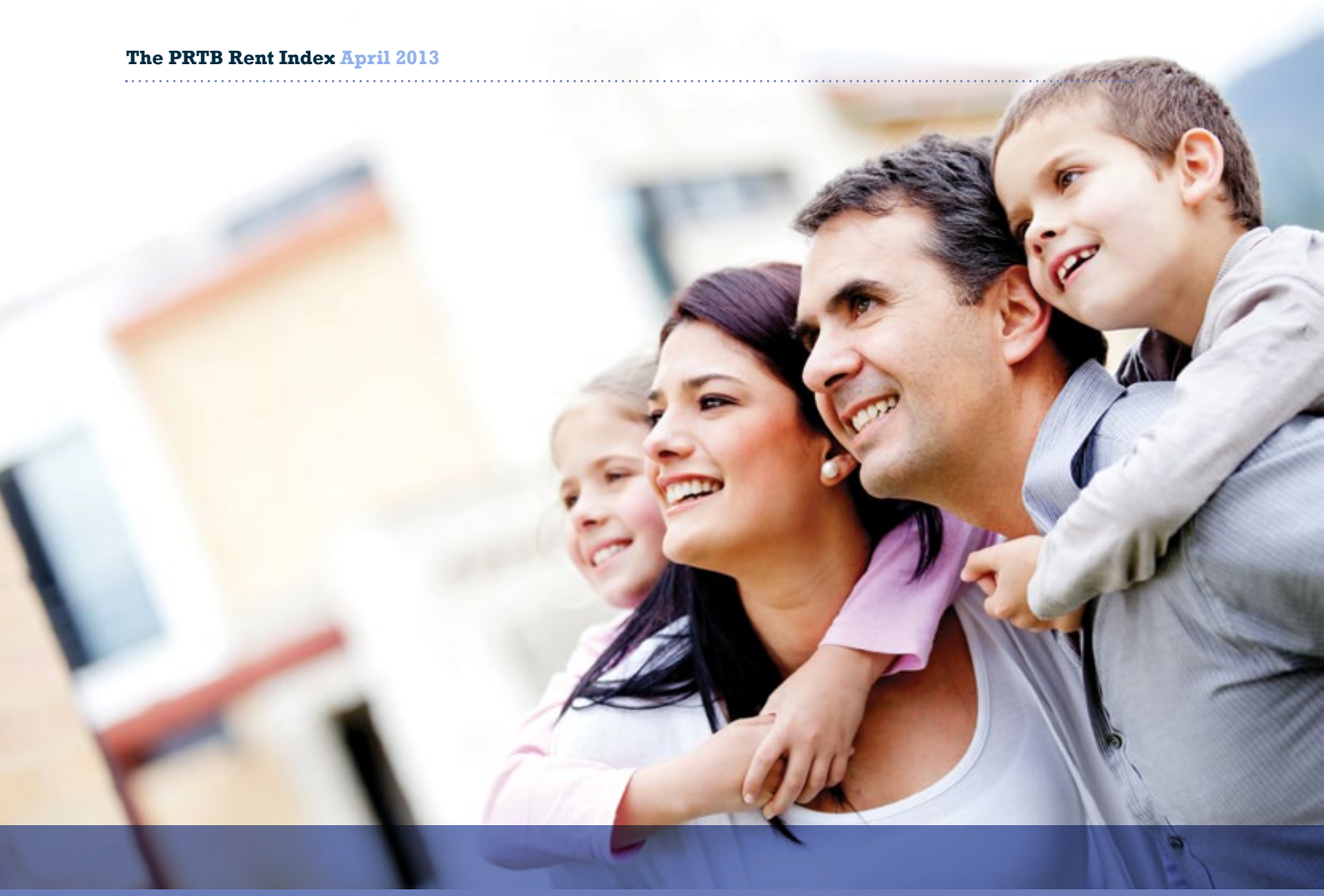
PRTB
Private Residential Tenancies Board
Bord um Thionóntachtaí Cónaithe Príobháideacha

The PRTB Rent Index

April 2013

Table of Contents



Introduction

In October 2012 following a tender process, the ESRI commenced working on the construction of a rent measure for the Private Residential Tenancies Board (PRTB). The project requires a number of specified outputs. These are:

1. A trends report based on historical data from September 2007 to August 2012 with tables and commentary.
2. A quarterly report including tables and commentary, with the fourth quarter to incorporate an annual report.
3. Organisation of press launch including oral presentation of findings and handling of any follow-up queries.
4. Preparation of anonymised interactive version of the data set to be hosted on a public sector website.

This report sets out the results of the analysis of the period September 2007 to December 2012 – the trend report.

The Rental Market 2007-2012

An Overview of the Irish Property Market in Recent Times

The dramatic changes experienced by the Irish property market during the last decade have been well-documented, e.g. Lyons (2012), Duffy and FitzGerald (2012)[1]. The contrasting five-year periods of 2002-2007 and 2008-2012 can be summarised as the largest boom-and-bust episode on record for the Irish property market.

The factors contributing to the boom were numerous. Strong economic growth accompanied by employment growth and increases in disposable income allowed the continuation of the housing market expansion. The favourable macroeconomic results included a consistently low unemployment rate and average annual GDP growth of 5 per cent for 2002-2007. Demographic trends also contributed to rising housing demand, particularly for first-time buyers. High population growth (especially in the main household formation age groups), a fall in average household size and a large net inflow of returning emigrants and immigrants contributed to the demographic shift (Rae and van den Noord, 2006).

Despite rapid price and rent growth, the demand for dwellings remained high. Fiscal policy supported house purchase, while low borrowing interest rates and high inflows of foreign capital following the introduction of the euro currency brought about a negative user cost of housing for some of the boom period (Barham, 2004, Duffy, 2011). These factors combined produced increasing levels of construction activity, and rapid growth of mortgage lending and housing market transactions. Housebuilding completions were above 80,000 per year on average for the three years 2005-2007, then falling to under 20,000 annual average for 2009-2011.

As prices and rents began to fall in 2007/2008, the global financial crisis took hold. With the collapse of the sub-prime mortgage market in the United States following the fall in property prices that was taking place there, the Lehman Brothers bankruptcy in September 2008 brought about a sharp global recession. In Ireland, construction employment collapsed, falling from 270,000 workers or 12.6 per cent of total employment in 2007 to just over 100,000 and 5.5 per cent in 2012.

The unemployment crisis coincided with a worsening fiscal position. The collapse of domestic banking sector was mostly brought about by heavily impaired loans to the construction sector, and nationalisation of banks followed the banking guarantee scheme announced on 30th September, 2008. The period 2008-2012 saw an annual average GDP contraction of 1.2 per cent, peaking in 2009 at -5.5 per cent. In the context of falling incomes and an ongoing macroeconomic downturn, the housing market has contracted substantially as shown in Figure 1.3, with prices falling from peak by 50 per cent nationally, while rents have stabilised some 20 per cent below peak.

Analysis of the Rental Market in Ireland

The PRTB data allows us to examine the rental market in some detail. Separate data from Census 2011 show that 28.8 per cent of households rent their accommodation. The Census also shows that, between 2006 and 2011, there was a dramatic increase in the share of households in private rented accommodation. Between 2006 and 2011 the number of households in Ireland increased by 187,000 or almost 13 per cent, to 1,649,000, while the number of households renting increased by 160,000.

1 For an international overview, including Ireland, see André (2010).

As a result of this change in tenure pattern, according to the 2011 Census, 18.5 per cent of households were in private rented accommodation, compared with 9.9 per cent in 2006. The change is particularly marked in the urban areas: for example the proportion in private rented accommodation in Galway city was 37.5 per cent (up from 24.9 per cent in 2006) and in Dublin city it stood at 32 per cent compared to 19.2 per cent in 2006[2].

PRTB data provides us with some insights into the rental market. Table 1 shows that apartments represent the largest proportion of rented properties and this proportion has remained broadly constant over the period. While detached houses represent the next largest group there has been a decline in this proportion, which now stands at 24 per cent, having peaked at 29 per cent in 2009. In contrast the proportions of rented properties that are semi-detached or terraced have risen over the time period.

Table 1: *Distribution of rented properties by type*

	2008	2009	2010	2011	2012
Semi-Detached	7.7	8.0	8.6	9.7	10.3
Detached	28.7	29.0	27.9	25.4	24.0
Terraced	12.7	12.8	13.3	14.5	15.0
Apartment	44.8	44.7	45.6	44.7	44.3
Other Flats	6.1	5.5	4.7	5.7	6.5
	100.0	**100.0**	**100.0**	**100.0**	**100.0**

Source: Based on PRTB data

The data shows that 2 bed and 3 bed properties are the most common property size in the rental market between 2008 and 2012, Table 2. The inclusion of properties with 0 bedrooms represents the bedsit market. It is also evident that the proportions have remained broadly stable over time.

2 In the report, cities are defined by local authority area.

Table 2: Distribution of rented properties by number of bedrooms

	2008	2009	2010	2011	2012
0 Bedrooms	0.0	0.0	0.0	0.1	0.1
1 Bedroom	17.1	16.4	15.6	15.4	15.6
2 Bedrooms	36.6	35.8	36.0	35.8	35.9
3 Bedrooms	31.3	30.7	30.8	30.7	30.6
4 Bedrooms	12.6	12.5	12.7	13.0	12.9
5 bedrooms plus	2.3	2.3	2.4	2.5	2.5
	100.0	**100.0**	**100.0**	**100.0**	**100.0**

Source: Based on PRTB data

Table 3 shows that Dublin city represents the main rental market. Outside of Dublin the Mid-East is the largest rental market. We can also identify the other main urban centres (Cork, Galway, Limerick and Waterford). These cities account for just over 14 per cent of rental properties in 2012.

