (1), the estimated coefficient for Treated × After is -0.0071. This corresponds to an approximately 0.7 per cent weaker price development in the treated area relative to the control area after the investment decision. However, the estimate is small and statistically insignificant.

The wild cluster bootstrap p-value is 0.5038, and the 95 per cent confidence interval includes zero.

The results are very similar in specification (2), excluding the dwellings located within 400–600 metres of the planned stops. The estimated coefficient is -0.0078 and remains statistically insignificant. This suggests that the baseline result is not driven by spillover effects from the observations located just outside the treatment area, which could potentially have been partly affected by the anticipated accessibility improvement.

In specification (3), focusing only on the new light rail line section, the estimated coefficient is positive with a value of 0.0077. Although the estimate becomes positive when the analysis is restricted to the new light rail line section, it remains small and statistically insignificant. This suggests that the inner-city observations are not the only reason why the estimated effect is close to zero in the baseline specification. Although excluding these observations does not significantly change the overall conclusion, the estimation is less precise in specification (3), likely due to the small number of observations in treatment and control groups.

In specification (4), with the train station-based control group, the estimated coefficient is 0.0145, suggesting a positive point estimate of approximately 1.5 per cent. However, the estimate is again statistically insignificant, and the confidence interval includes zero.

Table 3. Regression results for specifications 1-4.

Dependent variable: ln (sale price)				
	(1)	(2)	(3)	(4)
Treated × After	-0.0071	-0.0078	0.0077	0.0145
Clustered standard error	(0.0101)	(0.0117)	(0.0222)	(0.0169)
Wild bootstrap p-value	0.5038	0.5290	0.7571	0.4205
Wild bootstrap 95% CI	[−0.0282, 0.0171]	[−0.0327, 0.0195]	[−0.0468, 0.0575]	[−0.0231, 0.0540]
Control area	400–1,000 m	600–1,000 m	400–1,000 m	0–800 m, train
Treatment observations	5,972	5,972	2,265	5,972
Control observations	11,863	7,794	3,945	9,179
Controls	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Station fixed effects	Yes	Yes	Yes	No
Postcode fixed effects	No	No	No	Yes
Number of clusters	68	68	23	40
Observations	17,835	13,766	6,210	15,151
R-squared	0.9358	0.9326	0.8962	0.9288

Notes: Wild cluster bootstrap p-values and confidence intervals are based on 9,999 replications. Estimated coefficient is statistically significant at *** 1% level, ** 5% level, * 10% level, based on wild bootstrap. Standard errors are clustered at small city district level. Controls include the logarithm of the room area, age, age in second power, number of rooms, condition dummies, an own lot dummy, floor number, a sauna dummy and the logarithm of the maintenance fee. The treatment group consists of apartments located within 400 metres of the planned West-Helsinki Light Rail stops in all specifications. In specification (1), the control group includes all observations within 400–1,000 metres of the stops. In specification (2), observations between 400 and 600 metres of the stops are excluded. In specification (3), only stations along the new line section are included. The control group includes all observations within 400–1,000 metres of stops along the new line section. In specification (4), the control group consists of apartments within 800 metres of existing train stations.

The 2 × 2 DID results indicate that the estimated anticipation effect remains small across all the main specifications. The point estimates range from -0.78 to 1.45 per cent, which is clearly below the larger anticipation effects found in earlier studies such as Harjunen (2018) and Kauria (2021). More importantly, the confidence interval of the baseline specification ranges from approximately −2.8 to 1.7 per cent. It therefore excludes anticipation effects of the magnitude previously estimated for the West Metro and the Jokeri light rail, approximately 4 and 5 per cent. Thus, the baseline result represents not only a statistically insignificant estimate, but relatively strong evidence against a large positive anticipation effect.

Across the alternative specifications, the widest confidence interval ranges from approximately −4.7 to 5.8 per cent. This wider range reflects the lower precision of the more restricted specifications and should therefore be interpreted as an outer bound rather than the main estimate of the anticipation effect. The estimated effect is small, sensitive in sign across alternative specifications, and also statistically insignificant according to the wild cluster bootstrap inference.

However, the point estimates become more positive in specification (3), when the sample is restricted to the new line section and in specification (4), where the control group is more clearly separated from the immediate station area. This pattern may be consistent with a small positive effect that is attenuated in the broader specification. However, the pattern is not sufficiently stable or precise to provide evidence of a systematic anticipation effect. Together with the dynamic estimates, the results suggest that there is no statistically significant or systematic post-decision increase in prices near the planned light rail stops, while a small positive effect cannot be completely ruled out for the entire line.

5.2 Alternative model specifications and robustness checks

In this section, I assess the model credibility through robustness checks, balance checks, and alternative model specifications. In Section 5.2.1, I examine whether the estimated anticipation effect is robust to alternative treatment and control area boundaries and whether the sample remains comparable over time. In addition, I estimate two sets of alternative specifications based on the same DID framework to examine the presence of a possible anticipation effect. These analyses are presented in Sections 5.2.2 and 5.2.3.

5.2.1 Robustness checks

Empirically, an important criterion for control group selection is the similarity of pre-treatment price trends. In this chapter, I aim to assess the comparability of alternative control groups, the suitability of the treatment area boundary and the sensitivity of the model to different treatment and control area boundaries. The overall price developments for alternative control group definitions are presented in Figure A1 and A2 in the Appendix C.

The distance-based control groups compare apartments within 400 and 600 metres of the West-Helsinki Light Rail stops with apartments located farther away but within the defined distance from the same stops. In the station-based control groups the treatment area is compared with apartments close to existing commuter train stations. In these specifications, the treatment area is 400 metres of the planned stops, and the control areas are within 800 metres of the train stations.

The distance-based control groups broadly follow the same overall market cycle as the treatment group, with prices rising until around 2021 and declining after 2022. This suggests that the treatment and nearby comparison areas were exposed to similar housing market developments over the study period. The 600-metre treatment group specifications show slightly larger differences between the treatment and control groups. Overall, the price cycle remains similar before and after 2020. The station-based control groups also show broadly similar movements, but some of them have a steeper pre-treatment increase or greater volatility than the treatment group. Apartments close to the K commuter train line also show an increase in prices in the last year of observation.

These price trends do not provide a formal test of the parallel trends assumption, but they help identify which control group alternatives appear most credible. The final control group choice is therefore based not only on the visual similarity of pre-treatment trends, but also on the comparability of the areas and the dynamic models.

As a balance check, Table 4 presents descriptive statistics for the pre- and post-treatment periods to assess whether the overall composition of the sample remains comparable over time. This assessment includes observations from the baseline specification (1), which is the widest of the main specifications. The sample characteristics remain relatively stable across the two periods. Mean apartment size, the average number of rooms and the average real sale price change only marginally. The average building age is higher in the post-treatment period, likely due to the natural ageing of the housing stock. The largest difference is observed in the distribution of apartment condition, with a slightly higher share of apartments classified as being in good condition in the post-treatment period. Since the regression models control for apartment condition and other housing characteristics, these differences are unlikely to materially affect the estimated treatment effects.

Table 4. Descriptive statistics for pre- and post-treatment periods.

Sample	Pre-treatment	Post-treatment
Years	2016–2020	2021–2025
N	10,395	7,440
Sale price	461,256.90	456,015.67
	(273,282.79)	(301,734.86)
Area	62.71	62.08
	(33.51)	(32.93)
Age	71.13	76.26
	(26.16)	(26.58)
Rooms	2.35	2.36
	(1.12)	(1.12)
Maintenance charge	5.18	5.27
	(1.35)	(1.36)
Floor number	3.15	3.22
	(1.67)	(1.71)
Own lot	85.5%	86.8%
Sauna	12.4%	12.8%
Condition		
-Poor	4.1%	4.5%
-Decent	33.0%	31.4%
-Good	57.2%	62.6%
-Excellent	2.6%	0.1%
-New	1.8%	0.2%
-Unknown	1.3%	1.2%

Notes: All prices are deflated to 2025 using the consumer price index. Standard deviations are reported in parentheses below the means. For binary variables, the reported values are shares of observations.

