The relationship between house prices and *planned* demolition-and-development or *planned* rehabilitation projects

The case of Paris, France

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ABSTRACT

A focal point of Parisian authorities is economic redevelopment to maintain affordable and appropriate housing despite remaining the most expensive housing market among European cities. Economic redevelopment includes two types of projects: rehabilitation, and demolition-and-development projects. Due to environmental transition demands, lower ecological footprint and declining costs, rehabilitation is incentivized instead of demolition-and-development. In essence, this study examines current house prices in relation to planned redevelopment projects in location of advocating neighbourhood quality. Four groups of neighbourhoods were examined which operationalize projects of planned rehabilitation, planned demolition-and-development, both transformations and no transformation within a 500-meter radius around each transaction, through a measurement of the Euclidean distance. The investigation of the hedonic price model reflects that planned redevelopment projects within a 500-meter radius associate with a 2.17% lower transaction price. Furthermore, through the distinction of transformations a positive significant association is observed between house prices and planned rehabilitation projects near to transactions. Transformations beyond the 500-meter radius from a transaction until the 1,000-meter range associates with a higher negative house price. Heterogenous outcomes are found between the twelve territories of the Greater Metropolitan Region in Paris, France in support of the diverse neighbourhood qualities in the study area.

Keywords: house prices, planned rehabilitation projects, planned demolition-and-development projects, neighbourhood quality, Paris

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1. INTRODUCTION

1.1 Motivation

Paris has been a global city for centuries, leading to economic redevelopment as older properties are transformed through rehabilitation and demolition-and-development. The urban planner deputy, Emmanuel Gregoire, stated, 'in Paris, we no longer demolish, we transform' (Cazi, 2023). The current city's policies encourage the rehabilitation of buildings by restricting urban sprawl and incentivizing horizontal decentralization to effectively use the existing surface area (Lefebvre, 2021). Simultaneously, the city targets an ecological transition to provide a sustainable change in the housing stock as 85-95% of the current stock is predicted to remain standing in 2050 (Maduta et al., 2022). As of today, the building sector of France accounts for 28% of the greenhouse gas emissions (Lefebvre, 2021), foreseeing a relevance in sustainable rehabilitation, and change in real estate on an urban scale.

Rehabilitation considers improving the existing state of buildings through repairs, renovation or changing the purpose of properties to spark new interest (Buckley, 2012; Mayer, 1981). According to Buckley (2012), extensive rehabilitation and structural contributions can be obtained for a third less than the cost of demolition-and-development as well as the ecological footprint is assessed to be ca. 60% lower (Alba-Rodríguez et al., 2017), as demolition-and-development refers to the procedure of dismantling a building resulting in new constructions with potential new uses (Blanco, 2023).

The pivot of the analyses remains on planned redevelopments, substantiated by planned transformations of rehabilitation and demolition-and-development projects, as planned redevelopment project's objective is to improve the real estate stock and is likely to induce neighbourhood change (Kuiper, 2023). Local governments may instigate redevelopment in poor perceived neighbourhoods for place-based renewal policy implications (Rosenthal, 2008). Both transformations often initiate positive externalities to enrich the neighbourhood quality and appearances ultimately associated with house prices (Kuiper, 2023). Furthermore, a large share of housing in Europe is to ensure accessibility to affordable and appropriate housing to reduce socio-spatial polarisation in cities and strengthen social equality (Milovanović et al., 2022). The following research explores whether there is a relationship of house prices in proximity to planned transformations such as rehabilitation or demolition-and-development in Paris, France. This paper will amplify a connection between poor-quality neighbourhoods targeted by planned redevelopment projects relative to neighbourhoods in other territories and if it associates with house prices.

Parisian authorities are struggling to fulfil the accommodation needs of locals, in particular, offering affordable housing to low-income households. There are also undesired impacts of rehabilitation, mainly a rise in house prices caused by improving properties conflicting with current tenants or first-home buyers (Pipa et al., 2017), consequently, resulting in gentrification and an urban sprawl movement due to financial distress (Milovanović et al., 2022). Nevertheless, urban rehabilitation has raised in significance to maintain the vitality of historical

urban centres (Pipa et al., 2017). Rehabilitation, on the other hand, may lead to degrading historical areas due to orientation on urban recovery or converting areas to environments which lose its historical charm (Pipa et al., 2017). A focus has been on Haussmannian architecture which are an invaluable asset of Paris urban identity and distinctiveness (Cardoso, 2022). Particularly, incentive-based programmes have originated to prevent abandonment and lack of maintenance to preserve the building heritage.

1.2 Academic relevance

Previous research conducted comparative studies between rehabilitation versus demolition-and-development by considering economic and environmental impact assessments (Alba-Rodríguez et al., 2017). However, these indicators focus on the target properties and not the surrounding area. Other studies have analysed the relation of new constructions on nearby real estate in multiple cities such as Seville, in Spain (Alba-Rodríguez et al., 2017), Hong Kong (Liang et al., 2019), Helsinki, in Finland (Kurvinen & Vihola, 2016), and Chicago, in the United States of America (Zahirovich-Herbert & Gibler, 2014). A distinction of new construction types was also explored in association to targeted neighbourhoods based on their socioeconomic status.

Prior research has examined house prices change over time by post-redevelopment projects which have already been constructed and built in place. There is, however, a research gap regarding redevelopment projects in the pre-construction phase with implications on real estate prices of residential use. The studies of Liang et al. (2019) and Ki and Jayantha (2010) explored the impacts of urban redevelopment in different periodic phases on neighbourhood residential prices. The empirical results indicated a continuous response in neighbourhood housing prices prior redevelopment completion. Liang et al. (2019) focused on additional anticipatory psychological effects supported via the expectations of future advantages from urban redevelopment and influencing house prices.

For the last decades, literature reflected Parisian properties to be demolished and rebuilt instead of today's focal point which aligns with rehabilitation. Due to the absence of research, this paper seeks to discover planned redevelopment projects such as rehabilitation and demolition-and-development to associate with residential prices in the capital of France. However, project-specific Buckley (2012) analysed the relevance of rehabilitation instead of demolitions for the transformation of Bois-le-Pretre tower in Paris. Previous studies about Paris have focused on hedonic price models (Maurer et al., 2004; Bresson & Hsiao, 2011) or spatial analysis of housing inequality and Parisian housing market (Goix & Ysebaert, 2022; Nappi-Choulet & Maury 2011). Research has been conducted based on the influence of rehabilitation on the neighbouring transaction prices (Smith & Hevener, 2011; Ganduri & Maturana, 2022) while Zahirovich-Herbert and Gibler (2014) analysed the effect of new residential construction on house prices. Simultaneously, Bramley et al. (2007) conducted research on the impact of demolitions on nearby regions. Previously the focus of investigations has been on one or the other: rehabilitation or demolition-and-development. There remains an academic gap between using both redevelopment types, rehabilitation, and demolition-and-development, to evaluate residential prices in a research field. This paper analyses academic literature and interprets quantitative data in relevance for the case

study which raises the importance of planned demolition-and-development and rehabilitation projects in association to house prices in the twelve territories of the Greater Metropolitan Region of Paris.

1.3 Research problem statement

The research aim of this study is to associate planned rehabilitation and planned demolition-and-development projects with house prices in Paris. The outcome will contribute to the research gathered about the planned redevelopment projects in Paris in relation to transaction prices of housing. The research question consists of: *"To what extend do planned redevelopment projects associate with house prices?"*

Three sub-questions have been formulated:

1. What is the theoretical association between planned rehabilitation and planned demolition-and-development projects and nearby house prices?

The first sub-question will analyse the theoretical view of the research question through investigating academic publications regarding the relationship between house prices and planned redevelopment projects. Prior research will help to identify residential price characteristics as well as distinguish between rehabilitation and demolition-and-development projects. Nevertheless, this study will focus on planned redevelopment projects, which seeks challenges due to limited studies anticipating relations between pre-construction projects and house prices. The findings of the association will be supported through existing studies and hypotheses will be established.

2. What is the quantitative relationship between planned rehabilitation and planned demolition-and-development projects on nearby house prices in Paris?

This question will investigate the quantitative relationship of house prices and planned redevelopment projects, by distinguishing between planned rehabilitation and planned demolition-and-development projects. The public data source, Demandes de Valeurs Foncières (DVF) (2023), will reflect on the house prices through transaction data from the third quarter of 2018 to second quarter of 2023. The data from DVF is the basis for the analysis, with information on the prices, addresses and housing characteristics. While APUR is an open data platform publishing data among a variety of themes and simultaneous referenced in a GeoCatalogue. APUR (2023) offers an insight of planned demolition-and-development projects as well as planned rehabilitation projects in Paris including a distinction whether new constructions were housing or implied other uses.

3. What are the differences across the territories in Paris?

The Greater Metropolitan Region of Paris is divided into twelve territories which consist of four departments plus seven communes. These will be explored to assess heterogeneity of house prices across the observations in proxy to planned redevelopment projects. The variability of outcomes may be devoted to the type of redevelopment projects or distance to transactions. Nevertheless, there might be potential differences between the territories as the neighbourhood quality can be perceived differently due to physical and social attributes and infiltrate the housing market.

1.4 Outline

The consecutive order of the paper consists of a total of five sections. Section 2 explains theories of existing academic literature to explain the connections within the topic discussed. Section 3 describes the methods used for the data collection, while section 4 presents the results and follows up with a discussion in section 5. At last, section 6 consists of a conclusion and a reflection.

2. THEORETICAL FRAMEWORK

2.1 House prices

The house prices are acquired through the correspondence of housing supply and demand elasticity, and interactions between attributes of the targeted property and neighbourhood quality (Fingleton, 2008; Mulder, 2006; Rosen, 1974). Prior literature on hedonic pricing in the residential market have shown a strong relationship between the price and property characteristics, emphasizing on size, location and property type (Beimer & Maennig, 2020). The upscaling of property size, determined through the number of rooms or square meters, implies a correlation to an increase in house prices (Li et al., 2014; Nappi-Choulet & Maury, 2011; Wilhelmsson et al., 2021).

Location seems to matter for the transaction as highlighted by the preference for housing near central locations (Wheaton & Nechayev, 2005; Nappi-Choulet & Maury, 2011). Following the urban rent theory and the centre-periphery gradient, housing values diffuse with distance from the city centre to the suburbs (Evans, 2004; Goix & Ysebaert, 2022). The supply price elasticity is strongly influenced by geographical constraints resulting in demand shocks (Hilber, 2017). This cements that prices within the city are higher than in the outskirts (Teng et al., 2016; Oueslati et al., 2015). As housing scarcity is indefinite through extensive restrictions in urban land use and urbanization (Glaeser & Gyourko, 2018), a forthcoming result is constructing space efficiently via rehabilitation or demolition-and-development. Despite the transformations, there is an increasing demand for apartments in the urban housing market and induced higher prices. In contrast to previous research, McMillen (2008) observed that the type of housing nor location affects the change in the price distribution. Instead, the appreciation for higher priced homes is used as a determination.

It is challenging to disentangle the association of property attributes from the neighbourhood quality on house prices. The quality of neighbourhoods capitalizes house prices, fundamentally caused by differences in local attributes. There are constant fluctuations in urban areas through contributions of attributes, which may result in changes in perceived neighbourhood quality (Liu & Wang, 2014). The neighbourhood characteristics can consequently impact sorting by income or social capital as people tend to lean towards living in neighbourhoods based on their affordability and classification (Hilber, 2017). The most affluent households can afford to live in the highest amenity locations, generating positive externalities within the neighbourhood. The association for the prices to increase is through the attractiveness of the positive externalities, such as green spaces, exterior aesthetics, availability or distance to amenities (Daams et al., 2016; Hilber, 2017; Maurer et al., 2004).

The poor perceived neighbourhood quality may be attributed to the physical environment (e.g. lack of infrastructure, urban design, environmental disorder) as well as the social attributes (e.g. inequality in well-being, perceived safety, stigmatization) (Mouratidis, 2020). The lack of available characteristics captivates house prices negatively as well as influences the household's marginal willingness to pay to live in certain neighbourhoods (Hilber, 2017; Barreca et al., 2020). The poor-quality neighbourhoods tend to associate with

lower demand, as households prioritize to live near better attributes including higher capital values equalizing to higher neighbourhood quality. In contribution, Leonard et al. (2016) operationalized appraisal values as a measure of neighbourhoods. The results indicate interdependence of higher (lower) house prices in neighbourhoods of better (poorer) condition and vice versa.

2.2 Planned redevelopment projects – rehabilitation and demolition-and-development

Throughout the last decades, there has been a change of emphasis from new constructions to maintenance and rehabilitation within Europe (Balchin, 2004). Rehabilitation involves physical adjustments to improve property conditions (Hauge et al., 2012). Particularly, France has strongly implemented the task of tackling urban decay since the 1970s. Parisian properties focus on rehabilitation for the purpose of space constraints and to establish the highest and best use for existing properties while supporting the growth of the housing sector (Buckley, 2012; Tardiveau, 2020). This shift also proved to be more cost-effective at least in the short run (Balchin, 2004). In recent years, properties partly require rehabilitation to reach quality standards and to settle construction deficiencies, for instance, by upgrading poor insulation.

Despite rehabilitation being a focal point of modern urban areas, demolitions are still heavily relied upon. Demolition is commonly used to describe the process of dismantling a property due diligence in safety and health and disregards redevelopment (Paredes & Skidmore, 2017). However, for this study, demolition-and-development refers to the procedure to remove a structure and to redevelop a project for further improvements or a new use (Blanco, 2023). As reconstruction is included within the projects facing demolition-and-development, there is a distinction between a new construction of a building and the creation of non-built space. This space may evolve into infrastructure or a public open space such as a park/recreation area, which may lead to a positive association on property values when the area is valued as an attractive space (Daams et al., 2016).

Based on previous studies, redevelopment projects tend to occur in neighbourhoods with stagnant or declining income, population, or property prices (Weber et al., 2006). This presents the relationship between poor neighbourhood qualities and planned redevelopment projects. By the distinction of redevelopment projects, rehabilitations fail to relate to low socioeconomic status, as a high tendency is recorded to be near affluent neighbourhoods such as those in the city centre (Bogin & Doerner, 2019). Simultaneously, disinvested neighbourhoods of older housing stock often initiate redevelopment projects which may result in an influx of affluent households upholding socioeconomic status in comparison to previous residencies to improve neighbourhood quality (Rosenthal, 2008; Weber et al., 2006; Turnbull & Vlist, 2023). The results from Brunes et al. (2020) replicates the scenario and found that it leads to positive spillovers on house prices in proximity to development projects with the specification of areas with residents with low income, immigrants, and a relatively high number of nearby social housing. This process initiates gentrification which may imply costs and pressure on vulnerable residents such as families or elderly relying on low fixed income (Wilhelmsson et al., 2021; Zapatka & Beck, 2020). The loss of affordable housing contributes to displacement and changing neighbourhoods' quality through cultural and socio-economic intrusion.

