

Housing Policy and Urban Development in France

Politique du logement et développement urbain en France

Thèse de doctorat de l'université Paris-Saclay

École doctorale n°630 : Droit, Économie, Management- DEM

Spécialité de doctorat : Sciences économiques

Graduate School : Économie - Management. Référent : Université d'Évry Val d'Es-
sonne

Thèse préparée dans l'unité de recherche EPEE (Université Paris Saclay, Univ Evry) sous la direc-
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Thèse soutenue à Paris-Saclay, le 11 December 2024, par

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Titre : Politique du logement et développement urbain en France

Mots clés : Politique du logement, Développement urbain, Accessibilité au logement, Incitations fiscales, Zonage à usage mixte, COVID-19

Résumé : L'accessibilité au logement est devenue un défi majeur en économie urbaine, aggravée par la hausse des prix de l'immobilier, la stagnation des salaires et des chocs externes tels que la pandémie de COVID-19. En France, le marché du logement a subi des tensions, en particulier dans ses centres urbains, où l'augmentation des prix immobiliers a engendré une insécurité en matière de logement pour les ménages à faible et moyen revenu. Cette thèse explore trois aspects clés du marché du logement français : (1) l'impact du dispositif fiscal Denormandie pour la rénovation des logements, (2) la Directive sur le zonage à usage mixte de la région parisienne, et (3) les effets de la pandémie de COVID-19 sur les préférences en matière de logement et la dynamique du marché.

Le premier chapitre examine le **dispositif fiscal Denormandie, introduit en 2019** pour encourager la rénovation des logements dans les communes de taille moyenne. Cette politique a réorienté l'attention de la construction neuve vers la revitalisation des logements sous-utilisés. En utilisant une approche de différences en différences spatiales, l'étude a révélé que le dispositif avait significativement augmenté les activités de rénovation, avec une hausse des permis de construire et des rénovations d'unités locatives dans les zones éligibles. Le dispositif a également conduit à une augmentation notable des ventes de logements vacants. Cependant, des baisses à court terme des prix des logements anciens ont été observées en raison de l'afflux de propriétés rénovées. Ces résultats suggèrent que les incitations fiscales axées sur la rénovation peuvent efficacement stimuler la revitalisation urbaine, en particulier dans les zones en déclin économique.

Le deuxième chapitre de la thèse évalue la **Directive de 2018 sur l'utilisation mixte des terres** dans la région parisienne, qui visait à équilibrer le développement commercial et résidentiel. Dans la région métropolitaine de Paris, la croissance rapide du secteur commercial a dépassé la construction résidentielle, exacerbant les pénuries

de logements. La directive exigeait que les grands développements de bureaux incluent des unités résidentielles, promouvant ainsi une croissance urbaine plus équilibrée. Un modèle de différences en différences spatiales a révélé un impact limité à court terme avec une absence notable de stimulation de la construction résidentielle. Au lieu de cela, les promoteurs ont eu tendance à réaffecter des propriétés résidentielles à un usage commercial pour contourner la réglementation. Cela met en évidence la complexité des réglementations sur l'utilisation des terres dans des marchés très demandés et contraints comme celui de la région parisienne.

Le dernier chapitre explore l'impact de la **pandémie de COVID-19** sur la dynamique du marché du logement. Les résultats montrent que la pandémie de COVID-19 a transformé les marchés immobiliers urbains, avec des conséquences notables sur la valorisation des aménités locales. Dans les grandes métropoles comme Paris, l'attrait pour la proximité du centre-ville a diminué, probablement en raison des préoccupations sanitaires et de l'essor du télétravail. Parallèlement, une forte tendance vers la vie en banlieue s'est affirmée. Les préférences pour les transports privés et l'accès aux espaces verts ont reflété un changement plus large des priorités des acheteurs durant les périodes de confinement et les restrictions de mobilité. Cependant, à mesure que ces restrictions ont été levées et que les inquiétudes sanitaires se sont apaisées, de nombreuses préférences sont revenues à leurs schémas d'avant la pandémie.

Dans l'ensemble, cette thèse offre des perspectives complètes sur la manière dont les interventions politiques façonnent le développement urbain, l'accessibilité au logement et la dynamique du marché en France.

Title : Housing Policy and Urban Development in France

Keywords : Housing Policy, Urban Development, Housing Affordability, Tax Incentives, Mixed-Use Zoning, COVID-19

Abstract : Housing affordability has become a significant challenge in urban economics, compounded by rising property prices, wage stagnation, and external shocks such as the COVID-19 pandemic. In France, the housing market has experienced a strain, particularly in its urban centers, where escalating property prices have created housing insecurity for low- and middle-income households. This thesis explores three key aspects of the French housing market: (1) the impact of the Denormandie tax incentive scheme for housing renovation, (2) the Paris Region Mixed-Use Zoning Directive, and (3) the effects of the COVID-19 pandemic on housing preferences and market dynamics.

The first chapter examines the **Denormandie tax incentive, introduced in 2019** to encourage housing renovations in medium-sized municipalities. This policy shifted the focus from new construction to the revitalization of underutilized housing. Utilizing a spatial difference-in-differences approach, the study found that the scheme significantly increased renovation activities, evidenced by a substantial rise in building permits and the number of rental units renovated in eligible areas. The scheme also led to a notable increase in the sale of vacant housing. However, short-term price reductions in older housing stock were observed due to the influx of renovated properties. These results suggest that renovation-based tax incentives can effectively stimulate urban revitalization, especially in economically declining areas.

The second chapter of the thesis evaluates the **2018 Paris Region Mixed-Land Use Directive**, which aimed to balance commercial and residential development. In the Paris metropolitan area, rapid commercial growth has outpaced residential construction, exacerbating housing shortages. The directive required large office developments to include residential units, promoting more balanced urban growth. A

spatial difference-in-differences model revealed limited short-term impact, with residential construction not significantly increasing. Instead, developers tended to repurpose residential properties for commercial use to circumvent the regulation. This highlights the complexities of land-use regulations in high-demand, constrained markets like Paris.

The final chapter explores the impact of the **COVID-19 pandemic** on housing market dynamics. The COVID-19 pandemic has fundamentally transformed urban housing markets, leading to significant repercussions for the valuation of local amenities. In metropolitan areas such as Paris, the traditional appeal of proximity to the city center has diminished, a shift likely influenced by heightened health concerns and the increasing prevalence of remote work arrangements. Concurrently, there has been a pronounced migration toward suburban living, driven by health concerns and the rise of remote work. During the pandemic, a marked preference for private transportation and access to green spaces emerged, underscoring a broader shift in buyer priorities during lockdowns and mobility restrictions. However, as these restrictions eased and public health concerns waned, many of these preferences reverted to pre-pandemic patterns.

Overall, this thesis provides comprehensive insights into how policy interventions shape urban development, housing affordability, and market dynamics in France.

Housing Policy and Urban Development in France

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December 2024

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Abstract

Housing affordability has become a critical issue in urban economics, driven by rising property prices, wage stagnation, and external shocks such as the COVID-19 pandemic. This paper examines three key aspects of the French housing market: (1) the impact of the Denormandie tax incentive on housing renovation in medium-sized municipalities, (2) the effects of the Paris Region Mixed-Land Use Directive aimed at balancing residential and commercial development, and (3) the pandemic's influence on housing preferences and market dynamics. Employing spatial difference-in-differences and hedonic regression models, the analysis reveals that the Denormandie incentive significantly increased renovation activity and vacant housing sales, though it led to short-term price reductions in older housing markets. The Paris directive produced mixed results, with limited effects on new residential construction and some unintended conversions of residential space into commercial use. The pandemic shifted housing demand temporarily, with increased preference for individual transportation, green spaces, and a more permanent impact on suburban living, as proximity to urban centers became less desirable due to teleworking. The findings contribute to ongoing policy debates surrounding housing supply, urban resilience, and sustainable urban growth, offering insights applicable beyond France.

Keywords: Housing Policy; Urban Development; Real Estate Development; Housing Affordability; Spatial Difference-in-Differences; Hedonic Regression; Land Use Regulation; Pandemic Impact on Housing Preferences; Mixed-Use Zoning.

JEL Classification: R31; R38; H31.

Contents

| | |
|---|-----------|
| 1 Tax incentives and Housing Renovation: Evidence from France | 16 |
| 1.1 Introduction | 16 |
| 1.2 Related literature and policy overview | 20 |
| 1.2.1 Related literature | 20 |
| 1.2.2 Policy Overview | 22 |
| 1.2.3 Conceptual framework | 26 |
| 1.3 Context and data | 28 |
| 1.4 Empirical Framework | 32 |
| 1.4.1 Identification Strategy | 32 |
| 1.4.2 Addressing Potential Displacement Effects | 35 |
| 1.5 Results | 36 |
| 1.5.1 The Impact of Tax Incentives on Urban Housing Renovations | 36 |
| 1.5.2 The Impact of Tax Incentives on the Sale of Vacant Housing | 45 |
| 1.5.3 The Impact of Tax Incentives on Old Housing Prices | 49 |
| 1.6 Conclusion and Discussion | 54 |
| 1.6.1 Discussion on Mechanisms | 54 |
| 1.6.2 Conclusion | 55 |
| 2 Mixed-Use Zoning and Urban Spatial Balance : Evidence from the Paris Re- | |
| gion | 58 |
| 2.1 Introduction | 58 |
| 2.2 Literature Review and Context | 60 |

| | |
|---|-----------|
| 2.2.1 Literature Review | 60 |
| 2.2.2 Context of Commercial Construction Approval Permits in 2018 | 63 |
| 2.3 Context and Data | 65 |
| 2.4 Empirical Framework | 67 |
| 2.5 Result | 71 |
| 2.5.1 Commercial Real Estate | 71 |
| 2.5.2 Residential Real Estate | 81 |
| 2.5.3 Robustness Check | 90 |
| 2.6 Conclusion and Discussion | 93 |
| 3 The Valuation of Local Amenities after COVID-19 | 97 |
| 3.1 Introduction | 97 |
| 3.2 Related Literature and Data | 99 |
| 3.2.1 Related Literature | 99 |
| 3.2.2 Data | 101 |
| 3.3 Empirical Method | 102 |
| 3.4 Result | 105 |
| 3.4.1 Individual Transportation or Public Transportation? | 105 |
| 3.4.2 Proximity to Open Spaces? | 107 |
| 3.4.3 Demand for Spacious Homes (Teleworking)? | 109 |
| 3.4.4 Paris or Its Nearby Suburbs? | 111 |
| 3.5 Conclusion and Discussion | 113 |

List of Tables

| | | |
|-----|---|----|
| 1.1 | The Impact of Tax Incentives on Urban Housing Renovations | 37 |
| 1.2 | The Impact of Tax Incentives on Urban Housing Renovations - Controlling for Displacement Effect | 38 |
| 1.3 | The Impact of Tax Incentives on Urban Housing Renovations: Displacement Effects in Non-Eligible Municipalities | 40 |
| 1.4 | The Impact of Tax Incentives on Urban Housing Renovations (Full Sample) | 43 |
| 1.5 | The Impact of Tax Incentives on the Sale of Vacant Housing | 46 |
| 1.6 | The Impact of Tax Incentives on the Sale of Vacant Housing :Displacement Effects in Non-Eligible Municipalities | 47 |
| 1.7 | Impact of Tax Incentives on Old Housing Prices | 50 |
| 1.8 | Impact of Tax Incentives on Old Housing Prices : Displacement Effects in Non-Eligible Municipalities | 51 |
| 2.1 | Examples of Commercial Project Compensation for Housing | 64 |
| 2.2 | The Impact on Commercial Development at Different Distances | 72 |
| 2.3 | The Impact on Commercial Development Under Transformation Activity at Different Distances | 74 |
| 2.4 | The Impact on Commercial Development at Different Distances Without the Nearst Ring | 75 |
| 2.5 | The Impact on Commercial Development Under Transformation Activity at Different Distances Without the Nearst Ring | 75 |
| 2.6 | Impact on Commercial Prices | 80 |

| | |
|--|-----|
| 2.7 Impact on Residential Development by Distance | 84 |
| 2.8 Impact on Residential Development by Distance | 84 |
| 2.9 Impact of New Directive on Housing Prices | 89 |
| 2.10 The Impact on Commercial Development | 91 |
| 2.11 Impact on Residential Development | 93 |
| 3.1 Valuation of Private or Public Transport after COVID-19 Dependent Variable = $\ln(\text{Real Estate Transaction Price})$ | 106 |
| 3.2 Green Space at 300m vs. 500m after COVID-19 Dependent Variable = $\ln(\text{Real Estate Transaction Price})$ | 108 |
| 3.3 Valuation of Larger Living Space after COVID-19 Dependent Variable = $\ln(\text{Real Estate Transaction Price})$ | 110 |
| 3.4 Paris vs. Nearby Suburbs after COVID-19 Dependent Variable = $\ln(\text{Real Estate Transaction Price})$ | 111 |
| 3.5 Descriptive Statistics for Eligible and Not Eligible Groups by Distance - Building Permits | 117 |
| 3.6 Descriptive Statistics for Eligible and Not Eligible Groups by Distance - Residential Transaction | 117 |
| 3.7 Comparative Statistics between Eligible and Not Eligible Groups (2015) | 118 |
| 3.8 Comparative Statistics between Eligible and Not Eligible Groups (2015) | 119 |
| 3.9 Comparative Statistics between Control and Treated Groups (2014) | 120 |
| 3.10 Comparative Statistics Within Restricted Area Real Estate Transaction | 121 |
| 3.11 Comparative Statistics Within Restricted Area Building Permits | 122 |
| 3.12 Comparative Statistics between Eligible and Not Eligible Groups - Transaction Dynamics | 123 |
| 3.13 Comparative Statistics between Eligible and Not Eligible Groups - Urban Development | 123 |
| 3.14 Descriptive Statistics for Control and Treatment Groups | 124 |
| 3.15 Descriptive Statistics for Control and Treatment Groups (2014-2022) | 125 |
| 3.16 Descriptive Statistics for Control and Treatment Municipalities | 126 |

| | |
|-------------------------------|-----|
| 3.17 Transaction Volumes | 126 |
| 3.18 Descriptive Statistics | 127 |
| 3.19 Rent Caps by Zone (2024) | 141 |

List of Figures

| | |
|---|----|
| 1.1 The Effect of Tax Incentives on Urban Housing Renovations: An Event Study Approach | 41 |
| 1.2 Displacement Effects in Non-Eligible Municipalities on Urban Housing Renovations : An Event Study Approach | 42 |
| 1.3 The Impact of Tax Incentives on Urban Housing Renovations (Full Sample) - Event Study | 44 |
| 1.4 The Impact of Tax Incentives on the Sale of Vacant Housing | 48 |
| 1.5 Displacement Effects in Non-Eligible Municipalities on the Sale of Vacant Housing : An Event Study Approach | 49 |
| 1.6 Impact of Tax Incentives on Old Housing Prices | 53 |
| 1.7 Impact of Tax Incentives on Old Housing Prices : Displacement Effects in Non-Eligible Municipalities | 53 |
| 2.1 The Impact on New Commercial Development by Distance | 76 |
| 2.2 The Impact on New Commercial Development by Distance | 77 |
| 2.3 The Impact on New Commercial Development by Distance Without the Nearest Ring | 78 |
| 2.4 Impact on Commercial Prices | 80 |
| 2.5 Impact on Residential Development at Different Distance | 86 |
| 2.6 Impact on Residential Development at Different Distance Without the Nearest Ring | 86 |
| 2.7 The Impact on Housing Prices- Event Study | 90 |
| 2.8 The Impact on New Commercial Development | 92 |

| | |
|---------------------------------------|-----|
| 2.9 Impact on Residential Development | 93 |
| 3.1 Restricted Area | 128 |
| 3.2 Control Variables | 129 |
| 3.3 Parking vs. No Parking | 130 |
| 3.4 Subway at 200m vs. Subway at 500m | 131 |
| 3.5 Green Space at 300m vs. 500m | 132 |
| 3.6 2 Rooms vs. 3 Rooms | 133 |
| 3.7 Paris vs. Nearby Suburbs | 134 |

Introduction

Housing affordability has increasingly become one of the most critical socio-economic challenges confronting urban economies worldwide. The disproportionate rise in housing costs relative to wage growth exacerbates inequalities, making housing affordability a policy concern across both advanced and emerging economies. Over the last few decades, rising housing costs in many urban centers have become pronounced, creating stress on household budgets and increasing socio-economic polarization (Glaeser and Gyourko 2018). These developments reflect deeper underlying issues, including urban spatial imbalances, market inefficiencies, and demand-supply disparities in housing stock, all of which are further exacerbated by economic shocks, such as the COVID-19 pandemic.

The French housing market offers a compelling case for investigating these dynamics. Particularly in its urban centers, the market has experienced escalating property prices and rent burdens, leading to increased housing insecurity, particularly for low- and middle-income households. In response, policymakers have debated the best interventions to address these affordability issues: should policy favor supply-side interventions, such as increasing housing stock through construction or renovation, or should demand-side measures, such as rental subsidies, take precedence? (Apgar 1990; Olsen 2003). These questions are not merely academic but crucial for understanding how housing policy shapes urban outcomes and economic resilience.

This thesis investigates these critical housing policy debates by analyzing three interrelated dimensions of housing policy in France: (1) the effectiveness of supply-side measures aimed at stimulating housing renovation, (2) the role of mixed-use zoning

regulations in addressing urban spatial imbalances, and (3) the impacts of the COVID-19 pandemic on housing preferences and market dynamics.

The first chapter provides an in-depth analysis of the Denormandie tax incentive scheme, introduced in 2019. This policy specifically targets the renovation of dilapidated housing stock in medium-sized municipalities experiencing economic decline. Unlike previous housing policies that emphasized new construction, the Denormandie scheme represents a paradigm shift in French housing policy, focusing instead on reintegrating underutilized housing into the market through renovations. The rationale behind this shift lies in recognizing that existing urban land-use constraints and environmental concerns make large-scale new construction unsustainable (Chapelle, J. Eyméoud, and Wolf [2023](#)). The chapter uses a spatial difference-in-differences (DiD) approach to evaluate the scheme's effectiveness in stimulating housing renovations and influencing local market dynamics. This contributes to the broader literature on renovation-based housing incentives, which has thus far been underexplored in comparison to new construction subsidies (Sinai and Waldfoegel [2005a](#); Eriksen and Rosenthal [2010](#); Chapelle [2015](#); P. Bono and Trannoy [2019](#); Chareyron, Ly, and Trouvé-Sargison [2021](#)).

The second chapter investigates the 2018 Paris Region Mixed-Land Use Directive, a regulatory intervention designed to address the imbalance between residential and office space in the Paris metropolitan area. Over the past several decades, commercial development in the Paris region has outpaced residential growth, leading to significant housing shortages and rising property prices in employment-dense areas such as the western suburbs (Institut Paris Region Studies [2023](#)). This directive mandates that large office developments must include a residential component, thus fostering a more balanced urban spatial configuration. This chapter situates the Paris Region policy within the broader European context, where mixed-use zoning has become a central tool in addressing urban spatial imbalances and housing affordability (Hirt [2012](#)). Using a spatial DiD model, this chapter assesses the impact of the directive on residential construction, housing affordability, and commuting patterns. The study

aims to contribute to the ongoing debate on the efficacy of mixed land-use regulations in creating sustainable urban growth in constrained housing markets (Geyer Jr 2024).

The third chapter examines how the COVID-19 pandemic has transformed housing market dynamics, with a focus on dense urban environments such as Paris. The pandemic brought about significant changes in housing preferences, diverging from pre-pandemic trends due to lockdowns and the widespread adoption of remote work (Bergeaud, Cette, and Drapala 2023; Hansez 2021). This analysis employs a spatial hedonic regression model to quantify the effects of these shifts on housing prices, demand patterns, and urban spatial configurations. The chapter places particular emphasis on the revaluation of local amenities, including proximity to open spaces, public transportation and proximity to urban center. These findings are evaluated in terms of their medium-term implications for urban resilience and housing market sustainability in a post-pandemic context.

Together, these three chapters offer a comprehensive analysis of the French housing market, contributing to a deeper understanding of how policy interventions shape urban development and housing affordability. The findings provide valuable insights for policymakers seeking to design more effective housing policies, particularly in the context of broader global trends such as rapid urbanization and unforeseen external shocks.

Chapter 1: Tax incentives and Housing Renovation: Evidence from France

This chapter examines the impact of the Denormandie tax incentive, introduced by the French government in 2019 as part of the broader *Action Cœur de Ville* (ACV) urban revitalization program. The Denormandie scheme was designed to encourage the renovation of dilapidated housing stock in medium-sized municipalities, with a primary focus on revitalizing existing properties rather than promoting new construction. This policy represents a strategic approach to addressing urban decay and increasing housing availability in regions with significant underutilized housing.

The Denormandie tax incentive specifically targets municipalities experiencing eco-

conomic and demographic decline. By incentivizing the renovation of older, often under-used housing, the policy aims to reintegrate these properties into the housing market, either for sale or for rent. This chapter seeks to answer whether the tax incentive effectively stimulated renovation activities and influenced local housing market dynamics, particularly in areas with previously low levels of market activity.

To estimate the causal impact of the Denormandie tax incentive on housing renovations and broader market outcomes, this study employs a spatial difference-in-differences methodology. The approach exploits spatial discontinuities between municipalities eligible for the tax incentive and those that are not. By comparing outcomes between municipalities located near the boundary of eligibility, this analysis isolates the impact of the tax incentive on key metrics such as housing prices, the number of renovations, building permits and vacant property sales.

While the existing literature on tax incentives has largely focused on their role in encouraging new construction, this chapter contributes to the less-explored domain of renovation-specific incentives, particularly within the context of medium-sized urban areas. Previous studies on tax incentives for new construction, such as the Low-Income Housing Tax Credit (LIHTC) in the United States, have produced mixed findings regarding their effects on housing supply, demand, and prices (Sinai and Waldfo-gel [2005a](#); Eriksen and Rosenthal [2010](#)).

In the context of France, tax incentives have historically been a cornerstone of housing policy. Earlier initiatives, such as the Robien and Borloo tax schemes, were successful in increasing housing production, though they also produced unintended consequences, including rising land prices (Rigaud, Gay, and Barthélemy [2008](#); P.-H. Bono and Trannoy [2019](#)). In contrast to these earlier initiatives, the Denormandie incentive exclusively targets the renovation of existing housing stock, making it an important case study for understanding the role of tax incentives in urban renewal.

The empirical results indicate that the Denormandie tax incentive led to a substantial increase in housing renovation activities and a rise in vacant housing sales. Some evidence of displacement effects—where renovation efforts shifted from non-eligible

to eligible municipalities—was observed, but the overall positive impact of the policy remained robust. The influx of renovated properties temporarily reduced prices for older housing, reflecting the market’s response to an increased supply of lower-quality units. However, these price effects dissipated within two years. These findings suggest that renovation-based tax incentives can be an effective tool for urban revitalization, particularly in medium-sized municipalities facing economic decline. Nonetheless, ongoing monitoring is necessary to manage short-term market disruptions.

Chapter 2: Mixed-Use Zoning and Urban Spatial Balance

This chapter investigates the 2018 Paris Region Mixed-Land Use Directive, which was designed to rectify spatial imbalances between residential and office spaces in the region. As part of a broader policy aimed at promoting balanced urban growth, this directive mandates that large-scale office developments include residential units. The goal of this mixed-use zoning regulation is to alleviate housing shortages, reduce transportation pressures, and foster cohesive urban development. By ensuring that residential units accompany major office developments, the directive seeks to address the long-standing disparities between housing availability and employment concentration in areas traditionally dominated by office construction.

Mixed-use zoning, particularly in the Paris Region, has become a widely adopted strategy for mitigating urban spatial disparities, especially in cities experiencing acute housing shortages and escalating property prices. Such policies are designed to improve neighborhood walkability and land-use efficiency, as evidenced by similar initiatives in European cities like Berlin and Copenhagen (Kim, Potter, Cho, et al. 2020). However, the Paris Region directive distinguishes itself within this broader European trend of integrated urban planning by implementing mandatory requirements, offering a stricter regulatory framework (Hirt 2012).

A spatial difference-in-differences (DiD) approach is employed, exploiting regulatory discontinuities at municipal boundaries to assess the directive’s causal impact.

The primary data sources include the *Demande de Valeur Foncière* (DV3F) for transaction data and Sitadel for building permit data, enabling a comprehensive spatial analysis of the directive's regulatory impacts.

This study contributes to the literature by providing empirical evidence on the impact of mandatory mixed-use zoning directives on urban development. It also expands discussions surrounding land-use regulation, housing affordability, and the challenges of managing urban growth in high-demand, space-constrained regions.

The empirical results reveal limited short-term effects on new residential construction, with no significant changes in building permits or new surface areas for residential projects. However, there was an increase in the conversion of residential properties into commercial units, indicating that developers may repurpose assets to avoid regulatory constraints. The policy did not lead to significant changes in housing prices in the short term, suggesting that its intended goal of alleviating market pressure has not yet been realized.

Chapter 3: COVID-19 and the Transformation of Housing Market Dynamics

The COVID-19 pandemic has led to profound disruptions in urban economies, reshaping housing market dynamics in many global cities. In particular, the pandemic triggered notable shifts in housing preferences, as households reevaluated their living environments in response to public health concerns, lockdowns, and the rise of remote work. This chapter examines how these shifts have affected the housing market in the Paris metropolitan area, providing new insights into the medium-term implications for urban spatial configurations and housing demand.

The pandemic introduced unique housing preferences that diverged from pre-crisis trends. Health concerns regarding densely populated urban environments and the transmission risks associated with public transportation led to a reevaluation of proximity to urban amenities. Demand increased for properties with private transportation options and access to green spaces, reflecting heightened concerns over individual mobility and well-being. Additionally, the widespread adoption of teleworking reduced

the need for proximity to workplaces, shifting demand toward suburban and rural areas where larger and more affordable homes were available.

Using a spatial hedonic regression model, this chapter assesses how these shifts have impacted housing prices and demand distribution across different areas of the Paris metropolitan region. The analysis focuses on key factors such as proximity to green spaces, access to private transportation, and urban density. I explore whether these preferences represent temporary adjustments or signal more lasting changes in housing market behavior.

This study makes several key contributions to the urban economics literature. First, it provides empirical evidence on how a global health crisis altered housing market preferences, with a particular focus on the Paris market. Second, it contributes to the ongoing discussion on the long-term viability of teleworking as a driver of suburbanization. Finally, it offers new insights into the resilience of urban housing markets in the face of external shocks, such as pandemics.

The results show that the COVID-19 pandemic has profoundly altered urban housing markets, with significant implications for the valuation of local amenities. In metropolitan regions like Paris, the desirability of proximity to the city center diminished, likely driven by health concerns and the rise of remote work. Concurrently, there was a notable shift toward suburban living and increased demand for larger living spaces. Temporary preferences for private transportation and access to green spaces reflected broader shifts in buyer priorities during lockdowns and mobility restrictions. However, as these restrictions eased and public health concerns waned, many of these preferences reverted to pre-pandemic patterns.

In summary, this chapter highlights the pandemic's role as a catalyst for short-term shifts in housing preferences, while also suggesting that many of these changes may be transient. By focusing on the Paris housing market, this study contributes to the broader understanding of how urban housing markets respond to exogenous shocks, providing valuable insights for policymakers and urban planners considering the long-term implications of teleworking and suburbanization in a post-pandemic

world.

Together, these chapters provide a comprehensive analysis of the French housing market, offering valuable insights into how policy interventions shape urban development and housing affordability. The findings are relevant for policymakers seeking to address the challenges of rapid urbanization and unforeseen external shocks, such as the COVID-19 pandemic.

Chapter 1

Tax incentives and Housing Renovation: Evidence from France

Imen Daly

Chapter 1

Tax incentives and Housing

Renovation: Evidence from France

1.1 Introduction

The housing affordability crisis has become a critical issue in many advanced economies, including France, where rising housing costs, coupled with stagnant wage growth, have significantly increased rent burdens on households (Glaeser and Gyourko [2018](#)). In response, governments have implemented a variety of policy interventions aimed at stabilizing housing markets and alleviating affordability pressures. A central debate in urban economics concerns whether these interventions should focus on demand-side solutions, such as housing vouchers or subsidies, or prioritize supply-side strategies that seek to increase housing availability (Apgar [1990](#); Olsen [2003](#)).

In France, supply-side interventions, which focus on stimulating the construction or rehabilitation of housing units, have long been a cornerstone of housing policy. Beginning with the *dispositif Quilès-Méhaignerie* in 1984, successive French governments have implemented tax incentives to encourage private investment in rental housing, particularly for low-income tenants (Bosvieux [2011](#)). Over the years, these programs have expanded substantially, with government spending on housing tax incentives

quadrupling between 2005 and 2018, reaching an estimated 2 billion euros annually under stable conditions (Deniau et al. 2019). Despite these significant expenditures, questions persist regarding the effectiveness of such policies in expanding affordable housing supply, given the theoretical ambiguities and limited empirical evidence on their outcomes (Sinai and Waldfogel 2005b; Eriksen and Rosenthal 2010; Chapelle, Vignolles, and Clara Wolf 2018).

A key challenge in evaluating supply-side policies lies in their dependence on the elasticity of housing supply in targeted areas. Housing supply elasticity—defined as the responsiveness of housing stock to price changes—plays a crucial role in determining whether increased demand results in more housing units or simply drives up prices (Fack 2006; Chapelle, J. Eyméoud, and Wolf 2023). In regions with inelastic housing supply, such as many French urban centers, studies have documented systematic price increases following policies designed to expand supply, including rent subsidies, subsidized loans, and tax incentives (Labonne 2015; P. Bono and Trannoy 2019). These findings suggest that, in some cases, policies aimed at improving housing affordability may inadvertently exacerbate the problem by driving up prices rather than increasing the availability of affordable housing.

In 2019, the French government introduced the Denormandie scheme, a new supply-side policy targeting housing shortages in medium-sized municipalities experiencing economic decline and population loss. Unlike previous policies focused on new construction, the Denormandie scheme offers tax incentives for the renovation of dilapidated housing stock as part of the broader *Action Cœur de Ville* initiative.¹ This shift toward rehabilitating underutilized properties represents a strategic pivot aimed at reintegrating these units into the rental market, thus addressing both housing shortages and urban decay.

The Denormandie scheme was implemented not merely as a measure to alleviate housing shortages but also to mitigate underlying market inefficiencies and socio-

¹The *Action Cœur de Ville* initiative is a French program launched in 2017 to revitalize the urban cores of medium-sized municipalities facing economic and demographic challenges. It supports housing, business, and infrastructure development to enhance urban attractiveness. See more details in the Appendix.

economic disparities. In regions characterized by high vacancy rates and underutilized housing stock, private investment in renovations has been inhibited by low anticipated returns. This has perpetuated market inefficiencies, leaving potentially viable housing units unoccupied. By offering targeted tax incentives for renovations, the scheme aims to correct these inefficiencies, encouraging private actors to reintegrate deteriorated housing units into the active housing market. Furthermore, the policy addresses broader socio-economic objectives by prioritizing municipalities marked by urban decay and concentrated low-income populations. These factors exacerbate geographic inequalities and adversely affect urban economic health.

The Denormandie scheme also addresses key inefficiencies in earlier supply-side interventions, especially in areas where housing supply elasticity is limited by geographic or regulatory constraints. By prioritizing the renovation of existing properties over new construction—particularly in locations where new development faces barriers—the scheme offers a potentially more efficient strategy for increasing affordable housing supply (Redding and Rossi-Hansberg [2016](#); P. Bono and Trannoy [2019](#)). This approach reduces the risk of driving up property prices by avoiding the cost pressures typically associated with new construction, while also facilitating the return of vacant and underutilized properties to the rental market. As such, the Denormandie scheme presents a promising policy tool for promoting urban revitalization in regions constrained by spatial limitations and market rigidities.

Despite its potential, the Denormandie scheme's impact remains underexplored. While a large body of literature has evaluated the effects of tax incentives on new housing construction (Eriksen and Rosenthal [2010](#); Chapelle, Vignolles, and Clara Wolf [2018](#); P. Bono and Trannoy [2019](#); Chareyron, Ly, and Trouvé-Sargison [2021](#)), few studies have rigorously assessed the effectiveness of tax incentives aimed at renovating and rehabilitating existing housing stock, especially in economically declining areas. This research seeks to address that gap by analyzing the Denormandie scheme's effects on housing prices, local economic revitalization, and housing availability. Utilizing a difference-in-differences (DiD) framework, this study assesses whether the policy suc-

cessfully stimulated investment and revitalized urban centers.

This study employs a spatial difference-in-differences (DiD) framework to evaluate the causal effects of the Denormandie scheme, following the methodologies of Overman and Einio [2012](#) and Kline and Moretti [2014](#). Geographic discontinuities at municipal boundaries are exploited to compare treated municipalities eligible for the policy with neighboring ineligible municipalities. This boundary-based approach isolates policy effects from broader regional trends and addresses concerns about unobservable spatial characteristics.

To strengthen causal identification, treated and control areas are defined within a geographically constrained 1–5 kilometer radius of the policy boundary. This design minimizes heterogeneity and ensures comparability of pre-treatment trends. To address potential displacement effects—where investment might shift from untreated to treated areas—the analysis excludes transactions within the immediate 1-kilometer ring surrounding the boundary, where spillover risks are most pronounced. Additionally, treatment distances are varied within the 1–5 kilometer range in 2-kilometer increments (e.g., 1 km, 3 km, and 5 km) to test the robustness of the results, reinforcing the validity of the empirical strategy and enhancing confidence in the generalizability of the results.

To assess potential displacement externalities in untreated areas, complementary spatial analyses compare real estate activity across different distances from the boundary in non-eligible municipalities. Specifically, trends in untreated areas within the 0–5 kilometer and 5–10 kilometer ranges are analyzed to determine whether observed changes reflect displacement effects, broader spillovers, or purely localized impacts.

The findings reveal that the Denormandie tax incentive significantly boosted housing renovation activity. Building permits increased by 19%, and the number of renovated rental units rose by 32.3% within 1–5 kilometers of the policy boundary. Vacant housing sales grew by 18%, reflecting the reintegration of underutilized properties into the active housing market. These effects remained consistent across varying distances, underscoring the robustness of the results and the policy's effectiveness.

Displacement effects in non-treated municipalities were negligible, as renovation activity and housing prices remained stable in spatial comparisons with non-eligible areas. Within treated zones, the policy induced a temporary 2% decline in prices for older housing stock, likely driven by an increase in vacant housing sales that temporarily exceeded demand in the older housing segment. However, this decline dissipated within two years as the market adjusted.

