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Abstract
We estimate the effect of the UK Stamp Duty Land Tax (SDLT) – a transfer tax on the purchase price of property or land – on different types of household mobility using micro data. Exploiting a discontinuity in the tax schedule, we isolate the impact of the tax from other determinants of mobility. We compare homeowners with self-assessed house values on either sides of a cut-off value where the tax rate jumps from 1 to 3 percent. We find that a higher SDLT has a strong negative impact on housing-related and short distance moves but does not adversely affect job-induced or long distance mobility. Overall, our results suggest that transfer taxes may mainly distort housing rather than labor markets.

Keywords: Transfer taxes, stamp duty, transaction costs, homeownership, household mobility
JEL Classifications: D23, H21, H27, J61, R21, R31, R38

1. Introduction

Most developed countries impose a tax on transactions of property and land. This tax – in North America often labelled 'land transfer tax' and in Britain 'stamp duty' – increases the transaction costs associated with the sale of a property and therefore increases the costs of moving for homeowners. This cost increase can be expected to negatively affect the propensity to move. Thus, the tax is prone to have adverse effects on housing and labor markets. Households may not live in the type of dwelling and the location that most closely match their preferences. Similarly, individuals may be less willing to accept new jobs that are not within commuting distance or they may decide to hold on to a current job that is a less good match than another available job further away. Given these potential adverse effects caused by mismatch in housing and labor markets, the question of whether, and to what extent, the tax reduces household mobility is highly policy relevant.

Transfer taxes and in particular the UK Stamp Duty Land Tax (SDLT) – commonly referred to as 'stamp duty' – have long been criticized by economists as being inefficient. The Mirrlees Review (2011) highlights the fact that the SDLT "creates a disincentive for people to move house" (p. 403) and the adverse consequences of this on the functioning of housing and labor markets. To date, however, little is known about the *nature of the moves* (short vs. long distance or housing- vs. job-related) that are most strongly adversely affected. The present study sheds light on this question.

The UK stamp duty scheme in place until December 3, 2014 provides an ideal setting to explore the impact of transfer taxes on mobility decisions. This is partly because the tax liability was quite substantial, at least for more expensive housing (the top rate until December 3, 2014 was 7 percent, levied on the entire purchase price), and partly because the stamp duty liability jumped sharply at various cut-off values, providing various 'discontinuities' that can be exploited empirically.[1] Our analysis focuses on a discontinuity – or 'notch' – where the stamp duty jumps particularly strongly. This notch allows us to isolate the impact of the stamp duty from other determinants of mobility.

We first formalize our basic economic intuition by adopting a bargaining model originally proposed by Besley *et al.* (2014). We then slightly modify the model by assuming that the seller derives some exogenous payoff from moving and this payoff is larger for more momentous – employment- or life event-related – mobility shocks than for more gradual changes in life-cycle circumstances – which typically move homeowners away incrementally from their optimal location and housing consumptions.. The framework yields three empirically testable predictions: (i) At the house value cut-off of £250k, as a consequence of the tax notch, household mobility should decrease; (ii) The adverse impact of the notch should be greater for (more incremental) short distance moves than for (more momentous) long distance ones; and (iii) The adverse effect should be greater for (more gradual) housing-related than for (more momentous) job-related moves.

[1] The reform from December 3, 2014 removed these discontinuities.

To test these predictions, we use data from the British Household Panel Survey (BHPS) and compare homeowners with *self-assessed house values* on either side of the cut-off, while controlling for flexible but smooth functions of house values. Consistent with our theoretical priors, we find that the SDLT has a significant negative effect on household mobility. Moreover, this adverse effect is confined to short distance moves and to moves that are housing related. We find no significant effect on job-related moves and we find little evidence that the stamp duty adversely affects moves that are triggered by major 'life events' such as divorce or retirement. We document these key results both visually and using rigorous regression analysis.

Our core estimates indicate that the 2 percentage-point increase in the SDLT reduces the annual rate of mobility by roughly 2.5 to 3 percentage points. This is a very substantive effect given that in the UK only about 5 percent of all owner-occupier households move each year. The corresponding welfare loss in the form of distortions in the housing market is very substantial. Based on our point estimates, back-of-the-envelope calculations imply that the welfare loss associated with the rate increase from 1 to 3 percent is between 36 and 47 percent of the additional revenue generated by the tax increase.

In conducting our analysis we faced a number of empirical challenges. Some of these are specific to our underlying data and the specifics of our Regression Discontinuity (RD) research design. One such concern is that homeowners who intend to stay may not follow the market closely and give rough rounded estimates of their house values. We address this concern by including dummy variables for round values and by conducting a number of placebo tests. The converse argument is that homeowners with higher underlying propensity to move may be better informed about the stamp duty and may therefore be more likely to report the cut-off value rather than a value slightly above (i.e., sorting of homeowners close to the cut-off could partially drive our findings). To address this potential issue, we drop households that self-report the cut-off value (or values very close to it). In a similar vein, recent movers may be disproportionally represented just below the cut-off. We thus remove such movers from our analysis. In all these cases, our key findings are unaltered.

