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LIMITING THE DISTORTIONARY IMPACTS OF TRANSACTION TAXES: SCOTTISH STAMP DUTY AFTER THE MIRRLEES REVIEW

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Limiting the distortionary impacts of transaction taxes: Scottish stamp duty after the Mirrlees Review*

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Abstract

We investigate the distortionary impacts of transaction taxes through a case study of the Scottish property market. We make use of three sources of variation in transaction tax rates present in recent Scottish tax systems: price notches, time notches and a shift to a more progressive transaction tax regime. Our results indicate that both kinds of notches have a distortionary impact that is sub-optimal. The Scottish Government's recent reforms had a positive impact through removal of the price notches, but time notches re-emerged allowing other distortions to persist. Using variation in effective tax rates from a progressive reform of the transaction tax system, we also find that the permanent effect of increased tax rates is a reduction in transaction activity. Looking across the price distribution, our results indicate that the strongest permanent responses occur in price ranges where tax rates fell due to the reform. This suggests that if governments insist on keeping transaction tax regimes, progressive taxation might be a good way to limit their distortionary impact, whilst also encouraging transaction activity in the lower end of the market.

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JEL classification numbers: H21, H26, H30

1. Introduction

A clear recommendation of the Mirrlees Review (2011) was that an effective tax system should incorporate *"what we know about responses to taxes to minimise undesirable impacts on behaviour"*. Taxation should minimise distortions to economic behaviour which would otherwise be welfare and/or efficiency enhancing. To limit distortions to beneficial economic behaviours, optimal taxation should target activities that are either considered harmful (for example alcohol or tobacco consumption) or are relatively unresponsive to taxation (goods for which demand is inelastic).

Following these principles, the Review called for the abolition of the UK's stamp duty land tax (SDLT), a tax levied on property transactions. SDLT, and transaction taxes in general, are considered particularly inefficient as they discourage mutually beneficial property transactions, resulting in properties not being held by the individuals who value them most. By disincentivising house moves[1], at the margin they may create distortions elsewhere, for example in the labour market by making property owners less geographically mobile, reducing labour market flexibility.

The UK stamp duty was in place in Scotland until its recent devolution. In recent years, partly in response to the points outlined in the Mirrlees Review (2011), the transaction tax system was reformed in Scotland. This reform aimed to eliminate some features of the system, such as its 'slab[2]' structure, deemed especially distortionary to economic behaviour. However, the nature of these changes and their implementation introduced further margins for behavioural responses.

In this paper, we empirically evaluate the recent Scottish transaction tax regimes from the perspective of Mirrlees' ideal tax system: what features of the tax system are distortionary to economic behaviour, to what extent, and how did the recent reform fare in limiting these distortions? Specifically, we focus on economic behaviour in terms of transaction activity on the property market. Our findings can inform policy makers dealing with the appropriate design and implementation of transaction tax regimes: optimal design and implementation should minimise the distortions caused to economic behaviour. To empirically assess how the

[1] According to Hilber and Lyytikainen (2013) a 2% increase in stamp duty at the £250k threshold reduces the annual rate of mobility by 2 to 3 percentage points.
[2] In a 'slab' structure, tax rates are payable on the entire purchase price of the property. Once a given threshold is crossed, the new higher tax rate accrues on the full purchase price.

recent Scottish regimes fared in this regard, we utilise variation in tax rates arising from: 1) the 'slab' structure of the previous SDLT system 2) the early announcement of a new Scottish transaction tax that created temporary tax savings opportunities and 3) the shift to a more progressive tax regime in Scotland. The first two sources of variation help us estimate distortions from arbitrary tax differentiation across price and time dimensions – distortions from local changes in tax rates in the regions of notches, that is, kink points at which tax rates increase abruptly. On the other hand, variation in tax rates from the progressivity of the tax reform helps us determine the overall (permanent) effect transaction taxes have on property market behaviour, and how this differs by market segment. The following paragraphs outline these sources of variation in more detail.

First, until December 2014, the Scottish transaction tax system was characterised by a 'slab' structure – under a 'slab' structure, once a given price threshold is reached, tax rates are payable on the entire purchase price of the property leading to discontinuous jumps in tax liability at threshold values (also referred to as price notches). Under this regime, transactions similar in terms of value are taxed at very different rates - discouraging higher taxed transactions to a much larger extent than similarly valued but lower taxed transactions (Mirrlees 2011). The 'slab' system therefore created large incentives to transact at values just below the threshold. Focusing on this feature allows us to determine how responsive agents are to abruptly increasing tax rates in the regions of thresholds (price notches). In other words, we can assess the distortionary effect price notches in the tax system have had on property market behaviour.

Second, after the 'slab' structure was removed in December 2014, a 'smooth'[3] SDLT system was introduced UK wide[4], including in Scotland. In response, the Scottish Government announced the April 1, 2015 introduction (and the precise tax schedule) of a new Scottish version of the tax, the Land and Buildings Transaction Tax (henceforth LBTT). LBTT follows a more progressive schedule in comparison to SDLT: higher priced transactions are taxed at even higher rates (with lower rates in some lower price ranges). The announcement lead to a differentiation of tax rates for equally valued properties based on the timing of transactions - the period between the announcement and implementation of LBTT provided buyers of property in Scotland with a temporary savings opportunity. In other words, the

[3] Where tax rates are applicable on the share of the property price above threshold values.
[4] It is worth noting that it was the Scottish Government who initially announced the planned change to a 'smooth' system in October 2014. The UK Government applied the UK-wide change in December partly in response.

announcement created a time notch in the tax schedule at April 1: depending on the price of the property, tax liabilities were lower/higher if transacting before this date than after. The early announcement of the tax reform therefore created large incentives for agents to re-time their transactions where feasible. This provides us with the opportunity to estimate distortions to property market behaviour in the region of the time notch and determine how responsive property transactions in Scotland were to temporary savings opportunities.

Finally, the April 2015 introduction of LBTT resulted in a more progressive transaction tax system in Scotland. Effectively, due to the short period during which the 'smooth' SDLT regime was active, and the possibility that market activity in this period was affected by the timing responses outlined above, the reform can be considered as a shift from the 'slab' structured SDLT to LBTT. This shift brought with it changes in effective tax rates for most price ranges. The variation in effective tax rates can be used to assess a more permanent response to changing transaction tax rates, that is, to address the question: what is the overall effect of increased tax rates on property market activity or, in other words, what are the permanent distortions caused to market behaviour? Also, as the tax reform was progressive, with decreasing rates in some lower price ranges and increasing rates in higher ranges, we can assess how permanent responses differ across market segments that were differentially impacted by the policy.

Our estimations utilise a particularly rich data set containing the universe of property transactions in Scotland. These data allow us to determine the price and date of each individual property transaction, and control for property and market characteristics. Our contribution to the literature on the impacts of transaction taxes is through a comprehensive Scottish case study: recent changes in the tax system provide us with ample source of variation in tax rates; while the policy aspects/changes define the margins of distortions and behavioural responses very clearly. Using both local (in regions of tax thresholds or dates) and permanent (overall tax increases) variations in tax rates, we can assess the responsiveness of agents to transaction tax rates along different margins and across different market segments. Uniquely in the literature, we also assess the impacts and policy implications of progressive transaction tax reform. Furthermore, unlike other UK case studies (Besley et al. 2014, Best and Kleven 2017) that focus on transaction taxes, we are able to investigate the property market outside a period of economic turmoil where agents' responses might be less affected by additional factors.

Our results suggest that transaction taxation has been highly distortionary to property market activity in Scotland, and while the recent reform eliminated some margins of distortionary responses, its implementation[5] created others (albeit not permanent ones). Nevertheless, while the overall impact of transaction taxes remains questionable, progressive tax reform might be sensible in limiting permanent distortions to economic behaviour.

More specifically, we show that the previous 'slab' structure of the tax system, that included price notches at threshold values, has led to significant distortions in property market behaviour. Our findings provide evidence of substantial bunching of transactions just below threshold values – indicative of agents manipulating transaction price to avoid the higher tax liabilities. Therefore, the removal of the 'slab' structure in Scotland is a welcome step in the right direction. On the other hand, as discussed earlier, the subsequent announcement of the LBTT resulted in another margin for behavioural response for Scottish agents: a timing response to realise temporary tax savings opportunities. Our findings suggest that Scottish agents are highly responsive to temporary savings opportunities and are willing to bring forward or delay transactions to benefit from a more generous tax treatment.

Using the variation in effective tax rates from the LBTT reform, but controlling for behavioural responses, we further find that overall, a unit increase in effective tax rates leads to a (on average) 5.6% reduction in transaction activity. We also find some indication that the greatest permanent response to changing tax rates occurs at the part of the price distribution where taxes decreased under LBTT – making the tax schedule more progressive therefore might be a sensible policy to limit distortions as it encourages transactions more in the favoured (where tax rates decrease) market segment than it discourages transactions in the segment where tax rates increase.