Figure 11 presents the yearly estimates of the anticipation effect using distance-based control groups with three different boundaries for the control area to evaluate the suitability of the spatial definitions. The estimates are calculated relative to the omitted reference year 2020. The vertical line marks the beginning of the post-treatment period, after which the housing market could have started to capitalize expectations related to the investment decision. In addition to the preferred 400-metre treatment area, the figures also present estimates for a broader 600-metre treatment area as a robustness check.

The two lower panels show relatively similar patterns for both the 400-metre and 600-metre treatment area boundary, and the first figure shows a declining pattern, but the estimates are small and statistically insignificant. All estimates are close to zero with slightly positive point estimates in the pre-treatment period and coefficients fluctuating around zero after the treatment year. The confidence intervals include zero in all years, which supports the plausibility of the common pre-treatment trend assumption. Overall, the yearly estimates support the results from the main DID specifications. Across all three comparison area boundaries, the estimates remain small and statistically insignificant.

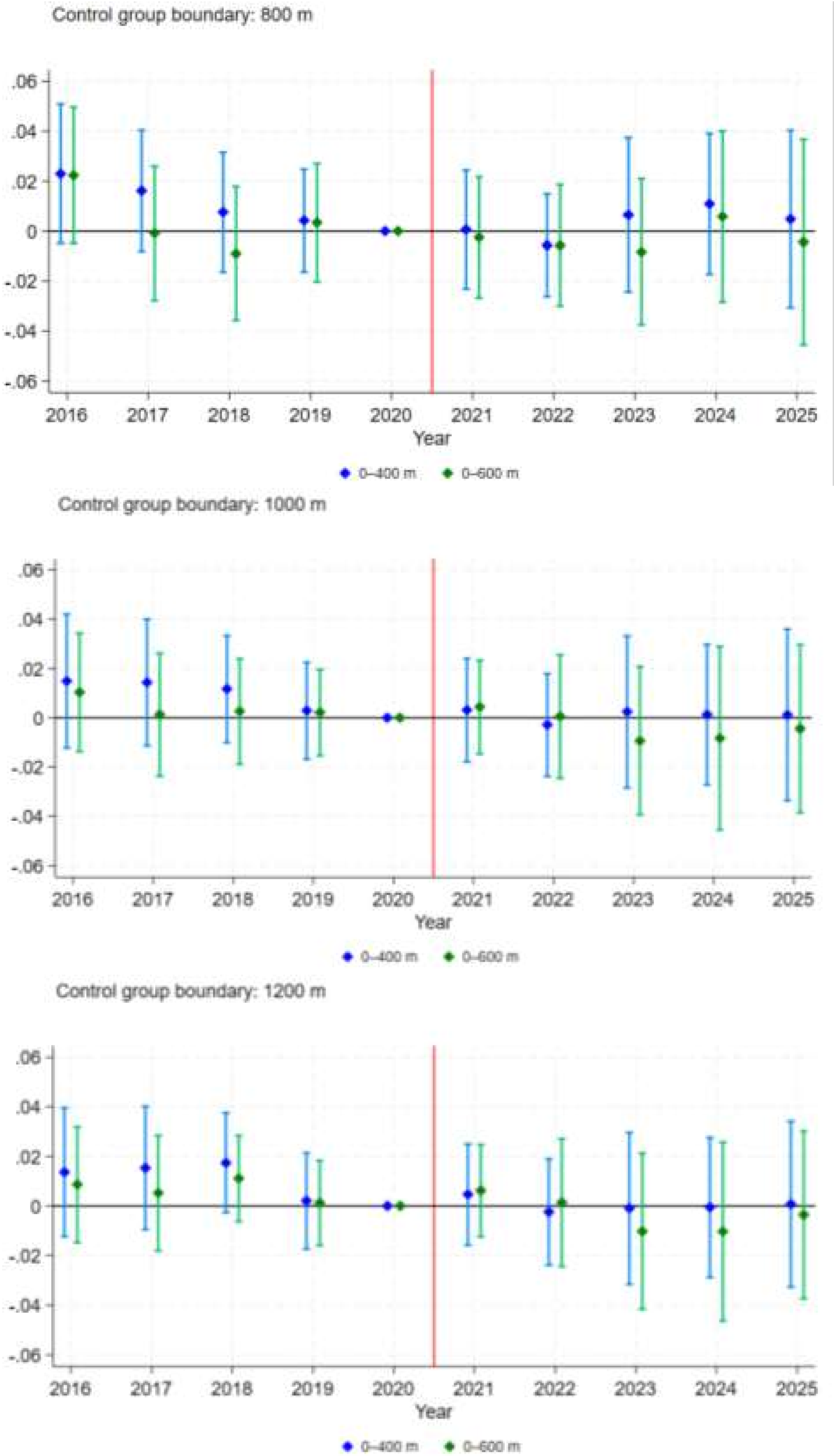

Figure 11. Yearly coefficient estimates with different control group boundaries.

Table 5 reports the regression results from the 2 × 2 DID model. Across all alternatives, the estimated treatment effect remains small and statistically insignificant. The results are stable across alternative spatial definitions, with coefficients ranging from -0.008 to -0.005. Expanding the comparison area from 800 metres to 1200 metres does not significantly change the estimated treatment effect. Similarly, using a 600-metre treatment radius instead of a 400-metre radius produces slightly smaller and statistically insignificant estimates. The results therefore do not provide evidence that the estimated effect is driven by one specific distance threshold.

Table 5. Sensitivity analysis of the estimated treatment effect using alternative treatment and control area boundaries.

Dependent variable: ln (sale price)						
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment boundary	400	400	400	600	600	600
Control boundary	800	1000	1200	800	1000	1200
N treatment	5,972	5,972	5,972	10,041	10,041	10,041
N control	8,045	11,863	14,949	3,976	7,794	10,880
treated × after	-0.007	-0.007	-0.008	-0.005	-0.005	-0.007
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
R-squared	0.939	0.936	0.932	0.939	0.936	0.932
Observations	14,017	17,835	20,921	14,017	17,835	20,921
Clusters	57	68	77	57	68	77

Notes: Estimated coefficient is statistically significant at *** 1% level, ** 5% level, * 10% level. Standard errors are in parentheses and clustered at small city district level. All specifications include controls, sale year fixed effects and station fixed effects. Controls include the logarithm of the room area, age, age in second power, number of rooms, condition dummies, an own lot dummy, floor number, a sauna dummy and the logarithm of the maintenance fee.

5.2.2 Station-type specification

To examine whether the estimated anticipation effect varies along the planned light rail corridor, I estimate additional specifications where the treatment effect is allowed to differ by the corridor section. I grouped the planned stations into station types according to the West-Helsinki Light Rail Design Manual (City of Helsinki, 2022). This provides a more interpretable way to examine heterogeneity along the corridor, while reducing the sensitivity of the estimates to individual stops with few observations. The stops are classified into three groups: stops located along the boulevard corridor, stops in suburban areas and stops that are part of the existing tram network.

The new boulevard corridor category includes stops where the planned light rail line is closely connected to broader urban redevelopment. Stops in suburban areas are in the northernmost part of the corridor. The existing tram network category includes stops located in areas where rail-based public transport accessibility is already relatively high. This classification is used to assess whether the estimated anticipation effect differs between areas where the project represents a substantial accessibility improvement or broader urban development change and areas where the marginal accessibility gain may be smaller.

Figure 12 presents the yearly treatment effect estimates separately by station type. For the boulevard light rail section, the pre-treatment estimates are mostly negative, while the post-treatment estimates are slightly positive. The confidence interval for the year 2021 is not shown, likely due to the small number of observations. The figure shows a rising pattern and the most positive post-treatment estimates among the station-type groups. However, the confidence intervals are relatively wide and include zero in all years except 2024, where the estimate remains positive.

