Trends in Rental Price Inflation and the Introduction of Rent Pressure Zones in Ireland

Achim Ahrens,
Maria Martinez-Cillero
and Conor O' Toole

June 2019

Prepared by the ESRI for the Residential Tenancies Board

ESRI ECONOMIC & SOCIAL RESEARCH INSTITUTE

RTB Bord um Thionóntachtaí Cónaithe
Residential Tenancies Board

ABOUT THE ESRI

The mission of the Economic and Social Research Institute is to advance evidence-based policymaking that supports economic sustainability and social progress in Ireland. ESRI researchers apply the highest standards of academic excellence to challenges facing policymakers, focusing on 12 areas of critical importance to 21st Century Ireland.

The Institute was founded in 1960 by a group of senior civil servants led by Dr T.K. Whitaker, who identified the need for independent and in-depth research analysis to provide a robust evidence base for policymaking in Ireland.

Since then, the Institute has remained committed to independent research and its work is free of any expressed ideology or political position. The Institute publishes all research reaching the appropriate academic standard, irrespective of its findings or who funds the research.

The quality of its research output is guaranteed by a rigorous peer review process. ESRI researchers are experts in their fields and are committed to producing work that meets the highest academic standards and practices.

The work of the Institute is disseminated widely in books, journal articles and reports. ESRI publications are available to download, free of charge, from its website. Additionally, ESRI staff communicate research findings at regular conferences and seminars.

The ESRI is a company limited by guarantee, answerable to its members and governed by a Council, comprising 14 members who represent a cross-section of ESRI members from academia, civil services, state agencies, businesses and civil society. The Institute receives an annual grant-in-aid from the Department of Public Expenditure and Reform to support the scientific and public interest elements of the Institute's activities; the grant accounted for an average of 30 per cent of the Institute's income over the lifetime of the last Research Strategy. The remaining funding comes from research programmes supported by government departments and agencies, public bodies and competitive research programmes.

Further information is available at www.esri.ie

THE AUTHORS

Conor O'Toole is a Senior Research Officer at the Economic and Social Research Institute (ESRI) and an Adjunct Associate Professor at Trinity College Dublin (TCD). Achim Ahrens and Maria Martinez are Post-Doctoral Research Fellows at the ESRI.

ACKNOWLEDGEMENTS

We would like to thank Rosalind Carroll, Caren Gallagher, Joseph Kilroy, Joseph Carey, Kieran McQuinn, and Christine Whitehead for comments, suggestions and discussion. We would also like to thank three anonymous reviewers for their comments as well as the wider RTB research committee for detailed discussions and input.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

CSO	Central Statistics Office
ESRI	Economic and Social Research Institute
GDA	Greater Dublin Area
LEA	Local Electoral Area
LHS	Left-hand side
ppts	Percentage points
RHS	Right-hand side
RPZ	Rent Pressure Zone
RTB	Residential Tenancies Board

EXECUTIVE SUMMARY

Rental price inflation in the private residential sector in Ireland has accelerated rapidly in recent years. This is the consequence of a confluence of factors which have led to an undersupply of both rental and owner-occupier housing and growing demand due to demographic household formation and a recovering economy. In an attempt to limit the rate of rent inflation, price controls were enacted in December 2016, which limited the rate of increase in rents to 4 per cent per annum in areas designated as Rent Pressure Zones (RPZs). RPZs can be classified at the local authority (LA) or local electoral area (LEA). A number of exemptions are available for landlords.

This study aims to understand and document the trends in rental prices in Ireland before and after the introduction of RPZs. It compares the trends in areas classified as RPZs relative to selected comparison groups of unclassified LEAs to identify whether changes in the inflation rate are evident after the policies were introduced. A range of methods have been used to undertake this assessment, including analysing the trends and developments at an LEA level using the quarterly Rent Index official series as well as an analysis at the property level using a matched sample from the RTB database.

Main findings

- Price inflation in RPZs has fallen relative to other areas since the introduction of the legislation. The magnitude of the moderation in inflation nationally has been in the order of 2-3 percentage points per annum when comparing the seven quarters since the policies to the seven quarters before. These estimates are robust across a range of methods.

- Indeed, the rate of price inflation across all RPZs fell from just over 9 per cent for the seven quarters before the regulations to just under 6.4 per cent in the seven quarters since the regulations – a drop of approximately 2.6 percentage points. In the non-RPZ areas, the average rent growth before and after the policy is virtually the same, with only a 0.24 percentage-point decline.

- Differences exist regionally in the change in rental price trends following the introduction of the measures. Larger reductions in rental inflation are evident in Cos Louth and Galway than in Cork, Dublin and the rest of the Greater Dublin Area. This may reflect both the initial level of rent inflation before the regulations as well as local market conditions such as the distance to non-RPZ alternatives, differing economic conditions, and area-specific trends.

- We explore the extent to which inflation at the property level has converged to the 4 per cent limit allowed under the legislation. We find that the share of properties whose annualised rental increase was greater than 4 per cent decreased from 73.2 per cent in Q4 2016 to 42.5 per cent in Q3 2018 in RPZ areas. From our econometric assessment, the likelihood of a tenant receiving an increase above 4 per cent fell by approximately 23 percentage points after the introduction of the legislation. Any full convergence is unlikely to happen on an aggregate LEA basis as new supply (properties without a rental history in the past 24 months) as well as substantially renovated properties are exempt from the regulations.

- These figures suggest that two-in-five tenants in RPZ areas still face rates of increase above 4 per cent per annum. However, due to date gaps, it is not possible to determine whether this is due to non-compliance with the scheme or high use of valid exemptions.

Implications for policy and scheme monitoring

- In terms of the ongoing monitoring and assessment of the scheme's functionality, we find that data gaps exist which do not allow us to disentangle the full effect of the scheme on the properties to which the regulations apply nor to make any assessment about compliance.

- To fully evaluate the effect of the scheme, data on all existing and new tenancies should be collated on an ongoing basis to build a full picture of the rental sector. These data capture all new agreements, changes to agreements and tenancy terminations. The proposals in the published Residential Tenancies Amendment Bill 2018 provide for annual registration, which would improve data coverage on the existing rental contract stock.

- Any new database should include not only the rental levels and property/tenancy characteristics but should receive sufficient information to allow each tenancy and property to be uniquely identified over time. This would allow an accurate rental history to be built up and ensure that new supply is measured correctly.

- The database should also ensure that data on substantial renovations are collected so as to assess the use of this exemption from the regulations. Information on the BER rating would also be helpful to monitor investments in energy efficiency.

- Where feasible with regard to operational or data protection considerations, two-way data-sharing with other agencies may improve the quality of information available to assess activity in the sector.

CHAPTER 1

Introduction

Since the onset of the financial crisis, the housing market in Ireland has been characterised by considerable volatility in prices. During the economic downturn, both house prices and rents fell markedly and, by 2013, stood well below peak 2007 levels. Housing supply also dropped dramatically; annualised completions were significantly lower than what would have been expected given demographic and population fundamentals (Byrne et al., 2014).

As the economy began to recover, rental and house prices have increased rapidly. Rising demographic pressures coincided with improvement in the labour market to fuel housing demand. Acute supply shortages and a tightening of credit availability through stricter lending standards on new mortgages added to pressures in the housing market. The resulting acceleration in house prices and rents has led to calls for policies to directly deal with housing affordability. Recent research by Corrigan et al. (2019) highlights the acute affordability challenge faced by certain groups of households in Ireland, in particular low-income households, those in the private rental sector and those in the Dublin area.

While it is unsurprising that both house prices and rents have grown rapidly following the downturn, as often prices overshoot during periods of turbulence, the more recent increases have led to questions as to whether the current market conditions are becoming unsustainable. This is particularly the case in the private rental sector where households have more limited security of tenure relative to mortgage-financed purchase.

In an attempt to address the rapid inflation in the private rented sector, the Government introduced rent control measures into the Irish rental market in late 2016. These controls designated areas as 'Rent Pressure Zones' under the Planning and Development (Housing) and Residential Tenancies Act 2016 (the '2016 Act'). The rules limited rent rises to a maximum of 4 per cent annually in areas designated as Rent Pressure Zones (RPZs). However, several exemptions were provided in these regulations. For example, landlords who undertook a substantial renovation or who did not have a rent history in the past two years were exempt. The calculations were set on a geographic basis, at the local electoral area (LEA) or local authority (LA) level. Initially, in December 2016, five LAs were designated as RPZs: the four Dublin LAs and Cork City.[1]

To ensure an objective, evidence-based calibration of the policies, the qualifying

[1] For details on the initial and subsequent designations, see Chapter 3 and Appendix I.

criteria for future designation of RPZ status at the LEA level were set relative to the RTB Rent Index and linked to the rate of inflation and the national average rent.

Despite the presence of the rent controls over the past 18 months, annual rent rises have continued well in excess of 4 per cent in areas classified as RPZs, as documented by the RTB/ESRI Index. This has raised questions about the functionality of and appropriate metric for monitoring the scheme. There are reasons why the RTB Index would not grow in line with the designated 4 per cent increase. The Rent Index only captures newly issued tenancies and part IV renewals;[2] therefore it does not capture the stock of all existing tenancies at a point in time. It cannot track the full stock of agreements upon which the rent control regulations apply. If new supply is coming onto the market, and landlords are validly applying the exemptions, the RTB index could continue to grow even if all covered agreements were applying the regulations. For example, if new highly priced properties enter the market, the Rent Index might grow by more than 4 per cent, even if annualised rent increases for existing properties do not exceed 4 per cent in accordance with the RPZ regulation.

Given this backdrop, it is timely to explore how rents have changed in Ireland across areas designated as RPZs. Using data from before and after the introduction of the policies, the objectives of this report are as follows:

a. Explore rental price trends across Ireland before and after the introduction of the RPZs with the aim of improving our understanding of the trends in rental prices

b. Formally test how rents have changed in areas designated as RPZs, using econometric techniques

c. Provide some insight for policy in terms of the future data requirements for monitoring and evaluating rent controls in Ireland

It must be noted that the assessment in this report does not undertake a review of the relative costs and benefits of rent controls in Ireland. Nor is the report any endorsement of such controls. Price regulation in any market has costs and benefits in terms of the incentives for purchasers and suppliers, in terms of economic welfare, investment efficiency and market supply. These issues are all outside the scope of this research. The current report is purely a review of the change in rent price trends following the introduction of the RPZ legislation.

The rest of this report is structured as follows. Section 2 presents the macro-economic backdrop and overviews the legislation. Section 3 presents trends and developments in rents before and after the introduction of the rent control legislation, and the results of the econometric analysis at the LEA level. Section 4 presents the results of the econometric assessment at the property level. Section 5 concludes.

[2] Defined as tenancies that have been renewed after 4/6 years.

CHAPTER 2

Background and context

2.1 MACRO-ECONOMIC DEVELOPMENTS AND THE IRISH HOUSING MARKET

Exploring the macro-economic backdrop for rental market developments is critical to understanding the relative forces determining trends in the sector. While the rental sector has not received as much research as the owner-occupied sector in Ireland, several papers have provided insight into the drivers of trends in rents. Both McCann (2016) and Kennedy et al. (2016) provide a clear link between rental price growth and the labour market as well as developments in housing supply and the price of residential housing. Population pressures through inward migration and natural change are also factors explaining developments in the rental sector.

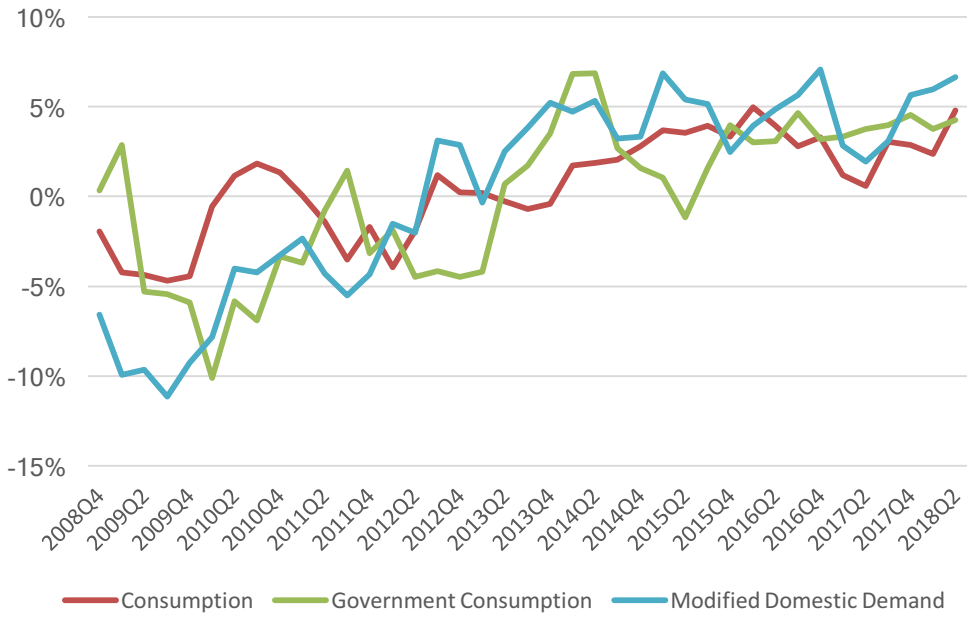
To contextualise our discussion of the trend in rent prices before and after the introduction of the RPZs, we briefly discuss the macro-economic influences that are driving price developments in the rental sector.

Irish economic performance since 2007 has been marked as one of the most tumultuous in terms of macro-economic and macro-financial instability. The onset of the domestic financial crisis, coupled with the international downturn, left the highly indebted Irish economy highly vulnerable to external shocks. The domestic economy shrank sharply and, given the instability in the public finances and the requirement to provide funding to recapitalise the banking sector, fiscal policy had to be tightened in a decidedly pro-cyclical manner.

Figure 1 presents trends in key macro-economic aggregates for Ireland over the 10-year period 2008-2018. It shows how the contraction in the domestic economy was very severe, with modified domestic demand[3] (which includes modified investment, consumption and government day-to-day spending) shrinking for a three-year period from 2009-2012. In 2013, the economy began to stabilise and has since recovered rapidly. Indeed, consumption spending on goods and services by households has grown at over 3 per cent for most of the 2014-2018 period.

[3] Modified domestic demand is an adjusted economic measure introduced by the CSO to remove the influences of investment in aircraft leasing and research and development-related intellectual property assets from the measurement of economic activity in Ireland. See https://www.cso.ie/en/methods/nationalaccounts/din/ for more details.

FIGURE 1 TRENDS IN MACRO-ECONOMIC AGGREGATES IN IRELAND (YEAR-ON-YEAR GROWTH, %)



Source: Authors' calculations using CSO National Account Data.

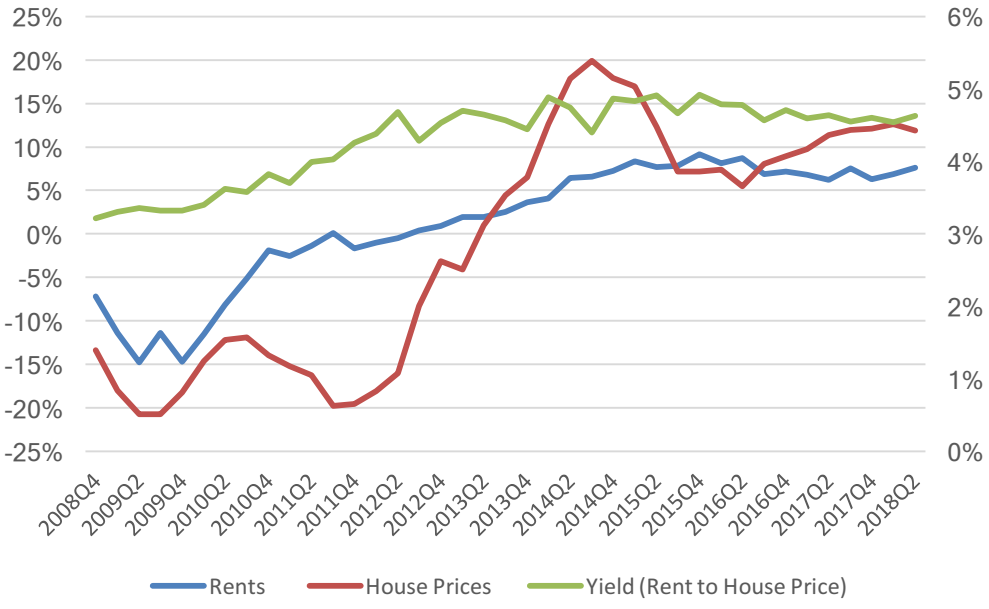
The recovery in economic activity has coincided with a robust performance in the labour market. During the economic crisis, the unemployment rate peaked at around 16 per cent in 2012, increasing from approximately 5 per cent in 2007 (see Figure 2). The scale of the increase in the unemployment rate was mitigated somewhat by the open nature of the labour market, with outward migration increasing sharply. Figure 2 also presents the trend in employee earnings, which did not fall as rapidly as employment. The fact that household earnings growth did not adjust to the same extent indicates that most of the labour-market changes occurred on the employment rather than earnings side (Bergin et al., 2012; Holton and O'Neill, 2017).

FIGURE 2 TRENDS IN UNEMPLOYMENT (LHS, %) AND EARNINGS (RHS, INDEX, 2008=100)

Source: Authors' calculations, based on CSO labour-market data.

The severe economic shock and labour-market adjustment had considerable impacts on prices in the rental sector and for owner-occupied housing. On the demand side, the increase in unemployment and outward migration reduced housing demand. On the supply side, tightened bank credit and the collapse in the construction sector also contributed to a dramatic fall in activity. As shown in Figure 3, house prices fell sharply following the end of the credit boom and the macro-economic shock.

FIGURE 3 TRENDS IN HOUSE PRICES AND RENTS (LHS), AVERAGE RENT TO HOUSE PRICE YIELD (%, RHS)



Source: Authors' calculations, based on CSO and RTB data.