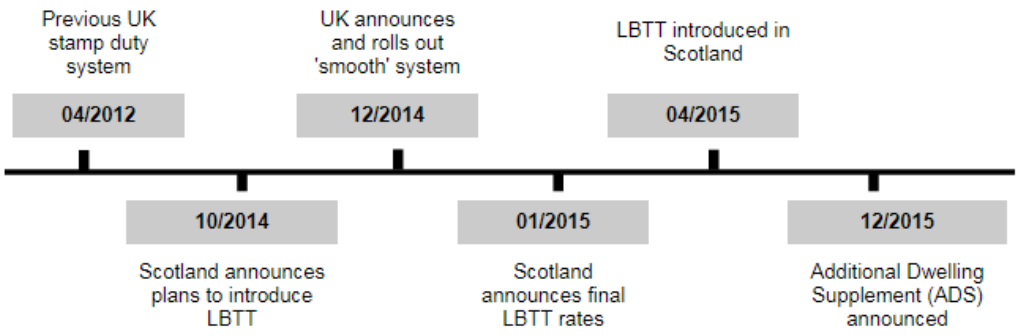
The remainder of the paper is organised as follows. Section 2 provides the relevant policy background. Section 3 reviews the related literature. Section 4 describes the data. Section 5 outlines our empirical approach and summarises our results. Section 6 concludes.

[5] In all fairness, the Scottish Government might not have the policy tools to avoid the emergence of time notches due to the ways in which UK and Scottish budgets are set (see Eiser 2017) – reliance on UK budgetary procedures makes the early announcement of Scottish tax policies unavoidable. Nevertheless, to limit distortions from timing responses, the Scottish Government needs to think of ways to constrain property market activity in announcement periods, or renegotiate current budgetary procedures.

2. Background

Tax on property transactions, previously known as stamp duty, is paid by buyers of properties every time a new property transaction takes place. Transaction tax rates are different for residential and commercial transactions. In our analysis, we consider the residential property market and the corresponding tax system. In Scotland, the residential transaction tax system has gone through several changes in recent years. We consider as the starting period of our analysis the previous UK stamp duty system[6] as at April 2012. The timeline of relevant changes to the Scottish property transaction tax system is presented in Figure 1.

Figure 1. Timeline of recent changes to Scottish property transaction tax system



In Scotland, the UK stamp duty system (known as Stamp Duty Land Tax, or SDLT) was in place until the introduction of the Land and Buildings Transaction Tax (LBTT) in April 2015. Initially, Scotland announced the introduction of LBTT in October 2014. In December 2014 however, the UK government changed the SDLT system from the previous 'slab' to a 'smooth' regime and also changed the rates and threshold values. This pre-reform SDLT continued to apply to Scotland until April 2015. After the UK wide change in the stamp duty system, the Scottish Government announced, in January 2015, final LBTT rates and thresholds to be in place from April 1, 2015. Later in 2015, they also announced the introduction of the Additional Dwelling Supplement (ADS), a three-percent surcharge on

[6] This period also corresponds to the end of a two-year period of first-time buyers' relief. The stamp duty system had different bands before this and we would like to avoid bias from this.

second properties. To avoid bias from the introduction and anticipation of ADS, our analysis is restricted to years before 2016.

In effect, three transaction tax regimes were in place in Scotland within our sample period of April 2012 to December 2015:

- The previous (UK wide) SDLT regime with the 'slab' structure from April 2012 to December 2014
- The new (UK wide) SDLT regime with the 'smooth' structure from December 2014 to March 2015
- The LBTT regime from April 2015

Nominal and effective tax rates under each regime are summarised in Figures 2-3. Key features and changes in recent transaction tax regimes in Scotland emerge from these comparisons. First, the 'slab' structure of the previous SDLT regime resulted in large jumps in effective tax rates at threshold values (price notches). These price notches created incentives to transact at prices just below threshold values. Second, the introduction of LBTT created a time notch in the system at April 1, 2015. In Figure 3, the area between the dashed and solid lines highlights the differences in tax rates payable before and after this date. Being taxed under SDLT before April 1, buyers of properties in Scotland had the incentive to change the timing of transactions and be taxed under the more generous tax regime. In the price range £125k to £333k, there was an incentive to delay transactions[7]; while in the over £333k price range there was an incentive to bring transactions forward.

Finally, the LBTT reform has made the transaction tax regime in Scotland more progressive – with lower tax rates at low prices, and higher tax rates at high prices. As the 'new' SDLT system was only in place during the announcement period of LBTT, property market activity in this period was likely influenced by the timing responses outlined above[8]. Therefore, the tax reform in Scotland is effectively a shift from the previous (slab) stamp duty system to the LBTT. The reform led to lower effective tax rates (see Figure 3) between £125k and £380k and higher effective tax rates over £380k.

[7] Albeit a tiny difference in effective tax rates, this is visible in Figure 3 as the dashed line is slightly left to the solid line for the £125k to £333k price range.
[8] Indeed, we find overwhelming evidence of this in our empirical analysis below.

Figure 2. Nominal tax rates in the Scottish transaction tax system under SDLT and LBTT tax regimes

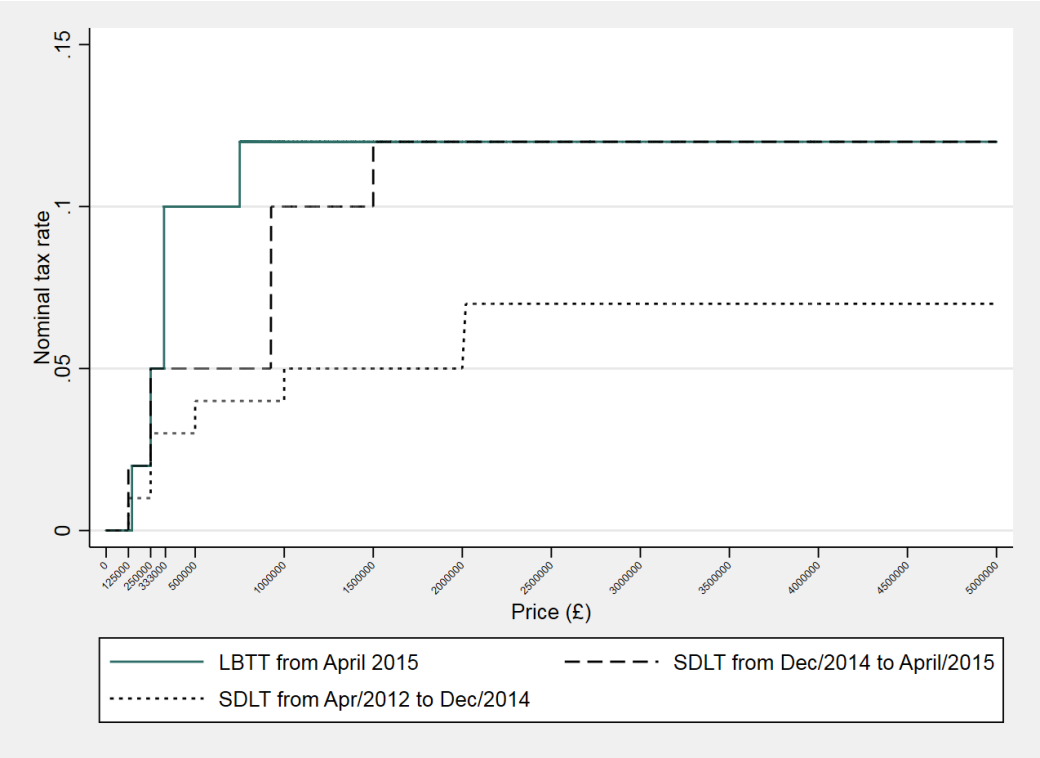
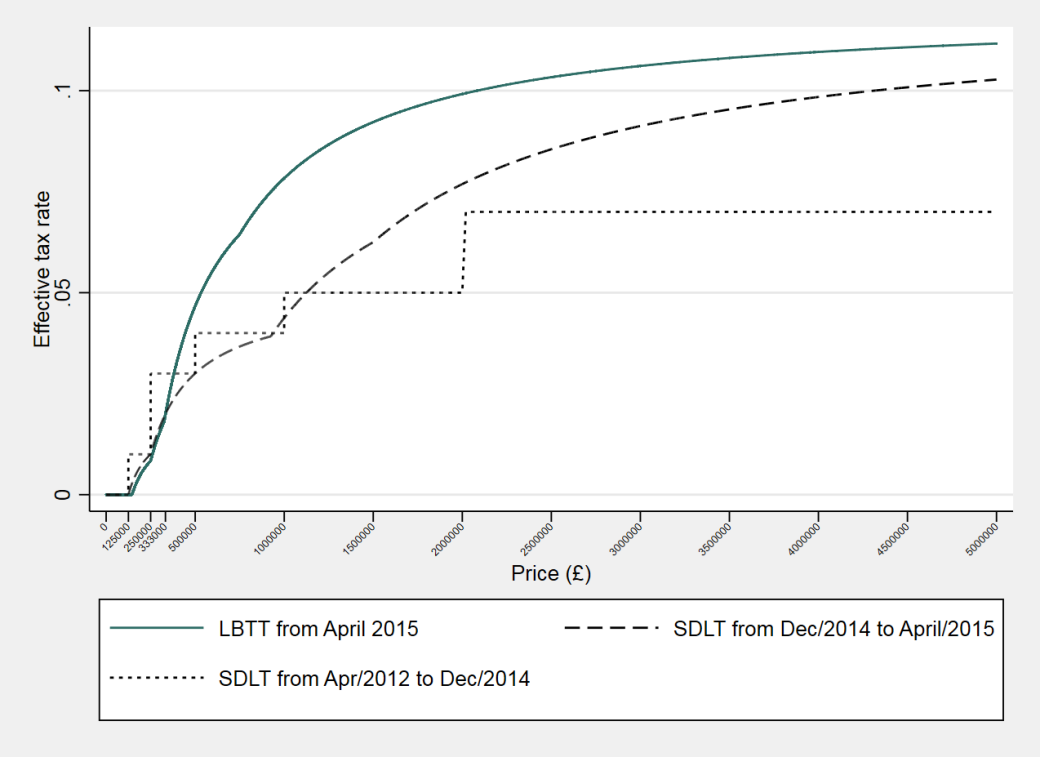