Prior research identified positive and negative externalities initiated by redevelopment projects, particularly, externalities derived by reconstructions, within a 400-meter radius (Zahirovich-Herbert & Gibler, 2014). The spillover effects vary strongly based on the distance to redevelopment projects. As redevelopment projects improve the standard of property sites, the projects attract opportunities, which contribute to creating a more vibrant, safe and healthy neighbourhood (Kurvinen & Vihola, 2016). Planned redevelopments will incentivize positive externalities and improve the city's appearance as well as enhance the living quality of the neighbourhood (Liang et al., 2019). Projects that enrich neighbourhood quality may improve the values of nearby residential real estate. Nevertheless, planned redevelopment projects establish uncertainties as these projects are forsaken to be set in the future. As there is an absence of investigations involving planned redevelopment projects, research regarding completed projects are used as a guidance. Planned projects shall apply similar externalities in the future in alignment with completed projects as well as generate positive benefits before completion through expected advantages. The study by Liang et al. (2019) discovered the effect of urban redevelopment on house prices in the promotion/review phase was higher than in the implementation/completion phase. As there is a continuous reaction in house prices prior to the completion of redevelopment projects, it implies the expectation that future benefits will outweigh external costs leading to an increase in prices (Liang et al., 2019).

Rehabilitation or demolition-and-development may temporarily lower the nearby housing values based on the process of construction. Zahirovich-Herbert and Gibler (2014) found that house prices may endure a reduction, when comparable sized houses are newly constructed nearby resulting in competition by contributing to the housing stock even though demand remained constant. The effects of construction noise pollution on residents were examined by Ng (2000) and the results reflected negative effects of severe significance for residents closest to construction sites such as distractibility, interference with communication and relaxation. Residents evaluated construction noise to be among the most unpleasant noises. Further negative externalities involve the creation of an undesirable environment, road detours, exhaust fumes, and unsightly views, such as steel frames and construction vehicles (Turf Factory Direct, 2021). These perceptions of inhabitants about construction sites have led to a lower demand and willingness to pay for housing near development projects (Zahirovich-Herbert & Gibler, 2014). According to Whitehead et al. (2015), development projects during the construction phase led to a decline in nearby house prices, but the prices recovered quickly upon completion. Transaction prices particularly increased when the area was in poor condition before the development procedure. As a contribution, distressed properties which executed rehabilitation generate beneficial spillovers to raise neighbouring house prices (Ganduri & Maturana, 2022). As to the analysis from Smith and Hevener (2011), rehabilitation raised the median sales price in the target region and generated positive influence on the neighbourhood. After Kurvinen and Vihola (2016) found an immediate positive 2.6% impact on house values within one year after the development is completed, then prices tend to depreciate at a rate of 0.5% per year thereafter. Particularly, supply constraints resulting from physical land scarcity leads to less depreciation and apartments tend to depreciate faster than non-residential real estate. Bokhari and Geltner (2016) acknowledged that depreciation

rates vary across the metropolitan area and future-oriented redevelopment projects occur unevenly across urban areas (Turnbull & Vlist, 2023).

Initial effects might be more negative through impacts from demolitions (Bramley et al., 2007). Regarding Yin and Silverman (2015), demolished properties have no significant impact on house transaction prices for the years before or after massive demolition effort. However, the study from Yin and Silverman (2015) only engages with demolitions and the removal of abandoned properties based on deterioration, health, and safety measures. The study does however exclude redevelopment, which in most cases is the essence of positive externalities on house prices and neighbourhood quality.

2.3 Theoretical predictions

The conceptual model in figure 1 describes the relationship of planned redevelopment projects in proximity to residential transaction prices. The characteristics of the planned projects are included to furtherly distinguish between the type of redevelopment such as rehabilitation or demolition-and-development. The control variables reflect housing characteristics plus location and time effects. For house characteristics, it is common within hedonic models to include size which refers to the surface area and number of rooms (Maurer et al., 2004). The location and date of transaction is also stated (Rosen, 1974), while there is a distinction between apartments and single-family houses (Gouriéroux & Laferrère, 2009; Bresson & Hsiao, 2011). The location effect is relying on the territories of the Greater Metropolitan Region of Paris while the time effect considers the transaction year of the real estate.

Based on the previous theoretical findings, a conceptual framework was developed as referred to below:

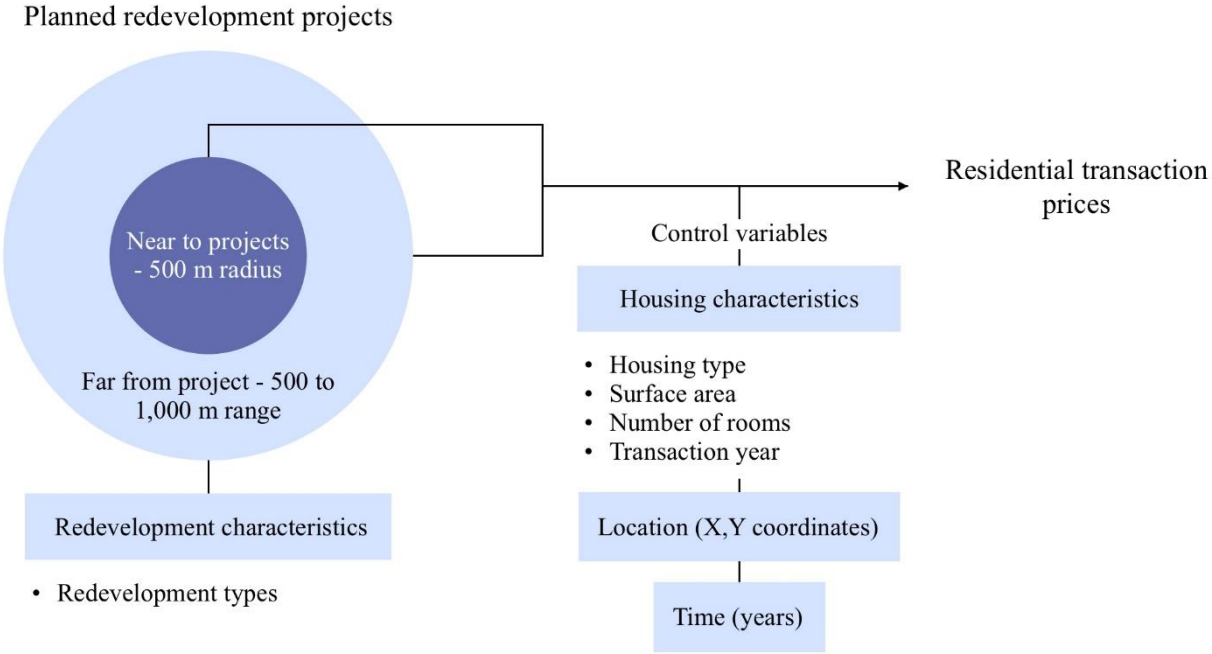

Figure 1. Conceptual model

The previous aspect of the theoretical framework included hedonic literature about house prices being associated with rehabilitation and demolition-and-development in Paris. Therefore, the following hypotheses were formulated.

Hypothesis I: There is a higher association between house prices and near planned redevelopment projects rather than between house prices and far from planned redevelopment projects.

Studies show a positive association after the completion of development projects on house appraisal values or transaction prices in near circumference (Kurvinen & Vihola, 2016; Brunes et al., 2020). It implies for planned redevelopment projects to contribute future benefits to the neighbourhood quality, which may result in an association of house prices prior to the completion of redevelopment projects (Liang et al., 2019). The positive and negative spillover effects vary through the distance between new construction and existing residential real estate but were strongly acknowledged in a 400-meter radius (Zahirovich-Herbert & Gibler, 2014). For instance, redevelopment projects in prosperous neighbourhoods have a positive relation with existing house prices. However, research of Kurvinen and Vihola (2016) reflect a disappearing relation, beyond a radius of approximately 92 meters of redevelopment projects on neighbourhood quality and house price. The investigations imply a higher interrelation with residential prices near planned development projects, while the association diminishes as distance increases. The radius differences per investigation seeks evaluations. On the contrary, findings from Yin and Silverman (2015) have found no significant association between development projects and house prices.

Hypothesis 2: The house prices near planned rehabilitation projects are higher than the house prices near planned demolition-and-development projects.

Kurvinen and Vihola (2016) discovered a positive relation of single-family house values based on new development projects and rehabilitation. However, real estate prices tend to have a lower association with rehabilitations in comparison to demolition-and-developments as properties enduring rehabilitation face less adjustments. Through less alterations, neighbourhood qualities are less provoked for change and therefore, associate less with house prices nearby. However, poor quality neighbourhoods with distressed properties which face rehabilitations generate beneficial spillovers to incline neighbouring residential real estate prices (Ganduri & Maturana, 2022). As to the findings from Smith and Hevener (2011), rehabilitation raised the median house price in the neighbourhood. Particularly, gentrified areas experience an influx of property prices through the implication of rehabilitation or demolition-and-development (Wilhelmsson et al., 2021). According to Bramley et al. (2007), there is larger negative influence on house prices from demolitions than new house constructions. Demolition-and-development projects are infiltrated through clear demolition and recreation which has a higher impact on the surrounding area through larger and longer time lasting construction activities leading to factors such as noise annoyance and dust disruption (Turf Factory Direct, 2021). These negative externalities result in impacting the surrounding area to be less strongly correlated as the less construction intensive procedures, as

these procedures impact the house prices. The planned projects may exert a foreseeable influence on house prices based on the registered redevelopment type.

Hypothesis 3: The association between planned redevelopment projects and house prices differs across the twelve territories.

Within the fundamentals, location does seem to matter for depicting house values (Wheaton & Nechayev, 2005). The distinction of house prices between the territories in the Greater Metropolitan Region of Paris is based on the administrative geographical structure formed in 2016 for collaboration between the city of Paris and its nearest suburbs. According to Teng et al. (2016), the housing values diffuse from the city centre to the suburbs meaning the prices descend with distance away from the city centre (Oueslati et al., 2015). Considering territory T1, city centre of Paris, there is a higher demand, higher space constraints than in the surrounding territories which may affect the house price differently across the various territories. Furthermore, the neighbouring quality tends to differentiate across the study area, which may associate to variations among residential prices (Weber et al., 2006). Especially, poorly perceived neighbourhoods are attractive for planned redevelopment projects (Rosenthal, 2008), creating positive and negative externalities associated to house prices. To explore whether this is the case, the third hypothesis is formulated regarding heterogeneity across the geographical territories.

3. DATA AND METHOD

3.1 Context

This research considers house prices being associated with planned redevelopment projects in the twelve territories of the Greater Metropolitan Region of Paris, France. The Greater Metropolitan Region of Paris is home to 7.08 million inhabitants, facing a steady population incline over time except for T1 Paris (APUR, 2018). As Parisians have been relocating to suburbs beyond the city centre (Jabot, 2023), T1 Paris has been slowly losing inhabitants due to the high living cost and space constraints in the centre of Paris (Global Property Guide, 2023). The research area consists of four departments in the Greater Metropolitan Region of Paris: Paris (75), Hauts-de-Seine (92), Seine-Saint-Denis (93), and Val-de-Marne (94), including seven communes.

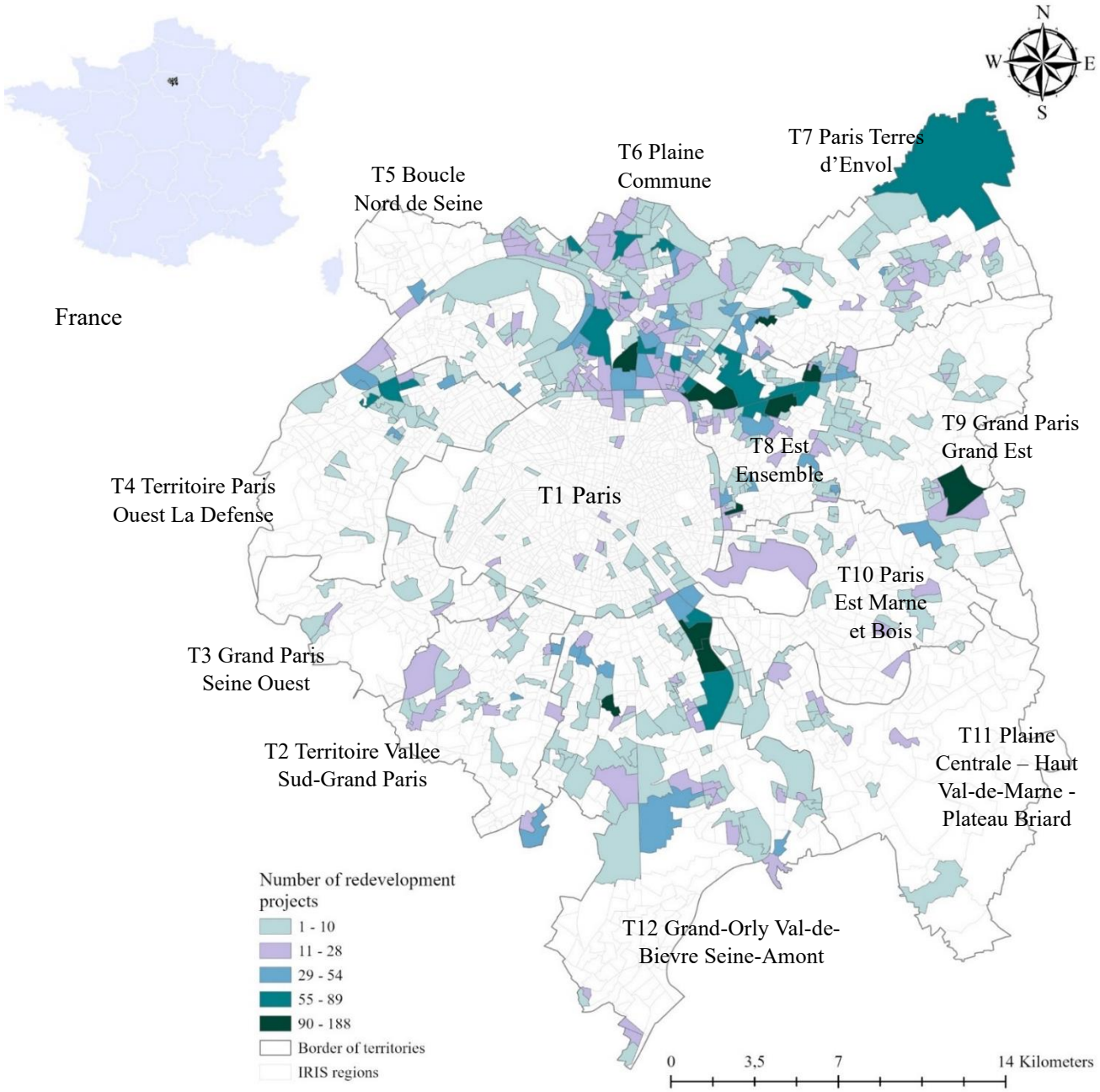

Figure 2. Map of study area distributed in the twelve different territories (APUR, 2023).

The study area is especially insightful to be investigated due to the correlation of planned redevelopment projects occurring in lower median income neighbourhoods, when the income of a neighbourhood inclines the number of projects tend to lean to a negative correlation. While regions of lower income households can be associated with neglected neighbourhood qualities as income or social capital relates to the availability of social or physical attributes of a neighbourhood (Hilber, 2017). As of figure 2, it indicates the frequency of planned redevelopment projects in the depicted IRIS geographical regions while Appendix D offers an overview of households with lower median income. The patterns between these two maps align with similarities, it may be concluded that in Paris, planned redevelopment projects tend to resign in areas that associate with poorly perceived neighbourhood quality. Nevertheless, poor neighbourhood quality interconnects with lower house prices. This may eventually explain the lower transaction prices in proximity to planned redevelopment projects. For instance, the regions with the majority of planned redevelopment projects are reflected in T6 Plaine Commune, T7 Paris Terres d'Envol, T8 Est Ensemble, in the north and T12 Grand-Orly Val-de-Bievre Seine-Amont in the south. In comparison to Appendix D, the two lowest categories of median declared income ranging from 6,870 and 27,620 are identified in the same regions as to where the frequency of planned projects is the highest (as seen in figure 2).

