HM Revenue & Customs

Evaluating the Impact of Stamp Duty Land Tax First Time Buyer's Relief

Anne Bolster

November 2011

HMRC Working Paper 13

Evaluating the Impact of Stamp Duty Land Tax First Time Buyer's Relief

Anne Bolster

HM Revenue & Customs

100 Parliament Street, London, SW1A 2BQ

November 2011

Abstract

Difference-in-difference and time-series regression analysis are employed to estimate the impact of stamp duty land tax first time buyer's relief. The impact on affordability for first time buyers and the policy's value for money are estimated. This is determined after controlling for other influences on the housing market. It allows estimation of deadweight – how many first time buyer transactions would have occurred anyway without the relief – and the estimation of how many additional first time buyers purchased a property due to the relief. The analysis concludes that the tax relief has not had a significant impact on improving affordability for first time buyers. It is estimated that most of the people who benefitted would have purchased property in the absence of the relief anyway. First time buyer transactions are estimated to be around 0-2 per cent higher than they would have been in the absence of the relief after controlling for wider economic and credit conditions.

1. Introduction

A temporary relief from Stamp Duty Land Tax (SDLT) for purchases of residential property up to £250,000 was introduced on 24 March 2010. The relief applies where the purchaser is a first time buyer (FTB) and intends to occupy the property as their only or main home. It is applied for transactions with an effective date (normally the date of completion) from 25 March 2010 to 24 March 2012. The relief raises the threshold for FTB at which SDLT is paid from £125,001 to £250,001. Non first time buyers have to pay a 1 per cent charge on the value of the property for purchases between £125,001 and £250,000.

The Coalition Agreement committed to review the effectiveness of the relief.[1] June Budget 2010 added that this review would take into account the policy's impact on affordability and value for money.[2] Budget 2011 confirmed the outcome of the review would be published in Autumn 2011.[3]

This paper details the empirical work that has been conducted by HM Revenue & Customs (HMRC) analysts to evaluate the impact of the relief against these criteria. Macroeconomic and credit conditions have a significant impact on the housing market. Therefore, time-series analysis is employed to estimate the impact of the relief over and above other influences on the housing market using a counterfactual. This allows estimation of deadweight – how many FTB transactions would have occurred anyway without the relief – and the estimation of how many additional FTBs purchased a property due to the relief.

---

[1] See: The Coalition: Our Programme for Government, p. 12

[2] See: *Budget 2010*, p. 49

[3] See: *Budget 2011*, p. 34

2. Background

2.1 Criteria for Evaluation

The objective of SDLT relief for FTBs is to help address problems of affordability faced by this group by reducing upfront transaction costs. The relief is reviewed against the following criteria:

- impact on affordability;

- value for money; and

- impact on the housing market

HMRC are monitoring the take-up and Exchequer cost of the FTB relief using administrative data from SDLT returns. While these data are sufficient for monitoring take-up, they do not allow us to answer fundamental questions about the effectiveness of the relief, which must be addressed in order to properly evaluate the policy. The key question is how many FTB transactions are estimated to be additional (i.e. due to the policy) versus how many are deadweight (i.e. ones that would have occurred anyway even without the relief).

Affordability is therefore evaluated in terms of the number of additional FTB residential property transactions due to the relief and by the impact on price. From this, value for money is evaluated by comparing the Exchequer cost with the number of additional transactions generated.

The impact on the housing market is determined primarily in terms of the direct impact of the relief on FTB transaction volumes and prices. The analysis does not examine the secondary effects of the relief in related markets. Whether the relief creates additional transactions or not, the tax relief makes the overall outlay of buying a house more affordable and could therefore be said to be a stimulus to the housing market. Nevertheless, the number of additional FTB transactions is the best measure of its effectiveness and is the one that is the focus of this paper.

There are potential wider indirect benefits of the relief such as stimulus to the non-FTB housing market if FTBs buy property sooner than they otherwise would have done. FTBs can play an important role by reducing the size of property

chains and therefore potentially reduce the risk of chains breaking down. These wider effects are harder to evaluate due to the range of other economic factors that impact on the housing market.

2.2 Relief Claims and Exchequer Cost

By the end of August 2011, the total number of residential property transactions where FTB relief was claimed stood at 118,000. On average, 22 per cent of all transactions in the price range each month are buyers claiming the relief as shown in Table 1.

Table 1 Volume of Residential Transactions in £125,001-£250,000 price range by Month (thousands)

Year	Month	Total Volume in Range	Volume Claiming FTB Relief	% of Transactions claiming FTB stamp duty land tax relief
2010	March	29	1	3
	April	31	5	16
	May	31	6	19
	June	38	9	24
	July	39	8	21
	Aug	35	8	23
	Sept	34	8	24
	Oct	34	7	21
	Nov	33	8	24
	Dec	34	7	21
2011	Jan	21	5	24
	Feb	23	5	22
	March	27	6	22
	April	29	6	21
	May	29	6	21
	June	35	6	17
	July	36	10	28
	Aug	32	8	25
Total			118	22 [1]

Notes:

Figures reflect latest count of completed transactions in the period. Rounding of data may cause totals to differ from sum of monthly figures

[1] Excludes March 2010 because relief only came into effect towards the end of March.

Part of the take-up figures are estimates after allowing for the use of a 'bucket' relief code on SDLT Returns in the first few months before the official FTB relief code was in place on the SDLT Returns form.

The Exchequer cost of the relief to the end of August 2011 totalled £210 million. For 2010-11 only, the figure was £150 million.

3. Methodology

Many factors affect transaction volumes and prices in the housing market. In order to obtain a reliable estimate of the impact of the FTB tax relief, it is important to control for other factors that affect the housing market in order to isolate the effect of the tax holiday. Difference-in-difference analysis is conducted as well as time-series regression analysis to estimate the impact of the relief.

3.1 Difference-in-Difference Analysis

Difference-in-difference (DiD) analysis provides an estimate of the additional impact of the relief over and above other influences on transactions volume and price. DiD analysis tests if there is a significant difference in transactions for FTBs buying within the relieved range compared to other buyer groups both before and after the policy change.

If the estimated difference between these buyer groups is the same both before and after the policy change then the relief is deemed to have no additional effect on transactions. If however, the difference was found to be higher after April 2010 in the relieved range, then this provides support to the hypothesis that the relief had an additional impact on transactions and improved affordability.

In the DiD analysis, FTBs are compared with non-FTBs buying in the same range. The DiD method goes some way in controlling for the effect of other influences on the housing market. This is because the non-FTB group acts as a form of comparison group, allowing us to strip away general economic influences that affect both FTBs and non-FTBs. The method is explained further in section 3.4.

3.2   Time-Series Regression Analysis

The time-series regression analysis uses a variety of comparison groups:

- non-FTBs in the same price range;

- FTBs purchasing property below £120,000; and

- FTBs in the £300,001-£500,000 price range.

The difference between these groups is compared after controlling for the impact of macroeconomic and credit conditions such as GDP growth, non-property disposable income, mortgage interest rate, loan-to-value ratio and income multiple.

The method goes some way in controlling for the effect of other influences on the housing market. This is because the non-FTB group and the FTBs in other ranges act as a form of comparison group, allowing us to strip away general economic influences that affect both FTBs and non-FTBs. In addition to this, buyer-specific credit conditions faced by FTBs and non-FTBs are netted off as these are known to be different across the two groups.

A number of specifications of the time-series regressions are tested in order to assess the robustness of the headline result. As will be detailed in section 4, after controlling for economic and credit conditions our results explain a high proportion of the variation in transactions (around 87 to 98 per cent of the variation in transactions is explained in the national level analysis).