Table 3: Distribution of rented properties by location[3]

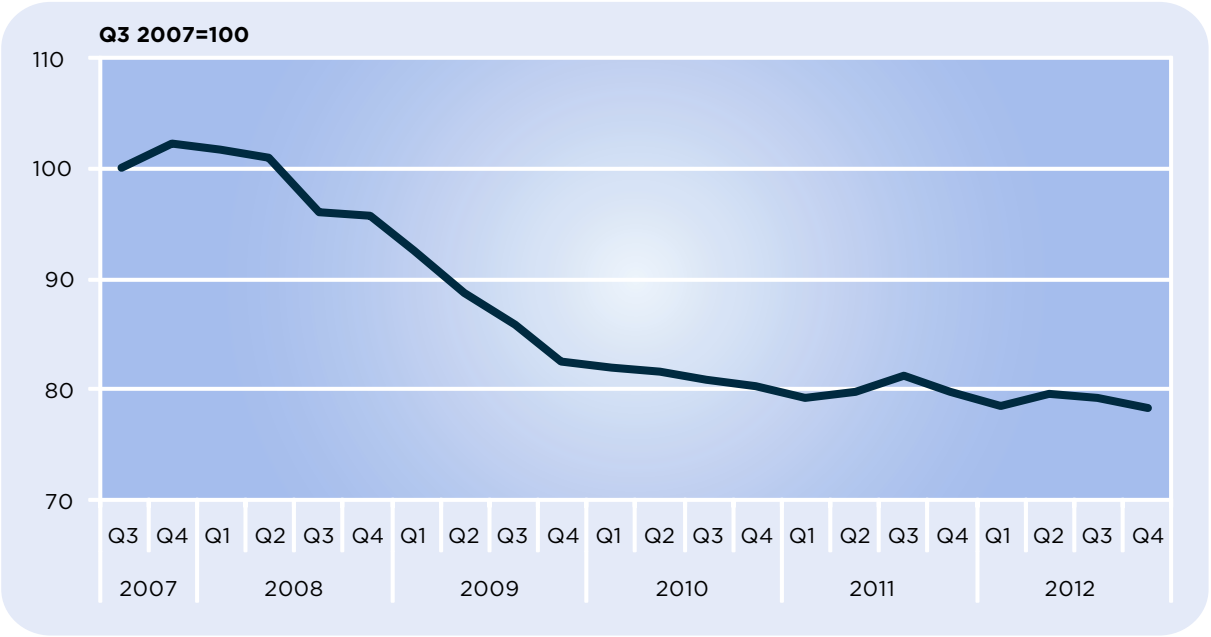
	2008	2009	2010	2011	2012
Dublin	40.0	41.6	42.0	41.2	41.1
Of which:					
Dun Laoghaire-Rathdown	11.5	11.3	11.2	11.5	12.0
Dublin City	58.4	57.8	57.3	58.7	60.1
South Dublin	13.5	13.8	13.6	12.3	11.1
Fingal	16.7	17.1	17.8	17.5	16.9
Outside Dublin	47.4	46.4	45.5	45.5	44.7
Of which:					
Border	14.8	14.6	15.2	15.2	14.6
Mid-East	17.6	18.1	18.9	19.6	20.7
West	8.0	7.6	6.8	6.5	6.0
Midlands	10.0	9.9	10.1	10.5	11.0
South-East	12.3	12.6	12.7	12.4	12.3
South-West	16.6	16.6	16.0	15.5	14.9
Mid-West	8.1	8.1	7.8	7.6	7.6
Other City	12.6	12.0	12.5	13.3	14.2
	100	**100**	**100**	**100**	**100**

Source: Based on PRTB data

3 A comparison to Census 2011 is contained in Appendix A3.

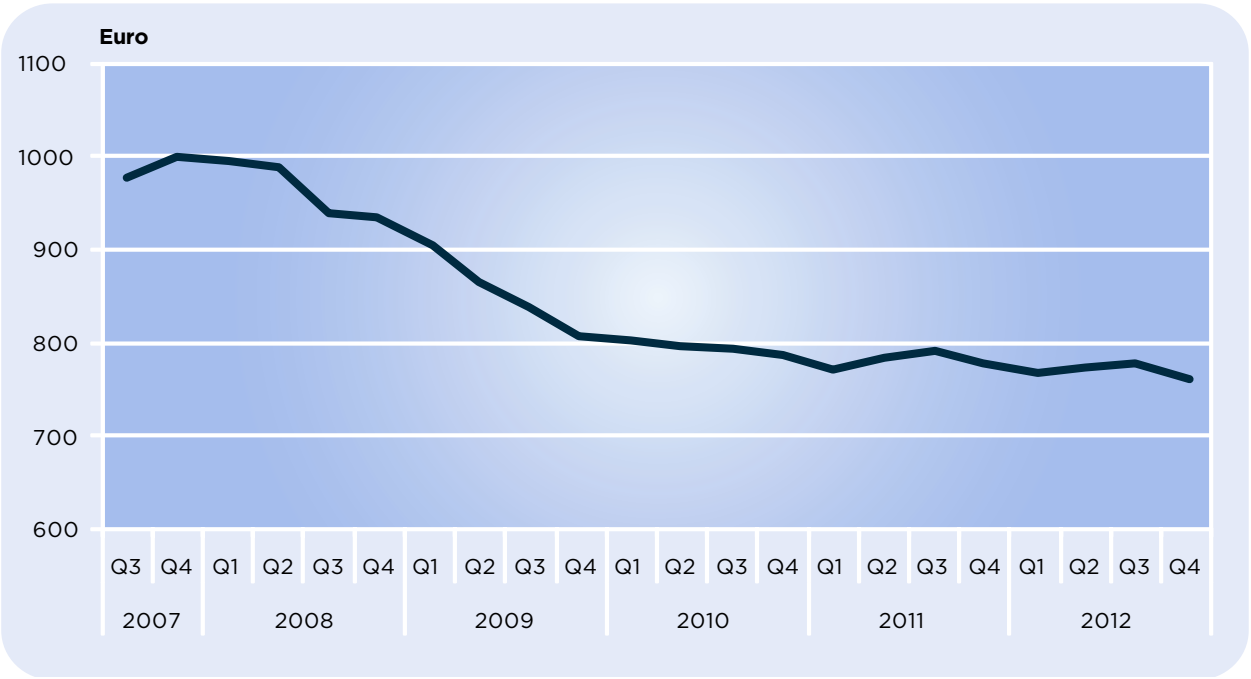
The new PRTB Rent Index allows us to examine what has happened to market rents since the second half of 2007. The index shows that rents rose between the third and fourth quarter of 2007. Rents fell sharply throughout 2008 and 2009. Since then the declines have been much more moderate and there have been some increases, although these have been infrequent. In nominal value terms, the index shows that rents declined from a value of €977 in quarter 3, 2007 to €763 in the fourth quarter of 2012.

Figure 1: *PRTB Rent Index, National*



Source: Based on PRTB data

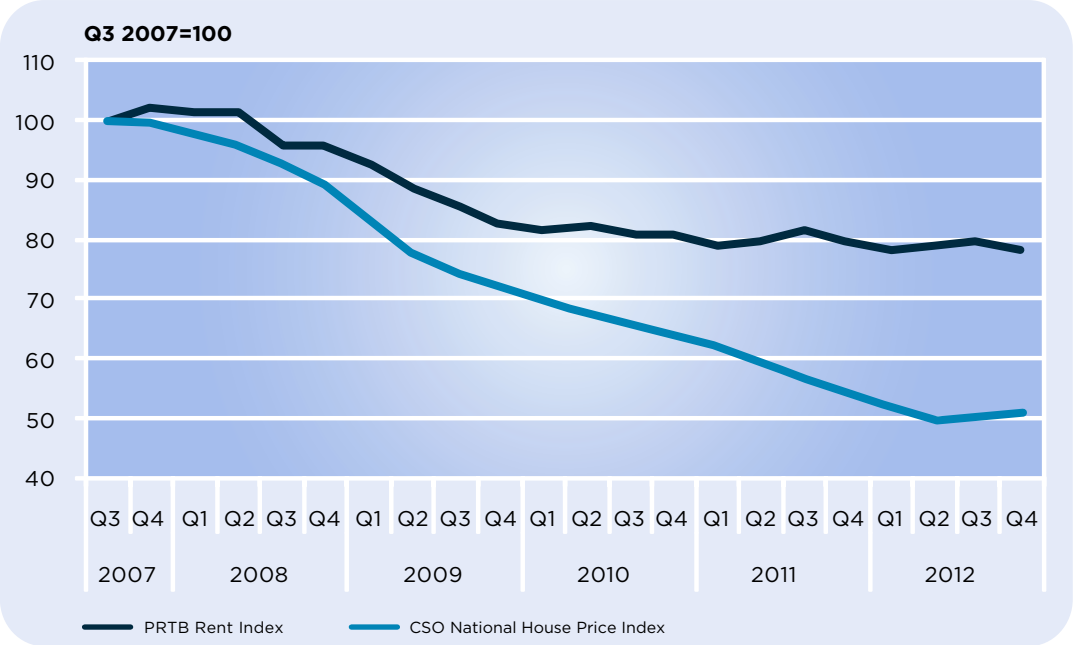
Figure 2: *PRTB Rent Index, National, euro*



Source: Based on PRTB data

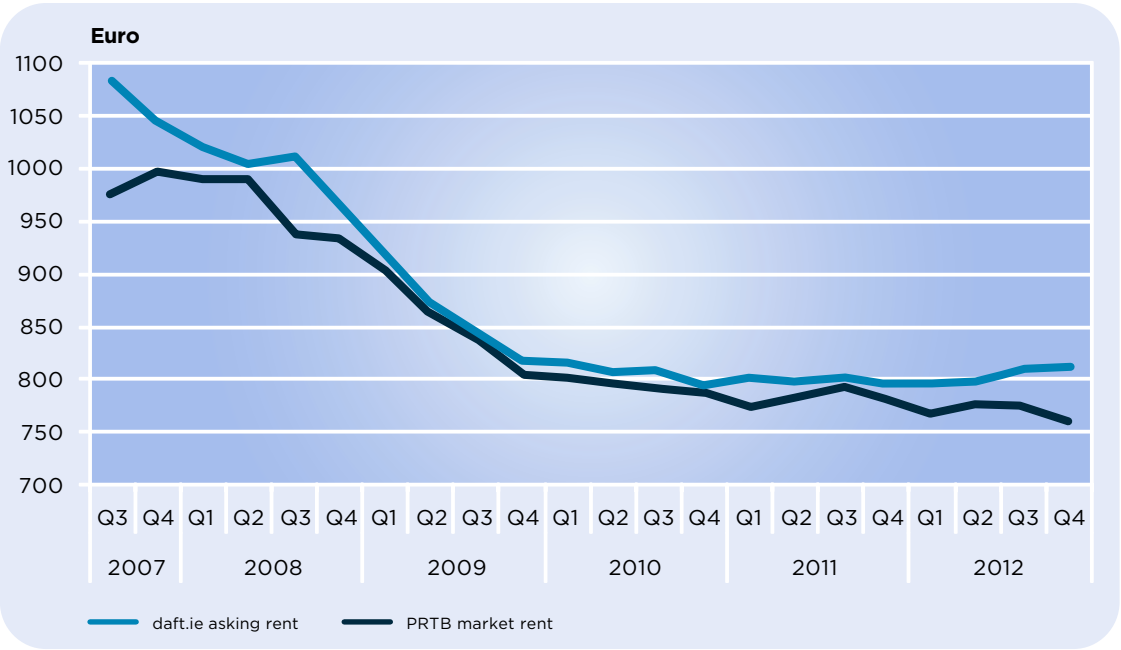
The new PRTB index also allows us to compare a mix-adjusted measure of rents with a mix-adjusted measure of house prices using the CSO Residential Property Price Index, Figure 3. The graph shows that house prices started to decline before rents. In addition the declines in house prices are more severe than the decline experienced in rent. From quarter 3, 2007 to quarter 4, 2012 house prices have fallen by close to 50 per cent, while market rents have fallen by just under 22 per cent.