For the suburban section, the pre-treatment estimates are very close to zero and fluctuate around zero after the treatment year. The coefficients for the last three years of the study period again have very wide confidence intervals, likely reflecting small sample sizes in the treatment and control groups.

For the stations close to the existing tram network, the estimates remain close to zero throughout the period. The pre-treatment estimates have a similar positive pattern as in the baseline specification, but the coefficients remain small. After the investment year the coefficients fluctuate around zero. This suggests that the additional accessibility effect of the new light rail line may be limited in areas where the initial level of public transport accessibility is relatively high. The positive pre-treatment pattern also suggests that pre-treatment price trends are not fully similar in the treatment and control areas.

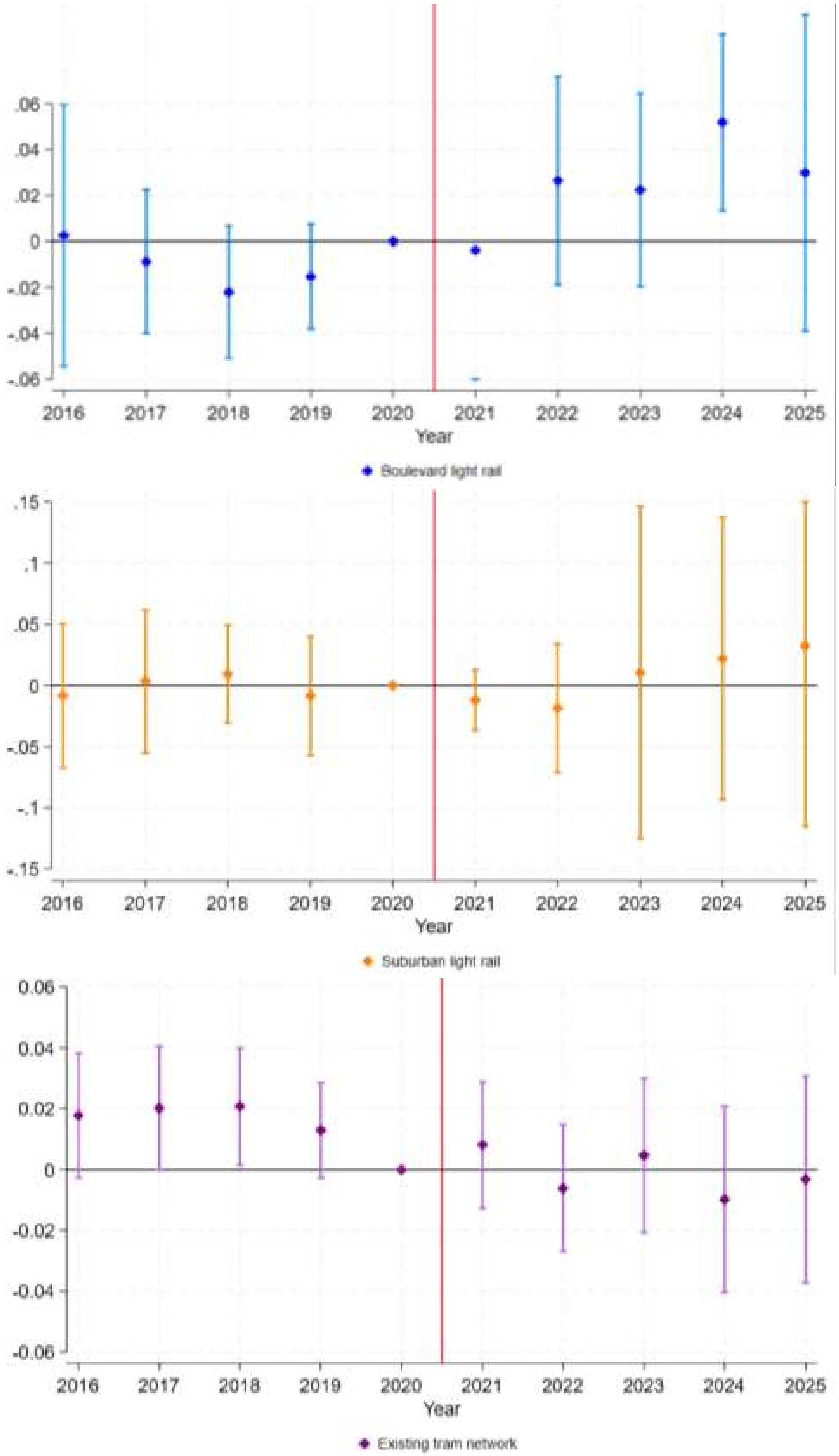

Figure 12. Yearly treatment effect estimates for the station type based specifications.

Overall, the station-type figures suggest that the treatment effect is not uniform across the corridor. The most positive pattern is found in the boulevard light rail section, where estimates have an increasing pattern. In the other sections, the estimates are more modest. Overall, the dynamic analysis shows that local price development varies across different parts of the corridor.

Table 6 presents the 2 × 2 DID estimates by station type. The results suggest some variation between different parts of the corridor. The most negative estimate is found for the existing tram network specification. The coefficient of -0.0144 suggests approximately 1.4 per cent weaker post-treatment price development near these stops relative to the comparison area, but the effect is statistically insignificant based on the wild cluster bootstrap p-value.

For the boulevard light rail specification, the estimated coefficient is positive, suggesting approximately 3.0 per cent stronger post-treatment price development near these stops, but the estimate is statistically insignificant. Therefore, it should not be interpreted as clear evidence of a positive anticipation effect in this category.

The estimate for the suburban section is only slightly positive and statistically insignificant. The sample sizes for the treatment and control groups are notably small, limiting the statistical power of this specification.

Table 6. Regression results for station-type based specifications.

Dependent variable: ln (sale price)			
	Boulevard light rail	Existing tram network	Suburban light rail
Treated × After	0.0299	-0.0144	0.0023
Clustered standard error	(0.0179)	(0.0084)	(0.0311)
Wild bootstrap p-value	0.1909	0.2043	0.9531
Wild bootstrap 95% CI	[-0.0186, 0.0713]	[-0.0315, 0.0071]	[-0.1371, 0.0933]
Treatment observations	1,459	3,707	806
Control observations	2,513	7,918	1,432
Observations	3,972	11,625	2,238
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Station fixed effects	Yes	Yes	Yes
Number of clusters	15	47	8
R-squared	0.9196	0.9404	0.8397

Notes: Wild cluster bootstrap p-values and confidence intervals are based on 9,999 replications. Estimated coefficient is statistically significant at *** 1% level, ** 5% level, * 10% level, based on wild bootstrap. Standard errors are clustered at small city district level. Controls include the logarithm of the room area, age, age in second power, number of rooms, condition dummies, an own lot dummy, floor number, a sauna dummy and the logarithm of the maintenance fee. The treatment groups consist of apartments located within 400 metres of the planned West-Helsinki Light Rail stops. The control group includes all observations within 400–1,000 metres of the stops. In each specification, only observations around the stops along the specific line section are included.

Overall, the results suggest that the estimated anticipation effect is small or non-existent. For the inner-city parts of the light rail line, the existing tram network specification suggests that the anticipation effect remains between -3.2 and 0.7 per cent. For the new light rail line, the estimates are more imprecise.

5.2.3 Corridor model

To test the robustness of the results to a narrower spatial definition, I estimated additional DID models using 200-, 300- and 400-metre distance thresholds from the planned West-Helsinki Light Rail stops. In these specifications, the sample was restricted to apartments located within the specified distance from the corridor. Within each sample, treated apartments were defined as those located within the corresponding distance from the nearest planned stop. This means that the models compare apartments very close to the planned stops with other apartments located within the same local corridor area, but outside the immediate stop area.