The confidence that can be placed on the estimates depends on the suitability of the comparison groups and quality of the controls. Here the month to month change in FTB transactions in the £125,001 to £250,000 range is highly correlated with transaction volumes for the three comparison groups. Correlation coefficients range from 80 per cent to 98 per cent even before introducing relevant controls (see Annex Table A1). This method is explained further in section 3.5
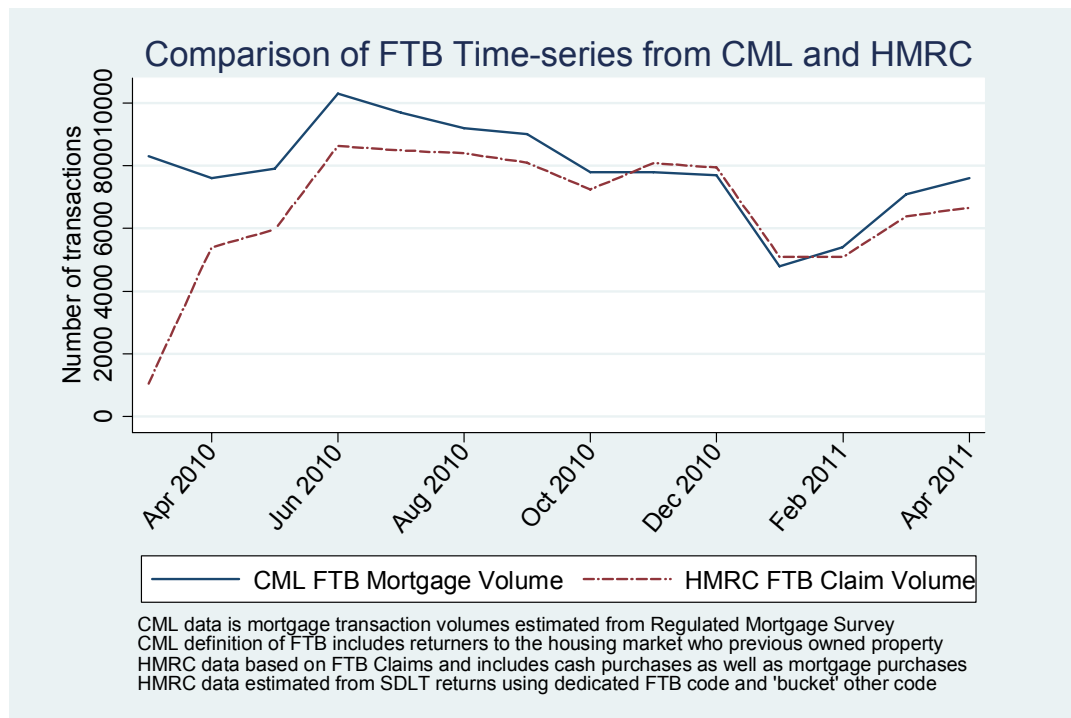
3.3   Data Source

Council of Mortgage Lenders' (CML) data are used to conduct the analysis. Monthly data for transaction volumes and prices have been obtained to allow modelling at UK level and at Local Authority level. CML data are required because it is disaggregated into FTB and non-FTB prior to April 2010 as well as after April 2010, which is not the case with HMRC SDLT data.

There are differences between CML and HMRC data on FTB that should be noted. Firstly, CML data covers transactions backed by a mortgage only, whereas the HMRC data covers all relevant FTB transactions, including cash purchases.[4] Secondly, the CML data are grossed estimates based on mortgage transactions from the Regulated Mortgage Survey (RMS). The RMS draws from statutory product sales data reported to the Financial Services Authority (FSA) and covers around 90 per cent of the total mortgage market. Thirdly, CML's definition of FTB includes a category of buyers ineligible for SDLT relief: namely returners to the housing market. Finally, there may be timing differences between the two series as mortgages will be approved before property transactions are completed.

The difference between CML and HMRC data are not thought to cause significant issues for the evaluation because what is important for estimating a 'true' additional impact is that CML FTB volumes have a stable relationship with FTB volumes claiming the relief. CML and HMRC time series are highly correlated since June 2010 – the correlation coefficient is 0.93. This is supported by Chart 1 below which shows close movement between the two series, particularly since October 2010.

---

[4] On the plus side, certain types of loans are not reported in the RMS, most significantly buy-to-let and further advances. This exclusion assists our analysis which is primarily focussed on first time buyers and thus excludes buy-to-let and those with pre-existing mortgages.

Chart 1   *Time-Series of Transaction Volumes: CML and HMRC Data*

Comparison of FTB Time-series from CML and HMRC

CML data is mortgage transaction volumes estimated from Regulated Mortgage Survey
CML definition of FTB includes returners to the housing market who previous owned property
HMRC data based on FTB Claims and includes cash purchases as well as mortgage purchases
HMRC data estimated from SDLT returns using dedicated FTB code and 'bucket' other code

Timing differences between the two series are not thought to cause significant issues for the evaluation. Indeed, movements in CML and HMRC data are highly correlated.

On a separate note, Chart 1 suggests that significant proportions of FTB did not claim the relief that they were due in the first two months of the relief, as the HMRC FTB claims data are significantly below the FTB mortgage volumes reported by CML.

3.4   *Difference-in-Difference Estimation - Transactions*

There are two distinct periods that can be incorporated into the analysis: the period before April 2010 when the relief was not in place and the period after April 2010 when the relief was applied. This can be illustrated using a stylised example:

7

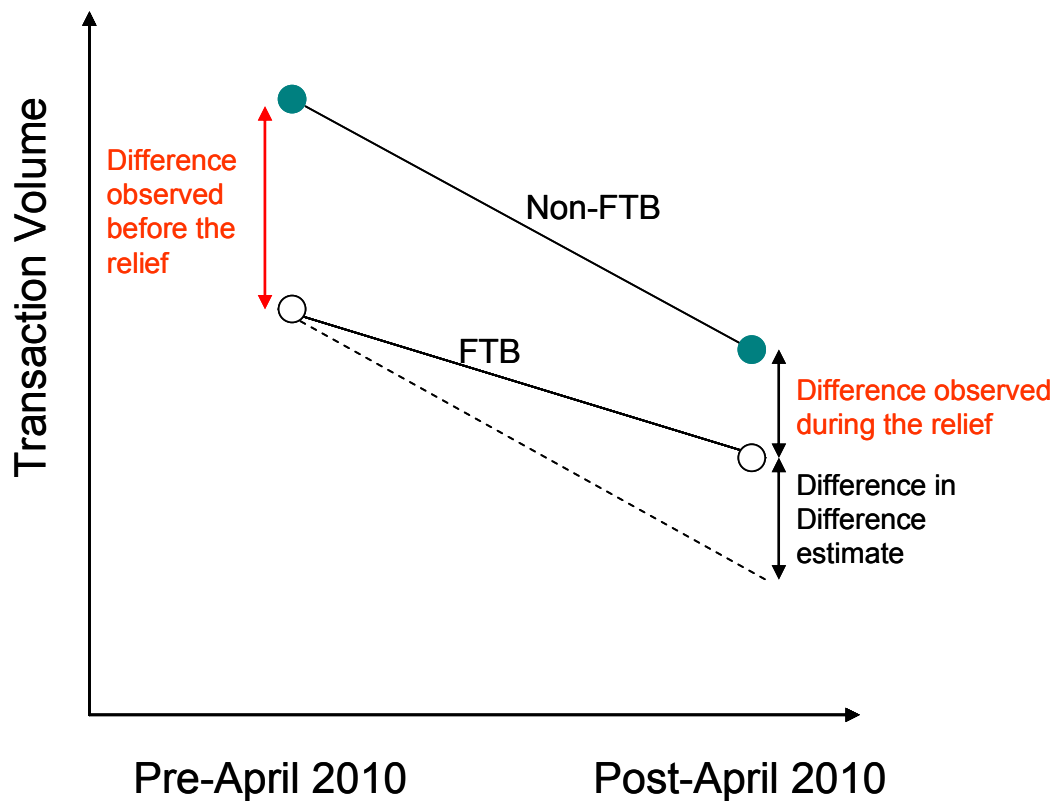*Chart 2   Description of Difference-in-Difference Estimation*

Chart 2, above, shows the transaction volumes for FTB and non-FTB over time for a stylised example of falling transaction volumes for both groups. It, compares the pre and post-April 2010 volumes. The difference in volumes between the two buyer groups prior to the relief is shown on the left-hand side of the chart. Moving across to the right-hand side, this pre-intervention difference is projected forward in order to obtain an estimate of what the FTB transaction volume might have been had no relief been granted. The difference observed during the relief is then taken away from the pre-intervention difference to obtain the DiD estimate.

Table 2 shows these basic principles of DiD analysis applied to the UK level data. It shows the mean monthly transactions of FTBs purchasing property in the £125,001 to £250,001 price range during the 'treatment' period of after April 2010 and compares this to the mean prior to April 2010. The table compares the 13-month period prior to the relief being introduced with the 13-month period from April 2010 to April 2011.

Table 2   Difference-in-Difference Analysis – UK Level[5]

	Before April 2010	After April 2010	Difference between periods
FTB in £125,001 - £250,000 price range	8600	7800	-800
non-FTB in £125,001 - £250,000 price range	14300	13300	-1000
Difference between groups	-5700	-5500	**200**
Estimate of Additional Transactions			**200**
Estimate of Percentage Increase			**2.6**

Sample is 13 month period before April 2010 (March 2009 - March 2010) and 13 month period during relief (April 2010 - April 2011). Figures rounded to nearest hundred

The difference in mean monthly transactions for FTBs is a decrease of 800. But what would have happened had there been no relief? In order to distinguish wider impacts of economic and credit conditions on the housing market from the impact of the SDLT relief, non-FTBs buying in the same range are used as a baseline. Prior to the relief, the level of FTB transactions was on average 5,700 lower than the number of non-FTB transactions. DiD assumes that this pre-intervention difference between FTB and non-FTB would have been the same after April 2010 had the FTB relief not been in place.