Figure 3: *National House Prices and National Rents, Q3 2007=100*



Comparing indices for asking rents and market rents, Figure 4 shows that any gap existing between the two measures disappeared during the downturn in rents. The two different measures show a widening of this gap again in recent quarters. It is also interesting to note that in recent quarters data from daft.ie indicate that asking rents rose, while the PRTB market rents continued to show moderate declines.

Figure 4: *Asking rents and Market rents, National, euro*



The PRTB Rent Index

The intention is that the results will be published quarterly, approximately one month after the end of the quarter. Separate indices are calculated for the national market, the national house market, and the national apartment market. Similar indices are calculated for Dublin and Outside Dublin. These indices are shown in Table 4. Table 5 shows standardised rents based on these indices. The standardised rent is based on the average rent in the base period which is then updated using the mix-adjusted index.

Figure 5 shows the index values for the national market, national houses and national apartments. The indices show that, nationally, rents rose in the latter half of 2007 before starting to decline in 2008. Declines were strongest in 2008 and 2009 and although there have been further, more moderate, monthly declines since then, on a mix-adjusted basis rents appear to have stabilised at around 80 per cent of their level in quarter 3, 2007.

Figure 5: Mix- Adjusted Rent Index, National market

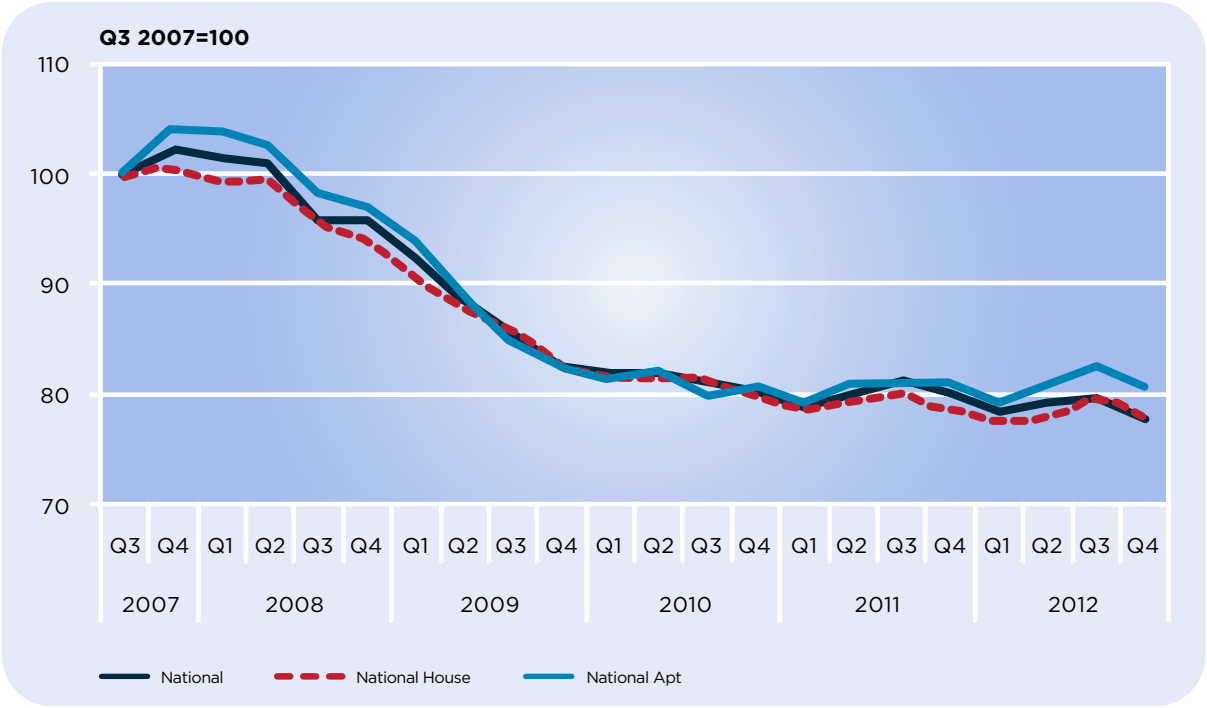


Figure 6 shows the index values for the Dublin market, Dublin houses and Dublin apartments. As in the case of the national market the indices show a decline in rents from mid-2008 and a broad stabilisation after the first quarter 2010. Having reached a trough in the first quarter of 2011, the indices show by the end of 2012 rents in Dublin had increased by close to 4 per cent.

Figure 6: Mix- Adjusted Rent Index, Dublin market

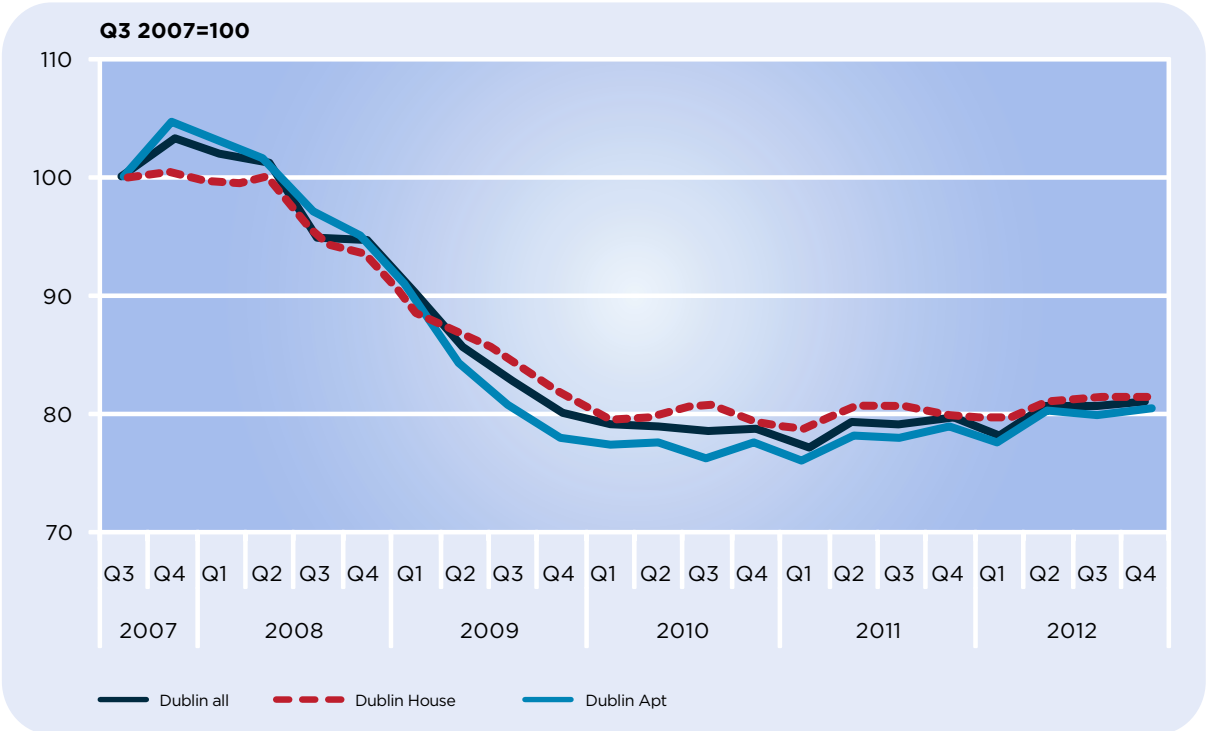


Figure 7 shows the index values for the non-Dublin market, non-Dublin houses and non-Dublin apartments, which shows that a similar trend in rents, although the graph suggests that the stablisation in rents occurred after the Dublin market.