Figure 3. Effective tax rates in the Scottish transaction tax system under SDLT and LBTT tax regimes



3. Related literature

Our paper contributes to the burgeoning literature on the impacts of transaction taxes on property markets. A number of studies (Best and Kleven 2017, Kopczuk and Monroe 2015, and Slemrod et al. 2017) investigate the distortions caused by price notches in transaction tax schedules. All these studies find significant evidence of bunching below price notches, although magnitudes vary according to the specific property market setting. In our estimations of bunching around price notches in Scotland, we employ the bunching estimator methodology[9] used in Best and Kleven (2017) who analyse the impact of the 2008/09 stamp duty holiday[10] on the UK property market. Using this estimator we can estimate counterfactual transaction densities for the price distribution – how transaction densities would be in the absence of price notches. To assess the impact of price notches, we can then compare actual densities to counterfactual ones in the regions of notches.

A few studies also investigate the impact time notches in transaction tax systems have on the timing of transactions. For example, Slemrod et al. (2017) find no significant evidence of a change in the timing of transactions in response to time notches for the Washington D.C. property market. Conversely, Fritzsche and Vandrei (2016) find evidence from Germany that in months before transaction tax hikes, transaction volumes for single-family homes increased by roughly 40%. Finally, Best and Kleven (2017) find that the anticipated ending of the stamp duty holiday led to significant bunching of transactions just before the end date. In other words, anticipating the end of the tax-exempt period, buyers of properties in the UK brought transactions forward to realise tax savings.

In our analysis of time notches, we build on the methodology used in Best and Kleven (2017). Our estimation relies on comparing actual time trends in transaction activity (in the months near the time notch) to counterfactual time trends. In Best and Kleven (2017) these counterfactual time trends are constructed using the price ranges unaffected by the time notch – differences in the bunching of transactions near the time notch between affected and unaffected price ranges are indicative of timing responses. They motivate this approach as means to control for the time notch being near Christmas – transaction activity is generally non-existent this time of the year leading to idiosyncrasies in market behaviour. In our case,

[9] This methodology was originally outlined in in Chetty et al. (2012)
[10] The stamp duty holiday was a temporary abolition of transaction taxes in the UK for the £125k to £175k price range.

the time notch is during the spring period when transaction activity is 'normal' and we only need to control for seasonality. Also, our only potential comparison group is the £0 to £125k price range (unaffected by reform in Scotland). We decide not to use this as our counterfactual to avoid arbitrary comparisons between price ranges that might be very different in terms of market activity. For these reasons, we use a simpler bunching estimator strategy than the one outlined in Best and Kleven (2017): our counterfactual time trends are based on predicted values from a fixed-effects time-series regression that models transaction activity using seasonal and cyclical time trends.

Finally, there are attempts in the literature to estimate the permanent effect increased transaction tax rates have on transaction activity. Some of these studies (Dachis et al. 2012, Best and Kleven 2017) use price, time, or geographical notches in tax systems to identify a permanent effect of changing tax rates. The estimates from these studies are however local to the regions of the notches investigated. Other studies (Besley et al. 2014, Slemrod et al. 2017) use a difference-in-differences approach where they compare price ranges with tax changes to price ranges with no tax changes taking place. We do not consider this approach appropriate for our analysis due to the lack of relevant comparison groups (see last paragraph).

Most closely related to our analysis is the study by Fritzsche and Vandrei (2016) who regress transaction volumes for single-family homes in German states on transaction tax rates (controlling for time notches) and find that on average, a unit increase in transaction taxes leads to a 6% long-term reduction in transaction volumes. To estimate the permanent effect of changing transaction tax rates, we employ a similar OLS methodology whereby we regress changes in (log) transaction volumes on changes in effective tax rates. Our analysis is different from Fritzsche and Vandrei (2016) in three main ways: 1) we study a country-wide tax system change as opposed to changes in local regimes[11] 2) our source of identifying variation is a progressive tax reform and 3) we use the entire universe of residential transactions in Scotland.

[11] This could be important if individuals respond to local changes in transaction taxes by relocating to other localities with lower taxes. Since the England-Scotland border area is relatively sparsely populated, we can assume that such inter-regional externalities are not going to influence our results.

4. Data

To analyse the distortionary impact of transaction taxes on the Scottish property market we use a data set containing the universe of Scottish property transactions from the Registers of Scotland (ROS)[12]. ROS are a non-ministerial government department responsible for compiling public registers in Scotland. Our data set includes all property transactions in Scotland during the sample period (April 2012 to December 2015). It also contains the types, addresses, postcodes, coordinates, and regions of properties, along with, most importantly, the date and price at which they were sold. As our analysis focuses on the residential property market we restrict our sample to include only residential transactions. Furthermore, we exclude transactions for which no price was given (or for which nonsensical[13] values were given). We observe when a property is transacted through the variable 'date of entry' which notes the date at which ownership rights were exchanged between the buyer and the seller. In our sample period, we have 351,292 property transactions in Scotland and the average monthly number of transactions is 8,065.

[12] Access to this data was granted through the Glasgow Urban Big Data Centre (UBDC).
[13] We exclude transactions at very low prices (lower than £5,000) and at very high prices (over £5m). Most of the transaction prices in these ranges do not make sense considering the types of properties sold.

5. Identification strategy and results

Our empirical investigation concerns the three features/changes in the recent Scottish transaction tax regimes summarised in Section 2: i) price notches in the previous stamp duty system ii) the time notch at the April 1 introduction of LBTT and iii) the shift from the previous stamp duty system to the more progressive LBTT system.

In this section, we estimate how responsive Scottish property market activity was to each of these features to assess their distortionary impact on economic behaviour. While we employ distinct identification strategies for each case, we also control for biases arising from their combined effects on the property market.

i. Estimating the distortionary impacts of price notches in the previous stamp duty system

The previous (UK wide) SDLT system based on a 'slab' structure was in place between April 2012 and December 2014. The transaction tax was charged on the entire purchase price of the property creating discrete jumps in tax liability at threshold prices. Tax rates and thresholds are summarised in Table 1 along with the jump in tax liability just above a given threshold.

Table 1. Previous UK Stamp Duty (SDLT) – Schedule and Price Notches

Price	Tax rate	Jump in liability at threshold
£0 - £125k	0%	£0
£125k - £250k	1%	£1,250
£250k - £500k	3%	£5,000
£500k - £1m	4%	£5,000
£1m - £2m	5%	£10,000
Over £2m	7%	£40,000

This previous SDLT system created large incentives for buyers to transact at a price just below a given tax threshold (price notches) and thereby avoid the abrupt increase in taxes payable. In Figures 4-5 we plot the density of property transactions at different prices. The figures aggregate transactions in Scotland for the entire period in which the previous SDLT system was in place. These plots already provide us with visible indications of bunching, that is, a higher density of property transactions just below price notches (and lower density just above). We can observe large kinks in the density of transactions corresponding to the £125k, £250k,

and £500k price notches and there is also some bunching around the £1m notch but this does not seem to be outstanding relative to other kinks in the price neighbourhood.

To estimate how responsive the Scottish property market was to the presence of price notches, we use the bunching estimator methodology originally outlined in Chetty et al. (2012). This methodology relies on the estimation of a counterfactual density of transactions – what the density of transactions would look like in the absence of price notches at threshold values. As noted in Section 3, our use of these estimators follows Best and Kleven (2017). We estimate counterfactual transaction densities by fitting a 5-th degree polynomial to the data, using the wider region of the price notch but excluding observations in a small range around the notch.