This assumes that non-tax impacts on the two buyer groups are the same over the two periods and that the only difference between the two groups is that one group benefitted from an SDLT relief whereas the other did not. FTB transactions in the absence of the relief are therefore estimated to be 7,600 transactions, which is derived by as follows: 13,300 (the observed number of mean monthly non-FTB during the relief); minus 5,700 transactions (the pre-intervention difference between non-FTB and FTB). This comes to approximately 7,600 transactions.

The difference between 7,800 transactions (FTB transactions after April 2010 with the relief) and 7,600 transactions (the estimated FTB transactions after April 2010 had the relief not been granted) is 200 transactions. So the number of genuinely additional FTB transactions due to the relief is estimated at 200 transactions per month. This equates to a 2.6 per cent additional transactions

---

[5] The UK-level difference-in-difference analysis and the figures of Table 2 can be represented as a regression as shown in Annex Table A3.

due to the relief compared to what is estimated would have been the case had there been no relief.

The above analysis was repeated at Local Authority (LA) level in order to take account of differences in local housing market characteristics across LAs. Comparing the 13 month period prior to the relief (March 2009 to March 2010) with the 13 month period after the relief (April 2010 to April 2011), the estimated additional transaction per LA is 0.4 transactions per month (see Table 3a). This equates to 2.2 per cent additional transactions due to the relief compared to what is estimated to have been the case had there been no relief.

Table 3a   Difference-in-Difference Analysis – Local Authority Level

	Before April 2010	After April 2010	Difference between periods
FTB in £125,001 - £250,000 price range	20.8	18.9	-1.9
non-FTB in £125,001 - £250,000 price range	34.9	32.6	-2.3
Difference between groups	-14.1	-13.7	**0.4**
Estimate of Additional Transactions per LA			**0.4**
Estimate of Percentage Increase			**2.2**

Sample is 13 month period before April 2010 (March 2009 - March 2010) and 13 month period during relief (April 2010 - April 2011). Figures rounded to nearest hundred. Allows for different time-trend, pre-intervention FTB to nonFTB difference and post-intervention difference across LA. 5317 observations

This simple example is however rather crude in that it computes the mean transaction over two fairly long time periods of time (pre-April 2010 and post-April 2010). Many economic variables such as GDP, income expectations, the cost of borrowing, mortgage availability will be driving the month to month change in transaction volumes. There is also no control for the previous SDLT holiday in effect for transactions below £175,000 from September 2008 to December 2009. There will therefore be a high variation in transaction volumes around the mean value and this DiD estimate could not be reliably attributed as being entirely due to the relief without further controlling for these other factors.

This is confirmed by sensitivity analysis (Table 3b) across the March 2009 to April 2011 period which shows that the estimated impact of the relief using this

mean DiD analysis varies from -6% to 17% additional transactions.[6] As a result, time-series regression analysis is employed as shown in section 3.5 to control for other factors that may be driving transaction volumes.

Table 3b   Difference-in-Difference Analysis – Local Authority Level – Sensitivity Analysis Across Periods

Period	Before Period	After Period	Estimate of Additional Transactions per LA	
			Volume	%
Whole Period	March 2009 - March 2010	April 2010 - April 2011	0.4	2.2
Part Period Comparison	March 2009 to August 2009	April 2010 - October 2010	-1.3	-5.9
	March 2009 to August 2009	Nov 2010 - April 2011	2.1	15.0
	Sept 2009 to March 2010	April 2010 - October 2010	-1.1	-4.8
	Sept 2009 to March 2010	Nov 2010 - April 2011	2.4	17.2

3.5   Time-Series Regression Analysis - Transactions

Regression analysis is employed to attribute monthly dynamics in transaction volumes to monthly/quarterly changes in macroeconomic and credit conditions and ensure that the impact of the relief is better isolated.[7] Monthly dynamics are analysed for four buyer types:

- FTBs buying in the relieved range;

- non-FTBs in the same price range;

---

[6]Tests of the stability of the pre-intervention difference in transaction volumes between FTB and non-FTB in the £125,001 - £250,000 price range over the April 2005 - March 2008 period also show variation in trends from -8 to 19 additional transactions, with the explained variation of transaction volume being less than 20 per cent.

[7] Some macroeconomic variables are only available on quarterly basis (e.g. GDP).

- FTBs purchasing property below £120,000; and

- FTBs in the £300,001-£500,000 price range.

Table 4 shows the controls used which include the cost of borrowing (building society mortgage interest rate) and GDP growth in order to capture income and GDP growth expectations of prospective buyers. Also included are three variables to capture various dimensions of the prevailing credit conditions: firstly quarterly UK net advances (£ million), and the median loan to value ratio and median income multiple in approved mortgage-backed transactions. Introducing controls that differentiate between the credit conditions faced by FTB and non-FTB is important because some of the difference in the decreases in mean transaction volumes (shown in Tables 2 and 3) could be due to the different sensitivity of these groups to credit restrictions.

Table 4   Variable Descriptions – Controls for Transactions Equation

Variable Name	Variable Description
lnrmort	Log Nominal quarterly average Building Society mortgage rate (repayment) % - Source: Office for National Statistics (code AJNL)
gr4_rgdp	GDP growth at market prices (real) – growth in current quarter over quarter in same quarter last year – Source: ONS (code ABMI)
lag_lnnetadvances_dwellings	Log (t-1) Quarterly Net Advances (£ million). This is lagged to take account of possible problems with endogeneity which would yield biased OLS regression results. – Source: CML table MM13
lnpercent_advance_bs	Log monthly Percentage Advance by buyer type (FTB and non-FTB) (median) – loan to value ratio Source: CML
lnincmult_bs	Log monthly medium income multiple by buyer type (FTB and non-FTB) (median) Source: CML

Variable Name	Variable Description
treat0809	Dummy to take account of SDLT holiday in operation for all residential properties with consideration to £175,000 from 3 September 2008 to 31 December 2009. This equals one for months from September 2008 to December 2009 and zero otherwise.
treat0809_ftb	Dummy to take account of the potentially different effect the September 2008 – December 2009 SDLT holiday had on FTB. This equals one for FTB transactions for months from September 2008 to December 2009 and zero otherwise.
Q2, Q3, Q4	Quarterly dummies to capture seasonal effects (quarters based on calendar year)

It should be noted that many factors potentially affect transaction volumes. The estimate of the impact of the relief is essentially a test to assess whether, after controlling for the major factors known to influence transaction volumes, the remaining size of the estimate is still sizeable enough to allow for either a conclusion that the relief may have had a moderate to large impact on additional FTB transactions or alternatively for a conclusion that the relief can have had at maximum only a small or insignificant impact.[8] Analysis of the sensitivity of the estimate to the set of controls is therefore important. This is in order to assess the degree of change in the estimate as each successive control is added and make a judgement on the likely maximum level of additional FTB transactions. As part of this, the set of controls captures the key simple known dimensions of

---

[8] The third potential conclusion – that the relief resulted in less FTB transactions than would have been the case in the absence of the relief (all other things equal) is not expected.

consumer behaviour[9] but are not an exhaustive list of possible controls – there needs to be a balance between under-fitting and over-fitting the regression equation to fit the data. Indeed, the estimates find that this small set of controls explains most of the variation of transaction volumes (98 per cent in the UK level analysis) which raises the confidence we can have in the results.

In summary, the basic regression equation for transaction volumes is as follows:

$$T_{jt} = \alpha_1 + dpr\_nonftb_j\alpha_2 + dpr\_u120k\_ftb_j\alpha_3 + dpr\_300k500k\_ftb_j\alpha_4 + FTBTREAT_{jt}\alpha_5$$
$$+ X_{jt}\alpha_6 + T_{j,t-1}\alpha_7 + TREAT0809_t\alpha_8 + Q2_t\beta_1 + Q3_t\beta_2 + Q4_t\beta_3 + \varepsilon_{jt}$$

[1]

The dependent variable T_{jt} is the log of UK monthly transaction volumes for buyer type j during month t. As discussed previously, there are 4 buyer types: FTB buying property within £125,001 to £250,000, non-FTB in the £125,001 to £250,000 price range; FTB buying under £120,000 and FTB buying property between £300,001 to £500,000. α and β represent the coefficients to be estimated and ε_{jt} is the error term

Table 5 further describes the explanatory variables. The *dpr* variables represent the difference in monthly transactions between FTBs in the £125,001 to £250,000 price range and each of the three comparison groups as detailed in Table 5. FTBTREAT represents the 'treatment effect' and is an estimate of the additional impact of the SDLT relief.