Figure 7: *Mix- Adjusted Rent Index, Outside Dublin market*

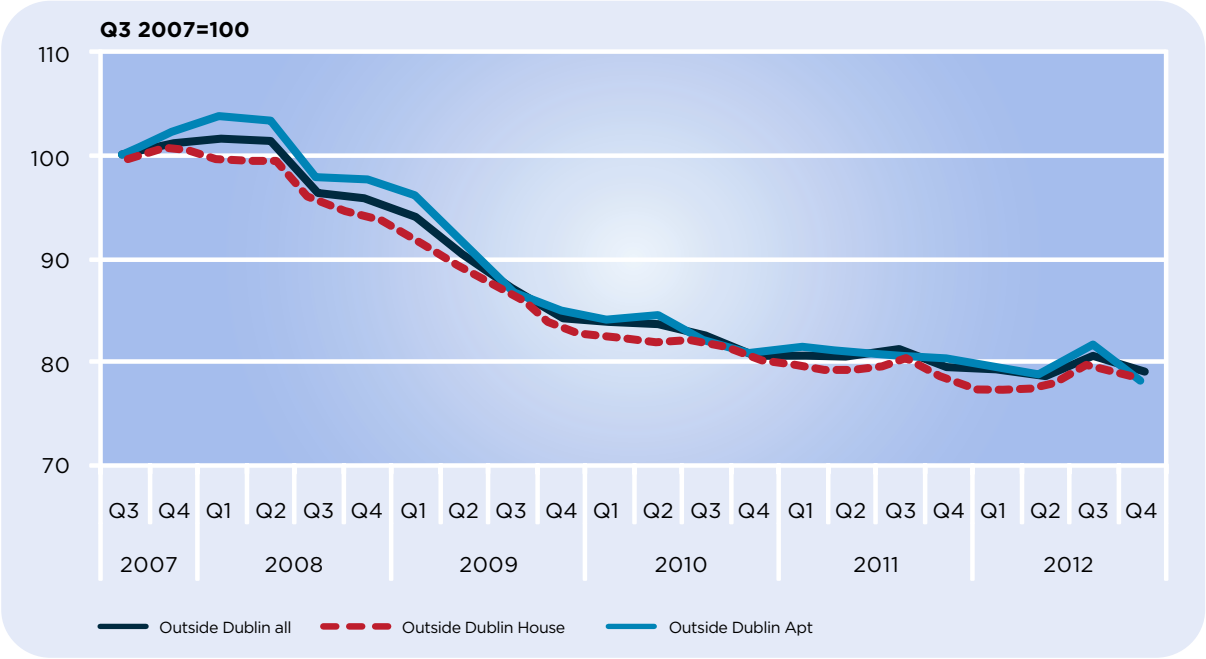


Table 4: *Quarterly Rental Indices by Property Type and Location, Q3 2007=100*

		National	National House	National Apt	Dublin All	Dublin House	Dublin Apt	Outside Dublin All	Outside Dublin House	Outside Dublin Apt
2007	Q3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	Q4	102.3	100.4	103.9	103.4	100.4	104.4	101.5	100.9	102.2
2008	Q1	101.5	98.9	103.8	102.1	99.0	103.0	101.5	99.5	103.5
	Q2	101.0	99.2	102.7	101.0	100.1	101.3	101.1	99.5	103.2
	Q3	95.9	94.9	98.2	94.9	94.4	96.7	96.2	95.3	98.1
	Q4	95.6	94.0	97.0	94.4	93.4	94.7	95.7	94.4	97.4
2009	Q1	92.6	90.7	93.6	89.9	88.9	89.3	94.2	91.7	96.0
	Q2	88.6	87.8	88.5	85.6	86.5	84.0	90.6	88.6	91.5
	Q3	85.7	86.0	84.9	82.5	84.3	80.5	87.3	86.7	86.9
	Q4	82.5	82.3	82.1	79.9	81.2	78.1	84.3	83.2	84.7
2010	Q1	81.8	81.3	81.6	78.9	79.3	77.5	83.7	82.4	83.8
	Q2	81.7	81.1	81.9	79.0	79.7	77.6	83.5	81.9	84.3
	Q3	81.0	81.4	79.9	78.3	81.1	75.9	82.4	81.9	82.2
	Q4	80.3	79.7	80.5	78.4	79.1	77.5	81.0	80.4	80.8
2011	Q1	79.1	78.5	79.3	77.1	78.6	76.0	80.5	79.0	81.3
	Q2	80.0	79.1	80.6	79.1	80.4	78.0	80.4	79.2	80.7
	Q3	81.1	80.7	80.8	79.1	80.6	77.7	81.0	80.7	80.1
	Q4	79.9	78.2	80.8	79.6	79.7	79.0	79.6	78.0	80.2
2012	Q1	78.4	77.3	79.1	78.1	79.3	77.8	79.1	77.1	79.5
	Q2	79.5	78.0	80.4	80.5	80.7	79.8	78.7	77.5	78.6
	Q3	79.4	79.4	82.4	80.5	81.1	80.1	80.7	79.2	81.4
	Q4	78.1	78.5	80.4	81.1	80.9	80.7	79.0	78.0	78.3

Table 5: *Quarterly Standardised Rents by Property Type and Location, euro*

		National	National House	National Apt	Dublin All	Dublin House	Dublin Apt	Outside Dublin All	Outside Dublin House	Outside Dublin Apt
2007	Q3	977	970	972	1214	1358	1218	812	818	822
	Q4	999	974	1010	1255	1364	1271	824	826	840
2008	Q1	992	959	1008	1239	1345	1254	824	814	851
	Q2	987	963	998	1226	1360	1234	821	814	848
	Q3	937	921	955	1152	1283	1178	781	779	806
	Q4	934	912	943	1146	1269	1153	777	772	801
2009	Q1	904	880	910	1092	1207	1087	764	750	789
	Q2	865	852	860	1040	1175	1023	735	725	752
	Q3	838	834	825	1002	1145	979	708	710	714
	Q4	806	798	798	970	1103	950	684	681	696
2010	Q1	799	789	793	958	1078	944	679	674	689
	Q2	799	786	796	959	1083	945	678	670	693
	Q3	791	790	777	951	1101	925	669	670	675
	Q4	785	773	783	952	1074	944	658	658	664
2011	Q1	773	761	771	936	1067	926	654	646	668
	Q2	782	767	784	960	1093	950	653	648	663
	Q3	793	783	785	960	1095	947	657	660	658
	Q4	780	759	785	966	1083	962	646	638	659
2012	Q1	766	750	769	948	1077	947	642	631	653
	Q2	776	756	782	977	1096	972	639	634	646
	Q3	775	771	801	977	1102	975	655	648	669
	Q4	763	761	781	985	1099	982	641	638	643

Note: The standardised rent is based on the average rent in the base period which is then updated using the mix-adjusted index.

Appendix: The Construction of a Hedonic Rent Index for the PRTB

A1. Data Description

Data source

Owners of private residential accommodation in Ireland are required to register with the PRTB, in accordance with the Residential Tenancies Act 2004. The registration requires an application to be filed for all tenancies with the PRTB's Register of Tenancies, from which aggregate data on the private rented sector is compiled. The PRTB serves three main functions: the operation of a national tenancy registration system, resolving disputes between landlords and tenants, and to provide advice to the Minister of Environment, Community and Local Government concerning the private rental sector.

Registration is the responsibility of the landlord and involves filing various details, either online or by hard copy, about the dwelling and the leasing arrangements, along with information about the tenant(s), the landlord(s) and the management company where applicable.

The PRTB provided the ESRI with an anonymised dataset of registrations – tenants or landlords are not identifiable. Selected variables from the dataset are shown in Table A.1. A new registration should be completed for each new lease agreement.

Table A.1: *Selection of available variables, with examples*

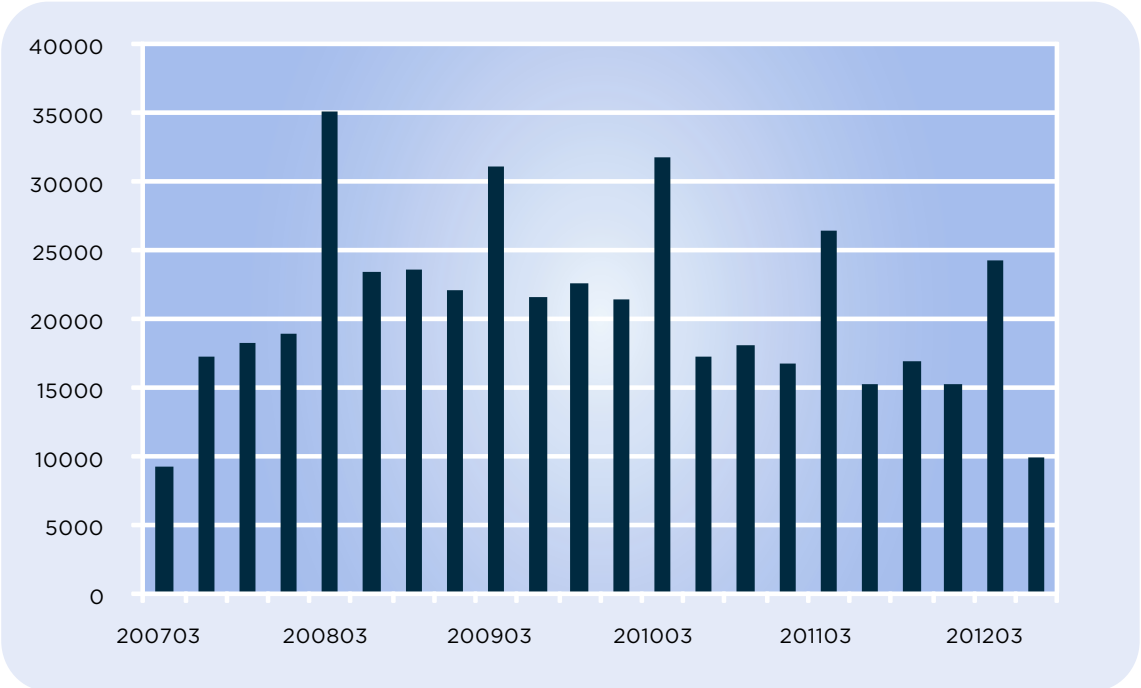
Variable	Examples
Application type	New, Further, Part 4
Rent Amount	€ 800
Rent Frequency	Weekly, Fortnightly, Monthly, Quarterly, Annual
Rental Deposit	€ 1,000
Dwelling Address	Address Line 1
Local Authority Name	Kerry County Council
Dwelling Type	Whole House, Part House, Maisonette, Apartment, Flat, Bedsit
Property Type	Terraced, Detached, Semi-Detached
Number of Bedrooms	1, 2, 3
Number of Bed Spaces	1, 2, 3
Number of Occupants	1, 2, 3
Floor Area (m2)	75
BER Certified	Y, N
BER Certificate (if Y)	A1-3, B1-3, C1-3, D1-2, E1-2, F, G
TV Licenced	Y, N

Data Editing and Imputation

The primary focus of the study is to create a mix-adjusted measure of rents; that is, a measure of rents that takes account of the changing mix of properties rented in different time periods. Thus, the data are examined prior to any mix-adjustment to identify outliers and/or data entry errors. This is not a check of all the variables but is focused on those that will form a part of the mix-adjustment process.

To arrive at the dataset for our analysis we restrict the data to the period specified in the tender documents for the "trend" report, 2007 quarter 3 to 2012 quarter 4. Extreme observations where the rent is below €100 or above €10,000 per month are also excluded. The dataset includes details of the registration status. We exclude cases where there is not enough data present to allow the application to be registered. The impact of these different steps is to reduce the dataset under consideration to just over 460,000 cases. Figure A.1 shows the distribution of observations by quarter. A peak in the third quarter of each year is noticeable, reflecting the peak of student letting taking place at the start of each academic year.