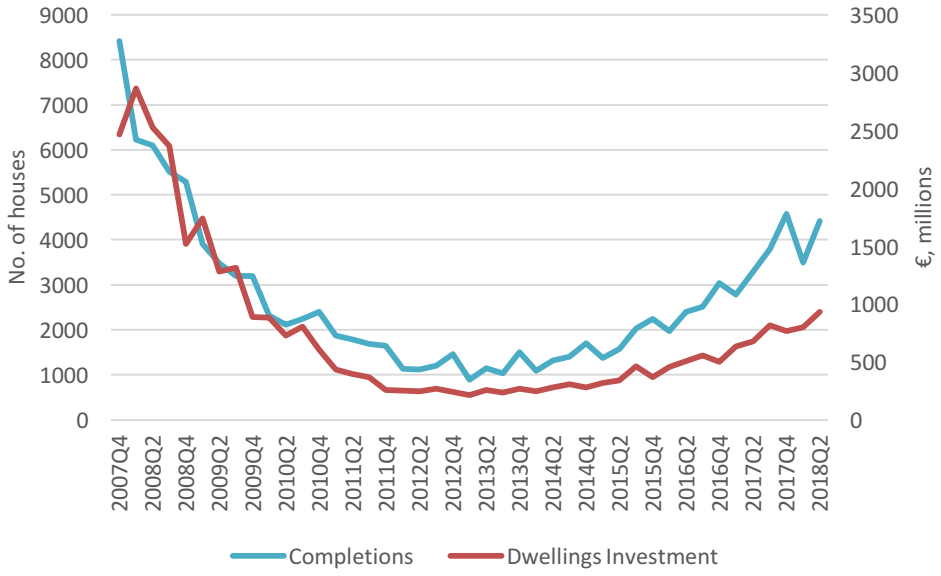
Rent prices also adjusted rapidly during the downturn, with falls evident throughout the period 2008-2012. However, the scale of the downturn was not as severe as for house prices. Rents also began to recover earlier than housing markets in line with the improvement in the labour market, but the scale of the recovery was also less pronounced: rental prices grew at a faster pace through the period 2012 to late 2014/early 2015, with growth moderating thereafter. House price growth was very rapid through 2013 and 2014 but moderated in 2015, coinciding with the introduction of the macroprudential regulations by the Central Bank of Ireland. As economic pressures increased in 2016 and into 2017, house prices began to rise again, only showing some moderation into 2018. Recent research (McQuinn, 2017) suggests that prices in the housing market are currently well explained by the growth in fundamental factors (demographics, supply, incomes, and credit conditions).

A common indicator to determine the relative trends of prices in the housing market is the rent to price ratio, which is presented in Figure 3 on the right-hand axis. This is calculated as the standardised monthly average rent from the RTB Index scaled up annually as a percentage of the average house prices from the CSO.[4] It provides an indicative estimate of the annual yield on housing services. As rents declined less rapidly than house prices in the period, the yields increased in the market. However, as house price growth outpaced rental growth more recently, yields fell somewhat through to 2018.

The strong demand-side pressures in the market coincided with a period of low housing supply. Figure 4 presents trends in housing completions and dwellings investments, using data from the CSO and the Department of Housing. It is clear that the level of housing completions (and investment) fell to critical levels following the crisis. Indeed, Byrne et al. (2014) indicated that 20,000 to 25,000 units are needed each year to keep pace with demographic demand. Actual supply was persistently below this level from 2010 onwards. From 2015 onwards, housing completions began to increase.

[4] CSO data taken from following series:
https://www.cso.ie/px/pxeirestat/Statire/SelectVarVal/Define.asp?maintable=HPM03&PLanguage=0

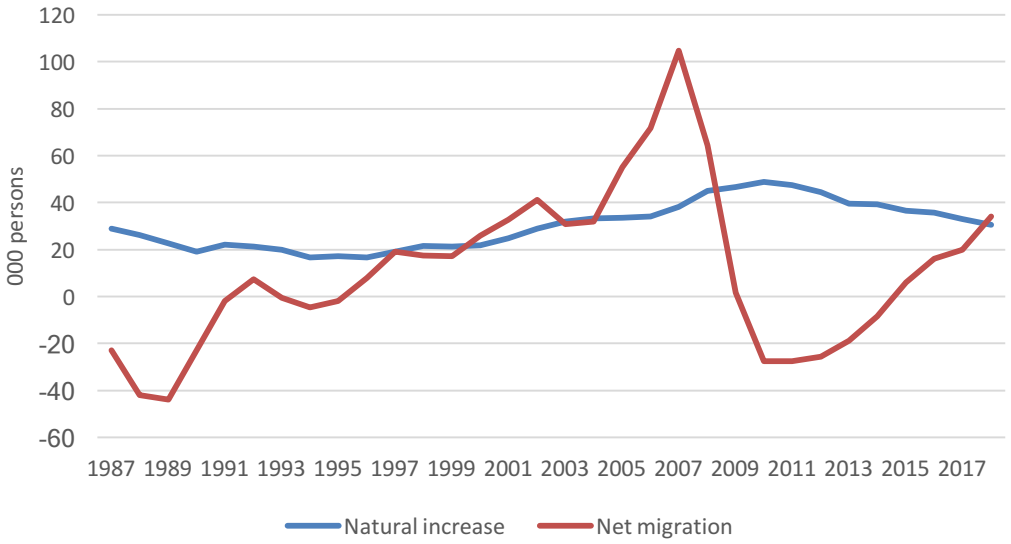
FIGURE 4 TRENDS IN HOUSING COMPLETIONS (LHS, HOUSING UNITS) AND DWELLINGS INVESTMENT (RHS, €MN)



Source: Authors' calculations, based on CSO data. For the completions series, the data pre-2010 has been grown back using the aggregate growth rate from the ESB connections data hosted by the Department of Housing. This avoids the 'level shift' effect that the CSO new data deals with.

The final factor worth exploring is the increased demographic pressure through the recent increase in net inward migration (natural increase has been slowing in recent years). Net migration feeds through into rental prices by increasing demand. While net migration was negative for the years following the crisis in Ireland, it has recovered strongly, which is likely to be adding to pressures in the private rental sector. Previous research has indicated that migrants are more likely to move into the private rental sector (Duffy, 2007). Reductions in headship rates, as indicated in Byrne et al. (2014), are also increasing the number of units required.

FIGURE 5 DEMOGRAPHIC PRESSURES FROM NET MIGRATION AND NATURAL INCREASE (000 PERSONS)



Source: Authors' calculations, based on CSO demographic data.

In summary, the private rental market in Ireland faces a confluence of factors contributing to upward price pressures: a robust macro-economic performance fuelled by a strong labour market, excess demand for housing from demographic pressures, limited access to home purchase due to high house prices, and tighter credit conditions in the owner-occupied sector. All these factors are providing strong economic tailwinds for prices in the rental sector.

2.2 THE INTRODUCTION OF RPZ LEGISLATION IN IRELAND

Given the aforementioned pressures in the rental market, and the growing public pressure over the cost of private rents, the Government introduced legislation in late 2016 aimed at limiting the rate of price inflation in private rental contracts. While rent controls are a feature of many markets internationally,[5] and were used historically in an Irish context, the explicit inflation cap introduced by these measures represented a marked policy shift for the sector. This section provides an overview of the legislation to contextualise the discussion of the impacts of the scheme on prices.

Policy description

Rental controls were introduced in Ireland in late 2016 to address rising inflationary pressures for private tenants. The controls were introduced as part of the *Planning and Development (Housing) and Residential Tenancies Act* 2016. Under this

[5] An overview of the international evidence on rent controls was recently published by Whitehead and Williams (2018).

provision, areas can be designated as Rent Pressure Zones (RPZs) by the Minister with responsibility for Housing, Planning and Local Government. This designation limits rental inflation in these areas to a maximum of 4 per cent per year. This limit is applied to rents agreed at the start of the tenancy (i.e. the previous rent on the property, or rent history, is used as the anchor for allowable rent increase) and to rents reviewed in an ongoing tenancy. Two geographic boundary areas can be designated as Rent Pressure Zones: local electoral areas (LEAs) or local authority areas (LAs).

Designation criteria and exemptions

Under the 2016 legislation, the Housing Agency, following consultation with the relevant housing authority, may make a proposal in writing to the Minister that an area should be classified as an RPZ. For an area to be designated, two criteria must be met. First, the rent inflation must have grown at a rate of 7 per cent or more on an annual basis in four of the previous six quarters. Second, the average rent[6] in the current quarter must be higher than the average national rent (i.e. the Rent Index national standardised rent). Then the director of the RTB submits a rent zone report to the Minister confirming that the area satisfies the conditions, and the Minister prescribes the area as an RPZ for a specific period not exceeding three years.

Two exceptions to the 4 per cent maximum increase are currently allowed in the legislation. First, properties new to the rental market (i.e. properties without a rent history for the previous two years relative to when the area in which the property is located was designated an RPZ) are exempt. Second, properties that have experienced a substantial change in the nature of the accommodation (i.e. renovations or reforms of such nature that they involved significant alterations that increased the value of the property) are also exempted. The RTB has provided guidance for good practice on the application of the substantial change exemption, which can be found on its website.

Current designations

Most of the current RPZs were designated between December 2016 and January 2017, although two more designation rounds have taken place since as a result of applying the criteria described (the specific dates of each designation are provided in a table in Appendix I). In total, the following five local authority areas and 16 LEAs around the country have been declared RPZs at present (for details on the LEAs in Dublin, Cork and Galway City Councils, see Appendix I):

- Ballincollig – Carrigaline, Co. Cork
- Cobh, Co. Cork

[6] Note that *only* tenancies registered with the RTB are considered to calculate the average.

- Cork City Council
- Dublin City Council
- Dun Laoghaire-Rathdown County Council
- Fingal County Council
- South Dublin County Council
- Galway City Council
- Galway City East
- Galway City West
- Celbridge-Leixlip, Co. Kildare
- Maynooth, Co. Kildare
- Naas, Co. Kildare
- Newbridge, Co. Kildare
- Ashbourne, Co. Meath
- Laytown-Bettystown, Co. Meath
- Ratoath, Co. Meath
- Bray, Co. Wicklow
- Greystones, Co Wicklow
- Wicklow, Co. Wicklow
- Drogheda, Co. Louth

CHAPTER 3

Review of developments at the LEA level

3.1 INTRODUCTION

To begin our formal analysis, we explore the trend in prices across different geographic areas using the actual published Rent Index data compiled by the ESRI for the RTB on a quarterly basis. The legislation allows for the designation of RPZs at LEA and LA level. Since the initial designation of the four Dublin LAs and Cork City Council as RPZs, subsequent classifications have taken place at the LEA level (see Appendix I for details). In this study, we undertake our assessment of price trends at the LEA level as this provides more granular insight into the area-specific trends in rental prices. There are a total of 137 LEAs in Ireland at present.

The practice of monitoring and analysing rental developments at an LEA level has only been in place since early 2017 when the ESRI and the RTB published rent indices for each LEA to be used in the RPZ classification evaluation. Lawless et al. (2018) published a new LEA-specific rental model, which has been adopted as the benchmark approach for the RTB/ESRI index. While the new model was introduced in 2017, with the data available, historical estimates for each LEA were produced covering the period 2008-2017. With these historical series for each LEA, it is possible to benchmark trends before and after the introduction of rent controls.

The objectives of this section are as follows: a) to review the data used in our assessment; b) to explore rental trends at a national level, and for specific regional areas that have received RPZ classification, before and after the introduction of the RPZ legislation; c) to test econometrically the magnitude of the change in rental inflation after the regulations were imposed at the LEA level.

3.2 DATA OVERVIEW AND SUMMARY STATISTICS

The data used for the assessment in this section are taken from the main ESRI/RTB Rent Index dataset, which is compiled on a quarterly basis by the ESRI. We use the most updated version available, which includes information on rental agreements up to Q3 of 2018. The calculations provide a standardised average rent level for each LEA per quarter. To calculate the standardised averages and the rent indices, a hedonic rent price model is used. This approach is based on the estimation of an econometric model, where reported rents are regressed on several control variables (i.e. number of bedrooms, property type, number of tenants, tenancy length).

The underlying granular micro data that form the inputs to the econometric analysis are taken from the RTB dataset of registered rental agreements across the Republic of Ireland. According to the 2004 Residential Tenancies Act, landlords are required to register rental agreements with the RTB. By law, they must fill in a form which requests information related to the level and frequency of rent, length of the tenancy, number of tenants, the location and characteristics of the property rented, as well as a number of other fields. The dataset relates to all new rental agreements and those agreements covered under part IV renewals.[7]

The means of key variables are provided in Table 1 for the period from Q3 2007 to Q3 2018. In the database, most tenancies are for two or three-bedroom properties (68 per cent) and nearly half are for apartments. The most frequent tenancy length is for 10-12 months. Almost half of the rental agreements included only one tenant, while a further 35 per cent of agreements included two tenants. This highlights the high demand for smaller units in the rental market. Finally, almost half of the rental agreements took place in Dublin County and the GDA.

TABLE 1 PROPERTY CHARACTERISTICS

	%
1 Bedroom	16.6
2 Bedrooms	36.9
3 Bedrooms	31.3
4 Bedrooms	12.8
5 + bedrooms	2.4
Apartment	44.0
Detached	10.2
Semi-detached	25.1
Terrace	14.2
Other property	6.4
Part house	1.4
1 Tenant	47.6
2 Tenants	35.5
3 Tenants	7.7
4+ Tenants	6.5
1-6 months tenancy	8.2
7-9 months tenancy	4.7
10-12 months tenancy	66.4
Over 1 year tenancy	20.7
Fortnightly rent	0.2
Monthly rent	86.9
Yearly rent	1.3
Quarterly rent	0.1
Co. Dublin	39.5
Greater Dublin Area	8.5
Rest of the country	52.0
No. of observations	1,085,124

[7] Part IV renewals are contract renewals for rental agreements over 4-6 years in length that are reregistered with the RTB.

These dwelling characteristics capture the mix of properties across time periods. The regression also includes the interaction of time (quarter) and controls for the effect of location (LEA), therefore capturing changes in the rental price of a constant quality-adjusted property.[8] The index is then calculated based on quarterly estimates of the LEA-specific rent level after taking out the effect of property characteristics. This approach relies on the assumption that the implicit price of characteristics remains constant over time. The methodology described generates a rent index (with base in Q4 2007) for each LEA. To estimate standardised rent levels in each LEA (i.e. rent levels that take into account the different composition of rental properties), we apply the growth rate generated by the model to an initial average value of rents in each LEA (these are compared to a national average rent from Q4 2007). Finally, we do not make any seasonal adjustment to rent levels. Seasonal patterns are noticeable in the data and any interpretation of the results should be cognisant of this. The statistics provided in the following tables and figures have been calculated using the full sample average annual growth at the LEA level.

More details of the specific estimation strategy, the analytical underpinnings and methodology are provided in Lawless et al. (2018) and also in the appendix to each quarterly RTB Rent Index report.[9]

To provide some detail across LEAs on the relative differences in the level of rents, the rate of price inflation, and the recovery relative to pre-crisis, we present three maps below. Figure 6 presents the standardised average rent in each LEA for Q3 2018, which is the latest available data from the RTB/ESRI index. While rents in rural areas remain well below €1,000 per month, urban centres such as Dublin, Cork and Galway, which contain most rental agreements, are well in excess of €1,000 per month. The LEAs with the highest rent levels nationally are located in South County Dublin (Stillorgan, Dundrum) where the standardised average new rent is in excess of €2,000 per month.

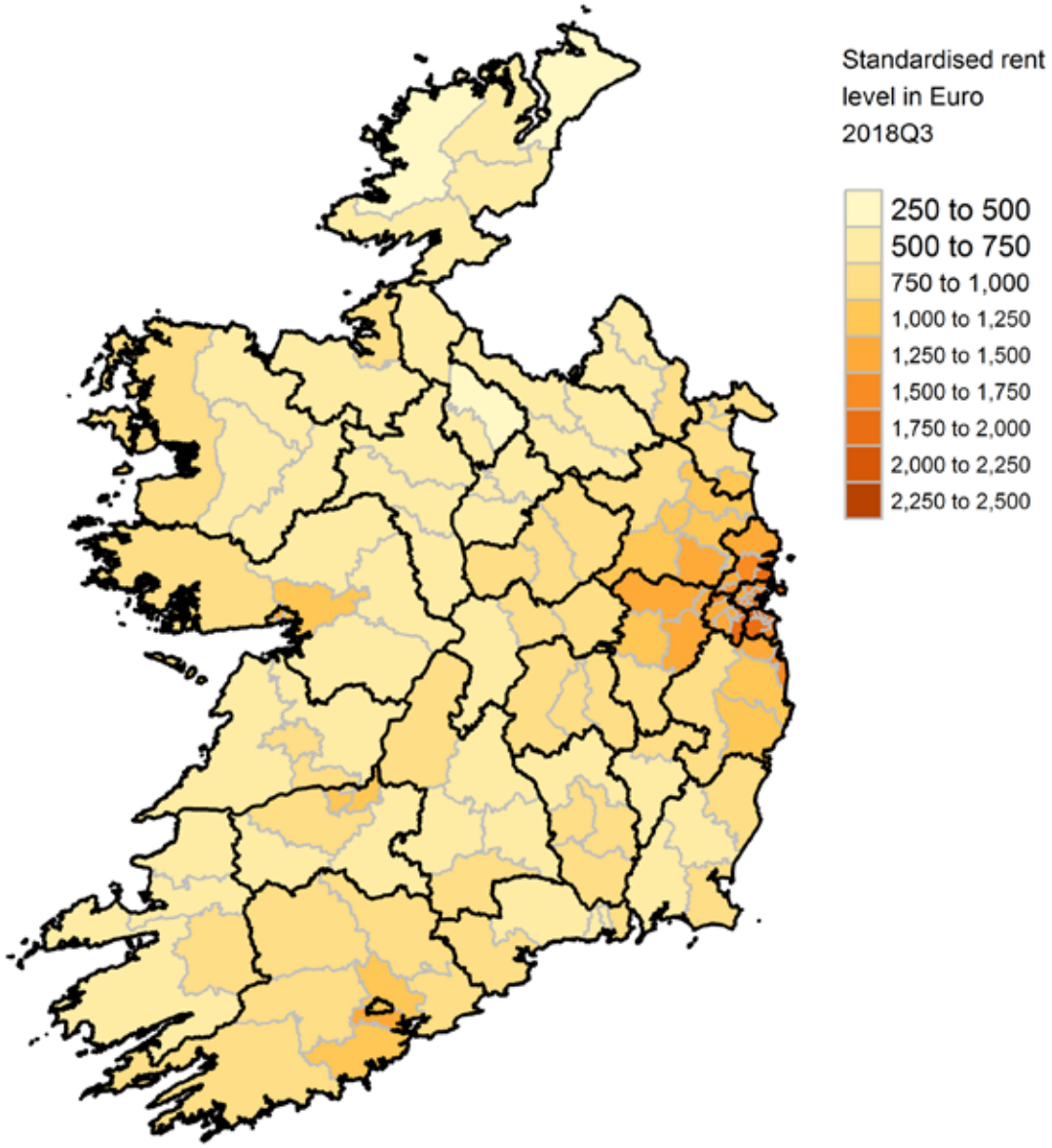
While the level of rents is highest in Dublin and the other urban centres, rental price inflation is dispersed at present. This is due to both the presence of rent controls in the urban areas as well as the relative strength of economic factors across regions. Figure 7 presents the year-on-year growth rate for Q3 2018 for each LEA. While most areas grew at between 0 and 10 per cent, some areas experienced substantially higher growth rates, while others registered price falls over the period.