Figure 4. Density of transactions at different prices in Scotland – previous stamp duty (SDLT) system from April 2012 to December 2014

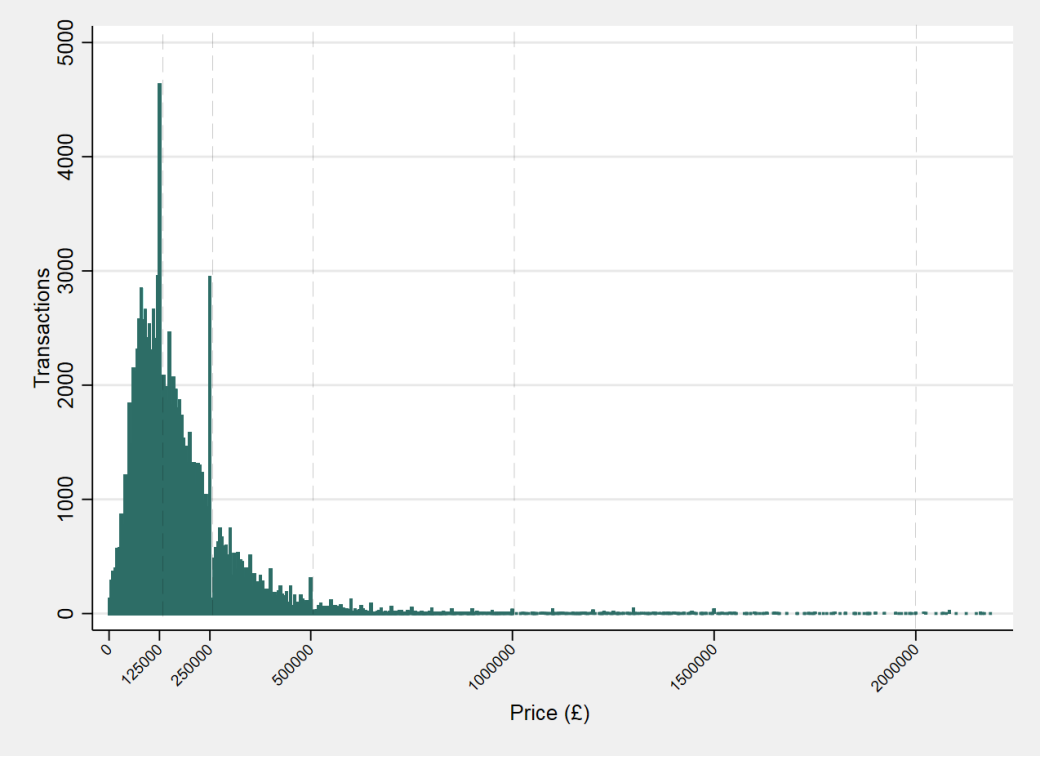
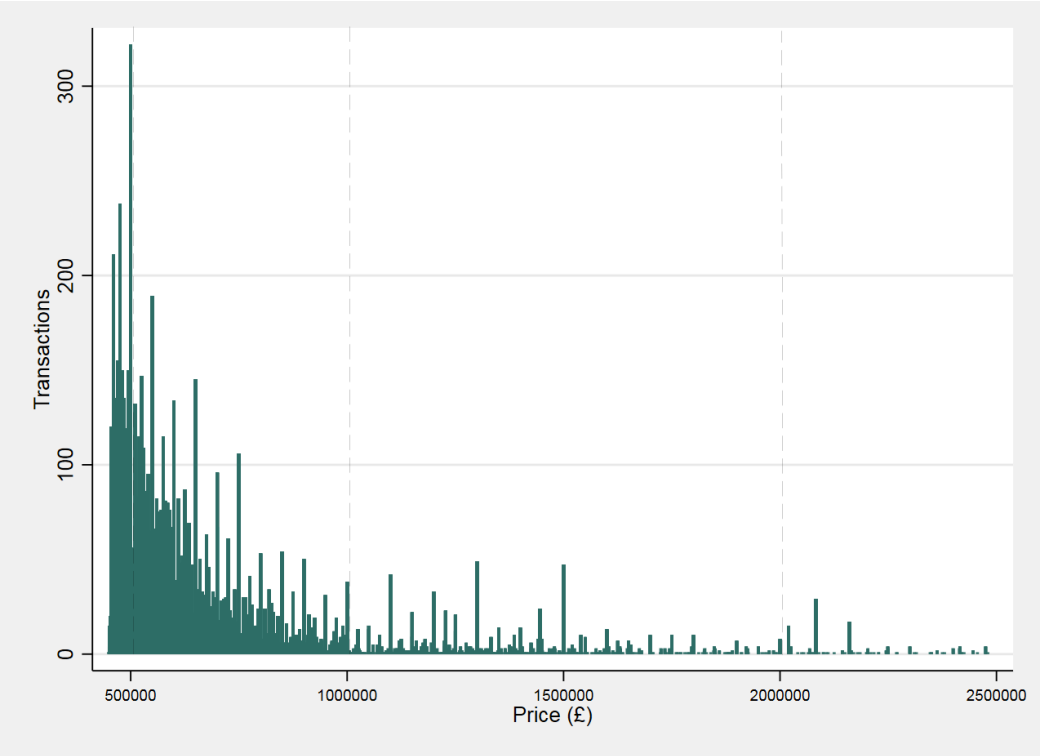


Figure 5. Density of transactions at different prices in Scotland– previous stamp duty system from April 2012 to December 2014 – higher price ranges



More specifically, the counterfactual distribution is estimated using the following regression model:

$$t_i = \gamma_0 + \sum_{j=0}^{5} \gamma_{1j} p^j + \sum_{r=1}^{3} \gamma_{2r} R_{ri} + \mu_i \quad (1)$$

Where t_i are the number of transactions in price bin $'i'$ and price bins are £5,000 wide[14]. The second term on the right-hand side is a 5-th degree polynomial of the transaction price $'p'$ aimed at approximating the relationship between an increase in price and the density of property transactions. The third term is a set of indicator variables for transactions at round number prices for multiples of £10,000, £25,000, and £50,000. This is to control for the fact that most transactions occur at round prices, and transactions are more frequent at some round prices than others. We exclude all transactions from the [-£10,000; +£10,000] range around the price notch so that bunching around the notch in the actual data does not affect our counterfactual distribution. To assess whether the density of transactions increased below the price notch (and

[14] In similar studies such as Best and Kleven (2017) or Slemrod et al. (2017) £100 (or $100) price bins are used. However, in the case of the Scottish property market, if aggregated at that level most price bins contain zero transactions as most transactions tend to occur at large round numbers. For this reason, we decide to aggregate at the £5,000 level.

dropped above), we plot the predicted (counterfactual) transaction density for each price bin and compare it to the actual transaction density. The plots are summarised in Figures 6-9[15]. The vertical difference in transaction density between actual and counterfactual plots in the region of the price notch should be indicative of the presence and extent of bunching responses.

Except for the £125k[16] price notch analysis, our counterfactual estimates fit actual data relatively well in the price regions not near the price notches. For all price notches, we find strong evidence of bunching behaviour. In the £5,000 price bin just under the price notch we estimate that, in comparison to the counterfactual, transaction volumes are approximately 1.5, 2.7, 2.8, and 2.8 times larger for the notches at £125k, £250k, £500k, and £1m, respectively. Our estimates for Scotland are higher than those for the whole of the UK in Best and Kleven (2017)[17] as their estimates for the £125k, £250k, £500k, and £1m price ranges are 0.78, 1.85, 1.64, and 0.70, respectively. We can also note that in all our estimations the higher density of transactions under the notch are followed by a lower density of transactions at prices just above the notch. Our findings are indicative of buyers manipulating prices to fall just under the relevant tax threshold. Our results show that the Scottish property market was highly responsive to the presence of price notches under the previous SDLT system. Removing these notches was therefore a step in the right direction to reduce the distortionary impacts of the tax system.

[15] In the neighbourhood of the £2m notch, there are very few transactions and the density follows an idiosyncratic pattern. We therefore cannot rely on our counterfactual estimation and will not analyse bunching around this notch.

[16] Even taking into account the poor fit at some prices, bunching in the notch region is substantial for the £125k notch. Nevertheless, we cannot consider bunching estimates to be as reliable in this case as in the case of other notches.

[17] Best and Kleven (2017) estimated bunching responses in earlier periods, however, we compare our estimates to cases in their analysis where the relevant jumps in tax liability are the same.