This study distinguishes between four groups of neighbourhoods which are infiltrated through housing transformations and may operationalize the nearby residential real estate price. These four groups distinguish through different compositions of planned redevelopment projects, which take place within a neighbourhood that is defined as the target and control area. The target area equivalates to a 500-meter radius to the transaction, while the control area replicates the range from 500-meters to 1,000-meters to the house price. These planned projects exist of demolition-and-development and rehabilitation. The four groups consist of: i.) no planned transformations, this option exists of neighbourhoods which have no redevelopment projects planned; the category, ii.) planned demolition-and-development projects, focuses only on neighbourhoods which have demolition-and-development projects planned in the future; on the other hand, iii.) planned rehabilitation projects, states the neighbourhoods with planned rehabilitation projects in the near circumference; while the last category, iv.) both planned transformations, relies on planned demolition-and-development and rehabilitation projects to occur in the neighbourhood.

3.2 Descriptive analysis

This research explores the relationship between house prices and two types of planned redevelopment projects: i.) demolition-and-development projects, and ii.) rehabilitation projects. The data comes from two sources: real estate transaction data is accessible from the platform of Demande de Valeurs Froncieres (DVF), and the planned projects are available through the GeoCatalogue from the platform of Atelier Parisien d`Urbanisme (APUR). The variables obtained from the datasets are shown in the descriptive statistics table 2 and 3.

The data from DVF offers sale transactions between the years of 2018 3rd quarter to 2nd quarter of 2023 in France. At first, the dataset was modified to append the different files per year into one. Then only the data was

kept of the Greater Metropolitan Region of Paris, therefore, 1,314,984 observations remain. These observations lie within the geographical borders of the four departments: Paris (75), Hauts-de-Seine (92), Seine-Saint-Denis (93), and Val-de-Marne (94) including seven further communes which are part of the region since January 1st, 2016. The extracted data includes the context of the house transaction prices, transaction date, type of housing, location, surface area (m^2), and number of rooms. The location is determined through the latitude and longitude coordinates.

Furthermore, data cleaning and selection led to a higher accuracy and removal of errors based on a reduction of observations. An overview of the commands applied on the individual datasets is shown in table 1. Particularly, removed observations were categorised as industrial and commercial premises within the type of property variables. So only residential properties were included in the dataset described as single-family houses or apartments. Then observations were dropped, which had missing values for the variables: transaction price, transaction date, location, surface area (m^2), and number of rooms.

Table 1. Data cleansing and selection of data

Data	*Command*	*Description*	*Observations*	*Removal*	*Remain*
Transaction data from DVF	*Select*	Study area	19,765,458	18,450,474	1,314,984
	Drop	Missing values of extracted variables	1,314,984	723,614	591,370
	Select	Residential properties			
	Drop	Multi complex building of apartments	591,370	114,042	477,328
	Drop	Bottom and top 1% tier of transaction price	477,328	9,542	467,786
	Drop	Outliers above 99.9% percentile of rooms	467,786	237	467,549
Planned redevelopment projects from APUR	*Drop*	New construction of un-built space (e.g. parks, open public spaces)	9,328	1,107	8,221
	Drop	Missing values	8,221	270	7,951
Planned redevelopment projects near transactions	*Merge*	Dataset of planned redevelopment projects and transactions	473,333	5,784	467,549
	Drop	Not matched based on coordinates missing	467,549	2,494	465,055
	Drop	Distance further than 1,000 meters	465,055	116,776	348,279

A few observations explicitly stated the existence of gardens on the property terrain. However, the data platform gave these gardens based on the large size their own individual observation with duplicated transaction IDs. To remove duplicates, the observations of non-residential properties such as gardens were deleted. Furthermore, a few observations were identified with identical transaction ID's, which equivalate to buildings sold for a total price including multiple apartments within the building. As there is a lack of specification on how much the transaction price is per apartment, the buildings are removed from the dataset. To further improve the data distribution, observations in the top and bottom 1% tier were removed of the variable: transaction price. Furtherly, the outliers above the 99.9% percentile within the field of number of rooms are removed. Therefore, 467,549 observations remain to investigate the residential transaction prices in Paris.

Secondly, the data of APUR is incorporated in the analysis as it identifies existing buildings that will be transformed by rehabilitation or demolition-and-development. A total of 9,328 buildings were intended to be fully transformed between the years of 2018 and 2050 within the study area. The data was published in the 1st quarter of 2023. The extracted variables are the type of redevelopment projects, new construction type, estimated completion year and location of the project. The location is available through the x and y coordinates. This research will focus on residential buildings and therefore, projects that align with developments of parks, open public spaces are removed from the data. To conclude 7,951 planned projects, remain, after dropping cases for which information on the extracted variables are missing or referred to constructions of un-built space. The targeted projects persist in the planning phase and were estimated to be completed post data publication in the years of 2023 to 2050.

The two datasets were combined to obtain information on the distance between the transaction prices and the planned redevelopment projects via measuring the Euclidean distance. These nearby distances created their own unique identifier, FID, which made it possible for a merge between the two datasets. The merge led to a total number of 473,333 observations. It turns out a few observations from the house transaction dataset were not matched as the coordinates were missing. To proceed two ranges were formed, through identifying the target area with a radius of 500 meters, and between the ranges of 500 to 1,000 meters. All the observations which exceed the range of 1,000 meters were eliminated which led to a remaining number of 348,279 observations for the analysis.

The descriptive statistics of the projects which are within a 500-meter radius to the transactions are shown in table 2. There is a distinction of four models each covering different total number of observations. The model (1) focuses on the outcome of both planned redevelopment types to be occurring simultaneously within the 500-meter radius. Model (2) establishes the planned redevelopment project type: demolition-and-development. Model (3), on the other hand, describes planned rehabilitation projects. The model (4) explains the outcome of all the planned redevelopment projects which are not within a 500-meter radius to transaction. The transaction price is listed as a continuous variable, same as the surface area. The housing type is determined through a binary variable between a single-family house [1] and an apartment [0]. The number of rooms within the unit are shown categorically ranging from 0 [studio] to 9 rooms. The year of transaction is ranging from 6 dummies each referring to a year between 2018 and 2023. Furthermore, there is a distinction of twelve territories where T1 Paris shows the highest percentage of transactions occurring in that field ranging from 22.4% to 52.3% depending on the planned redevelopment project. As most properties are identified in the city centre, it may not be surprising that the majority of properties are apartments while only 10.0-13.2% are single-family houses.

Table 2. Descriptive statistics of transactions near to planned redevelopment projects – within 500-meters

	(1)		(2)		(3)		(4)	
Variables	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Activity (near: 500 m)								
Transaction price	327083.6	250172	388396.5	276030	523325.1	443939.3	454288.8	346108.6
Single-family house [yes = 1]	.111115	.3142772	.1233382	.3288263	.0998458	.2998031	.1324423	.3389721
Surface area	57.16416	27.65153	58.93078	30.78764	60.88271	35.64977	60.55338	33.89249
Number of rooms								
0	.0006304	.0251009	.0006672	.0258224	.0009492	.0307957	.0006864	.0261909
1	.1538973	.3608535	.155699	.3625713	.2049122	.4036494	.17085	.3763791
2	.2859219	.4518563	.2892792	.4534297	.2671452	.4424819	.2787297	.4483757
3	.2998441	.4581935	.3009391	.4586682	.2598481	.4385641	.2856134	.4517076
4	.184246	.3876881	.1718628	.3772627	.1685453	.3743609	.1688555	.3746254
5	.0589461	.2355259	.0582912	.2342943	.0732084	.2604859	.0653858	.2472061
6	.0123811	.1105805	.0162138	.1262974	.0182724	.1339388	.0203986	.1413601
7	.0029946	.0546413	.0047207	.0685451	.0049241	.0700008	.0066571	.0813192
8	.0008056	.0283712	.0016848	.0410115	.0013052	.0361047	.0021176	.0459685
9	.0003327	.0182381	.0006422	.0253339	.0008899	.0298186	.0007059	.0265587
Transaction year								
2018	.1126736	.3161961	.1094097	.3121538	.1107617	.3138462	.1099714	.3128551
2019	.2190603	.4136132	.2228478	.4161587	.2182606	.4130775	.217346	.4124413
2020	.1909532	.3930557	.194924	.3961439	.1740033	.3791236	.1843131	.3877406
2021	.2099539	.407279	.201513	.4011319	.2011747	.4008902	.2036433	.402708
2022	.1940704	.3954868	.1957497	.3967784	.2100736	.4073727	.2024258	.4018092
2023	.0732886	.2606119	.0755559	.2642873	.0857262	.2799675	.0823004	.2748228
Territories								
T1 Paris	.2244541	.4172259	.2495037	.4327276	.5236118	.499457	.3791299	.4851721
T2 Vallée Sud Grand Paris	.0087911	.0933488	.1095932	.3123833	.0064072	.0797906	.0746914	.2628936
T3 Grand Paris Seine Ouest	.0256554	.1581064	.0381658	.1915971	.0577836	.2333407	.0683128	.2522827
T4 Paris Ouest La Défense	.068105	.2519282	.0792173	.2700788	.0899383	.2861018	.0836539	.2768689
T5 Boucle Nord de Seine	.0920792	.2891403	.0620444	.2412372	.0198149	.1393679	.0667651	.2496156
T6 Plaine Commune	.1895522	.3919501	.0589751	.2355791	.0001187	.0108924	.0017485	.0417781
T7 Paris Terres d'Envol	.0582456	.2342094	.0407763	.1977725	.0750475	.2634757	.0338099	.1807403
T8 Est Ensemble	.1673117	.3732572	.0519608	.2219489	.0183318	.134152	.0416456	.1997787
T9 Grand Paris - Grand Est	.0527818	.2235996	.0487247	.2152929	.0587328	.2351309	.0634495	.2437705
T10 Paris-Est-Marne & Bois	.0220304	.1467835	.1034463	.3045421	.0344684	.1824345	.0801116	.2714668
T11 Grand Paris Sud Est	.0241844	.1536226	.0358805	.1859929	.0304343	.1717841	.0366593	.1879245
T12 Grand-Orly Seine Bièvre	.0668091	.2496933	.1217118	.326954	.0853109	.279352	.0700224	.2551856
Observations		57,103		119,898		16,856		154,422

Notes: Columns – 1: Both planned transformations; 2: Planned demolition-and-development; 3: Planned rehabilitation; 4: No planned transformation

Table 3. Descriptive statistics of transactions far from planned redevelopment projects – 500 to 1,000-meters

	(1)		(2)		(3)		(4)	
Variables	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.	Mean	St. dev.
Activity (far: 500 to 1,000 m)								
Transaction Price	367370.1	282183.1	422760.8	304615.9	588313.3	468182	481718.6	383439.6
Single-family house [yes = 1]	.1269408	.3329078	.1341449	.340809	.0803793	.2718855	.0753592	.2639765
Surface area	56.91691	29.78037	61.11864	32.47097	60.92901	37.97806	62.5305	34.77084
Number of rooms								
0	.0006052	.0245936	.0006192	.0248762	.0013736	.0370378	.0009774	.0312492
1	.1669542	.3729363	.1539843	.3609348	.2207107	.414735	.168312	.3741523
2	.2948272	.4559666	.2715592	.4447651	.291519	.454472	.2804711	.4492404
3	.2937072	.455461	.2991325	.4578794	.2382134	.4259998	.2826214	.4502849
4	.1669055	.3728928	.1806535	.384732	.1475541	.3546652	.173248	.3784708
5	.0571262	.2320843	.0649362	.246414	.0713843	.2574713	.0672466	.2504547
6	.014372	.119019	.0196412	.1387645	.0213134	.14443	.0190597	.1367383
7	.0039304	.0625696	.0063964	.0797216	.0060262	.0773963	.0055713	.0744348
8	.00112	.0334475	.0022911	.0478103	.001285	.0358247	.0018082	.0424859
9	.0004522	.0212595	.0007864	.0280317	.0006203	.0248996	.0006842	.0261488
Transaction year								
2018	.1118454	.3151772	.1098534	.312708	.1084722	.3109827	.1042909	.305645
2019	.2168596	.4121076	.2215459	.4152883	.2141528	.4102424	.2289121	.4201428
2020	.1870861	.389982	.1903874	.392608	.1774637	.3820691	.1966572	.3974807
2021	.2072458	.4053346	.2021709	.4016203	.2036955	.4027541	.1929919	.3946563
2022	.1997816	.3998375	.1969944	.3977293	.2103421	.4075606	.199003	.3992601
2023	.0771815	.2668802	.0790479	.2698144	.0858738	.2801838	.0781449	.268406
Territories								
T1 Paris	.3142635	.4642235	.2718007	.4448891	.5962425	.4906608	.3702962	.4828958
T2 Vallée Sud Grand Paris	.0202223	.1407605	.1293956	.3356383	.0058047	.0759687	.0659271	.2481607
T3 Grand Paris Seine Ouest	.0273318	.1630489	.0537162	.2254574	.1539348	.3608942	.0726224	.2595221
T4 Paris Ouest La Défense	.0730285	.2601843	.0836858	.2769168	.0643832	.2454397	.1150914	.31914
T5 Boucle Nord de Seine	.0814597	.2735408	.0688062	.2531251	.0008419	.0290039	.0244355	.1544008
T6 Plaine Commune	.1162627	.3205408	.0089599	.0942321	.0003102	.0176094	0	0
T7 Paris Terres d'Envol	.056994	.2318319	.0293566	.1688045	.0445764	.2063764	.0371909	.1892339
T8 Est Ensemble	.1310034	.3374052	.0189291	.1362753	.0020383	.0451023	.0287851	.167206
T9 Grand Paris - Grand Est	.0592757	.2361408	.058546	.2347737	.0321251	.1763363	.0460854	.2096752
T10 Paris-Est-Marne & Bois	.026657	.1610795	.1270921	.3330772	.023263	.1507411	.0845958	.2782861
T11 Grand Paris Sud Est Avenir	.0250918	.1564046	.040911	.1980846	.0396136	.195054	.0366044	.1877932
T12 Grand-Orly Seine Bièvre	.0684095	.2524482	.1088008	.3113901	.0368664	.1884378	.1183658	.3230486
Observations		143,752		161,497		22,568		20,462

Notes: Columns – 1: Both planned transformations; 2: Planned demolition-and-development; 3: Planned rehabilitation; 4: No planned transformation

The table 3, shows the descriptive statistics of the redevelopment projects being far from transaction prices in the range between 500 to 1,000 meters. The frequency of planned redevelopment projects is distinguished between near (500-meter) and far (500 to 1,000-meters) from $property_i$. Furthermore, the descriptive statistics of the planned redevelopment projects are portrayed as pooled, differentiate between rehabilitation and demolition-and-development, and no transformations. There is a larger quantity of planned demolition-and-development projects recorded in this study than rehabilitation projects based on the total observations. The most common number of rooms per property is three with the exception for properties far from both transformations, and planned rehabilitation projects at both ranges as these properties tend to commonly have two rooms. In addition, the most transactions were completed in the year of 2019.