[8] The latest regression estimates (including Q3 of 2018) are available in Appendix 1, Table 1 (RTB, 2018). We do not present the change in the characteristics over time due to space constraints. However, each quarter the Rent Index contains trends in the main characteristics in its market overview section. The main variables are very consistent over time.

[9] These can be found on https://onestopshop.rtb.ie/research/ar/

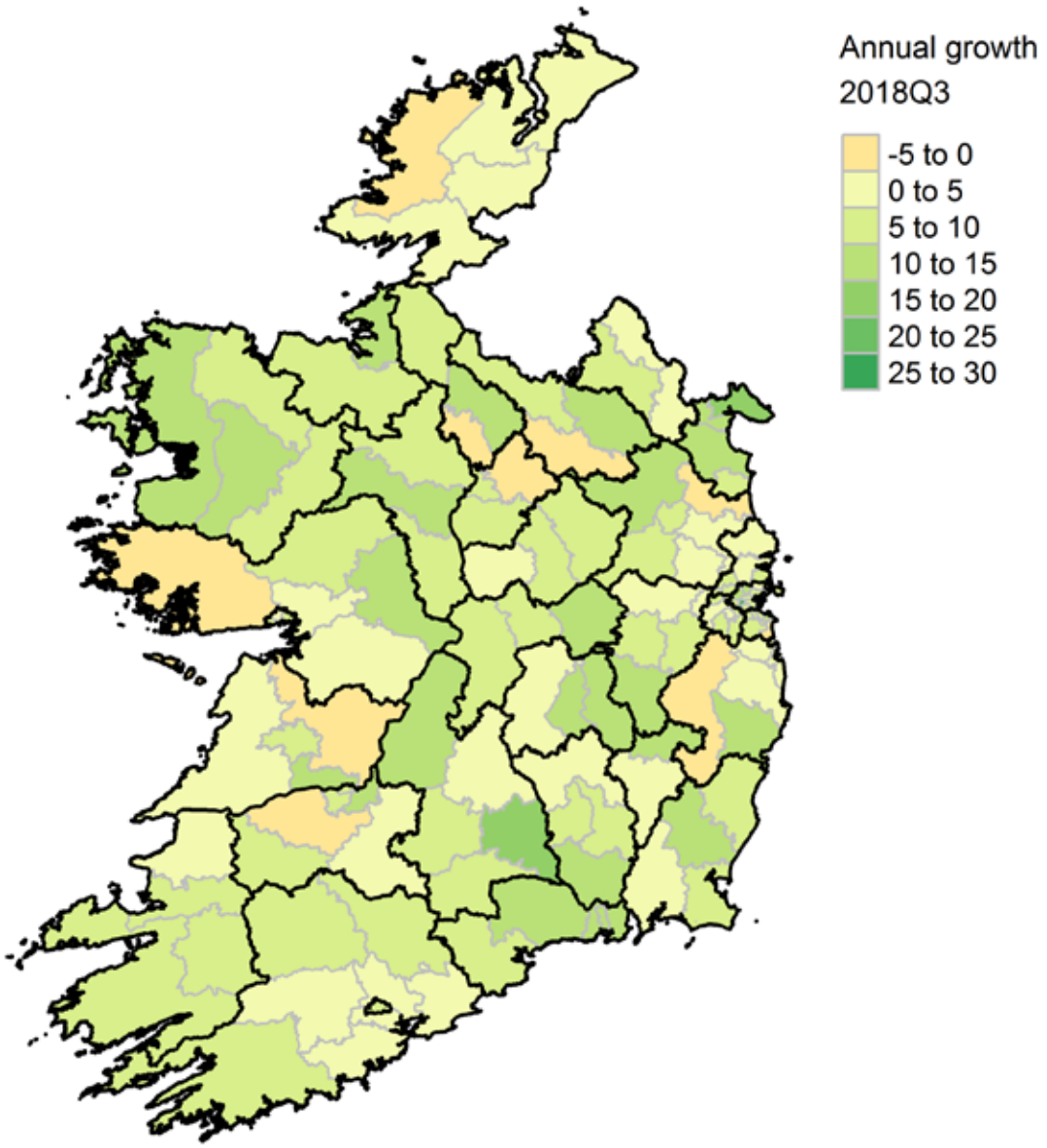
Finally, in Figure 8, we present the relationship between rents in Q3 2018 and Q3 2008 to show the extent to which rents have recovered back to peak since the financial crisis. It is clear that the rent in most of the country is now higher than it was just prior to the onset of the financial crisis.

FIGURE 6 LEVEL OF STANDARDISED RENTS BY LEA (€ PER MONTH)



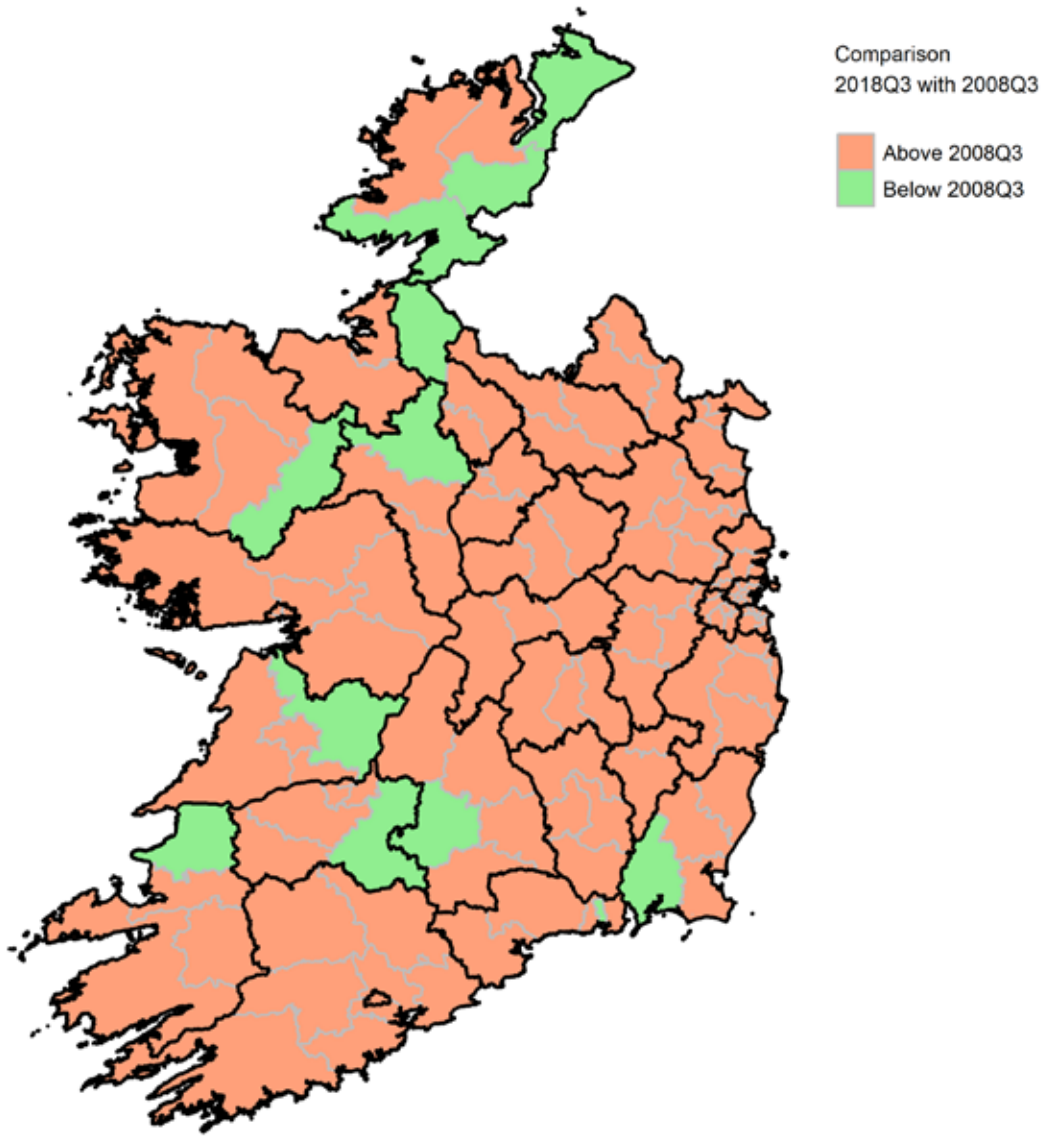
Source: RTB/ESRI Rent Index.

FIGURE 7 ANNUAL RENTAL PRICE INFLATION BY LEA Q3 2018



Source: RTB/ESRI Rent Index.

FIGURE 8 ANNUAL RENTAL PRICE INFLATION BY LEA Q3 2018



Source: RTB/ESRI Rent Index.

3.3 COMPARISON OF PRICE INFLATION BEFORE AND AFTER RPZ IMPLEMENTATION

We begin by undertaking a simple empirical exercise to assess whether price inflation changed after the introduction of the regulations. We focus on two time periods: *before* the policy, from Q2 2015 to Q4 2016; and *after* the policy, from Q1 2017 until Q3 2018. These two periods provide a symmetric time window (in terms of the number of quarters) around which to compare price developments. The symmetric time-window approach is similar to that used by the Central Bank of Ireland in its 2016 evaluation of the macroprudential borrower-based measures (see Kinghan et al., 2016). The selection of the time window would likely alter the results depending on the period selected. If shorter or longer horizons were included, we might see different findings. However, we employ this specific definition of 'before and after' period only for the purpose of this preliminary data analysis. We present results for alternative sample periods in the technical analysis of Section 3.5.

In this assessment, we compare the growth rate in areas classified as RPZs (treated LEAs) with areas not classified as RPZs (control LEAs) before and after the regulations. If the regulations have had a dampening effect on price growth, then we should see the difference between the growth rates in control and treatment areas increase after the policies have been introduced. This approach is the simplest form of a difference-in-difference method which compares the difference between two areas before and after the policies were introduced.

Tables 2 summarises the average annual growth of rents nationally before and after the RPZ policy was implemented (*Before* and *After* columns) for the 'control' (non-RPZ) LEAs and for 'treated' (RPZ) LEAs. The tables also provide the difference in average annual growth between the two periods (*Difference* column).

TABLE 2 NATIONAL COMPARISON OF ANNUAL RENT GROWTH

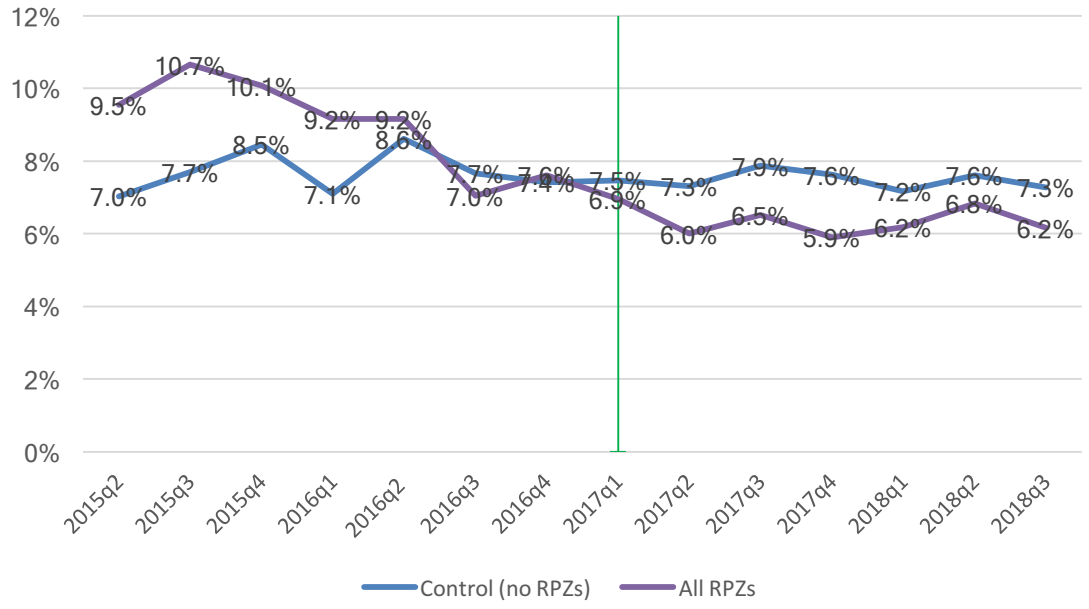
	Before	After	Difference	D-i-D
Control	7.71%	7.47%	-0.24 p.p.	
All treated RPZs	9.03%	6.36%	-2.67 p.p.	-2.43 p.p.

The average annual rent growth before and after the policy in the control LEAs is virtually the same, with only a 0.24 percentage-point decline. The fourth column of Table 1 provides the Difference-in-Difference (D-i-D, which is calculated as the difference between the differences in the before and after rent growth in the

control, i.e. non-RPZs, and treated groups, i.e. RPZs. It indicates that the reductions in rent growth have been larger in LEAs declared RPZs, with a -2.43 percentage-point difference-in-difference. This suggests that the trend in rental price growth in the period following the policy implementation was 2.43 percentage points lower in RPZ areas. While it is highly likely that the policy is a major contributory factor, it cannot be ruled out, using these simple summary statistics, that other confounding factors (such as diverging macro-economic or individual specific trends) could explain some of the difference after the policies.

Figure 9 displays the trends in annual rent growth for the past two and a half years, again for the control and for treated LEAs. Note that the rental price inflation declined in the treated areas well in advance of the introduction of the regulations. The falling price inflation appears to have begun around Q3 2015 and continued thereafter. The control areas did not experience such a rapid decline in the trend and the level of inflation was generally lower in these areas before the regulations. However, from Q2 2016 onwards, there does appear to be a common downward trend across both treatment and control. Following the regulations, there also appears to be a gap between the treated and control areas, with lower inflation in RPZ areas, which was lacking beforehand. It should be noted that a simple graphical representation like this does not control for unit or time effects and other economic shocks, which we adjust for in our econometric analysis.

FIGURE 9 OVERALL ANNUAL RENT GROWTH IN TREATED AND CONTROL LEAS



Source: Authors' calculations.

Note: Vertical line marks the earliest date of RPZ implementation. Different areas have been classified at different time points so the above chart is purely a simplification.

3.4 COUNTY COMPARISON OF PRICE INFLATION BEFORE AND AFTER RPZ IMPLEMENTATION

Given the differences in rental trends and economic conditions across Ireland, we provide a granular analysis of trends at the county level. In this comparison, we perform a calculation similar to Table 2 for each of the counties in which RPZs have been designated. As we require a comparison group, we can only do this for the counties in which there are both RPZ classified and unclassified LEAs. For this reason, this method is not feasible for Dublin, which was fully classified at the same point in time. We do, however, return to Dublin in our more detailed econometric evaluation.

To begin, we provide a simple visual comparison in map format of the change in rent inflation in each LEA before and after the introduction of the policies in the classified and non-classified areas (the difference between the growth rate before and after the policies for each LEA). The magnitude of the change is depicted by the size and darkness of the bubble in each LEA. A green colour depicts a decrease in rental inflation while a red colour depicts an increase. The areas classified as RPZs are depicted in blue, with different shades for the time of introduction (as indicated in the scale). The non-RPZ areas are in grey. For the policies to be effective, we would expect to see bubbles in RPZs tending towards large dark-green shapes, which corresponds to a reduction in rent inflation in the areas treated as RPZs after the introduction of the policies. We present visual maps for three areas: the Greater Dublin Area (GDA), which includes the counties Dublin, Wicklow, Louth, Kildare and Meath; Cork City and County, and Galway City and County.