Figure 6. Density plots around £125k price notch

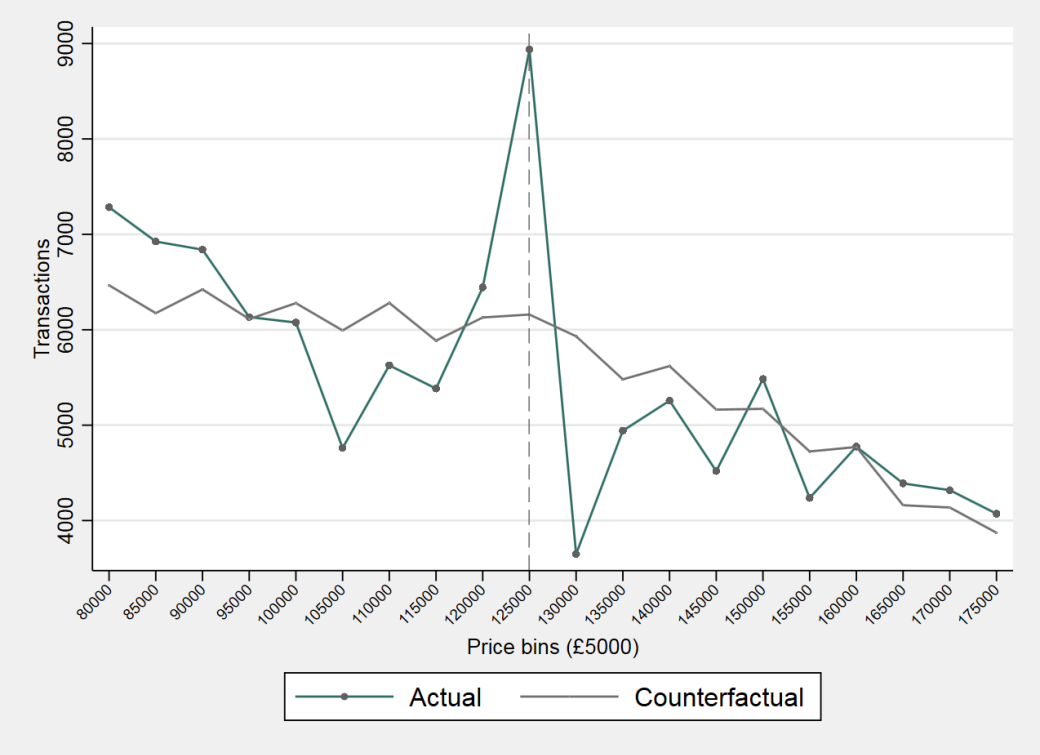


Figure 7. Density plots around £250k price notch

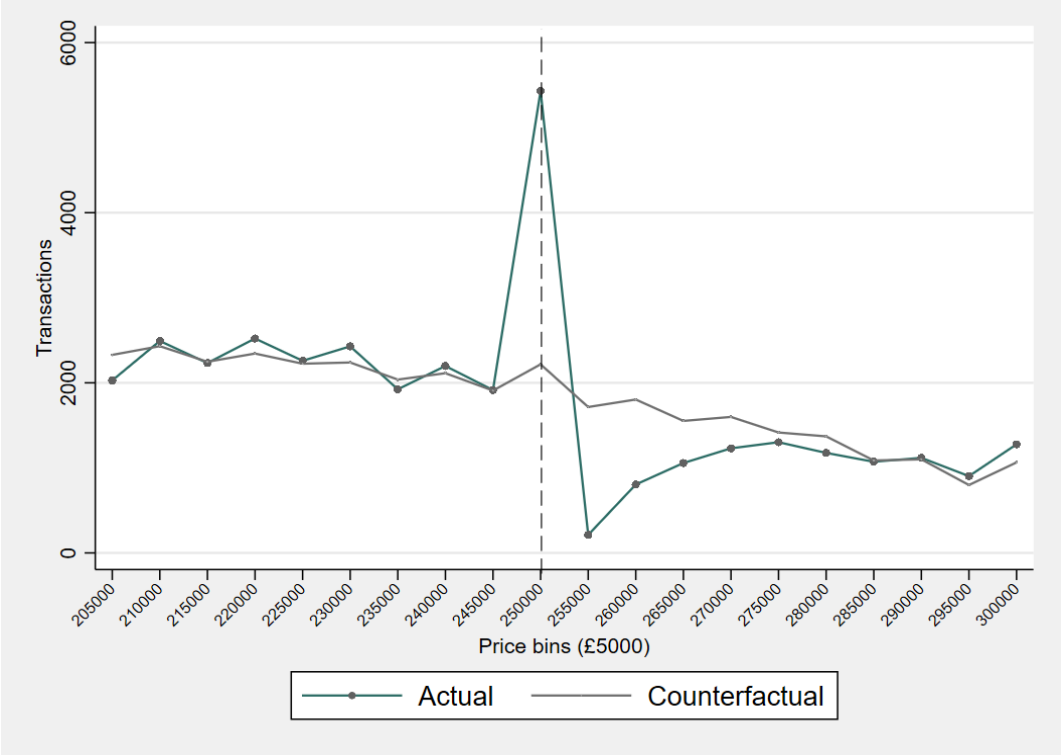


Figure 8. Density plots around £500k price notch

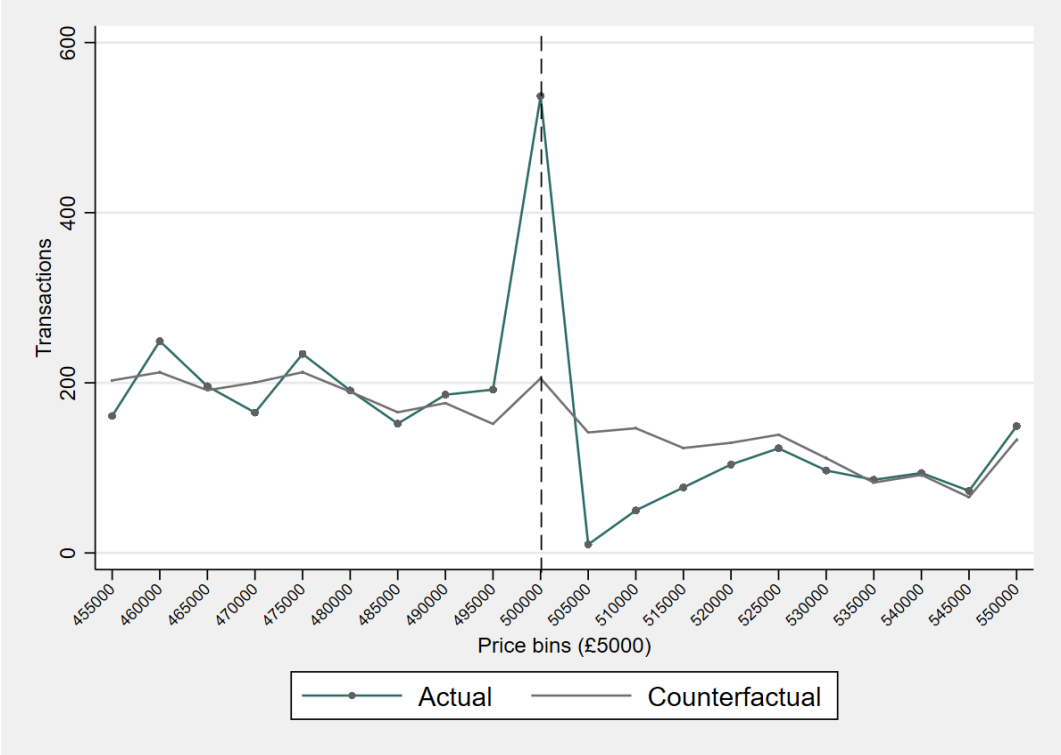
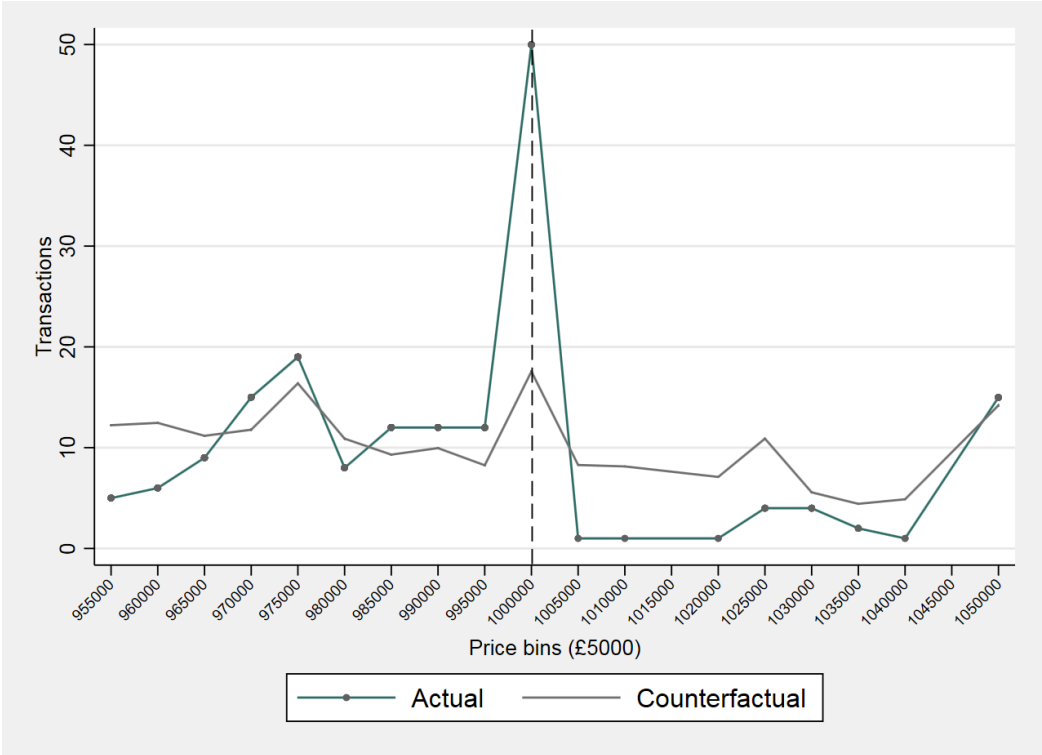


Figure 9. Density plots around £1M price notch



ii. Estimating the distortionary impacts of a time notch at the end of the LBTT announcement period

As previously explained in Section 2, the UK government removed the 'slab' structure of the stamp duty system and introduced a new tax schedule for SDLT in December 2014. The new tax regime applied to Scottish property transactions as well. In January 2015, the Scottish Government announced the April 1 introduction and specific tax schedule of LBTT, a more progressive tax with higher tax rates at higher property prices. The announcement period, which lasted from 21 January 2015, until the end of March 2015, provided[18] buyers of properties in Scotland with a temporary savings opportunity. Those aiming to transact in the £125k to £333k price range, where tax liabilities are lower under LBTT than under the new SDLT system, had the incentive to delay transactions and wait to be taxed under LBTT. On the other hand, in the over £333k range, buyers had the incentive to bring transactions forward and pay lower taxes under SDLT.