These findings provide new evidence on the short- and medium-term effects of renovation-focused tax incentives. Unlike studies primarily examining new construction subsidies, this analysis addresses the underexplored impacts of policies targeting dilapidated housing in economically declining areas. By employing a spatial difference-in-differences framework, the study isolates policy effects from displacement and spillover dynamics. The results underscore the potential of renovation-based incentives to expand housing availability while mitigating urban decay, offering key insights for policymakers addressing housing shortages and promoting sustainable urban revitalization.

The remainder of this paper is structured as follows: Section [1.2](#) reviews the relevant literature and policy background. Section [1.3](#) outlines the data. Section [1.4](#) describes the empirical strategy, followed by the presentation of results in Section [1.5](#). Section [1.6](#) concludes with a discussion of the findings and policy implications.

1.2 Related literature and policy overview

1.2.1 Related literature

This research contributes to the growing body of literature on the economic impacts of housing tax incentives, with a particular emphasis on policies aimed at stimulating investment in the renovation of existing housing stock. While tax incentives have been extensively studied in relation to new housing construction, relatively limited attention has been given to their role in promoting housing renovation. This gap is particularly relevant in the context of urban revitalization efforts, where the renova-

tion of existing housing stock can play a critical role in restoring underutilized urban areas, especially in medium-sized municipalities .

In the United States, the Low-Income Housing Tax incentive (LIHTC) has been a cornerstone of housing policy, extensively studied for its role in encouraging housing development. Notable studies, such as those by Sinai and Waldfoegel (2005) and Eriksen and Rosenthal (2010), have documented the LIHTC's success in attracting investment to affordable housing. However, these studies also highlight a redirection of funds towards alternative housing types, which in some cases has limited the expansion of affordable housing stock (Sinai and Waldfoegel 2005b; Eriksen and Rosenthal 2010). Similarly, McClure (2019) critiques the LIHTC for exacerbating socioeconomic segregation in metropolitan areas, as it often fails to increase supply in markets where affordability is most constrained (McClure 2019). These findings underline a broader issue in the literature: while tax incentives are powerful tools for stimulating investment, their effects on housing markets vary significantly across regions and housing types.

In France, tax incentives have also played a central role in housing policy. For instance, Rigaud, Gay, and Barthélemy (2008) evaluated the *Robien* tax incentive, which was introduced to boost housing construction, finding a positive impact on housing production in regions benefiting from the policy (Rigaud, Gay, and Barthélemy 2008). More recent studies, such as Chapelle, Vignolles, and Wolf (2018), reported that the cessation of the *Borloo-Robien* tax scheme did not significantly impact housing stock growth, but did contribute to a deflationary effect on housing prices (Chapelle, Vignolles, and Clara Wolf 2018). Bono and Trannoy (2019) further observed that the scheme led to rising land prices, suggesting inflationary pressures on property values (P.-H. Bono and Trannoy 2019). In Lyon, Chareyron, Ly, and Trouvé-Sargison (2021) found that tax incentives had a differential impact on housing prices, with new housing units experiencing price increases while older units saw a reduction (Chareyron, Ly, and Trouvé-Sargison 2021). These studies provide a nuanced understanding of the role of tax incentives in influencing housing supply and prices, but they primarily

focus on new housing construction rather than renovation.

While the above studies provide valuable insights into the effects of housing tax incentives on new construction, there is a notable gap in the literature regarding the impact of tax incentives on the renovation and rehabilitation of existing housing stock. The Denormandie scheme, which specifically targets the renovation of older housing units in medium-sized municipalities, addresses this gap. Unlike broader tax incentive programs that cover both renovation and new construction², the Denormandie scheme offers a targeted approach to urban revitalization through housing rehabilitation.

Massié (2022), for example, examined financial aid schemes related to energy-efficient renovations, finding that such incentives significantly influence homeowner decisions to retrofit older properties (Massié 2022). Similarly, Dohollou (2023) explored how tax benefits through real estate investment funds (SCPIs) have attracted significant investment into the French housing market, particularly for renovation projects (Dohollou 2023). However, these studies do not provide a regional or urban context that is central to understanding the potential of tax incentives like the Denormandie scheme to stimulate comprehensive urban renewal.

Our study aims to fill this gap by focusing on the Denormandie scheme's impact within the medium-sized municipalities targeted by the *Action Cœur de Ville* initiative. This initiative provides a unique context for studying the effects of tax incentives on housing renovation in areas that face significant economic and demographic challenges.

1.2.2 Policy Overview

The Denormandie scheme is an integral component of the *Action Cœur de Ville* (ACV) initiative, launched in 2018 to revitalize medium-sized French municipalities facing economic stagnation, population decline, and deteriorating housing conditions. The scheme specifically incentivizes the renovation of neglected housing stock through tax benefits, aiming to promote urban regeneration in the designated ACV areas.

²Such as Loi Besson; (Loi Besson Ancien 1999-2006)-(Loi Besson neuf 1999-2006).

Medium-sized French municipalities, defined as those with populations between 20,000 and 100,000 inhabitants and representing approximately 21% of the national population, have been disproportionately impacted by the decline of industrial activities and the concentration of economic resources in larger metropolitan regions (France Stratégie 2016). These trends have contributed to weakened infrastructure and aging housing stock, exacerbating social and economic challenges. According to a report by France Stratégie (2016) on Territorial Dynamics and Inequalities, these municipalities face diminishing economic opportunities, rising unemployment, and growing low-income populations. To address these issues, the ACV initiative focuses on five key objectives: the rehabilitation of city-center housing, the promotion of local economic development, improvement in mobility and accessibility, renovation of cultural heritage, and the enhancement of public services³.

The French government initially allocated €5 billion over five years for the ACV initiative, with further funding extended through 2026. These funds support a range of urban development projects, such as the creation of educational institutions, the rehabilitation of urban wastelands, and the renovation of public spaces. One of the primary mechanisms for addressing housing challenges is the Denormandie scheme, which provides tax incentives to encourage the renovation of existing properties in ACV areas.

Implemented on January 1, 2019, the Denormandie scheme offers tax incentives to private landlords who renovate deteriorated or unhealthy housing stock in medium-sized municipalities. Initially set to expire in 2022, the scheme has been extended to align with the ACV timeline. The program prioritizes the renovation of existing housing over new construction, with eligible renovations including energy efficiency improvements such as thermal insulation and heating system upgrades, provided these renovations account for at least 25% of the total transaction cost. The scheme is restricted to private landlords, excluding firms and agencies.

Landlords can claim a tax incentive based on the acquisition price of the property,

³More details in Appendix.

up to a maximum of €300,000. The tax incentive is scaled according to the length of the rental contract: 12% of the acquisition value for a six-year contract, 19% for a nine-year contract, and 21% for contracts lasting twelve years or longer. The maximum tax incentive per property is capped at €63,000 and is calculated using the following formula:

$$\text{AnnualDTC} = \left[\frac{1}{6}(0.12 \times \mathbf{1}_6) + \frac{1}{9}(0.18 \times \mathbf{1}_9) + \frac{1}{12}(0.21 \times \mathbf{1}_{12}) \right] \times \min(P, 300000)$$

where $\mathbf{1}_6$, $\mathbf{1}_9$, and $\mathbf{1}_{12}$ are dummy variables that equal one for rental contracts of six, nine, and twelve years, respectively, and P is the acquisition price capped at €300,000.

Eligibility for the tax incentive requires a minimum rental contract duration of six years, rental prices below the intermediate rent barometer set by the government,⁴ and the property's location in one of the 234 municipalities designated by the ACV initiative.

The Denormandie scheme specifically targets areas with high vacancy rates and underinvestment in housing and infrastructure (Desquinabo 2024; Stratégie 2016). Its zoning approach ensures that tax incentives are concentrated in municipalities most in need of urban revitalization.

One of the primary challenges in these municipalities is the prevalence of vacant housing, often due to poor physical conditions and energy inefficiency. High vacancy rates depress property values, reduce land-use efficiency, and limit the ability of these areas to attract both residents and businesses, exacerbating economic decline. The Denormandie scheme addresses these issues by incentivizing the renovation of vacant and neglected properties, transforming them into habitable units that support urban renewal.

The broader objective of the Denormandie scheme is to promote the rehabilitation of older, deteriorating housing units in urban centers, encouraging the repopulation

⁴The French zoning system (A, A bis, B1, B2, C) establishes rent caps based on regional housing market tension. See Table 3.19 for details on rent caps by zone.

of city centers and stimulating local economic activity (Glaeser and Gyourko 2005). By prioritizing the renovation of existing housing stock over new construction, the policy reflects a strategic shift in urban planning toward sustainability and revitalization. This emphasis also aligns with the growing demand for affordable and energy-efficient housing, modernizing the housing stock in medium-sized urban areas while addressing environmental and social challenges.

The Denormandie scheme serves as a targeted response to two primary challenges: addressing market failures in underinvested urban areas and mitigating socio-economic inequalities associated with the concentration of low-income populations in medium-sized municipalities. High vacancy rates and poor housing conditions in these areas signal a market failure, where the cost of renovation often exceeds the expected financial returns, discouraging private investment. By providing tax incentives for renovation, the scheme aims to correct this imbalance and stimulate revitalization in urban centers critical to economic and social cohesion.

Beyond addressing market failures, the policy aims to mitigate socio-economic challenges arising from the geographical concentration of deprivation. Reports from France Stratégie (Stratégie 2016) highlight diminished economic opportunities and elevated rates of low-income populations in these municipalities, rendering them increasingly vulnerable to decline without targeted government intervention. As part of the broader *Action Cœur de Ville* (ACV) initiative, the Denormandie scheme aligns with overarching objectives of promoting social equity through neighborhood revitalization and the development of affordable, habitable housing units.

While this paper primarily evaluates the scheme's effectiveness in stimulating renovations and influencing housing outcomes, a comprehensive policy evaluation would require an assessment of the financial costs of tax incentives relative to their long-term benefits. By late 2022, the program had exceeded its initial objectives, with financial commitments from the state and its partners surpassing €5 billion. Given the scheme's extension and substantial funding allocation, future research should examine the cost-effectiveness of these fiscal measures over time, particularly in relation to

the scale of urban regeneration achieved. Such an analysis should explore whether the investment in tax incentives translates into sustainable economic benefits, including enhanced property quality, improved local infrastructure, and a more resilient housing stock that supports the socio-economic vitality of these municipalities.

In this context, the Denormandie scheme highlights the delicate balance policy-makers must strike between offering financial incentives substantial enough to elicit meaningful market responses and ensuring the efficient allocation of public resources. By targeting municipalities disproportionately affected by vacancy and urban decay, the program employs a geographically focused intervention designed to address localized housing market failures. This approach seeks to maximize socio-economic benefits through urban regeneration while minimizing inefficiencies associated with broad-based fiscal measures. The scheme underscores the critical role of place-based policies in addressing spatial inequalities and revitalizing underperforming urban areas.

1.2.3 Conceptual framework

The Denormandie scheme operates through several mechanisms that collectively influence urban housing markets and broader urban revitalization efforts. The policy's design integrates demand- and supply-side incentives, each contributing distinctively to its overall impact.

On the demand side, the scheme reduces the effective cost of acquiring and renovating neglected properties through substantial tax incentives, lowering financial barriers to investment in underutilized urban areas. These incentives make renovation projects in weaker housing markets more attractive to investors, thereby increasing transaction volumes. By reducing the investment threshold, the policy enables acquisitions and renovations that would otherwise be financially unfeasible.

Another driver of demand stems from the intrinsic value of property ownership in France, where real estate is regarded as a form of *patrimoine*—a cultural and financial asset. Beyond serving as a secure investment, property ownership represents

a tangible legacy for future generations. This patrimonial perspective amplifies demand for housing units eligible under the scheme, particularly as renovations enhance their resale value. By improving both the functional and aesthetic quality of underutilized units, investors position these properties for higher market valuations post-renovation. This dual benefit of immediate tax relief and potential capital appreciation underscores the scheme's appeal, especially in markets where long-term value growth is a significant consideration for investors.

In addition to capital gains, investors may derive financial returns through rental income. However, the scheme requires compliance with rental caps on renovated units, restricting rental income relative to non-eligible areas with unrestricted rents⁵. These caps, summarized in Table 3.19, ensure that rents remain below market rates, positioning the tax incentive as the primary financial benefit. Despite limitations on rental income, the scheme remains attractive by balancing immediate fiscal benefits with long-term patrimonial gains.

On the supply side, the policy seeks to increase the availability of affordable rental units by incentivizing landlords to rehabilitate vacant or deteriorated properties into habitable rentals. By mandating minimum rental periods and rent caps for tax eligibility, the scheme directly enhances the supply of quality, affordable rental units in designated *Action Cœur de Ville* areas.

Additionally, the scheme alleviates liquidity constraints in urban housing markets by transforming previously undesirable or vacant properties into market-ready units. Before intervention, these properties were often deemed financially unviable due to their deteriorated state or high renovation costs. By altering the financial equation through tax incentives, the policy enables the rehabilitation of such properties, thereby broadening the housing supply and alleviating pressure on existing stock. This increase in liquidity fosters greater market efficiency and enhances the overall dynamism of targeted urban areas.

Beyond direct demand and supply effects, the scheme is expected to generate posi-

⁵The rental caps vary by zoning (A bis, A, B1, B2/C), reflecting regional housing market conditions. Higher caps are observed in zones with greater market tension.

tive externalities that extend its benefits to the broader urban environment. Improved housing quality and increased population density in previously underpopulated areas can stimulate local economic activity and attract businesses. As revitalized neighborhoods attract more residents, demand for retail, services, and amenities rises, creating opportunities for local businesses and drawing additional investment. Over time, this concentration of economic activity may lead to enhanced infrastructure and public services, further increasing the area's appeal and economic viability. These externalities could reinforce initial policy impacts by fostering a self-sustaining cycle of growth and investment, ultimately contributing to a more balanced urban development landscape (Glaeser and Gyourko 2005; De Groot, Poot, and Smit 2009).

The Denormandie scheme thus operates through a combination of demand, supply, and externality mechanisms, with the relative influence of each channel varying by local market conditions. For example, in areas with high vacancy rates, supply-side effects may dominate as idle properties are introduced into the market. In regions with moderate demand potential, positive externalities and portfolio considerations could play a larger role as businesses and services capitalize on the influx of residents. Observed outcomes, such as changes in transaction volumes and renovation activity, reflect the interplay of these channels, suggesting that the scheme's impact arises from a nuanced interaction of demand, supply, and externality effects, with tax incentives serving as the central driver.

1.3 Context and data

This study utilizes the *Demande de Valeur Foncière Version 3F* (DV3F) dataset, an enriched version of the standard DVF dataset, curated by the General Directorate of Public Finance (DGFIP) in collaboration with Cerema. The DV3F dataset provides transaction-level data on real estate across mainland France and the Overseas Departments and Regions (excluding Alsace-Moselle and Mayotte), spanning from 2010 to 2022. This comprehensive dataset includes key variables such as transaction prices,

property characteristics (e.g., total area, number of rooms), and precise geolocation data, offering highly granular insights into housing market dynamics. The richness of the DV3F dataset is particularly advantageous for evaluating the impacts of policy interventions like the Denormandie scheme, designed to stimulate housing renovation.

Transaction Dataset - A critical feature of the DV3F dataset is its distinction between transactions involving new and existing housing stock. This allows for an evaluation of the Denormandie scheme's specific focus on renovating existing housing in medium-sized towns, enabling a detailed assessment of how different segments of the housing market are affected. The dataset's geospatial precision, augmented by cadastral references, further facilitates spatial analysis of policy effects, particularly in relation to proximity to policy-eligible municipalities.

The analysis focuses on real estate dynamics between 2014 and 2022, capturing both the pre- and post-policy periods surrounding the implementation of the Denormandie scheme in 2019⁶. This time frame allows for a robust analysis of the policy's effects on market outcomes while accounting for broader economic trends. The sample is restricted to transactions involving residential properties, excluding land exchanges and non-residential properties. To ensure that the analysis reflects meaningful housing market activity, transactions below €40,000 are excluded to filter out outliers and non-standard sales.

The primary unit of observation in the DV3F dataset is the individual real estate transaction, allowing for a detailed and granular analysis of housing market dynamics. Each record corresponds to a unique property transaction, and we analyze these at the transaction level rather than aggregating them geographically. This approach enables a thorough examination of price trends, while controlling for each property's characteristics, in response to the Denormandie scheme.

⁶France's zoning system divides municipalities into four zones (A, A bis, B1, B2, and C) based on real estate market conditions, including housing demand and market pressure. Using the classification of Zone ABC from 2014, this study focuses on municipalities located in Zone C, which have maintained their status as Zone C municipalities throughout the period from 2014 to 2022. This approach ensures consistency in the treatment group, as the eligibility criteria and geographic boundaries for the Denormandie scheme did not change for these municipalities during this time. More details in section 1.4.

Vacant Properties - The DV3F dataset also includes information on transactions involving vacant properties, which is crucial for evaluating the Denormandie scheme's broader urban renewal goals. Vacant property transactions are identified using both transaction records and tax data, enabling us to track changes in vacancy rates and assess whether the policy has successfully brought underutilized housing stock back into the market. For the analysis, the sale of vacant units is aggregated at the municipal level, with transactions grouped by year. This creates a balanced panel, assigning a value of zero if no vacant units were sold in a given year.

Building Permits Dataset – To complement the DV3F data and evaluate changes in housing supply, we integrate data from the *Sitadel* database, which records building permits and urban planning authorizations across France. The Sitadel database tracks building permits for both residential and commercial projects, categorizing permits based on project type (e.g., new construction vs. renovation) and project purpose (e.g., personal use, sale, or rental). This dataset is particularly valuable for assessing the Denormandie scheme's impact on housing supply, with a specific focus on residential renovation projects—a key target of the policy.

To analyze the data, we construct a balanced panel at the municipal level, aggregated by year. This panel structure allows for a comprehensive examination of both annual housing market dynamics and the longer-term effects of the policy on real estate supply. Municipalities with no recorded building permits in a given year are assigned a value of zero, enabling the inclusion of all municipalities in the analysis and ensuring a detailed evaluation of renovation activity across treated and non-treated areas.

To address the presence of zeros in the permit data, we employ the transformation $\log(y + 1)$, as recommended by Chen and Roth [2024](#). This transformation ensures that the logarithmic function remains defined for municipalities without permits, while preserving the interpretability of the transformed variable. Moreover, the use of $\log(y + 1)$ mitigates potential biases introduced by the disproportionate influence of municipalities with no permits, enabling a more robust comparison between

treated and non-treated areas.

Spatial Data and Geolocation Precision – A critical aspect of this study involves the use of geospatial data to measure the proximity of real estate transactions and building permits to municipalities eligible for the Denormandie scheme. By leveraging advanced geospatial tools, we assign precise GPS coordinates to each transaction and building permit, allowing for accurate estimation of the causal impact of the policy. This is achieved by comparing treated and non-treated areas based on their relative proximity to policy boundaries.

A key challenge with the Sitadel dataset is the incomplete geolocation information for a significant portion of building permits; only 53% of permits include precise GPS coordinates (Table 3.5). To address this limitation and minimize potential biases, we implement a rigorous approach. First, the primary analysis sample focuses on permits with complete geolocation data to ensure robustness and reliability. Second, the sample is restricted to municipalities reporting GPS coordinates for at least one year and paired with counterfactuals—municipalities from the same year that also issued at least one building permit. This strategy ensures valid comparisons between treated and non-treated areas and minimizes the risk of bias caused by missing data. Finally, robustness checks are performed using the full sample, including municipalities with incomplete geolocation data, to confirm the consistency of findings across subsamples.

By combining DV3F and Sitadel datasets, we establish a robust foundation for analyzing the Denormandie scheme’s impact on housing market dynamics in medium-sized municipalities across France. The integration of these datasets enables a nuanced evaluation of policy-induced changes in both housing demand and supply.

Although the incomplete geolocation data poses challenges, the robustness checks demonstrate that the primary findings remain consistent, underscoring the reliability of the results. This geospatial approach contributes to a deeper understanding of how proximity to policy boundaries shapes housing market outcomes.

1.4 Empirical Framework

To estimate the causal impact of the Denormandie scheme on housing outcomes, we employ a spatial difference-in-differences (DiD) approach. This methodology leverages spatial discontinuities created by the policy, allowing us to compare housing outcomes in municipalities eligible for tax incentives (treatment group) with neighboring ineligible municipalities (control group). This approach, inspired by Overman and Einio (2012) and Chapelle et al. (2018) Overman and Einio [2012]; Chapelle, Vignolles, and Clara Wolf [2018], is particularly suited for evaluating place-based policies with spatial spillover concerns. Our analysis focuses on housing prices, transaction volumes, and renovation activities, accounting for potential spillover effects between treated and control areas.

1.4.1 Identification Strategy

The identification strategy relies on two primary components. First, we restrict our analysis to municipalities exclusively affected by the Denormandie scheme, excluding those eligible for broader housing policies targeting both renovation and new construction. Specifically, we focus on municipalities classified as Zone C in France's housing tax incentive zoning system,⁷ ensuring that observed changes in housing outcomes can be attributed to the scheme rather than other concurrent policies.

Second, we select neighboring Zone C municipalities not eligible for the scheme as control groups, ensuring geographic proximity and similarity in economic conditions to enhance the plausibility of the parallel trends assumption. The credibility of the DiD approach rests on the assumption that, in the absence of the policy, treated and control areas would have followed parallel trends in housing outcomes. By using neighboring municipalities as controls, we increase the likelihood of this assumption holding, thus attributing post-policy differences primarily to the Denormandie scheme.

⁷France's zoning system divides municipalities into four zones (A, A bis, B1, B2, and C) based on housing market conditions, where Zone C represents areas with low real estate pressure. These zones are generally excluded from incentives for new construction, which helps isolate the effect of the Denormandie scheme on renovations.

An essential component of our analysis is the assessment of comparability between treated municipalities and the control group of unaffected municipalities. Table 3.7 presents descriptive statistics comparing key characteristics across the two groups: municipalities eligible for the Denormandie scheme and those located near the policy boundary, which serve as the control group.

Although some differences in municipality characteristics between the treated and control groups remain, Table 3.8 shows that the two groups are largely comparable in terms of real estate market dynamics. Additionally, as demonstrated in Table 3.8, restricting the sample to transactions closer to the policy boundary further improves the comparability between municipalities on either side of the boundary.

The primary model delineates the study area as a 0-5 kilometer radius around the policy boundary. Within this framework, municipalities eligible for the Denormandie scheme constitute the treated group, while municipalities outside the scheme's scope serve as the control group.⁸

The selection of the 0-5 kilometer radius is methodologically motivated to achieve two key objectives: enhancing the reliability of the results beyond the immediate boundary and preserving the validity of the parallel trends assumption, which underpins the difference-in-differences (DiD) framework. By restricting the analysis to a geographically constrained area, this design minimizes heterogeneity between treated and control groups, thereby improving the comparability of pre-treatment trends. Differences in transaction values and renovation activities observed within this radius are more likely to capture causal effects of the policy intervention rather than confounding influences or broader market dynamics.

To assess the robustness of the results to the choice of treatment radius, we systematically vary this distance within the 0-5 kilometer range in 2-kilometer increments (e.g., 1 km, 3 km, 5 km). The findings remain consistent across these variations, indicating that the observed impacts persist even at greater distances from the boundary. By demonstrating stable effects across varying distances, the analysis reinforces the

⁸This spatial range captures approximately 51% of building permits and 95% of transactions (see Table 3.5), balancing proximity to the boundary with minimizing spillover effects.

validity of the empirical strategy and enhances confidence in the generalizability of the findings.

Our primary model is specified as follows:

$$\log(Y_{i,t}) = \delta_t + \phi_{b(i)} + \gamma_y(Post_t \times TaxIncentive_i) + \beta X_{i,t} + \varepsilon_{i,t} \quad (1.1)$$

In this model, $Y_{i,t}$ represents the outcome variable at time t (e.g., transaction prices, renovation permits). The interaction term ($Post_t \times TaxIncentive_i$) captures the treatment effect, equaling 1 for municipalities impacted by the policy post-implementation. Control variables, represented by $X_{i,t}$, adjust for time-varying factors affecting all municipalities. Time fixed effects δ_t capture broader economic trends, while boundary fixed effects $\phi_{b(i)}$ account for unobservable, time-invariant characteristics specific to the boundary. For municipal-level outcomes, $\phi_{b(i)}$ represents unobserved characteristics specific to each municipality.

A key challenge is the presence of missing address data in the building permit database. Approximately 53% of permits have precise geolocation information (see Table 3.5). Missing data could bias results if it correlates with treatment status or other unobserved factors.⁹ To address this, we employ two complementary strategies: (1) using only geolocated data with municipality fixed effects to control for spatial heterogeneity, and (2) analyzing the full sample without distance controls but with municipality fixed effects. This dual approach mitigates concerns related to missing data and enhances the robustness of our findings.

Event Study Specification for Parallel Trends Assessment – To rigorously test the parallel trends assumption, we implement an event study specification. This approach enables us to examine dynamic policy effects over time and identify any pre-treatment differences. The model is specified as follows:

⁹Municipalities with greater administrative capacity or renovation activity (likely treated areas) may report precise locations more diligently, introducing potential bias.

$$\log(Y_{i,t}) = \delta_t + \phi_{b(i)} + TaxIncentive_i \times \sum_{\substack{y=-5 \\ y \neq -1}}^3 \gamma_y I(t - t_c^* = y) + \beta X_{i,t} + \varepsilon_{i,t} \quad (1.2)$$

In this model, $I(t - t_c^* = y)$ is an indicator for each time period relative to the policy start date (t_c^*), allowing us to estimate the treatment effect for each period. The omitted category is the year prior to the policy ($y = -1$), with γ_y representing the treatment effect for each period. A lack of significant pre-treatment coefficients would support the parallel trends assumption.

1.4.2 Addressing Potential Displacement Effects

A critical consideration when evaluating spatial policies, such as the Denormandie scheme, is the potential violation of the Stable Unit Treatment Value Assumption (SUTVA). Tax incentives can induce spillover effects, where investment is shifted from untreated areas to treated zones near the policy boundary. This redistribution, commonly referred to as displacement, complicates causal inference, as increased activity in treated zones may reflect reallocation rather than genuine new investment. To address displacement effects, we employ two complementary analyses.

First, to mitigate the influence of displacement, the analysis excludes transactions within the 1-kilometer ring surrounding the policy boundary. This exclusion follows the approach of Kline and Moretti [2014](#) and is motivated by two key factors. The 1-kilometer zone represents the area of greatest economic and spatial integration with treated zones. As shown in Table [3.8](#), real estate characteristics, such as transaction values and property types, are more similar within this boundary than in areas farther away, such as those located 1–3 kilometers or 1–5 kilometers from the boundary. This proximity makes the 1-kilometer zone particularly susceptible to spillover effects, where investment in treated areas may directly influence neighboring untreated zones, or vice versa. By excluding this zone, the analysis reduces the risk of contamination and enhances the robustness of the causal estimates. Furthermore, spillover effects are

expected to attenuate with distance. Beyond the 1-kilometer boundary, the study area located 1–5 kilometers away is less likely to exhibit significant displacement effects, as the spatial and economic integration with treated areas weakens.

The findings remain consistent after this exclusion across different distance variations within the 1–5 kilometer range, indicating that the observed impacts persist even at greater distances from the boundary. This robustness supports the validity of the empirical strategy and reinforces confidence in the causal interpretation of the results.

To rigorously evaluate potential displacement effects and policy spillovers in non-eligible areas, the analysis implements two complementary assessments. First, within untreated areas located in a 0–5 kilometer range from the boundary, renovation activity, transaction volumes, and price trends are compared between the 0–1 kilometer area and the remaining 1–5 kilometer area. This comparison provides insight into whether displacement effects are concentrated in zones closest to the treated areas. Second, the analysis extends to untreated areas in the 5–10 kilometer range, contrasting trends in this outer zone with those observed in the primary untreated area (0–5 kilometers). This extended comparison isolates displacement effects by capturing whether the presence of the policy incentivizes activity in areas immediately adjacent to treated zones at the expense of more distant untreated areas.

In sum, the spatial difference-in-differences approach, incorporating boundary fixed effects, robust exclusion strategies, and multi-layered spillover assessments, provides a rigorous framework for evaluating the Denormandie scheme. This approach addresses the complexities inherent in spatial policy analysis and minimizes the risk of displacement biases, enhancing the reliability of the findings.

1.5 Results

1.5.1 The Impact of Tax Incentives on Urban Housing Renovations

In this subsection, we present the results from our spatial difference-in-differences (DiD) analysis and the event study, which estimate the impact of the Denormandie

tax incentives on urban housing renovations. The primary focus is on the number of building permits issued and the number of housing units renovated¹⁰, with a particular emphasis on those issued with rental purposes, as these were the primary target of the scheme.

As discussed earlier, a key challenge in this analysis is the presence of missing geolocation data for building permits. Approximately 53.2% of the permits include precise location data (see Table 3.5), and the missing information could introduce bias if the excluded permits are systematically related to treatment status or renovation activities. To address this issue, we adopt two complementary approaches. First, we estimate the model using the subset of geolocated data, controlling for distance to the boundary and applying municipality fixed effects to account for unobserved heterogeneity at the municipal level. Second, we estimate an alternative specification using the full sample of permits, without distance controls, but still incorporating municipality fixed effects. This comparison allows us to test the robustness of our findings across different model specifications and to mitigate concerns related to missing data.

Table 1.1 reports the estimated effects of the tax incentives across varying distances from the policy boundary. The results show that the tax incentives had the largest effect in municipalities closest to the policy boundary. In the 0-1 km range, the number of building permits increased by 12%, and the number of renovated units increased by 20.8%. These effects remain statistically significant up to 5 kilometers, where similar estimates are observed.

Table 1.1: The Impact of Tax Incentives on Urban Housing Renovations

| | 0-1km | | 0-3km | | 0-5km | |
|-----------------------------------|---------------------|--------------------|---------------------|---------------------|---------------------|---------------------|
| | Number of Permits | Renovated Units | Number of Permits | Renovated Units | Number of Permits | Renovated Units |
| Post Tax Incentive | 0.120*** (0.036) | 0.208** (0.071) | 0.295*** (0.056) | 0.492*** (0.108) | 0.292*** (0.056) | 0.492*** (0.108) |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Municipality Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of Observations | | | | 1,674 | | |
| Number of Municipalities | | | | 186 | | |
| Adjusted R² | 0.46 | 0.42 | 0.47 | 0.44 | 0.47 | 0.44 |

***p < 0.001; **p < 0.05; *p < 0.10

Note: This table presents results from boundary fixed-effects regressions, where the dependent variables are aggregated annually. The sample includes only building permits for existing constructions for rental purposes. The dependent variables are in the logarithm. The number of housing units renovated refers to the total number of units reported as per the building permit, which may include more than one unit per permit. Standard errors, presented in parentheses, are clustered at the municipality level.

¹⁰The number of housing units renovated refers to the total number of units reported as per the building permit, which may include more than one unit per permit. For instance, a single permit could account for the renovation of multiple housing units within a larger building.

Displacement effects - A key concern in spatial policy evaluations is the potential for displacement effects, where economic activities shift from untreated areas to treated municipalities rather than reflecting a net increase in renovations. Displacement effects may occur if tax incentives stimulate renovation activities in treated municipalities at the expense of neighboring, untreated areas, thereby misrepresenting the policy's true impact.

First, to evaluate displacement effects within treated areas, we analyze renovation activity and building permits in zones just outside the nearest boundary, specifically within the 1-5 kilometer range. The results, presented in Table 1.2, show a noticeable decline in renovation activities in control municipalities located farther from the boundary after excluding the immediate 0-1 kilometer ring. The coefficients, while remaining statistically significant, exhibit a reduced magnitude. For instance, the effect on the number of building permits decreased from 29.5% in the 0-3 kilometer range to 19.2% in the 1-3 kilometer ring, a pattern also observed for the number of renovated units. These findings suggest that part of the increased renovation activity within treated areas is potentially offset by reduced activity in neighboring untreated zones, indicative of localized displacement effects. However, the overall positive impact of the tax incentives remains evident beyond the immediate boundary, suggesting that the policy continues to generate net positive renovation activity despite some potential localized displacement.

Table 1.2: The Impact of Tax Incentives on Urban Housing Renovations - Controlling for Displacement Effect

| | 1-3km | | 1-5km | |
|-----------------------------------|---------------------|---------------------|---------------------|--------------------|
| | Number of Permits | Renovated Units | Number of Permits | Renovated Units |
| Post Tax Incentive | 0.192*** (0.052) | 0.323*** (0.097) | 0.190*** (0.052) | 0.323** (0.098) |
| Time Fixed Effects | Yes | Yes | Yes | Yes |
| Municipality Fixed Effects | Yes | Yes | Yes | Yes |
| Number of Observations | | | 1,674 | |
| Number of Municipalities | | | 186 | |
| Adjusted R² | 0.39 | 0.36 | 0.38 | 0.36 |

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Note: This table reports the results of boundary fixed-effects regressions conducted on a sample that excludes the nearest ring (0-1 km) to address potential displacement effects. Dependent variables include the logarithm of the number of building permits and renovated units for rental purposes, aggregated annually. The analysis focuses on untreated zones within 1-3 km and 1-5 km from the policy boundary. Standard errors, presented in parentheses, are clustered at the municipality level.

Second, to directly evaluate displacement effects in untreated municipalities, we analyze building permits and renovation activity within non-treated zones. Table 1.3 presents the results, with the first two columns comparing the 0–1 kilometer ring (treated area) to the remainder of the 0–5 kilometer non-treated sample. The findings indicate no statistically significant increase in building permits or renovation activity in non-treated municipalities. The coefficients for both the number of permits and renovated units are close to zero, suggesting the absence of displacement effects.

Similar results are observed when the analysis is extended to a 0–10 kilometer range, comparing the 0–5 kilometer treated area to the outer 5–10 kilometer region. Across both spatial scales, the results consistently demonstrate that the Denormandie scheme did not induce significant shifts in renovation activity or permits in adjacent non-treated municipalities, reinforcing the robustness of the policy’s localized impact.

These findings suggest that the policy’s effects are primarily concentrated within treated areas, with minimal immediate spillover into nearby untreated municipalities. However, the absence of short-term spillover effects does not preclude the possibility of longer-term positive externalities. Improvements in infrastructure, amenities, and housing quality within treated zones may gradually influence adjacent areas, as localized enhancements in urban environments often require time to stimulate broader market responses (De Groot, Poot, and Smit 2009).