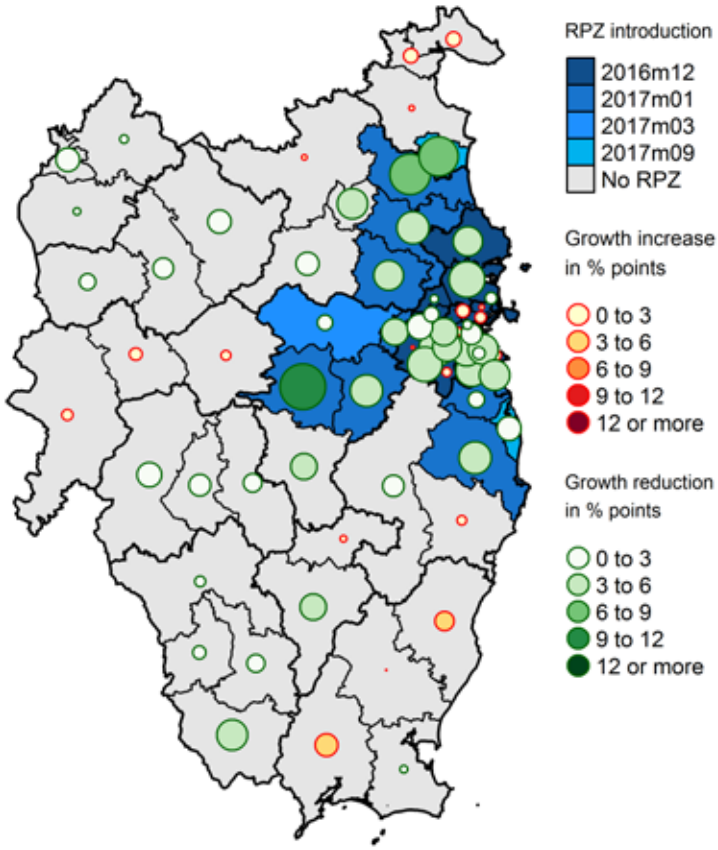
Table 3 provides details on the specific LEAs that are used in our classified and non-classified comparisons. These classifications are important as in what follows we compare the rental price trends in those LEAs in each county which has been classified with the unclassified LEAs.

TABLE 3 LEA CLASSIFICATION BY COUNTY

	RPZ LEAs	NON-RPZ LEAs
Co. Wicklow	Bray and Wicklow	Arklow and Baltinglass
Co. Kildare	Maynooth, Naas, Celbridge-Leixlip and Kildare-Newbridge	Athy
Co. Meath	Ratoath, Ashbourne and Laytown-Bettystown	Kells, Navan and Trim
Co. Louth	Drogheda	Ardee, Dundalk South and Dundalk Carlingford
Co. Galway	Galway city (West, Central and East)	Connemara, Tuam, Ballinasloe, Loughrea and Athenry-Oranmore
Co. Cork	Cork city (North Central, North East, North West, South Central, South East and South West), Cobh and Ballincollig-Carrigaline	Kanturk-Mallow, Fermoy, East Cork, Bandon-Kinsale, West Cork and Blarney-Macroom

Figure 10 presents the first map for the Greater Dublin Area (GDA), which includes RPZs in counties Dublin, Meath, Wicklow, Kildare and Louth. LEAs with RPZ designation show larger green bubbles than LEAs outside of the central Dublin area, which show lower rent growth reductions (small green bubbles) and even rent increased (red bubbles). This is suggestive evidence that the rate of inflation has fallen faster in these areas than in non-RPZ areas. Despite these general rent declines observed in RPZs, a number of areas in county Dublin show a small increase in growth rates of 0-3 percentage points, which is likely due to ongoing demand and demographic pressures.

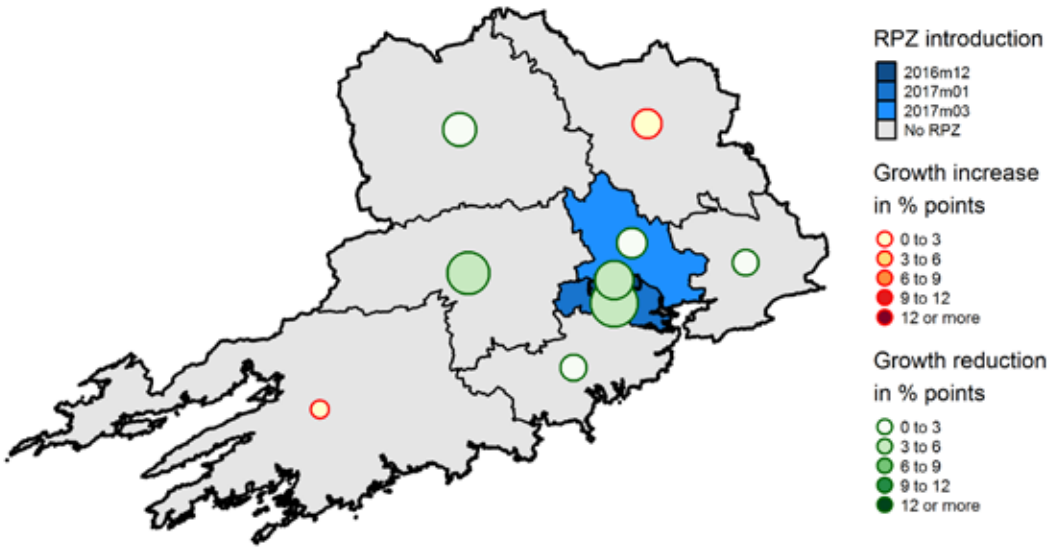
FIGURE 10 GREATER DUBLIN AREA MAP OF LEA GROWTH RATES BEFORE AND AFTER RPZS



Source: Authors' calculations.

Figure 11 provides a similar map for the LEAs in Cork city and county. Again, for the policies to be working, we would expect to see darker, larger green colours for those LEAs that are designated as RPZs. The map indicates rent growth reductions in RPZ areas in and around Cork city. However, the picture seems overall less clear in the case of county Cork, with some non-RPZ LEAs exhibiting rent growth reductions at a similar level. On the other hand, two of the non-RPZ LEAs experience an acceleration in rental price inflation.

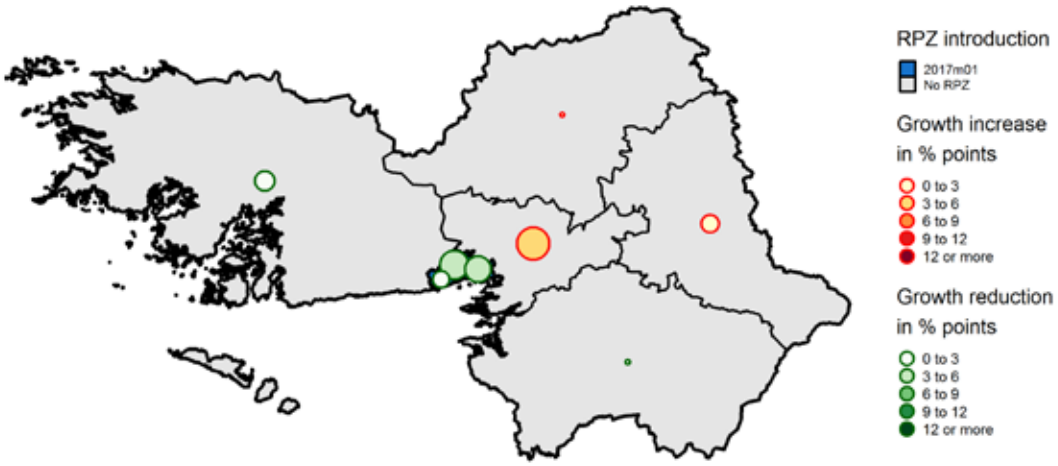
FIGURE 11 CORK MAP OF LEA GROWTH RATES BEFORE AND AFTER RPZS



Source: Authors' calculations.

The final visual map presented in Figure 12 covers the LEAs in Galway city and county. On inspection, it is clear that RPZ areas have experienced a reduction in the rate of inflation that is larger than in the non-RPZ areas. Indeed, three of the LEAs in county Galway have experienced an increase in the rental price growth rate.

FIGURE 12 GALWAY MAP OF LEA GROWTH RATES BEFORE AND AFTER RPZS



Source: Authors' calculations.

Taken together, these three maps provide visual evidence that the rate of inflation in the areas designated as rent pressure zones has fallen relative to those

unclassified LEAs. While this does not of course mean that the level of rents has fallen, it does provide tentative evidence that the inflationary pressures have eased.

To provide a more direct empirical estimate of the change in the rate of rental price inflation before and after the introduction of the measures in each county, we provide a similar comparison at the county level to that offered in Table 2. In Table 4, we compare control and treated LEAs in the counties that have both treated and untreated LEAs. (A full table including the pre and post RPZ implementation rent growth rates for all LEAs included in Table 4 can be found in Appendix II.)

Table 4 presents the following information. The figures presented in the columns labelled *Before* are the average annual growth rates across all the quarters from Q2 2015 until the period in which LEAs in this county became classified as RPZs. The figures in the *After* columns correspond to the time period from the date of declaration as RPZ until Q3 2018, which is the last quarter for which data is available. The *Control* areas are those LEAs not classified as RPZs, while the *Treated* are LEAs classified as RPZs. Three columns are of particular note: *Diff C* is the difference between the inflation rates before and after the introduction of RPZs for the undesignated LEAs whereas *Diff T* is the difference between the inflation rate before and after the introduction of RPZs for the designated LEAs. The column *D-i-D* is the difference between *Diff T* and *Diff C* (i.e. the difference in the rate of change between the treated and control areas).

TABLE 4 WITHIN-COUNTY COMPARISON OF ANNUAL RENT GROWTH

	Control (C)			Treated (T)			D-i-D
	Before	After	Diff C	Before	After	Diff T	(Diff T- Diff C)
Wicklow	8.42%	7.77%	-0.64 p.p.	7.83%	5.37%	-2.46 p.p.	-1.82 p.p.
Louth	10.42%	12.36%	1.94 p.p.	13.07%	7.30%	-5.77 p.p.	-7.71 p.p.
Kildare	12.22%	9.12%	-3.10 p.p.	9.60%	5.06%	-4.54 p.p.	-1.44 p.p.
Meath	11.51%	9.43%	-2.08 p.p.	11.86%	6.48%	-5.38 p.p.	-3.30 p.p.
GDA	10.60%	8.83%	-1.77 p.p.	9.75%	5.58%	-4.17 p.p.	-2.40 p.p.
Cork	8.09%	6.90%	-1.20 p.p.	9.91%	6.58%	-3.33 p.p.	-2.14 p.p.
Galway	8.07%	8.44%	0.37 p.p.	9.13%	5.31%	-3.83 p.p.	-4.20 p.p.

Note: Treated – LEAs in each county that have been declared RPZs; Control – LEAs in each county that have not been declared RPZs. GDA – Greater Dublin Area (includes Wicklow, Kildare and Meath).

A clear pattern emerges in these results. For LEAs in the control group, average annual rent growth was lower after the RPZs implementation except for Louth and Galway, where there was an increase of average annual rent growth of 1.9 and 0.4 percentage points respectively. Treated LEAs experienced more pronounced declines in average annual rent growths after the policy was implemented throughout all regions, particularly in Louth and Meath (5.8 and 5.4 percentage

points respectively). The declines were less pronounced in Cork, Kildare and Wicklow but still larger than for those areas without RPZ status. Focusing on the D-i-D figures, it is clear that the RPZ rent inflation was much lower than in the non-RPZ areas; these differences ranged between 1.4 percentage points in Kildare and 7.7 percentage points in Louth. In relation to the effect of the rent control policies, these figures would suggest that the measures have had a dampening effect on the inflation rate, which varies across counties and is in the order of 1.5 to 7.7 percentage points.

A series of figures displaying a detailed overview of the trends in annual rent growth for the treated and control LEAs in the counties included in the GDA, Louth, Galway and Cork are provided in Appendix II.

3.5 LEA-LEVEL ANALYSIS ECONOMETRIC ANALYSIS

While the D-i-D approach in Tables 2 and 4 provides valuable insights into the impact of RPZs, they only provide simple measures and do not give any insight into the statistical accuracy or significance of the changes.

In this section, we present econometric estimation strategies to validate the robustness of the findings. To this end, we evaluate change in rent inflation following the introduction of the RPZ regulation, through econometric panel data models. In a sense, these estimation techniques undertake a statistical version of the comparisons provided above. We undertake the assessment first at a national level and then provide a regional breakdown.

National econometric estimates

For these assessments, as above with the summary measures, we use the published LEA-level quarter-by-quarter data that are produced as part of the ESRI/RTB Rent Index. The data inputs used are taken from the latest quarter Q3 2018.

Our baseline econometric model is as follows:

$$growth_{i,t} = \delta . RPZ_{i,t} + \mu_i + \gamma_t + \epsilon_{i,t}, \qquad \text{(i)}$$

where $growth_{i,t}$ is the annual percentage change in the RTB Rent Index in LEA i and quarter t. $RPZ_{i,t}$ is a binary indicator which is set to 1 if the RPZ regulation is effective in LEA i at time t, and zero otherwise. μ_i accounts for different rent levels across LEAs (LEA-level fixed effects) and γ_t controls for temporal unobserved shocks (time fixed effects).

Our primary interest is in estimating the parameter δ, which measures the percentage-point effect of designating LEA i as an RPZ on annualised rental inflation. The baseline results are shown in Table 5. Four separate estimates are provided in the table. In column (1), we estimate model (i) on the sample period Q2 2015-2018. In column (2), we broaden the sample to the full period for which we have data available, Q4 2008-Q3 2018. This longer sample provides a robustness check against any sample selection effects that might occur by our choice of the fixed time window. In the longer time-period estimations, we include a lag of the dependent variable in the specifications to capture market dynamics.

One potential issue with estimations using LEA-level data is that they treat each LEA equally regardless of how many tenancies were registered in each LEA. Thus, LEAs with an above-average number of tenancies are underrepresented, which is likely to affect the magnitude of the estimated effect of the scheme. To address this concern, columns (3) and (4) use the share of tenancies in each LEA as weights in the regression and re-estimate the models.

TABLE 5 RPZ EFFECT IN IRELAND USING LEA-LEVEL DATA

	(1)	(2)	(3)	(4)
RPZ	-0.0262***	-0.0270***	-0.0236**	-0.0283***
	(0.00484)	(0.00291)	(0.00738)	(0.00521)
Lag		0.201***		0.221***
		(0.0225)		(0.0316)
N	1838	5211	1838	5211
LEAs	135	135	135	135
Sample	All	All	All	All
Period	2015Q2-2018Q3	2008Q4-2018Q3	2015Q2-2018Q3	2008Q4-2018Q3
Weights	--	--	Tenancies	Tenancies

Standard errors in parentheses are robust to heteroskedasticity and within-LEA dependence.
$^{\cdot}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Model (1) indicates that the RPZ designation is associated with a 2.6 percentage points (ppts) reduction in rent growth. The effect is significant at the 0.1 per cent level. The point estimate is close to the estimate of 2.4ppts from the pure D-i-D approach (see Table 2). Model (1) restricts the sample to the period 2015Q2 to 2018Q3 in order to ensure that the time frame before and after the introduction of the RPZ regulation is approximately the same (i.e. 7 quarters). As noted above, Model (2) widens the time frame to include all available data going back to 2008Q4. Extending the sample period also allows us to add lagged growth to capture serial dependence in rental growth over time.[10] The point estimate is slightly higher in absolute terms at -2.7ppts. The coefficient estimate on lagged growth is around

[10] As is well known, the inclusion of a lagged dependent variable in a fixed-effects model introduces a bias (Nickell Bias), which only vanishes as the time dimension in the data becomes large. In our case, the time dimension is reasonably large (T=39), so that we can assume that the bias is negligible. We have also considered a bias-correction procedure due to Everaert and Pozzi (2007), which yielded almost identical results.

0.2, suggesting a moderate persistence in rent growth over time. Model (1) and (2) apply equal weights to all LEAs. However, since the size of the rental market is not equal across LEAs, we weight LEAs with the number of tenancy agreements in Model (3) and (4). With coefficient estimates of 2.4 and 2.8ppts, the results of Model (1) and (2) are confirmed.

Robustness checks[11]

Theoretically, the deployment of these models to estimate a causal effect of a policy requires that no differential idiosyncratic or macro-economic shocks are present that separately affect the treatment or control groups. Indeed, on the macro-economic shocks, Figure 9 suggests that the slowing of the trend in the RPZ areas happened earlier than in the control areas, which may be due to differences in economic fundamentals.

The differential macro-economic patterns suggest that the estimate of the RPZ effect could be distorted by LEA-specific shocks that are correlated with the treatment assignment. Unfortunately, macro-economic variables are not available at the LEA level. As a second-best approach, we include disposable income (excluding rents) and the unemployment rate on the county level, which we have available going back to 2010. In this way we attempt to capture some of the confounding factors that could induce a bias to the impact assessment. The results are shown in Table 6. Model (1) and (3), which use the 2015Q2-2018Q3 time period, yield similar results. Model (2) and (4), which are based on data going back to 2010, suggest larger effects, at around 4 percentage points.

TABLE 6 RPZ EFFECT IN IRELAND USING LEA-LEVEL DATA

	(1)	(2)	(3)	(4)
RPZ	-0.0240***	-0.0395***	-0.0235**	-0.0407***
	(0.00543)	(0.00354)	(0.00860)	(0.00590)
Unemp. rate	-0.350	-0.283·	0.0161	-0.624**
(in %)	(0.332)	(0.162)	(0.471)	(0.216)
Log of income	-1.273	0.0264	0.544	0.163
	(0.879)	(0.0402)	(1.491)	(0.0992)
N	1838	4575	1838	4575
LEAs	135	135	135	135
Period	2015Q2-2018Q3	2010Q1-2018Q3	2015Q2-2018Q3	2010Q1-2018Q3
Weights	--	--	Tenancies	Tenancies

Standard errors in parentheses are robust to heteroskedasticity and arbitrary within-LEA dependence.
· p < 0.10, * p < 0.05, ** p < 0.01, *** p < 0.001

[11] We thank two anonymous reviewers for suggesting the inclusion of the material in this section and providing the contextual information.