In addition, we carried out a battery of 'standard checks' for RD models such as 'balancing tests' (to check for sorting of households with different characteristics around the cut-off), dual clustering of standard errors at house value group level in addition to the household level (to address the issue that, de facto, the assignment variable is discrete), or estimation of more flexible specifications in which we allow the slope of the regression line to differ by treatment status. Our key findings are robust to all these checks.

Overall, our results confirm the findings of the previous literature that transfer taxes are highly distortive in that they substantially reduce mobility. The main novel contribution of our study is that we demonstrate that these distortions are largely confined to short distance and housing-related moves.

Two strands of the economics literature motivate our analysis. The first strand is the existing literature on the impact of transfer taxes on household mobility. Transfer taxes are an important part of housing transaction/moving costs and they are the most important component directly determined by policy makers. Despite this, little is known about their effect on mobility. On the theoretical side, Lundborg and Skedinger (1999) modify Wheaton's (1990) seminal search model of the housing market by adding transfer taxes into the framework. They derive that the lock-in effects of the tax reduce welfare, with the adverse effect being larger at low vacancy rates and smaller with a buyer tax. The latter is because the buyer tax-induced price reduction dampens the negative effect on search effort caused by the tax. Nordvik (2001) analyzes the mobility effects of transfer taxes in a theoretical dynamic life-cycle model of housing demand. He finds that a transfer tax rate of 2.5 percent decreases the number of moves by the model household over the life cycle from three to one, implying a dead-weight loss of the transfer taxes in the region of between 17 and 34 percent of the tax revenue.

On the empirical side, Van Ommeren and Van Leuvensteijn (2005) provide indirect evidence on the mobility effects of transfer taxes using individual panel data for the Netherlands. They estimate a competing risks hazard model of moving to renting or owning with house values as an explanatory variable and use a theoretical model to infer the effect of transaction costs. Their results suggest that a 1 percentage-point increase in the value of transaction costs—as a percentage of the value of the residence—decreases residential mobility rates by at least 8 percent.

Dachis *et al.* (2012) utilize the introduction of land transfer taxes in Toronto to estimate their effect on the housing transaction volume and prices with a Differences–in-Differences approach, comparing market outcomes across the boundary of the affected area.[2] According to their estimates, a 1.1 percent land transfer tax led to a 15 percent decrease in transactions in the first eight months after the introduction. The implied welfare loss relative to an equivalent property tax is about $1 for every $8 in tax revenue.

Discontinuities in transfer tax schedules have recently attracted increasing attention as a source of insight into how the tax affects market outcomes. Most closely related to the present paper, Best and Kleven (2015) utilize (i) administrative data on all property transactions in the UK, (ii) the discontinuities in the UK schedule to study price responses and (iii) changes in the tax schedule over time to study the effect on the transaction volume. Best and Kleven (2015) provide evidence of a strong negative price effect. In addition, they document that a temporary 1 percentage-point cut in the tax rate – due to the 2008-9 stamp duty holiday on houses worth between £125,001 and £175,000 – led to a 20 percent increase in transactions. The bulk of this impact is explained by a long term reduction in sales rather than the timing of purchases.

[2] See also Dachis (2012) for follow-up work using a longer data period.

Besley *et al.* (2014) exploit the same 2008-9 stamp duty holiday to estimate the incidence of a transaction tax on housing. Their key findings are twofold. First, around 60 percent of the "surplus" due to the tax holiday accrued to buyers. Second, the tax holiday increased transactions of properties by about 8 percent but this effect was only short-lived. The effect reversed rapidly after the policy was withdrawn.

In a similar vein – exploiting a tax notch imposed by New York's so called 'mansion tax' – Kopczuk and Munroe (2015) find robust evidence of substantial bunching (both buyers and sellers have strong incentives not to transact near the threshold). Moreover, they document that the incidence of the mansion tax falls on the seller, may exceed the value of the tax, and cannot be explained by tax evasion.

Davidoff and Leigh (2013), finally, explore the incidence of transfer taxes using data from Australia where the marginal tax rate rather than the average tax rate jumps at various cut-off prices. They use past local house prices and national house price inflation to construct an instrumental variable for the transfer tax rate. Their results indicate that a higher tax rate reduces turnover and – in line with Kopczuk and Munroe's findings (2015) – the incidence of the tax is on the seller.

The second strand of the literature that motivates our analysis explores the link between homeownership and labor market outcomes. It is a well-established fact that homeownership induces significant barriers to mobility – transfer taxes are one important component of such barriers. In a seminal paper Oswald (1996) argues that homeownership, by reducing mobility, increases unemployment. Moreover, he provides cross-country evidence consistent with this conjecture. Subsequent studies (e.g., Van Leuvensteijn and Koning, 2004; Munch *et al.*, 2006 and 2008; Battu *et al.*, 2008) that use individual-level panel data and more rigorous estimating techniques, by and large, confirm Oswald's conjecture that homeowners are less mobile. They rebut, however, the hypotheses that homeowners are more likely to become unemployed or have longer unemployment spells.[3]

Coulson and Fisher (2009) explore a number of theoretical mechanisms that may affect the link between homeownership on the one hand and mobility and labor market outcomes on the other hand. They point out that different theoretical models can have very different predictions about the labor market at both micro and aggregate level. Their findings suggest that homeowners are less likely to be unemployed but they also have lower wages than renters. At the aggregate level, higher regional homeownership rates are associated with a greater probability of individual worker unemployment and higher wages.