The treatment and control groups used in the 200-metre specification are presented in Figure 13. The treatment area is shown in red and consists of dwellings located within 200 metres of a planned West-Helsinki Light Rail stop. The control group is shown in light red and consists of dwellings located within 200 metres of the same corridor but outside the 200-metre station buffers. The 300- and 400-metre specifications are constructed in the same way, with the treatment and corridor radius expanded.

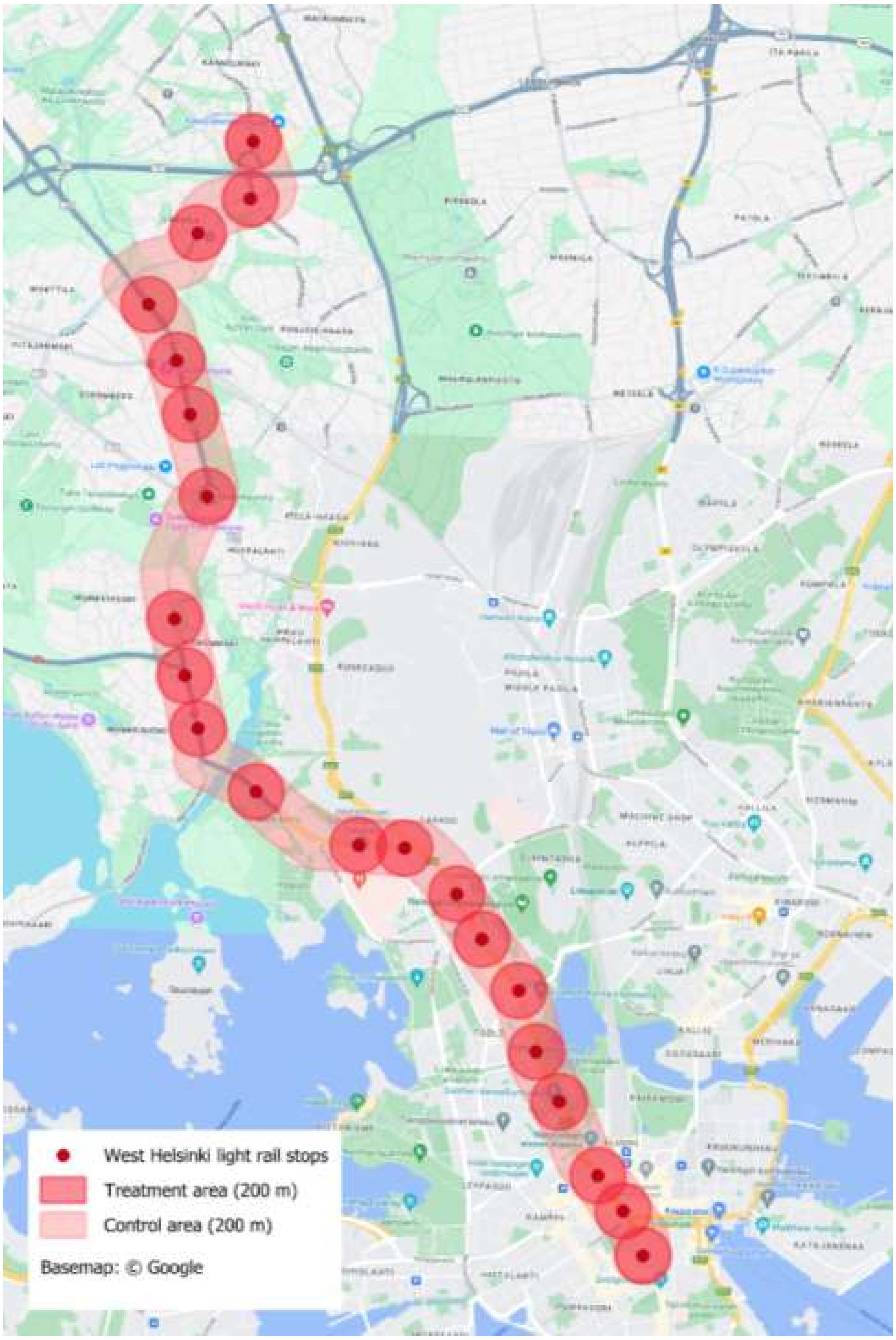

Figure 13. Treatment and control areas in the 200 m corridor model.

Before estimating the models, I examined the number of observations by station and treatment status. Stations were excluded if either the treated or comparison group contained fewer than ten observations. This restriction was used to avoid estimates being driven by stations with very small local samples and to improve the reliability of the station-level comparison. The excluded stations differ across the 200, 300 and 400 metre specifications because the number of observations within each treatment and comparison group depends on the chosen distance threshold.

Figure 14 shows the dynamic yearly treatment effect estimates for the 200-, 300- and 400-metre corridor specifications. The dynamic estimates indicate that the results are sensitive to the treatment and corridor radius. The 300-metre and 400-metre specifications have pre-treatment coefficients fluctuating close to zero. All specifications give somewhat more negative post-treatment pattern, but the estimates are imprecise and the confidence intervals include zero. Therefore, these dynamic models do not provide evidence of a clear anticipation effect close to the planned stops.

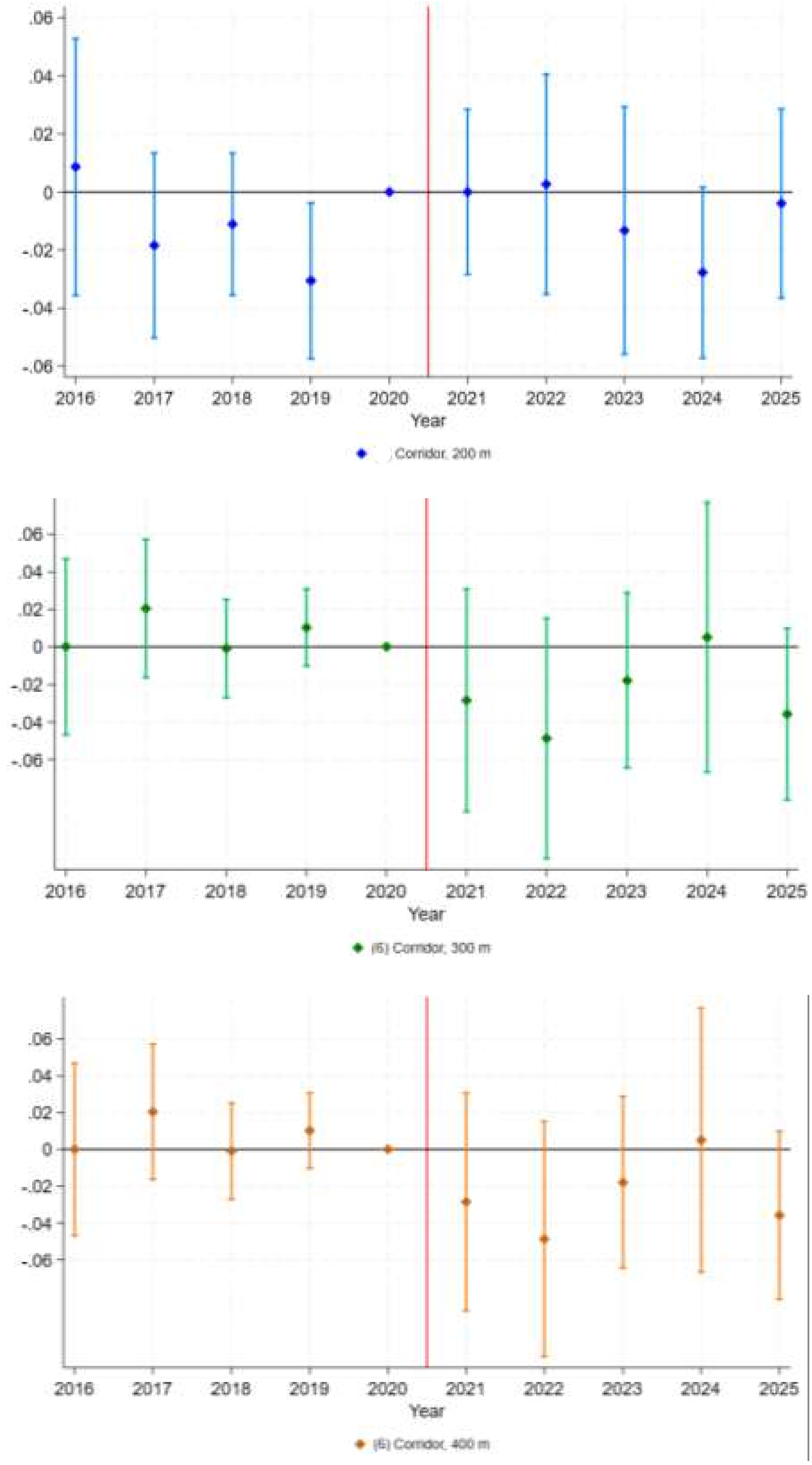

Figure 14. Yearly coefficient estimates for the corridor models.