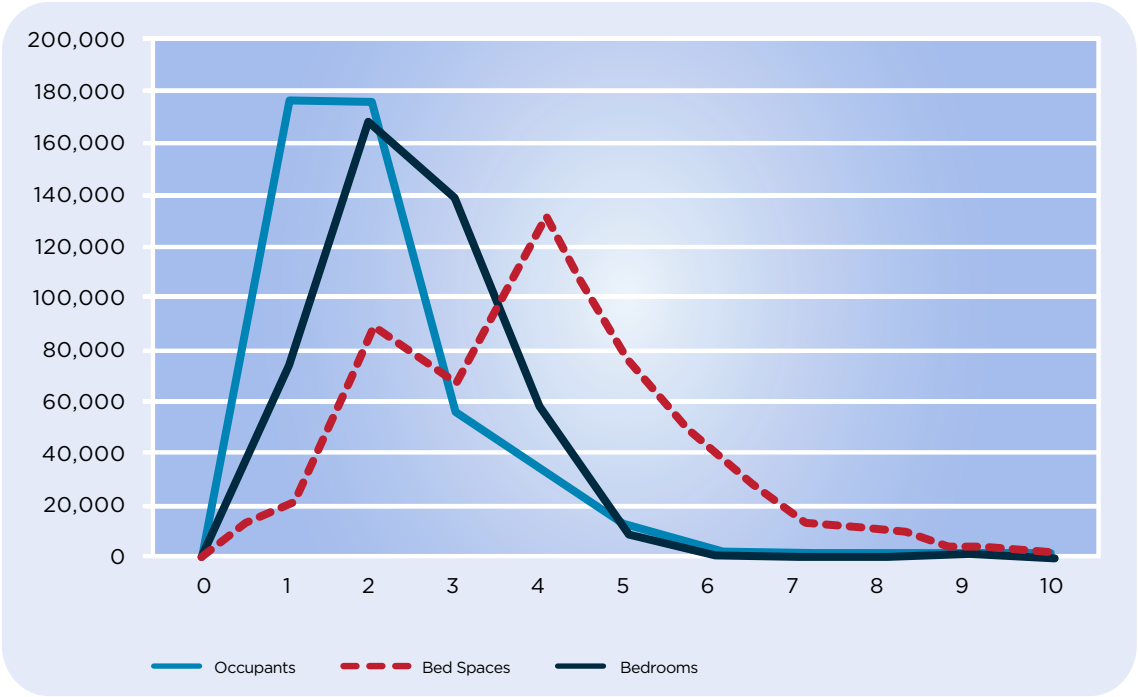
Figure A.1: *Distribution of observations by quarter*



In order to assess which variables we might use to measure rent we examine the properties of the variables within the dataset, for example, number of occupants, number of bedrooms, and number of bed spaces. The distributions in Figure A.2 have long right tails[4]. This suggests a number of outlier/ misclassification cases are present, and some basis for exclusion, imputation or correction of these entries may be appropriate. It is worth noting that the extreme values have low frequencies so their exclusion should not have a substantial impact on the number of observations available.

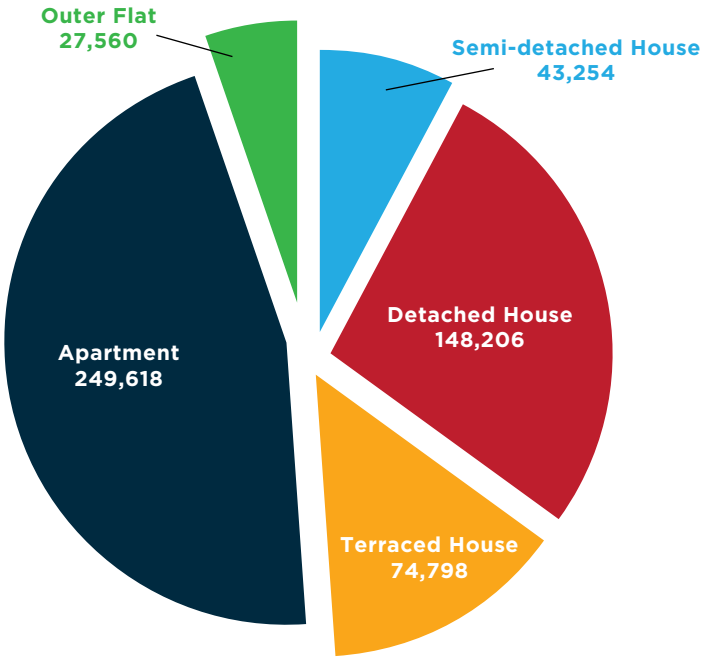
4 For illustrative purposes, the ranges have been abbreviated to 10, but records exist ranging up to several hundred for each.

Figure A.2: *Distribution of variables that reflect property size(values 0-10)*



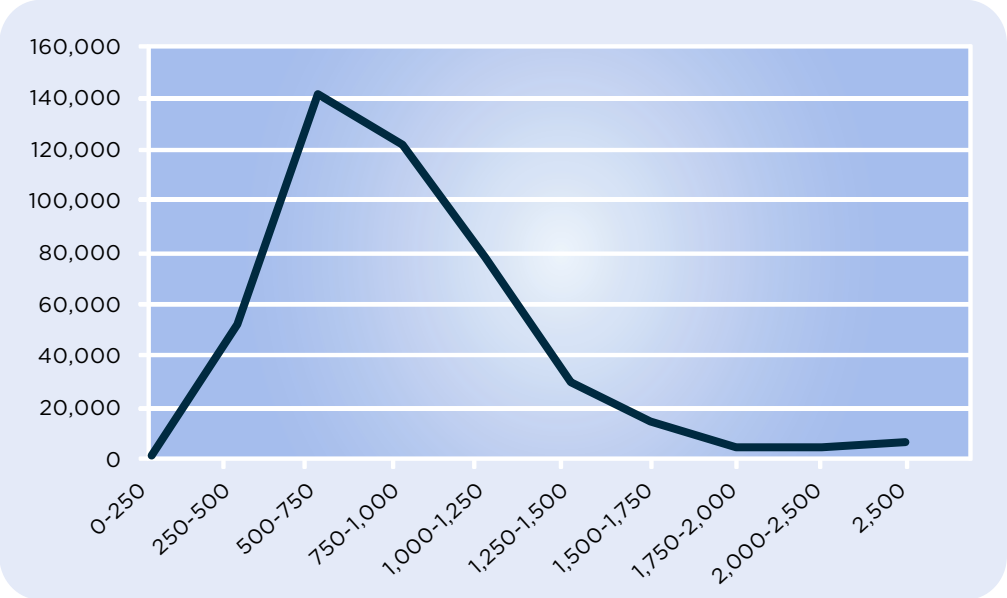
The majority of cases (93%) are either classified as apartments or as whole houses (semi-detached, detached and terraced), with maisonettes, part-houses, flats and bedsits comprising the remainder. The number of bedrooms by five dwelling types (semi-detached house, detached house, terraced house, apartment, other flat) is given in Figure A.3.

Figure A.3: *Distribution by Five Dwelling Types*



The dependent variable in our analysis is rent amount. As a continuous variable and given there is a large sample, it is helpful to use bands to group the data into bands for analysis purposes. Rent amount incorporates values for up to five frequencies of rent payments; weekly, fortnightly, monthly, quarterly and annual. We choose monthly rent as the preferred metric, and adjust the amounts for other payment frequencies accordingly (e.g. multiply weekly rent amounts by 4.3, etc.).

Figure A.4: *Distribution of Banded Monthly Rent*



The bands used for monthly rent are increasing by €250 to €2,000, with €500 for the ninth band and above €2,500 for the tenth band. Based on these bands, the frequency distributions are displayed in Figure A.4. The distribution shows the fourth band as the most common until 2008, but since 2009 the third band has been the most prevalent for rental amounts. The annual frequencies shown in Table A.2 indicate the number of observations in the sample peaked in 2009, just below 101,000.

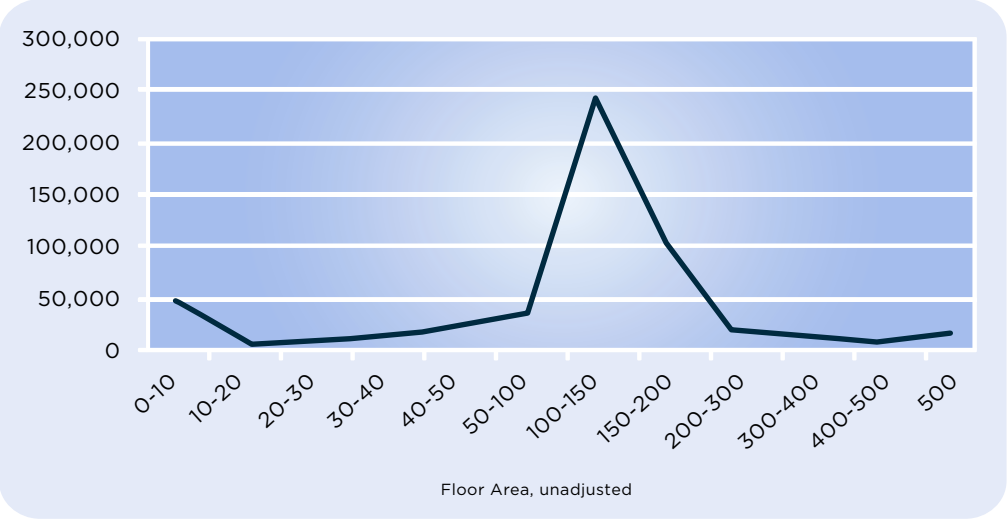
Table A.2: *Distribution of Banded Monthly Rent by year, 2007Q4-2012*

	2007Q4	2008	2009	2010	2011	2012
€0-250	115	759	634	750	627	473
€500-750	946	6,712	8,883	12,454	11,961	11,718
€750-1,000	3,982	23,284	31,874	32,984	27,011	21,357
€1,000-1,250	4,604	24,544	26,877	26,167	20,895	17,792
€1,250-1,500	3,451	19,817	19,631	14,319	11,063	9,688
€1,500-1,750	2,287	11,887	6,441	4,087	3,346	3,363
€1,500-1,750	1,320	5,864	2,726	2,004	1,648	1,739
€1,750-2,000	460	2,002	1,047	818	606	699
€2,000-2,500	387	1,938	1,118	745	641	630
≥ €2,500	599	2,724	1,665	726	611	719
Annual Total	**18,151**	**99,531**	**100,896**	**95,054**	**78,409**	**68,178**

Cases that appear to be misclassified, illogical, contradictory or incorrectly allocated, will be investigated further with a view to re-including their correct values in the dataset. As noted by O'Hanlon (2011), due to the continued use of both imperial and metric measures, there may be many examples of errors in floor area records.

Distinguishing between floor area records that were submitted as square metres or square feet is not easily achievable, since PRTB applications continue to be received listing either one or the other, but without an accompanying record of which records were square metres and which were square feet. Adding to this problem is the high number of missing floor area records – 8.9 per cent overall and up to 12.4 per cent in 2009 – see Figure A.5 for a distribution of available records.