Table 4. Correlation matrix

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Transaction price (1)	1.0000							
Near pl. projects (2)	-0.1466**	1.0000						
Far pl. projects (3)	-0.1486**	0.0788**	1.0000					
Single-fam house (4)	0.1363**	-0.0212**	0.0362**	1.0000				
Surface area (5)	0.6401**	-0.0376**	-0.0579**	0.3915**	1.0000			
Number of rooms (6)	0.5030**	-0.0056**	-0.0144**	0.4112**	0.8595**	1.0000		
Transaction year (7)	0.0578**	-0.0136**	-0.0019	0.0010	-0.0141**	-0.0136**	1.0000	
Territories (8)	-0.2904**	0.1285**	0.0606**	0.2507**	0.1247**	0.1746**	-0.0312**	1.0000

**P<0.05; **P<0.01*

The table 4 indicates the correlation between the variables in the analysis. If the correlation coefficient is equal to 0, it indicates no linear correlation, while the value equalling to 1 shows a linear correlation between two variables. The matrix shows a correlation between *surface area* and *number of rooms* by 0.8595, which indicates a strong positive correlated relationship. More surface area is strongly related to higher number of rooms. As these two independent variables are highly correlated, it may lead to an issue of multicollinearity. Nevertheless, this incident was expected as both variables identify the size of the property. Both variables: *surface area* and *number of rooms* indicate a strong positive correlation to the transaction price, noted in this condition when property increases in size it relates to higher transaction prices.

There is a negative correlation between the *transaction price* and variables related to the frequency of planned *near* and *far projects* to residential transactions. The negative correlation shifts to a stronger relationship from -0.1466 to -0.1486, when the buffer shifts from 500-meters radius to ranges of 500 to 1,000 meters, which has also been associated with more planned projects being recorded within that area (500-to-1,000-meter range). Meaning the transaction price is associated with a negative correlation when the frequency of redevelopment projects increases within the range. The values were significant at a p-value of 0.01. Other relationships are significant; however, these correlations are not as strong and studying these effects would be beyond the scope of this research.

3.3 Hedonic regression model

To pinpoint the interconnection of planned redevelopment projects on house transaction prices, a hedonic price model is explored. It supports the investigation through identifying whether the price associates with planned rehabilitation and demolition-and-development projects in defined regions. Therefore, the following equation is determined:

$$\ln P_{ijt} = \alpha + \beta_1 Planned\ demolition\ and\ development_j + \beta_2 Planned\ rehabilitation_j + \beta_3 Both\ planned\ transformations_j + \gamma\ X_{ijt} + \varepsilon_{it} \quad | \quad 1$$

Where $\log(P_{ijt})$ reflects the natural logarithm of the transaction price of $property_i$ in a $geographical\ area_j$and in $transaction\ year_t$. The transaction of $property_i$ was conducted before the completion of redevelopment projects. $Planned\ demolition\ and\ development_j$ is a variable indicating the planned demolition-and-development projects in distance to $property_i$, the target area represents a radius of 500 meters to $property_i$ and the control area identifies within the range of 500 to 1,000 meters. $Planned\ rehabilitation_j$ is a variable which refers to the planned rehabilitation projects near to $property_i$ (500-meter radius) or far from $property_i$ (500 to 1,000-meter range). At last, the $Both\ planned\ transformations_j$ addresses both planned demolition-and-development and rehabilitation projects taking place within the target or control area. X_{ijt} show a set of control variables which consider housing characteristics of $property_i$ such as housing type and size in $transaction\ year_t$ and $geographical\ area_j$; these are the estimated coefficients: $\alpha,\ \beta$; ε_{it} is an idiosyncratic error term.

These variables are interrelated within the target area, which allows to identify the various relations based on distance. The distance is calculated by the Euclidean distance between $property_i$ and the planned redevelopment projects, using Geographic Information System (GIS) techniques. The initial target area is within a 500-meter radius to the planned redevelopment projects, while the control area is between 500 to 1,000 meters.

A set of control variables are included such as size referring to the surface area and number of rooms (Maurer et al., 2004). Furthermore, the date of transaction and location referring to the individual territories is specified (Rosen, 1974). The distinction between apartments and single-family houses is also considered (Gouriéroux & Laferrère, 2009; Bresson & Hsiao, 2011). Transactions in real estate observed at different point in time may not necessarily mean that prices shift over time, but instead observe differences in location, size or distance to planned redevelopment projects (Maurer et al., 2004).

Through the estimated equation, a comparison between the property transactions were conducted within the same territory, and transaction year. Through including the location fixed effect by a dummy, it only compares the outcome within the same region as depicted in the twelve territories. Besides the location a time fixed effect is contributed through a dummy for a comparison within the same year of sale transaction. Regarding the

planned redevelopment projects, there is no time dimension as these are future-based estimations. In addition, the transactions may compute the relation of near to, and far from, planned transformations.

4. RESULTS

4.1 Multiple linear regressions

For comprehension of the linear relationship between the transaction prices and planned redevelopment projects, three models are conducted in order to observe the variance of the dependent variable increase over the models. The dependent variable in the multilinear regression is the natural log of residential transaction prices. The model (1) serves as a reference for the other models by the hedonic baseline which excludes the control variables and only focuses on the key independent variable: planned redevelopment projects. While the other two models include more variables, for instance model (2) considers the independent variables in relation to the research questions and includes the details of the housing characteristics. To last of model (3) considers all variables in relation to location.

All models show an overall significance, the coefficient of determination (R^2) increases between the models. The R^2 is an indicator of statistical measure in a regression model that specifies the proportion of variance in the dependent variable which can be explained by the variation of the independent variables. The model (1) has a lower (R^2) in comparison to model (3) and the overall goodness of fit of the model improved to 61.74% of the variance of the dependent variable, suggesting that the perceived house transaction price is not only explained by the range to planned redevelopment projects.

Table 5. Regression results of transaction prices in proximity to planned redevelopment projects

		Natural logarithm of house prices		
VARIABLES		(1)	(2)	(3)
Near to any planned project – within 500 m [yes = 1]		-0.16095***	-0.14029***	-0.02190***
		(0.00234)	(0.00182)	(0.00150)
Single-family house [yes = 1]			-0.13772***	0.18550***
			(0.00339)	(0.00304)
Surface area [in m^2]			0.01405***	0.01264***
			(0.00012)	(0.00011)
Number of rooms [0 = studio as reference]				
	1.		-0.08039*	-0.00603
			(0.04319)	(0.04294)
	2.		0.11322***	0.27784***
			(0.04323)	(0.04297)
	3.		0.10490**	0.36684***
			(0.04343)	(0.04313)
	4.		0.01510	0.31997***
			(0.04381)	(0.04344)
	5.		-0.03435	0.23017***
			(0.04445)	(0.04394)
	6.		-0.20660***	0.03371
			(0.04565)	(0.04493)
	7.		-0.42387***	-0.19043***
			(0.04922)	(0.04806)
	8.		-0.65165***	-0.41161***
			(0.06107)	(0.05847)
	9.		-0.97232***	-0.69990***
			(0.08411)	(0.07935)
Transaction year [2018 as reference]				
	2019		0.03543***	0.03750***

		(0.00331)	(0.00261)
	2020	0.08803***	0.09893***
		(0.00340)	(0.00269)
	2021	0.12160***	0.12035***
		(0.00337)	(0.00268)
	2022	0.15425***	0.13170***
		(0.00336)	(0.00267)
	2023	0.13205***	0.09212***
		(0.00417)	(0.00334)
Territories			
[T1 Paris as reference]			
	T2 Vallée Sud Grand Paris		-0.40804***
			(0.00264)
	T3 Grand Paris Seine Ouest		-0.18986***
			(0.00345)
	T4 Paris Ouest La Défense		-0.22139***
			(0.00291)
	T5 Boucle Nord de Seine		-0.47593***
			(0.00300)
	T6 Plaine Commune		-0.88160***
			(0.00371)
	T7 Paris Terres d'Envol		-1.06425***
			(0.00347)
	T8 Est Ensemble		-0.61280***
			(0.00325)
	T9 Grand Paris - Grand Est		-0.93591***
			(0.00322)
	T10 Paris-Est-Marne & Bois		-0.42373***
			(0.00310)
	T11 Grand Paris Sud Est Avenir		-0.83359***
			(0.00363)
	T12 Grand-Orly Seine Bièvre		-0.77191***
			(0.00262)
Constant		12.78836***	11.82614***	11.99950***
		(0.00177)	(0.04331)	(0.04302)
Observations		348,279	348,279	348,279
R-squared		0.01357	0.39423	0.61740

Notes: Dependent variable is the natural log of house prices
Location fixed effects are on territory level (12-levels)
Robust standard errors are in parentheses
****p<0.01; **p<0.05; *p<0.1*

As to the regression shown in table 5, it focuses on the independent variable being a dummy variable. Where 0 refers to the planned redevelopment projects being set in the range of 500 to 1,000 meters to the transaction of $property_i$, while 1 represents the planned projects taking place within a 500-meter radius to the transaction property. Therefore, there is a negative association of 2.17% on the transaction price when the planned redevelopment project is in proximity of 500-meters.

If the housing type of the transaction is a single-family house, then it is associated with a ($e^{0.1855}$ -1) x 100 (= 20.38%) percentage increase in the transaction price. This value might be distorted due to the large quantity of transaction prices considering apartments instead of single-family houses. Common advantages reflecting a house includes more space, possibly a garden and further independence. The previous mentioned parameters are all significant at the 1%-level.

The coefficients for the variable number of rooms are positive, until there are seven rooms within the properties of transaction in reference to a studio. The different number of rooms are significant at the 1%-level except for one-room and six-room housing. This means, as the number of rooms increase, so does the house price until the three-room housing as the coefficients from there onwards are in a descending order. When the number of rooms increases past a three-room housing, then the house transaction price declines, therefore, the marginal benefit would descend.

Location fixed effects are on a territory level based on the twelve territories consisting in the study area. The house transaction prices tend to be lower in all the territories besides the reference variable as of T1 Paris. The lowest transaction prices are expected within the neighbourhoods of the territories T6 Plaine Commune, T7 Paris Terres d'Envol and T9 Grand Paris - Grand Est, with a 59% to 66% lower price indication in comparison to the reference category. Therefore, it can be drawn to conclusion that T1 Paris is the most preferred location to live at in Paris.

Table 6. Regression results of transaction prices in proximity to distinct transformation types of planned redevelopment projects

	Natural logarithm of house prices		
VARIABLES	(1)	(2)	(3)
Near to planned project – within 500 m			
[Near to rehabilitation as reference]			
Near to demolition-and-development	-0.25273***	-0.18371***	-0.04788***
	(0.02020)	(0.01619)	(0.01349)
Near to both transformations	-0.38035***	-0.31311***	-0.21678***
	(0.02256)	(0.01879)	(0.01536)
Single-family house [yes = 1]		-0.10885***	0.24402***
		(0.01818)	(0.01676)
Surface area [in m^2]		0.01486***	0.01197***
		(0.00054)	(0.00048)
Number of rooms			
[0 = studio as reference]			
1.		-0.38961***	-0.30388**
		(0.14637)	(0.15176)
2.		-0.19222	-0.01948
		(0.14681)	(0.15206)
3.		-0.20677	0.07828
		(0.14843)	(0.15324)
4.		-0.32319**	0.05336
		(0.15116)	(0.15527)
5.		-0.38728**	-0.02043
		(0.15516)	(0.15809)
6.		-0.72059***	-0.32310*
		(0.16600)	(0.16649)
7.		-0.97987***	-0.55062***
		(0.18631)	(0.18360)
8.		-1.46823***	-0.96121***
		(0.26509)	(0.25239)
9.		-2.07906***	-1.43796***
		(0.49836)	(0.44237)
Transaction year			
[2018 as reference]			
2019		0.03469**	0.04550***
		(0.01520)	(0.01214)

2020		0.08914***	0.10328***
		(0.01559)	(0.01241)
2021		0.10210***	0.09141***
		(0.01587)	(0.01273)
2022		0.15191***	0.11168***
		(0.01540)	(0.01223)
2023		0.13579***	0.09350***
		(0.01884)	(0.01490)
Territories			
[T1 Paris as reference]			
	T2 Vallée Sud Grand Paris		-0.43737***
			(0.01135)
	T3 Grand Paris Seine Ouest		-0.16352***
			(0.01305)
	T4 Paris Ouest La Défense		-0.23013***
			(0.01089)
	T5 Boucle Nord de Seine		-0.62949***
			(0.01750)
	T6 Plaine Commune		-
			-
	T7 Paris Terres d'Envol		-0.98856***
			(0.01273)
	T8 Est Ensemble		-0.58268***
			(0.01810)
	T9 Grand Paris – Grand Est		-1.01485***
			(0.01201)
	T10 Paris-Est-Marne & Bois		-0.36405***
			(0.01378)
	T11 Grand Paris Sud Est Avenir		-0.94460***
			(0.01370)
	T12 Grand-Orly Seine Bièvre		-0.88858***
			(0.01074)
Constant		13.05507***	12.27055***	12.42806***
		(0.01933)	(0.14757)	(0.15249)
Observations		20,462	20,462	20,462
R-squared		0.01765	0.41410	0.62710

Notes: *Dependent variable is the natural log of house prices*
Location fixed effects are on territory level (12-levels)
Robust standard errors are in parentheses
****p<0.01; **p<0.05; *p<0.1*

Regarding the interpretation of table 6, the regressions were solely run on planned redevelopment projects in proximity to transactions of $property_i$. Any observation with planned transformations within the target area of 500 to 1,000-meters was secluded from the regressions, therefore, a composition of 327,817 observations were excluded from this subset. All remaining observations within table 6 have at least one planned redevelopment project near a 500-meter transaction. This table also distinguishes between the types of planned redevelopment projects. For instance, properties near projects of both planned transformations negatively associate a 19.49% with residential prices while planned demolition-and-development projects only have a 4.68% negative association to house prices in relation to the reference of planned rehabilitation projects. Both values have a significance level of 1%.