Figure 10 summarises the temporary savings opportunities available to buyers during the announcement period. Note, that while savings from delaying transactions in the £125k-£333k price range are relatively low, savings from bringing transactions forward in the higher price range can be almost 4% of the property value. On the other hand, delaying transactions might be easier than bringing them forward given the time[19] it takes to move from offer to ownership on the property market. Based on this, we can form the following expectations:

- In the £125k to £333k price range: lower than average transaction volumes in the months preceding April 2015 due to buyers delaying transactions, and higher than average transaction volumes during and after April 2015 due to those transactions taking place under LBTT
- In the over £333k price range: higher than average transaction volumes in the months preceding April 2015 due to buyers bringing transactions forward, and lower than average transaction volumes during and after April 2015 due to those transactions not taking place under LBTT

[18] Also, the initial (October 2014) announcement (see Section 2) of LBTT could have already led to tax planning behaviour from agents anticipating a tax change in April.
[19] According to Besley et al. (2014) the time from first offer to change in ownership for UK properties is usually under 60 days.

Figures 11 and 12 show monthly transaction volumes in the £125-£333k and over £333k price ranges, respectively. While there is a clear drop in transactions in the months before April 2015 in the lower price range, property market activity is generally low at this time of the year and it is difficult to disentangle seasonal effects from the impact of the behavioural response (indeed, that is what our empirical methodology aims to achieve, as explained below).

Figure 10. Gains and losses from being taxed under the SDLT regime as a share of the property value (in comparison to being taxed under LBTT)

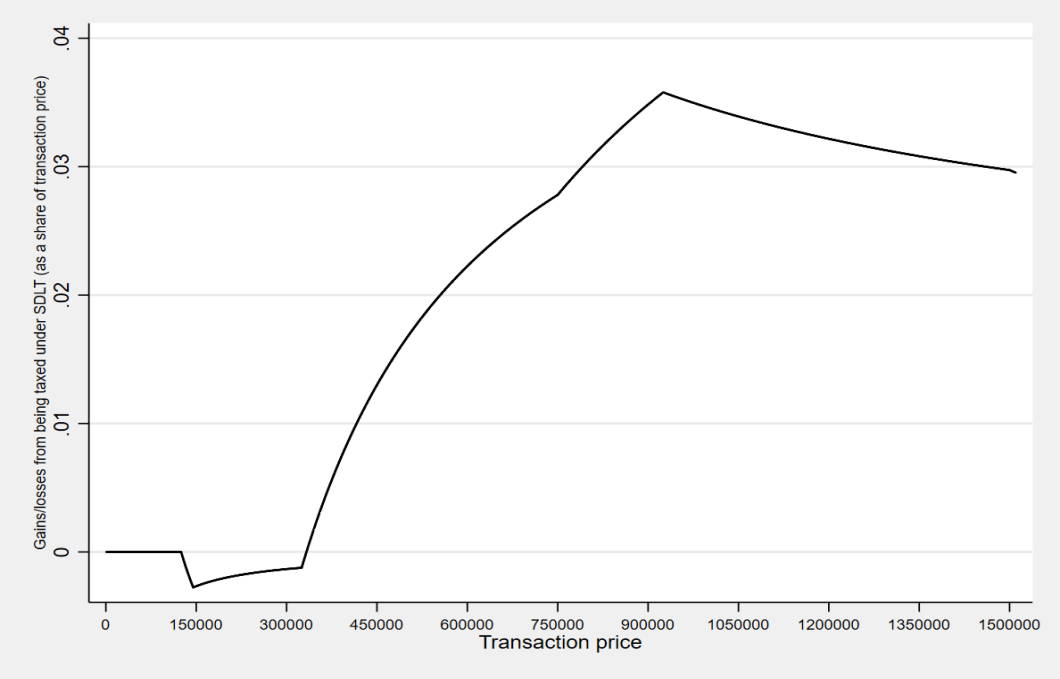


Figure 11. Monthly transaction volumes between £125k and £333k

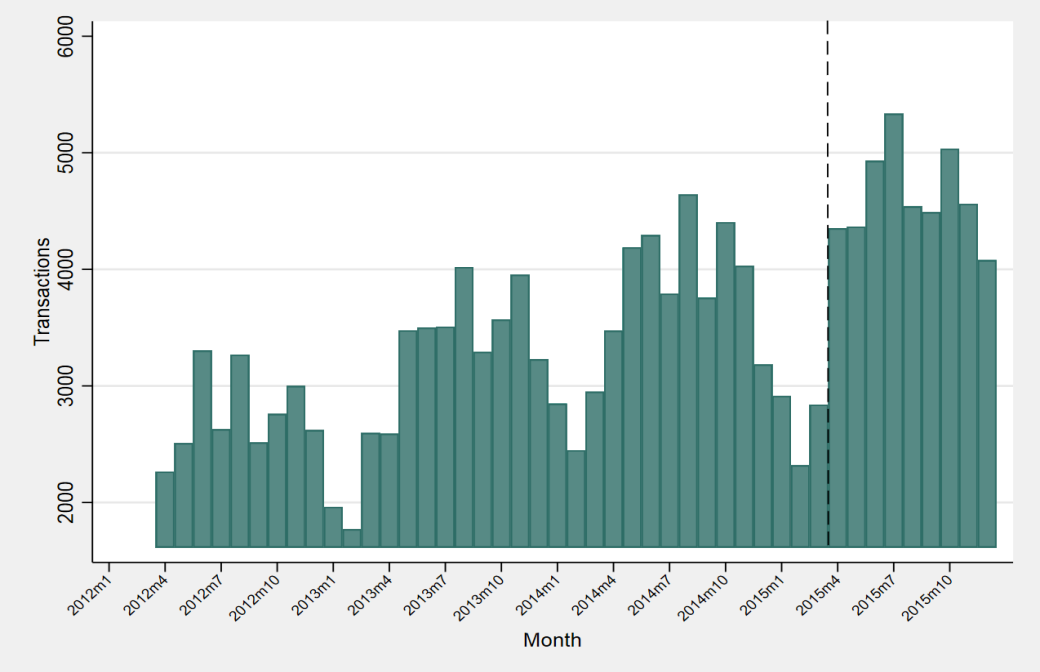
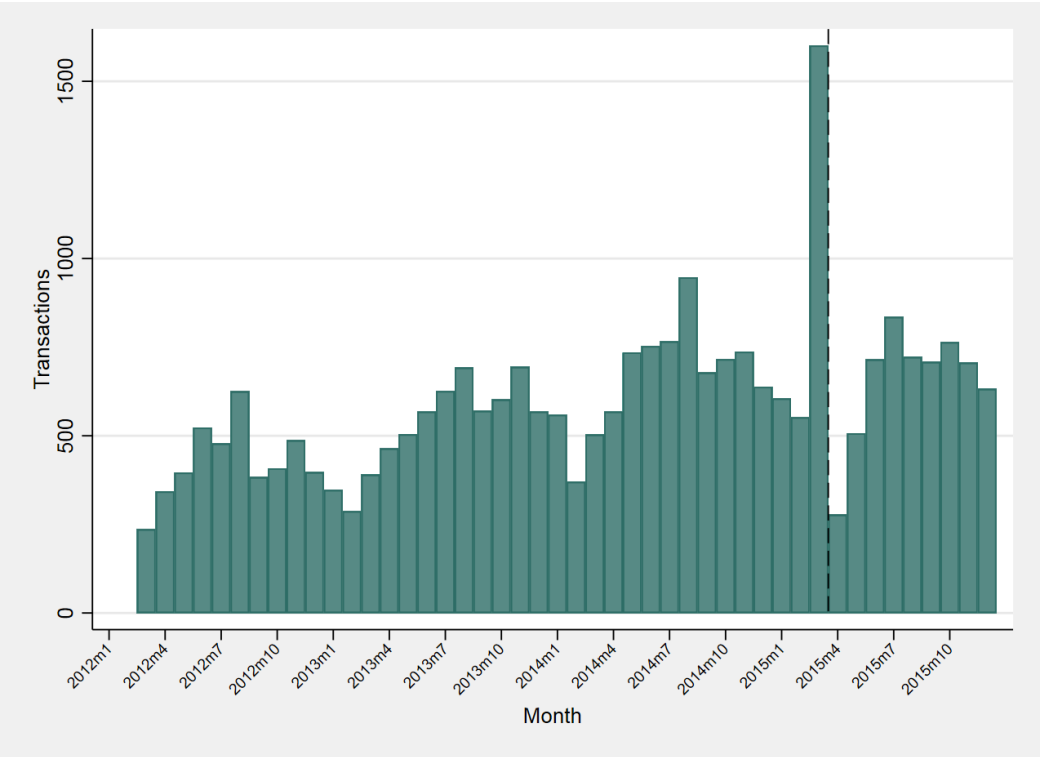


Figure 12. Monthly transaction volumes over £333k



On the other hand, in the over £333k price range (see Figure 12), bunching around the time notch is evident from the unusually high number of transactions in March 2015.