[3] Van Leuvensteijn and Koning (2004) find no evidence that homeowners change jobs less than tenants. They conclude that the housing decision is driven by job commitment (and not the reverse) and that homeowners are less vulnerable to unemployment. Munch *et al.* (2006) point out that homeowners may set lower reservation wages for accepting jobs in the local labor market. Hence, they are more likely than renters to find jobs locally. Munch *et al.* (2008) have argued, from a search theoretic perspective, that homeowners should have a lower transition rate into new non-local jobs and therefore should stay longer in their jobs. Battu *et al.* (2008) suggest that there are differential effects across tenure types and that it matters whether the starting point is employment or unemployment. Their findings imply that homeownership is a constraint for the employed and public renting is more of a constraint for the unemployed.

Finally, Ferreira *et al.* (2010 and 2011) point out that there may be an asymmetry in the mobility response of homeowners depending on whether they are in negative equity. Whereas their findings indicate that homeowners in negative equity are indeed less likely to move, other empirical studies (Schulhofer-Wohl, 2011; Coulson and Grieco, 2012) reach the conclusion that homeowners who are under water are slightly more likely to move than homeowners with positive equity.

The general lesson learned from this literature is that policies that make households less mobile may harmfully affect the performance of housing and labor markets. Our study contributes to this literature by demonstrating that transfer taxes prevent moves driven by more incremental life cycle changes (such as short distance and housing-related mobility) but they do not preclude moves driven by more momentous shocks (long distance and job-related mobility).

2. The UK stamp duty system and theoretical considerations

The stamp duty on transactions on property and land was introduced in the UK during the 1950s. We focus on the system of stamp duty on residential transactions that had been in place until December 3, 2014.

The stamp duty is paid by the buyer and is a percentage share of the purchase price of the house. The economic incidence, however – in line with the literature discussed above – can be expected to mainly fall on the seller.

The defining feature of the UK stamp duty system (i.e., the one in place until December 3, 2014) is a progressive schedule where the tax rate for the whole purchase price goes up at certain thresholds. Table 1 reports the tax schedule that applies during our sample period: Houses sold for up to 125,000 are exempt from stamp duty, but from £125,000 upwards the tax rate rises in a stepwise manner from 1 to 5 percent.[4]

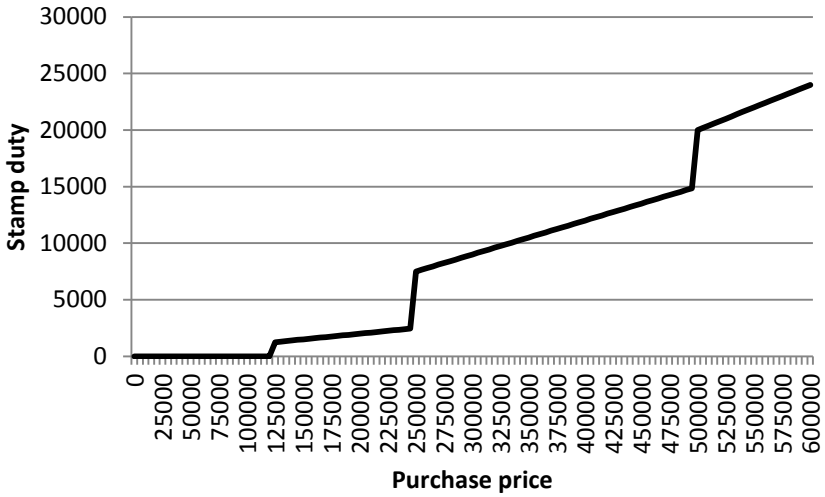
Figure 1 illustrates the relationship between the purchase price and stamp duty liabilities. Our empirical analysis focuses on the second cut-off at £250,000 where the tax rate increases from 1 to 3 percent. We do so because stamp duty payable increases significantly at the cut-off (from £2,500 to £7,500)[5], and because our data is reasonably dense around the £250k cut-off.[6] Significant variation in stamp duty liabilities and large sample size together make it possible to detect the effects of the stamp duty on mobility.

[4] A new higher "mansion" tax rate of 7 percent (or 15 percent for corporate bodies) was introduced for properties over £2 million on 22 March 2012. A tax 'holiday' was in place on properties worth between £125 and £175 during 2008-9. None of these changes affected the notch we investigate.

[5] At the £125k the treatment is much weaker as the tax liability rises only by £1,250.

[6] Lack of density around the cut-offs rules out using the thresholds of £500k and £1m. We also note that while the jumps in tax liability are £5k and £10k, respectively, for these two cut-offs, these jumps are smaller in 'relative terms' as only fairly high income and wealthy households will be able to afford to buy houses worth over £500k and especially over £1m.