While this study focuses on the immediate impacts of the policy, future analyses could explore whether these localized improvements contribute to broader spatial development over longer time horizons. Such research would provide valuable insights into the policy’s potential for fostering regional economic growth and enhancing market dynamics beyond the treated zones.

Table 1.3: The Impact of Tax Incentives on Urban Housing Renovations: Displacement Effects in Non-Eligible Municipalities

| | Non-Eligible Municipalities | | | |
|-----------------------------------|-----------------------------|-------------------|-------------------|-------------------|
| | 0-5km | | 0-10km | |
| | Number of Permits | Renovated Units | Number of Permits | Renovated Units |
| Post Tax Incentive | -0.002 (0.010) | -0.003 (0.013) | -0.001 (0.008) | -0.004 (0.016) |
| Time Fixed Effects | Yes | Yes | Yes | Yes |
| Municipality Fixed Effects | Yes | Yes | Yes | Yes |
| Number of Observations | | | 1,224 | |
| Number of Municipalities | | | 136 | |
| Adjusted R^2 | 0.38 | 0.29 | 0.36 | 0.27 |

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Note: This table reports the results of the displacement effects analysis conducted on non-eligible municipalities. The analysis utilizes a non-treated sample to estimate potential spillover effects. For the 0-5 km range, the treated sample includes municipalities within the 0-1 km boundary, compared to the 1-5 km boundary. For the 0-10 km range, the treated sample includes municipalities within the 0-5 km boundary, compared to the 5-10 km boundary. Dependent variables include the logarithm of the number of building permits and renovated units for rental purposes, aggregated annually. Standard errors, presented in parentheses, are clustered at the municipality level.

To further explore the temporal dynamics of the policy's effects and to test the validity of the parallel trends assumption inherent in the Difference-in-Differences (DiD) approach, we conduct an event study analysis. This method allows us to determine whether the policy's impact was immediate and sustained or transitory. The results, displayed in Figure 1.1, provide a detailed view of the policy's effects over time. The increase in building permits and renovations for rental purposes becomes statistically significant shortly after the policy's implementation. Importantly, the results confirm the parallel trends assumption, as the post-policy effects remain both robust and persistent over time, indicating a lasting policy impact.

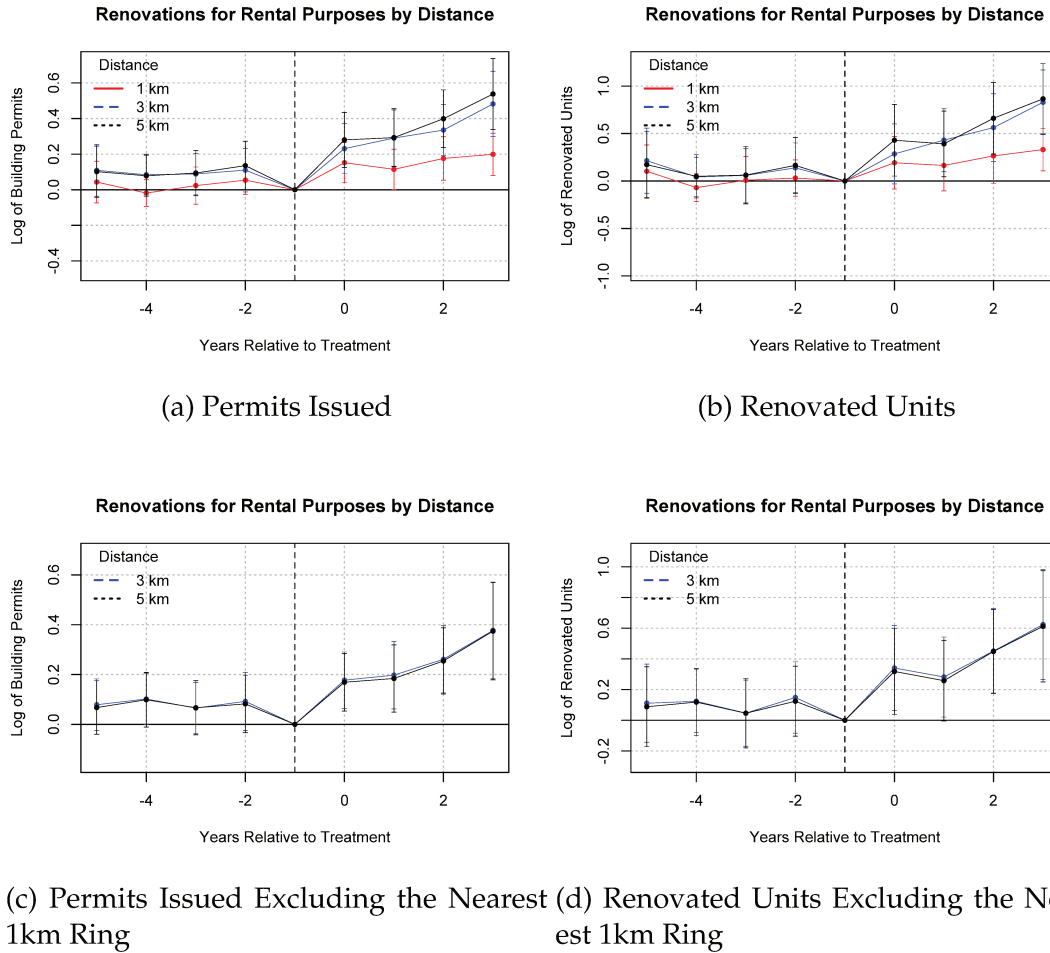


Figure 1.1: The Effect of Tax Incentives on Urban Housing Renovations: An Event Study Approach

The event study results illustrating displacement effects in non-eligible areas are presented in Figure 1.2. These findings corroborate the Difference-in-Differences (DiD) results, showing no significant impact on renovation activity. Furthermore, the results validate the parallel trends assumption, as the pre-policy effects are non-significant, while the post-policy trends remain robust and consistent over time.

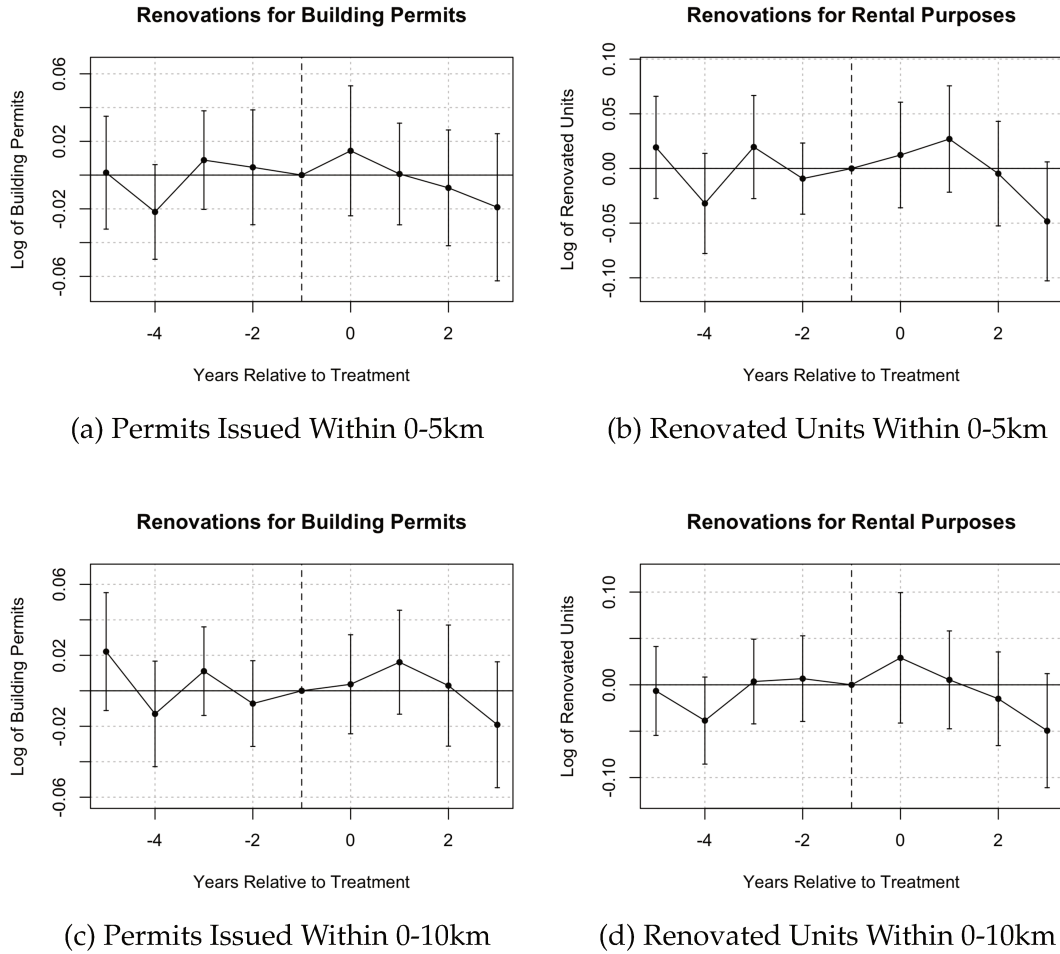


Figure 1.2: Displacement Effects in Non-Eligible Municipalities on Urban Housing Renovations : An Event Study Approach

Alternative Sample - To ensure the robustness of our findings, we estimate an alternative specification using the full sample of building permits, controlling for unobserved heterogeneity through municipality fixed effects. Table 1.4 presents results consistent with those from the spatial model controlling for distance to the boundary, showing that the tax incentives are associated with a 36.5% increase in building permits and a 65.4% increase in renovated units for rental purposes.

Table 1.4: The Impact of Tax Incentives on Urban Housing Renovations (Full Sample)

| | Building Permit for Rental Purposes | |
|-----------------------------------|-------------------------------------|---------------------|
| | Number of Permits | Renovated Units |
| Post Tax Incentive | 0.365*** (0.052) | 0.654*** (0.105) |
| Time Fixed Effects | Yes | Yes |
| Municipality Fixed Effects | Yes | Yes |
| Number of Observations | | 5,760 |
| Number of Municipalities | | 640 |
| Adj. R^2 | 0.47 | 0.48 |

*** $p < 0.001$; ** $p < 0.05$; * $p < 0.10$

Note: This table presents results from fixed-effects regressions at the municipality level, where the dependent variables are aggregated annually. The dependent variables are expressed in logarithmic. The sample includes only building permits for existing constructions. The number of housing units renovated refers to the total number of units reported as per the building permit, which may include more than one unit per permit. Standard errors, presented in parentheses, are clustered at the municipality level.

To explore the temporal pattern of the second specification and assess the validity of the parallel trends assumption in the DiD framework, we conduct an event study analysis. The event study estimates presented in Figure 1.3 confirm the sustained impact of the tax incentives over time. The lack of significant pre-treatment effects strongly validates the parallel trends assumption, which is crucial for the credibility of the DiD framework. The consistency of results across both specifications and the lack of pre-treatment effects in the event study reinforce the credibility of the findings. This robust replication across specifications confirms that the Denormandie tax incentives significantly increased renovation activity, particularly in the rental housing sector, demonstrating the effectiveness of the policy intervention.

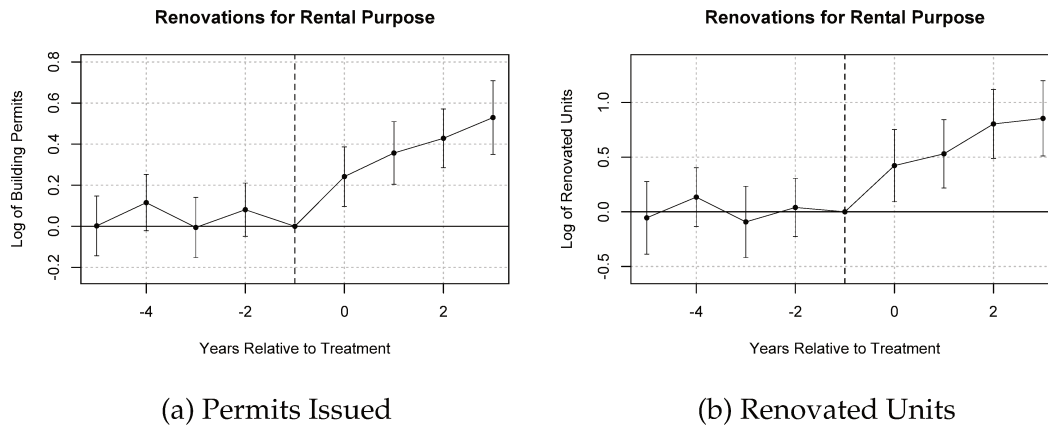


Figure 1.3: The Impact of Tax Incentives on Urban Housing Renovations (Full Sample) - Event Study

However, a limitation of this analysis is the absence of post-renovation energy efficiency data, which restricts our ability to fully assess the environmental benefits of the policy. Massié (2022), for instance, examined the effects of financial aid schemes for energy renovation in households on energy-efficient renovations and found that such incentives significantly influence homeowners' decisions to retrofit older properties Massié 2022. This suggests that similar mechanisms may be at work in the Denormandie scheme, where financial incentives could also encourage energy-efficient upgrades, although this aspect is not captured in our current dataset.

Moreover, a substantial portion of energy-inefficient and deteriorating housing stock in France, particularly in small and medium-sized municipalities, remains vacant for extended periods Desquinabo 2024. This vacancy issue undermines the attractiveness of urban centers and reduces land-use efficiency. The Denormandie scheme is well-positioned to address these broader challenges by incentivizing the renovation of older housing, particularly in underutilized urban areas. Although this study focuses primarily on renovation activities, future research should consider the scheme's potential impact on improving energy efficiency. Including post-renovation energy data would provide a more comprehensive evaluation of the scheme's environmental and urban revitalization effects.

1.5.2 The Impact of Tax Incentives on the Sale of Vacant Housing

This subsection evaluates the effect of the Denormandie tax incentives on the sale of vacant housing units. In medium-sized municipalities, a high portion of vacant properties typically consist of dilapidated or uninhabitable units, representing a significant share of the housing stock¹¹. These properties cannot be rented or sold without substantial renovations. By analyzing the impact of the Denormandie scheme on vacant housing sales, we assess its role in revitalizing underutilized properties and contributing to urban renewal objectives.

Table 1.5 reports the results of the boundary fixed-effects regressions, showing a positive and statistically significant effect of the tax incentives on vacant housing sales. In the 0–1 kilometer range, the sale of vacant properties increased by 13.6% following the introduction of the tax incentives. The magnitude of this effect grows with distance from the boundary, with sales increasing by 17.2% in the 0–3 kilometer range and by 18.0% in the 0–5 kilometer range. These results indicate that the policy had a significant and sustained positive impact on vacant housing sales.

Displacement effects - To address potential displacement effects—where tax incentives may shift investment from untreated to treated areas near the boundary—we estimate an alternative specification that excludes the 1-kilometer ring adjacent to the boundary. As shown in Table 1.7, although the coefficients are slightly smaller after this exclusion, they remain statistically significant. Specifically, the sale of vacant properties increased by 15.2% in the 1–3 kilometer range and by 18.0% in the 1–5 kilometer range. These findings suggest that while some displacement may have occurred, the tax incentives continued to exert a positive influence on vacant housing sales beyond the immediate boundary area.

¹¹Vacant units accounted for approximately 13% of the total housing stock in 2015 (see Table 3.7).

Table 1.5: The Impact of Tax Incentives on the Sale of Vacant Housing

| | Full Sample | | | Without Nearest Ring | |
|-----------------------------------|--------------------|---------------------|---------------------|----------------------|---------------------|
| | 0-1km | 0-3km | 0-5km | 1-3km | 1-5km |
| Post Tax Incentive | 0.136** (0.042) | 0.172*** (0.041) | 0.181*** (0.046) | 0.152*** (0.044) | 0.180*** (0.042) |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Municipality Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Number of Observations | | | 5,742 | | |
| Number of Municipalities | | | 638 | | |
| Adjusted R^2 | 0.85 | 0.86 | 0.86 | 0.85 | 0.85 |

*** $p < 0.001$; ** $p < 0.05$; * $p < 0.10$

Note: This panel fixed-effects regression uses the logarithm of vacant housing units sold per year as the dependent variable. The dependent variable is expressed in logarithmic form. Standard errors, shown in parentheses, are clustered at the municipality level.

To directly evaluate displacement effects in untreated municipalities, we examine the volume of vacant housing transactions within non-treated zones. The results, presented in Table 1.6, provide evidence on the spatial dynamics of the policy's impact. The first column reports findings for the 0-5 kilometer range, comparing the 0-1 kilometer ring (treated area) to the 1-5 kilometer ring (control group) within non-eligible municipalities. The coefficients for the post-tax incentive period are close to zero and statistically insignificant, indicating no detectable spillover effects on vacant housing transactions in non-treated municipalities. Similarly, the second column extends the analysis to the 0-10 kilometer range, comparing the 0-5 kilometer treated area to the outer 5-10 kilometer region. Again, the coefficients are small in magnitude and statistically insignificant, reinforcing the absence of substantial spillover effects.

These findings suggest that the tax incentives under the Denormandie scheme do not induce significant displacement effects into untreated municipalities. The observed impacts of the policy are spatially concentrated within treated areas and do not appear to influence transaction activity in adjacent non-treated zones. This localized effect underscores the targeted nature of the policy and suggests limited unintended

redistribution of economic activity across municipal boundaries.

Table 1.6: The Impact of Tax Incentives on the Sale of Vacant Housing :Displacement Effects in Non-Eligible Municipalities

| | Non-Eligible Municipalities | |
|-----------------------------------|-----------------------------|-------------------|
| | 0-5km | 0-10km |
| Post Tax Incentive | 0.003 (0.028) | -0.018 (0.025) |
| Time Fixed Effects | Yes | Yes |
| Municipality Fixed Effects | Yes | Yes |
| Number of Observations | | 5,139 |
| Number of Municipalities | | 571 |
| Adj. R^2 | 0.28 | 0.40 |

*** $p < 0.001$; ** $p < 0.05$; * $p < 0.10$

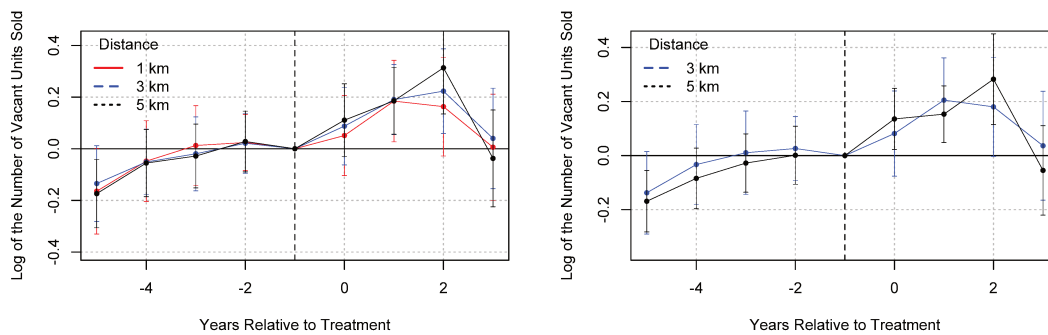
Note: This table presents results from fixed-effects regressions conducted at the municipality level, with the dependent variable being the logarithm of vacant housing units sold annually. The analysis focuses on non-eligible municipalities to estimate displacement effects. For the 0-5 km range, the comparison is made between municipalities within the 0-1 km boundary (treated sample) and those within the 1-5 km boundary (control group). For the 0-10 km range, the treated sample includes municipalities within the 0-5 km boundary, compared to those within the 5-10 km boundary. Standard errors, reported in parentheses, are clustered at the municipality level. All variables are expressed in logarithmic form, and the regressions control for both time and municipality fixed effects.

The effects of the Denormandie tax incentives on vacant housing sales are both statistically significant and economically meaningful, leading to a notable increase in the sale of previously underutilized housing stock. However, it is essential to analyze the temporal dynamics of these effects to fully understand the policy's long-term implications. Figure 1.4 illustrates the evolution of the policy's impact over time. The results indicate that the tax incentives had a significant effect on housing sales in the first year following implementation (year 1), with the impact persisting into the second year. By the third year (year 3), however, the coefficient decreased, and the effects became statistically insignificant, suggesting that the policy's influence may have been temporary.

One potential explanation for this diminishing impact is the constrained supply of vacant housing units eligible for the program. In the initial phase, demand for vacant

units requiring substantial renovation surged as buyers sought to capitalize on the tax incentives. The policy’s focus on properties in poor condition further stimulated demand. However, as the stock of eligible properties was exhausted, the program’s effectiveness weakened.

Additionally, the tax incentives likely motivated property owners to list their vacant units in anticipation of increased buyer demand. This combination of heightened demand and newly listed properties contributed to the substantial rise in vacant housing sales during the policy’s first two years.



(a) Different Distance to Boundary

(b) Without the Nearest Ring

Figure 1.4: The Impact of Tax Incentives on the Sale of Vacant Housing

The event study results illustrating displacement effects in non-eligible areas are presented in Figure 1.5. These findings provide further evidence supporting the Difference-in-Differences (DiD) results. Specifically, the event study reveals no statistically significant impact on vacant housing transactions in non-eligible municipalities, reinforcing the conclusion that spillover effects into untreated areas are minimal. Importantly, the event study results validate the parallel trends assumption, a critical requirement for the robustness of the DiD approach.

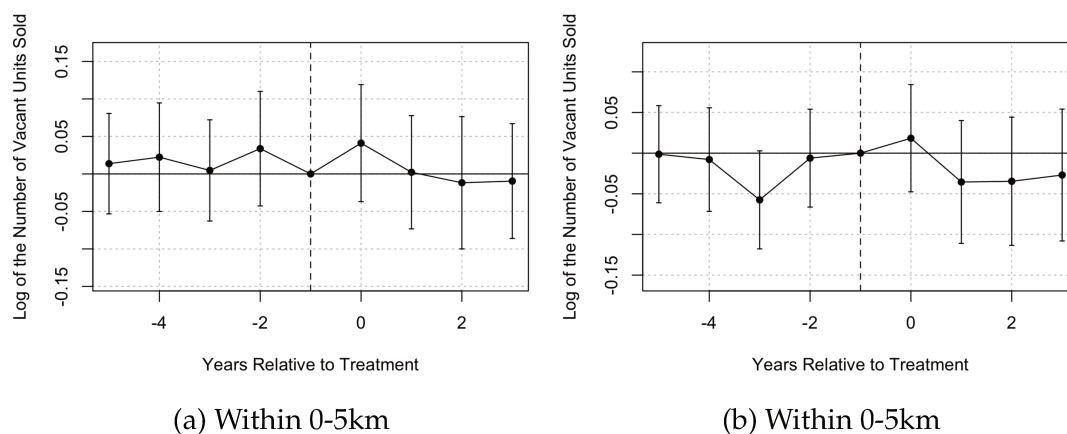


Figure 1.5: Displacement Effects in Non-Eligible Municipalities on the Sale of Vacant Housing : An Event Study Approach

In conclusion, the Denormandie tax incentives had a clear positive impact on the sale of vacant housing units, particularly in the early stages of the program. However, the long-term sustainability of these effects may be limited.

The long-term effectiveness of the Denormandie tax incentives in medium-sized municipalities is likely constrained by the limited stock of vacant or dilapidated housing units that qualify for the program. Unlike larger urban centers, medium-sized municipalities have fewer eligible properties, and as the program progresses and these units are renovated and sold, the policy’s overall impact may weaken.

While this section has primarily focused on the tax incentives’ effect on vacant unit sales volumes, the increase in available properties on the market may also influence housing prices, particularly within the older housing stock segment. These potential price dynamics will be discussed in the following subsection.

1.5.3 The Impact of Tax Incentives on Old Housing Prices

This subsection evaluates the impact of the Denormandie tax incentives on old housing prices, shedding light on the broader market effects of the policy in targeted areas. Given that the scheme specifically targets dilapidated properties, understanding its influence on prices in the older housing segment is crucial for assessing its economic implications.

Table 1.7 presents the boundary fixed-effects regression results, which indicate a negative and statistically significant impact of the tax incentives on old housing prices. Prices decreased by 2.3% in the 0-1 km range, with similar reductions observed in the 0-3 km (2.1%) and 0-5 km (2.0%) ranges. These findings suggest a localized price reduction, particularly near the policy boundary.

Displacement effects - To assess potential displacement effects, we estimated an alternative model excluding the nearest control ring (1 km). The results remained statistically significant, with consistent price reductions across the 1-3 km and 1-5 km ranges. This suggests that the observed price effects reflect broader market adjustments rather than being solely driven by displacement effects near the boundary.

As discussed earlier, the Denormandie tax incentives triggered a significant increase in the sale of vacant housing units, primarily targeting dilapidated properties. This surge in sales likely contributed to the observed temporary price reductions in the older housing segment, as the inflow of renovated properties temporarily exceeded demand, suppressing prices.

Table 1.7: Impact of Tax Incentives on Old Housing Prices

| | Full Sample | | | | Without Nearest Ring | |
|---------------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|---------------------|
| | 0-1km | 0-3km | 0-5km | | 1-3km | 1-5km |
| Post Tax Incentive | -0.023** (0.009) | -0.021** (0.007) | -0.020** (0.007) | -0.021*** (0.006) | -0.022** (0.008) | -0.020** (0.008) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Boundary Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of Observations | 76,655 | 154,855 | 168,792 | 177,672 | 78,200 | 92,137 |
| Number of Municipalities | 535 | 624 | 624 | 640 | 598 | 613 |
| Adjusted R² | 0.55 | 0.53 | 0.53 | 0.52 | 0.55 | 0.54 |

*** $p < 0.001$; ** $p < 0.05$; * $p < 0.10$

The dependent variable in this boundary fixed-effects regression is the logarithm of housing prices for older constructions. Control variables include surface area, number of main rooms, bedrooms, bathrooms, kitchens, dependencies, floor level, number of floors in the building, age of the building, distance to the nearest train station, distance to the urban center and distance to the border. Standard errors, shown in parentheses, are clustered at the municipality level.

To evaluate displacement effects on housing prices in non-eligible municipalities, we analyze changes in the prices of older constructions within non-treated zones. The

results, presented in Table 1.8, show no significant impact. In the 0-5 kilometer range, the coefficient for the post-tax incentive period is small and statistically insignificant, indicating no measurable effect. Similarly, in the 0-10 kilometer range, the coefficient is also small and statistically insignificant.

These findings suggest that the effects of the tax incentives under the Denormandie scheme are spatially concentrated within treated areas, with no evidence of spillover effects on housing prices in neighboring non-eligible zones. However, the impact on prices may take time to materialize, as housing markets often respond to policy changes with a lag. This localized impact highlights the targeted nature of the policy and minimal redistribution across municipal boundaries.

Table 1.8: Impact of Tax Incentives on Old Housing Prices : Displacement Effects in Non-Eligible Municipalities

| | Non-Eligible Municipalities | |
|-----------------------------------|-----------------------------|------------------|
| | 0-5km | 0-10km |
| Post Tax Incentive | 0.001 (0.009) | 0.005 (0.011) |
| Time Fixed Effects | Yes | Yes |
| Municipality Fixed Effects | Yes | Yes |
| Number of Observations | 112,402 | 113,969 |
| Number of Municipalities | 555 | 571 |
| Adj. R^2 | 0.50 | 0.48 |

*** $p < 0.001$; ** $p < 0.05$; * $p < 0.10$

Note: This table presents results from fixed-effects regressions conducted at the municipality level. The dependent variable in this boundary fixed-effects regression is the logarithm of housing prices for older constructions. Control variables include property characteristics such as surface area, number of main rooms, bedrooms, bathrooms, kitchens, dependencies, floor level, number of floors in the building, and age of the building. Additionally, locational characteristics such as distance to the nearest train station, urban center, and the municipal boundary are included. The analysis focuses on non-eligible municipalities to estimate displacement effects. For the 0-5 km range, the comparison is made between municipalities within the 0-1 km boundary (treated sample) and those within the 1-5 km boundary (control group). For the 0-10 km range, the treated sample includes municipalities within the 0-5 km boundary, compared to those within the 5-10 km boundary. Standard errors, reported in parentheses, are clustered at the municipality level.

The event study analysis presented in Figure 1.6 provides detailed insights into the temporal dynamics of these price effects. The absence of significant pre-treatment

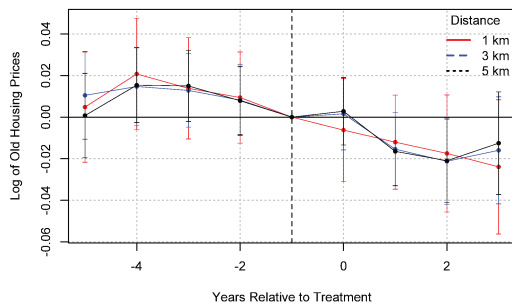
effects supports the validity of the parallel trends assumption, thereby ensuring robust causal identification. Price reductions became statistically significant in the first year (year 1) following the introduction of the Denormandie scheme and persisted into the second year (year 2). By the third year (year 3), however, these price effects dissipated, with coefficient estimates becoming statistically insignificant, suggesting a potential market adjustment. This temporal pattern closely mirrors the dynamics of vacant housing sales shown in Figure 1.4, where the temporary increase in the supply of vacant and dilapidated properties likely intensified competition among sellers, contributing to the observed price declines.

The observed price reductions in the older housing segment are consistent with a supply-side adjustment driven by the scheme's incentives. By encouraging property owners to renovate and list previously vacant units, the Denormandie scheme triggered a surge in the supply of available housing. This sudden influx of renovated and vacant units exceeded short-term demand, creating a temporary imbalance that suppressed prices in the older housing segment. Over time, as the market absorbed the additional supply, prices stabilized, consistent with the observed dissipation of effects within two years.

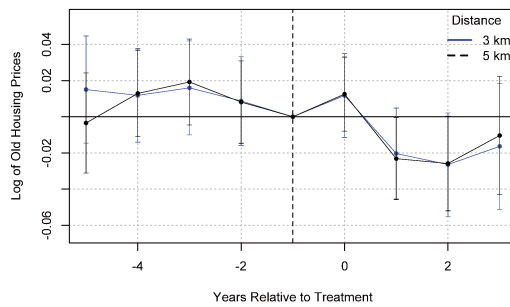
These findings highlight the importance of spatial and temporal dynamics in evaluating the impacts of place-based housing policies. They suggest that the Denormandie scheme's effectiveness in mobilizing underutilized housing stock came with short-term market adjustments that temporarily reduced property values in nearby areas. This underscores the need to account for supply-side pressures when assessing the broader implications of targeted housing incentives.

However, this pattern was not uniform across all distances from the policy boundary. In the nearest ring (0-1km), the coefficients became negative but remained statistically insignificant, possibly reflecting a displacement effect. This suggests that demand was partially shifted to areas closer to the policy boundary, where buyers sought to benefit from the scheme's incentives. As a result, the displacement effect may have mitigated the price decreases in the nearest control ring by sustaining demand and

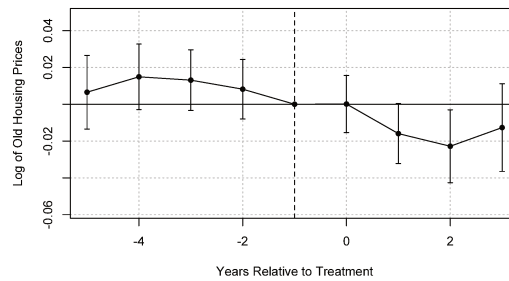
limiting downward pressure on prices in that area.



(a) Different Distance to Boundary



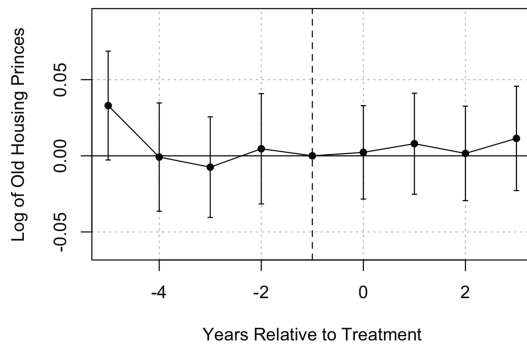
(b) Without the Nearest Ring



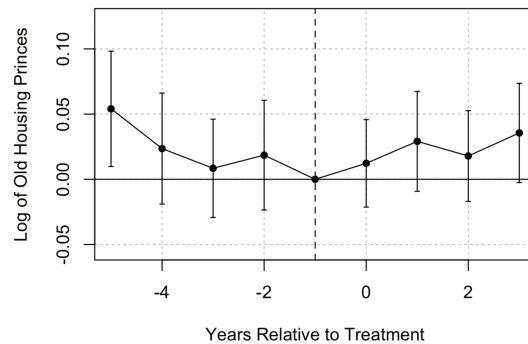
(c) Full Sample

Figure 1.6: Impact of Tax Incentives on Old Housing Prices

The event study results illustrating displacement effects in non-eligible areas are presented in Figure 1.7. These findings provide further evidence supporting the Difference-in-Differences (DiD) results suggesting an absence of significant impact.



(a) Within 0-5km



(b) Within 0-10km

Figure 1.7: Impact of Tax Incentives on Old Housing Prices : Displacement Effects in Non-Eligible Municipalities

Another potential explanation lies in the broader context of the Denormandie scheme, integrated within the Action Cœur de Ville (ACV) initiative, which provides additional insight into the short-term negative price impacts. While renovation activities may have introduced temporary challenges, such as construction disruptions and potential short-term externalities, the long-term objective of urban revitalization aims to enhance the economic prospects of the targeted municipalities. As housing quality improves and public infrastructure is upgraded, demand for housing in these urban cores is expected to increase, with corresponding upward pressure on housing prices in the longer term.

In conclusion, while the short-term effects of the Denormandie scheme led to observable price reductions, the long-term potential for price appreciation remains plausible as the market adjusts to the improved housing stock and enhanced urban infrastructure. Future research should extend the time horizon of the analysis to capture the full effects of the policy, particularly as the dynamics of housing demand and supply evolve in response to the comprehensive urban regeneration efforts. A more detailed examination of the long-term impacts, incorporating broader economic variables and urban policy developments, will be essential for fully understanding the efficacy of the Denormandie scheme.