We have also undertaken one further robustness check, which limits the regression window to the period Q1 2016 to Q4 2017 to test whether the selection of the time periods influences our findings. This should also stress-test the common trends assumption. Using Figure 9, it appears that a more consistent trend across treated and control areas was evident from early 2016 onwards. We still find a statistically significant effect in the magnitude of 2 percentage points, which is in line with our baseline estimates (these results are available on request from the authors).

Furthermore, we are aware that treatment assignment is not random due to the nature of the RPZ designation process. The aim of this study is to explore whether, conditional on RPZ designation and controlling for other common time and unit effects, the rental price regulation is associated with a drop in rent price inflation. The precise point estimate that we estimate may still be affected by confounding factors (as described above) that are unrelated to the policy or directly related to the assignment rules.

Regional econometric estimates

Table 5 provides estimates for the RPZ effect for Ireland as a whole. Yet the impact is likely to vary across regions, as we clearly demonstrated in Table 4. For example, since the same 4 per cent threshold applies to all RPZs, the RPZ impact is expected to be larger for LEAs that exhibited higher pre-RPZ growth. To get a local insight into the effect of the RPZs at the regional level, we calculate region-specific estimates of the RPZ effect by interacting regional indicators with the RPZ dummy (see Table 7). As in the national-level estimations of Table 5, we present results with and without LEA weights, and for the short and long time frame.

TABLE 7 RPZ EFFECT AT THE LEA LEVEL

	(1)	(2)	(3)	(4)
Lag		0.201***		0.220***
		(0.0225)		(0.0317)
GDA	-0.0227***	-0.0272***	-0.0186**	-0.0269***
	(0.00525)	(0.00321)	(0.00711)	(0.00511)
Cork	-0.0331**	-0.0231***	-0.0287	-0.0238*
	(0.0109)	(0.00512)	(0.0191)	(0.0109)
Galway	-0.0360***	-0.0352***	-0.0560***	-0.0507***
	(0.00881)	(0.00570)	(0.0129)	(0.00750)
Louth	-0.0673***	-0.0284***	-0.0716***	-0.0329***
	(0.00299)	(0.00238)	(0.00485)	(0.00400)
N	1838	5211	1838	5211
LEAs	135	135	135	135
Period	2015Q2-2018Q3	2008Q4-2018Q3	2015Q2-2018Q3	2008Q4-2018Q3
Weights	--	--	Tenancies	Tenancies

Standard errors in parentheses are robust to heteroskedasticity and arbitrary within-LEA dependence.
$^{\cdot}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As in the D-i-D analysis in Table 4, the RPZ impact is largest for Galway and Louth, with coefficient estimates of 5.6ppts and 7.2ppts in Model (3), which uses the short time-frame and tenancy weights. When comparing Cork to the GDA, the Cork effect seems larger when the short sample is considered, but smaller in comparison when we use the long time frame. Note that the point estimate for Cork in Model (3) is not significant at the 5 per cent level. However, we conclude that, based on the econometric panel analysis in this sub-section, that overall there is strong evidence that the introduction of the RPZ legislation is associated with a reduction in rent growth by above 2ppts across the regions considered. The findings of this econometric assessment are generally in line with the summary statistics presented in Table 4. Both approaches provide clear evidence of a slowdown in rental inflation after the introduction of the policies.

3.6 FOCUS ON DUBLIN

In the previous regional analysis, it was not feasible to obtain a valid estimate for county Dublin. Since all LEAs in Dublin were designated as RPZs at the same point in time, there is no Dublin-specific natural comparison group available that was not exposed to the RPZ regulation. For example, in other counties some LEAs were classified as RPZs and some were not, allowing a natural experiment that could be evaluated between these LEA groups.

Given the size and importance of the Dublin rental market in Ireland, we follow an alternative approach that identifies the effect on LEAs in Dublin by applying a before-after approach, comparing Dublin LEAs before and after the introduction of the RPZ instead of relying on a control group. Specifically, we consider the model:

$$growth_{i,t} = \alpha_i + \lambda_1 . growth_{i,t-1} + \delta . RPZ_{i,t} + \theta_{1i} t + \theta_{2i} t^2 + \beta . crisis_t + \epsilon_{i,t}, \quad \text{(ii)}$$

which is applied to all LEAs in the treatment group. In contrast to the previous panel model, we include LEA-specific time trends ($\theta_{1i} t$) and a squared trend ($\theta_{2i} t^2$) instead of overall time-specific effects (γ_t). This modification is required to guarantee identification of the RPZ effect in the above model. The regression model also includes a temporal lag to account for persistence in rent growth, and we add a crisis dummy, set to 1, for observations before 2013 to take account of the generally lower rent growth level during the housing market crisis. We therefore estimate the difference between inflation in Dublin in the period 2013–2016 to the period after the regulations have been introduced. We also include unemployment and disposable income as control variables.

TABLE 8 RPZ EFFECT ON DUBLIN

	(1)	(2)	(3)	(4)
RPZ	-0.0284***	-0.0361***	-0.0296***	-0.0222
	(0.00615)	(0.00736)	(0.00684)	(0.0153)
1st lag	0.178***	0.120**	0.204***	0.263***
	(0.0360)	(0.0395)	(0.0336)	(0.0597)
Crisis	-0.00272	-0.000429	-0.00662.	-0.0219*
	(0.00409)	(0.00410)	(0.00399)	(0.00966)
Unempl. Rate	-0.444.	-0.818.	-0.370	-0.181
	(0.256)	(0.462)	(0.416)	(0.877)
Log of income	-0.239*	-0.658***	-0.329***	0.0633
	(0.0957)	(0.0794)	(0.0689)	(0.115)
N	1678	910	1260	350
LEA	48	26	36	10
Period	2010Q1-2018Q3	2010Q1-2018Q3	2010Q1-2018Q3	2010Q1-2018Q3
Region	All	Dublin	GDA	GDA ex Dublin

Standard errors in parentheses. Due to the smaller number of LEAs, standard errors are only robust to within-LEA dependence in Model (1). Standard errors in (2)-(4) are robust to heteroscedasticity.
. $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Estimation results for Dublin are shown in Table 8 along with results for all Ireland, GDA, and GDA excluding Dublin, for comparison. Since we are exploiting the over-time variation of rent growth changes and in order to ensure comparability with the model for Dublin, we restrict the sample to LEAs that are designated as RPZs in all estimations.

The point estimate for Dublin suggests that the RPZ designation is associated with a 3.6 percentage point drop in rent growth. For comparison, the overall Ireland and GDA effect are 2.8 to 2.9ppts. Despite the use of a different estimation strategy, we arrive at point estimates that are in line with Tables 5 and 6. The last column shows that the effect for the GDA excluding Dublin is 2.2ppts, yet insignificant. However, the last model is based on a smaller sample size, with only 350 observations.

CHAPTER 4

Granular micro-level analysis of rental trends

4.1 INTRODUCTION

To this point, our analyses have attempted to provide an understanding of the change in the rate of rental price inflation after the introduction of the RPZ legislation. Our findings clearly indicate that the regulations have had a dampening effect on price inflation in the areas that have been designated, and the overall effect is in the region of 2.7 per cent. On the other hand, it is also clear that the growth rates have not converged fully to 4 per cent, which is the regulatory limit allowable under the legislation. Any full convergence is unlikely to happen on an aggregate LEA basis as new supply (properties without a rental history in the past 24 months) as well as substantially renovated properties are exempt from the regulations. This suggests that, to account for these specificities, an assessment of the impact of these regulations should be undertaken at the property level.

To explore these considerations in more detail, in this section we use the granular micro-data available from the RTB to create a property-level assessment. To this end, we develop a sample of properties for which we observe the rental history over time. While the current data do not provide any insight into whether the property is strictly new supply or applying a substantial renovation exemption, the analysis in this section should provide a cleaner estimate of the impact of the regulations at the property level. The aims of this section are twofold: first, we provide a property-level estimate of the impact of the RPZ scheme on rental price inflation; second, we explore the extent to which, following the introduction of the legislation, rental price increases converged to the 4 per cent cap.

4.2 PROPERTY-LEVEL ANALYSIS

Data overview and background

The previous analysis examined the effect of the RPZ designation on rent growth at an aggregate level using average rental price growth per LEA. In this section, we investigate rent prices at the property level in order to achieve a more granular analysis. This is not trivial, since the RTB database does not include a property identifier, which would allow matching multiple observations (i.e. tenancy agreements) to one property and calculate property-specific rent changes over time. The Eircode is the closest approximation to a property identifier, but does not distinguish between properties that share the same Eircode (e.g. apartments in the same building complex).

We combine Eircodes with information from the address field to match observations to properties. By matching character strings from the address field, we have been able to identify 201,500 distinct properties that appear more than once. These properties are associated with 614,004 tenancy agreements, which in turn yield 396,251 property-specific growth rates.[12] The address-matching methodology is explained in detail in Appendix III. Table 9 provides an overview of the number of observations, the number of properties and the resulting number of property-level growth rates. The degree to which Eircodes are missing from the data points to a data gap that should be filled in future.

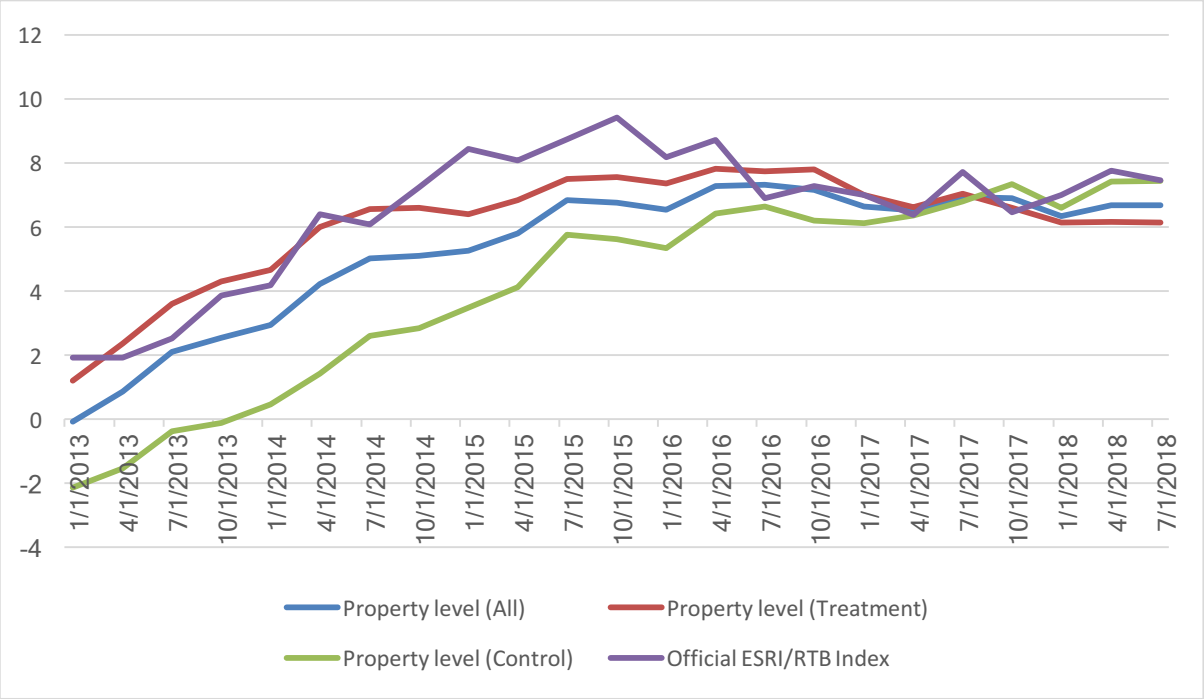
TABLE 9 OVERVIEW OF THE PROPERTY-LEVEL DATABASE

Observations (tenancy agreements)	1,085,124
Observations with valid Eircodes	852,247
Distinct Eircodes	319,079
Observations of Eircodes that appear more than once ('repeated Eircodes')	745,820
Distinct repeated Eircodes	212,652
Estimated number of properties	301,719
Observations of properties that appear more than once ('repeated properties')	614,004
Distinct repeated properties	201,500
Valid growth rates associated with repeated properties	396,251
Valid growth rates in RPZ with time gap less than or equal 24 months	13,291
Valid growth rates in RPZ above 4% with time gap less than or equal 24 months	6,671

Figure 13 compares the average rent growth from the property-level dataset and the growth rates from the RTB Rent Index. Figure 13 also shows the sample of LEAs that have been designated as RPZs (treatment group) and for the sample of LEAs that have never been designated (control group). Both groups exhibit accelerating growth until the end of 2016. The treatment group shows generally higher growth rates, although the gap between the groups appears to narrow over time. Following the RPZ introduction, average growth rate in the treatment group slowed down, and non-RPZ LEAs ultimately surpassed RPZ LEAs in mid-2017, suggesting that the RPZ reduced growth in rental prices.

[12] We have discarded the 1% of the smallest and largest growth rates to avoid the results being distorted by outliers.

FIGURE 13 HISTORIC TREND OF ANNUAL RENT GROWTH IN CONTROL AND TREATED LEAS



Source: Authors' calculations

Since a number of observations had to be dropped when constructing the property-level dataset, there may be concerns that the data omission induces a selection bias, and about the representativeness of the property-level dataset. To rule out this concern, we present summary statistics of the total sample and the reduced sample, which is used to calculate property-level growth rates, in Appendix III, Table A3-4. Since there are not substantial variations between the two datasets, we conclude that the property-level dataset is representative.

National property-level estimates

For a formal analysis, we proceed similarly to the regression analysis in the previous section. The regression model is given by:

$$growth_{ijmt} = \delta . RPZ_{jmt} + \mu_j + \theta_m + \gamma_t + \epsilon_{ijt}, \qquad \text{(iii)}$$

where the subscript i and j denote that property i is located in LEA j. We control for LEA effects (μ_j), year effects (γ_t) and month effects (θ_m) where t and m are the year and month index, respectively. The nature of the data, unfortunately, does not allow us to control for past rent growth. Since the size of rent growth tends to depend on the time gap between the changes in a non-linear way, we also add the time gap, the squared time gap and the logarithm of the time gap between observed rent increase and reference period. As in the LEA-level analysis, we consider a short and long time frame, starting in 2015m4 and 2010m1, respectively.

TABLE 10 REGRESSION ESTIMATES AT THE PROPERTY LEVEL

	(1)	(2)	(3)	(4)
RPZ	-0.0256***	-0.0197***	-0.0429***	-0.0292***
	(0.00236)	(0.00199)	(0.00493)	(0.00498)
N	362424	149892	169718	52298
From	2010m01	2015m04	2010m01	2015m04
To	2018m09	2018m09	2018m09	2018m09
Sample	All	All	<=24month	<=24month

Standard errors in parentheses
$^{.}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$

Model (1) and (2) in Table 10 confirm the results from the LEA-level analysis. The point estimates of 2.6ppts and 2.0ppts suggest that the rent inflation-reducing effect of RPZ is, as in Table 5, around or above 2ppts.

Recall that landlords are allowed to increase the rent beyond the 4 per cent per year threshold if the property is vacant for more than two years. Since we do not know from the data whether the property was partially vacant between the two observed tenancy agreements used for calculating growth rates, we restrict the sample to growth rates with a time gap of less than 24 months in Model (3) and (4). The point estimates are larger in absolute magnitude, especially for the extended time frame in Model (3). Focusing on models (2) and (4), the restriction of the sample to those properties with two consecutive observations within a 24-month period (to attempt to account for the rent history restriction), increases the impact of the scheme by approximately 1 percentage point. This finding is intuitive as the sample should be more closely associated with those properties to which the regulations apply.

An important comparison is between the estimate in column (4) in Table 10 and column (1) in Table 5. These would be baseline findings for the period Q2 2015-Q3 2018 for the LEA and property-level models. The findings from both of these analyses suggest a reduction in inflation following the regulations in the order of 2.6-2.9 percentage points.

Regional property-level estimates

As in the LEA-level analysis, we attempt to gain insights into regional variation of the RPZ impact. In Table 11, we re-estimate the models of Table 10, but use regional RPZ interaction effects. Model (3) and (4) yield generally higher coefficient estimates (in absolute terms) relative to Model (1) and (2). The RPZ effect is highly significant in all specifications and for all regions except for Louth in Model (1) and Cork in Model (4). While there is some variation in the coefficient estimates, we conclude that the impact appears largest for Galway and Louth, whereas it is

somewhat smaller for Cork. These findings are similar to the results from our LEA-level assessment.