FIGURE 1
Purchase price and stamp duty



Transfer taxes such as the British stamp duty drive a wedge between the price obtained by the seller and the price paid by the buyer and basic economic intuition suggests that these transaction costs will result in fewer housing transactions.[7] We can formalize this basic intuition and derive theoretical predictions by adopting and slightly modifying a bargaining model originally proposed by Besley *et al.* (2014).[8]

The setting consists of a buyer and a seller that are matched. The buyer has a valuation V of the seller's house. The seller's valuation is u. Thus, we can denote the difference between the buyer's and the seller's valuation as $V - u = \varepsilon$. The transfer tax rate is $\tau \in \{0, t\}$.

Buyer and seller bargain over the agreed transaction price p, which is generated by a generalized Nash bargaining solution.[9] In such a setting, as Besley *et al.* (2014) derive formally, transactions only occur if:

[7] To the extent that households who consider moving need the sales proceeds for their next down-payment or do not want to become a landlord and rent out their existing home, we would expect that the transfer tax also reduces household mobility. Moreover, in addition to the effect on the mobility of homeowners, the transfer tax may also affect the propensity that households choose to become homeowners (and, possibly, the aggregate housing consumption over the life cycle). Households (especially those with a short expected duration) can be expected to become renters because the moving costs are high. The effect of the transfer tax on tenure choice is a question that should be explored in future work.

[8] We follow the notation of Besley *et al.* (2014) for ease of comparison. For the full derivation of equation (1) we refer the interested reader to the seminal paper.

[9] We assume that the house will not resell. If we were to more realistically assume that a resale is possible, the transfer tax could be more than fully capitalized into property values. Our theoretical considerations also abstract from the fact that sellers may not only care about the sales price but also about the property's expected time-on-the-market, which signifies an opportunity cost to them. The existence of such opportunity costs may reduce the sharpness of the discontinuity in our empirical design. During our sample period, however, the median time on the market was quite short (see: http://www.hometrack.co.uk/our-insight/monthly-national-house-price-survey/time-to-sell-over-three-months-across-a-third-of-the-country; last accessed on 5/29/2012). Moreover, property sales in the UK are time-consuming mainly due to a complicated legal procedure that takes roughly 12 weeks irrespective of the 'attractiveness' of the asking price (see e.g., http://www.home.co.uk/

$$\varepsilon - u\tau > 0. \tag{1}$$

Equation (1) implies that the buyer's excess valuation of the seller's house ε must be sufficiently large to overcome the transaction cost imposed by the transfer tax. In other words, the transfer tax drives a wedge between the buyer's and the seller's valuation.

Let us denote the 'excess margin' of a transaction as

$$k = \varepsilon - u\tau, \tag{2}$$

with the transaction (move) occurring only if $k > 0$.

From equation (2) we can easily derive that

$$\frac{\partial k}{\partial \tau} = -u < 0. \tag{3}$$

We can formulate our first proposition:

PROPOSITION 1. *The propensity of a transaction (move) occurring is a decreasing function of the transfer tax rate.*

We further assume that the seller derives some exogenous payoff π from moving (swiftly) and that this payoff affects the seller's valuation of the property $u(\pi)$. If a household receives a job-related mobility shock (with a better offer in a different labor market), the payoff π of a (swift) move will likely be large, thus significantly lowering the seller's valuation of the property. This is because typically (i) a good job offer that poses a high payoff is valid only for a short period of time and (ii) the seller needs the down-payment for the new house so needs to sell quickly. A similar argument applies for a negative labor related mobility shock. If homeowners become unemployed and have to search for new jobs, they are under greater pressure to sell their homes quickly.

If, on the contrary, a household contemplates an incremental change in housing consumption (e.g., a young growing family considers expanding by moving to a larger house in the same school catchment area or an elderly homeowner ponders down-sizing by moving to a smaller apartment in the same neighborhood) this will typically yield a small(er) payoff π associated with the move.[10] Since the sellers intend to move locally and the opportunity cost of staying put are not very high, they may only lower their valuation u slightly. Following the logic of this line of reasoning, we can assume that

$$\frac{\partial u(\pi)}{\partial \pi} < 0. \tag{4}$$

Using (2) and substituting $\varepsilon = V - u$, we can write

$$k = V - u(\pi) - u(\pi)\tau, \tag{5}$$

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guides/buying/; last accessed on 8/24/2015). Hence, the discontinuity at the cut-off can be expected to persist even when endogenous time-on-the-market is taken into account.

[10] That is, the discrepancy between actual and optimal consumption in terms of quantity and location is smaller.

Differentiating k with respect to τ we obtain

$$\frac{\partial k}{\partial \tau} = -u(\pi). \tag{6}$$

If we finally differentiate $\partial k/\partial \tau$ with respect to π, we get

$$\frac{\partial k/\partial \tau}{\partial \pi} = -\frac{\partial u(\pi)}{\partial \pi}. \tag{7}$$

We argued above that $\partial u(\pi)/\partial \pi < 0$, hence we can state

$$\frac{\partial k/\partial \tau}{\partial \pi} = -\frac{\partial u(\pi)}{\partial \pi} > 0. \tag{7.1}$$

Our second proposition is thus:

PROPOSITION 2. *The likelihood that a given increase in the transfer tax rate leads to a positive 'excess margin' (i.e., does not prevent a transaction/move) will be greater for homeowners who contemplate a move with a greater expected payoff* π.