In the difference-in-difference method presented in section 3.4 a time trend is included for each buyer type (FTB and non-FTB). Meanwhile in this regression method, time-varying covariates aim to capture time-related influences that affect the different buyer types. The time-varying covariates include both

---

[9] That demand is affected by the cost of the good (in this case the cost of borrowing), that the level of income is important (captured by GDP growth in our analysis) and that credit constraints are important.

variables that are common to all buyer groups and some which are different for each buyer group (specifically the credit conditions). This aims to capture common trends and control for how trends may differ across the buyer groups.

Stability tests to ensure that the transaction dynamics of FTBs in the relieved range are the same as the other buyer groups prior to the intervention are accepted.

Table 5   Variable Descriptions – Transactions Time Series Parameters

Variable Name	Variable Description
dpr_nonftb	Dummy that equals 1 for non-FTBs in the relieved range and zero otherwise. The variable represents the difference in transactions between FTBs and non-FTBs in the relieved range (all other control variables held constant).
dpr_u120k_ftb	Dummy that equals 1 for FTBs in the under £120,000 price range and zero otherwise. The variable represents the difference in transactions between FTBs in the relieved range and FTBs in the under £120,000 price range (all other control variables held constant).
$dpr\_300k500k\_ftb$	Dummy that equals 1 for FTBs in the £300,000-£500,000 price range and zero otherwise. The variable represents the difference in transactions between FTBs in the relieved range and first term buyers in the £300,000-£500,000 price range (all other control variables held constant).
$FTBTREAT$	Denotes the treatment variable. It equals 1 for FTB transactions in the relieved range from April 2010 – March 2012 and zero otherwise.
X	Controls – explained in Table 4.

3.6   Taking Account of Geographic Variation

The analysis will first be conducted on monthly transactions for the whole of the UK, ignoring any differential impact across geographic areas. In order to test for the stability of the result, differences in housing market characteristics across Local Authority (LA) are accounted for by re-formulating the dependent variable of equation [1] to be monthly transactions by LA and including as an explanatory variables dummies for each LA. This LA-level estimate therefore takes account of time-invariant characteristics of LA in the analysis.

This formulation by LA also allows us to control for the difference in SDLT rates for properties bought in a disadvantaged area, ensuring that the impact of the FTB can be better isolated.

In addition to time-invariant characteristics of LA, it may be important to take account of time-varying local housing market characteristics such as population and dwelling stock. This data is however only available with considerable lag and population and dwelling stock are usually only reported on an annual basis making it difficult to see how this would improve the estimate of the more finely grained monthly DiD analysis. Conditioning on lagged transactions/price and controlling for time-invariant characteristics of LAs should in these circumstances control for heterogeneity across the UK in population density and dwelling stock.

3.7   Time-Series Regression Analysis - Prices

As for transactions, time-series analysis is employed to estimate the impact of the relief on prices paid by FTBs. This compares the average price in the £125,001 to £250,000 range paid by FTBs relative to that of non-FTB both before and after the relief is introduced to see if the average difference has changed after the relief was introduced. A variety of controls are added to see how sensitive the difference in price is to other factors that could be driving price changes. Controls include lagged monthly prices, seasonality factors and macroeconomic variables suggested by the economic literature such as non-

property disposable income, the mortgage interest rate and average income multiple in mortgage contracts.[10] As will be seen in section 4, other economic controls suggested by the literature such as GDP growth, measures of downside risk, and the unemployment rate were tested but ultimately rejected due to their unexpected signs. The type of economic controls used did not however affect the overall conclusion on the likely range of the impact of the relief on price.

The regression is tested at the UK level and also at LA level using panel data regression analysis to control for differences across LAs in housing market characteristics.

Price impacts are difficult to estimate. The data used is the average monthly price within the relieved price range by LA. Average price will be driven by changes in demand as well as composition changes in the type of property changing hands that month. If price impacts are very small or very localised, then price impacts may be difficult to detect.

Moreover, prior evidence does not give clarity on what price effect should be expected. If SDLT is capitalised into house prices, then the FTB relief has the potential to make affordability worse rather than better. Any price impact however depends on market expectations about whether the relief is permanent or temporary, and the relative bargaining power of buyers and sellers. This means that the a priori expected impact remains uncertain.

Table 6   Variable Descriptions – Controls for Price Equation

Variable Name	Variable Description
lnrincome_np	Log quarterly real gross (non-property) disposable income (£ million) constructed from ONS data series (codes NRJR, ROYL and D7BT).

---

[10] See: Muellbauer and Murphy (1997), Cameron et al (2006), Buckley and Ermisch (1982), Meen and Andrew (1998)

Variable Name	Variable Description
lnrmort	Log Nominal quarterly Building Society mortgage rate (repayment) %. Source: ONS (code: AJNL).
lnincmult_bs	Log monthly medium income multiple by buyer type (FTB and non-FTB) (median). Source: CML.
treat0809	Dummy to take account of SDLT holiday in operation for all residential properties with consideration to £175,000 from 3 September 2008 to 31 December 2009. This equals one for months from September 2008 to December 2009 and zero otherwise.
treat0809_ftb	Dummy to take account of the potentially different effect the September 2008 – December 2009 SDLT holiday had on FTB. This equals one for FTB transactions for months from September 2008 to December 2009 and zero otherwise.
Q2, Q3, Q4	Quarterly dummies to capture seasonal effects (quarters based on calendar year).

3.8 Sample Period

The regression equations are tested using monthly data from April 2005 to April 2011. Using a shorter sample period raises challenges with obtaining a sufficient sample size for the 'pre-intervention' period that has a reasonable number of months that are 'uncontaminated' with the effect of other policy changes – notably the SDLT holiday that was applied for all residential transactions (FTB and non-FTB) with consideration up to and including £175,000 from 3 September 2008 to 31 December 2009.

3.9   Movements of Transactions across Thresholds

The 'slab' structure of SDLT means there is a bunching of transactions under price thresholds where there the tax rate changes (and results in high marginal rates of tax). As can be seen from Chart 3a, which shows the distribution for 2009-10, there is a large spike in transactions just below £250,000 where the tax rate changes from 1 per cent to 3 per cent and a significant drop just above this price level. Similar patterns can be observed at £175,000, where the previous SDLT holiday raised the lower threshold to £175,000 until December 2010.

Chart 3a   Frequency Distribution of Residential Property Transactions in 2009-10 by Price (£100,000 - £300,000)
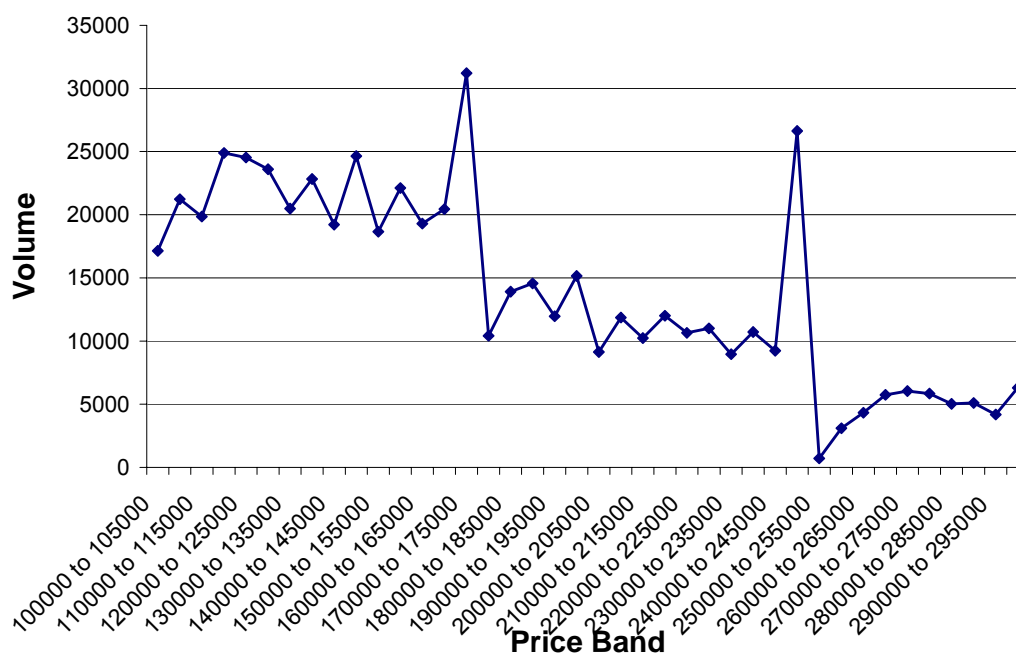
To demonstrate that bunching is sensitive to SDLT rates, Chart 3b presents the same distribution for the first quarter of 2010-11 (i.e. April to June). Compared to Chart 3a, this shows that the lower spike in transactions was observed just below £125,000 rather than at £175,000 as non-FTB purchases were subject to 1 per cent SDLT on property trading in the £125,001 to £250,000 price range.