Figure A.5: *Distribution of Floor Areas*



Presumably much of the absence of floor area records may reflect the need to convert between square feet and square metres at the time of registering online and not having conversion factors to hand. There may be conversion errors involved. The fact that one square metre is about 10.8 square feet, while one metre is about 3.3 feet, likely makes rough approximations a challenging and inaccurate exercise. The combination of these factors suggests the floor area variable is unreliable for use in our analysis. An observation listing 21 bedrooms for 2 occupants and 4 bed spaces would appear to be an error, which should most likely read as 2 (that is, an apartment with two bedrooms). Several other cases in the different variables of interest show similar errors. Errors such as these are isolated and adjusted as appropriate; where the error may be borderline, an element of subjective judgment comes into play.

Identifying and Excluding Outliers

Given the presence of outliers and cases that contain data errors, these must be excluded so that they do not bias the results. While some visual checking of the data is possible, the size of the dataset means that outlier detection must be automated. This is done by a measure known as "Cook's Distance" where a regression measures the distance between each observation and the means of the dependent and independent variables. In other words it provides a measure of the influence an observation is having on the results. Our examination of the data showed that data errors were independent of each other – an error in number of bedrooms did not mean that there was an error in the rent amount for the same observation. Given our concern is with the rent paid we conducted our outlier analysis on the monthly rent amount.

In addition we also examined the number of bedrooms by property type. Previous studies of Irish house prices have found that property size is a key explanatory variable (Conniffe and Duffy, 1999). Given the issues that surround the use of floor area we use the number of bedrooms as our explanatory variable for the size of a property.

As the majority of the data is inputted online as part of the registration process this means that the data has been input by a large number of individual landlords when registering their property. Thus, there is a wide distribution in the number of bedrooms, reflecting data input errors.

Given the size of the dataset implausible values for the number of bedrooms were identified through the use of thresholds[5]. The distribution of number of bedrooms by type of property was examined and if the number of bedrooms for a given property type was less than 1% of records for that property type then it was identified as outside the threshold. Table A.4 shows the permitted range for number of bedrooms by property type.

5 This is similar to the approach used by the CSO in constructing the Residential Property Price Index, see O'Hanlon, 2011.

Table A.4: Thresholds for Number of Bedrooms by Property Type

Property type	Number of bedrooms permitted
Semi-Detached, Detached, Terraced	1-8
Apartment	1-6
Flat, Maisonette	1-4
Bedsit	0-2

Following the procedure of excluding outliers using the Cook's Distance approach outlined above, the sample size reduces by some 11,000 cases, approximately 2 per cent of the dataset, to just above 449,000 remaining. Table A.5 shows the difference between the restricted sample and the full sample shown in Table A.2. The table reveals the largest share of the monthly rent outliers falls in the tenth band, while 2008 is the year with most outliers. In terms of the capacity variables analysed above, the impact on each of these variables is spread evenly across the categories. This means, as expected, the outliers were not concentrated in any dwelling type with particular characteristics.

Table A.5: Distribution of Banded Monthly Rent Outliers by year, 2007-2012

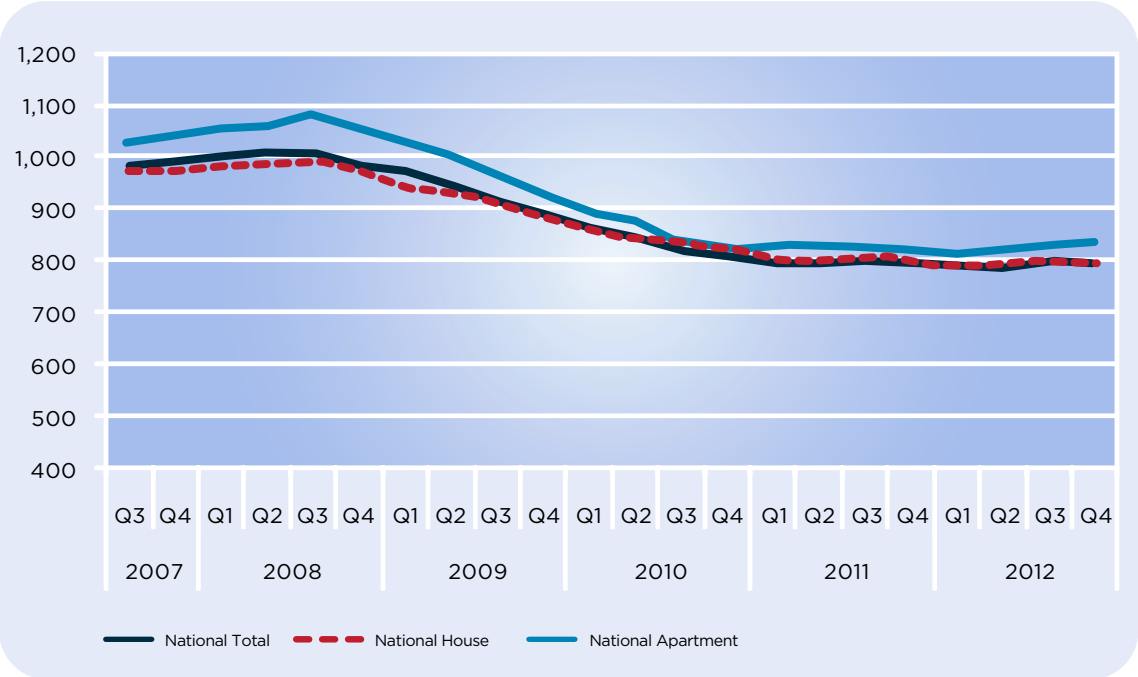
	2007Q4	2008	2009	2010	2011	2012
€0-250	11	82	68	76	72	54
€500-750	36	220	214	221	205	217
€750-1,000	31	174	185	160	137	112
€1,000-1,250	27	127	161	227	196	136
€1,250-1,500	25	144	165	149	139	127
€1,500-1,750	31	118	70	74	54	58
€1,500-1,750	51	227	109	109	78	64
€1,750-2,000	43	177	68	75	48	73
€2,000-2,500	75	379	196	174	161	173
≥ €2,500	338	1,610	1,019	528	469	518
Annual Total	**668**	**3,258**	**2,255**	**1,793**	**1,559**	**1,532**

A2: Mean Rents

With outliers and invalid observations removed mean rent values can be calculated based on the stock of rental contracts on record for each quarter. Figures A.6-A.8 below show the change over time of mean rents of all properties, houses and apartments for National, non-Dublin and Dublin rents over the study horizon (2007 quarter 3 to 2012 quarter 4).

The pattern broadly displayed is one of small increase to mid-2008, followed by a steady decline in average rents lasting until early 2011. Since then, there has been some stabilisation overall with the Dublin market registering small increases, whereas declines have continued for non-Dublin properties.

Figure A.6: *Mean National Rents for Total, Houses and Apartments*



The figures show national rents for apartments have, on average, remained higher than those for houses, although the trend for outside Dublin has been reversed since the third quarter of 2010. From mid-2010 to end-2012, rent levels for non-Dublin apartments have been in the region of €50 per month, or 7 per cent, less than rent for non-Dublin houses. For rental properties in Dublin, the spread of house over apartment rents has been higher since early 2010, indicating a larger percentage fall from peak for apartments than for houses. Overall, the figures show the rental market went through a period of considerable correction between 2008 and 2011, while broadly stable conditions subsequently emerged during 2012.

Figure A.7: *Mean Rent for non-Dublin Total, non-Dublin Houses and non-Dublin Apartments*

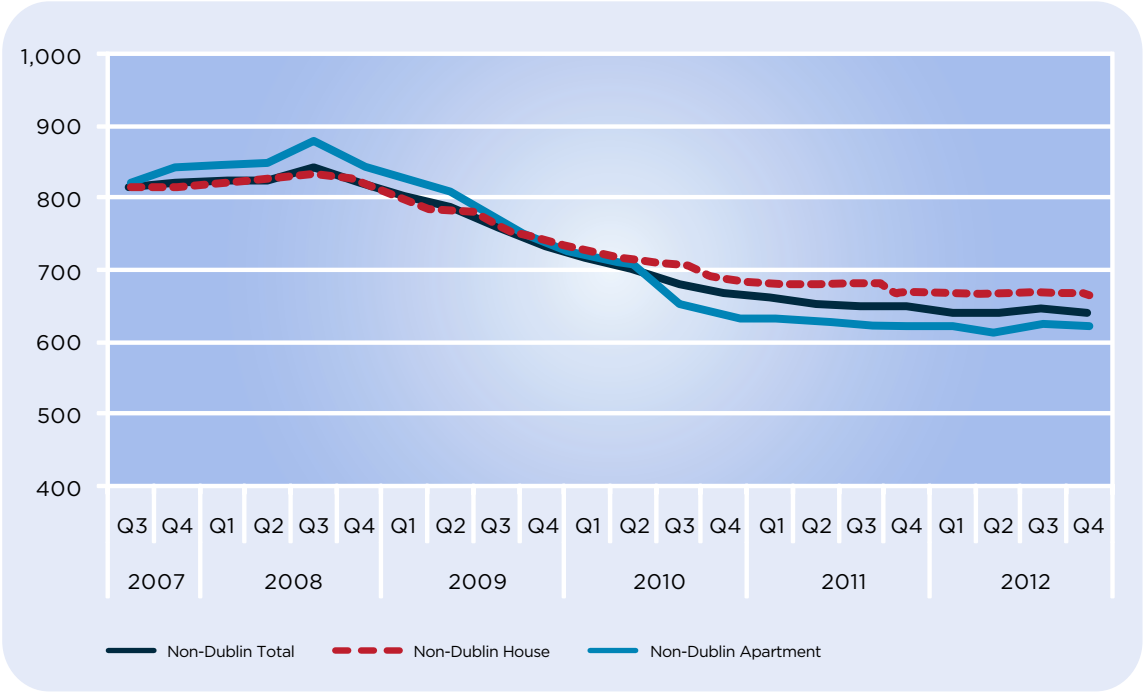
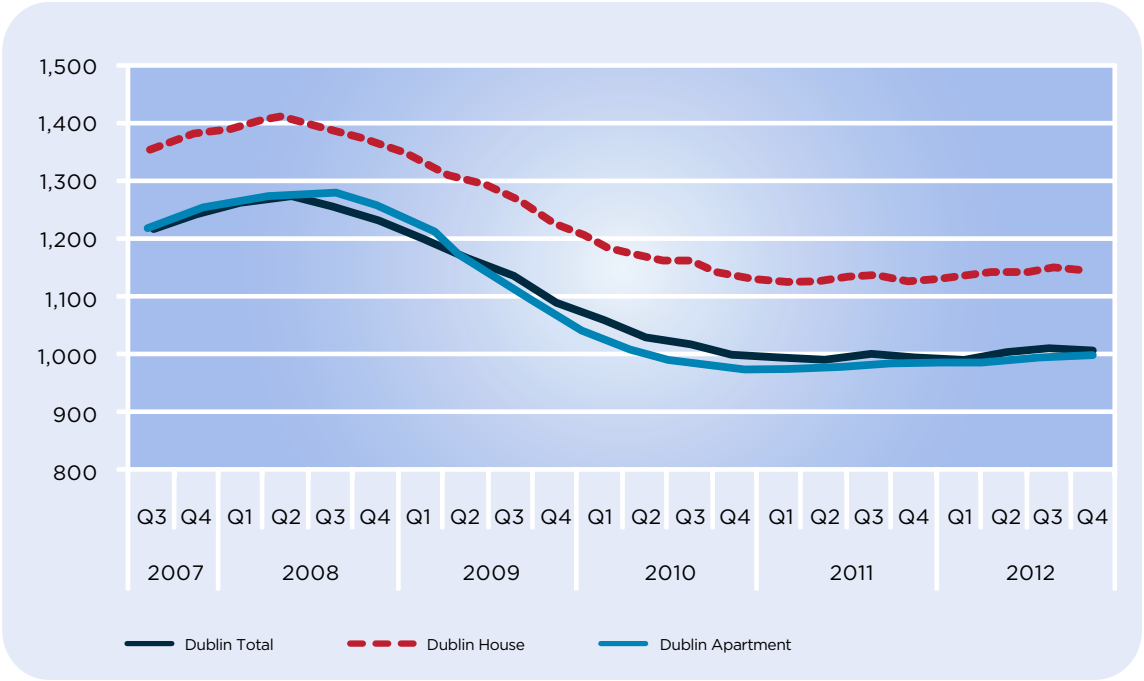