The above theoretical considerations yield three empirically testable predictions. Our main prediction (**Prediction 1**) follows directly from PROPOSITION 1: At the house value cut-off of £250k, as a consequence of the stamp duty tax notch, household mobility should decrease.

We would expect the magnitude of this adverse effect to depend on household specific circumstances (i.e., the underlying reason and expected payoff of the move). Following the line of reasoning above and PROPOSITION 2, we would expect that homeowners who face gradual changes in their life-cycle circumstances – which move them away incrementally from their optimal housing consumptions and locations – will be discouraged more strongly from moving, as a consequence of the stamp duty notch, than homeowners who face more momentous – typically employment related – mobility shocks. With respect to our empirical analysis; the adverse impact of the stamp duty tax notch should be greater for (i) short distance compared to long distance moves (**Prediction 2**) and (ii) housing-related compared to job-related moves (**Prediction 3**).

3. Empirical analysis

3.1. British Household Panel Survey (BHPS) data

The data used in this study is derived from the BHPS. The BHPS follows roughly 10,000 households over time. We use data from 1996 to 2008, which is the last year available.[11] The surveys for each wave are conducted between September and March. We define our 'year' variable as the year when data collection started.

In addition to a rich set of household characteristics, the dataset includes the owner-occupiers' assessments of the value of their homes and information on whether the household

[11] The BHPS was subsequently replaced by the *Understanding Society* survey and there was a break in the panel.

moved in the subsequent year, making it an ideal dataset to study the impact of transfer taxes on household mobility. The exact question on which the self-assessed house value is based is: "About how much would you expect to get for your home if you sold it today?" If the household gives a range, the interviewer will report the lowest figure in that range.

In our empirical analysis we essentially compare households reporting house values above the 250k cut-off, where the stamp duty tax rate jumps from 1 to 3 percent, with households with self-reported values below the cut-off. We limit the sample to owner-occupiers with self-assessed house values within 20, 30 or 40 percent bands around the £250k cut-off.

One limitation of our analysis is that the mobility status of the last wave (2008) is not known. Thus, the estimation sample consists of data from 1996 to 2007. Finally, we are concerned that recent movers may bias our results. Because many houses sell at and just below £250k, recent movers are disproportionately represented just below the cut-off. To the extent that the recent mover status affects mobility, this may bias our estimates. Moreover, recent movers may be problematic for our research design in the sense that they can precisely choose the value of their house. Their ability to "precisely manipulate" the assignment variable can invalidate the RD design. Due to these issues, we exclude households that moved into their current dwelling between year *t-1* and *t*.

Figure 2 shows the distribution of self-assessed house values in 2006. Overall, people tend to report round values divisible by £50k. There is a clear spike at £250k, but this spike does not stand out from the other round values. It is clearly much more pronounced in the transaction price distribution depicted in Figure 3. The fact that there is no abnormal pile-up at the cut-off in Figure 2 supports the validity of our RD design.

Figure 3 illustrates the distribution of actual transaction prices in the UK in 2006 from a data set obtained from the Land Registry. We expect to observe a pile-up in the transaction price distribution at £250k because houses that would sell for up to £255k absent of the tax rate notch will sell for £250k. This is indeed what Figure 3 reveals.[12]

[12] Basic economic intuition suggests that the price distribution right of the cut-off should move left and the distribution should continue smoothly after the cut-off. However, Figure 3 shows a dip in the distribution immediately right of the cut-off. Very few properties sell at £251k – £255k. The possibility to avoid taxes by selling fixtures and fittings separately at excessive prices is a possible explanation for this dip. Even though the SDLT system introduced in 2003 made such tax avoidance harder, it is likely that close to the cut-off people are more prone to engage in tax avoidance, even by unlawful means, because just above the cut-off, the expected benefits of trying to bring down the declared purchase price may exceed the cost associated with the risk of getting caught.

FIGURE 2
Distribution of self-assessed house values in 2006 (excluding recent movers)