1.6 Conclusion and Discussion

1.6.1 Discussion on Mechanisms

The results of this study provide compelling evidence that the Denormandie tax incentives have significantly stimulated urban housing renovations and the sale of vacant properties in treated municipalities. The mechanisms underlying these effects, however, warrant closer examination to fully understand the policy's impact and its broader implications.

First, the increase in building permits and renovation activity suggests that the financial incentives effectively reduced barriers to entry for investors and property own-

ers targeting dilapidated housing in the targeted area. By subsidizing renovation costs, the policy likely improved the financial viability of investing in older housing stock, particularly in medium-sized municipalities where underutilized properties represent a substantial portion of the housing market.

Second, the observed reductions in old housing prices may reflect short-term adjustments in supply and demand dynamics. The increase in the volume of vacant housing sales and the resulting inflow of dilapidated properties may have temporarily suppressed prices in the older housing segment, as supply outpaced demand. This transitory phase aligns with findings in urban renewal literature, where temporary trends often precede long-term market stabilization and appreciation as improved housing stock and enhanced urban infrastructure create new demand over time (DeGiovanni 1983; Glaeser and Gyourko 2005).

Third, the limited evidence of displacement effects in untreated municipalities indicates that the policy's impacts were largely localized, with minimal unintended redistribution of economic activity. This highlights the targeted nature of the Denormandie scheme, which appears to have succeeded in revitalizing treated areas without significantly detracting from adjacent non-treated zones.

Finally, the potential for positive externalities, such as improvements in local infrastructure and urban attractiveness, remains an important area for further exploration. While these benefits may not materialize immediately, they could enhance housing market dynamics and economic activity in treated and neighboring areas over a longer horizon. Future studies should investigate the spillover effects and the broader urban development impacts of the scheme.

1.6.2 Conclusion

This paper demonstrates that the Denormandie tax incentives significantly increased renovation activity, vacant housing sales, and building permits in treated municipalities. While short-term price reductions were observed, they likely reflect temporary market adjustments rather than permanent declines in property values.

The absence of significant spillover or displacement effects into untreated areas further underscores the policy's effectiveness in targeting its intended zones. However, the sustainability of these effects may be constrained by the limited stock of eligible properties in medium-sized municipalities. As the pool of dilapidated and vacant properties diminishes, the policy's capacity to stimulate further activity may weaken.

In the long term, the Denormandie scheme has the potential to catalyze broader urban regeneration by improving housing quality and infrastructure in underutilized areas. To fully understand its impact, future research should extend the time horizon of analysis and incorporate additional data on energy efficiency and urban development outcomes. By capturing these dimensions, policymakers can better assess the scheme's contributions to sustainable urban revitalization.

Chapter 2

Urban Development Dynamics Under Mixed-Use Zoning Regulation : Evidence from the Paris Region

Imen Daly

Chapter 2

Mixed-Use Zoning and Urban Spatial Balance : Evidence from the Paris Region

2.1 Introduction

Urban land-use policies critically shape the spatial distribution of economic activities in metropolitan areas, often leading to imbalances that disrupt housing affordability and strain infrastructure. In the Paris metropolitan area, particularly the Paris Region, urban development has long been characterized by pronounced spatial disparities. Office construction has consistently outpaced residential development, contributing to elevated property prices, chronic housing shortages, and an overburdened transportation infrastructure (Fourcaut, Bellanger, and Flonneau [2007](#); Behar 1, Loisel 2, and Rio 3 [2016](#); Merlin [2022](#)). Extensive commuting networks connect residential areas, primarily in the eastern suburbs, with employment hubs concentrated in central and western regions (Enright [2023](#)). These imbalances have resulted in employment densities that far exceed residential densities in key municipalities, such as Paris, La Défense, and Boulogne-Billancourt (Institut Paris Region Studies [2023](#)).

To address these spatial disparities, mixed-use zoning strategies have been intro-

duced to integrate residential, commercial, and occasionally industrial uses within the same urban areas. This approach promotes higher land-use efficiency and urban density, with models ranging from vertical mixed-use (e.g., ground-floor retail with residential units above) to horizontal mixed-use (e.g., adjacent parcels with varied uses). In line with European urban planning traditions, the 2018 Paris Region Mixed-Land Use Directive adopts a dual-use model. This directive mandates that large-scale office developments incorporate residential units, with the goal of alleviating housing shortages, reducing commuting distances, and fostering more balanced urban growth.

Zoning policies like the Paris Region directive are generally expected to reduce commuting times, increase the supply of residential units, and mitigate housing price pressures in high-demand areas. By requiring the development of residential spaces alongside office projects, the policy aims to alleviate spatial imbalances and foster more inclusive urban growth. However, empirical studies have shown that land-use regulations can lead to unintended outcomes (Glaeser, Gyourko, and Saks [2005](#); Wolf-Powers [2005](#); Glaeser and Ward [2009](#)). Developers often adapt their strategy to comply with stricter requirements. This adaptive behavior can undermine the policy's objectives, limiting the effectiveness of zoning regulations. Therefore, the real-world impact of mixed-use zoning remains uncertain, particularly in markets characterized by high demand and land scarcity.

This study evaluates the economic impact of the 2018 Paris Region Mixed-Land Use Directive, focusing on its effects on real estate development and property prices. Using a spatial difference-in-differences (DiD) framework, I leverage regulatory discontinuities at municipal boundaries to assess the directive's causal effects. My methodology compares urban outcomes—such as housing prices and building permit issuance—between municipalities affected by the directive (treatment group) and adjacent, unaffected municipalities (control group), while controlling for unobserved time-invariant factors (Overman and Einio [2012](#); Kline and Moretti [2014](#)). To ensure robust results, I implement a fixed-effects model and restrict my sample to municipalities within varying distance thresholds (e.g., 1 km) from the regulatory boundary.

A series of robustness checks, including varying distances to the boundary and the exclusion of municipalities near the regulatory boundary, ensures that my estimates capture the directive's impact without confounding spillover effects. Additionally, I conduct an event study to examine the dynamic effects of the directive over time.

Our results show that the 2018 Paris Region Mixed-Land Use Directive had a limited short-term impact on new residential construction and property prices. While the directive did not significantly increase the issuance of building permits for new construction, I observe a notable rise in the conversion of residential spaces into commercial units, suggesting that developers have adapted by repurposing existing properties to circumvent regulatory constraints. This finding highlights the challenges of implementing land-use policies in high-demand urban areas, where developer behavior may undermine policy objectives.

This paper contributes to the urban economics literature in two key ways. First, it provides empirical evidence on the effectiveness of a novel land-use regulation aimed at promoting mixed-use development in a highly constrained real estate market. Second, it adds to the broader discussion on urban growth management, spatial inequality, and housing affordability by analyzing the adaptive strategies of developers in response to regulatory changes.

The paper is organized as follows: Section 2.2 reviews the relevant literature on land-use regulation and urban development. Section 2.3 describes the data and study context. Section 2.4 details the empirical strategy. Section 2.5 presents the results, and Section 2.6 discusses the conclusions and policy implications.

2.2 Literature Review and Context

2.2.1 Literature Review

Zoning regulations are central to urban development, shaping land use, building form, and density across different regions and countries (Kayden 2004). In France, land-use regulation is primarily governed by regional urban plans such as the Schéma Directeur

de la Région Île-de-France (SDRIF) for the Paris Region. In the absence of regional plans, municipalities default to the National Urbanism Regulations (RNU), which restrict new developments to already urbanized areas¹. Zoning policies can either promote urban expansion ("up-zoning") or impose constraints ("restrictive zoning"), both of which significantly impact housing markets and urban spatial structures.

The effect of zoning regulations on housing markets has been widely studied, particularly in the United States. Glaeser et al. (2005) demonstrate that restrictive zoning in Manhattan constrains housing supply, thereby inflating property prices (Glaeser, Gyourko, and Saks 2005). Similarly, Glaeser and Gyourko (2009) highlight how land-use restrictions in cities like San Francisco and Los Angeles exacerbate housing affordability issues and contribute to urban inequality (Glaeser and Ward 2009). Extending this analysis, Severen (2018) finds that restrictive zoning in coastal U.S. cities worsens economic segregation and housing costs, reinforcing the link between zoning and urban inequality (Severen and Plantinga 2018). These findings align with trends observed in global cities such as London and Paris, where stringent land-use regulations also inflate housing prices and limit supply (Hilber and Vermeulen 2016).

In response to these issues, mixed-use zoning has gained popularity, particularly in Europe, where zoning regulations are often more flexible. Mixed-use zoning integrates residential, commercial, and sometimes industrial uses within the same area, promoting vibrant, walkable neighborhoods. Hirt (2012) notes that many European cities naturally employ mixed-use zoning due to their historical urban forms, contrasting with the strict land-use segregation in the U.S. that has contributed to urban sprawl and longer commutes (Hirt 2012). This distinction is particularly relevant to the 2018 Paris Region land-use directive, which seeks to balance housing and office development through a mixed-use approach.

The form of mixed-use zoning varies by region. In dense metropolitan areas such as Tokyo and New York, vertical mixed-use development, where residential and commercial uses are integrated within the same building, is common (Hirt 2012; Wolf-

¹The SDRIF outlines major goals for the Paris Region concerning urbanism, housing, transportation, and environmental sustainability.

Powers (2005). However, balancing commercial development with affordable housing in up-zoned mixed-use districts presents significant challenges, as noted by Wolf-Powers (2005) in her study of New York City (Wolf-Powers (2005)).

Horizontal mixed-use zoning, as seen in Berlin and Copenhagen, integrates residential, commercial, and recreational uses across adjacent parcels. This model reduces urban sprawl and enhances walkability. For instance, Kim et al. (2020) show that horizontal mixed-use zoning in Seoul reduced car dependency and fostered social inclusion by bringing diverse land uses within walking distance (Kim, Potter, Cho, et al. (2020)). Similarly, Nohn (2011) observes that flexible zoning in Indian cities co-locates residential and commercial uses, promoting efficient land use and stimulating local economies (Nohn (2011)).

Incentive zoning, implemented in cities like New York and Chicago, grants developers density bonuses for including residential units in predominantly commercial projects. Cannon et al. (2013) find that while such policies can raise property values, the expected rise in housing supply is often delayed (Cannon et al. (2013)). Similarly, Freemark (2020) notes that up-zoning in Chicago increased property values without significantly expanding housing supply in the short term (Freemark (2020)). These studies emphasize the limitations of incentive-based zoning, particularly in markets where immediate housing availability remains constrained despite increases in property values.

This study adds to the literature by providing empirical evidence on the 2018 dual-use land directive in the Paris Region. Unlike incentive zoning, which provides optional benefits to developers, this directive mandates the simultaneous development of residential and commercial spaces in areas with low housing-to-office ratios². This mandatory dual-use requirement directly addresses the spatial imbalances caused by the over development of office spaces relative to housing. By evaluating the directive's effects on housing supply and spatial distribution, this study contributes to the broader discussion on the potential of mixed-use zoning to mitigate urban inequali-

²Incentive zoning offers voluntary incentives, such as density bonuses, to developers in exchange for public benefits like affordable housing. Compliance is optional.

ties.

2.2.2 Context of Commercial Construction Approval Permits in 2018

The Paris Region has long faced significant spatial imbalances in the distribution of housing and office developments, particularly in the allocation of construction permits. This development pattern, characterized by a concentration of residential projects in the eastern areas and commercial projects in the western regions, has deepened socio-economic disparities across the region. Limited issuance of commercial permits in the eastern municipalities has further restricted economic opportunities and access to services for residents, exacerbating regional divides.

In response to these pronounced housing-office imbalances and their associated social, fiscal, and infrastructural challenges, the Prefect of the Paris Region³ introduced new guidelines in October 2018, in collaboration with industry stakeholders. These guidelines sought to incentivize residential development in municipalities where commercial real estate dominates.

The updated approval process, implemented at the end of 2018, mandates a housing-office mix for large-scale developments exceeding 10,000 m² or 20,000 m², depending on the imbalance level in the municipality⁴. Projects exceeding these thresholds must incorporate residential space amounting to three times the office space. This requirement primarily targets land recycling projects or significant extensions, with specific thresholds varying based on local housing-to-office ratios. Stricter thresholds apply to municipalities with severe imbalances, while others have more flexible standards⁵.

For example, a commercial project with 10,000 m² of office space must provide 30,000 m² of residential housing. Additionally, 30% of the residential units must be designated as social housing (HLM), ensuring the provision of affordable housing

³The Prefect is a government-appointed official responsible for overseeing regional administration and urban development.

⁴The Prefect's directives serve as broad guidelines for regional development, though they are not legally binding. They outline clear expectations for aligning with regional planning goals.

⁵Figure 3.1a displays the two restricted areas.

alongside commercial development (see Table 2.1).

Table 2.1: Examples of Commercial Project Compensation for Housing

| Project Type | Office Space (m ²) | Required Residential Space (m ²) | Social Housing (m ²) | Location Requirement for Residential Development |
|----------------------|--------------------------------|--|----------------------------------|--|
| Commercial Project 1 | 10,000 | 30,000 | 9,000 (30%) | Same municipality or Greater Paris region |
| Commercial Project 2 | 20,000 | 60,000 | 18,000 (30%) | Same municipality or Greater Paris |

Note: Project 1 is located in a municipality where the restriction applies to developments exceeding 10,000 m², while Project 2 is located in a municipality where the restriction applies to developments exceeding 20,000 m².

Furthermore, the directive mandates that residential units be constructed within the same municipality as the commercial project. If local construction is not feasible, developers may alternatively build the units within the Greater Paris region (within the restricted area). The residential units must be completed before the office project is delivered. As another option, developers may demolish an equivalent amount of office space within the same area, provided this action facilitates new residential development.

As compensation for the approval of office constructions or extensions exceeding 10% of the existing project size, developers are required to create residential units three times the additional office space. These housing units must also be situated within the same municipality or the Greater Paris region. In cases where demolition is part of the compensation, the demolition must directly enable residential development in the same area.

Subsequent updates in September 2021 revised zoning definitions and adjusted thresholds, reflecting ongoing efforts to promote a balanced distribution of housing and office developments across the Paris region⁶. These updates are critical to fostering more equitable urban growth and addressing long-standing regional imbalances.

⁶Further details are provided in the Appendix.

2.3 Context and Data

This study utilizes several French data sources to assess the impact of the 2018 Paris Region Mixed-Land Use Directive on real estate prices and development activity. The primary datasets are the *Demande de Valeur Foncière* (DV3F) and the *Sitadel* databases, each of which provides rich transaction-level and permit-level information essential for evaluating the directive's effects.

Transaction Data: DV3F — The DV3F database serves as the core dataset for analyzing real estate transaction dynamics. It provides detailed records for each property sale in the Paris Region, including information on transaction type (e.g., standard sales, auctions, off-plan sales), location, property characteristics (such as dimensions and typologies), and ancillary facilities. With precise GPS coordinates available for each transaction, I can conduct spatial analysis by merging property data with municipal boundaries, enabling a thorough examination of how the directive influenced real estate prices at the regulatory boundary level.⁷

To estimate the directive's impact on property prices, I implement a spatial difference-in-differences (DiD) framework that compares price trends between municipalities affected by the regulation (treatment group) and adjacent, unaffected municipalities (control group). This approach controls for time-invariant unobservable factors shared by neighboring municipalities, thus providing a causal estimate of the directive's effect. Additionally, the granularity of the DV3F data mitigates aggregation bias by allowing for property-specific controls, such as location, size, and property type, enhancing the precision of the estimates.

Building Permit Data – The *Sitadel* database provides comprehensive data on building permits for residential and commercial real estate projects across the Paris Region. This dataset is instrumental in evaluating the directive's impact on real estate development, particularly in assessing shifts in construction activity toward mixed-use projects. It classifies permits by project type—such as new construction and ren-

⁷Geospatial data on municipalities was sourced from APIs provided by <https://geo.api.gouv.fr>.

ovations—and by sector (e.g., residential, commercial, industrial), enabling a detailed analysis of market-specific transformations.⁸ For this study, permits related to hotel accommodations and public services were excluded to focus on the directive’s specific objective of influencing real estate development patterns.

One notable limitation of the *Sitadel* database is the incomplete geolocation data for certain permits. Precise location information is available for approximately 66% of residential permits and 63% of commercial permits. The absence of geolocation data poses challenges in fully leveraging spatial variation, particularly at the boundary level. To mitigate this issue, the analysis incorporates two complementary approaches: (1) models estimated using only the geolocated permits, and (2) alternative specifications leveraging the entire sample, excluding distance-based controls. These approaches ensure a balanced assessment of the directive’s spatial implications while maximizing the available data.

To assess the directive’s effects on real estate development, a balanced panel dataset is constructed at the municipal level, aggregated annually. This panel structure allows for a comprehensive examination of both short-term housing market dynamics and the longer-term effects of the directive on real estate supply. Municipalities with no recorded building permits in a given year are assigned a value of zero, ensuring that the dataset captures activity across all municipalities, treated and non-treated, thereby providing a nuanced analysis of renovation and construction activity.

Given the presence of zeros in the permit data, a $\log(y + 1)$ transformation is employed as recommended by Chen and Roth²⁰²⁴.⁹ This transformation ensures that the logarithmic function remains defined for municipalities without permits while maintaining the interpretability of the transformed variable. Additionally, the $\log(y + 1)$ approach addresses potential biases caused by the overrepresentation of municipalities with no permits, enabling robust comparisons between treated and non-treated areas.

⁸Permit types include residential housing, offices, retail, and several other categories.

⁹Chen, X., Fang, H., & Zhao, L. (2024). Transformations in Urban Housing Markets. *Journal of Urban Economics*, 138(4), 1–20.

In addition, I restrict my analysis to observations classified under specific *NAF/APE codes* related to real estate activities¹⁰¹¹. This restriction ensures that the analysis is focused on professional real estate activities, excluding private individuals or firms developing their own premises. By doing so, I provide a more targeted evaluation of the directive's effects on the commercial and residential property sectors.

I employ a spatial difference-in-differences (DiD) model to estimate the directive's impact on urban development. By comparing outcomes in treated municipalities to those in adjacent untreated areas, I control for unobservable factors that are consistent across municipalities close to the regulatory boundary. The use of precise GPS data for each transaction and permit ensures that my analysis accurately captures the spatial distribution of the directive's effects, while the detailed nature of both the DV3F and Sitadel datasets minimizes aggregation bias.

This empirical strategy is supplemented with robustness checks, such as excluding observations within a 1-kilometer radius of the boundary, to reduce potential spillover effects. Additionally, I implement an event study design to capture the directive's dynamic effects over time.

2.4 Empirical Framework

This section outlines the empirical strategy used to evaluate the impact of the 2018 Paris Region Mixed-Land Use Directive on real estate transactions and development activities. To estimate the causal effects of the directive, I employ a spatial difference-in-differences (DiD) methodology, building on techniques proposed by Overman and Einio (2012) and Chapelle, Vignolles, and Clara Wolf (2018). This approach leverages spatial discontinuities at municipal boundaries to identify treatment effects.

The spatial DiD method compares urban outcomes in municipalities subject to the

¹⁰The (NAF) and (APE) codes are French industry classification systems used to categorize economic activities.

¹¹The NAF/APE codes used include those related to real estate development and management, such as 68.10Z (real estate activities with own property), 68.20A (rental of residential property), 41.10A (construction of residential buildings), and others.

directive (treated municipalities) with those in adjacent municipalities unaffected by the directive (control municipalities). By exploiting spatial heterogeneity in exposure to land-use restrictions, this approach isolates the directive’s causal impact while controlling for shared unobservable factors could otherwise confound the analysis.

Our identification strategy focuses on frontier municipalities, defined as those located along the boundary of the restricted areas (see Figure 3.1). These municipalities serve as a credible treatment group because their proximity to the regulatory boundary minimizes concerns about unobservable heterogeneity between treated and control areas. Although these municipalities may be farther from the Paris Region’s urban center than other restricted municipalities—potentially leading to an underestimation of the policy’s effects—their spatial proximity to untreated areas ensures comparability and mitigates biases arising from endogenous treatment assignment.

Table 3.9 provides summary statistics comparing frontier municipalities (treated group) to all restricted municipalities. While some pre-directive differences in characteristics are evident, these differences are relatively small and unlikely to introduce significant bias into my estimates. Furthermore, Table 3.10 compares real estate dynamics across these groups, and Table 3.11 compares real estate development, demonstrating that they remain comparable on key metrics such as transaction volumes and building permit issuances.

Despite potential limitations related to proximity to the urban center, the evidence supports the validity of using these frontier municipalities (treated group) in my spatial DiD framework. Tables 3.12 and 3.13 compare real estate outcomes between restricted and control municipalities, indicating strong alignment in both transaction volumes and permit issuances. This supports my assumption that frontier municipalities provide a robust setting for identifying the directive’s impact. Where differences in real estate market dynamics remain, Tables 3.12 and 3.13 demonstrate that properties on either side of the boundary exhibit increasing similarity as the sample is restricted to those closer to the boundary. This finding reinforces the appropriateness of using frontier municipalities as a valid comparison group in my spatial DiD framework.

To address any remaining concerns about spatial heterogeneity, I implement a fixed-effects model that incorporates progressively stricter distance thresholds. This model exploits variations in land-use exposure across municipalities located near the regulatory boundary, controlling for unobservable characteristics that vary at the municipal level but remain constant in close proximity to the boundary. By comparing adjacent municipalities subject to different land-use restrictions, this approach allows us to account for unobservable factors that may affect both groups similarly, thereby isolating the directive's causal impact on urban development outcomes.

Our primary analysis focuses on municipalities within a 1-kilometer radius of the regulation boundary. For robustness, I progressively expand the sample to include municipalities within a 5-kilometer radius, ensuring that my results hold across different spatial thresholds¹².

By combining these empirical strategies, including the spatial DiD framework and fixed effects, my approach rigorously addresses potential spatial heterogeneity and selection bias. The consistency of my findings across different spatial thresholds further reinforces the robustness of my results and ensures the validity of my conclusions regarding the impact of the 2018 Paris Region Mixed-Land Use Directive on urban development. I estimate the following baseline model:

$$\log(Y_{i,t}) = \delta_t + \phi_{b(i)} + \gamma_y(Post_t \times NewDirective_i) + \theta X_{i,t} + \varepsilon_{i,t} \quad (2.1)$$

Where $Y_{i,t}$ represents the outcome variable for municipality i at time t , which could be real estate transaction prices, building permits issued, or the number of units under construction. The interaction term $Post_t \times NewDirective_i$ captures the treatment effect, equal to 1 for municipalities impacted by the directive after its implementation. The introduction date of the regulation is set to November 1st, 2018. However, my choice of the treatment start date on January 1st, 2019, is motivated by the time required for accreditation request approval¹³. Year fixed effects, δ_t , control for time-specific

¹²This expanded sample includes approximately 65% of building permits (see Table 3.14) and 75% of real estate transactions (see Table 3.15).

¹³If the submitted dossier is complete, the processing time is typically between 2 and 3 months.

factors, while boundary fixed effects, $\phi_{b(i)}$, account for unobserved characteristics that are similar across municipalities adjacent to the regulation boundary. The control variables $X_{i,t}$ include relevant socio-economic and geographic factors, further isolating the directive's impact on urban outcomes.

A potential challenge in this analysis is the risk of spillover effects between treated and untreated municipalities, which could violate the Stable Unit Treatment Value Assumption (SUTVA). Developers or investors may shift activities from restricted to unrestricted municipalities, affecting outcomes in control areas. To address this, I follow the approach of Kline and Moretti (2014), excluding observations within a 1-kilometer radius of the boundary between treated and control municipalities. This exclusion reduces the likelihood of spillover effects influencing my estimates.

Another limitation arises from missing geolocation data in the building permit dataset, with approximately 66% of residential and 63% of commercial permits including precise location data. This lack of data could hinder my ability to fully capture spatial variation near the regulation boundary, potentially introducing bias if missing information correlates with treatment status. For instance, municipalities with higher administrative capacity—more likely to be treated—may be more diligent in reporting permit locations.

To address this issue, I employ two complementary strategies. First, I restrict the sample to geolocated permits and include distance-to-boundary controls to account for spatial heterogeneity. Second, I estimate an alternative specification that omits distance controls incorporating municipality fixed effects, allowing us to utilize the full dataset. As shown in Table 3.13, the results from both approaches are consistent, suggesting that the missing geolocation data does not materially affect the overall findings.

In addition to the spatial DiD model, I implement an event study specification to examine the dynamic effects of the directive over time. This specification allows us to explore how the directive's impact evolves in the years following its implementation.

Therefore, all permits approved between November 1st, 2018, and January 1st, 2019, would not be affected by the restrictions.

The event study specification is as follows:

$$\log(Y_{i,t}) = \delta_t + \phi_{b(i)} + NewDirective_i \times \sum_{\substack{y=-n \\ y \neq -1}}^m \gamma_y I(t - t_c^* = y) + \beta X_{i,t} + \varepsilon_{i,t} \quad (2.2)$$

where $I(t - t_c^* = y)$ is an indicator for each period relative to the implementation of the directive. This allows us to estimate treatment effects for each year before and after the regulation. The coefficients γ_y capture the treatment effect for each year, with the omitted category corresponding to the year immediately preceding the directive's implementation. If the parallel trends assumption holds, pre-treatment coefficients should be statistically insignificant, indicating that treated and control municipalities were on similar trajectories before the directive.

2.5 Result

In this section, I analyze the impact of policy changes on the commercial and residential real estate markets. I begin by examining the commercial real estate sector, focusing on the issuance of building permits intended for commercial projects and transaction volumes in the commercial property market. Subsequently, I shift to the residential real estate market, evaluating building permits issued for residential developments and residential property prices.

2.5.1 Commercial Real Estate

This section evaluates the impact of the 2018 Paris Region Mixed-Land Use Directive on commercial real estate development. Using a fixed-effects regression model, I analyze four key outcomes: the number of building permits issued for commercial developments, the commercial surface area constructed, the transformation of residential spaces into commercial uses¹⁴, and the ratio of residential to commercial spaces after

¹⁴This refers to the conversion of residential spaces into commercial uses, typically through renovations or internal modifications.

these transformations¹⁵.

Effect of the Directive on Commercial Urban Development

The results, shown in Table 2.2, provide key insights into the directive's effects on commercial real estate development, particularly in terms of building permits, residential-to-commercial conversions, and the balance between residential and commercial spaces. I analyze these outcomes across three distance thresholds (0–1 km, 0–3 km, and 0–5 km).

The interaction term *Post x NewDirective* is statistically insignificant across all distance thresholds for both the number of new building permits and the amount of commercial surface constructed. The estimated coefficients are close to zero, indicating that the introduction of the directive did not significantly affect new commercial development during the study period. This pattern holds across all proximity thresholds, suggesting that the directive had no meaningful short-term impact on new commercial construction in the treated municipalities.

Table 2.2: The Impact on Commercial Development at Different Distances

| | 0-1km | | | 0-3km | | | 0-5km | | |
|---------------------------------|----------------------|----------------------|--------------------------------|----------------------|----------------------|--------------------------------|----------------------|----------------------|--------------------------------|
| | New Building Permits | Old Building Permits | Commercial Surface Constructed | New Building Permits | Old Building Permits | Commercial Surface Constructed | New Building Permits | Old Building Permits | Commercial Surface Constructed |
| Post x NewDirective | 0.000 (0.003) | 0.001 (0.003) | -0.051 (0.080) | 0.004 (0.006) | 0.009 (0.005) | -0.039 (0.106) | 0.003 (0.006) | 0.010 (0.005) | -0.041 (0.106) |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Municipalities FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Estimation Period | 2014-2022 | | | | | | | | |
| Number of Observations | 2,529 | | | | | | | | |
| Number of Municipalities | 281 | | | | | | | | |
| Adjusted R² | 0.86 | 0.89 | 0.80 | 0.85 | 0.89 | 0.73 | 0.86 | 0.88 | 0.73 |

***p < 0.001; **p < 0.01; *p < 0.05

Note: This fixed-effects regression analyzes the logarithm of yearly sums per municipality as the dependent variables. The sample includes building permits for new construction and renovations within the commercial real estate sector. The "Ratio Habitations to Locals" variable represents the proportion of residential to commercial space in new developments. Standard errors are clustered at the municipality level and are reported in parentheses.

Developer Adaptation and Strategic Behavior– A plausible explanation for the absence of significant effects on new developments is that developers may have shifted their focus toward renovating existing structures to circumvent the regulatory con-

¹⁵The ratio represents the proportion of habitable residential spaces to commercial spaces following renovations, transformations, or extensions.

straints. Table 2.3 shows a statistically significant increase in the transformation of residential spaces into commercial uses¹⁶, suggesting that developers were more inclined to repurpose existing properties rather than initiate new construction.

Interestingly, in Table 2.3 the ratio of habitable residential space to commercial space shows a statistically significant decline in the 0–3 km and 0–5 km rings. This decline suggests that developers prioritized converting residential units into commercial properties, thereby undermining the directive’s intended goal of promoting mixed-use development and increasing the residential supply. The reduction in the residential-to-commercial ratio indicates that while residential units are being transformed into commercial spaces, the reverse transformation is occurring at a slower pace, which could exacerbate the existing housing shortage in the Paris Region.

This adaptive behavior is consistent with broader findings in the land-use regulation literature, which suggests that stringent regulations often prompt developers to adopt alternative strategies. For example, Wolf-Powers 2005 find that up-zoning in New York led to rapid, opportunistic development, with developers shifting toward more profitable land uses, often displacing less profitable industrial spaces. In the case of the Paris Region directive, developers likely prioritized commercial over residential construction as a means of navigating regulatory constraints while responding to increased demand for commercial space. This shift mirrors patterns observed in other highly regulated urban markets, where developers frequently optimize for short-term profits by favoring land uses that face fewer regulatory hurdles.

¹⁶In the Paris Region, obtaining permission for a change of use (from residential to commercial or vice versa) typically requires authorization from the local municipality or the prefecture. If no significant works are required, a simple approval is often sufficient. However, if the transformation involves substantial renovations or construction work, a building permit is necessary, and these cases are included in my sample. In certain communes, especially those with over 200,000 inhabitants or located within the Hauts-de-Seine, Seine-Saint-Denis, or Val-de-Marne departments, compensation may also be required in the form of converting commercial spaces into residential ones to maintain housing stock (not in my sample). Detailed information on these regulations can be found in the Appendix 3.5

Table 2.3: The Impact on Commercial Development Under Transformation Activity at Different Distances

| | 0-1km | | 0-3km | | 0-5km | |
|---------------------------------|--|-----------------------------|--|-----------------------------|--|-----------------------------|
| | Residential Surface Under Transformation | Ratio Habitations to Locals | Residential Surface Under Transformation | Ratio Habitations to Locals | Residential Surface Under Transformation | Ratio Habitations to Locals |
| Post x NewDirective | 0.038* (0.017) | -0.003 (0.004) | 0.040* (0.019) | -0.010* (0.005) | 0.035* (0.018) | -0.009* (0.005) |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Municipalities FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Estimation Period | | | 2014–2022 | | | |
| Number of Observations | | | 2,529 | | | |
| Number of Municipalities | | | 281 | | | |
| Adjusted R² | 0.07 | 0.09 | 0.05 | 0.09 | 0.06 | 0.07 |

***p < 0.001; **p < 0.01; *p < 0.05

Note: This fixed-effects regression analyzes the logarithm of yearly sums per municipality as the dependent variables. "Residential Surface Under Transformation" refers to the surface area of units initially intended for residential use that were converted to commercial use under commercial building permits. The "Ratio Habitations to Locals" variable represents the proportion of residential to commercial space following these transformations. Standard errors are clustered at the municipality level and are reported in parentheses.

A critical consideration in evaluating spatial policies is the potential for displacement effects, where economic activities are relocated from treated areas to neighboring, untreated municipalities, rather than yielding a genuine net impact. To account for such spatial spillover effects, I exclude the nearest 1 km ring from the analysis, as shown in Tables 2.4 and 2.5. Following this exclusion, I observe a slight increase in the number of building permits issued for older buildings, and the transformation of residential spaces within existing developments remains statistically significant. These findings suggest that spillover effects may have muted the directive's impact in municipalities closest to the regulatory boundary. By excluding the nearest ring, I provide a clearer estimate of the directive's influence on building renovations, confirming that developers have strategically adapted to the new regulatory environment by converting residential spaces for commercial use.

Table 2.4: The Impact on Commercial Development at Different Distances Without the Nearst Ring

| | 1-3km | | | 1-5km | | |
|---------------------------------|----------------------|----------------------|--------------------------------|----------------------|----------------------|--------------------------------|
| | New Building Permits | Old Building Permits | Commercial Surface Constructed | New Building Permits | Old Building Permits | Commercial Surface Constructed |
| Post x NewDirective | 0.005 (0.005) | 0.008* (0.003) | 0.044 (0.076) | 0.006 (0.005) | 0.010* (0.004) | 0.032 (0.076) |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Municipalities FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Estimation Period | 2014–2022 | | | | | |
| Number of Observations | 2,529 | | | | | |
| Number of Municipalities | 281 | | | | | |
| Adjusted R² | 0.86 | 0.89 | 0.64 | 0.85 | 0.89 | 0.63 |

***p < 0.001; **p < 0.01; *p < 0.05

Note: This fixed-effects regression analyzes the logarithm of yearly sums per municipality as the dependent variables. The sample includes building permits for new construction and renovations within the commercial real estate sector. The "Ratio Habitations to Locals" variable represents the proportion of residential to commercial space in new developments. Standard errors are clustered at the municipality level and are reported in parentheses.

Table 2.5: The Impact on Commercial Development Under Transformation Activity at Different Distances Without the Nearst Ring

| | 1-3km | | 1-5km | |
|---------------------------------|--|-----------------------------|--|-----------------------------|
| | Residential Surface Under Transformation | Ratio Habitations to Locals | Residential Surface Under Transformation | Ratio Habitations to Locals |
| Post x NewDirective | 0.040* (0.019) | -0.008* (0.005) | 0.035* (0.018) | -0.008* (0.005) |
| Time FE | Yes | Yes | Yes | Yes |
| Municipalities FE | Yes | Yes | Yes | Yes |
| Estimation Period | 2014–2022 | | | |
| Number of Observations | 2,529 | | | |
| Number of Municipalities | 281 | | | |
| Adjusted R² | 0.07 | 0.09 | 0.05 | 0.09 |

***p < 0.001; **p < 0.01; *p < 0.05

Note: This fixed-effects regression analyzes the logarithm of yearly sums per municipality as the dependent variables. "Residential Surface Under Transformation" refers to the surface area of units initially intended for residential use that were converted to commercial use under commercial building permits. The "Ratio Habitations to Locals" variable represents the proportion of residential to commercial space following these transformations. Standard errors are clustered at the municipality level and are reported in parentheses.