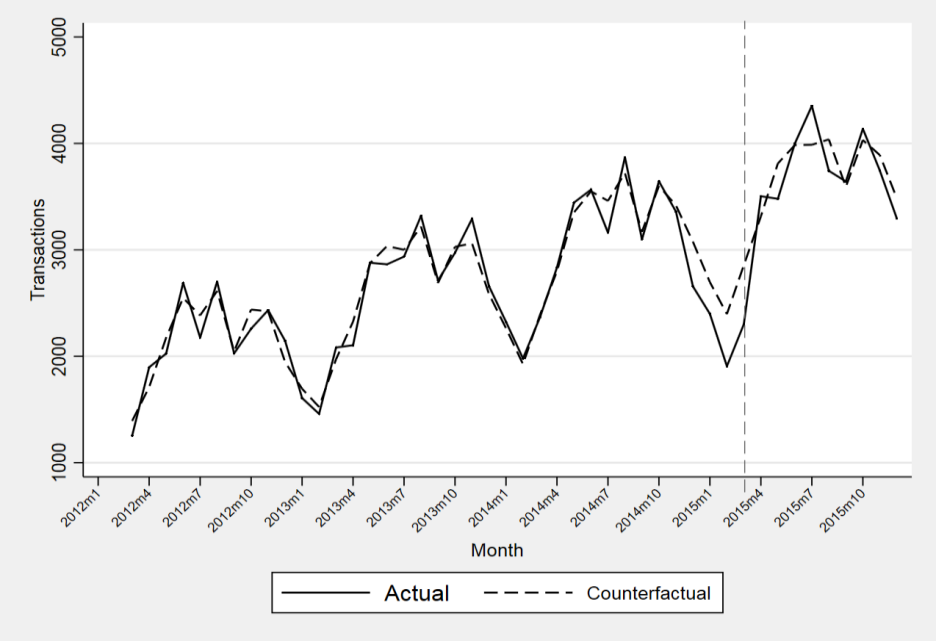
Our empirical strategy aims to isolate the timing responses arising from temporary savings opportunities from the daily, monthly, and yearly time trends affecting the property market. Similar to our approach in section 5i, we estimate counterfactual monthly distributions of property transactions over time. We do this by fitting a fixed-effects time-series model to the empirical data, excluding the months around the April 2015 LBTT introduction that might be affected by reduced/increased transaction volumes due to timing responses. This counterfactual time trend approximates a scenario where no tax savings opportunities are present during the LBTT announcement period. We then compare the counterfactual time trends to actual time trends to estimate the impact of behavioural responses on transaction numbers in the months around April 2015.

Our counterfactual is based on the following fixed-effect regression model:

$$t_{im} = \gamma_0 + \theta_y + \theta_m + \theta_{dow} + \theta_{dom} + \theta_p + \epsilon_{im} \quad (2)$$

Where t_{im} are transaction volumes in price bin $'i'$ and month $'m'$ and $\theta_y, \theta_m, \theta_{dow}, \theta_{dom}, \theta_p$ are fixed-effects for year, month, day of the week, day of the month, and price bin, respectively. From this estimation we exclude the announcement period (December 2014 to April 2015) and the two months[20] following the introduction of LBTT. Our sample period covers the old SDLT system (from April 2012) and the LBTT system until the announcement of the Additional Dwelling Supplement (ADS), a tax on second properties, in December 2015[21]. Our model is estimated for both the £145k to £333k[22], and the over £333k price range. We plot the counterfactual time trends estimated using (2) against the actual time trends in transaction volumes. We associate the vertical difference between actual and counterfactual time trends (near April 2015) with the timing response to the LBTT introduction. Our results are presented in Figures 13-14.

Figure 13. Actual and counterfactual time trends of transaction volumes between £125k and £333k

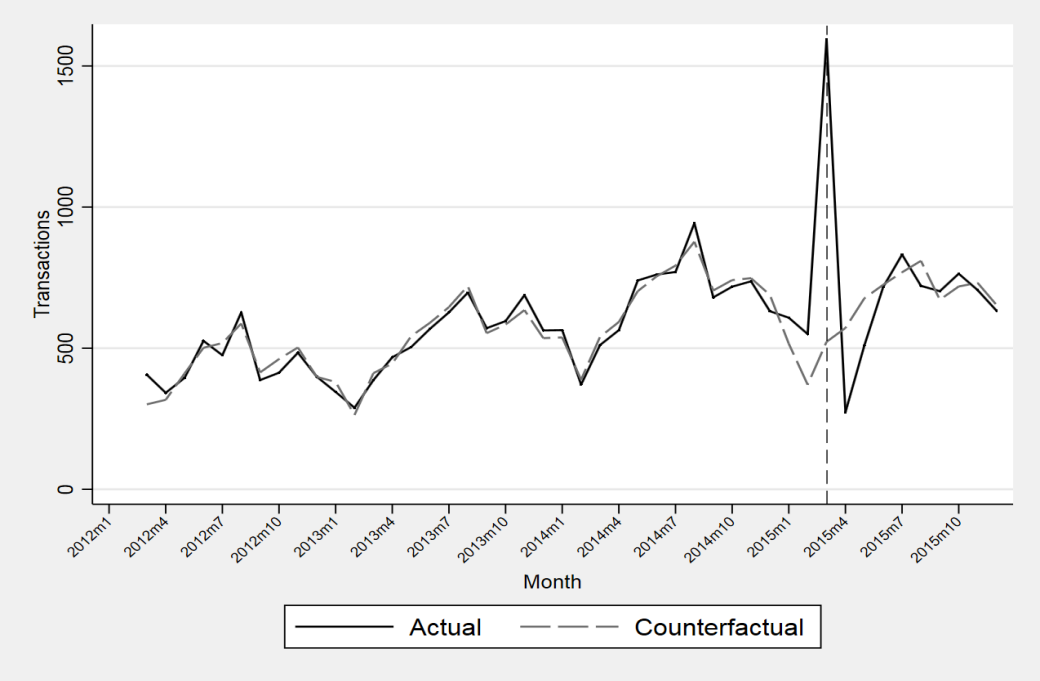


[20] Our results do not change when three months are excluded – markets recover by June indicating that the timing response had little effect on transactions in June (and after).

[21] The ADS was announced during the last days of November, however, since it was only introduced next April we assume no behavioural responses until 2016 (there would not be enough time to file and process property transactions in 2015).

[22] We exclude transactions between £125k and £145k so that our estimates are not biased by the removal of the £125k price notch in December 2014. As the notch has led to a lower transaction density just over £125k its removal might have led to increased transaction volumes in the price range just above.

Figure 14. Actual and counterfactual time trends of transaction volumes over £333k



In the £125k to £333k price range, there seems to be some evidence (see Figure 13) that buyers delayed transactions in response to the nearby introduction of LBTT. In February and March, transaction volumes are below counterfactual ones, however the actual level of transactions is not low in comparison to previous winters. The effect therefore does not seem to be very large, a decrease in transactions of roughly 16-17% in the months February and March. Nevertheless, when compared to the size of the tax savings opportunity from delaying, this response is considerable: for the estimated tax savings of 0.17% of property value, a reduction of 17% in transaction volumes. This would be equivalent to a 100% reduction in transactions in response to a tax savings of 1% of property value.

In the over £333k price range, the impact of the behavioural response of bringing transactions forward is evident in the comparison of the time trends (see Figure 14). Compared to the counterfactual, March 2015 has approximately three times as many transactions, indicating a large change in transaction volumes in response to the introduction of LBTT. Conversely, transactions levels in April and May are quite low (buyers who transacted in March do not transact in these months) although the market does seem to recover by June. Nevertheless, this response, a roughly 220% increase in transaction corresponds to a very large tax savings opportunity for buyers, on average 2.7% of property value. This is equivalent to an 82% increase in response to a tax savings of 1% of property value. Therefore, once considering the

scale of the tax savings opportunity, our estimates suggest a slightly larger response for the lower end of the market[23].

Our findings are consistent with those of Best and Kleven (2017) and Fritzsche and Vandrei (2016) in that we find substantial evidence of agents re-timing their transactions in anticipation of a tax change. Nonetheless, estimates are not directly comparable (and have little external validity) as they are highly dependent on the context of the specific case study. Factors such as the tax savings from re-timing transactions, the length of the announcement period, awareness of planned tax changes, and institutional constraints that make it easier/harder to change timing should all influence the extent of timing responses.

iii. Estimating permanent changes in transaction volumes in response to changing effective tax rates due to the LBTT reform

Using the variation in effective tax rates arising from the LBTT introduction in 2015, we can also estimate the behavioural (semi) elasticities of Scottish taxpayers when transitioning to a new transaction tax system. More specifically, we can define the behavioural semi-elasticity as the change in (log) transaction volumes in a price bin in response to a change in the effective tax rate in said price bin. The change here can be measured as the change from the transaction volumes (average) and effective tax rates during the previous SDLT period to the LBTT period. Estimating the behavioural semi-elasticity allows us to gauge the permanent effect changes in transaction tax rates have on transaction volumes.