Table 7 reports the 2×2 DID estimates. The results do not provide strong evidence of a robust treatment effect in the immediate stop surroundings. The 200-metre estimate is small and statistically insignificant. The 300-metre estimate is larger, but negative, suggesting approximately 3.3 per cent weaker post-treatment price development in the treated area. In the 400-metre specification, the estimate turns positive again and remains statistically insignificant. Overall, the estimates are sensitive to the chosen distance threshold and do not show a consistent pattern. This suggests that the estimated effect is not clearly concentrated within the narrowest station-distance bands.

The results should also be interpreted cautiously because the narrow distance thresholds reduce the number of observations in the local comparison groups. Several stations are excluded because either the treated or comparison group contains fewer than ten observations. As the excluded stations vary across the 200-, 300- and 400-metre specifications, differences between the estimates may partly reflect changes in the included station composition rather than only differences in the spatial definitions.

Table 7. DID estimates for immediate stop surroundings using corridor-based control groups.

Dependent variable: ln (sale price)			
Treated × After	0.0056	-0.0331	0.0092
Clustered standard error	(0.0102)	(0.0206)	(0.0238)
Wild bootstrap p-value	0.5696	0.2190	0.7486
Wild bootstrap 95% CI	[-0.0153, 0.0296]	[-0.0786, 0.0162]	[-0.0806, 0.0534]
Distance threshold	200 m	300 m	400 m
Treatment observations	2,452	4,080	4,149
Control observations	1,039	774	680
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Station fixed effects	Yes	Yes	Yes
Number of clusters	21	25	26
Observations	3,491	4,854	4,829
R-squared	0.9431	0.9405	0.9421
Excluded stations	Kantelettarentie Kolmikulma Meijeritie Paciuksenkaari Näyttelijäntie	Kantelettarentie Kolmikulma Lasipalatsi Meijeritie Töölön tulli Ylioppilastalo	Kantelettarentie Kolmikulma Kansaneläkelaitos Meijeritie Niemenmäki Ooppera Valimo asema Töölön tulli Ylioppilastalo

Notes: Wild cluster bootstrap p-values and confidence intervals are based on 9,999 replications. Estimated coefficient is statistically significant at *** 1% level, ** 5% level, * 10% level, based on wild bootstrap. Standard errors are clustered at small city district level. Controls include the logarithm of the room area, age, age in second power, number of rooms, condition dummies, an own lot dummy, floor number, a sauna dummy and the logarithm of the maintenance fee. The treatment group consists of apartments located within the specified distance threshold of the planned West-Helsinki Light Rail stops. The control group includes all observations within the corresponding corridor buffer, as presented in Figure 13.

6 Discussion and conclusions

The purpose of this thesis was to examine whether the 2021 West-Helsinki Light Rail investment decision was capitalized into apartment prices during the pre-construction period. In the analysis, I used KVKL transaction data from 2016–2025 and a hedonic DID approach to compare price developments near the planned stops with selected control areas.

The main finding is that there is no clear evidence of an immediate anticipation effect. Across the main specifications, the estimated treatment effects remain small and statistically insignificant. The point estimates range from slightly negative to slightly positive, but the confidence intervals include zero in all specifications. The baseline specification suggests that the price effect remains between -2.8 and 1.7 per cent, ruling out a larger anticipation effect of 4 and 5 per cent reported in earlier research on the West Metro and Jokeri light rail. The dynamic models support the same conclusion, as the yearly estimates do not show a systematic increase in prices near the planned stops after the 2021 investment decision.

This suggests that the investment decision alone was not sufficient to create a clear housing price response during the early pre-construction phase of the project. The result does not mean that the West-Helsinki Light Rail will have no effect on housing prices. Instead, the effect may appear later, when construction is more visible or when the opening of the line becomes closer and the accessibility improvements become more concrete.

Compared to earlier Finnish studies, the results are smaller than the positive anticipation effects found for the West metro and Jokeri light rail line. One possible explanation is the existing level of accessibility in western Helsinki. Large parts of the planned line run through already urbanised and relatively well-connected areas. In these locations, the marginal improvement caused by a new light rail connection may be limited.

The station-type specifications give some support for this interpretation, although the results are imprecise. The boulevard section shows the most positive pattern with the point estimate suggesting 3.0 per cent stronger post-treatment price development, which may reflect stronger expected changes in both accessibility and urban environment. In contrast, the existing tram network section does not show a positive effect, which is consistent with the idea that the additional accessibility benefit is smaller in areas where public transport connections are already strong. However, because the estimates are imprecise and the confidence intervals also include zero in these specifications, the results do not provide evidence of an effect and should be interpreted cautiously.

The difference between these results and earlier findings may also reflect methodological choices, the timing of the assessment, market conditions, and the nature of the investment. Thereby, the difference in the estimated anticipation effects cannot be explained solely by differences in accessibility improvements or by the earlier stage at which the project is assessed. In the cases of the West Metro and Jokeri light rail, the investments were, for example, directed at entirely new lines, creating new connections and urban development in new areas.

The study has several limitations. First, the estimated effect cannot be interpreted as a pure accessibility effect, since the West-Helsinki Light Rail is connected to broader urban development along the corridor. Second, the post-treatment period overlaps with COVID-19-related changes, rising interest rates and a weaker housing market after 2022. Year fixed effects control for common shocks, but they do not fully remove the problem if different areas were affected differently. Third, some specifications have relatively small samples and a limited number of clusters, which increases statistical uncertainty.

Overall, the results answer the research questions by showing that there is no robust evidence of a statistically significant price effect related to the West-Helsinki Light Rail investment decision. The investment decision does not appear to have been capitalized into apartment prices immediately after the decision. The point estimates also suggest that the initial level of accessibility may matter, as they are most positive in the new line section, where the accessibility improvement is most significant, but the estimates are not statistically significant.

The main contribution of this thesis is to show that rail-based transport investments do not automatically create clear anticipation effects in housing prices. The capitalization of expected accessibility improvements depends on the type of investment, the existing transport network, the timing of the project and the broader housing market context.

Future research on the West-Helsinki Light Rail line could examine whether the effect changes during construction or closer to the opening of the line. More detailed accessibility measures, such as changes in travel times or network connectivity, could also help distinguish between areas where the project creates a substantial improvement and areas where the change is more marginal.

References

Abadie, A. (2005). Semiparametric Difference-in-Differences Estimators. *The Review of Economic Studies*, 72: 1–19.

Agostini, C. A. and Palmucci, G. A. (2008). The Anticipated Capitalisation Effect of a New Metro Line on Housing Prices*. *Fiscal Studies*, 29: 233–256.

Ahrend, R., Bétin, M., Caldas, M. P., Cournède, B., Ramirez, M. D., Pionnier, P.-A., Sanchez-Serra, D., Veneri, P. and Ziemann, V. (2022). *Changes in the geography housing demand after the onset of COVID-19: First results from large metropolitan areas in 13 OECD countries*. OECD Publishing. https://www.oecd.org/en/publications/changes-in-the-geography-housing-demand-after-the-onset-of-covid-19-first-results-from-large-metropolitan-areas-in-13-oecd-countries_9a99131f-en.html. Accessed 25 June 2026.