The persistence of residential-to-commercial conversions beyond the immediate regulatory boundary suggests that developers may have viewed the directive as an opportunity to maximize commercial space within existing structures. This adaptive response runs counter to the directive's objective of promoting mixed-use development and could, in fact, exacerbate spatial imbalances between residential and commercial spaces.

The 2018 Paris Region Mixed-Land Use Directive was designed to promote mixed-use developments and increase residential supply in areas dominated by commercial

properties. However, the findings suggest that, at least in the short term, the directive may have had counterproductive effects. Rather than fostering an increase in residential supply, developers found ways to circumvent the regulation by converting residential properties into commercial spaces, exacerbating the region’s housing shortage.

These results highlight the challenges of implementing land-use regulations in urban settings where demand for commercial space is high and land is scarce. As seen in other global cities, zoning policies can sometimes lead to unintended consequences, such as increased property values without a corresponding rise in housing supply (Glaeser and Ward 2009; Freemark 2020).

Temporal Analysis – To explore the temporal dynamics of the directive and verify the parallel trends assumption, I conducted an event study analysis. In Figure 2.1 the pre-treatment coefficients are statistically insignificant, which supports the parallel trends assumption in my DiD model. Moreover, the post-treatment coefficients remain insignificant, further indicating that the directive did not generate discernible short-term changes in commercial real estate outcomes. This lack of immediate effect may be explained by developers anticipating the regulation and adjusting their strategies to mitigate its impact, or by the relatively short post-treatment period (2019–2022), which may not capture longer-term trends.

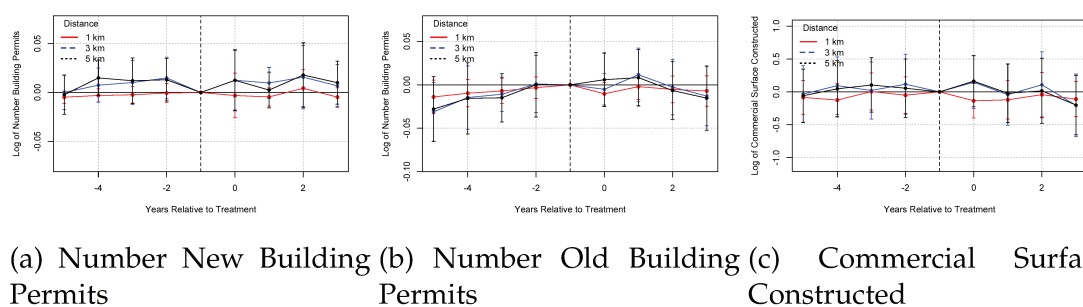


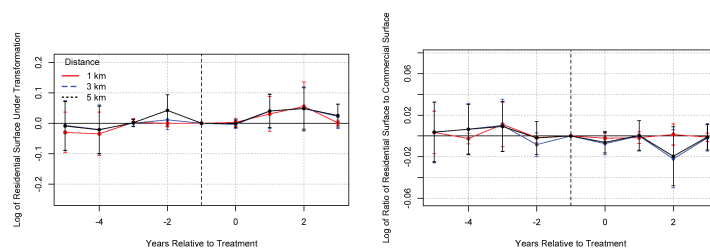
Figure 2.1: The Impact on New Commercial Development by Distance

Figure 2.2 presents the evolution of residential surface transformations and the ratio of residential to commercial space over time. In Figure 2.2a, the coefficient for residential surface transformations is statistically insignificant during the pre-regulation

period. Similarly, in the year prior to the directive’s implementation, there is a noticeable, albeit statistically insignificant, increase in residential surface transformations, which may suggest anticipation effects among developers. However, following the directive’s introduction, while the coefficients exhibit an upward trend from the first year, they remain statistically insignificant. This implies that any potential shifts in developer behavior in response to the new regulations are not conclusively captured by the data.

Likewise, in Figure 2.2b, the ratio of habitable residential spaces to commercial spaces shows no significant variation prior to the directive’s implementation at the 5% level. In the year leading up to the directive, the coefficient, which had been positive in earlier years, turns negative. Despite this shift, the results remain statistically insignificant, indicating that while there may have been changes in developer strategies, these changes are not statistically robust enough to confirm a definitive impact of the directive.

Although none of the coefficients achieve statistical significance—likely due to the relatively small sample size—these trends still offer tentative insights into the evolving dynamics of residential transformations. The observed post-directive increase in activity suggests that the regulation may have begun to influence developer behavior, even if these short-term effects are not fully captured in a statistically significant manner.



(a) Residential Surface Under Transformation (b) Ratio Habitations to Locals

Figure 2.2: The Impact on New Commercial Development by Distance

Figure 2.3 illustrates the temporal dynamics after the exclusion of the nearest ring, further supporting the parallel trends assumption. The absence of significant pre-

treatment differences between treated and control areas strengthens the robustness of the results, indicating that the observed post-treatment effects are likely attributable to the directive itself, rather than confounding spatial spillovers.

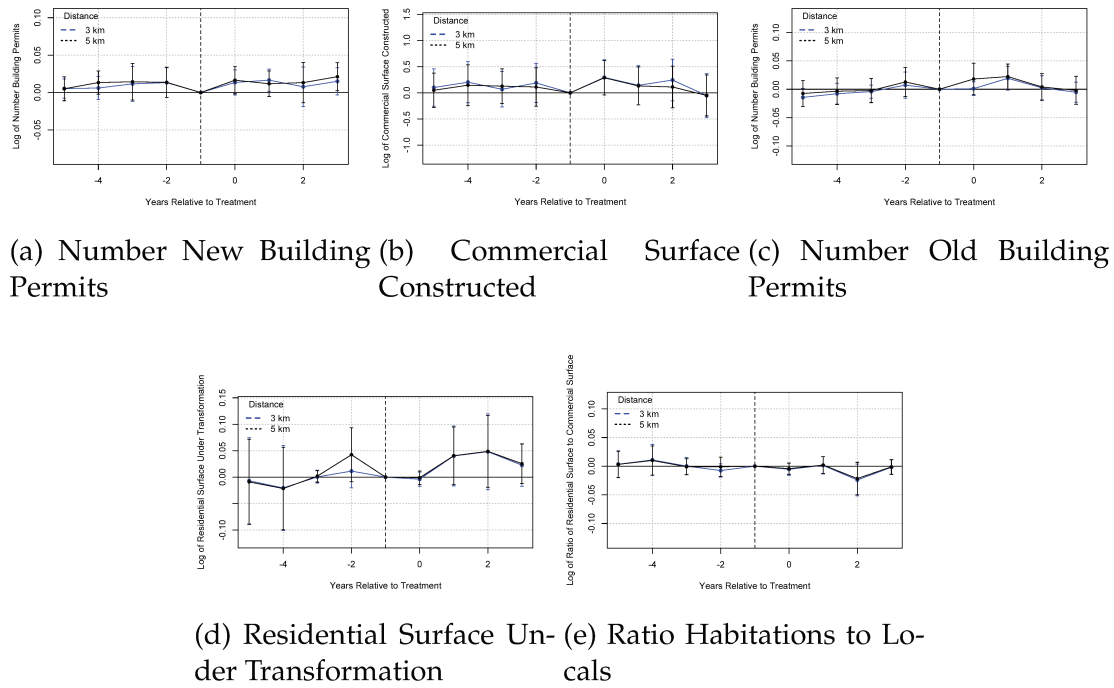


Figure 2.3: The Impact on New Commercial Development by Distance Without the Nearest Ring

The findings suggest that more stringent enforcement mechanisms or regulatory amendments may be necessary to protect residential spaces from further depletion. Additionally, the longer-term impacts of the directive remain uncertain, and further research is needed to explore whether the observed trends persist over time. As the real estate market continues to adjust to the regulation, it will be important to assess whether these initial findings evolve into more significant patterns of urban development.

Future studies could also investigate the potential for alternative regulatory approaches that balance the need for commercial development with the preservation of residential housing stock, ensuring that spatial imbalances are mitigated in the long run.

Effect of the Directive on Commercial Prices

This subsection examines the impact of the 2018 Paris Region Mixed-Land Use Directive on commercial real estate prices using a boundary fixed-effects regression model. The dependent variable is the logarithm of commercial space prices. To account for potential displacement effects, I analyze three distance thresholds (0–1 km, 0–3 km, and 0–5 km), along with control rings (1–3 km and 1–5 km) to test for robustness.

Table 2.6 presents the results, with the interaction term *Post x NewDirective* capturing the directive's effect on commercial prices. Across all distance thresholds, the coefficients are negative and statistically insignificant, suggesting that the directive did not have a substantial impact on commercial real estate prices in the short term. The lack of significant results across specifications indicates the directive's limited regulatory influence on prices.

The inclusion of time and boundary fixed effects, as well as controls for property characteristics (e.g., surface area, building age, and proximity to transport), supports the robustness of these findings. Adjusted R^2 values range from 0.41 to 0.51, indicating that the model explains a reasonable portion of the variance in commercial prices.

One plausible explanation for the absence of price effects is developers' adaptive behavior in response to the directive. Rather than initiating new projects subject to the directive's constraints, developers may have chosen to renovate existing commercial spaces to avoid regulatory limitations on new construction.

Additionally, the directive's threshold for requiring compensation (20,000 m² of new commercial space) may have been set too high to meaningfully deter new developments. This threshold may have provided developers with enough flexibility to continue projects without facing substantial regulatory burdens, thus limiting any significant upward pressure on prices. In urban markets, where developers often balance regulatory constraints with market demand, thresholds that are perceived as lenient can diminish the effectiveness of policy interventions.

Table 2.6: Impact on Commercial Prices

| | Full Sample | | | | Without Nearest Control Ring | |
|-------------------------------|-------------------|-------------------|------------------|-------------------|------------------------------|------------------|
| | 0-1km | 0-3km | 0-5km | | 1-3km | 1-5km |
| Post x NewDirective | -0.143 (0.156) | -0.030 (0.076) | 0.005 (0.066) | -0.009 (0.056) | 0.006 (0.091) | 0.048 (0.074) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Boundary Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of Observations | 1,092 | 4,505 | 5,547 | 5,861 | 3,413 | 4,455 |
| Adjusted R² | 0.41 | 0.49 | 0.49 | 0.48 | 0.51 | 0.49 |

Note: In this panel fixed-effects regression, the dependent variable is the logarithm of commercial space prices. Control variables include surface area, number of main rooms, number of bathrooms, number of kitchens, number of dependencies, floor, number of floors in the building, age of the building, distance to the city center, distance to the nearest train station, and distance to the border. Standard errors are in parentheses and are clustered at the municipality level.

Standard errors in parentheses. *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Temporal Analysis – To further investigate the temporal dynamics of the directive’s impact, Figure 2.4 presents the event study results across different distance rings, including the full sample. The results mirror the findings from the regression analysis, showing no statistically significant change in commercial prices following the policy’s implementation over the three-year post-treatment period. Importantly, the event study indicates no significant pre-treatment differences in trends between treated and control areas, reinforcing the parallel trends assumption. These findings provide additional evidence that the directive did not generate any immediate, observable effects on commercial real estate prices.

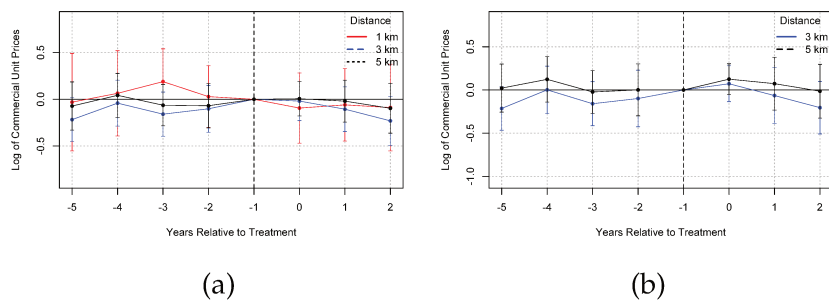


Figure 2.4: Impact on Commercial Prices

The findings are consistent with economic theory, which predicts that production constraints on a good will not necessarily lead to price increases if sufficiently close substitutes are available. In this case, the availability of alternative commercial real estate locations outside the directive's jurisdiction may have mitigated any potential price effects. Markets with a variety of substitute locations typically experience less price sensitivity to regulatory changes, as developers and tenants can shift demand to less regulated areas. This substitution effect likely played a significant role in reducing the directive's impact on commercial prices.

From a policy perspective, the absence of significant price adjustments suggests that the Paris Region Mixed-Land Use Directive alone may not be sufficient to induce immediate changes in the commercial real estate market. The directive's regulatory framework, while well-intentioned, may lack the enforcement mechanisms or incentives necessary to produce a meaningful effect on commercial real estate prices in the short term.

Policymakers might consider complementary measures, such as offering incentives for mixed-use development or implementing stricter enforcement of the directive's provisions, to achieve more pronounced effects on the market. For instance, density bonuses or tax incentives could encourage developers to pursue new projects rather than simply renovating existing structures, thus enhancing the directive's effectiveness.

Furthermore, future policy interventions could focus on refining the compensation thresholds for new commercial space development. Lowering these thresholds could deter excessive commercial development and incentivize residential construction, aligning more closely with the directive's goals of promoting balanced urban growth.

2.5.2 Residential Real Estate

In this subsection, I evaluate the impact of the 2018 Paris Region Mixed-Land Use Directive on residential real estate development by examining key indicators such as

the number of building permits issued for residential development, the newly constructed residential surface area, and the conversion of residential spaces into commercial uses.¹⁷ Additionally, I assess the balance between residential and commercial spaces in new construction.

Effect of the Directive on Residential Urban Development

Table 2.7 reports the estimated effects of the directive on the number of residential building permits, the newly constructed residential surface area, and the ratio of residential to commercial spaces. The results suggest that the directive had a limited impact on residential development, with the coefficients for the interaction term *Post x NewDirective* generally remaining statistically insignificant across the various distance rings. For example, while the number of residential building permits in municipalities located within 0–1 km of the regulatory boundary exhibited a slight increase (coefficient of 0.024), this effect was not statistically significant. Similarly, the impact on newly constructed residential surface area, though positive, remained statistically insignificant across all distances, with the largest coefficient observed for the 0–5 km zone (0.209).

The ratio of habitable residential space to commercial surface in new residential developments, as shown in Table 2.7, indicates mixed results. The coefficient on *Post x NewDirective* is negative for municipalities within 0–1 km of the boundary, at -0.019 , though not statistically significant. For the 0–5 km ring, the coefficient becomes positive, at 0.032, but remains insignificant. This suggests that the directive did not materially alter the balance between residential and commercial development in the immediate post-policy period.

These findings suggest that the directive did not lead to a substantial increase in residential construction in the short term. Although there was a marginal rise in both building permits and constructed surface area near the regulatory boundary, the lack of statistical significance implies that the directive's primary objective of fostering new

¹⁷The conversion of residential spaces refers to the reallocation of these spaces to commercial or other non-residential uses, typically through renovations, modifications or extension.

residential development may not have been fully realized during the study period.

It is also important to consider that the lack of statistically significant effects could stem from the relatively small sample size, coupled with a high number of zero observations from municipalities that reported no new construction in certain years. This sparsity of data likely reduced the statistical power of the analysis, limiting my ability to detect significant effects, particularly in areas with low levels of construction activity.

Transformation of Residential Spaces into Commercial Use – Table 2.7 reports the estimated effects of the 2018 Paris Region Mixed-Land Use Directive on the transformation of residential spaces into commercial uses, focusing on the commercial surface area generated and the ratio of residential to commercial spaces after redevelopment.

The results show that the coefficient for the transformation of residential spaces into commercial use is positive and statistically significant at the 5% level across various distance rings. For example, in the 0–3 km ring, the coefficient for commercial surface transformation is 28.9%, indicating a substantial increase in the repurposing of residential spaces for commercial purposes in this proximity. The positive and significant coefficients across multiple distance rings highlight the directive’s role in encouraging such conversions.

These results suggest that developers responded to the directive by repurposing existing residential properties, likely in an attempt to navigate regulatory challenges and capitalize on existing assets in areas with higher demand for commercial spaces. The significant increase in transformed commercial surfaces within residential development demonstrates that the directive influenced development patterns, even if its immediate effect on new residential construction was limited.

Table 2.7: Impact on Residential Development by Distance

| | 0-1km | | | | 0-3km | | | | 0-5km | | | |
|--------------------------|-------------------|---------------------------------|---|---------------------------|-------------------|---------------------------------|---|---------------------------|-------------------|---------------------------------|---|---------------------------|
| | Number of Permits | Residential Surface Constructed | Commercial Surface After Transformation | Ratio Habitants to Locals | Number of Permits | Residential Surface Constructed | Commercial Surface After Transformation | Ratio Habitants to Locals | Number of Permits | Residential Surface Constructed | Commercial Surface After Transformation | Ratio Habitants to Locals |
| Post x NewDirective | 0.024 (0.040) | 0.160 (0.194) | 0.179** (0.068) | -0.019 (0.021) | 0.029 (0.051) | 0.208 (0.203) | 0.289** (0.088) | 0.011 (0.034) | 0.020 (0.050) | 0.209 (0.205) | 0.229* (0.091) | 0.032 (0.037) |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Municipalities FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Estimation Period | 2014-2022 | | | | | | | | | | | |
| Number of Observations | 2,745 | | | | | | | | | | | |
| Number of Municipalities | 305 | | | | | | | | | | | |
| Adjusted R ² | 0.38 | 0.43 | 0.28 | 0.29 | 0.38 | 0.43 | 0.28 | 0.29 | 0.38 | 0.43 | 0.28 | 0.29 |

Note: The sample consists of building permits issued for residential use. The dependent variables are the logarithms of yearly totals per municipality and include the number of building permits issued for new residential development, the residential surface area constructed, the commercial surface area generated from the transformation of residential spaces, and the ratio of residential to commercial space ("Habitations to Locals") after transformation.

To address concerns about potential displacement effects—where development might shift from treated to untreated areas—I also examine control rings (1–3 km and 1–5 km). As shown in Table 2.8, the results remain largely unchanged, with no statistically significant effects on the number of permits or residential surface construction when the nearest 1 km ring is excluded from the analysis. This consistency across different distance thresholds and control rings reinforces the conclusion that the directive had a limited impact on new residential development but did lead to some conversion of commercial spaces into residential units.

Table 2.8: Impact on Residential Development by Distance

| | 1-3km | | | | 1-5km | | | |
|--------------------------|-------------------|---------------------------------|---|---------------------------|-------------------|---------------------------------|---|---------------------------|
| | Number of Permits | Residential Surface Constructed | Commercial Surface After Transformation | Ratio Habitants to Locals | Number of Permits | Residential Surface Constructed | Commercial Surface After Transformation | Ratio Habitants to Locals |
| Post x NewDirective | -0.025 (0.044) | -0.044 (0.188) | 0.246** (0.081) | 0.032 (0.031) | -0.027 (0.044) | -0.010 (0.187) | 0.261*** (0.076) | 0.057 (0.036) |
| Time FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Municipalities FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Estimation Period | 2014-2022 | | | | | | | |
| Number of Observations | 2,745 | | | | | | | |
| Number of Municipalities | 305 | | | | | | | |
| Adjusted R ² | 0.50 | 0.57 | 0.28 | 0.25 | 0.51 | 0.59 | 0.26 | 0.27 |

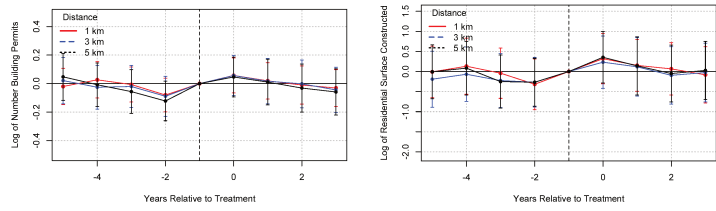
Note: The sample consists of building permits issued for residential use. The dependent variables are the logarithms of yearly totals per municipality and include the number of building permits issued for new residential development, the residential surface area constructed, the commercial surface area generated from the transformation of residential spaces, and the ratio of residential to commercial space ("Habitations to Locals") after transformation.

Temporal Analysis – To further evaluate the temporal dynamics of the regulation and verify the parallel trends assumption within the Difference-in-Differences (DiD) framework, I conduct an event study analysis. As depicted in Figure 2.5 for the different control rings and Figure 2.9 after excluding the nearest ring, the coefficients for the pre-treatment periods remain statistically insignificant, confirming the validity of

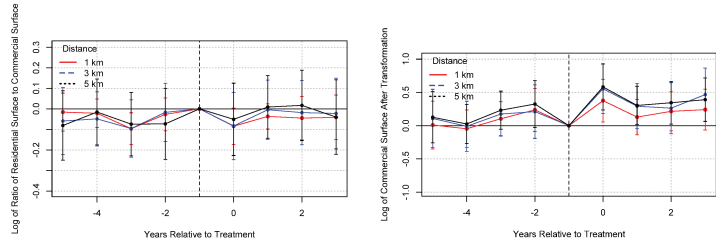
the parallel trends assumption. Moreover, the event study results indicate a persistent increase in the commercial surface area generated through the transformation of existing residential constructions.

Notably, the effect of these conversions becomes more pronounced when the nearest control ring (0–1 km) is excluded, as shown in Table 2.8. Excluding this zone mitigates potential displacement effects, whereby development may shift from treated areas to adjacent untreated areas due to the regulatory constraints. This adjustment allows us to derive a more accurate estimate of the directive’s impact on the transformation of residential spaces into commercial use across the 1–5 km distance bands, thereby reducing potential bias from spillover effects.

The stronger effect observed in areas further from the regulatory boundary can be explained by heightened competitive pressures or market frictions experienced by municipalities closer to the boundary, which may have limited developers’ capacity to repurpose residential spaces. In contrast, municipalities located further from the boundary likely faced fewer distortions related to displacement effects, allowing developers to more fully capitalize on opportunities to convert residential spaces into commercial use, without facing significant constraints from nearby untreated areas.

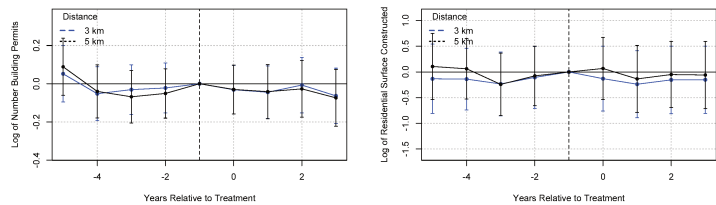


(a) Number of Building Permits (b) Residential Surface Constructed

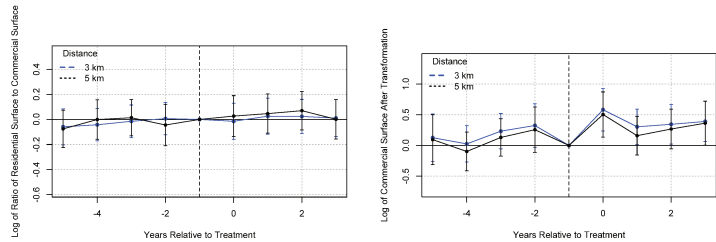


(c) Ratio Residential to Commercial Surface (d) Commercial Surface After Transformation

Figure 2.5: Impact on Residential Development at Different Distance



(a) Number of Building Permits (b) Residential Surface Constructed



(c) Ratio Residential to Commercial Surface (d) Commercial Surface After Transformation

Figure 2.6: Impact on Residential Development at Different Distance Without the Nearest Ring

A potential limitation of my analysis is the influence of external factors, such as broader economic conditions and the COVID-19 pandemic, which may have affected

the trends observed during the study period, complicating the isolation of the directive's effects.

The global economic downturn triggered by the COVID-19 pandemic, especially in 2020, had a profound impact on real estate markets and construction activity. Lockdowns and restrictions disrupted construction timelines, delayed new projects, and led to significant uncertainty among developers and investors. These disruptions may have attenuated the immediate responses to the Paris Region Mixed-Land Use Directive, as developers likely focused on mitigating pandemic-related risks rather than adapting to new regulations.

Moreover, the rise in telework, accelerated by the pandemic, could have introduced longer-term structural changes to urban real estate markets. A significant shift away from traditional office space towards more flexible working arrangements may have dampened the demand for new commercial developments, particularly in high-density urban areas (Bergeaud, Cette, and Drapala 2023). This trend would further complicate the assessment of the directive's short-term impacts, as the underlying demand for office space may have fundamentally shifted in response to new working patterns.

Overall, the findings indicate that the 2018 Paris Region Mixed-Land Use Directive had a relatively limited short-term impact on new residential construction. However, the significant effects on the transformation of commercial spaces into residential use suggest that the directive had unintended consequences, with developers repurposing existing spaces rather than initiating new projects. This reflects the regulatory flexibility discussed in previous sections on commercial real estate. Future studies could explore whether these trends persist over time and whether the directive's impact becomes more pronounced as developers adapt to the regulatory framework.

Effect of the Directive on Housing Prices

This subsection examines the impact of the 2018 Paris Region Mixed-Land Use Directive on housing prices, focusing on the geographic distribution of effects across

varying distances from the regulatory boundary. A boundary fixed-effects regression model is employed, with the logarithm of housing prices as the dependent variable. The analysis is conducted using three proximity thresholds—0–1 km, 0–3 km, and 0–5 km—and includes control rings of 1–3 km and 1–5 km to account for potential displacement effects. This approach enhances the robustness of the estimates by examining both immediate and adjacent regions. The model controls for property characteristics (e.g., surface area, number of rooms, building age), proximity to transport hubs, and fixed effects for time and boundaries.

Table 2.6 presents the estimated effects of the directive on housing prices. The coefficient on the interaction term *Post x NewDirective*, which captures the treatment effect of the directive on housing prices, is consistently close to zero and statistically insignificant across all distance thresholds.

Similarly, the results for the control rings (1–3 km and 1–5 km) are also statistically insignificant. These findings suggest that the directive did not produce a measurable impact on housing prices, even in areas immediately outside the regulatory boundary.

The adjusted R^2 values, ranging from 0.71 to 0.74, indicate that the model explains a substantial portion of the variation in housing prices. The inclusion of time fixed effects and boundary fixed effects controls for time-invariant factors related to specific municipalities and the timing of the directive, ensuring that any unobserved heterogeneity is accounted for.

The absence of statistically significant effects on housing prices can be attributed to several factors. First, as discussed in previous sections, the directive has had limited success in stimulating new residential construction. Without a notable increase in housing supply, the directive alone is unlikely to trigger meaningful changes in housing prices. Furthermore, the binding nature of the policy may have encouraged developers to avoid compliance by converting existing residential units into commercial spaces, potentially worsening the housing shortage.

Second, the short-term nature of this evaluation may not capture delayed price adjustments typical of real estate markets. The conversion of residential supply into

commercial use could further reduce housing availability, leading to upward pressure on prices in the long term.

External economic conditions, particularly the COVID-19 pandemic, also likely influenced price dynamics. The pandemic altered housing demand, as remote work drove a shift toward suburban living and reduced the need for proximity to workplaces (Bergeaud, Cette, and Drapala 2023; Daly 2024). This reorganization of demand may have overshadowed any direct effects of the directive. As a result, housing preferences shifted toward more spacious suburban homes, weakening demand for urban housing during the study period (Chareyron, Régnier, Sari, et al. 2022).

The directive’s objective of fostering horizontal mixed-use zoning—integrating residential and commercial spaces—faces new challenges due to these changes in housing preferences. While the policy aimed to balance urban growth by promoting co-located residential and commercial development, remote work has diminished the need for housing near office spaces, complicating its intended effects.

Table 2.9: Impact of New Directive on Housing Prices

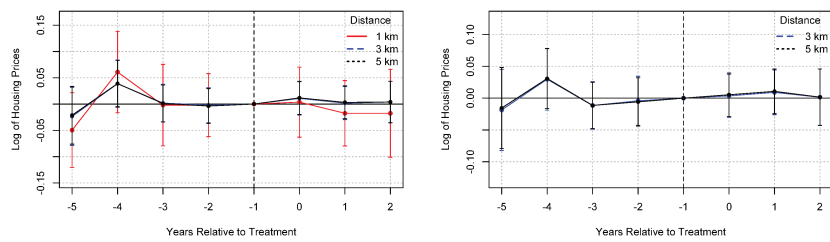
| | Full Sample | | | Without Nearest | |
|-------------------------------|-------------------|------------------|------------------|------------------|------------------|
| | 0-1km | 0-3km | 0-5km | 1-3km | 1-5km |
| Post x NewDirective | -0.012 (0.026) | 0.002 (0.013) | 0.004 (0.013) | 0.006 (0.014) | 0.007 (0.014) |
| Controls | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Boundary Fixed Effects | Yes | Yes | Yes | Yes | Yes |
| Number of Observations | 21,108 | 74,031 | 91,726 | 52,923 | 70,618 |
| Adjusted R² | 0.71 | 0.72 | 0.73 | 0.73 | 0.74 |

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

Note: The table reports results from a panel fixed-effects regression, where the dependent variable is the logarithm of housing prices. Control variables include surface area, number of main rooms, number of bathrooms, number of kitchens, number of dependencies, floor, number of floors in the building, age of the building, distance to the city center, distance to the nearest train station, and distance to the border. Standard errors are reported in parentheses and are clustered at the municipality level.

Temporal Analysis – To further explore the temporal dynamics of the directive’s impact on housing prices, an event study analysis was conducted, with the results depicted in Figure 2.7. The event study examines the evolution of the directive’s effect

over time and across distance thresholds. Additionally, it verifies the parallel trends assumption, which is crucial for the validity of the Difference-in-Differences (DiD) framework. The findings show no statistically significant change in housing prices following the implementation of the directive, supporting the parallel trends assumption. This lack of pre-treatment divergence between treated and control municipalities reinforces the robustness of the results.



(a) At Different Distance (b) Excluding the Nearest Ring

Figure 2.7: The Impact on Housing Prices- Event Study

In conclusion, the findings suggest that the 2018 Paris Region Mixed-Land Use Directive has not had an immediate or statistically significant impact on housing prices. The lack of a notable effect on housing supply, combined with developers' strategies to repurpose residential spaces, may explain the absence of short-term price effects. However, the conversion of residential units into commercial spaces could exacerbate long-term housing shortages, potentially increasing price pressures over time. Future research should explore the directive's long-term effects on housing prices and broader market dynamics as developers continue to adjust to the regulatory framework and evolving work patterns.

2.5.3 Robustness Check

A key limitation of the analysis stems from the missing geolocation data in the building permit dataset. Approximately 66% of residential and 63% of commercial permits lack precise location information, which could limit my ability to fully capture spatial variation near the regulatory boundary. This introduces the potential for bias if

the missing data correlates with treatment status, such as municipalities with greater administrative capacity being more diligent in reporting permit locations.

Commercial Development – To ensure the robustness of my findings, I estimate an alternative specification using the full sample of building permits, incorporating municipality fixed effects to account for unobserved heterogeneity. The results, shown in Table 2.10, are consistent with those from the spatial model that controls for distance to the regulatory boundary. This reinforces the conclusion that developers strategically adapted to the new regulatory environment by converting residential spaces for commercial purposes. Figure 2.8 further investigates the temporal dynamics, confirming the validity of the parallel trends assumption. The absence of significant pre-treatment differences between treated and control areas strengthens the robustness of these results, indicating that the observed post-treatment effects are likely attributable to the directive itself, rather than to confounding spatial spillovers.

Table 2.10: The Impact on Commercial Development

| | New Development | | Work on Existing Development | | |
|---------------------------------|------------------------------------|-----------------------------------|------------------------------------|---|--------------------------------|
| | Number for New Building Permits | Commercial Surface Constructed | Number for Old Building Permits | Residential Surface Under Transformation | Ratio Habitations to Locals |
| Post x NewDirective | 0.007 (0.009) | -0.121 (0.131) | 0.007 (0.007) | 0.040* (0.017) | -0.015* (0.006) |
| Time FE | Yes | Yes | Yes | Yes | Yes |
| Municipalities FE | Yes | Yes | Yes | Yes | Yes |
| Estimation Period | 2014–2022 | | | | |
| Number of Observations | 2,646 | | | | |
| Number of Municipalities | 294 | | | | |
| Adjusted R² | 0.56 | 0.68 | 0.89 | 0.05 | 0.09 |

***p < 0.001; **p < 0.01; *p < 0.05

Note: In this fixed-effects regression, the dependent variables are calculated as the logarithm of the yearly sums per municipality. The sample includes only building permits for new construction intended for the commercial real estate market. "Residential space transformed" refers to the surface area of residential spaces that have been converted into other uses, such as commercial space, due to renovations or internal modifications. "Residential space from transformations" refers to the surface area gained or retained as residential space through transformations or internal modifications within existing buildings. Standard errors are in parentheses and are clustered at the municipality level.

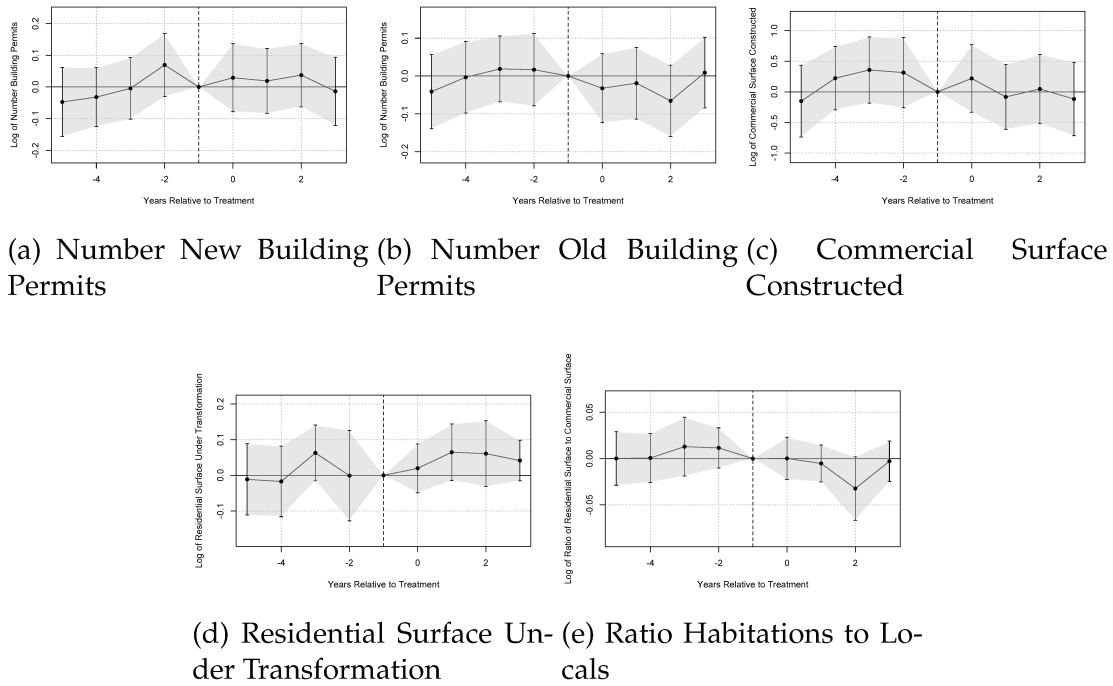


Figure 2.8: The Impact on New Commercial Development

Housing Development –To further validate the robustness of my results on residential development , I estimate an alternative specification by utilizing the entire dataset of building permits, while accounting for unobserved heterogeneity via municipality fixed effects. The results, shown in Table [2.11](#), remain consistent with those obtained from the spatial model, which incorporates distance to the boundary as a control variable. Additionally, [Figure 2.8](#) explores the temporal dynamics, supporting the validity of the parallel trends assumption.