TABLE 11 REGIONAL REGRESSION ESTIMATES AT THE PROPERTY LEVEL

	(1)	(2)	(3)	(4)
GDA	-0.0265***	-0.0204***	-0.0460***	-0.0301***
	(0.00260)	(0.00201)	(0.00508)	(0.00475)
Cork	-0.0187***	-0.0157**	-0.0256**	-0.0242.
	(0.00361)	(0.00532)	(0.00925)	(0.0133)
Galway	-0.0321***	-0.0187***	-0.0488***	-0.0261**
	(0.00420)	(0.00244)	(0.00542)	(0.00828)
Louth	-0.00160	-0.0200***	-0.0164***	-0.0537***
	(0.00154)	(0.00142)	(0.00348)	(0.00338)
N	362424	149892	169718	52298
From	2010m01	2015m04	2010m01	2015m04
To	2018m09	2018m09	2018m09	2018m09
Sample	All	All	<=24month	<=24month

Standard errors in parentheses
. $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

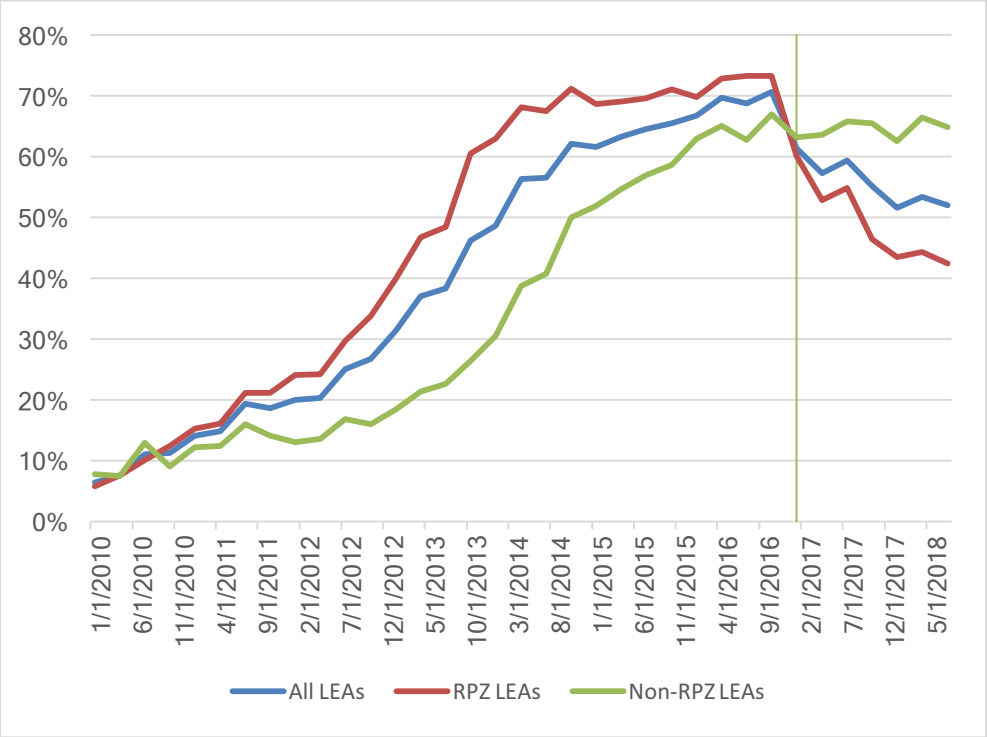
4.3 EXPLORING GROWTH RATES AROUND THE 4 PER CENT CAP

The RPZ regulation limits annualised rent increases to 4 per cent but allows a number of specific exemptions from the regulations, as discussed previously. The property-level dataset, which we have obtained using address-matching, allows us to calculate the share of tenancy agreements that correspond to more than 4 per cent annual rent growth. This allows us to provide insights into how many agreements are transacting in and around the regulatory limit. It must be noted that our growth rates in the property-level database are based on a compound annualised rate in order to make rent increases over different time periods comparable.

Summary statistics

Figure 14 displays the share of tenancy agreements with a more than 4 per cent annualised rent growth relative to the previous tenancy agreement. The three graphs correspond to the national average, control and treatment LEAs. The overall share rose from below 10 per cent during the Irish housing crisis to around 70 per cent at the end of 2016. In particular, treatment LEAs exhibited a share of around 70 per cent throughout 2015 and 2016. The share in the control group increased from 52 per cent in the first quarter of 2015 to 67 per cent in the last quarter of 2016. These figures demonstrate the high level of inflationary pressures in the private rental sector in Ireland.

FIGURE 14 SHARE OF TENANCY AGREEMENTS WITH GROWTH RATES ABOVE 4 PER CENT



Source: Authors' calculations.
Note: Vertical line marks the earliest date of RPZ implementation.

With the introduction of RPZ at the end of 2016, the ratio of above-threshold growth rates dropped sharply for the treatment group, from 73.2 per cent in Q4 2016 to 42.5 per cent in Q3 2018. In contrast, the share in the control group remains at a similar level throughout 2017 and 2018. The graphical comparison of treatment and control provides strong evidence that the RPZ reduced the number of tenancy agreements with annualised growth rates exceeding 4 per cent. We present the same graphs for Cork, GDA, Louth and Galway in Figures A4-1 to A4-4 in Appendix IV, which show a similar pattern.

Econometric estimates

In Table 12, we consider a probit model to estimate the impact of RPZs on the probability that the annualised rent growth for a property is above 4 per cent. All estimations control for LEA, year and months effects (analogous to the linear model in equation (iii)).

The average marginal effect is -0.242 and -0.226, implying that the RPZ reduced the probability of exceeding the 4 per cent threshold by 24 and 22.6 percentage points on average when the long and short time frames are considered, respectively. Table 13 estimates separate effects for different regions, and confirms significant effects across Ireland, with point estimates ranging from 14.3 to 26.6 percentage points.

TABLE 12 SHARE OF TENANCY AGREEMENTS WITH GROWTH RATES ABOVE 4 PER CENT

	(1)	(2)
RPZ	-0.242***	-0.226***
	(0.00560)	(0.00800)
N	169721	52297
	2010q1	2015q2
	2018q3	2018q3

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

TABLE 13 SHARE OF TENANCY AGREEMENTS WITH GROWTH RATES ABOVE 4 PER CENT – REGIONAL INTERACTION EFFECTS

	(1)	(2)
GDA	-0.266***	-0.233***
	(0.00599)	(0.00865)
Cork	-0.188***	-0.251***
	(0.0104)	(0.0155)
Galway	-0.157***	-0.143***
	(0.0123)	(0.0176)
Louth	-0.161***	-0.263***
	(0.0363)	(0.0491)
N	169721	52297
From	2010m01	2015m04
To	2018m09	2018m09

Standard errors in parentheses
* p < 0.05, ** p < 0.01, *** p < 0.001

It is striking that the ratio of above 4 per cent annualised growth rates remains at a high level across Ireland even after the introduction of the RPZs. Since the RTB database does not include information on renovations that may have been carried out, we cannot assess to what extent the rent increases comply with the regulation. However, there is a concern that the effectiveness of RPZs in reducing rent inflation is undermined by a high share of tenancy agreements that are not in accordance with the 4 per cent cap, either due to non-compliance or for other reasons. Of critical importance for the monitoring and compliance of the scheme in future would be the collation of sufficient information on all tenancies to assess compliance and functionality of the scheme, given the exemptions that are currently in place.

CHAPTER 5

Conclusions and policy implications

The aim of this study has been to explore the change in rental price inflation after the introduction of the RPZ regulations by comparing areas designated as RPZs to undesignated areas, using data from the ESRI/RTB quarterly Rent Index. This assessment is undertaken on a national basis as well as providing an assessment across regions. We consider two strategies for the analysis: first, we focus on the LEA level using the ESRI/RTB Rent Index; secondly, we undertake a more granular assessment using a matched property sample that we compiled from the RTB database for the purpose of this report.

A number of clear findings emerge. Rental inflation in areas classified as Rent Pressure Zones (RPZs) has moderated by between 2.4 and 3 percentage points depending on the empirical approach and data used. Differences exist across counties in terms of the change in the inflation rate, with a wide range – from 1.8 percentage points in the GDA to approximately 7 percentage points in Louth. Such differences naturally reflect the rate of rent inflation prior to the RPZ designation as well as region-specific property market conditions (including potentially the proportion of exempted tenancies and compliance rates). These findings hold at both the LEA and property level.

Finally, we explore the extent to which growth rates at a property level have converged to the 4 per cent regulatory limit allowable under the legislation. Any full convergence is unlikely to happen on an aggregate LEA basis, as new supply (properties without a rental history in the past 24 months) as well as substantially renovated properties are exempt from the regulations. Using a sample of matched properties, we find that the share of properties whose annualised rental increase was greater than 4 per cent dropped from 73.2 per cent in Q4 2016 to 42.5 per cent in Q3 2018 in RPZ areas. From our econometric assessment, the likelihood of a tenant receiving an increase above 4 per cent fell by approximately 23 percentage points after the introduction of the legislation. This suggests that two-in-five of those tenants who have reregistered a tenancy still face rates of increase above 4 per cent. However, with the data available, it is not possible to determine whether this is due to non-compliance with the scheme or valid exemptions such as substantial renovations. Given the data only cover properties that have been reregistered with the RTB, data is limited relative to all tenancies active in the market.

Some clear implications for the ongoing monitoring and evaluation of these

policies arise from this study. While the introduction of the scheme has been associated with a material reduction in the rental inflation rate, the non-convergence towards 4 per cent in the subsequent period has led to questions around the functionality of the measures. Our assessment would suggest that data gaps exist which do not allow us to disentangle the full effect of the scheme on the properties to which the regulations apply, and to make any assessment around compliance. To fully evaluate the effect of the scheme, data on all new tenancy agreements, changes to agreements (rent changes in particular) and tenancy terminations should be collated on an ongoing basis to build a full picture of the rental market. Tenancy agreements should be linked to properties, which should receive a unique identifier in order to build up a rental history over time. This would allow new supply to be accurately measured and tenancy agreements to be matched with property characteristics. The database should also ensure that data on substantial renovations are collected so as to assess compliance with the regulation. If possible, the BER rating should be collected over time for each property, to assess the level of energy efficiency. Changes in BERs would provide a way of measuring investments in energy efficiency. Where feasible with regard to operational or data protection considerations, two-way data-sharing with other agencies, including the CSO and Revenue Commissioners, may improve the quality of information available to the RTB to assess activity in the sector. The recent announcement of an annual registration of all tenancies as part of the Residential Tenancies Amendment Act 2018 may provide an avenue to bridge data gaps.

A number of caveats must also be noted. This study solely reviews the change in observed trends in rental price inflation. It does not evaluate the effectiveness of the rent price regulation in promoting a sustainable rental market. Price caps in any market have a number of consequences for both suppliers and purchasers, in particular around investment dynamics, as well as for affordability. For the housing market in particular, while providing short-term alleviation to sitting tenants in terms of price increases, rent controls impose price rigidities which may have a detrimental effect on the quality and quantity of supply in the medium to long term. All of these aspects of the regulations are critically important to the overall long-term impact of the scheme, but are outside the scope of this narrow report.

Solving Ireland's housing crisis is complex, but the main alleviating measure in the long term, as noted by previous research (McQuinn et al., 2017), is the introduction of new supply into the market. As noted in Corrigan et al. (2019), this includes new supply relating to new affordable rental accommodation (such as cost-rental models) as well as affordable housing in the owner-occupation sector. Ongoing research and monitoring should be undertaken to assess the broader implications of price controls in the Irish residential rental sector and to identify the costs and benefits of the scheme.

REFERENCES

Bergin, Adele, Kelly, Elish and McGuinness, Seamus, (2012), 'Explaining Changes in Earnings and Labour Costs During the Recession', No EC9, Papers, Economic and Social Research Institute (ESRI).

Byrne, David, Duffy, David and Fitzgerald, John, (2014), 'Household Formation and Tenure Choice', No RN2014/2/2, Research Notes, Economic and Social Research Institute (ESRI).

Corrigan, Eoin, Foley, Daniel, McQuinn, Kieran, O'Toole, Conor and Slaymaker, Rachel. (2018) 'Exploring affordability in the Irish housing market', *Economic and Social Review*, forthcoming.

Everaert, G. and Pozzi, L. (2007), 'Bootstrap-based bias correction for dynamic panels', *Journal of Economic Dynamics & Control*, 31, pp.1160-1184.

Holton, N. and O'Neill, D. (2017), 'The Changing Nature of Irish Wage Inequality from Boom to Bust', *Economic and Social Review*, 48 (1), pp.1-26.

Kennedy, Gerard, Sheenan, Lisa and Woods, Maria, (2016), 'Modelling Irish Rents: Recent Developments in Historical Context', No 14/EL/16, Economic Letters, Central Bank of Ireland.

Kinghan, Christina, McCarthy, Yvonne and O'Toole, Conor, (2016), 'The Effects of Macroprudential Policy on Borrower Leverage', No 08/EL/16, Economic Letters, Central Bank of Ireland.

Lawless, Martina, McQuinn, Kieran and Walsh, John, (2018), 'Identifying Rent Pressures in Your Neighbourhood: A New Model of Irish Regional Rent Indicators', *Economic and Social Review*, 49, issue 1, p. 73-92.

McCann, Fergal, (2016), 'Exploring developments in Ireland's regional rental markets', No 13/EL/16, Economic Letters, Central Bank of Ireland.

McQuinn, Kieran, (2017), 'Irish house prices: Déjà vu all over again?', *Quarterly Economic Commentary*: Special Articles, issue, no. QEC2017WIN_SA_McQuinn.

RTB (2018), Rent Index 2018 – Quarter 3, available at: https://onestopshop.rtb.ie/images/uploads/Comms%20and%20Research/RTB_RI_2018_Q3_Final.pdf

Whitehead, Christine, and Williams, Peter (2018), 'Assessing the Evidence on Rent Control from an International Perspective', Commissioned LSE Report by the Residential Landlords Association.

APPENDIX I: LIST OF RPZs IN URBAN AREAS

	Designation round	Date
Dublin		
Dublin City Council	1	December/2016
Cabra - Finglas		
Ballymun		
North Inner City		
Beaumont - Donaghmede		
Clontarf		
Ballyfermot - Drimnagh		
Crumlin - Kimmage		
Rathgar - Rathmines		
Pembroke - South Dock		
South Dublin County Council	1	December/2016
Lucan		
Clondalkin		
Templeogue - Terenure		
Tallaght Central		
Tallaght South		
Rathfarnham		
Dun Laoghaire-Rathdown County Council	1	December/2016
Glencullen - Sandyford		
Dundrum		
Stillorgan		
Blackrock		
Dún Laoghaire		
Killiney - Shankill		
Fingal County Council	1	December/2016
Balbriggan		
Swords		
Castleknock		
Mulhuddart		
Howth - Malahide		
Galway city		
Galway City Central	2	January/2017
Galway City East	2	January/2017
Galway City West	2	January/2017
Cork		
Cork City Council	1	December/2016
Cork City North -Central		
Cork City North-East		
Cork City North-West		
Cork City South-Central		
Cork City South-East		
Cork City South-West		
Ballincollig - Carrigaline	2	January/2017
Cobh	3	March/2017
Kildare		
Maynooth	3	March/2017
Celbridge - Leixlip	2	January/2017
Naas	2	January/2017
Kildare - Newbridge	2	January/2017
Meath		
Ashbourne	2	January/2017

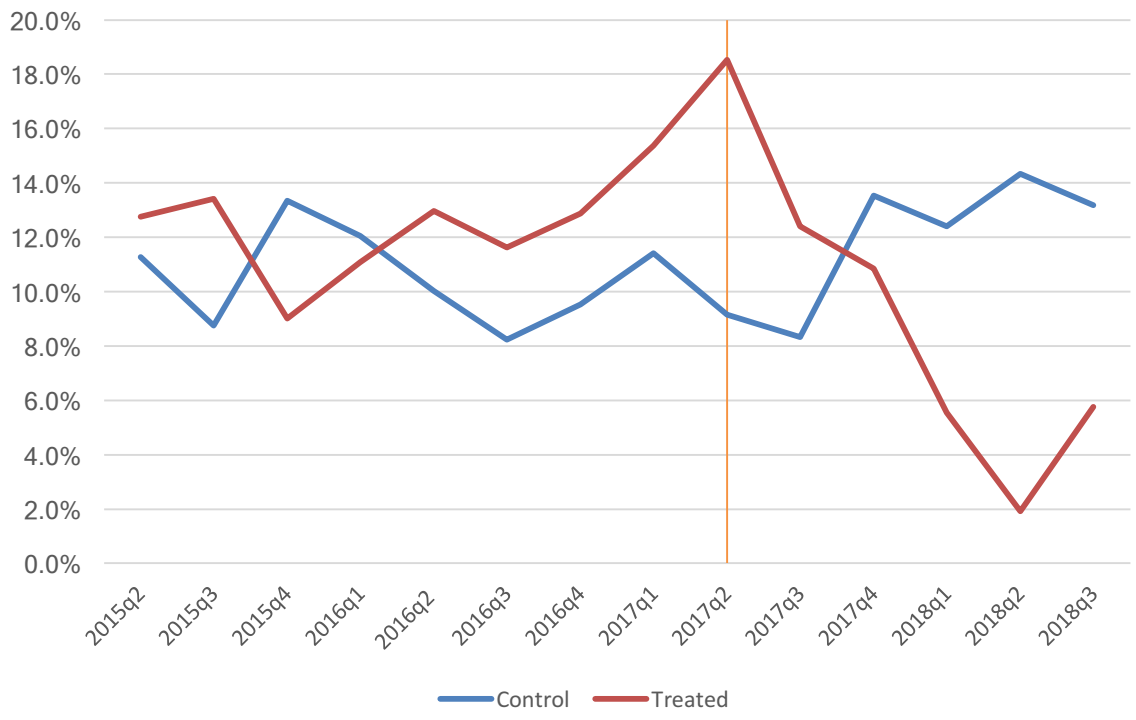
Laytown - Bettystown	2	January/2017
Ratoath	2	January/2017
Wicklow		
Bray	2	January/2017
Wicklow	2	January/2017
Greystones	4	September/2017
Louth		
Drogheda	4	September/2017

APPENDIX II: ANNUAL RENT GROWTH IN LEA BY COUNTY

The trends in annual rent growth for the treated and control LEAs in the GDA, Louth, Galway and Cork are displayed in Figures A2-1 to A2-6 below. A general pattern is evident, with significant differences in the trends in treated and control LEAs after the policy implementation.