Chart 3b   Frequency Distribution of Residential Property Transactions in 2010-11 Q1 by Price (£100,000 - £300,000)
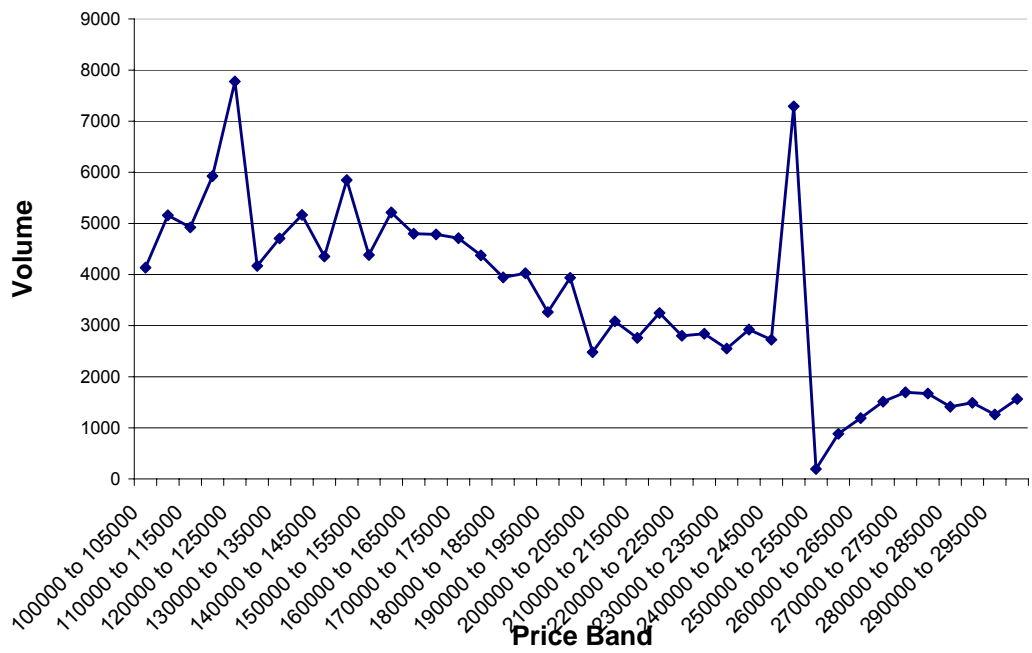
One of the expected effects of the FTB tax relief is to reduce trades just below the £125,000 threshold and increase those just above the threshold. Excluding trades just below the threshold may therefore over-estimate the impact of the FTB tax relief. Similarly, there may be an effect around the £250,000 threshold with a higher number of transactions occurring just below the threshold and a lower number just above it. Therefore, sensitivity analysis is conducted on the results by repeating the analysis for a slightly wider range of £120,000 and £300,000 and testing for evidence of movements of transactions across thresholds. The upper and lower bounds for the new range are based on analysis of the historic clustering of transactions around the relevant threshold.

4. Empirical Results

4.1   Impact on First Time Buyer Transactions

Table 7 below shows the estimated additional FTB transactions that occurred during the period for which the FTB relief was in effect (from April 2010) according to the type of economic and credit controls introduced. If no controls for economic and credit conditions are introduced, then FTB transactions in the

relieved range of £125,001-£250,000 are estimated to be around 40 per cent lower in the period after April 2010 than before the relief was introduced.

Table 7   Estimated Additional Transactions in £125,001 to £250,000 Price Range – UK level

Equation Type	%	Volume	Proportion of Transaction Variation Explained
Basic (no lagged dependent variable)	-40		
Basic (with lagged dependent variable)	-4	-4000	98
Plus Macro Controls	3	3000	98
Plus Macro Controls (excl GDP growth)	2	2000	98
Plus Credit Controls (LTV and Income Multiple)	1	1000	98
Plus 0809 holiday FTB interaction	3	3000	98
Plus seasonal variables	0	0	98

Comparison groups: FTB in under £120,000, £300,001-£500,000 and nonFTB in £125,00-£250,001/£120,001-£300,000

However the depressed macroeconomic conditions and lack of credit availability largely explains this large negative figure: once these are controlled for, FTB transactions in the relieved range are estimated to be only around 1 per cent higher than they would have been in the absence of the relief. The figure rises to 3 per cent when allowing for buyer specific differences of the previous 2008-09 holiday on transactions. However when controlling for the seasonality in transactions then the overall estimated effect of the relief on FTB transactions falls to 0 per cent.

Annex Table A2 shows the full regression results and shows that the regressions have acceptable diagnostics: the Mackinnon unit root test of the residuals is rejected at the 1% level of significance; the Durbin Watson null hypothesis of no serial correlation is accepted at the 1% level; and the validity of the set of controls applied is accepted by a likelihood ratio test at the 1% level of significance. In addition, the signs on the economic and credit controls are sensible: increases in the building society mortgage rate tend to reduce transaction volumes, improvements in credit conditions (i.e. increase in net advances in £million, average loan to value ratios and income multiple requirements) all increase the number of house purchases. The analysis overall

explains around 98 per cent of the variation in transaction volumes over the May 2005 – April 2011 period.

Robustness checks at LA level show a similar pattern in the estimated additional impact of the relief on FTB transactions in the relieved range as successive economic and credit controls are added. As shown in Table 8, the largest estimated impact (5 per cent) is found when seasonal factors are not controlled for. Once all controls are added, the **LA level analysis indicates a 2 per cent additional impact** (around 2,000 transactions)[11]. The LA regression will better capture differences in the housing market characteristics of LAs. However this regression explains a lower proportion of the variation in transactions than the UK level regression. The explained proportion, at 86 per cent, is still sizeable and the similarity in the pattern of estimated impacts by the type of control provides some support towards clarifying what the maximum and minimum ranges for the impact of the relief might be.

The estimated increase in additional FTB transactions due to the relief in the £125,001 to £250,000 price range ranges from 0% to 2% once all controls are added. This is equivalent to a 0 to 2,000 increase in transaction volumes over the period April 2010 to April 2011.

Table 8   Estimated Additional Transactions in £125,001 to £250,000 Price Range – Local Authority level

Equation Type	%	Volume	Proportion of Transaction Variation Explained
Basic (with lagged dependent variable)	-11	-11000	86
Plus Macro Controls	3	3000	86
Plus Macro Controls (excl GDP growth)	2	2000	86
Plus Credit Controls (LTV and Income Multiple)	2	2000	86
Plus 0809 holiday FTB interaction	5	4000	86
Plus seasonal variables	2	2000	86

Comparison groups: FTB in under £120,000, £300,001-£500,000 and nonFTB in £125,00-£250,001/£120,001-£300,000

---

[11] Regression results shown in Annex Table A4.

Sensitivity analysis across the different price ranges suggests that some of this increase inside the relieved range represents movements of FTB transactions across thresholds since there are changes in the relative level of 'bunching' under thresholds after the relief was introduced. Bunching in transactions under the 1 per cent threshold change tends to occur in the narrow £120,000 to £125,000 range. For the 3 per cent threshold, the 'low-trade' zone after £250,000 tends to extend to £300,000. Taking these price ranges, Table 9 analyses the relative level of FTB transactions to non-FTB transactions. The percentages show whether the actual level of FTBs relative to the FTB counterfactual[12] increased or decreased after the relief was introduced across all price ranges.[13]

*Table 9   Level of FTB Transactions relative to FTB Counterfactual –
Comparing Before and After SDLT FTB Relief was Introduced*

Price Range	%
Under £120,000	18
£120.000 - £125,000	2
£125,001 - £250,000	19
£250,001 - £300,000	2
£300,001 - £500,000	6
Over £500,001	7

Estimates after controlling for macroeconomic, credit conditions, seasonal dummies

The relative level of FTB transactions to the FTB counterfactual was broadly the same after the relief was introduced for the two price ranges immediately outside the relieved range[14] as the percentage difference is only 2 per cent. This is perhaps what might be expected given that FTB in these ranges did not benefit from a relief. However, when considering price ranges below £120,000 or over £300,000, it can be seen that the relative changes in FTB transactions were considerably higher than 2 per cent after the relief was introduced. It might

---

[12] The counterfactual is non-FTB transactions adjusted for the macroeconomic and credit trends (i.e. counterfactual after adjusting for common trends.) It is the assumption for what would have happened to FTB transactions in the absence of the relief.