Table 2.11: Impact on Residential Development

| | Residential Permits for New Construction | | | Residential Permits for Existing Construction |
|---------------------------------|--|---------------------------------|---------------------------|---|
| | Number of Permits | Residential Surface Constructed | Ratio Habitants to Locals | Commercial Surface After Transformation |
| Post x NewDirective | 0.025 (0.059) | 0.152 (0.203) | 0.015 (0.009) | 0.261*** (0.076) |
| Time FE | Yes | Yes | Yes | Yes |
| Municipalities FE | Yes | Yes | Yes | Yes |
| Estimation Period | 2014–2022 | | | |
| Number of Observations | 2,772 | | | |
| Number of Municipalities | 308 | | | |
| Adjusted R² | 0.35 | 0.462 | 0.09 | 0.27 |

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Note: The sample consists of building permits issued for residential use. The dependent variables are the logarithms of yearly totals per municipality and include the number of building permits issued for new residential development, the residential surface area constructed, the commercial surface area generated from the transformation of residential spaces, and the ratio of residential to commercial space ("Habitations to Locals") after transformation.

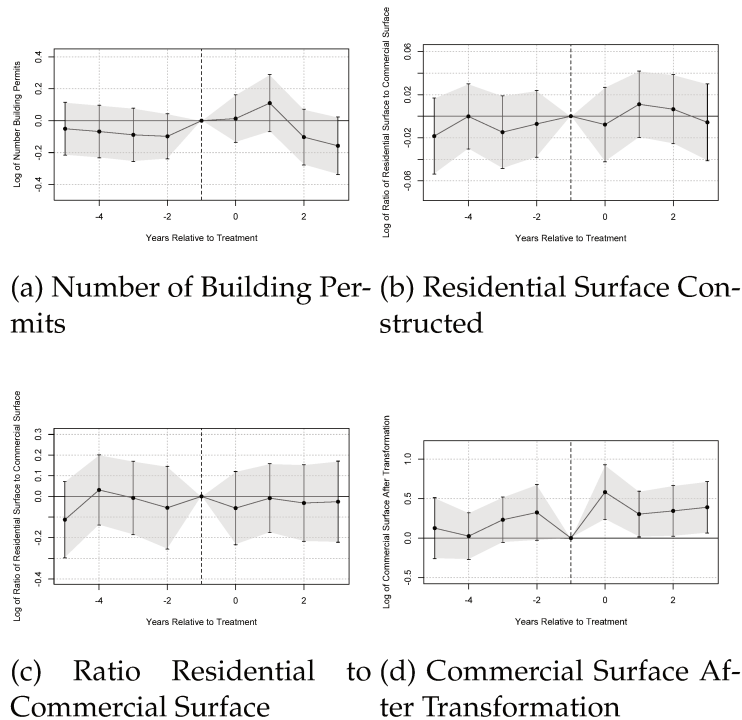


Figure 2.9: Impact on Residential Development

2.6 Conclusion and Discussion

This paper investigates the short-term impacts of the 2018 Paris Region Mixed-Land Use Directive on ratio of commercial and residential real estate development. Utilizing spatial fixed-effects regression models, I examine several key indicators, including building

permits, newly constructed residential and commercial surface areas, and the conversion of residential spaces into commercial uses. My findings contribute to the growing literature on the effectiveness of land-use regulations in shaping urban development.

The results indicate that the directive had a limited immediate impact on stimulating new commercial and residential development. Across all distance bands, the effects on the number of building permits and newly constructed surface areas were statistically insignificant, suggesting that the directive did not substantially accelerate new development within the regulatory boundary. This may reflect the short evaluation period, during which developers were either hesitant to initiate new projects or preemptively adapted to the regulatory environment.

However, I find a statistically significant increase in the conversion of residential spaces into commercial uses, particularly in proximity to the regulatory boundary. This indicates that developers may have strategically repurposed existing residential properties for commercial use to circumvent the directive's constraints on new developments. This finding highlights an unintended consequence of the directive: rather than promoting mixed-use development and increasing residential supply, the regulation may have contributed to the depletion of existing residential spaces in favor of commercial conversions. Such strategic adaptations by developers reflect the flexibility with which market actors respond to urban land-use regulations, particularly in high-demand commercial areas where land is scarce.

The study also finds no significant short-term effects on commercial or residential real estate prices. This lack of immediate price response suggests that the directive did not introduce sufficient supply-side adjustments to affect prices in either market. External factors, such as the COVID-19 pandemic, which disrupted real estate markets and introduced broader economic uncertainties, may have further muted the directive's effects during the evaluation period.

From a policy perspective, the findings raise concerns about the efficacy of the directive in achieving its intended goals of fostering mixed-use development and increasing the residential supply. The increase in residential-to-commercial conver-

sions may exacerbate the housing shortage in the Paris Region, particularly in areas where commercial development is outpacing residential growth. To achieve more pronounced effects, policymakers might consider strengthening enforcement mechanisms, offering incentives for residential development, or revisiting the directive's provisions to ensure that residential supply is adequately protected.

Looking ahead, future research should explore the long-term effects of the directive, as its impacts may become more apparent over time. In particular, it would be valuable to assess whether the observed trends persist or evolve as developers continue to navigate the regulatory landscape. Additionally, further investigation into potential displacement effects, where development shifts to untreated areas, and the role of external economic shocks, such as the pandemic, would provide deeper insights into the broader implications of urban land-use regulations. Understanding how these factors interact with regulatory frameworks will be crucial for informing future policy design and urban planning strategies.

Chapter 3

The Valuation of Local Amenities after COVID-19

Imen Daly

Chapter 3

The Valuation of Local Amenities after COVID-19

3.1 Introduction

In 2016, the French real estate market witnessed substantial growth, exceeding previous peaks seen in 2006 and 2012. This growth was primarily driven by low interest rates, leading to a 10% increase in transaction volumes. In Paris, the average price per square meter increased by more than 40% within four years, marking an all-time high. However, this upward trend was abruptly disrupted by the onset of the COVID-19 pandemic. The real estate market in Île-de-France experienced a significant slowdown, characterized by decreased transaction volumes and heightened uncertainty. Successive lockdowns throughout 2020 led to periods of near inactivity, followed by uneven phases of recovery. This pattern, particularly pronounced in urban areas like Paris, reflected a shift in buyer preferences as the pandemic altered the desirability of metropolitan living.

The pandemic's impact on densely populated areas, especially in metropolitan centers like Paris, was severe due to the rapid virus transmission facilitated by population density (Moore et al. 2020). The crisis prompted reconsiderations of traditional factors driving real estate decisions, highlighting the need to understand subtle shifts in buyer

preferences during such unprecedented times. In particular, the trade-offs between proximity to amenities and health risks became a central concern for homebuyers.

This paper examines two competing hypotheses regarding buyer preferences in the aftermath of the pandemic. The first suggests that proximity to amenities, such as public transportation and green spaces, may have become more valuable as buyers anticipate future lockdowns and mobility restrictions. In contrast, the second hypothesis posits that these same amenities, due to their role as potential sites for virus transmission, may have been devalued, as buyers prioritized health and safety over traditional urban conveniences.

The widespread adoption of teleworking, which accelerated in response to physical distancing measures, has also played a crucial role in reshaping urban housing demand. Workers able to perform their tasks remotely have increasingly sought larger living spaces, often outside urban centers (Liu and Su [2021](#); Ramani and Bloom [2021](#); Bergeaud, J.-B. Eyméoud, and Garcia [2023](#); Bergeaud, Cette, and Drapala [2023](#)). As a result, the pandemic may have contributed to an increase in demand for housing in suburban areas, while reducing the appeal of city centers.

This study employs a spatial discontinuity design to examine the effects of the COVID-19 pandemic on housing preferences in the Paris real estate market. By utilizing transaction data from properties located within 0.2 km of municipal boundaries, I compare housing prices in areas that share similar economic conditions and unobservable neighborhood characteristics. The focus on transactions near these boundaries allows us to isolate the impact of geographic location and urban amenities on housing prices while controlling for potential confounding factors.

To ensure the robustness of my results, I extend the analysis to properties located within 0.5 km and 1 km of the boundaries. This additional sample enables us to test whether the observed effects persist across broader geographic ranges, thereby confirming that the results are not driven by location-specific factors. The robustness checks strengthen the generalizability of my findings and ensure the validity of my conclusions.

I estimate the impact of the health crisis on various housing characteristics, particularly those related to transportation and green spaces, using a hedonic regression model adapted to a spatial event study framework. My results indicate a temporary increase in the valuation of individual transportation, with buyers willing to pay a premium for parking spaces in the second year following the onset of the pandemic. Concurrently, proximity to metro stations experienced a temporary depreciation during this period. I also explore the effect of teleworking on residential relocation patterns, finding that the demand for suburban housing increased as health concerns and remote work outweighed the benefits of geographic proximity to the city center.

Lastly, I reassess the importance of proximity to open spaces, finding that while the pandemic initially led to a positive revaluation of apartments near green spaces, this trend did not persist beyond the first year of the crisis. These findings provide insights into the evolving dynamics of urban housing demand in the wake of the COVID-19 pandemic.

This paper contributes to the growing literature on the effects of exogenous shocks on urban real estate markets by providing empirical evidence of how the COVID-19 pandemic has altered the valuation of local amenities. My findings have significant implications for urban policy and planning, as they suggest that future urban development strategies should account for shifts in demand driven by health concerns and the widespread adoption of teleworking.

3.2 Related Literature and Data

3.2.1 Related Literature

This article contributes to the extensive literature on the valuation of local amenities in real estate markets (Rosen 1974). Local amenities—characteristics of cities and neighborhoods that influence residents' location preferences—have been widely studied for their impact on housing prices. My analysis focuses on the post-COVID-19 health crisis and its effect on real estate price formation, specifically in the dynamic Paris

market.

Real estate markets are inherently cyclical, which introduces temporal dynamics into the valuation of amenities (Kuminoff, Parmeter, and Pope [2010](#); Bin et al. [2017](#); Fernandez and Bucaram [2019](#); Towe and Tra [2019](#)). Households often perceive these amenities as hedges against property value declines during market downturns (A. Chernobai and E. Chernobai [2013](#); Coulson and J. E. Zabel [2013](#); Sinai and Souleles [2013](#); J. Zabel [2015](#)). These studies suggest that amenities may offer resilience during economic downturns, but declines in household income during recessions can reduce demand for amenities, especially when viewed as part of everyday consumption (Kuminoff, Parmeter, and Pope [2010](#)). However, exogenous shocks like the COVID-19 pandemic may alter the anticipated evolution of amenity pricing ([towe2019hedonic](#) ; [Irwin2021measuring](#); Bin et al. [2017](#)).

A growing body of literature examines the impact of COVID-19 on housing prices and rents (Ling, Wang, and Zhou [2020](#); Davis, Ghent, and Gregory [2021](#); Cheung and Fernandez [2021](#); Brueckner, Kahn, and Lin [2023](#)). Gupta et al. [2022](#) document price fluctuations between urban cores and suburbs in U.S. metropolitan areas, noting a sharper decline in rents than in house prices. They argue that the market perceives the impact of COVID-19 as temporary, largely driven by shifts to remote work, with reduced importance placed on proximity to consumption amenities.

Research on the U.S. housing market also reveals a decline in demand for high-density and central city neighborhoods due to the diminished need to live near workplaces suitable for remote work (Liu and Su [2021](#)). High-value neighborhoods prior to the pandemic experienced more significant declines in housing demand. These findings are mirrored in the Stockholm area, where demand for central and high-density neighborhoods similarly decreased due to teleworking needs (Vuuren [2023](#)).

Batalha et al. [2022](#) examine the effects of the pandemic on housing prices and supply in areas with a high concentration of short-term rentals. They report a 4.8% decline in sale prices, which aligns with my analysis of the French real estate market. My findings on the Paris market corroborate these results.

Cheung and Fernandez [2021](#) observe that pre-pandemic homebuyers in Auckland paid a premium for properties near open spaces, but this premium disappeared or reversed during lockdowns. In contrast, my results show a short-lived, positive impact on the valuation of open spaces in the Paris market following the health crisis.

Harris [2020](#) highlights the role of public transportation in the spread of COVID-19 in New York, noting a depreciation in the value of proximity to transit during the pandemic. Similarly, my results indicate a temporary preference for properties with parking spaces and a temporary devaluation of proximity to public transport, suggesting that the pandemic's effects on real estate preferences were temporary rather than permanent.

In France, the pandemic accelerated residential mobility toward rural and peri-urban areas, as urban residents sought larger spaces and lower living costs (Breuillé, Le Gallo, and Verhac [2022](#)). This trend resulted in rising property prices in these areas, while urban real estate prices stagnated or declined (Chareyron, Régnier, Sari, et al. [2022](#)). Similarly, teleworking reduced demand for central office spaces, leading to declines in commercial property prices (Bergeaud, Cette, and Drapala [2023](#)).

3.2.2 Data

This article uses a comprehensive dataset developed jointly by the French General Directorate of Public Finances (DGFIP) and Cerema. The data are derived from two fiscal sources: the FIDJI database (Fichier Informatisé des Données Juridiques Immobilières) and the MAJIC database (Mise à Jour des Informations Cadastrales). These are further supplemented by variables extracted from the land registry files (Fichiers Fonciers, FF).

The dataset, known as DV3F, contains detailed property transaction data from 2010 onwards. The acquisition procedure is detailed on the Datafoncier website^{1,2}. DV3F

¹Please refer to the acquisition procedure on the Datafoncier website: <https://datafoncier.cerema.fr>.

²Additional information is available in Appendix B.

provides precise transaction details³, and stands out for its integration of geospatial data⁴.

I also make use of application programming interfaces (APIs)⁵ to extract GPS coordinates for the boundaries of the municipal limits. The geolocated DV3F data are crucial in my sample selection process, allowing us to narrow down properties within specific geographic areas.

Through an API⁶, I obtain the IRIS code⁷ for each property. This allows us to align my data with specific socio-economic characteristics of neighborhoods.

Our analysis further incorporates a public database containing geographic and administrative information about Paris and its surrounding regions⁸. This database includes data on local services, public infrastructure, and geographic features⁹. Using this geolocated dataset, I compute the distance of properties to various urban amenities such as public transportation and green spaces.

This paper is structured as follows: Section 3.3 presents the empirical model. Section 3.4 discusses the results, and Section 3.5 provides the conclusion.

3.3 Empirical Method

This section outlines the empirical strategy used to assess the impact of the COVID-19 pandemic on the valuation of urban amenities in the Paris real estate market. I employ a hedonic pricing model combined with a spatial event-study framework that leverages municipal boundaries to focus on properties within a small, localized area. This approach ensures comparability among nearby housing units while verifying the ro-

³Including information such as the type of property, nature of the transfer, surface area, number of rooms, outbuildings, transaction date, land value, postal address, and more.

⁴Including precise location information through cadastral references or detailed addresses.

⁵Accessible via: <https://geo.api.gouv.fr>

⁶Accessible via: <https://www.data.gouv.fr/fr/reuses/insee-iris-geolocalisation/>

⁷IRIS refers to small statistical units created by INSEE (the French National Institute of Statistics and Economic Studies). Each IRIS represents a geographically and socially homogeneous area to facilitate detailed local-level statistical analysis.

⁸Available via: <https://data.iledefrance.fr/explore/?sort=modified>

⁹This includes data on geographic boundaries, budgetary and statistical information, service locations, regulatory documents, administrative accounts, and transportation data.

bustness of my results by extending the sample slightly beyond the boundary.

Our analysis focuses on the periphery of Paris, driven by both methodological and contextual considerations. The Parisian real estate market, the densest and most dynamic in France, experienced significant economic impacts during the pandemic due to its high population density. The periphery of Paris is ideal for studying how the health crisis affected housing preferences because it offers a mix of amenities such as transportation and green spaces that are more widely available compared to the city center. Additionally, this area provides larger homes, often with parking spaces and terraces, offering variation in property characteristics that enrich the analysis.

The high density of the real estate market in the periphery ensures a large sample, even for properties near the boundary, creating relative homogeneity among populations and enhancing the robustness of the results. I ensure that my sample includes areas with consistent public policies, as municipalities on the Paris border share similar urban dynamics and are classified in highly strained zones (Zone Abis), aligning their real estate policies with those of Paris.

I estimate a hedonic pricing model to examine the effects of COVID-19 on the valuation of urban amenities. The dataset comprises real estate transactions from 2014 to 2022, capturing both pre- and post-pandemic periods. The dependent variable $P_{i,t}$ is the logarithm of the transaction price for property i at time t . The model is specified as follows:

$$\ln(P_{i,t}) = \delta_t + \alpha_{\text{iris}(i)} + \phi_{\text{b}(i)} + \text{COVID-19}_i \times \sum_{\substack{y=-6 \\ y \neq -1}}^2 \beta_y I(t - t_c^* = y) + \beta X_{i,t} + \varepsilon_{i,t} \quad (3.1)$$

Where $X_{i,t}$ represents the hedonic characteristics of each transaction, including the number of rooms, size, and proximity to amenities; $\alpha_{\text{iris}(i)}$ are spatial fixed effects; δ_t are year fixed effects; and $\phi_{\text{b}(i)}$ captures boundary-related fixed effects.

The variable COVID-19_i is binary, taking the value 1 if the transaction concerns a property in the treated group with the studied characteristic, and 0 otherwise. The in-

dicators $I(t - t_c^* = y)$ measure the time relative to the year of the health crisis onset (t_c^*) for transactions in the treated group and are null for the control group. The reference category is $y = -1$, the year before the pandemic. Thus, each coefficient β_y gives the change in the outcomes for the studied housing characteristic relative to transactions without that characteristic in year y , measured from the year before the pandemic.

Identification Strategy– My identification strategy leverages a spatial discontinuity design, focusing on properties located within 0.2 km of municipal boundaries. Properties near the boundary are assumed to be exposed to similar economic and environmental conditions, allowing us to isolate the effects of amenities on housing prices while controlling for unobserved variables. By limiting the sample to properties within this narrow band, I ensure that my comparisons are robust to omitted variable bias.

I extend the analysis to properties located within 0.5 km and 1 km of the boundary to test the persistence of the observed effects. If the results hold at these extended distances, it confirms the robustness and generalizability of my findings.

To validate my identification strategy, I examine pre-pandemic trends in the treatment and control areas. If properties on either side of the boundary exhibited similar trends before the pandemic, the pre-treatment coefficients should be small and statistically insignificant, confirming the validity of my difference-in-differences approach. I also re-estimate the model using different geographic ranges to verify that the results persist across broader spatial areas.

Amenity-Specific Analysis–I focus my analysis on three key amenities: transportation, green spaces, and proximity to Paris. First, I assess the impact of transportation access, comparing properties near public transportation stations (within 500 meters) to those further away. I then explore how the pandemic shifted preferences between individual and collective transportation by comparing properties with parking spaces to those without.

Next, I analyze the impact of proximity to green spaces on post-pandemic real estate valuation by comparing price trends for properties near green spaces to those

further away. Finally , I examine the broader effects of teleworking on residential relocation patterns, comparing price trends between Paris and its immediate suburbs.

I re-estimate Equation 3.1 to assess the differential valuation of two-room versus three-room apartments, given the high density of these types of homes in the study area.

3.4 Result

I begin by presenting the results related to the revaluation of local amenities, focusing on how the COVID-19 pandemic influenced the perception of density and, subsequently, the appreciation of public transportation, individual transportation, and green spaces. I also assess the impact of teleworking, which became widespread during the pandemic, on the revaluation of more spacious homes. Finally , I compare housing prices in Paris with those in its nearby suburbs.

3.4.1 Individual Transportation or Public Transportation?

In Table 3.1, I find a temporary increase in the valuation of homes with parking spaces in the years following the pandemic's onset, particularly for properties with immediate access to public transport. In the first year, home prices for properties with parking spaces increased by 1% (for the 0.5 km and 1 km samples), but this effect diminishes to 0.5% in the second year and disappears by the third year.

Table 3.1: Valuation of Private or Public Transport after COVID-19
Dependent Variable = ln (Real Estate Transaction Price)

| | Parking vs. No Parking (1) | | | Subway at 200m vs. Subway at 500m (2) | | |
|----------------------------|-------------------------------|---------------|---------------|--|----------------|----------------|
| | 0.2 km | 0.5 km | 1km | 0.2 km | 0.5 km | 1km |
| Event Study Model: | | | | | | |
| Year 2 | 0.004(0.005) | 0.005(0.006) | 0.006(0.004) | 0.012(0.066) | -0.055(0.052) | -0.058(0.051) |
| Year 1 | 0.012(0.006) | 0.013*(0.005) | 0.011*(0.003) | 0.005(0.030) | -0.037*(0.016) | -0.037*(0.016) |
| Year 0 | 0.010(0.007) | 0.008(0.006) | 0.007(0.004) | -0.000(0.026) | 0.004(0.017) | 0.005(0.017) |
| Year -1 (Omitted) | | | | | | |
| Year -2 | 0.003(0.007) | 0.004(0.005) | 0.001(0.004) | 0.000(0.027) | 0.019(0.014) | 0.017(0.013) |
| Year -3 | -0.001(0.008) | -0.002(0.007) | 0.002(0.005) | -0.019(0.020) | 0.005(0.013) | 0.007(0.012) |
| Year -4 | 0.004(0.006) | 0.003(0.005) | 0.005(0.003) | -0.008(0.023) | -0.019(0.014) | -0.022(0.014) |
| Year -5 | 0.005(0.008) | 0.002(0.007) | 0.003(0.004) | 0.017(0.028) | -0.0177(0.018) | -0.019(0.018) |
| Year -6 | 0.005(0.007) | 0.009(0.006) | 0.009(0.005) | 0.024(0.007) | -0.038(0.022) | -0.039(0.022) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Boundary Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Neighborhood Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Estimation Period | 2014 – 2019 | 2014 – 2021 | 2014 – 2021 | 2014 – 2021 | 2014 – 2019 | 2014 – 2021 |
| Number of Observations | 14,615 | 44,188 | 125,155 | 8,148 | 32,830 | 89,254 |
| Number of Boundaries | 31 | 35 | 36 | 32 | 35 | 36 |
| Number of Municipalities | 36 | 36 | 38 | 35 | 36 | 38 |

***p < 0.001; **p < 0.01; *p < 0.05

Note: In this fixed-effects regression, the dependent variable is the log of real estate transaction prices. My control variables include the number of dwellings sold, floor area, number of main rooms, number of bedrooms, number of bathrooms, number of kitchens, number of outbuildings, floor, number of floors in the building, age of the building, distance to the nearest green space, and distance to the boundary (see figure 3.3c). For the regression on individual transport valuation, my treatment group consists of apartments sold with parking located within 500m of a subway station, while the control group consists of apartments without parking also located within 500m of a subway station. For the regression on public transport valuation, my treatment group consists of apartments sold within 200m of a subway station, while the control group consists of apartments located more than 500m from a subway station (see figure 3.4).

Standard errors are in parentheses and are clustered at the municipality level.

These results suggest that concerns about the use of public transportation during the pandemic initially led to increased demand for homes with private parking spaces, indicating a shift toward individual modes of transportation. This finding is consistent with prior research, such as Harris (2020), which highlights the role of public transportation in facilitating the transmission of the virus, leading to a decreased use of public transit and a heightened preference for private transportation options due to fears of contamination in public spaces (Harris 2020). These results align with the broader literature on urban economics, particularly during public health crises, where concerns about contagion significantly reduce public transport usage and promote alternatives like private vehicles.

The fading of this effect by the third year suggests that as the pandemic waned, public transportation usage began to normalize, aided by vaccination campaigns and a general decline in infection rates. Another possible explanation for this trend is the gradual return of the pre-pandemic equilibrium in the transportation market, where concerns about cost and convenience reassert their influence. This is consistent with

the transportation theory, which emphasizes the importance of long-term economic factors in determining transportation choices.

However, it is essential to note that the statistical power of the analysis may have been reduced by a sharp decline in the number of transactions in 2022 (see Table 3.17). The reduced sample size may have limited the ability to detect smaller effects, particularly in the later years of the study period.

3.4.2 Proximity to Open Spaces?

— Table 3.2 shows that proximity to green spaces had a significant, positive impact on property values during the first year of the pandemic in the 1 km sample, with a 0.7% increase in prices. However, no significant effects were observed for the 0.2 km and 0.5 km samples. This suggests that the perceived value of open spaces was higher for properties located slightly farther from parks, possibly because these properties were typically more urbanized and thus green spaces were more highly valued during lockdowns, when outdoor activities were restricted.

Table 3.2: Green Space at 300m vs. 500m after COVID-19
 Dependent Variable = ln (Real Estate Transaction Price)

| | Green Space at 300m vs. 500m | | |
|----------------------------|------------------------------|---------------|---------------|
| | 0.2 km | 0.5 km | 1km |
| Event Study Model: | | | |
| Year 2 | 0.000(0.005) | 0.000(0.005) | 0.001(0.004) |
| Year 1 | -0.000(0.003) | -0.000(0.003) | 0.000(0.003) |
| Year 0 | 0.003(0.004) | 0.005(0.003) | 0.007*(0.003) |
| Year -1 (Omitted) | | | |
| Year -2 | 0.005(0.004) | 0.003(0.003) | 0.007(0.004) |
| Year -3 | 0.002(0.004) | 0.003(0.003) | 0.003(0.003) |
| Year -4 | -0.001(0.003) | 0.003(0.003) | 0.003(0.003) |
| Year -5 | -0.001(0.004) | -0.002(0.004) | 0.000(0.003) |
| Year -6 | 0.005(0.004) | 0.004(0.003) | 0.004(0.003) |
| Controls | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes |
| Boundary Fixed Effects | Yes | Yes | Yes |
| Neighborhood Fixed Effects | Yes | Yes | Yes |
| Estimation Period | 2014 – 2019 | 2014 – 2021 | 2014 – 2021 |
| Number of Observations | 15,031 | 30,057 | 84,422 |
| Number of Boundaries | 32 | 34 | 35 |
| Number of Municipalities | 36 | 34 | 37 |

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Note: In this fixed-effects regression, the dependent variable is the log of real estate transaction prices. My control variables include the number of dwellings sold, floor area, number of main rooms, number of bedrooms, number of bathrooms, number of kitchens, number of outbuildings, floor, number of floors in the building, age of the building, distance to the nearest green space, and distance to the boundary (see figure 3.5).

The sample for the regression covers the period from 2014 to 2022, with a treatment year in 2020. For the regression on green space valuation, My treatment group consists of apartments sold within 300m of a green space, while the control group consists of apartments located more than 500m from a green space.

Standard errors are in parentheses and are clustered at the municipality level.

The temporary increase in the value of green spaces supports findings from other research showing that the pandemic made outdoor space an essential amenity (Fernandez and Bucaram 2019). This is particularly relevant in the context of Paris, where public parks and green spaces are relatively limited compared to suburban areas. The demand for outdoor space may have been amplified by the strict lockdown measures enforced in France, where outdoor activities were restricted, making proximity to green spaces even more valuable during that time.

Interestingly, the disappearance of this effect in the second year indicates that buy-

ers' preferences may have returned to pre-pandemic norms as movement restrictions eased and other urban amenities regained importance. This cyclical pattern is common in real estate markets, where the valuation of environmental amenities can fluctuate based on broader economic and social conditions (J. Zabel 2015). The fact that this effect did not persist suggests that the revaluation of green spaces may have been a short-term response to the crisis rather than a fundamental shift in housing preferences.

3.4.3 Demand for Spacious Homes (Teleworking)?

Table 3.3 examines whether the pandemic-driven increase in teleworking led to a revaluation of more spacious homes. Contrary to expectations, the event-study coefficients are not statistically significant, indicating no substantial revaluation of two-room apartments relative to three-room apartments. This suggests that while teleworking became widespread, it did not significantly alter housing preferences for additional rooms, such as home offices, in the Paris real estate market.

Table 3.3: Valuation of Larger Living Space after COVID-19
 Dependent Variable = ln (Real Estate Transaction Price)

| | 2 Rooms vs. 3 Rooms | | |
|----------------------------|---------------------|---------------|---------------|
| | 0.2 km | 0.5 km | 1km |
| Event Study Model: | | | |
| Year 2 | 0.065(0.075) | 0.026(0.059) | -0.054(0.037) |
| Year 1 | -0.031(0.054) | -0.024(0.043) | -0.048(0.047) |
| Year 0 | -0.027(0.035) | -0.007(0.033) | 0.018(0.038) |
| Year -1 (Omitted) | | | |
| Year -2 | -0.058(0.036) | -0.050(0.030) | -0.058(0.037) |
| Year -3 | -0.027(0.044) | -0.031(0.032) | -0.052(0.029) |
| Year -4 | 0.000(0.028) | -0.001(0.023) | 0.014(0.028) |
| Year -5 | -0.065(0.034) | -0.048(0.035) | -0.017(0.037) |
| Year -6 | -0.036(0.029) | -0.022(0.025) | -0.019(0.034) |
| Controls | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes |
| Boundary Fixed Effects | Yes | Yes | Yes |
| Neighborhood Fixed Effects | Yes | Yes | Yes |
| Estimation Period | 2014 – 2019 | 2014 – 2021 | 2014 – 2021 |
| Number of Observations | 11,722 | 36,176 | 64,177 |
| Number of Boundaries | 33 | 34 | 36 |
| Number of Municipalities | 36 | 37 | 38 |

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Note: In this fixed-effects regression, the dependent variable is the log of real estate transaction prices. My control variables include the number of dwellings sold, floor area, number of main rooms, number of bedrooms, number of bathrooms, number of kitchens, number of outbuildings, floor, number of floors in the building, age of the building, distance and transport mode to the nearest station, distance and type of the nearest green space, as well as distance to the boundary. (see figure 3.6)

The sample for the regression covers the period from 2014 to 2022, with a treatment year in 2020. For the regression on the valuation of larger living space, my treatment group consists of apartments with 2 rooms, while the control group consists of apartments with 3 rooms.

Standard errors are in parentheses and are clustered at the municipality level.

One explanation for this result could be that the Parisian housing market is constrained by limited space, particularly in dense urban areas. Even with teleworking, the availability of larger homes in the city center may be restricted, which could dampen the demand for extra rooms. Alternatively, teleworking could have led to a shift in housing demand toward suburban or rural areas, outside the geographic scope of this study (Bergeaud, Cette, and Drapala 2023).

3.4.4 Paris or Its Nearby Suburbs?

— Table 3.4 and Figure 3.2 present a comparison of housing price trends within Paris and its nearby suburbs. The results show that prices in Paris remained stable before the pandemic, but there was a statistically significant decline in prices within the city relative to nearby suburbs starting from the second year of the pandemic.

Table 3.4: Paris vs. Nearby Suburbs after COVID-19
Dependent Variable = ln (Real Estate Transaction Price)

| | Paris vs. Nearby Suburbs | | |
|----------------------------|--------------------------|------------------|------------------|
| | 0.2 km | 0.5 km | 1km |
| Event Study Model: | | | |
| Year 2 | −0.090(0.058) | −0.089** (0.049) | −0.106** (0.035) |
| Year 1 | −0.031(0.022) | −0.052* (0.022) | −0.035** (0.012) |
| Year 0 | −0.017(0.037) | −0.022(0.024) | −0.001(0.011) |
| Year -1 (Omitted) | | | |
| Year -2 | 0.034(0.024) | 0.006(0.018) | 0.004(0.006) |
| Year -3 | 0.028(0.022) | 0.008(0.016) | 0.009(0.010) |
| Year -4 | 0.026(0.019) | −0.001(0.015) | −0.008(0.012) |
| Year -5 | −0.024(0.023) | −0.022(0.018) | −0.011(0.011) |
| Year -6 | −0.022(0.037) | −0.024(0.020) | −0.032(0.017) |
| Controls | Yes | Yes | Yes |
| Time Fixed Effects | Yes | Yes | Yes |
| Boundary Fixed Effects | Yes | Yes | Yes |
| Neighborhood Fixed Effects | Yes | Yes | Yes |
| Estimation Period | 2014 – 2019 | 2014 – 2021 | 2014 – 2021 |
| Number of Observations | 19,540 | 60,502 | 164,839 |
| Number of Boundaries | 33 | 36 | 36 |
| Number of Municipalities | 37 | 37 | 38 |

*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$

Note: In this fixed-effects regression, the dependent variable is the log of real estate transaction prices. My control variables include the number of dwellings sold, floor area, number of main rooms, number of bedrooms, number of bathrooms, number of kitchens, number of outbuildings, floor, number of floors in the building, age of the building, distance and transport mode to the nearest station, distance and type of the nearest green space, as well as distance to the boundary. (see figure 3.2)
The sample for the regression covers the period from 2014 to 2022, with a treatment year in 2020. For the regression on the valuation of Paris residency, my treatment group consists of apartments sold within Paris, while the control group consists of apartments located outside of Paris. (see figure 3.7)
Standard errors are in parentheses and are clustered at the municipality level.

This decline likely reflects the generalization of teleworking, which reduced the need for proximity to workplaces and allowed buyers to seek housing in less dense, suburban areas. Furthermore, the depreciation of consumption amenities—such as

restaurants, bars, and cultural attractions, which are more concentrated in city centers—may have reduced the desirability of living in high-density urban neighborhoods (Rappaport [2008](#); Garrett [2008](#)).