Table 7. Regression results of transaction prices in distance to specific transformation types referred to planned redevelopment projects

	Natural logarithm of house prices					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Near to planned project – within 500 m [no transformation as reference]						
Near to rehabilitation	0.06343***	0.05988***	0.03647***	0.05063***	0.04262***	0.03624***
	(0.00650)	(0.00531)	(0.00412)	(0.00643)	(0.00521)	(0.00411)
Near to demolition-and-development	-0.12200***	-0.10616***	-0.00488***	-0.11765***	-0.09929***	-0.00126
	(0.00256)	(0.00196)	(0.00161)	(0.00260)	(0.00199)	(0.00165)
Near to both transformations	-0.30896***	-0.27263***	-0.09005***	-0.25921***	-0.24252***	-0.07939***
	(0.00327)	(0.00269)	(0.00224)	(0.00343)	(0.00282)	(0.00230)
Far from planned project – 500 - 1,000 m [no transformation as reference]						
Far from rehabilitation				0.08291***	0.12605***	0.06718***
				(0.00767)	(0.00605)	(0.00505)
Far from demolition-and-development				-0.13158***	-0.10004***	-0.01853***
				(0.00556)	(0.00428)	(0.00347)
Far from both transformations				-0.23554***	-0.15406***	-0.05483***
				(0.00557)	(0.00435)	(0.00354)
Single-family house [yes = 1]		-0.13663***	0.18260***		-0.12271***	0.18435***
		(0.00338)	(0.00304)		(0.00338)	(0.00304)
Surface area [in m^2]		0.01382***	0.01258***		0.01347***	0.01245***
		(0.00012)	(0.00011)		(0.00012)	(0.00011)
Number of rooms [0 = studio as reference]						
1.		-0.07759*	-0.00622		-0.06107	-0.00061
		(0.04269)	(0.04267)		(0.04205)	(0.04246)
2.		0.12351***	0.27919***		0.15016***	0.28785***
		(0.04273)	(0.04269)		(0.04208)	(0.04248)
3.		0.12078***	0.36956***		0.15617***	0.38058***
		(0.04293)	(0.04286)		(0.04228)	(0.04265)
4.		0.03633	0.32481***		0.07602*	0.33721***
		(0.04330)	(0.04317)		(0.04266)	(0.04295)
5.		-0.01146	0.23626***		0.02899	0.24965***
		(0.04394)	(0.04366)		(0.04328)	(0.04345)
6.		-0.18144***	0.04075		-0.13651***	0.05616
		(0.04514)	(0.04466)		(0.04450)	(0.04445)
7.		-0.39487***	-0.18224***		-0.34271***	-0.16424***
		(0.04872)	(0.04779)		(0.04811)	(0.04759)
8.		-0.61890***	-0.40195***		-0.55590***	-0.37966***
		(0.06049)	(0.05821)		(0.05980)	(0.05796)
9.		-0.93850***	-0.69014***		-0.86835***	-0.66557***
		(0.08389)	(0.07933)		(0.08328)	(0.07912)
Transaction year [2018 as reference]						
2019		0.03472***	0.03728***		0.03374***	0.03694***
		(0.00328)	(0.00260)		(0.00324)	(0.00260)
2020		0.08804***	0.09895***		0.08737***	0.09878***
		(0.00337)	(0.00268)		(0.00334)	(0.00267)
2021		0.12195***	0.12060***		0.12160***	0.12062***
		(0.00334)	(0.00267)		(0.00331)	(0.00266)
2022		0.15283***	0.13144***		0.15141***	0.13130***
		(0.00333)	(0.00266)		(0.00329)	(0.00265)
2023		0.12960***	0.09183***		0.12757***	0.09167***
		(0.00413)	(0.00333)		(0.00408)	(0.00332)
Territories [T1 Paris as reference]						
T2 Vallée Sud Grand Paris			-0.41410***			-0.41425***
			(0.00265)			(0.00269)
T3 Grand Paris Seine Ouest			-0.19026***			-0.20306***
			(0.00345)			(0.00346)

T4 Paris Ouest La Défense			-0.21917***			-0.21464***
			(0.00289)			(0.00288)
T5 Boucle Nord de Seine			-0.46529***			-0.45224***
			(0.00303)			(0.00303)
T6 Plaine Commune			-0.84617***			-0.82201***
			(0.00379)			(0.00387)
T7 Paris Terres d'Envol			-1.05724***			-1.04895***
			(0.00344)			(0.00344)
T8 Est Ensemble			-0.58771***			-0.56487***
			(0.00329)			(0.00333)
T9 Grand Paris - Grand Est			-0.93145***			-0.92355***
			(0.00320)			(0.00318)
T10 Paris-Est-Marne & Bois			-0.42790***			-0.42866***
			(0.00310)			(0.00313)
T11 Grand Paris Sud Est Avenir			-0.83265***			-0.83277***
			(0.00359)			(0.00357)
T12 Grand-Orly Seine Bièvre			-0.77262***			-0.76912***
			(0.00261)			(0.00261)
Constant	12.78836***	11.82675***	11.99962***	12.93218***	11.91088***	12.01642***
	(0.00177)	(0.04281)	(0.04275)	(0.00571)	(0.04239)	(0.04269)
Observations	348,279	348,279	348,279	348,279	348,279	348,279
R-squared	0.02747	0.40525	0.61934	0.04374	0.41565	0.62114

Notes: Dependent variable is the natural log of house prices
Location fixed effects are on territory level (12-levels)
Robust standard errors are in parentheses
****p<0.01; **p<0.05; *p<0.1*

Regarding table 7, there is a distinction of transformations in proximity to $property_i$. The transformations of planned redevelopment projects distinguish between no planned transformation, planned rehabilitation, planned demolition-and-development and the planned combination of both transformations. For instance, models 1, 2, and 3 focus on the transformations occurring near to $property_i$ within a 500-meter radius. One unexpected finding was the extent to which the coefficients changed the sign and value based on the distinction between transformations. Nevertheless, the coefficients tend to resonate in size as more control variables are added to the individual models. The transactions in proximity to planned rehabilitation have led to positive significant coefficients. The residential transactions located near planned rehabilitation associate a 3.69% higher house price, while properties near planned demolition-and-development are not significant as compared to the reference category of no near planned transformations. The association of transaction prices are largest when both transformations infiltrate within a 500-meter radius on the transaction. Both planned transformations correlate to a significant 7.63% lower transaction price as opposed to the reference class.

The outcomes for the variables far from planned projects in relative distance to transactions are significant. The models 4, 5, 6 resemble the continuity of planned rehabilitation having a positive association on house prices while both planned transformations have a negative relation to house prices. Planned rehabilitation projects, within the 500 to 1,000-meter range, explore a 6.95% higher house price, as to the reference variable. This is a higher percentage than the value of rehabilitation projects in proximity to transactions.

The residential transaction prices far from planned demolition-and-development projects associate a price drop of 1.84%, while far from both planned transformations relate a 5.34% decline in house prices in comparison to

the reference icon. No planned transformation is used as the reference category. The coefficients of no planned projects in relation to house prices are expected to remain constant, therefore, the outcomes can rely on the reference category of no transformation. In addition, the outcomes of the control variables tend to align with the regressions as shown in table 5.

In contribution of the results, a regression was run as shown in Appendix E, where the observations were mutually exclusive, the observations were either set within a 500-meter radius or in the range of 500 to 1,000-meters. The distinction between the types of planned redevelopment projects located in the control or target area has strengthened the results of table 7. The association between the variables increased while the tendency remains the same, with the exception of the planned demolition-and-development projects, which positively associates with house prices.

4.2 Robustness and heterogeneity

For the robustness test, the regressions are surpassing robust standard of errors. Furthermore, Chow tests are implied to assess the stability of coefficients in multiple linear regression models (Chow, 1960). In addition to evaluating whether there is a significant difference among the coefficients in the regression model between different subgroups, providing insights to determine structural change between the variable in the data.

$$Chow\ F = \frac{RSS_p - (RSS_1 + RSS_2)}{k} \Big/ \frac{RSS_1 + RSS_2}{T - 2k}$$

Where, the Chow F test follows a k-distribution, last factor of the denominator $(T - 2k)$ is the degree of freedom, k is the number of parameters, RSS_p is the sum of the squared residuals from the dataset, RSS_1 and RSS_2 are the sum of residuals from the individual regression subgroup, and T is the total number of observations in the data.

Table 8. Regression results of the Chow tests

	Natural logarithm of house prices		
VARIABLES	Residual Sum Squares	Number of observations	Regressors
Housing type			
Pooled	63734.0113	348,279	28
Single-family house	7750.45027	43,268	
Apartments	52587.3247	305,011	
Territories			
Pooled	99410.7762	348,279	18
T1 Paris	23479.6353	110,104	
T2 Vallée Sud Grand Paris	2860.14881	25,284	
T3 Grand Paris Seine Ouest	2930.72019	17,564	
T4 Paris Ouest La Défense	4580.83827	27,821	
T5 Boucle Nord de Seine	3708.88025	23,341	
T6 Plaine Commune	3594.83632	18,167	
T7 Paris Terres d'Envol	1565.27464	14,701	
T8 Est Ensemble	4143.77781	22,524	
T9 Grand Paris - Grand Est	2709.79368	19,644	
T10 Paris-Est-Marne & Bois	5109.38468	26,613	
T11 Grand Paris Sud Est Avenir	1295.73509	11,857	
T12 Grand-Orly Seine Bièvre	4084.60819	30,659	

Notes: Dependent variable is the natural logarithm of house prices.

The units for the Chow tests are portrayed in table 8. Two heterogeneity tests are being run, one based on the housing type and the other one shows the geographical diversity of Parisian territories. The individual regression for each subgroup is indicated in Appendix G.

In the regressions for single-family houses and apartments, the variables have a significant and positive coefficient in both estimations. To test whether the coefficients are significantly different between the distinction of housing types, a Chow test is performed as shown below:

$$Chow\ F = \frac{63734.01 - (7750.45 + 52587.32)}{28} \Big/ \frac{7750.45 + 52587.32}{348{,}279 - 2(28)} = 700.02$$

The Chow test indicates an F-score of 700.02 which is higher than the critical value of 1.48 at a significance of 0.05 (f [28, ∞] = 1.48). The critical value is found in the F-distribution table (refer to Appendix F). Based on these results, the correlation between transaction prices state significantly different outcomes for single-family houses and apartments.

Furthermore, concerns may arise when assessing the results especially by taking into the account spatial and societal differences across the twelve territories. Therefore, heterogeneity is tested across the twelve geographical territories with the Chow test.

$$Chow\ F = \frac{99410.78 - (23479.64 + 2860.15 + 2930.72 + 4580.84 + 3708.88 + 3594.84 + 1565.27 + 4143.78 + 2709.79 + 5109.38 + 1295.74 + 4084.61)}{18} \Big/ \frac{523479.64 + 2860.15 + 2930.72 + 4580.84 + 3708.88 + 3594.84 + 1565.27 + 4143.78 + 2709.79 + 5109.38 + 1295.74 + 4084.61}{348{,}279 - 12(18)}$$

$$= 12667.38$$

The results of the regressions for each of the twelve territories show the Chow test state the F-score of 12667.38 which is greater than the critical value of 1.61 at a 0.05 significance (f [18, ∞] = 1.61). These results show diverse correlations between the territories meaning transaction prices are significantly different for each territory.

5. DISCUSSION

The research explores the relationship between planned redevelopment projects and house transaction prices. To assess the house prices in proximity of a 500-meter radius to planned redevelopment projects and whether there is a distinction between the types of transformation: planned demolition-and-development and planned rehabilitation. The research also aims to identify whether planned projects are targeted to be implemented in specific neighbourhoods and if the findings were generalisable in the territories of the Greater Metropolitan Region of Paris.

The findings suggest that there is a negative association of planned redevelopment projects in proximity to house prices in the transaction years of 2018 to 2023. The significant coefficient exemplifies a negative 2.17% association to house prices. The house prices tend to shift to lower prices, when there are planned redevelopment projects within a radius of 500-meters, as seen in the theoretical framework and investigated with a hedonic regression model. In support of the findings, the house prices may have a negative association with planned redevelopment projects as these are ultimately not constructed yet and therefore, the house prices may have more of an association to neighbourhood characteristics. The findings associate planned redevelopment projects with being lucrative in neighbourhoods of poor perceived qualities. Most projects are planned in neighbourhoods with a lower range of income, consistent with the literature of Weber et al. (2006) who confirms for redevelopment projects to occur in neighbourhoods with declining/stagnant income or property prices. Neighbourhoods in territories T6 Plaine Commune, T7 Paris Terres d'Envol and T12 Grand-Orly Val-de-Bievre Seine-Amont have the highest number of planned redevelopment projects, as well as households with the lowest income while the regressions record the lowest house prices in the territories T6 Plaine Commune, T7 Paris Terres d'Envol, and T9 Grand Paris Grand Est. Furthermore, lower transaction prices are accumulating from existing housing in neighbourhoods of poor quality or in competition to properties undertaken improvements such as rehabilitation or new contributions through demolition-and-development. The results indicate an assumption where transaction prices associate more with neighbourhood qualities than the planned redevelopment projects. Nonetheless, a variability across the twelve territories of the Greater Metropolitan Region of Paris is taken on record based on the heterogeneity test.

Despite the neighbourhood qualities, house prices increased over the previous years in Paris, as the city struggles with spatial scarcity for housing. The potential net additions to the housing stock by planned redevelopment projects may reduce the housing scarcity and may release the pressure on housing demand. On the contrary, house prices may decline, due to the expected disturbances during the construction phase which may distort the willingness to pay for housing near planned redevelopment projects (Ng, 2000; Turf Factory Direct, 2021; Kuiper, 2023). Regarding Whitehead et al. (2015), nearby house prices decline throughout the construction phase of redevelopment projects, but the prices rise after completion, which is falling in line with the study of Kurvinen and Vihola (2016). Based on these studies, it is expected to for the planned redevelopment projects to influence the statistical analysis post construction.

The distinction of transformation types: no transformation, planned rehabilitation, planned demolition-and-development and transformation of both features led to significant coefficients. Lower coefficients are present between house prices in distance to the individual planned redevelopment project in comparison to the joint impact of both planned redevelopment projects. This means that the individual planned transformations of rehabilitation and demolition-and-development have a lower relation to house prices while the unity of both transformations have a stronger association to prices. The coefficients showed a significant positive relation of planned rehabilitation despite the radius change. For instance, properties in proximity to planned rehabilitation are associated with a 3.69% higher house price, while properties near both planned transformations have transaction prices lower by 7.63% as compared to the reference category of no transformations in 500-meter radius. The association of transaction prices is largest when both transformations infiltrate near the transaction. On the other hand, the house prices far from planned rehabilitation are associated with higher positive values as opposed to the house prices declining far from planned demolition-and-development projects. The observed increase in house prices by planned rehabilitation could be attributed to the upcoming physical improvements of the property plus neighbouring qualities. These findings support the results of Smith and Hevener (2011), where rehabilitation raised the median sales price in the target region, in particular distressed properties which executed rehabilitation led beneficial spillovers to raise neighbouring transaction prices (Ganduri & Maturana, 2022). Unfortunately, the findings of planned demolition-and-development on house price are rather difficult to interpret because of the combination of two concepts. For instance, through the destruction of properties tends to resonate a negative association with house prices in sequence of the study from Bramley et al. (2007). While Yin and Silverman (2015), acknowledged demolished properties to have no significant impact on house prices for the years before or after massive demolition effort, which could relate to the lower association within the findings. Overall, the results have similarities with the research of Brunes et al. (2020), who discovered positive house prices in proximity to developments. The combination of demolition, which tends to have a negative relation to house prices and development, which contributes with positive outcomes can compensate for the small percentage associating to house prices. However, the literature of Kurvinen and Vihola (2016) demonstrated an immediate positive 2.6% relation on house values within one year after the development is completed, cementing the theoretical belief that rehabilitation and demolition-and-development do indeed raise house prices following a certain period of time.

This study focuses on future-oriented planned redevelopment projects in proximity to the residential transactions and identifies a reaction of house prices prior to the completion as the expectation of future benefits leads to an increase in prices (Liang et al., 2019). Planned projects will eventually induce urban change, enhance living quality, and improve the city's appearance leading to an ultimate increase of house prices (Kuiper, 2023; Liang et al., 2019). However, the negative outcomes of planned projects relate to a rise in house prices resulting in gentrification and displacement of vulnerable groups (Wilhelmsson et al., 2021).

The data lacks to certify hypothesis 1, instead of a higher relation, there is a lower negative percentage association to transaction prices within a 500-meter radius in comparison to the 500 to 1,000-meters range from

planned redevelopment projects. Several components could explain this observation. For instance, it might be explanatory due to the frequency, which is at large in the buffer of 500 to 1,000 meters. Nevertheless, this study struggles to demonstrate the association of planned redevelopment projects to fade with distance to the transaction. Therefore, an alternative explanation for this result is based on transactions distanced far from projects are less associated to redevelopment projects, but instead, these relate to externalities caused by neighbourhood qualities. As previously discovered more redevelopment projects are planned in poor perceived neighbourhoods, which supports the lower transaction prices in these neighbourhoods. It is possible that the results have been confounded by the external factors to reassure hypothesis 1, as house prices may not only stand in association to redevelopment projects depending on the distance. Positive and negative externalities are therefore judged on the perceived neighbourhood qualities rather than those interpreted from planned redevelopment projects. Nevertheless, the idea implication of planned redevelopment may increase the neighbourhood quality because of socio-economic and environmental changes. This modifies poorly perceived qualities to highly perceived neighbourhood qualities which supports the expectation of house prices to rise.