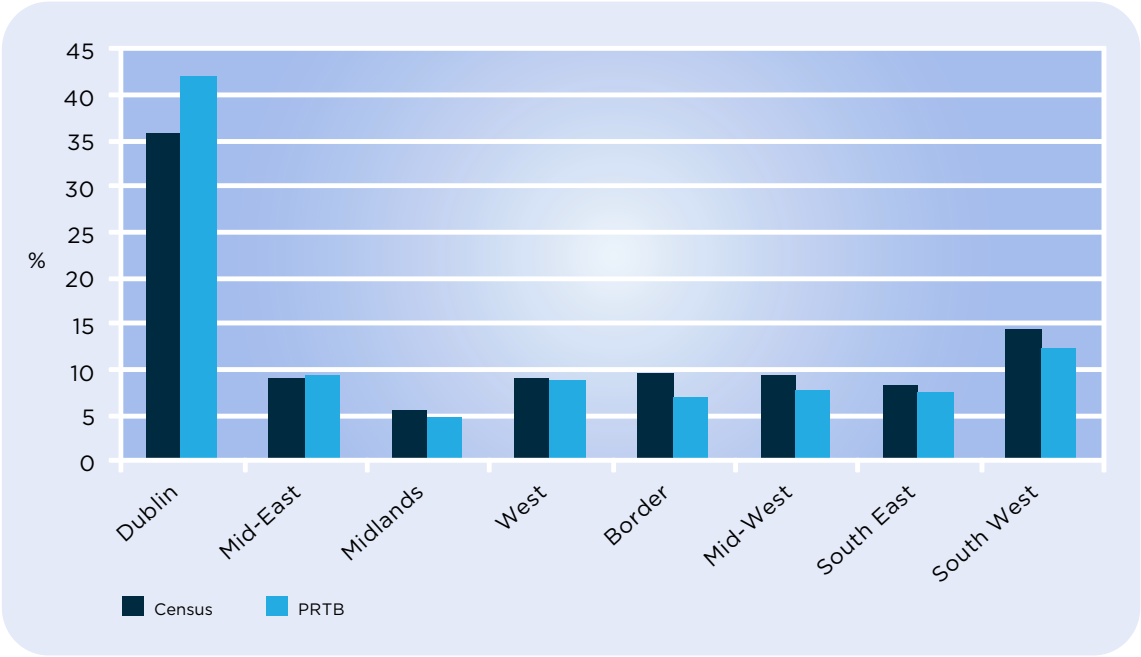
Figure A.8: *Mean Rent for Dublin Total, Dublin Houses and Dublin Apartments*



A3. The Sample

If a measure of rents constructed using the PRTB data is to reflect movements in rents in the overall market, it is necessary that the PRTB data is representative of the rental market as a whole. In order to assess this we can compare the PRTB data to data published as part of Census 2011[6]. It can be seen in Figure A.9 that the Dublin region is somewhat over-represented in the sample. This may reflect misinterpretation of or households declining to answer the Census questions on homeownership. Under-representation may be due to landlords not registering or being unaware of the need to register with the PRTB.

Figure A.9: *Distribution of rental properties by Region*



Note: PRTB data is for quarter 2, 2011 to compare to Census 2011.

Table A.6 shows the distribution of rented properties by property type and the average rent. As can be seen the PRTB sample is more heavily concentrated in detached houses and in apartments, flats and bedsits, while showing a smaller proportion of semi-detached dwellings. Despite this the average weekly rent for semi-detached houses and apartments is very similar. However, the average weekly rent for detached and terraced houses is higher in the PRTB sample.

6 Central Statistics Office, 2012, Profile 4: The Roof over our Heads, August.

Table A.6: Distribution of and Average Weekly Rent by Property Type

	Census 2011	PRTB		Census 2011	PRTB
	Distribution by property type			Average weekly rent	
	%	%		€	€
Detached	18.3	26.0		160	185
Semi-detached	27.7	10.0		171	171
Terraced	17.1	14.8		176	191
Apt.,Flat etc	36.8	49.1		147	144
	100	**100**			

Note: Census data for properties rented from a private landlord. Census 2011 data are April 2011, PRTB data are for quarter 2, 2011.

The distribution of average rents may well provide some explanation as to the differences in average weekly rent. The data suggests that the PRTB sample does not contain as many low rental properties as the Census data, see Table A.7. A similar pattern is evident of detached and terraced houses, the PRTB sample has a higher proportion of more expensive properties than in the Census.

Table A.7: Distribution of Average Weekly Rent

	Census 2011	PRTB
Weekly Rent		
Under 25 (Euro)	1.1	0.1
25 - < 50 (Euro)	2.8	0.4
50 - < 100 (Euro)	10.6	7.3
100 - < 150 (Euro)	28.1	26.4
150 - < 200 (Euro)	27.2	30.6
200 - < 250 (Euro)	16.2	18.9
250 - < 300 (Euro)	7.7	9.5
300 and over (Euro)	6.3	6.9
Total rented dwellings (Number)	**100.0**	**100.0**

Note: Census data for properties rented from a private landlord. Census 2011 data are April 2011, PRTB data are for quarter 2, 2011.

In spite of the variations the PRTB sample appears to be sufficiently comprehensive to provide a suitable base for constructing hedonic rent indices that reflect the rental market as a whole.

Over the period under review (quarter 3, 2007 to quarter 4, 2012) the most commonly rented dwellings were apartments, followed by detached houses. The most common property sizes have also remained unchanged with two bedrooms being the most popular, followed by three bedrooms, however, for houses specifically three bedrooms are the most popular.

A4. Hedonic Indices

One of the challenges faced when measuring changes in prices is to take account of the impact that a change in the composition of goods sold in a period can have on the price level. Even if all rents remained unchanged over a time period, the average rent would change if the mix of properties rented changed.

The need to mix-adjust so that a measure of "pure" price change is constructed has lead to extensive use of the hedonic regression methodology. The methodology used is based on the hedonic approach. The hedonic technique is based mainly on work by Griliches (1971) and Rosen (1974). According to Rosen "Hedonic prices are defined as the implicit prices of attributes and are revealed to economic agents from observed prices of differentiated products and the specific amounts of characteristics associated with them."

Thus,

$$P_{it}=f(A_{1it},A_{2it},.....A_{jit})$$

where, Pit is the price of ith dwelling in period t, and A1it, A2it,.....Ajit are the quantities of attributes 1, 2, ...j, possessed by the ith dwelling in time period t. The implicit prices are generated by regressing the product price on its characteristics.

This methodology has been extensively used to measure house price change both internationally and in Ireland. However, it has also been applied to the rental market (see Lyons 2012, Hoffmann and Kurz, 2002).

What is Hedonic Regression?

Hedonic regression, in economics, is a method of estimating demand or prices. It decomposes the item being researched into its constituent characteristics, and obtains estimates of the value of each characteristic. In other words, it is based on the hypothesis that products can be treated as bundles of characteristics and that prices can be attached to each characteristic. For example a house may be valued according to such components as the number of bedrooms, floor area, the age of the house and its location. It is usually estimated using ordinary least squares (OLS) regression analysis. The characteristics may be non-numeric attributes that are represented by dummy variables. The regression coefficients are treated as estimates of the contributions of the characteristics to the overall prices.

The Variables

The rent paid for a dwelling can be influenced by a wide range of variables. While not all the variables are captured in the sample, the PRTB dataset does contain variables that can be used as explanatory variables to explain variation in rents. The variables can be grouped into the following: size, dwelling type, location and other characteristics.

Dwelling size

The PRTB registration form contains a number of variables that could be used as a measure of size: the floor area of the dwelling, the number of bedrooms, number of occupants and number of bedspaces. However, an analysis of the data indicated that for a number of these variables there is a problem with how they are interpreted. For example, does a double bed represent one or two bedspaces, or does the number of occupants include, for example, young children? In addition it is evident that the floor area is reported as either square metres or square feet, but no indication of which is reported is available. Based on the analysis it has been decided to use number of bedrooms as a measure of dwelling size.

Dwelling type

The data includes dwelling identifiers for semi-detached, detached, terraced, maisonette, apartment, flat and bedsit. Using this data, dummy variables are constructed for the different types of dwellings, with maisonette, flat and bedsits grouped into a single variable "other property". The PRTB registration form also requires the landlord to indicate, when the property being rented is a house, if the property is the whole house or part of the house. A dummy variable is constructed to control for this.