The decline in housing demand in Paris is consistent with studies documenting similar trends in other high-density cities during the pandemic (Gupta et al. [2022](#); Liu and Su [2021](#); Chareyron, Régnier, Sari, et al. [2022](#)). However, the long-term sustainability of this trend is uncertain. As public health concerns subside and urban amenities regain their value, it is possible that demand for housing in city centers will recover. Future research should explore whether the shift toward suburban living persists as teleworking becomes more ingrained in workplace culture.

The results of this study have important implications for urban planning and housing policy. The temporary nature of the effects I observe, particularly regarding the valuation of individual transportation and green spaces, suggests that urban planners should be cautious in overreacting to short-term shifts in housing preferences. Long-term planning should focus on creating resilient urban environments that can adapt to fluctuating demand for different types of amenities.

The decline in demand for housing within Paris underscores the need for policies that support teleworking while also revitalizing city centers, particularly in high-density areas. The revaluation of suburban housing and the depreciation of urban amenities highlight the importance of flexible zoning policies that can accommodate shifting housing preferences without exacerbating inequalities in housing accessibility.

Finally, further research is necessary to evaluate the long-term effects of the pandemic on housing preferences. Given the temporary nature of many of the trends observed, future studies should assess whether these shifts represent a fundamental reconfiguration of urban housing markets or a short-term response to the crisis.

3.5 Conclusion and Discussion

Fluctuations in real estate prices can be influenced by external shocks, such as those caused by a health crisis, and their impact can be short-term or long-term.

Our results suggest a temporary preference for homes with parking spaces, while a devaluation of proximity to public transport indicates a temporary shift towards individual transportation during the health crisis. This effect disappears from the third year, marking the end of the pandemic in France. This change may reflect a temporary preference for individual transportation, in response to concerns about contagion in public transportation.

Furthermore, my results suggest that during the initial lockdown phases, buyers were willing to pay a premium for homes located near open spaces.

Our analysis also suggests that the desire to avoid potential infection hotspots, coupled with the rise of teleworking, may prevail over the search for increased proximity to the capital.

However, it is essential to note that these changes may be temporary, linked to the immediate period following the health crisis. Real estate markets are subject to cycles, and it is plausible that buyer preferences may evolve again in the future. Additionally, my results focus on a specific geographic area, Paris, and other regions may have reacted differently to the pandemic.

In conclusion, my study sheds light on the dynamics at play in the Paris real estate market following the COVID-19 pandemic, revealing changes in buyer priorities in response to this health crisis. If these trends persist, it will become imperative for policymakers to integrate them into the development of urban policies that address contemporary needs and concerns. Moreover, understanding these new buying trends will be crucial for guiding investments and tax incentives in a wise manner.

Conclusion and Discussion

This study examines the impact of three major urban policies and shocks on housing markets: tax incentives for housing renovation, mixed-use zoning regulations, and the dynamics of real estate markets in the aftermath of the COVID-19 pandemic. The empirical findings underscore that while housing policy interventions can produce significant localized effects, these impacts are intricately shaped by broader market dynamics and behavioral responses from developers, investors, and homebuyers.

The success of the Denormandie tax incentive in stimulating housing renovations offers valuable insights for policymakers grappling with housing shortages and urban decay. The results show that renovation-focused incentives are effective tools for revitalizing underutilized housing stock, particularly in medium-sized municipalities experiencing economic stagnation. A notable finding is the significant increase in renovated rental units and vacant property sales, suggesting that such incentives can lead to meaningful improvements in housing supply. However, the temporary distortions in housing prices following the introduction of the incentive, where prices for older housing stock declined before stabilizing, highlight the need for complementary measures. Policymakers should pair tax incentives with strategies that ensure long-term market stability and affordability, avoiding short-term volatility that could undermine the broader goals of the policy.

The evaluation of the Paris Region Mixed-Land Use Directive reveals critical lessons for cities worldwide dealing with spatial imbalances between commercial and residential development. The limited impact of the directive on new residential construction, combined with a rise in conversions from residential to commercial proper-

ties, underscores the challenge of designing effective mixed-use zoning policies. These findings suggest that zoning regulations must be tailored to the specific economic and real estate conditions of a given city. Developers often respond strategically to regulatory frameworks, and without careful policy design, such regulations may be circumvented, leading to unintended market distortions. For mixed-use zoning policies to succeed, they must include incentives that make residential development attractive and sustainable, ensuring a genuine balance between residential and commercial spaces rather than encouraging conversions that favor short-term commercial gains.

The analysis of post-COVID-19 real estate dynamics highlights the importance of adaptive urban planning in responding to external shocks. The pandemic has reshaped housing preferences, as urban residents increasingly sought out larger living spaces and proximity to green areas, reflecting a shift in demand toward suburban and rural locations. This shift, driven by the rise of remote work and concerns about densely populated urban centers, led to a revaluation of urban versus suburban real estate. The devaluation of urban proximity during the pandemic may be temporary, but it offers important lessons for urban planners and policymakers. Cities must anticipate and prepare for sudden shifts in housing demand, ensuring that housing policies remain flexible and resilient in the face of economic or health-related shocks. Infrastructure investments in suburban and rural areas, including transportation, health-care, and education, will be crucial to support these evolving preferences.

The findings of this study carry broader international relevance for cities across both developed and emerging economies. Renovation-focused tax incentives, such as those seen in the Denormandie scheme, could be a valuable tool for revitalizing aging urban areas, addressing both housing shortages and urban decay. However, the design of such incentives must consider local market dynamics to prevent price distortions or displacement effects. Similarly, mixed-use zoning regulations need to be carefully constructed to account for the behavior of developers, ensuring that they lead to genuine mixed-use developments rather than allowing for regulatory circumvention through property conversions.

The COVID-19 pandemic has provided a unique lens through which to examine the adaptability of housing markets. The shifts in housing demand, from urban centers to more spacious suburban and rural areas, provide critical insights for future urban planning and policy-making. Flexible policies that accommodate sudden demand changes, whether caused by economic disruptions, health crises, or technological advancements, will be essential for maintaining urban resilience.

This research contributes to the broader literature on urban economics by providing empirical evidence on the short- and medium-term effects of urban policies on housing markets. Specifically, it highlights the role of targeted tax incentives, zoning regulations, and external shocks in shaping real estate markets. Future research should expand on these findings by exploring different geographical contexts and longer time horizons. Understanding the long-term effects of such policies on housing affordability, urban inequality, and sustainable development will be crucial for designing effective, equitable, and resilient urban strategies.

While this thesis offers valuable contributions, several limitations warrant discussion. First, this study primarily captures short- and medium-term effects; future work should investigate the longer-term impacts of policies like the Denormandie tax incentive and the Paris Region directive to better understand their sustained influence on housing markets. Additionally, the potential for displacement effects, where renovations or developments in treated areas could lead to reduced activity in nearby untreated areas, should be examined further. Moreover, this research relies on available data, which in some cases is limited and does not allow for the assessment of the environmental impact of these policies. Improved data collection would enable more precise evaluations of policy impacts, especially regarding renovation activity. Finally, the shifts in housing preferences following the COVID-19 pandemic suggest that further analysis is needed to determine whether these changes are temporary or represent a more permanent transformation in housing markets, particularly in relation to urban-to-suburban migration patterns.

Tables

Table 3.5: Descriptive Statistics for Eligible and Not Eligible Groups by Distance - Building Permits

| | Eligible | Not Eligible | Total |
|---|-----------------|---------------------|--------------|
| 0-1 km | 285 | 75 | 360 |
| 0-2 km | 524 | 140 | 664 |
| 0-3 km | 613 | 190 | 803 |
| 0-4 km | 630 | 216 | 846 |
| 0-5 km | 630 | 227 | 857 |
| 0-6 km | 633 | 229 | 862 |
| 0-7 km | 637 | 232 | 869 |
| 0-8 km | 639 | 234 | 873 |
| 0-9 km | 639 | 235 | 874 |
| 0-10 km | 639 | 240 | 879 |
| Total Including Exact Locations | 650 | 244 | 894 |
| Percentage Including Exact Locations | 57.8% | 43.7% | 53.2% |
| Total in Full Sample | 1,124 | 558 | 1,682 |

Note: The values refer to the number of building permits present in each ring from 2014 to 2022.

Table 3.6: Descriptive Statistics for Eligible and Not Eligible Groups by Distance - Residential Transaction

| | Eligible | Not Eligible | Total |
|--------------|-----------------|---------------------|--------------|
| 0-1 km | 22,624 | 55,859 | 78,483 |
| 0-2 km | 38,583 | 96,237 | 134,820 |
| 0-3 km | 48,417 | 110,319 | 158,736 |
| 0-4 km | 54,640 | 113,403 | 168,043 |
| 0-5 km | 58,441 | 114,401 | 172,842 |
| 0-6 km | 60,879 | 114,633 | 175,512 |
| 0-7 km | 62,544 | 114,782 | 177,326 |
| 0-8 km | 63,614 | 114,866 | 178,480 |
| 0-9 km | 64,485 | 114,899 | 179,384 |
| 0-10 km | 65,274 | 114,905 | 180,179 |
| Total | 115,048 | 67,113 | 182,161 |

Note: The values refer to the number of transactions present in each ring from 2014 to 2022.

Table 3.7: Comparative Statistics between Eligible and Not Eligible Groups (2015)

| | Eligible in Zone C | Zone C at the Frontier | |
|--------------------------------------|--------------------|------------------------|--------|
| | Mean | Difference in Mean | t-stat |
| Population | 15,817 | 14,525 | 22.49 |
| Male Population | 7,424 | 6,789 | 22.69 |
| Female Population | 8,393 | 7,736 | 22.24 |
| Population 15 years or older | 13,368 | 12,306 | 22.52 |
| Households | 7,787 | 7,234 | 21.76 |
| Population 15 years or older Married | 5,286 | 4,732 | 21.57 |
| Housing | 9,211 | 8,568 | 22.09 |
| Primary Residences | 7,788 | 7,235 | 21.77 |
| Secondary Residences | 263 | 224 | 9.99 |
| Vacant Dwellings | 1,161 | 1,109 | 20.42 |
| Houses | 4,419 | 3,839 | 16.91 |
| Apartments | 4,722 | 4,662 | 16.27 |
| Main Residence with 1 Room | 399 | 393 | 13.67 |
| Main Residence with 2 Rooms | 1,084 | 1,060 | 18.66 |
| Main Residence with 3 Rooms | 1,914 | 1,837 | 19.10 |
| Main Residence with 4 Rooms | 2,124 | 1,963 | 20.54 |
| Main Residence with 5 Rooms or More | 2,266 | 1,982 | 20.07 |
| Main Residences Occupied by Owners | 3,636 | 3,216 | 19.31 |
| Main Residences Occupied by Tenants | 3,995 | 3,873 | 19.30 |
| Main Residences HLM Rented Empty | 1,666 | 1,633 | 12.83 |
| Main Residences Free Housing | 156 | 147 | 17.62 |
| Employed Persons Aged 15 and Over | 5,549 | 5,021 | 21.83 |
| Employed Men Aged 15 and Over | 2,865 | 2,589 | 22.25 |
| Employed Women Aged 15 and Over | 2,685 | 2,432 | 21.07 |
| Unemployed Persons Aged 15-64 | 1,258 | 1,195 | 18.95 |
| Retirees and Pre-retirees Aged 15-64 | 827 | 744 | 21.10 |
| Number of Municipalities | 69 | 571 | |

Note: The t-statistics compare the mean values for “Eligible in Zone C” with “Zone C at the Frontier.” The statistics are for the year 2015.

Table 3.8: Comparative Statistics between Eligible and Not Eligible Groups (2015)

| | Full Sample | | | 0-1km | | | 0-3km | | | 0-5km | | |
|--|-----------------|--------|---------|-----------------|--------|---------|-----------------|--------|---------|-----------------|--------|---------|
| | Mean Difference | t-stat | p-value | Mean Difference | t-stat | p-value | Mean Difference | t-stat | p-value | Mean Difference | t-stat | p-value |
| Real Estate Transaction | | | | | | | | | | | | |
| Transaction Value | 17,439.41 | 5.63 | 0.00 | 4,741.46 | 0.57 | 0.57 | 57,168.90 | 1.41 | 0.16 | 16,966.84 | 5.47 | 0.00 |
| Number of 1-Room Houses | 0.01 | 5.39 | 0.00 | 0.01 | 0.96 | 0.34 | 0.00 | 1.41 | 0.16 | 0.01 | 5.03 | 0.00 |
| Number of 2-Room Houses | 0.03 | 7.82 | 0.00 | 0.03 | 2.73 | 0.01 | 0.03 | 3.74 | 0.00 | 0.03 | 7.42 | 0.00 |
| Number of 3-Room Houses | 0.06 | 7.54 | 0.00 | -0.01 | -0.31 | 0.76 | 0.03 | 2.78 | 0.01 | 0.06 | 7.44 | 0.00 |
| Number of 4-Room Houses | 0.11 | 9.22 | 0.00 | -0.03 | -0.42 | 0.68 | 0.05 | 2.33 | 0.02 | 0.11 | 8.97 | 0.00 |
| Number of 5-Room Houses | 0.11 | 11.14 | 0.00 | 0.05 | 1.51 | 0.13 | 0.08 | 5.01 | 0.00 | 0.12 | 11.28 | 0.00 |
| Total Built Area (m ²) | -1.08 | -0.19 | 0.85 | -14.28 | -0.89 | 0.38 | 103.93 | 0.98 | 0.33 | -0.04 | -0.01 | 0.99 |
| Number of Commercial Buildings Sold | -0.05 | -9.49 | 0.00 | -0.03 | -1.27 | 0.21 | 0.07 | 0.67 | 0.50 | -0.05 | -8.99 | 0.00 |
| Number of Residential Buildings Sold | -0.57 | -16.53 | 0.00 | -0.39 | -3.25 | 0.00 | -0.40 | -7.78 | 0.00 | -0.58 | -16.73 | 0.00 |
| Number of Unit Sold | -0.54 | -13.91 | 0.00 | -0.58 | -2.66 | 0.01 | -0.31 | -2.10 | 0.04 | -0.55 | -13.95 | 0.00 |
| Number of Recent Unit Sold (year<5 years) | 0.00 | 1.43 | 0.16 | -0.01 | -0.39 | 0.69 | -0.00 | -0.23 | 0.81 | 0.01 | 1.49 | 0.13 |
| Commercial Building Floor Area (m ²) | -5.13 | -0.99 | 0.32 | -4.88 | -0.49 | 0.62 | 99.51 | 0.95 | 0.34 | -3.96 | -0.72 | 0.47 |
| House Floor Area (m ²) | 39.43 | 15.96 | 0.00 | 15.71 | 1.74 | 0.10 | 29.89 | 8.33 | 0.00 | 39.53 | 15.98 | 0.00 |
| Distance to City Center (km) | 1.17 | 0.33 | 0.74 | 0.07 | 0.02 | 0.98 | -1.29 | -0.37 | 0.71 | 1.15 | 0.32 | 0.75 |
| Distance to Nearest Train Station (km) | 16.87 | 0.85 | 0.40 | 20.15 | 0.98 | 0.33 | 22.47 | 1.11 | 0.27 | 16.48 | 0.83 | 0.41 |
| Building Permits | | | | | | | | | | | | |
| Commercial Space Created (m ²) | -8.86 | -1.69 | 0.10 | -3.03 | -1.00 | 0.33 | -9.19 | -0.81 | 0.42 | -9.91 | -0.90 | 0.37 |
| Residential Space Created (m ²) | -9.32 | -0.89 | 0.37 | 29.56 | 1.95 | 0.06 | 12.34 | 0.95 | 0.34 | 7.93 | 0.64 | 0.52 |
| Commercial Space Demolished (m ²) | -6.26 | -1.72 | 0.10 | 3.59 | 0.37 | 0.71 | -10.31 | -1.13 | 0.26 | -11.89 | -1.34 | 0.19 |
| Residential Space Demolished (m ²) | -0.64 | -4.38 | 0.00 | 1.40 | 0.24 | 0.82 | 3.95 | 0.84 | 0.40 | 2.36 | 0.59 | 0.56 |
| Residential Space Transformed (m ²) | -16.48 | -2.38 | 0.06 | -37.48 | -1.92 | 0.07 | -37.98 | -2.85 | 0.01 | -41.90 | -3.21 | 0.00 |
| Residential Space from Transformations (m ²) | -56.67 | -6.08 | 0.00 | -33.51 | -0.84 | 0.41 | -93.84 | -3.64 | 0.00 | -94.21 | -3.76 | 0.00 |
| Commercial Space from Transformations (m ²) | -7.14 | -1.93 | 0.06 | -4.11 | -1.67 | 0.11 | -13.32 | -1.43 | 0.16 | -13.54 | -1.46 | 0.15 |
| Total Number of Units Created | -1.02 | -6.03 | 0.00 | -0.29 | -0.68 | 0.51 | -1.03 | -3.53 | 0.00 | -1.04 | -3.64 | 0.00 |
| Number of Social Housing Units Created | -0.16 | -2.23 | 0.03 | -0.08 | -1.34 | 0.20 | -0.16 | -2.20 | 0.03 | -0.16 | -2.20 | 0.03 |
| Number of Housing Units Demolished | -0.00 | -0.28 | 0.78 | -0.02 | -1.00 | 0.33 | -0.01 | -1.69 | 0.10 | -0.01 | -1.69 | 0.10 |

*Note:*The t-statistics and p-values refer to the differences in means between ineligible and eligible groups for each variable by distance ring. The values are based on transactions and building permits from 2014 to 2018, excluding building permits issued for personal use.

Table 3.9: Comparative Statistics between Control and Treated Groups (2014)

| | Treated - Restricted at the Frontier | Area Restricted | | Control -Not Restricted at the Frontier | |
|--------------------------------------|---|------------------------|--------|--|--------|
| | Mean | Mean Difference | t-stat | Mean Difference | t-stat |
| Population | 6,335 | -6,824 | -5.77 | 4,574 | 6.13 |
| Male Population | 3,095 | -3,272 | -5.75 | 2,230 | 6.18 |
| Female Population | 3,239 | -3,551 | -5.78 | 2,343 | 6.08 |
| Population 15 years or older | -4,995 | 5,452 | -5.81 | 3,585 | 6.13 |
| Households | 2,457 | -2,926 | -5.89 | 1,775 | 5.96 |
| Population 15 years or older Married | 2,333 | -2,286 | -5.64 | 1,643 | 6.24 |
| Housing | 2,648 | -3,222 | -5.89 | 1,890 | 5.86 |
| Primary Residences | 2,457 | -2,926 | -5.89 | 1,776 | 5.96 |
| Secondary Residences | 43 | -81 | -4.13 | 17 | 2.32 |
| Vacant Dwellings | 146 | -215 | -5.76 | 97 | 4.72 |
| Houses | 1,380 | -424 | -2.79 | 816 | 6.42 |
| Apartments | 1,234 | -2,749 | -6.13 | 1,052 | 4.83 |
| Main Residence with 1 Room | 136 | -336 | -5.68 | 113 | 4.82 |
| Main Residence with 2 Rooms | 296 | -636 | -5.88 | 234 | 4.93 |
| Main Residence with 3 Rooms | 510 | -864 | -6.12 | 408 | 5.17 |
| Main Residence with 4 Rooms | 593 | -624 | -5.60 | 444 | 5.96 |
| Main Residence with 5 Rooms or More | 920 | -464 | -4.19 | 574 | 6.59 |
| Main Residences Occupied by Owners | 1,511 | -1,281 | -5.42 | 1,008 | 6.401 |
| Main Residences Occupied by Tenants | 901 | -1,570 | -5.93 | 738 | 5.07 |
| Main Residences HLM Rented Empty | 470 | -735 | -5.28 | 418 | 4.89 |
| Main Residences Free Housing | 44 | -74 | -5.15 | 29 | 4.41 |
| Employed Persons Aged 15 and Over | 2,835 | -3,111 | -5.82 | 2,025 | 6.19 |
| Employed Men Aged 15 and Over | 1,449 | -1,570 | -5.80 | 1,031 | 6.17 |
| Employed Women Aged 15 and Over | 1,385 | -1,541 | -5.83 | 993 | 6.20 |
| Unemployed Persons Aged 15-64 | 338 | -411 | -5.52 | 261 | 5.69 |
| Retirees and Pre-retirees Aged 15-64 | 235 | -166 | -4.80 | 162 | 6.42 |

Note: The t-statistics compare the mean values for “Restricted at the Frontier” with “Full Restricted Area” and “Not Restricted at the Frontier” respectively. The statistics are for the year 2014 (Excluding Paris).

Table 3.10: Comparative Statistics Within Restricted Area Real Estate Transaction

| | Mean Difference | t-stat | p-value |
|--|-----------------|--------|---------|
| Residential Real Estate Transaction | | | |
| Transaction Value | 58128.98 | 5.10 | 0.00 |
| Total Built Area (m ²) | -2.42 | -0.27 | 0.78 |
| Total Commercial Surface Area (m ²) | 0.96 | 0.13 | 0.89 |
| Total Residential Surface Area (m ²) | -9.72 | -5.04 | 0.00 |
| Number of Commercial Units | 0.00 | 0.75 | 0.45 |
| Number of Apartments | 0.28 | 3.61 | 0.00 |
| Number of 1-Room Apartments | 0.03 | 3.23 | 0.00 |
| Number of 2-Room Apartments | 0.04 | 1.56 | 0.12 |
| Number of 3-Room Apartments | 0.07 | 2.25 | 0.02 |
| Number of 4-Room Apartments | 0.09 | 6.24 | 0.00 |
| Number of 5-Room Apartments | 0.03 | 5.76 | 0.00 |
| Commercial Real Estate Transaction | | | |
| Transaction Value | 540647.12 | 2.84 | 0.01 |
| Number of Commercial Units | 0.27 | 1.76 | 0.08 |
| Number of Tertiary Commercial Units | 0.23 | 1.62 | 0.11 |
| Total Built Area (m ²) | -160.50 | -0.83 | 0.40 |
| Total Commercial Surface Area (m ²) | -193.23 | -1.03 | 0.30 |
| Number of 1-Room Apartments | 0.00 | 0.06 | 0.95 |
| Number of 2-Room Apartments | 0.19 | 1.49 | 0.13 |
| Number of 3-Room Apartments | 0.33 | 2.12 | 0.03 |
| Number of 4-Room Apartments | 0.25 | 2.64 | 0.01 |
| Number of 5-Room Apartments | 0.07 | 2.19 | 0.03 |

Note: The t-statistics and p-values refer to the differences in means between full restricted area and restricted area groups at the frontier for each variable. The values are based on building permits (Excluding Paris) from 2014 to 2018, excluding building permits issued for personal use.

Table 3.11: Comparative Statistics Within Restricted Area Building Permits

| | Mean Difference | t-stat | p-value |
|--|-----------------|--------|---------|
| Residential Building Permits | | | |
| Commercial Space Created (m ²) | -1.75 | -0.27 | 0.79 |
| Residential Space Created (m ²) | 28.53 | 0.46 | 0.64 |
| Commercial Space Demolished (m ²) | 1.84 | 0.50 | 0.61 |
| Residential Space Demolished (m ²) | 0.36 | 0.11 | 0.91 |
| Residential Space Transformed (m ²) | -6.85 | -2.11 | 0.04 |
| Residential Space from Transformations (m ²) | -8.12 | -1.76 | 0.08 |
| Commercial Space Transformed (m ²) | -0.70 | -0.19 | 0.84 |
| Commercial Space from Transformations (m ²) | 0.57 | 0.44 | 0.66 |
| Number of Apartments Created | -0.06 | -0.07 | 0.94 |
| Number of Social Housing Units Created | -0.14 | -0.34 | 0.73 |
| Total Number of Units Created | 0.02 | 1.39 | 0.16 |
| Commercial Building Permits | | | |
| Commercial Space Created (m ²) | -704.30 | -2.98 | 0.00 |
| Residential Space Created (m ²) | 122.62 | 4.69 | 0.00 |
| Commercial Space Demolished (m ²) | -1.49 | -0.08 | 0.93 |
| Residential Space Demolished (m ²) | 3.79 | 2.90 | 0.00 |
| Residential Space Transformed (m ²) | 22.30 | 1.70 | 0.10 |
| Residential Space from Transformations (m ²) | 2.50 | 0.77 | 0.43 |
| Commercial Space Transformed (m ²) | -43.61 | -2.59 | 0.01 |
| Commercial Space from Transformations (m ²) | -23.82 | -1.14 | 0.25 |

Note: The t-statistics and p-values refer to the differences in means between full restricted area and restricted area groups at the frontier for each variable. The values are based on building permits (Excluding Paris) from 2014 to 2018, excluding building permits issued for personal use.

Table 3.12: Comparative Statistics between Eligible and Not Eligible Groups - Transaction Dynamics

| | Full Sample | | | 0-1km | | | 0-3km | | | 0-5km | | |
|--|-----------------|--------|---------|-----------------|--------|---------|-----------------|--------|---------|-----------------|--------|---------|
| | Mean Difference | t-stat | p-value | Mean Difference | t-stat | p-value | Mean Difference | t-stat | p-value | Mean Difference | t-stat | p-value |
| Residential Real Estate Transaction | | | | | | | | | | | | |
| Transaction Value | 5813.60 | 0.64 | 0.52 | 27672.94 | 1.43 | 0.16 | 5666.84 | 0.57 | 0.57 | 5600.04 | 0.61 | 0.54 |
| Total Built Area (m ²) | -3.31 | -0.41 | 0.68 | -6.15 | -0.46 | 0.64 | -2.49 | -0.30 | 0.76 | -3.00 | -0.37 | 0.71 |
| Total Commercial Surface Area (m ²) | -8.57 | -1.36 | 0.18 | -12.93 | -1.09 | 0.28 | -8.65 | -1.34 | 0.18 | -8.34 | -1.32 | 0.19 |
| Total Residential Surface Area (m ²) | 11.90 | 5.31 | 0.00 | 10.27 | 2.22 | 0.03 | 11.27 | 4.80 | 0.00 | 11.99 | 5.36 | 0.00 |
| Number of Old Units (year>=5) | -0.12 | -1.88 | 0.06 | -0.05 | -1.14 | 0.26 | -0.11 | -1.75 | 0.08 | -0.12 | -1.90 | 0.06 |
| Number of Recent Commercial Units (year<5) | -0.04 | -1.56 | 0.12 | -0.01 | -1.09 | 0.28 | -0.01 | -1.42 | 0.16 | -0.03 | -1.55 | 0.12 |
| Number of Recent Residential Units (year<5) | -0.02 | -1.96 | 0.05 | -0.01 | -0.39 | 0.70 | -0.02 | -2.07 | 0.04 | -0.02 | -1.99 | 0.05 |
| Number of Apartments | -0.1777 | -2.80 | 0.01 | -0.0474 | -1.26 | 0.21 | -0.1514 | -2.42 | 0.02 | -0.1799 | -2.84 | 0.00 |
| Number of 1-Room Apartments | -0.0257 | -3.30 | 0.00 | -0.0022 | -0.11 | 0.91 | -0.0310 | -2.50 | 0.01 | -0.0265 | -3.42 | 0.00 |
| Number of 2-Room Apartments | -0.0442 | -1.50 | 0.14 | -0.0034 | -0.22 | 0.83 | -0.0313 | -1.08 | 0.28 | -0.0443 | -1.50 | 0.14 |
| Number of 3-Room Apartments | -0.0729 | -2.31 | 0.02 | -0.0260 | -1.62 | 0.11 | -0.0604 | -1.93 | 0.06 | -0.0736 | -2.34 | 0.02 |
| Number of 4-Room Apartments | -0.0316 | -4.36 | 0.00 | -0.0226 | -2.42 | 0.02 | -0.0271 | -3.50 | 0.00 | -0.0322 | -4.46 | 0.00 |
| Number of 5-Room Apartments | -0.0031 | -0.70 | 0.49 | 0.0067 | 1.08 | 0.28 | -0.0014 | -0.32 | 0.75 | -0.0032 | -0.72 | 0.47 |
| Distance to City Center (km) | 0.04 | 0.28 | 0.78 | 0.09 | 1.57 | 0.12 | -0.04 | -1.11 | 0.27 | -0.08 | -1.92 | 0.06 |
| Distance to Nearest Train Station (km) | 1.35 | 4.66 | 0.00 | 0.78 | 2.59 | 0.01 | 1.24 | 4.64 | 0.00 | 1.23 | 4.62 | 0.00 |
| Commercial Real Estate Transaction | | | | | | | | | | | | |
| Transaction Value | -402,525.28 | -3.05 | 0.00 | -90,069.02 | -0.60 | 0.55 | -373,657.93 | -2.61 | 0.01 | -403,123.15 | -3.03 | 0.00 |
| Number of Commercial Units | -0.20 | -1.74 | 0.08 | -0.00 | -0.02 | 0.99 | -0.19 | -1.56 | 0.12 | -0.20 | -1.74 | 0.08 |
| Number of Tertiary Commercial Units | -0.17 | -1.41 | 0.16 | 0.00 | 0.03 | 0.98 | -0.16 | -1.26 | 0.21 | -0.17 | -1.42 | 0.16 |
| Total Built Area (m ²) | -583.70 | -2.90 | 0.00 | -11.36 | -0.02 | 0.98 | -587.39 | -2.66 | 0.01 | -578.88 | -2.86 | 0.00 |
| Total Commercial Surface Area (m ²) | -573.63 | -2.92 | 0.00 | -32.16 | -0.07 | 0.95 | -583.04 | -2.69 | 0.01 | -568.75 | -2.87 | 0.00 |
| Total Residential Surface Area (m ²) | 13.86 | 0.88 | 0.38 | 10.18 | 0.91 | 0.37 | 17.30 | 1.01 | 0.32 | 13.46 | 0.86 | 0.39 |
| Number of Old Units (year>=5) | -0.50 | -0.98 | 0.33 | -0.19 | -0.67 | 0.51 | -0.50 | -0.91 | 0.36 | -0.50 | -0.97 | 0.34 |
| Number of Recent Commercial Units (year<5) | -0.06 | -0.90 | 0.37 | 0.03 | 0.62 | 0.54 | 0.00 | 0.07 | 0.95 | -0.05 | -0.86 | 0.39 |
| Number of Apartments | -0.43 | -1.38 | 0.17 | 0.10 | 0.76 | 0.45 | -0.42 | -1.25 | 0.21 | -0.43 | -1.35 | 0.18 |
| Number of 1-Room Apartments | -0.12 | -1.26 | 0.21 | -0.03 | -0.77 | 0.44 | -0.14 | -1.26 | 0.21 | -0.12 | -1.24 | 0.22 |
| Number of 2-Room Apartments | -0.06 | -0.62 | 0.54 | 0.04 | 1.00 | 0.32 | -0.03 | -0.29 | 0.77 | -0.06 | -0.60 | 0.55 |
| Number of 3-Room Apartments | -0.12 | -1.23 | 0.22 | 0.06 | 0.97 | 0.34 | -0.12 | -1.06 | 0.29 | -0.11 | -1.16 | 0.25 |
| Number of 4-Room Apartments | -0.11 | -1.98 | 0.05 | 0.02 | 0.51 | 0.61 | -0.12 | -1.67 | 0.10 | -0.11 | -1.99 | 0.05 |
| Number of 5-Room Apartments | -0.02 | -0.99 | 0.32 | 0.01 | 0.47 | 0.64 | -0.01 | -0.66 | 0.51 | -0.02 | -1.02 | 0.31 |
| Distance to City Center (km) | -0.12 | -1.76 | 0.08 | -0.11 | -1.28 | 0.20 | -0.05 | -0.86 | 0.39 | -0.10 | -1.52 | 0.13 |
| Distance to Nearest Train Station (km) | 1.13 | 3.49 | 0.00 | 0.51 | 1.22 | 0.23 | 1.21 | 3.63 | 0.00 | 1.11 | 3.45 | 0.00 |

Note: The t-statistics and p-values refer to the differences in means between ineligible and eligible groups for each variable by distance ring. The values are based on transactions from 2014 to 2018.