Nevertheless, there are limitations to this research. This study focuses on future-oriented planned redevelopment projects in proximity to the residential transactions, the results are explorative, so predictions remain and are used for interpretations. There remains a likelihood for planned projects to be withdrawn before construction, this may happen and should be considered in the outcomes. There is an absence of investigations involving planned redevelopment projects, which struggles to support the results in comparison to completed redevelopment projects. Regarding the data, multiple observations had to be eliminated due to missing values and transaction prices which exemplified buildings instead of specifying the price per apartment. Furthermore, the DVF dataset did not provide the construction years of the properties, which may have been useful for determining the deterioration of the properties and to build a relation with foreseen rehabilitation. The new use type of reconstruction was also not specified within the data, which may have alternated the residential transaction prices as well. Another limitation was the lack of neighbourhood characteristics which contributed to the empirical analysis; therefore, the results might have been affected by alternative reasons instead of the planned redevelopment projects. Although there are these limitations, it remains a relevant study as it establishes the association of house prices with different types of transformations of future-oriented redevelopment projects and creates a potential foundation for a causal effect of redevelopment projects influencing house prices.

6. CONCLUSION AND REFLECTION

This study aims to analyse the association of planned redevelopment projects in the proximity of house transaction prices in the Greater Metropolitan Region of Paris, France. The research examines house prices using a hedonic model and the use of ordinary least-square regressions. The investigation reflects a significant association of 2.17% lower residential transaction prices, when planned redevelopment projects are within a 500-meter radius. Furthermore, significant differences in residential transaction prices are observed between the distinct types of transformations. Planned rehabilitation projects associate positively with prices while neighbourhoods including planned demolition-and-development projects or both transformations describe a negative relation to transaction prices. Nonetheless, the combination of both transformations indicates a higher association with house prices when in proximity to transactions. The distinction between far and near may be explained by the concentration of where the redevelopment projects are planned, as there is a higher tendency for transformations to take place in poorer neighbourhoods and therefore, reflect a lower transaction price. The investigation explored heterogenous outcomes between the two categories of housing type and the twelve territories of the Greater Metropolitan Region in Paris, France. Based on these findings/research, it appears that planned redevelopment projects tend to be associated with residential transaction prices.

The central research question was comprehensively investigated through concepts found in redevelopment literature and quantitative record presenting transactional data in Paris. This analysis contributes to further discussions of policies to support future planned transformations while considering the local housing market. Due to geographical and environmental constraints, local policymakers should acknowledge and promote policies to support rehabilitation of existing properties further instead of focusing on demolition-and-development projects. Results indicate spatial differences among house prices in range of planned redevelopment projects. Neighbourhoods of poorly perceived quality should be considered by urban policymakers as housing prices can be associated with neighbourhood quality. Housing policies have the potential to offer assistance for vulnerable residents, prevent displacement, and provide affordable housing as recommendations for achieving more equitable housing. The redevelopment projects are in the planning phase; therefore, the policymakers have enough time to establish regulations to condemn the potential causal effect of new redevelopment projects on house prices. In addition, environmental contributions such as green spaces have an impact on stability and safety, as well as subjective welfare benefits. For instance, the inhabitants of poor-quality neighbourhoods should be provided with assistance to enhance their wellbeing through health and life satisfaction. These changes can impact the perception of neighbourhoods, therefore increasing neighbourhood quality, and changing the association to house prices. The findings raise awareness for homebuyers and potential property buyers and sellers as house prices can be associated with upcoming redevelopment projects, taking into account both the project being conducted as well as the positive and negative externalities that come from it.

Future investigations may elaborate on what neighbourhoods' developments take place while considering further external neighbourhood characteristics such as safety measures, or access/distance to facilities, which may be associated with house transaction prices. To develop deeper understanding of the association, additional studies will be needed that distinguish between the different causes. This study suggests that in proximity to anticipated improvements it will incentivize future benefits as well as create disturbances influencing house prices. To validate the causes, anticipation effects are relevant to consider for evaluating planned redevelopment projects. Furthermore, after the planned redevelopment projects are constructed, research can measure the before and after effect of the built projects influencing house prices. In addition, this research can be applied to other study areas to gain deeper understanding of the potential redevelopment projects and their association between transactional prices and redevelopment projects.

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APPENDICES

Appendix A. Data descriptives

Table 9. Definition of variables

Variables	Definition
Transaction price	Sales price of $property_i$ at time t
Near to planned redevelopment projects	Dummy 1 if the planned redevelopment project is within a 500-meter radius to the transaction of $property_i$, otherwise 0, where the planned redevelopment project is between the range of 500 to 1,000 meters to $property_i$
Far from planned redevelopment projects	Far from planned redevelopment projects in the range between 500-to-1,000-meter buffer to the sale of $property_i$
Near to no transformations	The transaction of $property_i$ is within 500-meter radius with no planned transformations
Far from no transformations	The transaction of $property_i$ is between the range of 500-to-1,000 meter with no planned transformations
Near to planned demolition-and-development	The transaction of $property_i$ is near to planned demolition-and-development within 500 meters
Far from planned demolition-and-development	The transaction of $property_i$ is far from planned demolition-and-development between the range of 500-to-1,000-meter
Near to planned rehabilitation	The transaction of $property_i$ is near to planned rehabilitations within 500meter radius
Far from planned rehabilitation	The transaction of $property_i$ is far from planned rehabilitations between the range of 500-to-1,000-meter
Near to both planned transformations	The transaction of $property_i$ is within 500-meter radius to both planned transformations of rehabilitation and demolition-and-development
Far from both planned transformations	The transaction of $property_i$ is between the range of 500-to-1,000 meter both planned transformations of rehabilitation and demolition-and-development
Single-family house	Dummy 1 if $property_i$ is a single-family house, 0 (apartment) otherwise
Surface area	Surface area of $property_i$ in square meters
Number of rooms	Number of rooms of $property_i$
Transaction year	Transaction year in which the $property_i$ is sold, time t
Territories	Location of $property_i$ in the twelve territories of the Greater Metropolitan Region of Paris
Observations	Total number of observations

Appendix B. Syntax from statistical software – Stata

Dataset of house transaction prices from the data source: Demandes de Valeurs Foncières (2023)

```
**Append datasets of all house prices in France of 2018-2023

use "D:\Master\Master Thesis\Paris Data\Geodata maybe\Geodata 2018 Q3-4.dta"
append using "D:\Master\Master Thesis\Paris Data\Geodata maybe\Geodata 2019.dta", force
append using "D:\Master\Master Thesis\Paris Data\Geodata maybe\Geodata 2020.dta", force
append using "D:\Master\Master Thesis\Paris Data\Geodata maybe\Geodata 2021.dta", force
append using "D:\Master\Master Thesis\Paris Data\Geodata maybe\Geodata 2022.dta", force
append using "D:\Master\Master Thesis\Paris Data\Geodata maybe\Geodata 2023 Q1-2.dta", force

**Cleaning data of DVF

keep if nom_commun == "Argenteuil" | nom_commun == "Paray-Vieille-Poste" | nom_commun == "Athis-Mons" |
nom_commun == "Juvisy-sur-Orge" | nom_commun == "Savigny-sur-Orge" | nom_commun == "Viry-Chatillon" |
nom_commun == "Morangis" | code_depar == "92" | code_depar == "93" | code_depar == "94" | code_depar == "75"

drop if missing(surface_re)
drop if missing(date_mutat)
drop if missing(valeur_fon)
drop if missing(code_type_)
drop if missing(nombre_pie)

drop if code_type_=="Dépendance"
drop if code_type_=="Local industriel. commercial ou assimilé"

duplicates report
duplicates list
duplicates drop
duplicates report

drop if nature_cul=="jardins"
drop if nature_cul=="terrains d'agrément"

duplicates tag id_mutation  valeur_fon id_parcelle, generate(Duplicates_Homes)
drop if Duplicates_Homes>0

sum valeur_fon, d
drop if valeur_fon<10800
drop if valeur_fon>2345000
*(1st percentile was at 10,800 and 99th percentile was at 2,345,000 so dropped past those values)

*Recode dummy variable housing type (1= house; 0=apartment)
recode code_type_ 2=0

_pctile nombre_pie , percentiles(0.1 99.9)
return list
*(percentiles: scalars: r(r1) =  1; r(r2) =  9)
drop if nombre_pie >9

split date_mutat, p(-)
rename date_mutat1 year
rename date_mutat2 month
rename date_mutat3 day
```

```
destring day, replace
destring month, replace
destring year, replace

gen modate=ym(year,month)
format modate %tm

destring valeur_fon, dpcomma replace
destring latitude, dpcomma replace
destring longitude, dpcomma replace
rename NEAR_FID near_fid
rename oid_ in_fid

summarize valeur_fon code_type_ surface_re nombre_pie i.year

**Histogram
histogram valeur_fon     (bin=55, start=10800, width=42440)
gen log_housevalue = log(valeur_fon)
histogram log_housevalue        (bin=55, start=9.2873011, width=.09782718)
```

Dataset of the planned redevelopment projects from the data source: APUR (2023)

```
**Cleaning the dataset of APUR

drop if missing(an_achev)
drop if missing(nat_decons)
drop if missing(c_projet)
drop if missing(m2_planche)

recode nat_decons 2=0

destring m2_planche, dpcomma replace
egen NewConstruction = group(c_projet)
recode NewConstruction 2=0 [0= non-built space; 1= building]

egen territories = group(l_epci)

rename oid_ NEAR_FID
```

Datasets merged: APUR and DVF

```
use "D:\Master\Master Thesis\Data from November\Merge\Distance Merge all 3 datasets.dta"
merge 1:1 in_fid using "D:\Master\Master Thesis\Data from November\House transactions\House Transaction inc
FID.dta"
rename _merge merge_transactions
merge m:1 near_fid using "D:\Master\Master Thesis\Data from November\Demolition\Demolition Data Destring 8880
inc FID.dta"

**Cleaning the merged dataset
drop if missing(in_fid)
drop if missing(near_fid)

gen Distance = near_dist
replace Distance = 1 if Distance<1000
drop if Distance>1

**Planned redevelopment projects: distinction between demolition-and-development and rehabilitation
```

```
generate n_total_500 = n_1_500 + n_2_500
generate n_total_1000 = n_1_1000 + n_2_1000

generate n_2_be_500_1000 = n_2_1000 - n_2_500
generate n_1_be_500_1000 = n_1_1000 - n_1_500
generate n_total_be_500_1000 = n_total_1000 - n_total_500

**Descriptive statistics for data within 500m radius
summarize valeur_fon n_1_* n_2_*

gen D_n_1_500 = (n_1_500 > 0)
gen D_n_2_500 = (n_2_500 > 0)

gen GroupA = (D_n_1_500==0)&(D_n_2_500==0)
gen GroupB = (D_n_1_500==1)&(D_n_2_500==0)
gen GroupC = (D_n_1_500==0)&(D_n_2_500==1)
gen GroupD = (D_n_1_500==1)&(D_n_2_500==1)

summarize GroupA GroupB GroupC GroupD

g Group= 1
replace Group=2 if GroupB==1
replace Group=3 if GroupC==1
replace Group=4 if GroupD==1

tab Group
bys Group: sum valeur_fon
bys Group: sum valeur_fon code_type_ surface_re i.nombre_pie i.year i.Territory

**Descriptive statistics for data in 500 to 1,000-meter range
gen D_n_1_500_1000 = (n_1_be_500_1000 > 0)
gen D_n_2_500_1000 = (n_2_be_500_1000 > 0)

gen GroupZ = (D_n_1_500_1000==0)&(D_n_2_500_1000==0)
gen GroupY = (D_n_1_500_1000==1)&(D_n_2_500_1000==0)
gen GroupX = (D_n_1_500_1000==0)&(D_n_2_500_1000==1)
gen GroupW = (D_n_1_500_1000==1)&(D_n_2_500_1000==1)

summarize GroupZ GroupY GroupX GroupW

g Group500_1000=1
replace Group500_1000=2 if GroupY==1
replace Group500_1000=3 if GroupX==1
replace Group500_1000=4 if GroupW==1

tab Group500_1000
bys Group500_1000: sum valeur_fon
bys Group500_1000: sum valeur_fon code_type surface_re i.nombre_pie i.year i.Territory

**Formation of dummies based on distance
g D_n_total_500=0
replace D_n_total_500=1 if D_n_1_500==1
replace D_n_total_500=1 if D_n_2_500==1

g D_far=0
replace D_far=1 if D_n_1_500_1000==1
replace D_far=1 if D_n_2_500_1000==1
```

```
tab D_far
tab D_n_total_500

**Correlation matrix
correlate valeur_fon Group Group500_1000 code_type surface_re nombre_pie year Territory
pwcorr valeur_fon Group Group500_1000 code_type surface_re nombre_pie year Territory, star(0.05)
pwcorr valeur_fon Group Group500_1000 code_type surface_re nombre_pie year Territory, star(0.01)

**Regression with dummies
reg log_housevalue D_n_total_500 code_type surface_re i.nombre_pie i.year i.Territory
reg log_housevalue D_far code_type surface_re i.nombre_pie i.year i.Territory

**Regression of the types of redevelopment projects
reg log_housevalue Group code_type_ surface_re i.nombre_pie i.year i.Territory
reg log_housevalue Group500_1000 code_type_ surface_re i.nombre_pie i.year i.Territory

*Table 5
**Regressions for dummy variable near (1), far (0)
reg log_housevalue D_n_total_500, robust
outreg2 using myfile, word dec(5) replace ctitle(model 1)
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year, robust
outreg2 using myfile, word dec(5) append ctitle(model 2)
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year i.Territory, robust
outreg2 using myfile, word dec(5) append ctitle(model 3)

*Table 7
**Multilinear regression with specific transformation types
reg log_housevalue i.Group, robust
outreg2 using myfile, word dec(5) replace ctitle(model 1)
reg log_housevalue i.Group code_type surface_re i.nombre_pie i.year, robust
outreg2 using myfile, word dec(5) append ctitle(model 2)
reg log_housevalue i.Group code_type surface_re i.nombre_pie i.year i.Territory, robust
outreg2 using myfile, word dec(5) append ctitle(model 3)
reg log_housevalue i.Group i.Group500_1000, robust
outreg2 using myfile, word dec(5) append ctitle(model 4)
reg log_housevalue i.Group i.Group500_1000 code_type surface_re i.nombre_pie i.year, robust
outreg2 using myfile, word dec(5) append ctitle(model 5)
reg log_housevalue i.Group i.Group500_1000 code_type surface_re i.nombre_pie i.year i.Territory, robust
outreg2 using myfile, word dec(5) append ctitle(model 6)

*For table 8
**Chow test for house types
reg log_housevalue D_n_total_500 surface_re i.nombre_pie i.year i.Territory if code_type_ == 1
reg log_housevalue D_n_total_500 surface_re i.nombre_pie i.year i.Territory if code_type_ == 0
reg log_housevalue D_n_total_500 surface_re i.nombre_pie i.year i.Territory

**Chow test for territories
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 1
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 2
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 3
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 4
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 5
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 6
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 7
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 8
```

```
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 9
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 10
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 11
reg log_housevalue D_n_total_500 code_type_ surface_re i.nombre_pie i.year if Territory == 12

*Table 6
**Removal of observations far from projects
drop if Group500_1000>1
tab Group500_1000

**Regression
reg log_housevalue i.Group, robust
outreg2 using myfile, word dec(5) replace ctitle(model 1)
reg log_housevalue i.Group code_type_ surface_re i.nombre_pie i.year, robust
outreg2 using myfile, word dec(5) append ctitle(model 2)
reg log_housevalue i.Group code_type_ surface_re i.nombre_pie i.year i.Territory, robust
outreg2 using myfile, word dec(5) append ctitle(model 3)

**Generate a mutual exclusive group either near or far
gen Group15 = 2
replace Group15=0 if Group==1
replace Group15=1 if Group500_1000==1
drop if Group15 = 2

*Table 11
reg log_housevalue i.Group, robust
outreg2 using myfile, word dec(5) replace ctitle(model 1)
reg log_housevalue i.Group code_type surface_re i.nombre_pie i.year, robust
outreg2 using myfile, word dec(5) append ctitle(model 2)
reg log_housevalue i.Group code_type surface_re i.nombre_pie i.year i.Territory, robust
outreg2 using myfile, word dec(5) append ctitle(model 3)
reg log_housevalue i.Group i.Group500_1000, robust
outreg2 using myfile, word dec(5) append ctitle(model 4)
reg log_housevalue i.Group i.Group500_1000 code_type surface_re i.nombre_pie i.year, robust
outreg2 using myfile, word dec(5) append ctitle(model 5)
reg log_housevalue i.Group i.Group500_1000 code_type surface_re i.nombre_pie i.year i.Territory, robust
outreg2 using myfile, word dec(5) append ctitle(model 6)
```

Appendix C. OLS assumptions

This appendix indicates whether the third model meets the assumptions of a linear regression. Furthermore, the possible consequences are described when the assumptions are not reached. Table 10 shows an overview of the technical notations and explanations of the five assumptions for linear regressions, as assessed by Brooks and Tsolacos (2010).