Ala-Viikari, S. (2025). Changes in the urban price premium in the Helsinki commuting zone during the covid-19 pandemic. Master’s thesis. Aalto University. https://urn.fi/URN:NBN:fi:aalto-202601161385. Accessed 25 June 2026.

Alonso, W. (1964). *Location and Land Use*. Harvard University Press.

Angrist, J. D. and Pischke, J.-S. (2009). *Mostly Harmless Econometrics: An Empiricist’s Companion*. Princeton University Press.

Banzhaf, H. S. (2021). Difference-in-Differences Hedonics. *Journal of Political Economy*, 129: 2385–2414.

Bertrand, M., Duflo, E. and Mullainathan, S. (2004). How Much Should We Trust Differences-In-Differences Estimates? *The Quarterly Journal of Economics*, 119: 249–275.

Cameron, A. C., Gelbach, J. B. and Miller, D. L. (2008). Bootstrap-Based Improvements for Inference with Clustered Errors. *The Review of Economics and Statistics*, 90: 414–427.

Cameron, A. C. and Miller, D. L. (2015). A Practitioner’s Guide to Cluster-Robust Inference. *Journal of Human Resources*, 50: 317–372.

Camins-Esakov, J. and Vandegrift, D. (2018). Impact of a light rail extension on residential property values. *Research in Transportation Economics*, 67: 11–18.

Canay, I. A., Santos, A. and Shaikh, A. M. (2021). The Wild Bootstrap with a “Small” Number of “Large” Clusters. *The Review of Economics and Statistics*, 103: 346–363.

Cervero, R., Murphy Steven, Ferrell, C., Goguts Natasha, Tsai, Y.-H., Arrington, G. B., Boroski, J., Smith-Heimer, J., Golem, R., Peninger, P., Nakajima, E., Chui, E., Dunphy, R., Mayers, M., McKay, S. and Witenstein, N. (2004). *Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects. Transit Cooperative Research Program (TCRP) Report 102*. Washington: Transportation Research Board.

City of Helsinki (2025a). A Helsinki we can be proud of - 2025–2029 Helsinki City Strategy. https://www.hel.fi/static/helsinki/kaupunkistrategia/2025-2029-Helsinki-city-strategy.pdf. Accessed 23 April 2026.

City of Helsinki (2024). *Asumisen ja siihen liittyvän maankäytön toteutusohjelma* (on-line). https://www.hel.fi/static/kanslia/Julkaisut/2024/Asumisen_ja_maankayton_ohjelma_2024.pdf. Accessed 23 April 2026.

City of Helsinki (2025b). District Division of the City of Helsinki. *City Survey Services* (on-line). https://kartta.hel.fi/avoindata. Accessed 23 June 2026.

City of Helsinki (2025c). *Helsingin ja Helsingin seudun väestöennuste 2024–2070 - Ennuste alueittain 2024–2039*. https://www.hel.fi/static/kanslia/Kaupunkitieto/18_12_25_Tilastoja_07_2025.pdf. Accessed 24 April 2026.

City of Helsinki (2025d). *Land use and planning review 2025*. Helsinki. https://www.hel.fi/static/liitteet/kaupunkiymparisto/julkaisut/julkaisut/julkaisu-14-25.pdf. Accessed 24 April 2026.

City of Helsinki (2020). *Länsi-Helsingin raitioteiden yleissuunnitelma*. https://www.hel.fi/static/liitteet/kaupunkiymparisto/julkaisut/julkaisut/julkaisu-11-20.pdf. Accessed 3 March 2026.

City of Helsinki (2022). Länsi-Helsingin raitiotien Design manual. : 1–90. https://www.hel.fi/static/hel2/ksv/liitteet/2022_kaava/5704_5_Lansi_Helsingin_raitiotien_Design_Manual.pdf. Accessed 8 April 2026.

City of Helsinki (2025e). *Verkostokaupungin joukkoliikennejärjestelmä Kaupunkiympäristön aineistoja 2025:15*.

City of Helsinki (2026a). *Western Boulevard City* (on-line). https://www.hel.fi/en/urban-environment-and-traffic/urban-planning-and-construction/plans-and-building-projects/western-boulevard-city. Accessed 12 February 2026.

City of Helsinki (2025f). Western Helsinki is developing – West-Helsinki Light Rail project to kick off extensive urban development. 2025. https://www.hel.fi/en/news/western-helsinki-is-developing-west-helsinki-light-rail-project-to-kick-off-extensive-urban. Accessed 15 December 2025.

City of Helsinki (2026b). *West-Helsinki Light Rail* (on-line). https://www.hel.fi/en/urban-environment-and-traffic/urban-planning-and-construction/plans-and-building-projects/west-helsinki-light-rail. Accessed 12 February 2026.

Destia (2024). *Destia and WSP to build Helsinki's three new light rail lines* (on-line). https://destia.fi/en/release/destia-and-wsp-to-build-helsinkis-three-new-light-rail-lines/. Accessed 18 February 2026.

Diao, M., Leonard, D. and Sing, T. F. (2017). Spatial-difference-in-differences models for impact of new mass rapid transit line on private housing values. *Regional Science and Urban Economics*, 67: 64–77.

Dieleman, F. and Wegener, M. (2004). Compact city and urban sprawl. *Built Environment*, 30: 308–323.

EEA (2021). *Rail and waterborne: best for low-carbon motorised transport* (on-line). https://www.eea.europa.eu/en/analysis/publications/rail-and-waterborne-best-for-low-carbon-motorised-transport. Accessed 6 January 2026.

Glaeser, E. L., Gyourko, J. and Saiz, A. (2008). Housing supply and housing bubbles. *Journal of Urban Economics*, 64: 198–217.

Gupta, A., Mittal, V., Peeters, J. and Van Nieuwerburgh, S. (2022). Flattening the curve: Pandemic-Induced revaluation of urban real estate. *Journal of Financial Economics*, 146: 594–636.

Gupta, A., Van Nieuwerburgh, S. and Kontokosta, C. (2022). Take the Q train: Value capture of public infrastructure projects. *Journal of Urban Economics*, 129: 103422.

Harjunen, O. (2018). *METRO INVESTMENT AND THE HOUSING MARKET ANTICIPATION EFFECT*. https://www.hel.fi/hel2/tietokeskus/julkaisut/pdf/18_01_25_tyopapereita_02_Harjunen.pdf. Accessed 16 December 2025.

Helsingin seudun liikenne (2026a). *HSL organisaationa* (on-line). https://www.hsl.fi/hsl/hsl-organisaationa. Accessed 3 March 2026.

Helsingin seudun liikenne (2026b). *Trunk route network* (on-line). https://www.hsl.fi/en/hsl/trunk-route-network. Accessed 5 March 2026.

Helsinki City Council (2021). *Länsi-Helsingin raitioteiden yleissuunnitelman hyväksyminen* (on-line). https://paatokset.hel.fi/en/case/hel-2018-002298?decision=b0d8a152-776a-4299-8a04-c20f45a7a638. Accessed 12 February 2026.

Higgins, C. D. and Kanaroglou, P. S. (2016). Forty years of modelling rapid transit's land value uplift in North America: moving beyond the tip of the iceberg. *Transport Reviews*, 36: 610–634.

Infraohjelma Helsinki (2026). *Länsiratikat* (on-line). https://infraohjelmahelsinki.fi/lansiratikat/. Accessed 14 January 2026.

Jaramillo, P., Kahn Ribeiro, S., Newman, P., Dhar, S., Diemuodeke, O., Kajino, T., Lee, D. S., Nugroho, S., Ou, X., Hammer Strømman, A. and Whitehead, J. (2023). Transport. In: P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, A. Hasija, J. Malley, R. Fradera, M. Belkacemi, G. Lisboa, D. McCollum, P. Vyas, M. Pathak, R. Van Diemen, S. Luz & S. Some (eds) *Climate Change 2022 - Mitigation of Climate Change*. Cambridge University Press. pp.1049–1160.