[13] After controlling for macroeconomic, credit conditions and seasonality.

[14] i.e. £120,000-£125,000 and £250,000 to £300,000.

normally be expected that the difference should also be close to 2 per cent as for the £120,000 to £125,000 and £250,001 to £300,000 price ranges.

Instead, the percentage change at 18 per cent for the below £120,000 group is very similar to that in the relieved range (19 per cent), the increase in the difference dropping off as the price range exceeds £300,001. This suggests that some FTB transactions that would have been priced at £120,000 to £125,000 prior to the relief have tended to occur in the above £125,000 range relative to before the relief was introduced.[15] Similarly, this provides an indication that FTB transactions that would have been priced at £250,000 to £300,000 price range prior to the relief are tending to be priced at below £250,000 after the relief was introduced.

This provides some support to the hypothesis that properties that would have otherwise sold at just below the £125,001 threshold due to the SDLT liability are tending to sell above the threshold after the FTB relief was introduced. Likewise, this suggests that the tendency for transactions to bunch just below the £250,000 threshold is more acute for FTB after the relief was introduced. This is consistent with the fact that the relative increase in the tax rate due to the FTB relief is now greater for FTB at the £250,000 price (an increase of 0% to 3% relative to 1% to 3% before the relief was introduced) so there is more incentive for FTB transactions to bunch just below this price than before the relief was introduced.

Due to these factors, when transactions over the slightly wider price range of £120,000 to £300,000 are considered, the estimated additional FTB transactions reduce to a range of -1% to 1% where -1% represents the UK-level estimate and 1% represents the level after Local Authority housing market differences are controlled for.

Value for money appears to be low. Even considering the top end estimate of 1,000-2,000 additional FTB transactions across the 13 month period (April 2010

---

[15] Also see Table 3a and 3b which shows that house buyers do respond to changes in the SDLT thresholds as there are distinct changes in the level of bunching of transactions across the price range according to the prevailing SDLT rate thresholds.

to April 2011) the estimated cost to the Exchequer of the tax foregone is approximately £80,000 to £160,000 per additional transaction.

4.2 Impact on Prices Paid by First Time Buyers

The empirical results suggest that the FTB relief may have increased the average price paid by FTBs in the £125,001 to £250,000 by around 0.5-0.7 per cent when comparing against the average monthly price paid by non-FTB in the same price range.

Table 10 below shows the estimated impact across a number of different controls and shows that this result is relatively stable across the different equations. It can be seen that after controlling for average house prices in the previous month and the previous tax holiday in September 2008 to December 2010, FTB prices are estimated to have increased by around 0.7 per cent due to the relief. Once controls for the observed seasonal trends in house prices and other macroeconomic effects are added, then the estimated impact falls to 0.5 per cent. Controlling for differences in average price by LA hardly changes the estimate – the estimated impact is 0.7% for both the 'basic' controls and the more extensive controls. This model for house prices explains around 90-95 per cent of the variation in average price in the April 2005 – April 2011 period when considering the UK as a whole but explains a smaller proportion of the data, around 75 per cent when taking account of LA differences.[16] This is not surprising given the difficulty in modelling house prices but the stability of the estimated result across all specifications increases the confidence in the estimated result.

Annex Table A5 shows the full regression results for the UK and shows that the regressions have acceptable diagnostics: the Mackinnon unit root test of the residuals is rejected at the 1% level of significance; the Durbin Watson null hypothesis of no serial correlation is accepted at the 1% level; and the validity of the set of controls applied is accepted by a likelihood ratio test at the 1% level of

---

[16] Regression results shown in Annex Table A5 (UK Level) and Table A6 (Local Authority Level)

significance. It should be noted that a number of economic controls suggested by the literature were tested but as can been seen in Annex Table A5, these were ultimately rejected due to their unexpected signs. These include GDP growth and a number of variables capturing credit conditions (net advances in £ million). The type of economic controls used did not, however, affect the overall conclusion on the likely range of the impact of the relief on price.

The SDLT FTB relief of 1 per cent is therefore estimated to have increased FTB prices by 0.5-0.7 per cent on average implying that the majority of the relief was capitalised in higher prices. This is equivalent to stating that the post-tax outlay for buying property is estimated to have decreased by 0.3-0.5 percentage points after the relief was introduced.

Table 10   Estimated Impact of SDLT Relief on Average Prices paid by First Time Buyers in £125,000-£250,000 Price Range

Equation Type	Mean Difference		Proportion of Transaction Variation Explained
	%	Price £	
No controls for Local Authority Fixed Differences			
Basic - lagged prices	0.7	1300	0.90
Plus seasonal controls	0.7	1300	0.90
Plus macro controls	0.5	1000	0.95
Controls for Local Authority Fixed Differences			
Basic - lagged prices	0.7	1300	0.75
Plus seasonal controls	-0.2	-300	0.75
Plus macro controls	0.7	1200	0.75

Macro controls are: building society mortgage interest rate, real non-property disposable income, median income multiiple in mortgage contracts

5. Summary and Conclusion

The analysis concludes SDLT relief has not had a significant impact in terms of improving the affordability of residential property for FTBs. It is estimated that most of the buyers who benefitted from the relief would have purchased property in its absence anyway (i.e. are deadweight). FTB transactions in the relieved range are only estimated to be around 0-2 per cent higher than they

would have been in the absence of the relief after controlling for wider economic and credit conditions. The overall top-end estimated impact of the relief on FTB transactions is however lower at 1 per cent. This is because analysis of transactions across the different price ranges suggests that FTBs who would have otherwise bought at just below the £125,001 threshold due to the SDLT liability are tending to buy above the threshold after the relief was introduced. The number of additional transactions is therefore estimated to be closer to 0-1 per cent (1,000 additional transactions) once movements across thresholds are considered (i.e. substitution and displacement effects). The results are broadly comparable across the two modelling approaches set out in the paper.

Considering the impact on prices, after controlling for wider economic and credit conditions, SDLT relief of 1 per cent is estimated to have increased FTB prices by 0.5-0.7 per cent on average. This implies that the majority of the 1 per cent tax relief was capitalised in higher prices. It is equivalent to stating that the post-tax outlay for buying property is estimated to have decreased by 0.3-0.5 percentage points. The relief therefore appears to have had a small impact on reducing the overall outlay of buying a first home.

The cost of the tax relief was around £150 million in 2010/11. Taking account of the top end estimate of 1,000 additional FTB transactions across the 13-month period April 2010-April 2011, this represents an estimated cost to the Exchequer of approximately £160,000 per additional transaction in tax relief.

A high proportion of the variation in transactions, around 85-98 per cent, is explained by these results. While there are many influences on transaction volumes, our overall assessment from sensitivity analysis across all price ranges is that there is little evidence that FTB transactions within the relieved range, or the slightly wider £120,000 to £300,000 price range, are much higher relative to other comparable buyer groups after the relief was introduced compared to before the relief was introduced.

Although this study only covers the first 13 months of FTB relief, this is a period of time within which it is reasonable to expect the relief to have 'bedded down' and to have had its economic impact reflected in the data such that the conclusions of this evaluation study can reliably inform policymaking.

References

Buckley, R. and Ermisch, J. (1982), Government Policy and House Prices in the United Kingdom: An Econometric Analysis, Oxford Bulletin of Economics and Statistics, 47, 273-304.

Cameron, Muellbauer and Murphy (2006) "Was there a British house price bubble? Evidence from a regional panel", University of Oxford, Department of Economics Discussion Paper Series No 276, August 2006.

Meen, G. and Andrews, M. (1998), Modelling Regional House Prices: A Review of the Literature, Report Prepared for the Department of the Environment, Transport and the Regions, Centre for Spatial and Real Estate Economics, University of Reading.