Table 10. Assumptions of linear regression (Brooks & Tsolacos, 2010)

Technical notation	*Interpretation*
1. $E(\varepsilon_t) = 0$	The errors have a zero mean [linearity]
2. $V(\varepsilon_i) = \sigma^2 < \infty$	The variance of the errors is constant and finite over all values of x_i [homoskedasticity]
3. $Cov(\varepsilon_i, \varepsilon_j) = 0 \; for \; i \neq j$	The errors are statistically independent of one another [no autocorrelation]
4. $Cov(\varepsilon_t, x_t) = 0$	There is no relationship between the error term and corresponding x variable [no endogeneity]
5. $\varepsilon_t \sim N\,(0, \sigma^2)$	ε_t is normally distributed [normality]

$\boldsymbol{E(\varepsilon_t) = 0}$ **– Linearity**

$\boldsymbol{V(\varepsilon_i) = \sigma^2 < \infty}$ **– Homoskedasticity**

$\boldsymbol{Cov(\varepsilon_i, \varepsilon_j) = 0 \; for \; i \neq j}$ **– No autocorrelation**

$\boldsymbol{Cov(\varepsilon_t, x_t) = 0}$ **– No endogeneity**

$\boldsymbol{\varepsilon_t \sim N\,(0, \sigma^2)}$ **– Normality**

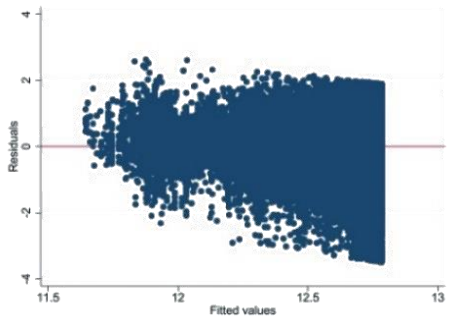

Figure A. Residuals plot OLS regression

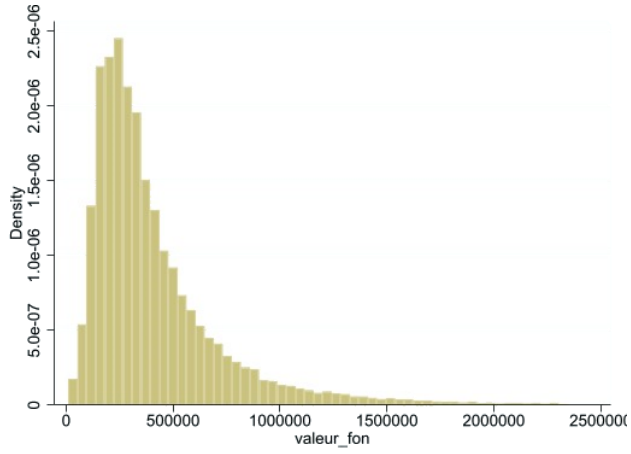

Figure B. Histogram of transaction house value

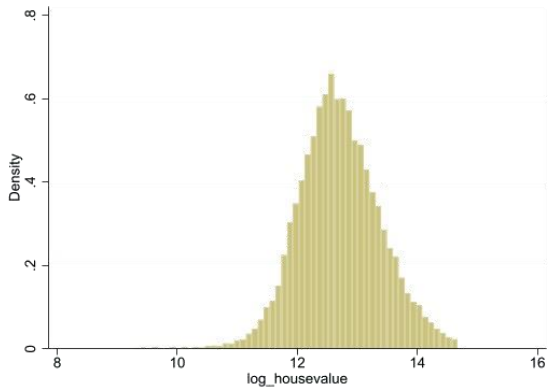

Figure C. Histogram of OLS regression, natural log of transaction value

Appendix D. Study area assertive in neighbourhoods in planned redevelopment projects occurring in poor neighbourhood quality

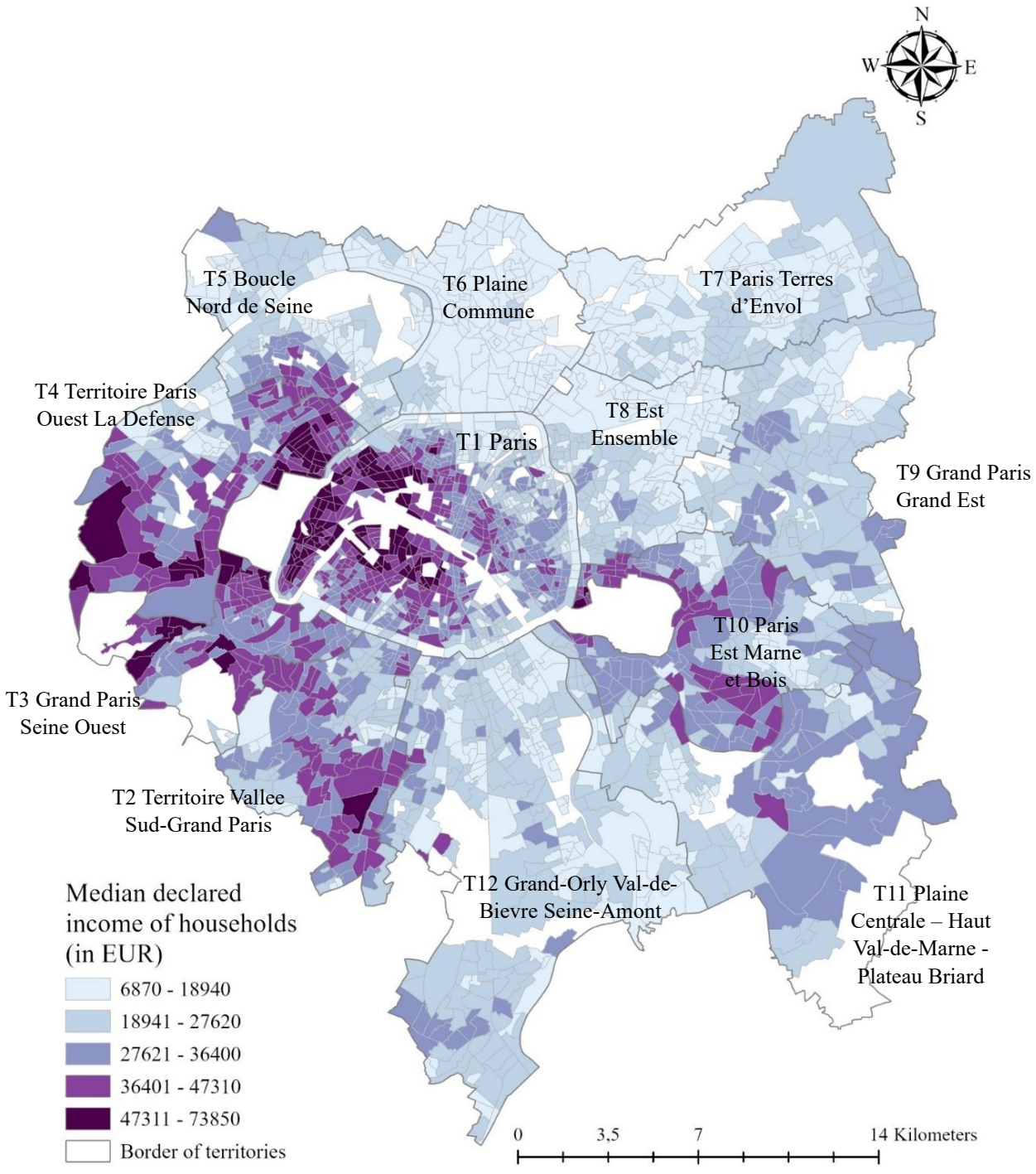

Figure D. Map of the study area in distribution of the median declared income of households (in EUR) (Insee, 2023).

Appendix E. Regression of planned redevelopment projects near versus far

Table 11. Regression of mutual exclusive observations regarding near versus far

	Natural logarithm of house transaction prices					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Only near planned project – within 500 m [no transformation as reference]						
Near to rehabilitation	0.26672***	0.16940***	0.07053***	0.33584***	0.20909***	0.10631***
	(0.01940)	(0.01591)	(0.01345)	(0.01956)	(0.01602)	(0.01353)
Near to demo-and-dev	0.01399**	-0.01589***	0.03329***	0.08312***	0.02033***	0.06494***
	(0.00613)	(0.00456)	(0.00368)	(0.00660)	(0.00498)	(0.00403)
Near to both transformations	-0.11363***	-0.14939***	-0.14557***	-0.04451***	-0.11358***	-0.11450***
	(0.01178)	(0.01049)	(0.00759)	(0.01203)	(0.01068)	(0.00777)
Only Far from planned project – 500 to 1,000 m [no transformation as reference]						
Far from rehabilitation				0.27817***	0.22497***	0.11690***
				(0.00743)	(0.00586)	(0.00503)
Far from demo-and-dev				0.07182***	0.02279***	0.03368***
				(0.00377)	(0.00293)	(0.00241)
Far from both transformations				-	-	-
Single-family house [yes = 1]		-0.19971***	0.18548***		-0.18823***	0.18780***
		(0.00488)	(0.00445)		(0.00489)	(0.00444)
Surface area [in m^2]		0.01369***	0.01214***		0.01345***	0.01203***
		(0.00015)	(0.00014)		(0.00015)	(0.00014)
Number of rooms [0 = studio as reference]						
1.		-0.16115***	-0.13853**		-0.15868***	-0.13733**
		(0.05941)	(0.05822)		(0.05852)	(0.05770)
2.		0.05950	0.17126***		0.07065	0.17580***
		(0.05944)	(0.05824)		(0.05856)	(0.05772)
3.		0.07122	0.28245***		0.08927	0.28919***
		(0.05968)	(0.05843)		(0.05880)	(0.05791)
4.		0.00201	0.25839***		0.02278	0.26605***
		(0.06013)	(0.05879)		(0.05925)	(0.05827)
5.		-0.04317	0.17085***		-0.02332	0.17881***
		(0.06088)	(0.05937)		(0.06000)	(0.05885)
6.		-0.22458***	-0.03016		-0.19938***	-0.01987
		(0.06257)	(0.06082)		(0.06171)	(0.06032)
7.		-0.46004***	-0.25483***		-0.43029***	-0.24268***
		(0.06669)	(0.06441)		(0.06589)	(0.06391)
8.		-0.72410***	-0.51989***		-0.68499***	-0.50411***
		(0.08435)	(0.08080)		(0.08360)	(0.08030)
9.		-1.03534***	-0.75567***		-0.98981***	-0.73811***
		(0.10709)	(0.09808)		(0.10601)	(0.09747)
Transaction year [2018 as reference]						
2019		0.03378***	0.03805***		0.03347***	0.03771***
		(0.00473)	(0.00378)		(0.00470)	(0.00377)
2020		0.08268***	0.09207***		0.08268***	0.09195***
		(0.00489)	(0.00390)		(0.00486)	(0.00389)
2021		0.11621***	0.11298***		0.11574***	0.11282***
		(0.00484)	(0.00389)		(0.00481)	(0.00388)
2022		0.15014***	0.12685***		0.14923***	0.12670***
		(0.00478)	(0.00385)		(0.00474)	(0.00384)
2023		0.12826***	0.08907***		0.12749***	0.08902***
		(0.00584)	(0.00475)		(0.00579)	(0.00473)
Territories [T1 Paris as reference]						
T2 Vallée Sud Grand Paris			-0.42688***			-0.42276***
			(0.00375)			(0.00377)
T3 Grand Paris Seine Ouest			-0.16675***			-0.17947***
			(0.00424)			(0.00430)
T4 Paris Ouest La Défense			-0.20566***			-0.20029***
			(0.00404)			(0.00399)
T5 Boucle Nord de Seine			-0.53869***			-0.52600***
			(0.00444)			(0.00444)
T6 Plaine Commune			-1.15977***			-1.14169***
			(0.01640)			(0.01645)
T7 Paris Terres d'Envol			-1.06404***			-1.06176***
			(0.00511)			(0.00514)

T8 Est Ensemble			-0.57766***			-0.55316***
			(0.00544)			(0.00549)
T9 Grand Paris - Grand Est			-0.92016***			-0.91452***
			(0.00390)			(0.00388)
T10 Paris-Est-Marne & Bois			-0.47789***			-0.47588***
			(0.00429)			(0.00433)
T11 Grand Paris Sud Est Avenir			-0.90049***			-0.89881***
			(0.00475)			(0.00473)
T12 Grand-Orly Seine Bièvre			-0.82341***			-0.81852***
			(0.00389)			(0.00388)
Constant	12.78836***	11.90172***	12.13794***	12.71923***	11.86511***	12.10493***
	(0.00177)	(0.05953)	(0.05830)	(0.00303)	(0.05869)	(0.05780)
Observations	174,884	174,884	174,884	174,884	174,884	174,884
R-squared	0.00249	0.41184	0.61924	0.01302	0.41904	0.62101

Notes: Dependent variable is the natural log of house transaction prices
Location fixed effects are on territory level (12-levels)
Variable: Far from both transformations is omitted because of collinearity
Robust standard errors are in parentheses
****p<0.01; **p<0.05; *p<0.1*

Appendix F. F distribution table

Table 12. F-statistic: distribution table [α = 0.05], F (df1, df2)