Kajova, M. (2015). Access to public transport and housing prices, The case of a metro line extension in the Helsinki region. Master's thesis. Aalto University.

Kangas, R. and Viippola, V. (2023). Tracking Apartment Appreciation - An Analysis of the Effects of a New Tramway on the Housing Market in Tampere, Finland. Master's thesis. Aalto University.

Kaupunkiliikenne Oy (2023). *Länsi-Helsingin raitioteiden hankesuunnitelma*. Helsinki. https://ahjojulkaisu.hel.fi/18799178-5639-CDB8-9543-8BF5E2E00000.pdf. Accessed 27 June 2026.

Kauria, E. (2021). The anticipation effect of a light rail transit line on housing prices in the Helsinki region. *Journal of the Finnish Economic Association*, 2: 49–73.

Kim, K. and Lahr, M. L. (2014). The impact of Hudson-Bergen Light Rail on residential property appreciation. *Papers in Regional Science*, 93: S79–S98.

Kruunusillat (2022). *About the project - Kruunusillat* (on-line). https://kruunusillat.fi/en/about-the-project/. Accessed 3 March 2026.

KTI Finland (2026). *The Finnish Property Market 2026*. Helsinki. https://view.taiqa.com/kti/finnish-property-market-2026#/page=1. Accessed 23 April 2026.

KVKL (2026). *Hintaseurantapalvelu - Kiinteistönvälitysalan Keskusliitto ry* (on-line). https://www.hintaseurantapalvelu.fi. Accessed 27 March 2026.

Laakkonen, A. (2023). Tampereen raitiotien vaikutus asuntojen hintoihin ja vuokriin. Master's thesis. University of Turku.

Laakso, S. (1992). Public transport investment and residential property values in helsinki [1]. *Scandinavian Housing and Planning Research*, 9: 217–229.

Liu, S. and Su, Y. (2021). The impact of the COVID-19 pandemic on the demand for density: Evidence from the U.S. housing market. *Economics Letters*, 207: 110010.

Liu, Y., Nath, N., Murayama, A. and Manabe, R. (2022). Transit-oriented development with urban sprawl? Four phases of urban growth and policy intervention in Tokyo. *Land Use Policy*, 112: 105854.

Lönnqvist, H. (2025). ON THE EFFECTS OF URBAN NATURAL AMENITIES, ARCHITECTURAL QUALITY AND ACCESSIBILITY TO WORKPLACES ON HOUSING PRICES. Doctoral thesis. Helsingin kaupungin tietokeskus.

McMillen, D. P. and McDonald, J. (2004). Reaction of House Prices to a New Rapid Transit Line: Chicago's Midway Line, 1983–1999. *Real Estate Economics*, 32: 463–486.

Mohammad, S. I., Graham, D. J. and Melo, P. C. (2017). The effect of the Dubai metro on the value of residential and commercial properties. *Journal of Transport and Land Use*, 10: 263–290.

Mohammad, S. I., Graham, D. J., Melo, P. C. and Anderson, R. J. (2013). A meta-analysis of the impact of rail projects on land and property values. *Transportation Research Part A: Policy and Practice*, 50: 158–170.

Pääkaupunkiseudun Kaupunkiliikenne Oy (2025a). *Länsiratikat käynnistää kaupunkikehityksen uuden aikakauden osana Infraohjelma Helsinkiä* (on-line). https://kaupunkiliikenne.fi/uutisartikkelit/lansiratikat-kaynnistaa-kaupunkikehityksen-uuden-aikakauden-osana-infraohjelma-helsinkia/. Accessed 18 February 2026.

Pääkaupunkiseudun Kaupunkiliikenne Oy (2026a). *Länsiratikat valmistautuu aloittamaan rakentamisen toukokuussa — valmistelevia töitä maaliskuussa* (on-line). https://kaupunkiliikenne.fi/hankkeet/lansiratikat-valmistautuu-aloittamaan-rakentamisen-toukokuussa-valmistelevia-toita-maaliskuussa/. Accessed 5 March 2026.

Pääkaupunkiseudun Kaupunkiliikenne Oy (2026b). *Major rail transport projects* (on-line). https://kaupunkiliikenne.fi/en/urban-rail-projects-and-maintenance/major-rail-transport-projects/. Accessed 3 March 2026.

Pääkaupunkiseudun Kaupunkiliikenne Oy (2025b). *Vuosikertomus 2024*. https://kaupunkiliikenne.fi/content/uploads/2025/04/Vuosikertomus-2024.pdf. Accessed 13 January 2026.

Qiu, F. and Tong, Q. (2021). A spatial difference-in-differences approach to evaluate the impact of light rail transit on property values. *Economic Modelling*, 99.

Raide-Jokeri (2026). *Saastuttaako Raide-Jokeri?* (on-line). https://raidejokeri.info/usein-kysyttya/saastuttaako-raide-jokeri/. Accessed 6 February 2026.

Rakli and Taaleri (2026). *Residential Market in Finland*. https://taaleri.com/wp-content/uploads/2026/01/Taaleri-Real-Estate-x-Rakli_Residential-Market-in-Finland.pdf. Accessed 28 April 2026.

Ransom, M. R. (2018). The effect of light rail transit service on nearby property values: Quasi-experimental evidence from Seattle. *Journal of Transport and Land Use*, 11.

Rennert, L. (2022). A meta-analysis of the impact of rail stations on property values: Applying a transit planning lens. *Transportation Research Part A: Policy and Practice*, 163: 165–180.

Rojas, A. (2024). Train stations' impact on housing prices: Direct and indirect effects. *Transportation Research Part A: Policy and Practice*, 181.

Rosen, S. (1974). Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition. *Journal of Political Economy*, 82: 34–55.

Sheppard, S. (1999). Chapter 41 Hedonic analysis of housing markets. *Handbook of Regional and Urban Economics*, 3: 1595–1635.

The Bank of Finland (2025). *Operating environment – Bank of Finland's Annual Report 2024*. https://annualreport.bankoffinland.fi/2024/annual-report/operating-environment/. Accessed 24 April 2026.

Trojanek, R. and Gluszak, M. (2018). Spatial and time effect of subway on property prices. *Journal of Housing and the Built Environment*, 33: 359–384.

Valaja, A. (2018). Raitiotien vaikutus asuntojen hintoihin Tampereella. Master's thesis. Aalto University.

Valtioneuvosto (2022). *Selvitys: Kestävä kaupungistuminen edellyttää liikkumisen, asumisen ja rakentamisen päästöjen vähentämistä* (on-line). https://valtioneuvosto.fi/-/10616/selvitys-kestava-kaupungistuminen-edellyttaa-liikkumisen-asumisen-ja-rakentamisen-paastojen-vahentamista. Accessed 23 April 2026.

Wessman, R. (2019). *Asuntoja ahkerille. Eva analyysi, 76*. https://www.eva.fi/wp-content/uploads/2019/10/eva_analyysi_no_76.pdf. Accessed 5 February 2026.

Yang, L., Liang, Y., He, B., Lu, Y. and Gou, Z. (2022). COVID-19 effects on property markets: The pandemic decreases the implicit price of metro accessibility. *Tunnelling and Underground Space Technology*, 125: 104528.

Appendix A. The KVKL transaction data variables

Table A1. The KVKL (2026) transaction data variables.