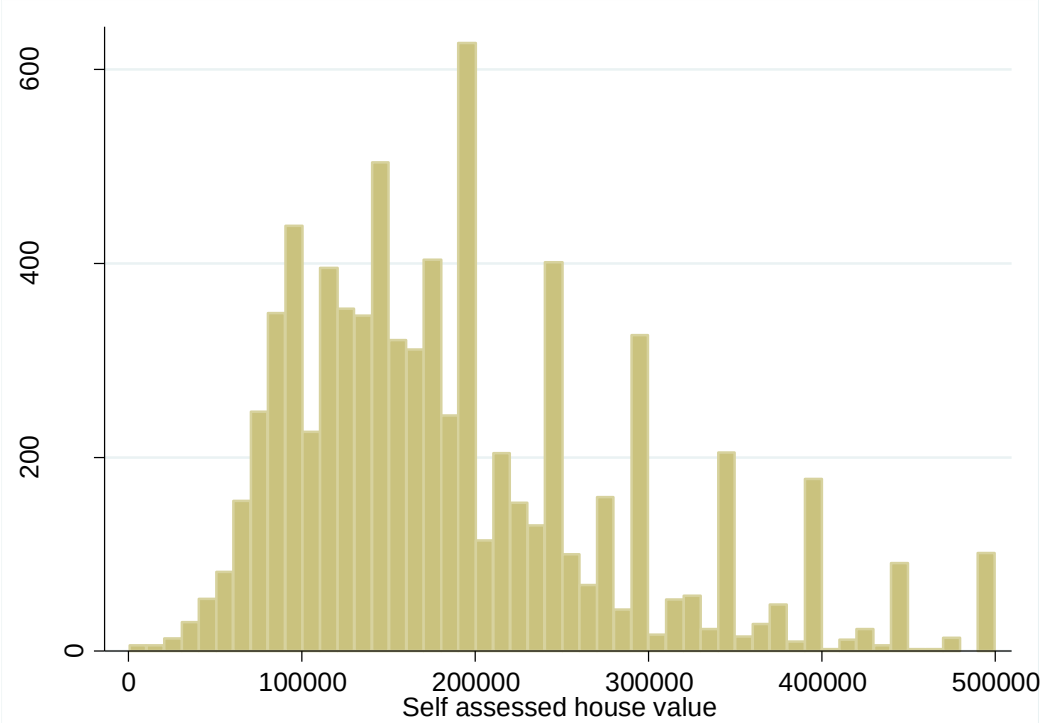
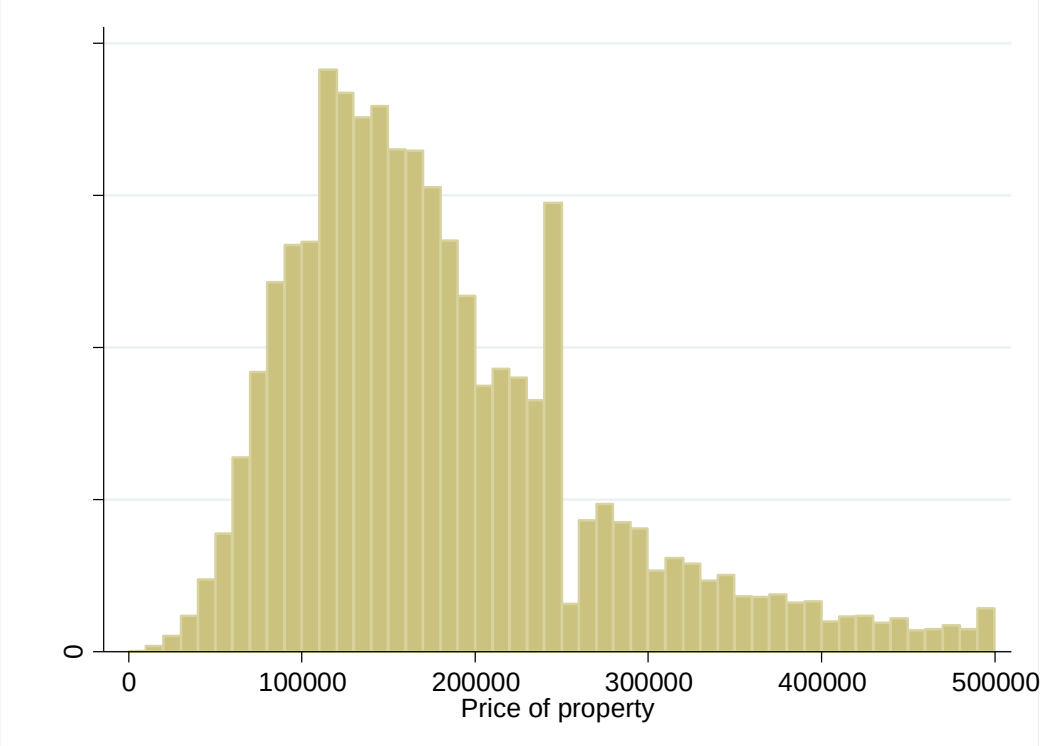


FIGURE 3
Housing transaction prices in the UK in 2006



Treatment variable

Our treatment variable is a dummy that equals one if the self-assessed house value of household *i* in year *t*-1 exceeds £250k, $Treat_{it-1}$ = D($House\ value_{it-1}$ > 250k). We argue that the likelihood that the household's moving decision is affected by the 3 percent tax rate rather than the 1 percent rate increases drastically at, or in the vicinity, of this point. The self-assessed value may not be an accurate measure of the actual value when a house is sold. However, the self-assessed value is arguably more relevant for our purposes as households' expectations regarding stamp duty payable upon sale are likely based on the self-assessed house value.

Outcome variable

Our outcome variable measures actual moves between the interview date and the subsequent interview. The variable *move* gets the value one if the BHPS records classify the household as a mover household in *t*. We lose some observations due to attrition from the panel between *t*-1 and *t* but we were able to recover the value of the moving indicator for some non-respondent households by utilizing information in the sample record files of the BHPS. In addition to the overall mobility, we study different types of mobility separately by using information on the distance of move and main reasons of moving.

We argue that a direct measure of household mobility is preferable to measures of housing transactions, used in most previous studies, when the interest is on the potential adverse impact of the transfer tax on the functioning of housing and labor markets. One crucial advantage of the BHPS with respect to our core research question is that it allows us to gain insight into the effects of transfer taxes by analyzing different types of moves.