Muellbauer and Murphy (1997) "Booms and Busts in the UK Housing Market", Economic Journal, 107:1701-27

Annex – Tables of Statistics and Regression Results

Table A1   Correlation of FTB Transactions in £125,001 - £250,000 Price Range with Other Price Ranges by Buyer Type – UK Level

	Price Range	Buyer Type	Correlation Coefficient
Transactions (Level)	Under £120,000	FTB	0.83
	£120.000 - £125,000	FTB	0.89
	£250,001 - £300,000	FTB	0.90
	£300,001 - £500,000	FTB	0.80
	Over £500,001	FTB	0.66
	£125,001 - £250,000	non-FTB	0.98
Log Transactions (Level)	Under £120,000	FTB	0.89
	£120.000 - £125,000	FTB	0.91
	£250,001 - £300,000	FTB	0.91
	£300,001 - £500,000	FTB	0.80
	Over £500,001	FTB	0.67
	£125,001 - £250,000	non-FTB	0.98
Log Transactions (Monthly Difference)	Under £120,000	FTB	0.87
	£120.000 - £125,000	FTB	0.88
	£250,001 - £300,000	FTB	0.81
	£300,001 - £500,000	FTB	0.77
	Over £500,001	FTB	0.45
	£125,001 - £250,000	non-FTB	0.97

Table A2   Unit Root Test of Log Transactions by Buyer Type and Price Range

Price Range	Buyer Type	Mackinnon unit root test p-value	
		Level	Monthly Difference
£125,001 - £250,000	FTB	0.17	0.00
Under £120,000	FTB	0.46	0.00
£300,001 - £500,000	FTB	0.39	0.00
£125,001 - £250,000	non-FTB	0.48	0.00

Table A3   *Transaction Volume Time-Series Regression Results: UK Level – £125,001-£250,000*

Transaction Volume by price range - Regression Results (Comparison Group is FTB in non-relieved price ranges) - level equation
Default category: Monthly transactions in £125,000 to £250,000 price range

VARIABLES	LABELS	(1) lntrans_didset_la	(2) lntrans_didset_la	(3) lntrans_didset_la	(4) lntrans_didset_la	(5) lntrans_didset_la	(6) lntrans_didset_la
lag_lntrans_didset_la	Log (t-1) Monthly mortgages approved	0.912***	0.817***	0.815***	0.811***	0.808***	0.708***
		(0)	(0)	(0)	(0)	(0)	(0)
dpr_125k250k_nonftb	Dummy for Monthly nonFTB transactions in £125,000-£250,000 price range	0.0475	0.115***	0.115***	0.192**	0.241***	0.260***
		(0.155)	(0.00248)	(0.00210)	(0.0188)	(0.00933)	(0.00407)
dpr_u120k_ftb	Dummy for Monthly FTB transactions under £120,000	-0.0362	-0.0470	-0.0472	-0.0496	-0.0388	-0.0771**
		(0.294)	(0.163)	(0.159)	(0.141)	(0.268)	(0.0256)
dpr_300k500k_ftb	Dummy for Monthly FTB transactions in £300,001-£500,000 price range	-0.212***	-0.427***	-0.432***	-0.443***	-0.437***	-0.692***
		(0.00744)	(1.71e-05)	(6.56e-06)	(7.38e-06)	(9.60e-06)	(4.81e-09)
ftbtreat	FTB Tax Holiday	-0.0297	0.00935	0.00646	-0.00282	0.00853	-0.00664
		(0.588)	(0.873)	(0.909)	(0.961)	(0.883)	(0.904)
treat0809	2008-2009 Tax Holiday	0.00744	0.0558	0.0601	0.0622	0.0203	0.00923
		(0.845)	(0.212)	(0.124)	(0.130)	(0.714)	(0.861)
treat0809_ftb						0.0850	0.0724
						(0.259)	(0.312)
lnrmort	Log Nominal Building Society mortgage rate (repayment) %		-0.657***	-0.652***	-0.672***	-0.680***	-0.983***
			(7.55e-05)	(7.00e-05)	(5.60e-05)	(4.56e-05)	(1.76e-07)
lag_lnnetadvances_dwellings	Log (t-1) Quarterly Net Advances (£m)		0.156***	0.154***	0.135***	0.129***	0.215***
			(1.84e-05)	(1.23e-05)	(0.000543)	(0.00110)	(2.27e-06)
lnpercent_advance_bs	Log Percentage Advance by buyer type (median)				0.378	0.556	0.307
					(0.266)	(0.138)	(0.393)
lnincmult_bs	Log Medium income multiple by buyer type (median)				0.105	0.0636	0.0949
					(0.770)	(0.860)	(0.783)
q2							0.144***
							(2.14e-07)
q3							0.134***
							(4.62e-05)
q4							0.144***
							(9.80e-06)
gr4_rgdp	GDP growth at market prices (real) - Source ABMI		-0.00117				
			(0.843)				
Constant	Constant	0.812***	1.272***	1.300***	-0.261	-0.915	0.671
		(0.00164)	(4.41e-05)	(2.69e-06)	(0.851)	(0.544)	(0.648)
Observations		288	288	288	288	288	288
R-squared		0.981	0.982	0.982	0.983	0.983	0.984
MacKinnon p-value for Residual unit root t		0.00	0.00	0.00	0.00	0.00	0.00
Durbin-Watson Stat		2.09	2.16	2.15	2.13	2.13	2.17
D-W Critical Value - 1%		1.71	1.75	1.74	1.77	1.78	1.84
LR test p-value - against previous eq.		-	0.00	0.84	0.51	0.25	0.00
F-test		2442	1728	1950	1557	1417	1236
No. regressors		6	9	8	10	11	14
Degrees of Freedom		281	278	279	277	276	273
Log Lik		104.2	114.2	114.1	114.8	115.5	131.8

pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table A4   Transaction Volume Time-Series Regression Results: Local Authority Level – £125,001-£250,000

Transaction Volume by price range and by Local Authority - Difference in Difference Estimation (Comparison Group is FTB in non-relieved price ranges) - level equation
Default category: Monthly transactions in £125,000 to £250,000 price range

VARIABLES	LABELS	(1) Intrans_didset_la	(2) Intrans_didset_la	(3) Intrans_didset_la	(4) Intrans_didset_la	(5) Intrans_didset_la	(6) Intrans_didset_la
lag_lntrans_didset_la	Log (t-1) Monthly mortgages approved	0.823***	0.809***	0.809***	0.810***	0.809***	0.803***
		(0)	(0)	(0)	(0)	(0)	(0)
dpr_125k250k_nonftb	Dummy for Monthly nonFTB transactions in £125,000-£250,000 price range	0.130***	0.156***	0.155***	0.184***	0.247***	0.180***
		(0)	(0)	(0)	(0)	(0)	(0)
dpr_u120k_ftb	Dummy for Monthly FTB transactions under £120,000	-0.102***	-0.0771***	-0.0759***	-0.0773***	-0.0631***	-0.0759***
		(0)	(0)	(0)	(0)	(0)	(0)
dpr_300k500k_ftb	Dummy for Monthly FTB transactions in £300,001-£500,000 price range	-0.351***	-0.351***	-0.351***	-0.351***	-0.338***	-0.361***
		(0)	(0)	(0)	(0)	(0)	(0)
ftbtreat	FTB Tax Holiday	-0.0748***	0.00879	0.00239	0.00137	0.0167*	0.00114
		(0)	(0.328)	(0.782)	(0.875)	(0.0605)	(0.898)
treat0809	2008-2009 Tax Holiday	-0.0401***	0.0397***	0.0508***	0.0450***	-0.00250	-0.0107
		(0)	(5.89e-08)	(0)	(0)	(0.767)	(0.202)
treat0809_ftb						0.100***	0.0774***
						(0)	(0)
lnrmort	Log Nominal Building Society mortgage rate (repayment) %		-0.549***	-0.534***	-0.537***	-0.544***	-0.598***
			(0)	(0)	(0)	(0)	(0)
lag_lnnetadvances_dwellings	Log (t-1) Quarterly Net Advances (£m)		0.138***	0.132***	0.120***	0.110***	0.133***
			(0)	(0)	(0)	(0)	(0)
lnpercent_advance_bs	Log Percentage Advance by buyer type (median)				0.262***	0.516***	0.242***
					(2.35e-06)	(0)	(0.000134)
lnincmult_bs	Log Medium income multiple by buyer type (median)				-0.159***	-0.218***	-0.389***
					(0.00692)	(0.000237)	(6.67e-11)
q2							0.132***
							(0)
q3							0.0843***
							(0)
q4							0.112***
							(0)
gr4_rgdp	GDP growth at market prices (real) - Source ABMI		-0.00275***				
			(0.00734)				
Constant	Constant	0.341***	-0.0449	-0.0188	-0.881***	-1.849***	-0.624**
		(3.38e-07)	(0.515)	(0.783)	(0.000273)	(0)	(0.0205)
Observations		93,231	93,231	93,231	93,231	93,231	93,231
R-squared		0.857	0.859	0.859	0.859	0.859	0.860
MacKinnon p-value for Residual unit r		-	-	-	-	-	-
F-test		1352	1356	1359	1353	1352	1357
No. regressors		413	416	415	417	418	421
Degrees of Freedom		92817	92814	92815	92813	92812	92809
Log Lik		-66240	-65820	-65824	-65808	-65770	-65314

pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Dummies per Local Authority included in regression