Location

Properties are registered with full address, including local authority. In the case of Dublin city location includes city postcode. Rents are calculated for the country as a whole, Dublin, and outside Dublin. For the Dublin regressions location is identified by postcode and by a dummy variable identifying Dublin locations outside Dublin City, based on local authority, for example South County Dublin. In the National regressions location is captured by a dummy variable identifying the planning region in which the property is located, (if outside Dublin), and by the local authority if located in Dublin. We separately identify urban areas outside Dublin based on local authority (Galway, Waterford, Limerick and Cork). Similarly, for the regressions that measure rents outside Dublin, location is captured by the planning region dummy variables.

Other Characteristics

The PRTB registration form aims to capture additional details about the tenancy. For example, landlords registering their property are asked to indicate charges incurred by the tenant (Electricity, Oil, TV licence, Waste, Gas, Other) subletting (Y/N), BER Certificate (Y/N), BER Rating (Y/N), length of lease, deposit amount, frequency of rent (weekly, monthly, annually) and if the rent applies to whole of house or part of house. In reality most of this information is not provided by landlords when registering and has only been completed in a small proportion of cases. This limits the number of other characteristics that can be used as explanatory variables. However, as an additional location explanatory variable we construct a dummy variable taking the value of 1 if there is a third level institution located in the local authority.

Table A.8: *Summary of Variables Used*

Variable	Description
Rent	Monthly rent. Log of monthly rent used in regressions
Number of bedrooms	Dummy variable: 1 Bed, 2 Bed, 3 Bed, 4 Bed, 5 bed plus
Dwelling type	Dummy variable: Detached, Semi-detached, Terraced, Apartment, Other property (flat, maisonette, bedsit)
Part	Identifies if rented house is whole or part of house
Number of tenants	Dummy variable: 1, 2, 3, 4 plus
Tenancy length	Dummy variable: 1-6 months, 7-9 months, 10-12 months, Over 12 months
Rent Frequency	Dummy Variable: Weekly, Fortnightly, Monthly, Quarterly, Annual
Location	Dummy Variable: Dun Laoghaire-Rathdown, Fingal, Dublin city, South Dublin, Other City, Midlands, Mid-East, Mid-West, West, Border, South-East, South West
Record type Third level	Dummy variable indicating the presence of a third level institution in the local authority.

A5. Constructing the Indices

Having identified outliers, imposed the threshold for the number of bedrooms, the next stage is to run hedonic regressions. Following international practice the dependent variable is the log of the monthly rent for the dwelling. The explanatory variables are entered as a series of dummy variables. For each characteristic group one dummy variable is omitted to avoid multicollinearity[7]. As is the norm internationally the omitted dummy variable is the most frequent. Thus, the equations calculate the difference in the price of each transaction for that of a reference dwelling.

A number of alternative hedonic methodologies exist[8]. One approach is to run a separate hedonic regression for each time period. This has the advantage of allowing the implicit price for each characteristic to vary over time but requires large amounts of data and so may become unreliable if the volume of transactions becomes very low. In addition the need to run a regression for each time period is time-consuming, particularly if data is to be revised over a long time series.

An alternative is to include time dummy variables in the hedonic regression. In this case the characteristics variables capture the changing mix of properties between time periods while the time dummies capture changes in the price or rent of a constant quality representative dwelling. A mix adjusted index is then calculated based on the time dummy coefficients. An assumption of this approach is that the implicit price of characteristics remains constant over time.

In constructing the rent index we follow the practice of the Central Statistics Office when constructing the Residential Property Price Index and use the rolling time dummy hedonic regression model. The PRTB rent index is constructed using quarterly time dummies. In each regression a dummy variable is added for the most recent quarter and the "oldest" time dummy is dropped. This is a variant of the time-dummy method and has the advantage of keeping the coefficients relatively up-to-date while still using pooled data.

In general the equations are found to explain approximately 50 per cent of the rent paid. It is worth noting that for some of the sub-indices the proportion explained declines to between 30 and 40 per cent. This is particularly the case for sub indices by location. In view of the limited number of explanatory variables we are able to use and the cross-sectional nature of the data this can be regarded as satisfactory. The coefficients for individual variables are fairly consistent over time, have the expected signs and in most cases are significant at a 95 per cent confidence level in all equations. When a sufficiently long data series exists, and given the peak in the third quarter of each year, the seasonality of the data can be assessed and a seasonally adjusted index introduced if necessary.

7 Multicollinearity arises if some or all of the explanatory variables are highly correlated with one another. If it is present the model has difficulty telling which explanatory variable is influencing the dependent variable.

8 These are discussed in Conniffe and Duffy (1999).

Table A.9 provides an example of the regression results for the national market for each quarter of 2009. All the time dummy variables are not shown, only the relevant variable for each time period. The coefficients are broadly stable over time and generally have the expected sign. For example, rent for a 1 bed property is lower than for a two bed property, and rent increases as the number of bedrooms increase.

Table A.9: *Regression Results, National Market, 2009 Q1 to 2009 Q4*

	Coefficient	t Value	Coefficient	t Value	Coefficient	t Value	Coefficient	t Value
Intercept	6.689	1711.6	6.682	1773.6	6.626	1856.3	6.626	1845.6
1 Bedroom	-0.219	-79.9	-0.218	-82.5	-0.213	-81.1	-0.205	-79.9
3 Bedrooms	0.089	33.7	0.091	35.7	0.086	34.5	0.085	34.4
4 Bedrooms	0.174	49.5	0.180	52.8	0.169	50.8	0.171	51.5
5 bedrooms	0.191	29.9	0.195	31.5	0.229	39.2	0.243	40.7
Detached	-0.047	-16.5	-0.045	-16.2	-0.030	-10.9	-0.029	-10.9
Semi-Det.	-0.056	-14.1	-0.051	-13.2	-0.033	-8.7	-0.024	-6.3
Terrace	-0.043	-14.2	-0.039	-13.4	-0.026	-9.1	-0.022	-7.9
Other Property	-0.346	-88.1	-0.342	-88.6	-0.328	-84.5	-0.291	-70.4
Part House	-0.155	-17.1	-0.151	-17.1	-0.141	-16.5	-0.135	-16.1
2 Tenants	0.052	26.8	0.053	28.1	0.054	29.2	0.051	27.9
3 Tenants	0.092	26.0	0.090	26.1	0.097	29.7	0.094	28.7
4 Tenants	0.084	18.9	0.082	19.0	0.112	27.8	0.122	30.3
1-6 mths tenancy	-0.036	-13.2	-0.041	-15.1	-0.052	-18.8	-0.058	-21.5
7-9 mths tenancy	-0.064	-12.2	-0.067	-13.1	-0.079	-18.9	-0.094	-21.2
Over 12 mths tenancy	-0.100	-37.0	-0.086	-33.1	-0.078	-30.3	-0.058	-22.7
Fortnightly rent	-0.090	-7.1	-0.074	-5.7	-0.077	-6.0	-0.038	-2.7
Yearly rent	-0.632	-13.2	-0.681	-13.5	-0.470	-9.7	-0.438	-8.7
Quarterly Rent	1.063	114.5	1.081	117.9	1.148	156.9	1.154	122.7
Dun Laoghaire Rathdown	0.582	117.7	0.573	119.5	0.553	115.9	0.537	113.1
South County Dublin	0.015	3.6	0.013	3.4	0.010	2.6	-0.003	-0.7
Fingal	-0.028	-7.4	-0.031	-8.6	-0.036	-10.1	-0.041	-11.9
Other City	-0.353	-113.8	-0.349	-115.9	-0.343	-117.3	-0.349	-119.6
Border region	-0.319	-78.8	-0.322	-81.4	-0.333	-85.5	-0.334	-87.1
West region	-0.126	-23.9	-0.124	-24.0	-0.117	-22.5	-0.134	-25.7
Midlands region	-0.330	-72.7	-0.330	-74.6	-0.340	-76.6	-0.341	-79.0
Mid-East region	0.188	45.1	0.180	44.8	0.162	40.0	0.145	36.8
South-East region	-0.138	-30.8	-0.134	-30.9	-0.146	-33.8	-0.141	-33.5
South-West region	-0.042	-9.9	-0.035	-8.7	-0.062	-15.1	-0.041	-10.2
Mid-West region	-0.141	-26.7	-0.141	-27.5	-0.135	-26.8	-0.121	-24.0
Application type	-0.024	-8.5	-0.022	-9.0	-0.023	-9.9	-0.020	-9.2
Third Level Institution	0.432	135.0	0.428	137.9	0.413	133.6	0.408	134.3
Time dummy	-0.096	-27.4	-0.137	-40.5	-0.108	-36.6	-0.148	-47.2
Adjusted R sq	0.5243		0.5284		0.5201		0.5178	

References:

André, C., 2010, "A Bird's Eye View of OECD Housing Markets", OECD Economics Department Working Papers, No. 746, OECD Publishing.http://dx.doi.org/10.1787/5kmlh5qvz1s4-en

Barham, G., 2004, "The Effects of Taxation Policy on the Cost of Capital in Housing – A Historical Profile (1976-2003)", Central Bank Financial Stability Report.

Central Statistics Office, 2012, Profile 4: The Roof over our Heads, August.

Conniffe, D. and D. Duffy, 1999 "Irish House Price Indices: Methodological Issues" Economic and Social Review, Vol.30, No.4, October.

Duffy, D., 2011, "User Cost and Irish House prices", Quarterly Economic Commentary, Special Article, Autumn.

Griliches, Z., 1971, "Hedonic Price Indices for Automobiles", in Z. Griliches (ed.), Price Indices and Quality Change: Studies in New Methods of Measurement, Cambridge: Harvard University Press.

Hoffman, J., and C. Kurz, 2002, "Rent Indices for Housing in West Germany 1985 to 1998", ECB Working Paper No. 116.

Lyons, R., 2012, "East, West, Boom and Bust: The Spread of House Prices and Rents in Ireland, 2006-2012"

O'Hanlon, N., 2011, "Constructing a National House Price Index for Ireland, Journal of the Statistical and Social Inquiry Society of Ireland, Vol. XL

Rae, D. and P. van den Noord, 2006, "Ireland's Housing Boom: What has Driven it and Have Prices Overshot?", OECD Economics Department Working Papers.

Rosen, S., 1974, "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition", Journal of Political Economy, Vol. 82, Issue 1.