/	**df_1=1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**12**	**15**	**20**	**24**	**30**	**40**	**60**	**120**	∞
df_2=1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	10.13	9.552	9.277	9.117	9.014	8.941	8.887	8.845	8.812	8.786	8.745	8.703	8.660	8.639	8.617	8.594	8.572	8.549	8.526
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964	5.912	5.858	5.803	5.774	5.746	5.717	5.688	5.658	5.628
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735	4.678	4.619	4.558	4.527	4.496	4.464	4.431	4.398	4.365
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060	4.000	3.938	3.874	3.841	3.808	3.774	3.740	3.705	3.669
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637	3.575	3.511	3.445	3.410	3.376	3.340	3.304	3.267	3.230
8	5.318	4.459	4.066	3.838	3.688	3.581	3.500	3.438	3.388	3.347	3.284	3.218	3.150	3.115	3.079	3.043	3.005	2.967	2.928
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137	3.073	3.006	2.936	2.900	2.864	2.826	2.787	2.748	2.707
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978	2.913	2.845	2.774	2.737	2.700	2.661	2.621	2.580	2.538
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854	2.788	2.719	2.646	2.609	2.570	2.531	2.490	2.448	2.404
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753	2.687	2.617	2.544	2.505	2.466	2.426	2.384	2.341	2.296
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671	2.604	2.533	2.459	2.420	2.380	2.339	2.297	2.252	2.206
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602	2.534	2.463	2.388	2.349	2.308	2.266	2.223	2.178	2.131
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544	2.475	2.403	2.328	2.288	2.247	2.204	2.160	2.114	2.066
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494	2.425	2.352	2.276	2.235	2.194	2.151	2.106	2.059	2.010
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450	2.381	2.308	2.230	2.190	2.148	2.104	2.058	2.011	1.960
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412	2.342	2.269	2.191	2.150	2.107	2.063	2.017	1.968	1.917
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378	2.308	2.234	2.156	2.114	2.071	2.026	1.980	1.930	1.878
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348	2.278	2.203	2.124	2.082	2.039	1.994	1.946	1.896	1.843
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321	2.250	2.176	2.096	2.054	2.010	1.965	1.916	1.866	1.812
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297	2.226	2.151	2.071	2.028	1.984	1.938	1.889	1.838	1.783
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275	2.204	2.128	2.048	2.005	1.961	1.914	1.865	1.813	1.757
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255	2.183	2.108	2.027	1.984	1.939	1.892	1.842	1.790	1.733
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236	2.165	2.089	2.007	1.964	1.919	1.872	1.822	1.768	1.711
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220	2.148	2.072	1.990	1.946	1.901	1.853	1.803	1.749	1.691
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204	2.132	2.056	1.974	1.930	1.884	1.836	1.785	1.731	1.672
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190	2.118	2.041	1.959	1.915	1.869	1.820	1.769	1.714	1.654
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177	2.104	2.027	1.945	1.901	1.854	1.806	1.754	1.698	1.638
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165	2.092	2.015	1.932	1.887	1.841	1.792	1.740	1.683	1.622
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077	2.003	1.924	1.839	1.793	1.744	1.693	1.637	1.577	1.509
60	4.001	3.150	2.758	2.525	2.368	2.254	2.167	2.097	2.040	1.993	1.917	1.836	1.748	1.700	1.649	1.594	1.534	1.467	1.389
120	3.920	3.072	2.680	2.447	2.290	2.175	2.087	2.016	1.959	1.910	1.834	1.751	1.659	1.608	1.554	1.495	1.429	1.352	1.254
∞	3.842	2.996	2.605	2.372	2.214	2.099	2.010	1.938	1.880	1.831	1.752	1.666	1.571	1.517	1.459	1.394	1.318	1.221	1.000

Appendix G. Regressions for Chow tests

Table 13. Regression of data for house types: pooled

Source	SS	df	MS
Model	100373.432	27	3717.53452
Residual	63734.0113	348,251	0.183011711
Total	164107.443	348,278	0.471196697

Number of obs.	=	348,279
F (27, 348251)	=	20313.10
Prob > F	=	0.0000
R – squared	=	0.6116
Adj R – squared	=	0.6116
Root MSE	=	0.4278

VARIABLES Transaction price	Coefficient	Std. err.	T	P > | t |	[95% conf.	Interval]
Near to planned project – within 500 m [1 as yes]	-.0277378	.0015115	- 18.35	0.000	-.0307003	-.0247754
Surface area [in m^2]	.0128876	.0000451	285.93	0.000	.0127993	.0129759
Number of rooms [0 = studio as reference]						
1.	-.0139707	.0277891	-0.50	0.615	-.0684366	.0404951
2.	.2666447	.0277816	9.60	0.000	.2121934	.3210959
3.	.3602047	.0278332	12.94	0.000	.3056524	.414757
4.	.3278441	.027943	11.73	0.000	.2730766	.3826115
5.	.2719594	.0281753	9.65	0.000	.2167366	.3271822
6.	.1078937	.0287533	3.75	0.000	.0515381	.1642494
7.	-.1014811	.0301394	-3.37	0.001	-.1605534	-.0424087
8.	-.3131652	.0336204	-9.31	0.000	-.3790602	-.2472701
9.	-.5985848	.0409401	-14.62	0.000	-.6788263	-.5183433
Transaction year [2018 as reference]						
2019	.0371471	.0026758	13.88	0.000	.0319027	.0423916
2020	.0980869	.0027487	35.68	0.000	.0926995	.1034743
2021	.1213007	.0027102	44.76	0.000	.1159888	.1266126
2022	.133654	.0027221	49.10	0.000	.1283188	.1389892
2023	.0934247	.0033856	27.60	0.000	.0867891	.1000603
Territories [T1 Paris as reference]						
T2 Vallée Sud Grand Paris	-.3901495	.00302	-129.19	0.000	-.3960686	-.3842303
T3 Grand Paris Seine Ouest	-.1857774	.0034903	-53.23	0.000	-.1926182	-.1789365
T4 Paris Ouest La Défense	-.2160183	.0028959	-74.59	0.000	-.2216942	-.2103425
T5 Boucle Nord de Seine	-.4579301	.003106	-147.43	0.000	-.4640178	-.4518424
T6 Plaine Commune	-.8565709	.0035362	-242.23	0.000	-.8635017	-.8496401
T7 Paris Terres d'Envol	-.9954	.0038064	-261.51	0.000	-1.00286	-.9879395
T8 Est Ensemble	-.5819075	.0031679	-183.69	0.000	-.5881165	-.5756984
T9 Grand Paris - Grand Est	-.8934602	.0033528	-266.49	0.000	-.9000315	-.8868889
T10 Paris-Est-Marne & Bois	-.3983349	.002951	-134.98	0.000	-.4041188	-.392551
T11 Grand Paris Sud Est Avenir	-.809668	.0041638	-194.45	0.000	-.8178289	-.801507
T12 Grand-Orly Seine Bièvre	-.7406891	.0028109	-263.51	0.000	-.7461983	-.7351798
Constant	11.99398	.0278489	430.68	0.000	11.9394	12.04857

Table 14. Regression of data for house type: apartments

Source	SS	df	MS
Model	91116.4521	27	3374.68341
Residual	52587.3247	304,983	.172427069
Total	143703.777	305,011	.471144476

Number of obs.	=	305,011
F (27, 304983)	=	19571.66
Prob > F	=	0.0000
R – squared	=	0.6341
Adj R – squared	=	0.6340
Root MSE	=	0.41524

VARIABLES Transaction price	Coefficient	Std. err.	T	P > | t |	[95% conf.	Interval]
Near to planned project – within 500 m [1 as yes]	-.0228333	.0015711	-14.53	0.000	-.0259125	-.019754
Surface area [in m^2]	.0159436	.0000539	296.04	0.000	.015838	.0160492
Number of rooms [0 = studio as reference]						
1.	.0036755	.0274377	0.13	0.893	-.0501016	.0574525
2.	.2306888	.0274385	8.41	0.000	.1769102	.2844674
3.	.2504163	.0275133	9.10	0.000	.1964909	.3043416
4.	.146208	.0276641	5.29	0.000	.0919872	.2004288
5.	.0208695	.028044	0.74	0.457	-.0340959	.0758349
6.	-.3345447	.029562	-11.32	0.000	-.3924853	-.2766041
7.	-.8302691	.034785	-23.87	0.000	-.8984467	-.7620915
8.	-1.509855	.0518637	-29.11	0.000	-1.611506	-1.408203
9.	-2.319515	.0934213	-24.83	0.000	-2.502618	-2.136412
Transaction year [2018 as reference]						
2019	.0405018	.0027741	14.60	0.000	.0350646	.045939
2020	.1017027	.002849	35.70	0.000	.0961187	.1072867
2021	.1188579	.0028152	42.22	0.000	.1133402	.1243755
2022	.1262816	.0028259	44.69	0.000	.1207429	.1318203
2023	.0870417	.0034967	24.89	0.000	.0801882	.0938952
Territories [T1 Paris as reference]						
T2 Vallée Sud Grand Paris	-.4199058	.0031309	-134.12	0.000	-.4260423	-.4137693
T3 Grand Paris Seine Ouest	-.1991736	.0034863	-57.13	0.000	-.2060066	-.1923406
T4 Paris Ouest La Défense	-.233261	.0028987	-80.47	0.000	-.2389423	-.2275797
T5 Boucle Nord de Seine	-.4796608	.0031943	-150.16	0.000	-.4859217	-.4734
T6 Plaine Commune	-.8601454	.0036742	-234.10	0.000	-.8673468	-.8529441
T7 Paris Terres d'Envol	-1.072998	.0047567	-225.57	0.000	-1.082321	-1.063675
T8 Est Ensemble	-.5901865	.0033546	-175.93	0.000	-.5967614	-.5836116
T9 Grand Paris - Grand Est	-.9417846	.0037645	-250.17	0.000	-.949163	-.9344062
T10 Paris-Est-Marne & Bois	-.4057745	.0031066	-130.62	0.000	-.4118633	-.3996856
T11 Grand Paris Sud Est Avenir	-.8395268	.0044236	-189.78	0.000	-.848197	-.8308566
T12 Grand-Orly Seine Bièvre	-.7704361	.0029875	-257.89	0.000	-.7762915	-.7645807
Constant	11.90582	.0275152	432.70	0.000	11.85189	11.95975

Table 15. Regression of data for house type: single-family houses

Source	SS	df	MS
Model	8387.59151	27	310.651538
Residual	7750.45027	43,240	.179242606
Total	16138.0418	43,267	0.471196697

Number of obs.	=	43,268
F (27, 43240)	=	1733.13
Prob > F	=	0.0000
R – squared	=	0.5197
Adj R – squared	=	0.5194
Root MSE	=	0.42337

VARIABLES Transaction price	Coefficient	Std. err.	T	P > | t |	[95% conf.	Interval]
Near to planned project – within 500 m [1 as yes]	-.000457	.0042576	-0.11	0.915	-.008802	.007888
Surface area [in m^2]	.0059389	.000078	76.15	0.000	.005786	.0060918
Number of rooms [0 = studio as reference]						
1.	-.3082224	.1509858	-2.04	0.041	-.6041575	-.0122874
2.	-.1481095	.149911	-0.99	0.323	-.4419379	.1457189
3.	-.0478467	.1497888	-0.32	0.749	-.3414355	.2457421
4.	-.0052206	.1498279	-0.03	0.972	-.2988861	.2884448
5.	.0074315	.1499141	0.05	0.960	-.2864029	.3012659
6.	.0273174	.150096	0.18	0.856	-.2668736	.3215084
7.	.0121904	.150485	0.08	0.935	-.2827631	.3071439
8.	-.0016969	.1513869	-0.01	0.991	-.2984181	.2950244
9.	-.1069262	.1533758	-0.70	0.486	-.4075458	.1936933
Transaction year [2018 as reference]						
2019	.0171754	.0075415	2.28	0.023	.002394	.0319569
2020	.08393	.007762	10.81	0.000	.0687164	.0991436
2021	.1323645	.0075384	17.56	0.000	.1175891	.14714
2022	.1737683	.0076028	22.86	0.000	.1588668	.1886699
2023	.1356718	.0098242	13.81	0.000	.1164163	.1549274
Territories [T1 Paris as reference]						
T2 Vallée Sud Grand Paris	-.4684309	.0205705	-22.77	0.000	-.5087495	-.4281124
T3 Grand Paris Seine Ouest	-.2395476	.0231213	-10.36	0.000	-.2848657	-.1942295
T4 Paris Ouest La Défense	-.310528	.021521	-14.43	0.000	-.3527095	-.2683464
T5 Boucle Nord de Seine	-.5725229	.0208802	-27.42	0.000	-.6134485	-.5315974
T6 Plaine Commune	-1.166418	.0212206	-54.97	0.000	-1.208011	-1.124825
T7 Paris Terres d'Envol	-1.227988	.0201643	-60.90	0.000	-1.26751	-1.188465
T8 Est Ensemble	-.8615279	.0205152	-41.99	0.000	-.901738	-.8213177
T9 Grand Paris - Grand Est	-1.057657	.020217	-52.32	0.000	-1.097282	-1.018031
T10 Paris-Est-Marne & Bois	-.6222725	.0203262	-30.61	0.000	-.6621122	-.5824327
T11 Grand Paris Sud Est Avenir	-.9188343	.0214457	-42.84	0.000	-.9608682	-.8768004
T12 Grand-Orly Seine Bièvre	-.9154289	.0201503	-45.43	0.000	-.9549238	-.8759339
Constant	13.2082	.0278489	430.68	0.000	11.9394	13.50433

Table 16. Regression of pooled data: territories

Source	SS	df	MS
Model	64696.6671	17	3805.6863
Residual	99410.7762	348,261	0.285449063
Total	164107.443	348,278	0.471196697

Number of obs.	=	348,279
F (17, 348261)	=	13332.28
Prob > F	=	0.0000
R – squared	=	0.3942
Adj R – squared	=	0.3942
Root MSE	=	0.53427

VARIABLES							
Transaction prices		Coefficient	Std. err.	t	P > | t |	[95% conf.	Interval]
Near to planned project – within 500 m [1 as yes]		-.1402924	.0018256	-76.85	0.000	-.1438705	-.1367143
Surface area [in m^2]		.0140486	.0000561	250.28	0.000	0.0139385	.0141586
Single-family house [1 as yes]		-.1377207	.0030665	-44.91	0.000	-.1437309	-.1317104
Number of rooms							
[0 = studio as reference]	1.	-.0803922	.0347047	-2.32	0.021	-.1484124	-.012372
	2.	.1132216	.0346931	3.26	0.001	.0452242	.1812191
	3.	.1048977	.0347519	3.02	0.003	.0367849	.1730104
	4.	.0150963	.0348864	0.43	0.665	-.05328	.0834726
	5.	-.034345	.0351867	-0.98	0.329	-.1033099	.0346198
	6.	-.2065955	.0359249	-5.75	0.000	-.2770073	-.1361838
	7.	-.4238658	.0376632	-11.25	0.000	-.4976846	-.350047
	8.	-.651653	.0420129	-15.51	0.000	-.7339971	-.5693089
	9.	-.9723194	.0511493	-19.01	0.000	-1.07257	-.8720683
Transaction year							
[2018 as reference]	2019	.0354275	.0033416	10.60	0.000	.028878	.041977
	2020	.0880319	.0034324	25.65	0.000	.0813046	.0947593
	2021	.1216048	.0033846	35.93	0.000	.1149711	.1282384
	2022	.1542536	.0033986	45.39	0.000	.1475924	.1609148
	2023	.132052	.0042262	31.25	0.000	.1237687	.1403352
Constant		11.82614	.034772	340.11	0.000	11.75799	11.89429