Round values

Exploring the data suggests that households that report round house values divisible by £50k (£150k, £200k etc.) have a lower propensity to move. One might be concerned that households intending to stay do not follow the market as closely and give rough rounded estimates of the value of their house. The round value effect might bias our estimates if disproportionately many round values are in the treatment or the control group. To address this issue, we include a dummy variable for round house values divisible by £50k in the model as a control variable.

Summary statistics

Table 2 presents summary statistics for the variables used in our empirical analysis for the largest regression sample (40 percent band around the cut-off). The average house value in the sample is £220,000 and 4.6 percent of households moved within a year. To analyze whether different types of moves are differentially affected, we divide moves into two categories based on the distance of move: less than 10km, and 10km or more. In addition, we use information about the main reason for the move to construct three categories: 'housing and area related', 'employment related' and 'life-event related'. The categories are described

in detail in Appendix Table A1. Housing- and area-related reasons are most common. Moves motivated mainly by job-related reasons seem to be rare. This may partly reflect how the survey question is formulated. Employment motives may still be important even if they are not the main reason for the move. Moving distance and main reason for move being employment related are strongly positively correlated and we think that by analyzing the distance of move we can gain additional insight into whether transfer taxes hinder relocation of the workforce. Less than one percent of short distance moves (less than 10km) but about 11 percent of moves beyond 10km are mainly job related. Similarly, 56 percent of short distance moves but only 27 percent of long distance moves are mainly housing related. Life-event related mobility is not strongly correlated with the distance of move.

3.2. Empirical specification

We use regression analysis to estimate the impact of an increase in the stamp duty rate on the propensity to move of owner-occupier households. The estimation of the effect of the stamp duty is challenging because stamp duty liabilities are likely to be correlated with other factors that affect mobility. However, the fact that the stamp duty rate for the whole property jumps at certain cut-off points can be used to identify the impact of the stamp duty. More specifically, we use the RD method discussed in Lee and Lemieux (2010). The idea is to compare mobility rates below the £250k cut-off point, where the stamp duty amount increases sharply, with the moving probability of households above the cut-off . We estimate a regression model of a mobility dummy on a dummy for being above the cut-off and include a flexible but smooth function of house values in the set of control variables. The house value variables pick up the impact of all determinants of mobility correlated with house values, apart from the stamp duty. Hence, we obtain a reliable estimate of the effect of the stamp duty on mobility clean from confounding factors that might otherwise bias our estimates.

We estimate by OLS a reduced form model, evaluating the mobility effect of being above the £250k threshold compared with the effect below. Specifically, we estimate:

$$Move_{it} = \beta_t + \beta_1 Treat_{it-1} + f(House\ Value_{it-1}) + u_{it}, \qquad \text{(model 1)}$$

where the dependent variable $Move_{it}$ is the mobility indicator that gets the value one if household i moved between $t-1$ and t. The treatment variable takes the value one if the household's self-assessed house value exceeds £250k. The function $f(House\ Value_{it-1})$ is a 1^{st} – 4^{th} order polynomial of the self-assessed house value. In addition, we test the robustness of the results to allowing for different polynomials on either side of the cut-off. To facilitate comparability of the treatment and control groups, we limit the data to 20, 30 or 40 percent bands around the cut-off.

The identifying assumption of the model is that other determinants of mobility develop smoothly with respect to house values and are therefore captured by the f function. The ability of households to precisely manipulate whether they are to the right or to the left of the cut-off would invalidate the design. Manipulation of the self-assessed value is naturally possible but households do not have incentives to misreport in the BHPS survey.

Manipulation of the actual value of the house may be possible too by, for example, neglecting renovation. However, local demand and supply conditions are the main drivers of house prices and therefore precise manipulation is impossible. The fact that there is no abnormal mass in self assessed house values below the cut-off in Figure 2 suggests that manipulation is not a major concern.[13]

If all households respond similarly to the stamp duty, our results for the £250k cut-off can be generalized to apply for the whole population in the UK and possibly tell us something about the effects of similar taxes in other countries as well. With heterogeneous responses, the results may apply to a smaller sub-population. Drawing on Lee and Lemieux (2010), our estimates can be interpreted as a weighted average of treatment effects of the British owner-occupier households in the BHPS data. The weight of each household is the probability that their self-assessed house value falls within the band around the cut-off used in each specification we estimate.

Our empirical results may be affected by the fact that we cannot be sure whether all households reporting house values above the limit are affected by the 3 percent tax rate (or whether households below the limit are affected by the 1 percent tax rate). Thus the treatment group indicator likely measures actual treatment status with error which leads to attenuation bias towards zero.[14]

The panel property of the data and the lumpiness of the distribution of self-assessed house values have potential implications for statistical inference. Firstly, since the households in our sample are observed in multiple years, we have to account for within household correlation of the error terms. We thus cluster the error terms at the household level in our base specification. Another potential issue regarding statistical inference was pointed out by Lee and Card (2008), who discuss RD analysis with a discrete assignment variable. They argue that specification errors in the fitted regression line imply that at each discrete value there is an error component positively correlated within observations at that particular point, which means that standard errors are downward biased. They show that clustering standard errors by the values of the discrete assignment variable solves the problem. In principle, the self-assessed house value is a continuous variable and in the BHPS data there are observations at 147 different self-reported values within the broadest house value band we use (£150k – £350k). However, 97.7 percent of the observations are concentrated at values divisible by £5k. We construct a new house value variable by rounding house values up to the closest value divisible by £5k and use it as an alternative assignment variable in a robustness check where we cluster standard errors at the house value group level in addition to the household

[13] McCrary (2008) type formal tests of discontinuity in the distribution of house values are not suitable with our data. This is because the strong concentration of the data in round values could be erroneously interpreted as manipulation.