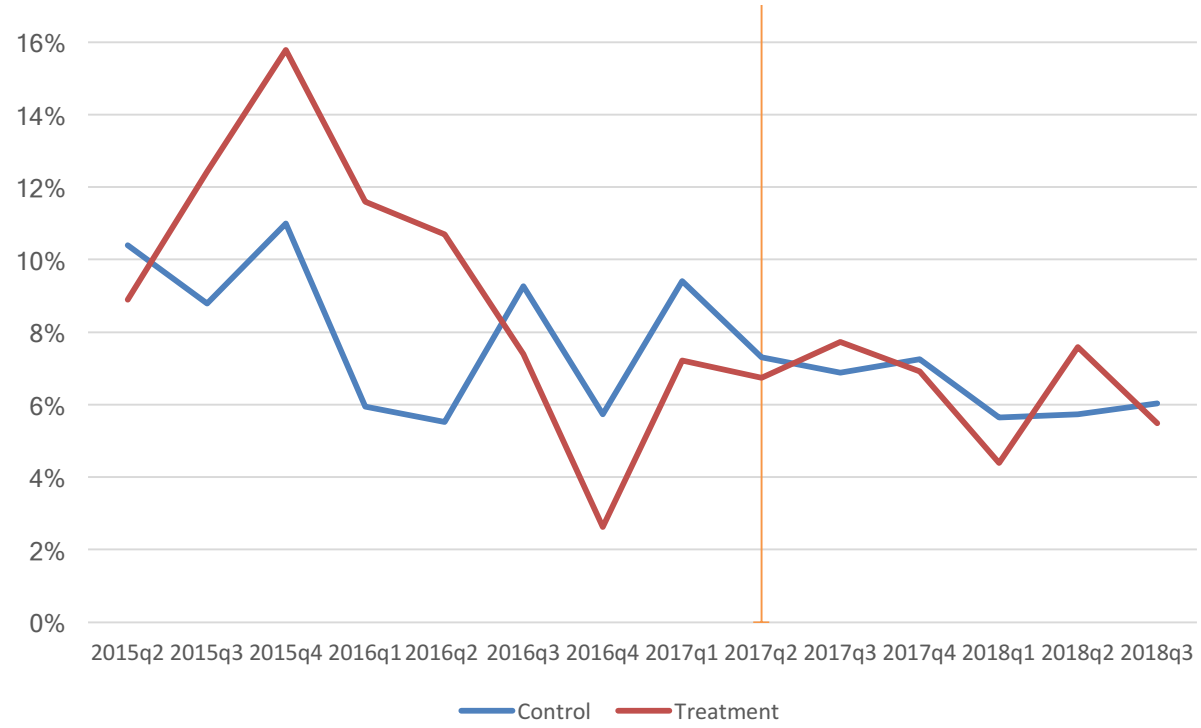
The decline in average annual rent growth in treated LEAs is particularly noticeable in county Louth. In Cork, the trends in control LEAs are relatively stable, with a mild declining trend in treated LEAs since the implementation of the RPZs at the beginning of 2017. Trends in county Galway do not display as clear a change in the trend, as they display high volatility for both treated and control LEAs.

FIGURE A2-1 TREND IN TREATMENT AND CONTROL LEAS IN LOUTH (ANNUAL RENTAL PRICE CHANGE, %)



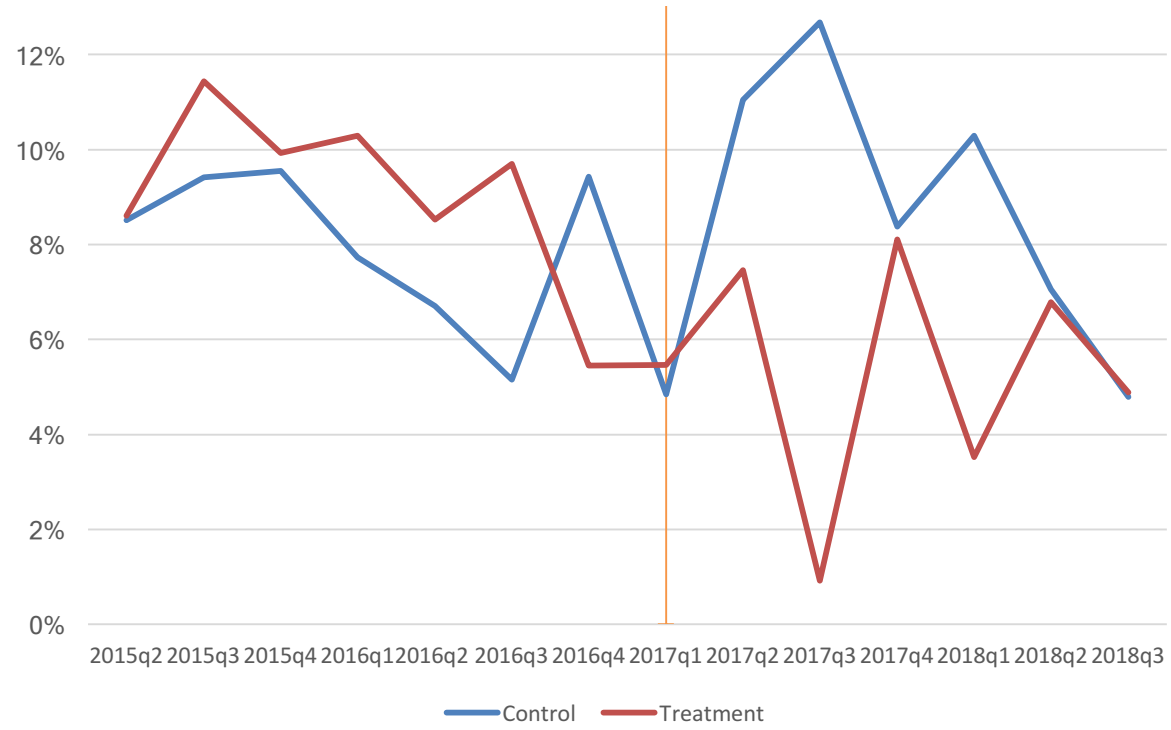
Source: Authors' calculations.
Note: Vertical line marks the date of RPZ implementation.

FIGURE A2-2 TREND IN TREATMENT AND CONTROL LEAs IN CORK (ANNUAL RENTAL PRICE CHANGE, %)



Source: Authors' calculations.
Note: Vertical line marks the date of RPZ implementation.

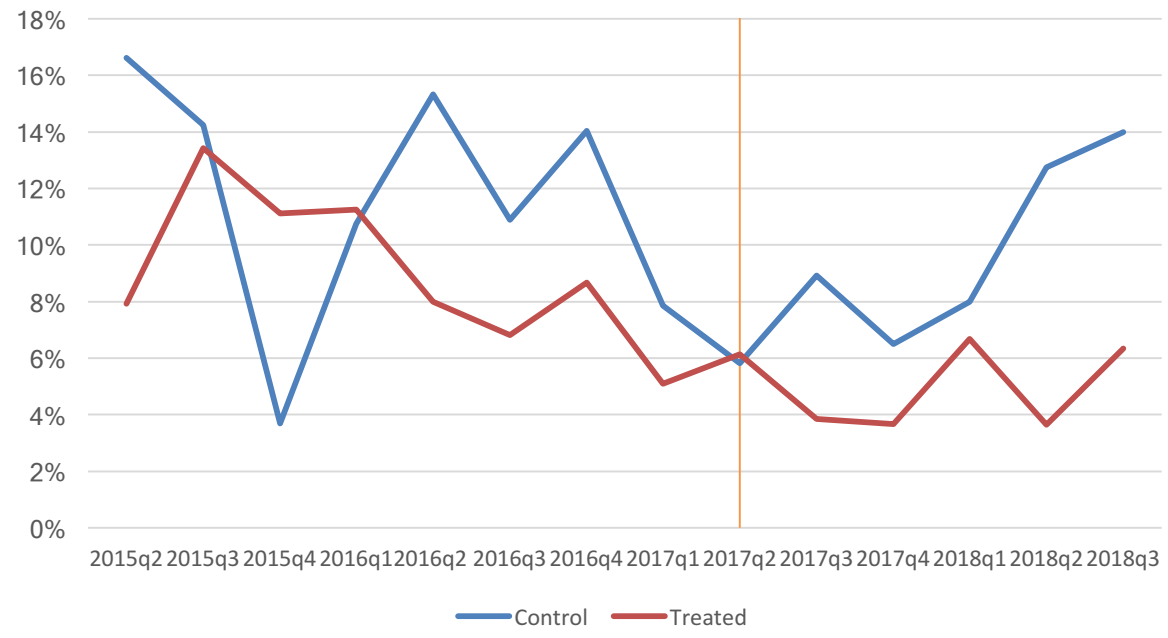
FIGURE A2-3 TREND IN TREATMENT AND CONTROL LEAs IN GALWAY (ANNUAL RENTAL PRICE CHANGE, %)



Source: Authors' calculations.
Note: Vertical line marks the date of RPZ implementation.

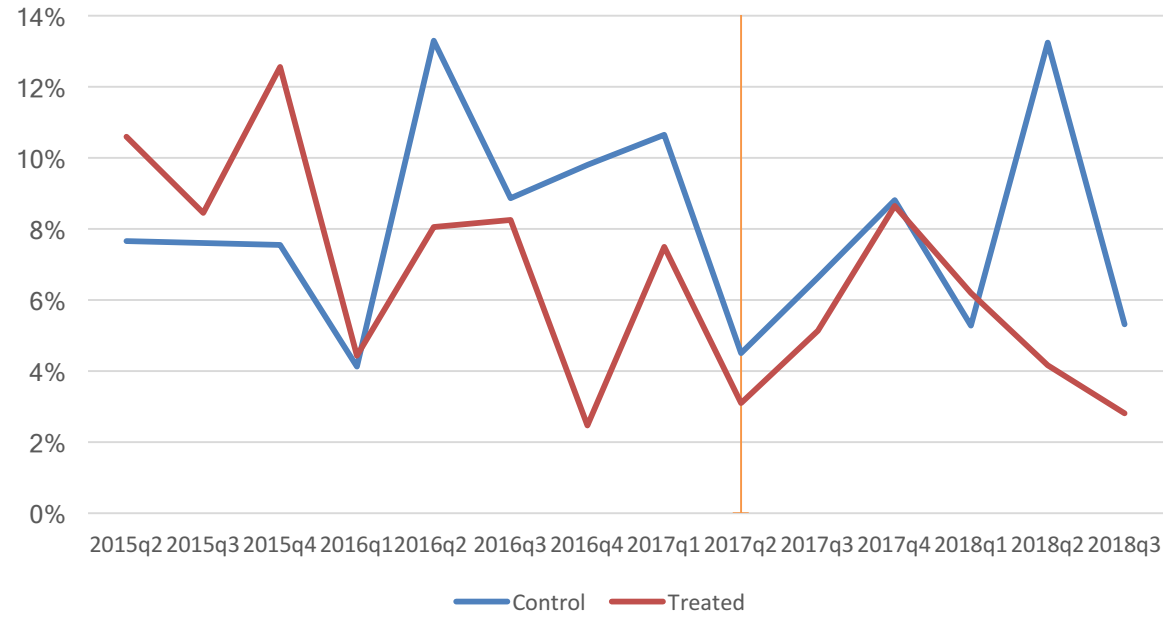
Annual growth trends for rents for treated LEAs in the counties that form the GDA also display signs of decline after the RPZs declaration, particularly in county Meath. However, rent increases also occurred in the remaining LEAs in each county that so far have not been declared RPZs.

FIGURE A2-4 TREND IN TREATMENT AND CONTROL LEAs IN KILDARE (ANNUAL RENTAL PRICE CHANGE, %)



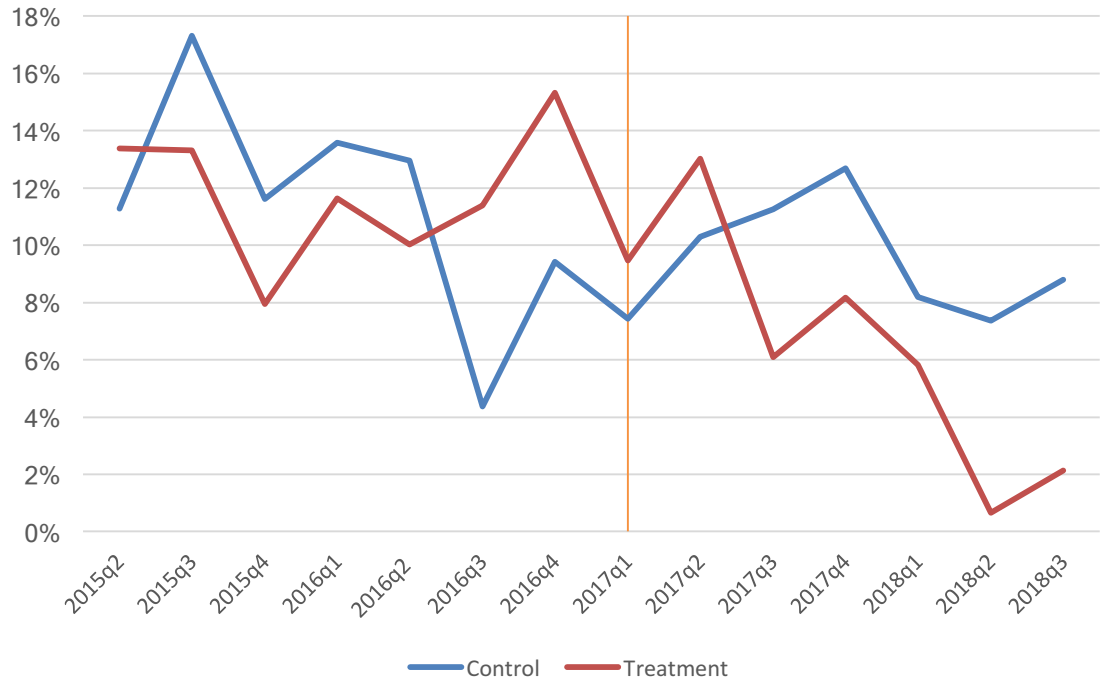
Source: Authors' calculations.
Note: Vertical line marks the date of RPZ implementation.

FIGURE A2-5 TREND IN TREATMENT AND CONTROL LEAs IN WICKLOW (ANNUAL RENTAL PRICE CHANGE, %)



Source: Authors' calculations.
Note: Vertical line marks the date of RPZ implementation.

FIGURE A2-6 TREND IN TREATMENT AND CONTROL LEAs IN MEATH (ANNUAL RENTAL PRICE CHANGE, %)



Source: Authors' calculations.

Note: Vertical line marks the date of RPZ implementation. .

Finally, Table A2 provides detailed information on annual rent growth in each LEA in the counties included in the GDA, Galway, Cork and Louth.

TABLE A2 ANNUAL RENT GROWTH BY LEA

	2015q2	2015q3	2015q4	2016q1	2016q2	2016q3	2016q4	2017q1	2017q2	2017q3	2017q4	2018q1	2018q2	2018q3
County Kildare														
Maynooth (T)	13.5%	17.0%	10.6%	6.9%	2.5%	-2.5%	9.0%	8.3%	9.2%	8.8%	5.8%	9.2%	6.3%	3.5%
Celbridge - Leixlip (T)	2.9%	13.1%	10.7%	10.7%	6.2%	3.6%	6.0%	2.8%	7.7%	4.6%	-0.3%	11.7%	-0.7%	4.3%
Naas (T)	7.9%	13.2%	11.7%	12.9%	10.1%	4.5%	9.9%	5.3%	5.2%	6.8%	6.0%	2.2%	3.1%	9.2%
Athy	16.6%	14.2%	3.7%	10.7%	15.3%	10.9%	14.0%	7.9%	5.8%	8.9%	6.5%	8.0%	12.7%	14.0%
Kildare - Newbridge (T)	7.3%	10.4%	11.4%	14.5%	13.2%	21.7%	9.9%	3.9%	2.4%	-4.8%	3.3%	3.6%	5.9%	8.4%
County Louth														
Dundalk - Carlingford	4.7%	11.3%	12.1%	13.4%	13.0%	9.7%	8.3%	12.7%	7.5%	2.2%	14.1%	14.0%	17.1%	17.8%
Dundalk South	8.6%	8.3%	10.1%	7.3%	12.4%	5.3%	13.9%	13.8%	10.3%	12.4%	8.5%	9.0%	14.3%	10.2%
Ardee	20.5%	6.6%	17.9%	15.5%	4.6%	9.7%	6.4%	7.7%	9.7%	10.4%	17.9%	14.3%	11.6%	11.5%
Drogheda (T)	12.7%	13.4%	9.0%	11.1%	13.0%	11.6%	12.9%	15.4%	18.5%	12.4%	10.8%	5.5%	1.9%	5.8%
County Meath														
Kells	11.2%	21.0%	3.4%	9.6%	10.3%	4.6%	9.2%	2.9%	5.4%	5.0%	20.2%	8.6%	16.1%	12.9%
Laytown - Bettystown (T)	11.8%	10.9%	9.4%	15.8%	18.1%	15.1%	22.3%	8.0%	12.3%	11.5%	6.4%	13.7%	0.5%	-0.9%
Ashbourne (T)	11.1%	16.9%	7.3%	13.7%	8.5%	8.7%	11.3%	8.8%	9.9%	1.5%	7.6%	5.2%	7.8%	3.8%
Ratoath (T)	17.2%	12.2%	7.1%	5.4%	3.5%	10.4%	12.4%	11.6%	16.9%	5.2%	10.5%	-1.4%	-6.3%	3.6%
Trim	8.9%	14.4%	12.3%	19.0%	11.2%	0.1%	13.5%	6.5%	16.0%	19.0%	6.0%	9.1%	-1.3%	7.3%
Navan	13.7%	16.6%	19.1%	12.1%	17.4%	8.4%	5.5%	12.9%	9.5%	9.7%	11.9%	6.9%	7.4%	6.3%
County Wicklow														
Baltinglass	9.1%	4.6%	4.1%	1.3%	17.7%	12.2%	8.5%	12.1%	-4.3%	4.6%	12.0%	2.0%	19.2%	-2.5%
Bray (T)	6.5%	6.8%	18.5%	5.8%	8.8%	9.4%	-5.8%	5.4%	2.2%	3.7%	12.1%	9.1%	8.3%	0.6%
Greystones (T)	13.5%	9.2%	5.1%	5.2%	3.7%	7.9%	6.6%	4.0%	11.3%	7.0%	6.0%	7.6%	1.8%	3.6%
Wicklow (T)	11.7%	9.3%	14.0%	2.3%	11.7%	7.5%	6.6%	13.1%	-4.2%	4.7%	7.9%	1.9%	2.3%	4.3%
Arklow	6.3%	10.6%	11.0%	6.9%	8.9%	5.5%	11.1%	9.2%	13.3%	8.7%	5.7%	8.5%	7.3%	13.1%
County Galway														