Recall from Section 2 that the LBTT reform was progressive, leading to lower tax rates in lower price ranges and higher rates in higher prices. We estimate a different semi-elasticity for the higher price ranges (where effective rates increased) to assess the relative responsiveness of different market segments to progressive tax reform.

Estimating the semi-elasticities comes with two distinct empirical challenges already discussed in this paper: bunching due to price notches in the previous SDLT system and bunching due to the time notch during and after the LBTT announcement period.

[23] Recall, however, that delaying transactions for the lower end of the market might have been considerably easier than bringing transactions forward in higher price ranges.

To control for these, in our estimation of elasticities, we exclude the price ranges found to be impacted by bunching in Section 5i and exclude the time periods found to be impacted by bunching in Section 5ii. To include counterfactual transaction densities in different price bins and months, we combine our models from the previous sections and expand it with a term to measure how transaction volumes are affected by changes in the effective tax rates. In effect, our estimation compares average transaction volumes during the previous stamp duty period (between April 2012 and December 2014) and the LBTT period (between June 2015 and December 2015) and relates changes in transaction volumes to changes in effective tax rates. We cannot include later periods due to the introduction of the Additional Dwelling Supplement (ADS) as the impacts of this would bias our results. Our regression model is as follows:

$$\Delta \ln t_{it} = \gamma_0 + \beta \Delta ETR_{it} + \sum_{j=0}^{5} \gamma_{1j} p^j + \theta_y + \theta_m + \theta_{dow} + \theta_{dom} + \theta_p + \epsilon_{it} \quad (3)$$

Where $\Delta \ln t_{it}$ is the average (log) change in transaction volumes from the previous SDLT period to the LBTT period and ΔETR_{it} is the change in effective tax rates between the same periods. β is our coefficient of interest: the behavioural semi-elasticity of transaction volumes to effective tax rates. Once again, we fit a 5-th degree polynomial to control for the density of transactions in each price bin in absence of bunching around price notches (these price regions are excluded). The time and price bin fixed effects are included to control for seasonal, cyclical, and price range specific effects influencing the property market. Standard errors are clustered at the price bin level to allow for correlation in transaction volumes within price bins over time. Our results are summarised in Table 2. We estimate three different (columns 1-3) specifications of (3) to assess the sensitivity of our results to the inclusion of the terms on the right-hand side.

Finally, to estimate the behavioural (semi) elasticity at the higher end of the property market, we specify (3) including only the price range for which effective tax rates increased with the introduction of LBTT[24]. Results for this specification are summarised in column 4 of Table 2.

[24] When comparing liabilities under LBTT to liabilities under the previous SDLT, this price range is the one over £380k.

Table 2. Regression output – Estimating the behavioural semi-elasticity

	$\Delta \ln t_{it}$	$\Delta \ln t_{it}$	$\Delta \ln t_{it}$	$\Delta \ln t_{it}$
	(1)	**(2)**	**(3)**	**Over £380k**
ΔETR_{it}	-0.056** (0.024)	-0.056** (0.024)	-0.056** (0.024)	-0.041*** (0.001)
Polynomial	Yes	No	No	Yes
Month FE	Yes	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes
Day of week FE	Yes	No	No	Yes
Day of month FE	Yes	No	No	Yes
Price bin FE	Yes	Yes	Yes	Yes
Constant	7.163*** (0.121)	7.229*** (0.022)	7.208*** (0.021)	7.369*** (0.415)
R-squared	0.340	0.339	0.339	0.329
Observations	46,208	46,208	46,208	9,686

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

We estimate the overall behavioural semi-elasticity to be -0.056. The estimates are significant at the 5% level and robust to the inclusion/exclusion of fixed effects and the polynomial term. Our results indicate that, on average, a unit increase in effective tax rates resulting from the transition from the previous stamp duty to the LBTT system can be associated with a 5.6% reduction in transaction volumes. This result is similar in magnitude to the semi-elasticity estimate in Fritzsche and Vandrei (2016), but smaller in magnitude in comparison to the local estimates found in Dachis et al. (2012) and Best and Kleven (2017).

For the higher end of the market, we find that a unit increase in effective tax rates can be associated with a 4.1% reduction in transaction volumes – our original semi-elasticity is therefore likely driven by the size of the response at the lower end of the market, where effective tax rates decreased. It is therefore possible that the progressive tax reform prompted a smaller response in the higher end of the market in comparison to the lower end[25]. As it is stated in Mirrlees (2011) it is sensible to differentiate taxes based on the responsiveness of agents to tax rates – namely, tax increases should be applied to less responsive tax bases to

[25] One likely explanation for this is that supply is less constrained in lower price ranges – buyers could more easily substitute to a larger set of available properties or the rental market (agents in higher price ranges might not want to access this market) leading to a higher price elasticity of demand. Nevertheless, a deeper investigation is required to determine how supply side factors affect behavioural responses.

minimise distortions to behaviour. Since, in our case the lower end of the market seems more responsive, lower tax rates from the LBTT reform should encourage transaction activity more than increased tax rates discourage transactions at the higher end. Making the tax system more progressive seems like a sensible policy under such circumstances, even though the overall impact of transaction taxes remains distortionary.

iv. Discussion

In general, taxation of property transactions is not optimal (Mirrlees 2011). In Scotland this sub-optimality arises for (at least) two reasons: 1) transaction taxes discourage an otherwise beneficial economic activity and 2) agents are highly responsive to them, leading to large welfare costs (deadweight losses) from behavioural responses. From a policy perspective, the significant responses to tax savings and avoidance opportunities indicate that the Scottish Government risks foregoing substantial revenue from transaction taxes due to the design and implementation of related tax policies.

Nevertheless, as Scotland seems intent on keeping the transaction tax regime in place, recent policy changes did well (in part) to reduce the distortionary aspects of the tax system. The removal of price notches led to a more simple and sensible tax system, where manipulation of prices to avoid higher taxes is no longer incentivised. Also, our findings indicate that the lower end of the property market is slightly more responsive to transaction tax changes (both local[26] and permanent) than the higher end – making the system more progressive is therefore sensible, as the economic burden of the tax is on the less responsive part of the market while the benefits accrue to the segment where (negative) distortionary behaviour would have been more likely.

On the other hand, time notches continue to re-emerge upon the introduction and announcement of new tax policies (for example the ADS mentioned earlier). Scottish budget setting procedures are complicated by their reliance on UK budgetary procedures (see Eiser 2017) – politically, it might therefore be difficult to amend the way policies are announced. Regardless, as long as transaction tax changes are anticipated (and announcement periods remain lengthy), our results suggest that timing responses will cause large distortions to market activity.

[26] See Section 5ii.

Two recent policies not elaborated on in our analysis deserve a mention here. The ADS, a three-percent tax charged on second homes introduced in 2016, and the planned first-time buyer's relief, an extension of the zero-tax threshold to properties under £175k for first-time buyers. While policies such as these might be used to encourage transaction activity from agents trying to access the property market for the first time, they also are not neutral from the point of view of taxation. It is unclear whether second homes transactions should receive a different tax treatment from first homes, and how harmful this might be to economic behaviour. For ADS, some evidence already exists for timing responses (see Mathews 2016) indicating the distortionary impacts of the tax. Further evidence is needed to evaluate these policies, and precisely what impact they have on property market activity.

6. Conclusion

This paper studies the distortionary impact of three distinct features of recent Scottish transaction tax systems: 1) the presence of price notches (jumps in tax liabilities at threshold values) in the previous stamp duty system 2) a time notch corresponding to the April 2015 introduction of LBTT and 3) the shift to the more progressive LBTT regime.

Using a bunching estimator methodology whereby we estimate counterfactual transaction densities for each price range, we find clear evidence of bunching around price notches in the previous stamp duty system. When compared to estimates found in the related literature, our findings suggest that the Scottish property market was more responsive to price notches than the property market in the whole of the UK. We also find substantial evidence that the temporary tax savings opportunity created by the early announcement of LBTT rates resulted in a large-scale re-timing of property transactions. Finally, using the variation in effective tax rates resulting from the shift to the LBTT system, we find that a unit increase in effective transaction tax rates reduces transaction volumes by 5.6%. Our results also suggest that this reduction is lower for the higher end of the market (where effective tax rates increased), indicating that the lower end of the market (where tax rates decreased) was more responsive to the progressive tax reform.

Overall, our results suggest that the Scottish property market is highly responsive to changes in transaction taxes, and particularly responsive to tax savings opportunities available due to the presence of notches in the tax system. While, overall, transaction taxes are distortionary

to property market behaviour, tax policy should focus on mitigating their effects on economic behaviour. Removing price notches from the Scottish tax system was therefore a sensible policy, but time notches due to pre-announced tax changes should be avoided as much as possible. In addition, behavioural responses to the LBTT reform suggest that progressive changes to transaction tax system should be encouraged if they induce transaction activity in lower market segments more than they reduce activity in higher segments.

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