Table 3.13: Comparative Statistics between Eligible and Not Eligible Groups - Urban Development

| | Full Sample | | | 0-1km | | | 0-3km | | | 0-5km | | |
|--|-----------------|--------|---------|-----------------|--------|---------|-----------------|--------|---------|-----------------|--------|---------|
| | Mean Difference | t-stat | p-value | Mean Difference | t-stat | p-value | Mean Difference | t-stat | p-value | Mean Difference | t-stat | p-value |
| Residential Building Permits | | | | | | | | | | | | |
| Commercial Space Created (m ²) | -15.68 | -1.88 | 0.06 | -15.90 | -1.56 | 0.13 | -8.37 | -1.17 | 0.24 | -9.05 | -1.26 | 0.21 |
| Residential Space Created (m ²) | -160.16 | -3.31 | 0.00 | -85.34 | -0.84 | 0.40 | -126.88 | -2.33 | 0.02 | -142.00 | -2.63 | 0.01 |
| Commercial Space Demolished (m ²) | -6.67 | -1.49 | 0.14 | 0.59 | 1.73 | 0.09 | -10.70 | -1.40 | 0.17 | -10.37 | -1.35 | 0.18 |
| Residential Space Demolished (m ²) | -6.64 | -1.83 | 0.07 | 1.20 | 1.02 | 0.31 | -4.37 | -1.19 | 0.23 | -5.09 | -1.41 | 0.16 |
| Residential Space Transformed (m ²) | 3.85 | 0.69 | 0.49 | 5.74 | 0.83 | 0.41 | 5.05 | 1.00 | 0.32 | 3.24 | 0.62 | 0.53 |
| Residential Space from Transformations (m ²) | 4.62 | 0.67 | 0.51 | 4.98 | 0.47 | 0.64 | 0.27 | 0.04 | 0.97 | 2.51 | 0.36 | 0.72 |
| Commercial Space Transformed (m ²) | -0.91 | -0.20 | 0.84 | -0.83 | -0.12 | 0.90 | -7.33 | -1.07 | 0.29 | -2.07 | -0.41 | 0.69 |
| Commercial Space from Transformations (m ²) | -1.68 | -1.49 | 0.14 | -0.07 | -0.54 | 0.59 | -2.56 | -1.43 | 0.16 | -1.35 | -1.50 | 0.14 |
| Number of Apartments Created | -2.55 | -3.29 | 0.00 | -1.52 | -0.93 | 0.36 | -2.04 | -2.51 | 0.01 | -2.15 | -2.65 | 0.01 |
| Number of Social Housing Units Created | -1.00 | -2.80 | 0.01 | 0.49 | 0.62 | 0.54 | -0.63 | -2.15 | 0.03 | -0.67 | -2.30 | 0.02 |
| Number of Housing Units Demolished | -0.00 | -0.40 | 0.69 | -0.01 | -1.32 | 0.19 | -0.01 | -0.84 | 0.41 | -0.02 | -1.37 | 0.17 |
| Total Number of Units Created | -2.61 | -3.30 | 0.00 | -1.59 | -0.92 | 0.36 | -2.10 | -2.39 | 0.02 | -2.25 | -2.57 | 0.01 |
| Commercial Building Permits | | | | | | | | | | | | |
| Commercial Space Created (m ²) | -1148.68 | -3.37 | 0.00 | -445.09 | -2.23 | 0.03 | -526.86 | -2.40 | 0.02 | -587.59 | -2.47 | 0.02 |
| Residential Space Created (m ²) | 1.00 | 0.25 | 0.81 | -1.01 | -0.30 | 0.76 | 7.53 | 1.92 | 0.06 | 7.86 | 2.04 | 0.05 |
| Commercial Space Demolished (m ²) | -39.23 | -1.63 | 0.11 | -12.17 | -1.46 | 0.15 | -77.24 | -1.71 | 0.09 | -79.85 | -1.82 | 0.07 |
| Residential Space Demolished (m ²) | -0.34 | -0.84 | 0.40 | -0.34 | -0.93 | 0.36 | -1.41 | -2.03 | 0.05 | -0.98 | -1.81 | 0.07 |
| Residential Space Transformed (m ²) | 1.18 | 0.60 | 0.55 | 0.00 | NaN | NaN | 1.47 | 0.67 | 0.50 | 1.70 | 0.80 | 0.43 |
| Residential Space from Transformations (m ²) | -7.49 | -1.80 | 0.08 | 2.45 | 0.61 | 0.55 | -3.18 | -1.30 | 0.20 | -2.89 | -1.22 | 0.23 |
| Commercial Space Transformed (m ²) | -37.57 | -1.28 | 0.20 | -17.04 | -0.97 | 0.34 | 5.49 | 0.08 | 0.93 | 6.01 | 0.09 | 0.93 |
| Commercial Space from Transformations (m ²) | -28.90 | -0.99 | 0.32 | -19.50 | -1.16 | 0.25 | 10.15 | 0.15 | 0.88 | 10.60 | 0.16 | 0.87 |

Note: The t-statistics and p-values refer to the differences in means between ineligible and eligible groups for each variable by distance ring. The values are based on building permits from 2014 to 2018, excluding building permits issued for personal use.

Table 3.14: Descriptive Statistics for Control and Treatment Groups

| | Not Restricted | Restricted |
|--------------------------------|-----------------------|-------------------|
| Residential Real Estate | | |
| 0-1 km | 6,261 | 15,422 |
| 0-2 km | 16,206 | 40,257 |
| 0-3 km | 18,984 | 57,287 |
| 0-4 km | 19,981 | 69,296 |
| 0-5 km | 20,489 | 73,995 |
| 0-6 km | 20,519 | 75,591 |
| 0-7 km | 20,519 | 76,162 |
| 0-8 km | 20,519 | 76,213 |
| 0-9 km | 21,367 | 76,213 |
| 0-10 km | 22,702 | 76,216 |
| Total | 22,728 | 76,310 |
| Commercial Real Estate | | |
| 0-1 km | 511 | 734 |
| 0-2 km | 1070 | 2381 |
| 0-3 km | 1204 | 3791 |
| 0-4 km | 1246 | 4475 |
| 0-5 km | 1283 | 4835 |
| 0-6 km | 1283 | 4941 |
| 0-7 km | 1283 | 4962 |
| 0-8 km | 1283 | 4976 |
| 0-9 km | 1316 | 4976 |
| 0-10 km | 1480 | 4976 |
| Total | 1,488 | 4,991 |

Note: The values refer to the number of transactions present in each ring from 2014 to 2022.

Table 3.15: Descriptive Statistics for Control and Treatment Groups (2014-2022)

| | Not Restricted | | Restricted | | Total |
|---|----------------|---------------|---------------|---------------|-------|
| | Old Structure | New Structure | Old Structure | New Structure | |
| Residential Building Permits | | | | | |
| 0-1 km | 66 | 402 | 95 | 375 | 938 |
| 0-2 km | 106 | 387 | 181 | 535 | 1,209 |
| 0-3 km | 40 | 122 | 100 | 326 | 588 |
| 0-4 km | 11 | 47 | 55 | 133 | 246 |
| 0-5 km | 9 | 35 | 12 | 29 | 85 |
| 0-6 km | 0 | 4 | 13 | 0 | 17 |
| 0-7 km | 0 | 0 | 2 | 3 | 5 |
| 0-8 km | 0 | 0 | 0 | 0 | 0 |
| 0-9 km | 3 | 6 | 1 | 1 | 11 |
| 0-10 km | 8 | 1 | 1 | 1 | 11 |
| Total (Including Exact Locations) | 246 | 1,020 | 460 | 1,413 | 3,139 |
| Percentage Including Exact Locations | 74.3% | 63.2% | 76.9% | 61.1% | 65.7% |
| Total | 331 | 1,613 | 598 | 2,311 | 4,853 |
| Commercial Building Permits | | | | | |
| 0-1 km | 58 | 48 | 159 | 108 | 373 |
| 0-2 km | 107 | 61 | 257 | 124 | 549 |
| 0-3 km | 31 | 19 | 177 | 99 | 326 |
| 0-4 km | 12 | 3 | 97 | 51 | 163 |
| 0-5 km | 12 | 4 | 33 | 15 | 64 |
| 0-6 km | 0 | 2 | 15 | 3 | 20 |
| 0-7 km | 0 | 0 | 2 | 5 | 7 |
| 0-8 km | 0 | 0 | 0 | 0 | 0 |
| 0-9 km | 11 | 5 | 1 | 2 | 19 |
| 0-10 km | 14 | 4 | 0 | 2 | 20 |
| Total (Including Exact Locations) | 247 | 146 | 742 | 409 | 1,544 |
| Percentage Including Exact Locations | 71.1% | 52.3% | 68.3% | 55.5% | 63.0% |
| Total | 347 | 279 | 1085 | 736 | 2,447 |

Note: The values represent the number of building permits within each distance ring from 2014 to 2022.

Table 3.16: Descriptive Statistics for Control and Treatment Municipalities

| | Restricted | Not Restricted |
|---|------------|----------------|
| Real Estate Transaction | | |
| Number of housing transactions | 76,310 | 22,728 |
| Number of housing transactions (single-family) | 43,007 | 17,431 |
| Number of flat transactions (multi-family) | 33,303 | 5,297 |
| Number of commercial transactions | 4,056 | 1,440 |
| Residential Building Permits | | |
| Number of permits for new residential construction | 2,311 | 1,613 |
| Number of permits for existing residential structures | 598 | 331 |
| Number of new flat units | 9,209 | 2,671 |
| Number of new housing units | 3,035 | 1,941 |
| Number of new flat units through renovation (single-family) | 617 | 369 |
| Number of new housing units through renovation (multi-family) | 1,092 | 598 |
| Commercial Building Permits | | |
| Number of permits for new commercial construction | 736 | 279 |
| Number of permits for existing commercial structures | 1,085 | 347 |
| Number of permits for hotel accommodation | 13 | 3 |
| Number of permits for office buildings | 134 | 25 |
| Number of permits for commercial premises | 190 | 33 |
| Number of permits for craft industry | 40 | 14 |
| Number of permits for industrial buildings | 44 | 19 |
| Number of permits for agricultural buildings | 50 | 45 |
| Number of permits for warehouses | 86 | 42 |
| Number of permits for public service or collective interest buildings | 233 | 80 |
| Number of municipalities | 155 | 154 |

Note: The values are based on building permits from 2014 to 2018, excluding building permits issued for personal use.

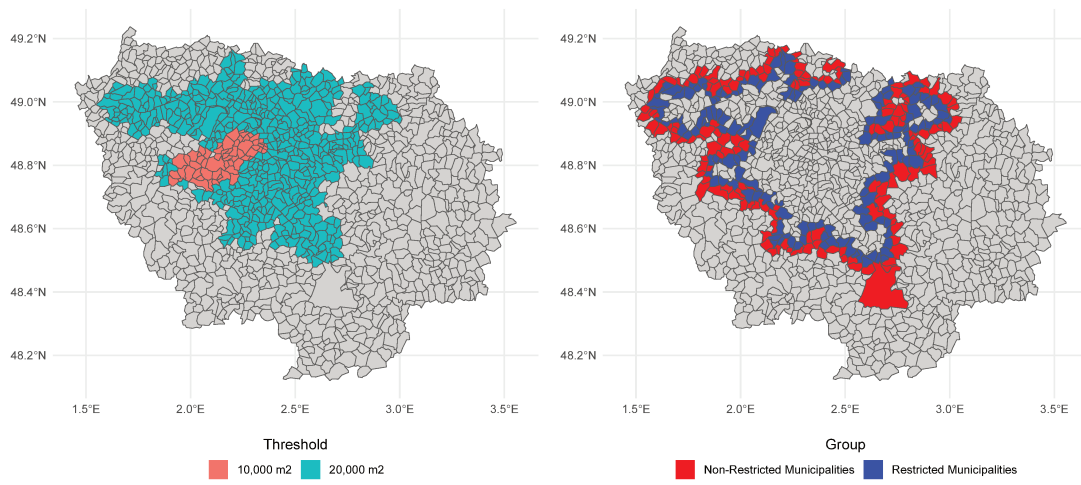
| Number of Transactions | Full Sample | | Between 0 and 0.2km | | Between 0 and 0.5km | | Between 0 and 1km | |
|------------------------|----------------|----------------|---------------------|---------------|---------------------|---------------|-------------------|---------------|
| | S1 | S2 | S1 | S2 | S1 | S2 | S1 | S2 |
| Year 2022 | 8,887 | 9,564 | 722 | 603 | 1,166 | 2,748 | 5,902 | 5,513 |
| Year 2021 | 18,108 | 17,279 | 1,035 | 1,031 | 3,319 | 4,094 | 8,853 | 10,197 |
| Year 2020 | 13,402 | 19,424 | 797 | 1,296 | 1,599 | 4,489 | 5,859 | 10,626 |
| Year 2019 | 23,219 | 24,548 | 1,182 | 1,630 | 4,787 | 5,042 | 10,367 | 12,958 |
| Year 2018 | 19,857 | 25,144 | 1,138 | 1,654 | 4,042 | 4,484 | 10,127 | 12,682 |
| Year 2017 | 19,997 | 24,075 | 1,183 | 1,909 | 3,825 | 4,342 | 10,139 | 12,839 |
| Year 2016 | 18,111 | 25,441 | 1,043 | 1,022 | 3,414 | 3,524 | 8,717 | 11,989 |
| Year 2015 | 16,693 | 21,358 | 1,062 | 1,000 | 2,920 | 3,677 | 8,327 | 10,106 |
| Year 2014 | 16,009 | 19,265 | 1,012 | 1,079 | 2,690 | 2,930 | 7,739 | 8,988 |
| Total | 154,283 | 186,098 | 9,174 | 11,224 | 27,762 | 35,330 | 76,030 | 95,898 |

Table 3.17: Transaction Volumes

| Variables | Full Sample Complete | Between 0 and 0.2 km | Between 0 and 0.5 km | Between 0 and 1 km |
|---|----------------------|----------------------|----------------------|---------------------|
| Number of transactions | 340,381 | 20,398 | 63,092 | 171,928 |
| Number of municipalities | 38 | 37 | 37 | 38 |
| Proportion of transactions with 1 dwelling | 60.8% | 54.8% | 56.1% | 58.3% |
| Proportion of transactions with more than 2 dwellings | 39.2% | 45.2% | 43.9% | 41.6% |
| Median transaction price | 354,000 | 355,000 | 350,016 | 353,250 |
| Mean transaction price | 519,155 | 503,876 | 502,209 | 508,901 |
| Median price (1 dwelling sold) | 260,000 | 245,000 | 244,333 | 252,500 |
| Mean price (1 dwelling sold) | 347,411 | 327,302 | 325,617 | 333,505 |
| Median size | 48.00m ² | 52.00m ² | 51.00m ² | 49.00m ² |
| Mean size | 56.89m ² | 59.68m ² | 58.56m ² | 57.20m ² |
| Number of dwellings with 1 bedroom | 74,405 | 3,840 | 12,401 | 35,773 |
| Number of dwellings with 2 bedrooms | 113,595 | 6,652 | 20,727 | 57,565 |
| Number of dwellings with 3 bedrooms | 89,363 | 5,773 | 17,649 | 46,858 |
| Number of dwellings with 4 bedrooms | 42,459 | 2,891 | 8,443 | 21,848 |
| Number of dwellings with 5 bedrooms | 20,028 | 1,192 | 3,507 | 9,694 |
| Number of dwellings with parking | 6,212 | 318 | 1,091 | 2,890 |
| Number of dwellings without parking | 334,169 | 20,080 | 62,001 | 169,038 |
| Mean distance to green spaces | 388m | 250m | 361m | 401m |
| Median distance to green spaces | 244m | 196m | 312m | 329m |
| Mean distance to public transport | 362m | 416m | 386m | 371m |
| Median distance to public transport | 324m | 389m | 353m | 339m |

Table 3.18: Descriptive Statistics

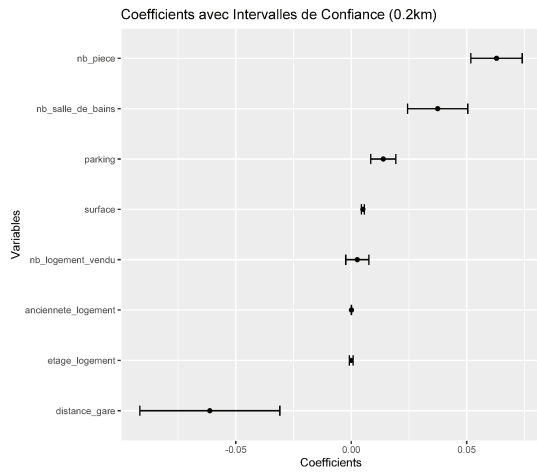
Figures



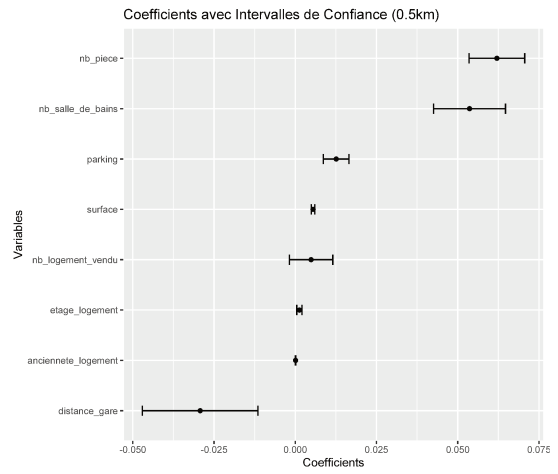
(a) Paris Region two Restricted Zones

(b) Treated and Control Group

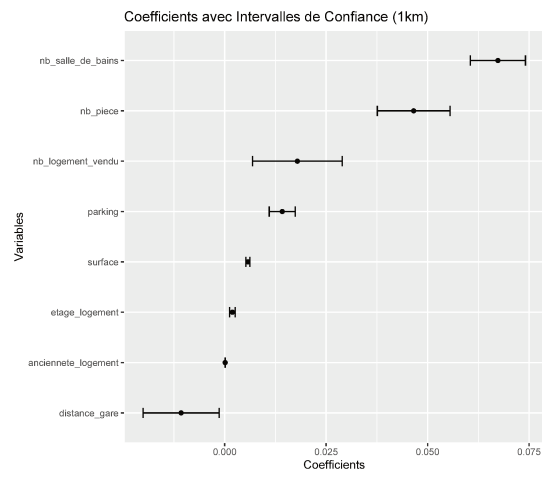
Figure 3.1: Restricted Area



(a) Within 0 and 0.200 km

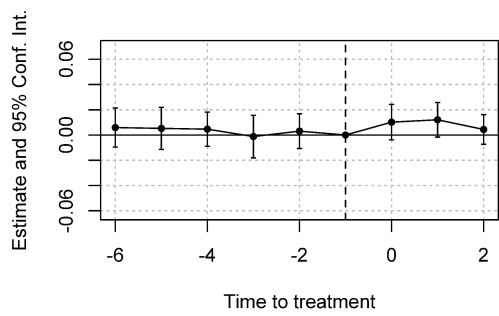


(b) Within 0 and 0.500 km

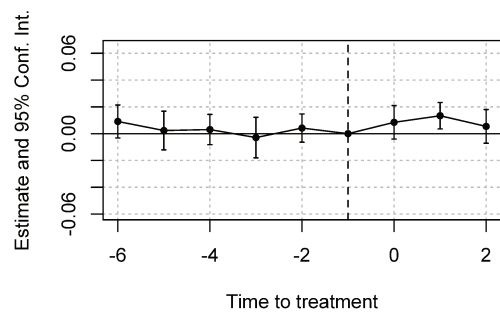


(c) Within 0 and 1 km

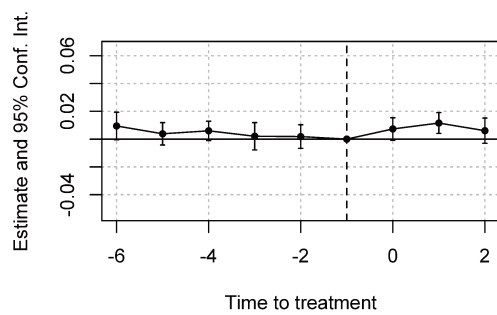
Figure 3.2: Control Variables



(a) Within 0 and 0.200 km

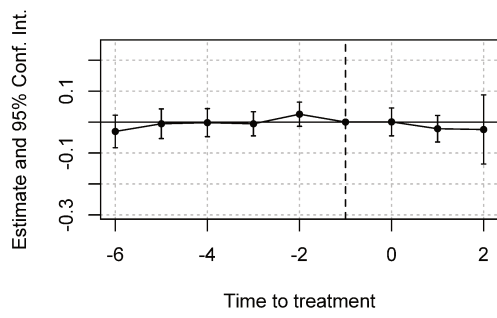


(b) Within 0 and 0.500 km

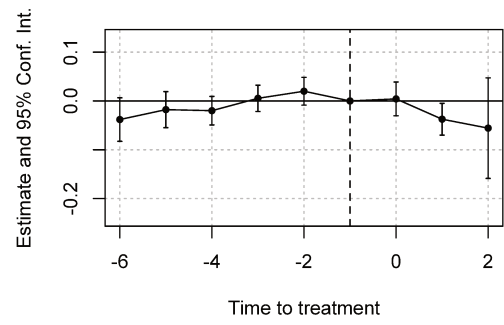


(c) Within 0 and 1 km

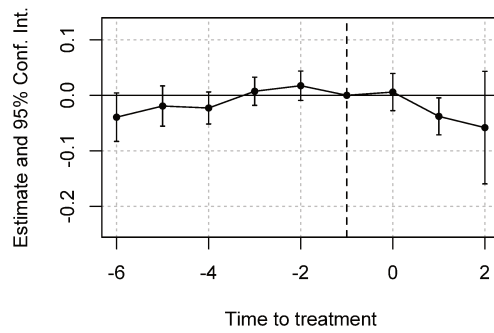
Figure 3.3: Parking vs. No Parking



(a) Within 0 and 0.200 km

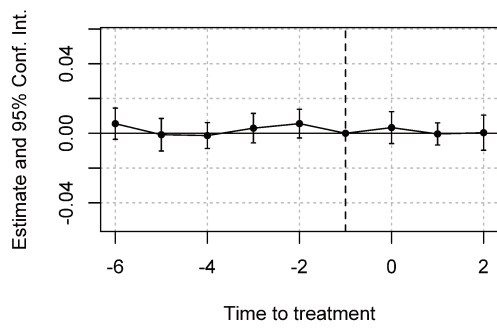


(b) Within 0 and 0.500 km

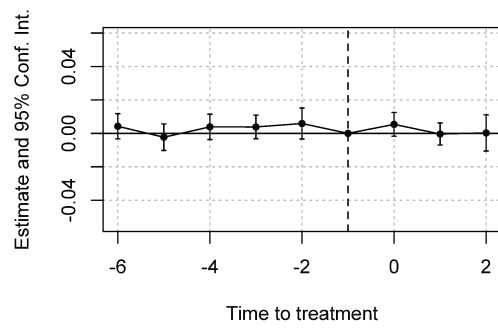


(c) Within 0 and 1 km

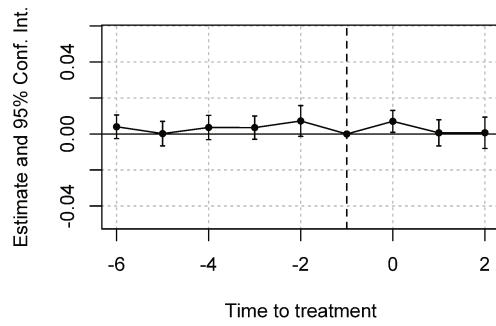
Figure 3.4: Subway at 200m vs. Subway at 500m



(a) Within 0 and 0.200 km

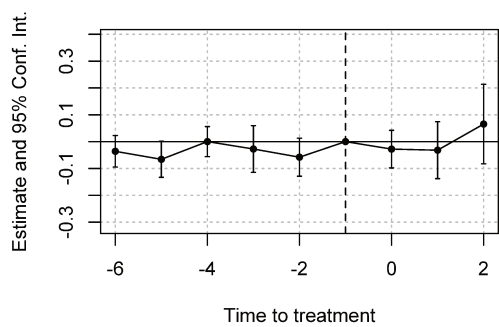


(b) Within 0 and 0.500 km

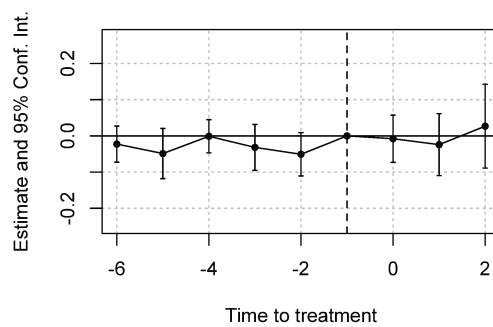


(c) Within 0 and 1 km

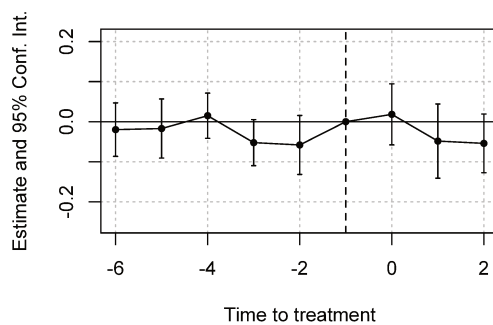
Figure 3.5: Green Space at 300m vs. 500m



(a) Within 0 and 0.200 km

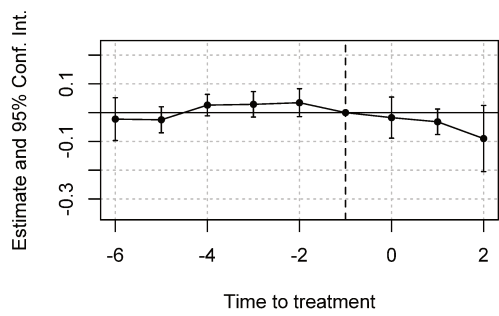


(b) Within 0 and 0.500 km

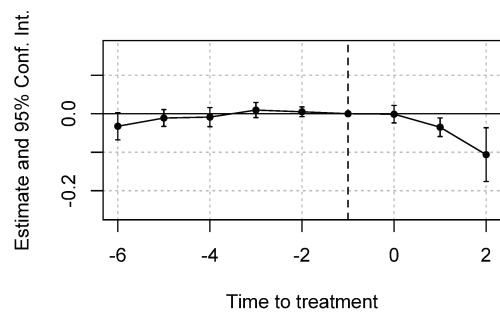


(c) Within 0 and 1 km

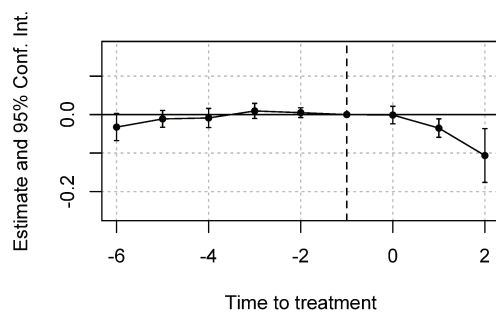
Figure 3.6: 2 Rooms vs. 3 Rooms



(a) Within 0 and 0.200 km



(b) Within 0 and 0.500 km



(c) Within 0 and 1 km

Figure 3.7: Paris vs. Nearby Suburbs

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Appendix A.

The *Action Cœur de Ville* Initiative

The *Action Cœur de Ville* initiative is a comprehensive urban revitalization program launched by the French government in December 2017. Its primary objective is to address the economic and social decline of medium-sized municipalities, which have suffered from population loss, economic stagnation, and deteriorating infrastructure. The program is designed to revitalize urban centers (*cœurs de ville*) and make these municipalities more attractive for residents and businesses alike.

The initiative has four main goals. First, it aims to improve the housing stock by promoting the rehabilitation of deteriorating buildings. This effort is focused on increasing the supply of affordable housing and attracting new residents to city centers while improving living conditions for existing populations. Second, it seeks to boost economic activity by supporting local businesses and enhancing commercial areas in urban centers. This is intended to stimulate the local economy, attract new enterprises, and foster a more vibrant business environment. Third, the initiative focuses on revitalizing urban infrastructure by modernizing transportation networks, public spaces, and cultural venues. Improved mobility, connectivity, and public amenities are key to making these municipalities more livable and attractive to residents and tourists. Finally, the initiative seeks to enhance public services, such as healthcare, education, and administrative functions, ensuring that the targeted municipalities offer the necessary infrastructure for everyday life.

The program targets medium-sized municipalities with populations generally ranging from 10,000 to 100,000, which face significant economic and demographic challenges. By the end of 2019, 222 municipalities had been selected to participate. These municipalities were chosen based on criteria such as population decline, urban decay, and the potential for urban renewal. Local authorities are responsible for the implementation of projects, and their involvement ensures that the specific needs of each municipality are addressed.

The *Action Cœur de Ville* initiative is supported by substantial financial backing, with over 5 billion euros allocated for the period between 2018 and 2024. This funding comes from a combination of public and private resources, including contributions from the French government, local municipalities, financial institutions such as the *Caisse des Dépôts et Consignations*, and private sector partners. The initiative relies heavily on partnerships between local governments and private investors, and these collaborations are essential for the success of the urban renewal efforts.

The key components of the initiative focus on housing rehabilitation, economic revitalization, improved accessibility, and the modernization of public spaces and services. Housing rehabilitation is central to the program, with a significant portion of funding allocated to renovating existing buildings, particularly in areas where the housing stock has fallen into disrepair. Economic revitalization is pursued by attracting businesses back into city centers, including retail, services, and other commercial enterprises that can reinvigorate local economies. Accessibility is improved through investments in transportation infrastructure, parking facilities, and pedestrian areas, ensuring better connections between urban cores and surrounding areas. Finally, the modernization of public spaces and services includes renovating public squares, parks, cultural sites, and administrative buildings, making these areas more

functional and appealing to residents and visitors.

The expected outcomes of the *Action Cœur de Ville* initiative are multifaceted. First, the program aims to increase population retention and attract new residents to the revitalized urban cores. By improving housing quality and availability, the initiative seeks to create more livable and affordable municipality centers. Second, it aims to stimulate local economic growth by encouraging business activity in areas that have experienced economic decline. Third, the initiative is expected to enhance the overall attractiveness of these municipalities, improving the quality of public spaces and services and making them more appealing for residents and tourists. Ultimately, the goal of the *Action Cœur de Ville* initiative is to create vibrant, economically sustainable municipality centers that can serve as models for balanced urban development across France.

In summary, the *Action Cœur de Ville* initiative plays a crucial role in France's strategy to promote balanced territorial development by focusing on municipalities that have been economically and demographically disadvantaged. By addressing the specific challenges faced by these medium-sized municipalities, the initiative seeks to create vibrant urban centers that are economically, socially, and culturally sustainable for the long term.

Table 3.19: Rent Caps by Zone (2024)

| | Rent Cap (€/m²) |
|-------------|-----------------------------------|
| Zone A bis | 18,89 |
| Zone A | 14,03 |
| Zone B1 | 11,31 |
| Zone B2 / C | 9,83 |

Note: The zoning system (A bis, A, B1, B2/C) categorizes areas in France based on housing market tension.

Appendix B.

Commercial premises approval requests

In 1995, a reform delegated the responsibility for regional planning to the Paris Region, which, in association with the State, develops a master plan covering the entire region, known as the SDRIF (Schéma Directeur de la Région Paris Region).

The approval procedure for business real estate dates back to the mid-1950s. Its objective is to guide private and public market players in choosing locations for their activities, promoting a balanced distribution between housing and economic activities.

This procedure is governed by Articles L.510 – 1 *et seq.* of the *TownPlanningCode*. It is a regulatory tool implemented by the State, based on assessment criteria aligned with the orientations of the SDRIF, national territorial development regulation, and social housing development.

Approval is a preliminary authorization given by the State for certain types of real estate operations that require a building permit or prior declaration of work. The procedure has been revised several times, with a significant change on March 1, 2012, which expressed the areas subject to approval in terms of floor area.

The approval for office operations aims to contribute to urban diversity by favoring mixed-use projects that develop buildings for both housing and economic activities.

While the procedure has a broad scope, it also contains legally provided exceptions. Some demographic areas and categories of premises are exempt from approval, such as commercial premises, cinemas, restaurants, hospital equipment, and hotel residences. Specific thresholds must be respected, such as 1,000 square meters for technical, scientific, teaching, or office use, and 5,000 square meters for industrial premises not assigned to warehouses. These exceptions allow the approval procedure to achieve its regulatory objectives without hindering the economic development of small and medium-sized enterprises.

Commercial Construction Approval Permits in 2018

In 2018, the approval directives focused on addressing the historical east-west imbalance in the production of housing and office spaces within the Paris Region. This imbalance has led to significant social and fiscal disparities, creating a need for long-distance transportation between residential and employment areas.

The directives aimed to contribute to urban and social diversity by prioritizing mixed-use projects that simultaneously develop housing for residents of the Paris Region. They emphasized the importance of creating social housing in areas lacking such infrastructure, supporting the renewal of obsolete tertiary properties, and ensuring that new office spaces are accompanied by adequate residential facilities to maintain a balance between housing and employment.

To achieve these goals, the directives introduced the concept of geographical perimeters of reinforced attention, including territories with persistent housing-office imbalances and those under the application of the SRU law. The SRU law mandates social diversity by requiring a certain percentage of social housing in municipalities.

The directives aimed to encourage mixed-use projects that develop both residential and office spaces. This approach aimed to create urban diversity and reduce the need for long commutes, thereby enhancing the quality of life for residents. They stressed

the need for social housing in areas lacking such infrastructure, which was particularly relevant for municipalities deficient in social housing as per the SRU law.

The renewal and requalification of outdated office buildings was a key focus, with the aim of upgrading these properties to meet modern standards and make them more attractive for current market needs. The directives introduced the concept of geographical perimeters of reinforced attention, including territories with significant housing-office imbalances and areas governed by the SRU law.

Within these perimeters, specific measures were taken to promote balanced development. Large plots of land that were subject to recycling had to include housing developments along with office spaces. In municipalities marked as deficient under the SRU law, any new office developments were required to include a significant portion of social housing.

The directives facilitated up to 10% extensions of existing office buildings in areas of enhanced attention, provided these extensions contributed to the housing stock. They introduced more flexible compensation mechanisms for significant tertiary developments, requiring that the additional office space created be offset by corresponding housing developments within the same territory.

Transport capacity was a critical consideration, ensuring that new developments did not overwhelm existing transportation infrastructure. This holistic approach aimed to support the sustainable growth and attractiveness of the Paris Region while addressing long-standing spatial and social disparities.

Regulatory Updates : Commercial Construction Approval Permits in 2021

The 2021 updates to the approval directives built upon the 2018 framework by further refining the criteria for project approval. The updates reinforced the need for a pragmatic, equitable, and evaluated approach to regional rebalancing. The goal was to encourage the development of office spaces in specific territories while ensuring that these developments were accompanied by additional housing to prevent exacerbating existing imbalances.

The updates also facilitated up to 10% extensions of existing buildings in areas of reinforced attention, provided these projects contributed to the overall housing stock. They introduced more flexible compensation mechanisms for significant tertiary developments, requiring that the additional office space created be offset by corresponding housing developments within the same territory.

The 2019 directives underscored the importance of transport capacity in approving large-scale office projects, ensuring that new developments did not overwhelm existing transportation infrastructure. This holistic approach aimed to support the sustainable growth and attractiveness of the Paris Region while addressing long-standing spatial and social disparities.

Regulatory Process for Use Transformations in the Paris Region

In the Paris Region, transforming a residential space into a commercial or professional space (or vice versa) is subject to specific administrative approvals. The following process outlines how these transformations are regulated:

Authorization Requirement In municipalities with over 200,000 inhabitants and in certain departments (Hauts-de-Seine, Seine-Saint-Denis, Val-de-Marne), developers must request a change of use authorization from the local municipality or prefecture.

This approval is required for any residential-to-commercial transformation, including annexed spaces like service quarters, lodges, and staff accommodations.

Conditions and Compensation The municipality or prefecture may impose conditions on these changes to ensure the preservation of residential housing stock. For example, the loss of a residential unit may need to be compensated by converting a commercial or office space into residential use.

Approval Procedure Developers must file a request with the appropriate municipal office. In Paris, this is handled by the *Bureau Accueil et Service à l'Usager* (BASU). The request is processed by the local mayor's office, and in some cases, reviewed by the prefect of the department.

Types of Authorizations

With Compensation: This type of authorization is attached to the property and is definitive, meaning that the commercial transformation is permanent, but requires compensating the loss of residential space.

Without Compensation: This authorization is personal and temporary, tied to the professional activity of the applicant. It ceases when the applicant ends their professional activity and cannot be transferred to a new owner.