Connemara	15.3%	9.4%	6.0%	7.5%	3.4%	1.8%	14.3%	4.4%	5.2%	15.3%	-0.5%	7.9%	8.7%	-0.9%
Tuam	0.2%	13.3%	13.8%	5.3%	18.5%	8.9%	4.1%	9.9%	6.9%	8.7%	10.2%	8.1%	12.7%	8.1%
Ballinasloe	4.0%	8.2%	5.7%	3.1%	4.2%	0.2%	17.5%	2.5%	17.0%	11.5%	-2.9%	13.5%	-3.4%	12.0%
Loughrea	8.3%	7.3%	12.0%	13.7%	7.7%	9.6%	6.1%	1.8%	11.6%	13.4%	15.7%	10.2%	8.4%	2.1%
Athenry - Oranmore	14.7%	8.9%	10.3%	9.0%	-0.3%	5.2%	5.2%	5.7%	14.5%	14.5%	19.4%	11.6%	8.9%	2.7%
Galway City West (T)	8.0%	12.4%	10.3%	9.0%	7.5%	0.6%	5.1%	11.7%	2.3%	4.6%	7.4%	0.0%	6.1%	7.7%
Galway City Central (T)	11.4%	7.7%	10.2%	7.8%	10.5%	10.0%	5.3%	2.7%	6.5%	1.5%	5.2%	1.8%	6.5%	1.5%
Galway City East (T)	6.4%	14.2%	9.3%	14.1%	7.6%	18.5%	5.9%	1.9%	13.5%	-3.3%	11.7%	8.8%	7.8%	5.4%
County Cork														
Kanturk - Mallow	13.8%	7.8%	8.7%	10.4%	8.7%	12.6%	11.9%	8.8%	7.4%	6.5%	10.9%	8.3%	6.6%	8.3%
Fermoy	6.4%	7.7%	10.3%	4.9%	4.7%	12.5%	-0.2%	5.8%	12.4%	6.5%	15.3%	6.6%	1.9%	8.7%
East Cork	11.5%	10.1%	6.4%	8.1%	9.7%	8.8%	9.9%	9.2%	1.1%	10.8%	6.9%	5.2%	16.1%	4.5%
Cobh (T)	5.7%	7.5%	13.3%	3.4%	11.2%	10.4%	5.5%	11.3%	9.5%	8.8%	4.0%	7.7%	6.3%	2.8%
Ballincollig - Carrigaline (T)	8.8%	12.5%	11.1%	15.6%	10.5%	5.5%	6.1%	3.7%	4.4%	7.0%	5.8%	5.7%	5.8%	3.5%
Bandon - Kinsale	3.1%	11.7%	10.8%	1.9%	9.5%	6.8%	7.1%	13.3%	2.3%	4.9%	8.3%	1.2%	7.0%	3.1%
West Cork	11.7%	5.4%	15.6%	5.0%	0.0%	7.1%	0.8%	6.1%	9.9%	6.5%	6.3%	8.4%	5.3%	7.6%
Blarney - Macroom	15.9%	10.0%	14.2%	5.4%	0.5%	7.8%	4.8%	13.3%	10.7%	6.1%	-4.1%	4.2%	-2.6%	3.9%
Cork City North Central (T)	7.5%	16.0%	15.7%	6.3%	8.3%	11.0%	3.1%	9.5%	9.9%	2.6%	7.0%	5.0%	7.7%	6.5%
Cork City North East (T)	9.5%	31.0%	23.2%	7.9%	13.1%	3.5%	-5.5%	10.0%	6.1%	3.5%	8.3%	-3.3%	7.7%	6.9%
Cork City North West (T)	14.3%	5.1%	13.1%	24.4%	10.4%	14.5%	4.5%	4.9%	6.7%	2.8%	8.5%	7.0%	10.8%	8.4%
Cork City South Central (T)	6.5%	10.4%	16.1%	13.5%	15.3%	11.4%	7.1%	14.0%	7.7%	4.2%	0.3%	2.5%	0.7%	2.4%
Cork City South East (T)	10.7%	14.0%	14.2%	11.9%	12.7%	-0.3%	3.0%	3.7%	2.3%	11.3%	8.0%	9.4%	9.1%	6.0%
Cork City South West (T)	8.3%	2.9%	19.6%	9.9%	4.0%	3.1%	-3.0%	0.7%	7.4%	21.7%	13.4%	1.1%	12.6%	7.3%

Note: LEAs marked with a (T) are RPZs.

APPENDIX III: PROPERTY MATCHING

This technical appendix describes the method used for matching properties. We use the Eircode together with the address field 'dwellingaddressline1' to generate a property ID. To demonstrate the methodology, we use a fictional example:

TABLE A3-1 EXAMPLE DATA

Observation	Date	Eircode	dwellingaddressline1	Rent
1	2010m1	A00 A1A1	Main St 9	500
2	2015m1	A00 A1A1	main st. 9	600
3	2017m1	A00 A1A1	9 Main St	700
4	2018m1	A00 A1A1	9 Mayn St	750
5	2011m1	B00 B1B1	Apartment 1	1000
6	2013m1	B00 B1B1	Apartment 1	1100
7	2014m1	B00 B1B1	Apartment 2	800
8	2015m1	C00 C1C1	Small Street 3	1000

In this example, we observe four distinct properties. The address field suggests that there is one property located at Eircode A00 A1A1 and one property at C00 C1C1, while there are two distinct properties (i.e. apartments) at Eircode B00 B1B1.

Given the size of the dataset, manual matching is not feasible. To be able to match properties automatically, we first need to process the field dwellingaddressline1. We remove spaces and special characters, convert all characters to lower case and split the field dwellingaddressline1 into one character field and one numeric field. The new data looks as follows:

TABLE A3-2 PROCESSED EXAMPLE DATA

Observation	Date	Eircode	Address numeric	Address characters	Rent	Property ID
1	2010m1	A00 A1A1	9	mainst	500	1
2	2015m1	A00 A1A1	9	mainst	600	1
3	2017m1	A00 A1A1	9	mainst	700	1
4	2018m1	A00 A1A1	9	maynst	750	2
5	2011m1	B00 B1B1	1	apartment	1000	3
6	2013m1	B00 B1B1	1	apartment	1100	3
7	2014m1	B00 B1B1	2	apartment	800	4
8	2015m1	C00 C1C1	3	smallstreet	1000	5

This process allows us to identify all observations for which both 'Address numeric'

and 'Address characters' are the same as one property, and generate the Property ID shown in the last column. Note that, in this example, observation 4 is falsely identified as a distinct property due to a typographical error ('mayn' instead of 'main') and therefore omitted from the analysis. While we could use approximate string matching methods that allow for typographical errors, this would go beyond the scope of this report and this issue might be revisited in future work. However, the current method is conservative in that addresses are only matched if the numeric and character entries match exactly. With the help of the property ID, we can calculate compound annual growth rates for each observations:

TABLE A3-3 RESULTING ANNUALISED GROWTH RATES

Observation	Date	Rent	Property ID	CAGR
1	2010m1	500	1	n/a
2	2015m1	600	1	3.71%
3	2017m1	700	1	8.01%
4	2018m1	750	2	n/a
5	2011m1	1000	3	n/a
6	2013m1	1100	3	4.88%
7	2014m1	800	4	n/a
9	2015m1	1000	5	n/a

To calculate the CAGR, we use the formula:

$$CAGR_{it} = \left(\frac{rent_{it}}{rent_{it-s}}\right)^{12/(t-s)} - 1,$$

where s is the time gap between the two tenancy agreements in months. Summary statistics of the reduced property-level dataset are shown in Table A3-4 along with means for the full dataset for comparison.

TABLE A3-4 SUMMARY STATISTICS

	All (%)	Reduced (%)
No bedroom	0.14	0.12
1 Bedrooms	16.59	15.2
2 Bedrooms	36.88	36.1
3 Bedrooms	31.26	33.7
4 Bedrooms	12.75	12.67
5+ Bedrooms	2.38	2.2
1 Tenant	47.62	45.38
2 Tenants	35.47	36.38
3 Tenants	7.73	8.38
4 Tenants	4.28	4.75
4+ Tenants	6.54	7.35
1-6 months tenancy	8.21	8.27
7-9 months tenancy	4.66	4.38

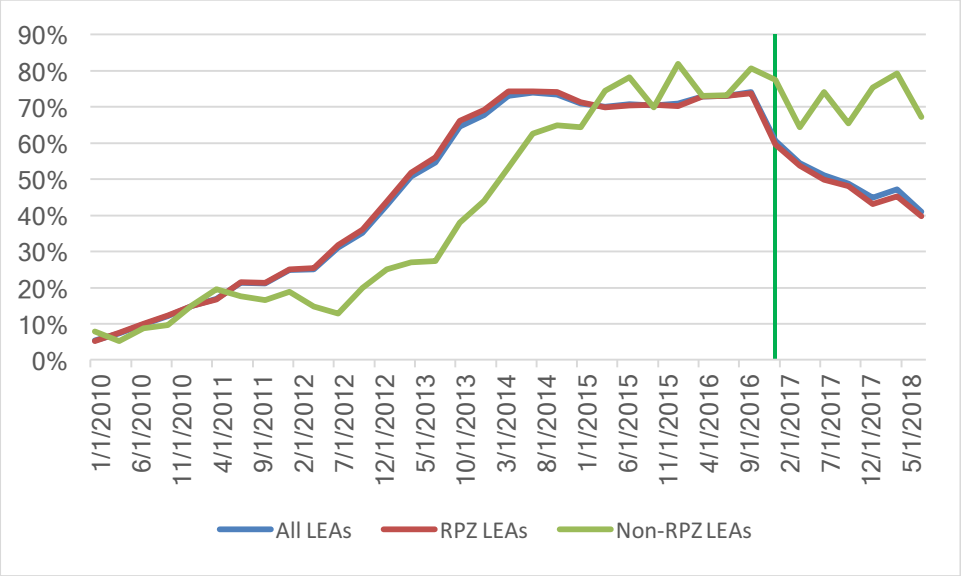
10-12 months tenancy	66.43	67.57
Over 1 year tenancy	20.69	19.77
Apartment	44.02	42.46
Detached	10.22	5.77
Part House	1.35	1.01
Semi-detached	25.06	29.26
Terrace	14.16	16.7
Other property	6.36	5.67
Fortnightly rent	0.25	0.26
Monthly rent	86.92	88.7
Quarterly rent	0.08	0.04
Yearly rent	1.27	1.02

APPENDIX IV: ANNUALISED GROWTH RATES ABOVE 4 PER CENT BY COUNTY

Figures A4-1 to A4-4 display the percentage of properties with annual rent growth above 4 per cent, using a dataset including repeated properties in both treated and control areas. It presents trends separately by county.

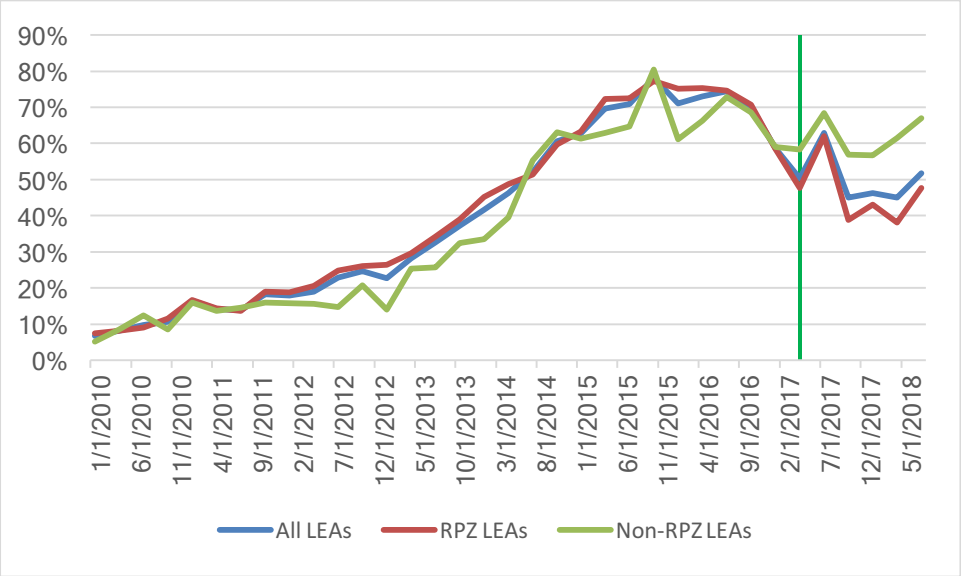
Regardless of location, the trends displayed in the four figures show a stark increase in the percentage of properties with annual rent increases above 4 per cent, which occurred in parallel to the recovery of the economy post-crisis. However, all figures also show a decline in the percentage of properties with rents growing above 4 per cent annually since the end of 2016 and the beginning of 2017, which is coincidental with the start of the introduction of RPZs. It is clear from the figures below that such decline has been entirely driven by properties located in treated LEAs. The decline is particularly noticeable in the GDA counties.

FIGURE A4-1 GROWTH RATES ABOVE 4 PER CENT IN TREATMENT AND CONTROL LEAs IN THE GDA



Source: Authors' calculations.
Note: Vertical line marks the earliest date of RPZ implementation.

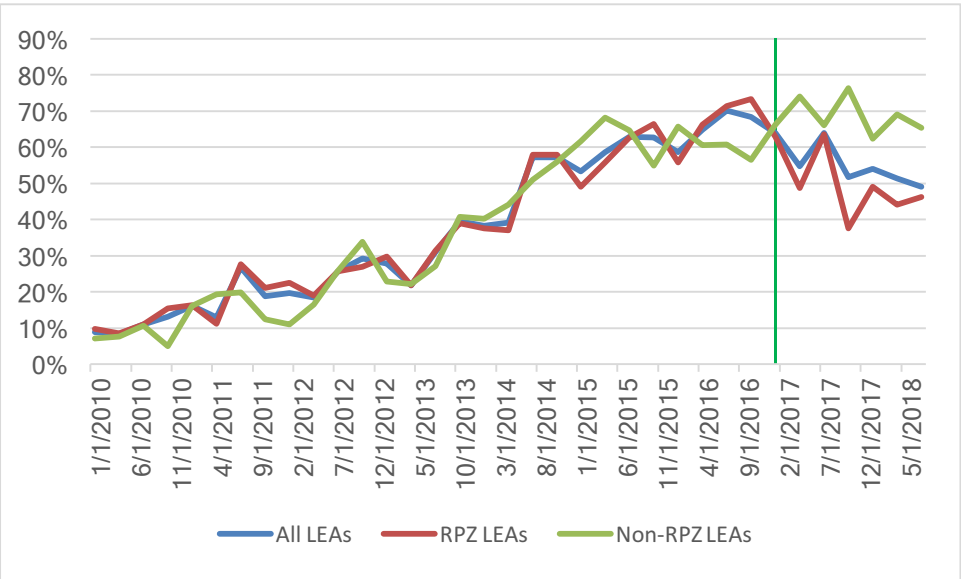
FIGURE A4-2 GROWTH RATES ABOVE 4 PER CENT IN TREATMENT AND CONTROL LEAs IN CORK



Source: Authors' calculations.

Note: Vertical line marks the earliest date of RPZ implementation

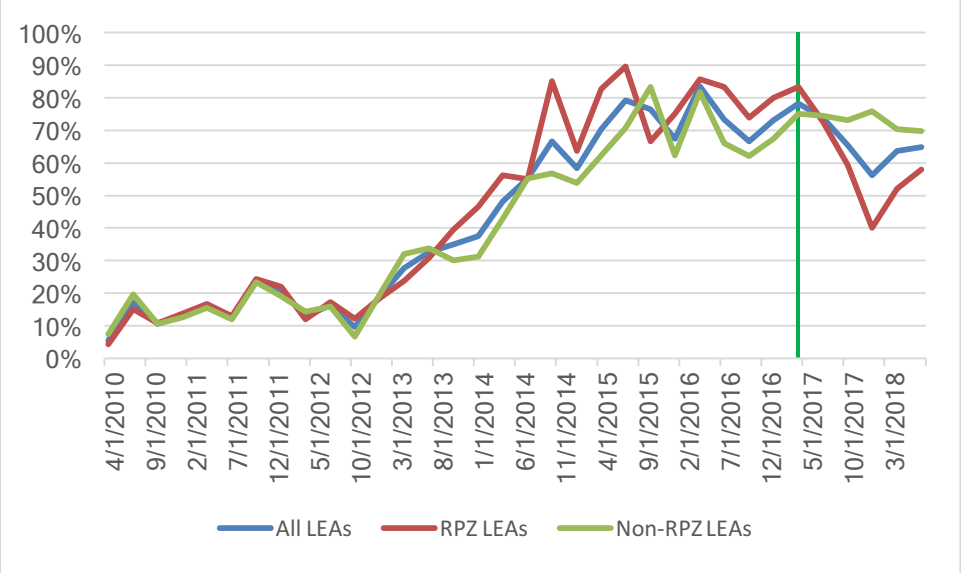
FIGURE A4-3 GROWTH RATES ABOVE 4 PER CENT IN TREATMENT AND CONTROL LEAs IN GALWAY



Source: Authors' calculations.

Note: Vertical line marks the earliest date of RPZ implementation.

FIGURE A4-4 GROWTH RATES ABOVE 4 PER CENT IN TREATMENT AND CONTROL LEAs IN LOUTH



Source: Authors' calculations.

Note: Vertical line marks the earliest date of RPZ implementation.