1	Share/property
2	Property code
3	Share numbers
4	Property type
5	Municipality
6	District
7	Postal code
8	Street address
9	Residential area
10	Year of construction
11	Rooms
12	Apartment description
13	Floor number
14	Floors
15	Sale price
16	Debt share
17	Debt-free price
18	Price per square metre
19	New property
20	Condition
21	Date of sale
22	Plot ownership
23	Plot description
24	Plot area in square metres
25	Sales start date
26	Sales time in days
27	Maintenance charge
28	Maintenance charge per square metre
29	Building material
30	Waterfront
31	Elevator
32	Rented
33	Sauna
34	Balcony
35	Description of the year of construction
36	Building area of the plot
37	Gross area (other area)
38	Building rights
39	Description of the shore
40	Heat source
41	Energy class
42	Redemption price of the plot share
43	Monthly rent of the plot share
44	Plot share redeemed
45	Completed renovations
46	Upcoming renovations

Appendix B. Observations by planned stop and group

Table A2. Number of observations in treatment and control groups by planned stop.

Station name	N treatment (main)	N control (1) 400–1000 m	N control (2) 600–1000 m
Hesperian puisto	546	567	285
Kansallismuseo	345	919	535
Kansaneläkelaitos	916	49	11
Kantelettarentie	139	786	586
Kolmikulma	521	3,438	2,251
Lasipalatsi	42	909	661
Meijeritie	3	138	133
Meilahden sairaala	418	235	108
Munkkiniemi	709	197	89
Munkkivuori	350	748	479
Niemenmäki	204	142	110
Näyttelijäntie	177	470	354
Ooppera	409	288	288
Paciuksenkaari	160	494	182
Pohjois-Haaga asema	490	176	90
Töölön halli	716	99	0
Töölön tulli	280	87	87
Valimo asema	2	68	60
Valimokuja	94	476	327
Vihdintie	102	950	648
Ylioppilastalo	70	932	703

Appendix C. Indexed price trends across control group alternatives

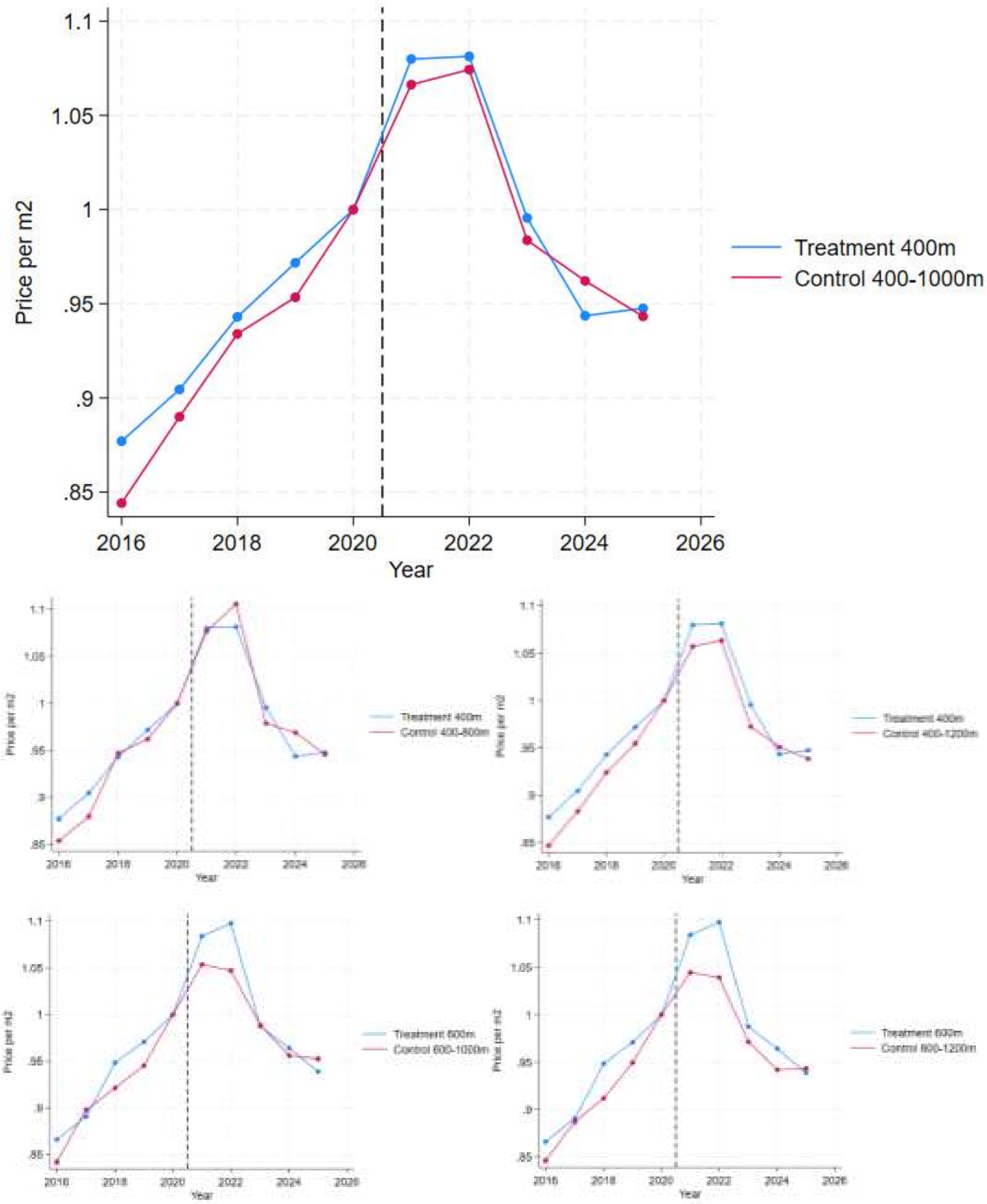

Figure A1. Indexed price development for distance-based control group alternatives

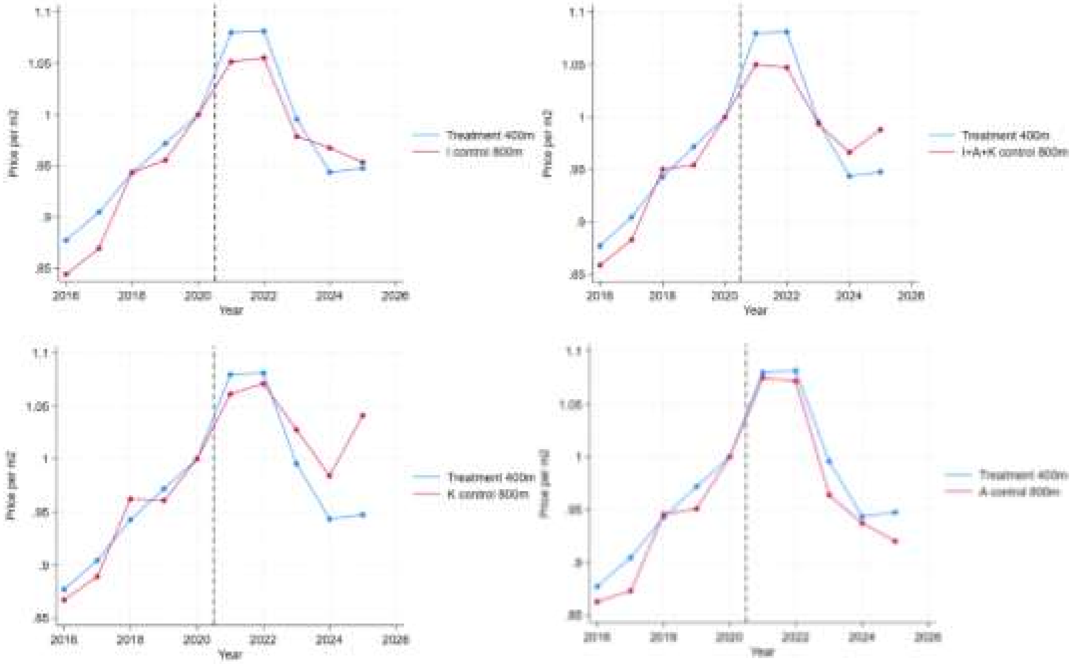

Figure A2. Indexed price development for station-based control group alternatives