Table A5   Average Price Times-Series Regression Results: UK Level – £125,001-£250,000

Average Price (UK) in £125,000 to £250,000 price range - Difference in Difference Estimation - level equation with lagged dependent variable

VARIABLES	LABELS	(1) monthly lnpri_125250	(2) monthly lnpri_125250	(3) monthly lnpri_125250	(4) monthly lnpri_125250	(5) monthly lnpri_125250	(6) monthly lnpri_125250	(7) monthly lnpri_125250	(8) monthly lnpri_125250	(9) monthly lnpri_125250	(10) monthly lnpri_125250	(11) monthly lnpri_125250	(12) monthly lnpri_125250
lag_lnpri_125250_la	Log (t-1) Av. monthly price	0.742***	0.655***	0.568***	0.565***	0.445***	0.566***	0.573***	0.403***	0.450***	0.445***	0.371***	0.741***
		(0)	(0)	(0)	(0)	(5.04e-09)	(0)	(0)	(3.36e-08)	(1.51e-09)	(2.35e-09)	(8.81e-07)	(0)
ftb	FTB Dummy	-0.0163***	-0.0210***	-0.0267***	-0.0266***	-0.0340***	-0.0265***	-0.0258***	-0.0338***	-0.0461***	-0.0463***	-0.0540***	-0.0162***
		(0.000132)	(3.39e-06)	(1.06e-08)	(1.55e-08)	(5.59e-11)	(6.85e-09)	(5.50e-06)	(5.34e-05)	(4.61e-09)	(4.06e-09)	(5.61e-11)	(0.000402)
ftbtreat	FTB Tax Holiday	0.00429	0.000975	0.00319	0.00156	0.00238	0.00158	0.00203	0.000872	0.00253	0.00164	0.00391	0.00431
		(0.233)	(0.808)	(0.411)	(0.681)	(0.516)	(0.666)	(0.635)	(0.802)	(0.476)	(0.650)	(0.277)	(0.249)
treat0809	2008-2009 Tax Holiday	-0.00334	-0.0189***	-0.0201***	-0.0130***	-0.0158***	-0.0130***	-0.0131***	-0.0119***	-0.00784***	-0.00542	-0.00465	-0.00263
		(0.103)	(0.000500)	(0.000118)	(4.48e-05)	(9.23e-07)	(1.67e-06)	(2.62e-06)	(0.000234)	(0.00921)	(0.135)	(0.187)	(0.364)
gr4_rgdp	GDP growth at market prices (real) - Source ABMI		-0.00184**	-0.00138*									
			(0.0258)	(0.0815)									
lnrmort	Log Nominal Building Society mortgage rate (repayment) %		0.00390	-0.00409	-0.00603	0.0343*	-0.00626	-0.00728	-0.00273	-0.0175***	-0.0190***	-0.0172***	
			(0.778)	(0.759)	(0.653)	(0.0513)	(0.239)	(0.320)	(0.719)	(0.00547)	(0.00314)	(0.00674)	
lag_lnnetadvances_dwellings	Log (t-1) Quarterly Net Advances (£m)		-0.00313	0.000358	-5.68e-05	0.00148							
			(0.306)	(0.906)	(0.985)	(0.619)							
lnrincome_np	Log Real Gross (non-property) disposable income (£m)		0.320***	0.341***	0.206**	0.342***	0.345***	0.309***	0.315***	0.311***	0.395***		
			(0.000167)	(5.73e-05)	(0.0215)	(2.19e-05)	(2.82e-05)	(4.55e-05)	(5.66e-05)	(6.63e-05)	(1.51e-06)		
lnulfs	Log LFS Unemployment (ILO) 000s					0.0649***							
						(0.000801)							
downside_risk125250_uk	Perception of Downside Risk Indicator: mean negative price change							0.259					
								(0.838)					
lnpercent_advance_bs	Log Percentage Advance by buyer type (median)								-0.0838***				
									(0.00177)				
lnincmult_bs	Log Medium income multiple by buyer type (median)								0.119***	0.123***	0.132***	0.161***	
									(0.00156)	(0.00160)	(0.000888)	(5.77e-05)	
treat0809_ftb											-0.00440	-0.00455	-0.000747
											(0.239)	(0.209)	(0.857)
q2												-0.00490**	-0.000635
												(0.0261)	(0.794)
q3												-0.00249	3.68e-05
												(0.244)	(0.988)
q4												-0.00723***	-0.00245
												(0.00174)	(0.310)
Constant	Constant	3.136***	4.215***	1.335	1.098	3.652***	1.088	0.963	3.685***	2.704***	2.802***	2.640***	3.151***
		(1.07e-05)	(2.00e-07)	(0.203)	(0.294)	(0.00408)	(0.220)	(0.372)	(0.000362)	(0.00720)	(0.00549)	(0.00835)	(1.88e-05)
Observations		144	144	144	144	144	144	144	144	144	144	144	144
R-squared		0.919	0.928	0.935	0.933	0.939	0.933	0.933	0.942	0.938	0.939	0.944	0.920
MacKinnon p-value for Residual unit ro		-	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Durbin-Watson Stat		2.48	2.34	2.28	2.26	2.05	2.26	2.26	2.21	2.29	2.29	2.16	2.48
D-W Critical Value - 1%		1.68	1.72	1.74	1.72	1.72	1.71	1.72	1.74	1.72	1.74	1.78	1.78
LR test p-value - against previous eq.		-	0.00	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00
F-test		396.0	248.8	242.0	272.0	258.3	319.6	272.0	276.1	294.2	258.3	200.8	194.6
No. regressors		4	7	8	7	8	6	7	8	7	8	11	8
Degrees of Freedom		139	136	135	136	135	137	136	135	136	135	132	135
Log Lik		461.4	469.1	476.7	475.1	481.1	475.1	475.1	485.6	480.4	481.1	487.1	462.2
FTB Relief estimated change in price-£GBP		1300	300	900	400	600	400	500	200	700	400	1000	1300
FTB Relief estimated change in price-%		0.7%	0.1%	0.5%	0.2%	0.3%	0.2%	0.3%	0.1%	0.4%	0.2%	0.5%	0.7%

pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Average Price by Local Authority in £125,000 to £250,000 price range - Difference in Difference Estimation - level equation

VARIABLES	LABELS	(1) monthly lnpri_125250_la	(2) monthly lnpri_125250_la	(3) monthly lnpri_125250_la
lag_lnpri_125250_la	Log (t-1) Av. monthly price by LA	0.200***	0.168***	0.199***
		(0)	(0)	(0)
ftb	FTB Dummy	-0.0874***	-0.114***	-0.0871***
		(0)	(0)	(0)
ftbtreat	FTB Tax Holiday	0.00610***	-0.00122	0.00590***
		(0)	(0.273)	(1.17e-10)
treat0809	2008-2009 Tax Holiday	-0.00565***	-0.000107	-0.00520***
		(0)	(0.926)	(1.76e-10)
treat0809_ftb			-0.00798***	-0.00127
			(0)	(0.279)
lnrmort	Log Nominal Building Society mortgage rate (repayment) %		-0.00285	
			(0.148)	
lnrincome_np	Log Real Gross (non-property) disposable income (£m)		0.514***	
			(0)	
lnincmult_bs	Log Medium income multiple by buyer type (median)		0.262***	
			(0)	
q2			-0.00217***	0.000997
			(0.00138)	(0.140)
q3			-0.00212***	0.00254***
			(0.00227)	(0.000176)
q4			-0.00620***	0.00142**
			(0)	(0.0382)
Constant	Constant	9.845***	3.655***	9.848***
		(0)	(0)	(0)
Observations		57,661	57,661	57,661
R-squared		0.737	0.744	0.737
MacKinnon p-value for Residual unit ro		0.0	0.0	0.0
F-test		389.7	397.9	386.1
No. regressors		411	418	415
Degrees of Freedom		57249	57242	57245
Log Lik		83311	84117	83319
FTB Relief estimated change in price-£GBP		1300	-300	1200
FTB Relief estimated change in price-%		0.7	-0.2	0.7

pval in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Dummies per Local Authority included in regression