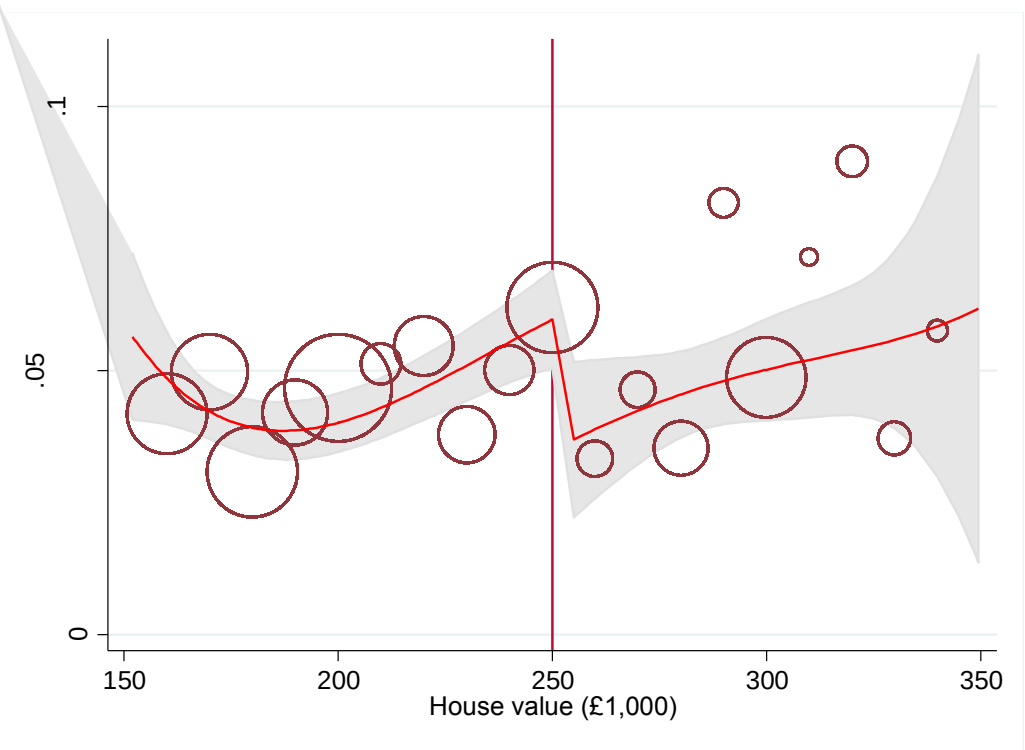
[14] Our empirical model can be interpreted as a reduced form of a fuzzy RD design. Standard fuzzy RD analysis uses a discontinuity in the likelihood of obtaining the treatment as an instrument for the actual treatment status in a Two-Stage-Least-Squares regression. This approach is not feasible with the BHPS data because there is no way to identify the treated households with certainty.

level. Clustering at all of the 147 discrete values is not feasible because of very few observations at several non-round values. Clustering at the house value group level may be problematic with the samples using the 20 percent bands around the £250k cut-off because the number of clusters is limited. However, with the 40 percent band, and possibly with the 30 percent band, the number of house value clusters is reasonably large (40 or 30 clusters). This robustness check indicates to what extent standard errors clustered only at the household level are likely to be downward biased.

3.3. Results

We start with results on the impact of the stamp duty increase on observed household mobility. Figure 4 provides a descriptive analysis of mobility and illustrates our econometric results. The circles in Figure 4 depict the mobility rate for £10k wide house value groups. The size of the circle is proportionate to the number of observations in the group. The red line shows predicted mobility from model (1) with a 4th order polynomial of house value, and the band around it represents the 95% confidence interval. Consistent with our PROPOSITION 1 (and **Prediction 1**), the figure reveals that there is a clear downward shift in moving probability when the self-assessed house value exceeds £250k.

FIGURE 4
Mobility and self-assessed house values



Notes: Circles indicate mobility rate in £10k bins after controlling for round values divisible by £50k. The size of the circle is proportionate to the number of observations in the bin. The line shows predicted mobility from a regression of a mover dummy on a dummy for self-assessed house value above £250k, a 4th order polynomial for the whole range and a dummy for round values divisible by £50k.

Table 3 presents the corresponding estimates of the effect of the stamp duty with various specifications. Columns 1 – 4 report the results with 1^{st} – 4^{th} order polynomials of house value. Rows 1 – 3 use 20, 30 and 40 percent bands around the £250k cut-off. The Akaike Information Criterion (AIC) is shown in italics to assist specification selection (low values preferred).

The coefficient on the treatment indicator is negative in all specifications. With the +/-20 percent band, the estimates are insignificant and vary from -0.012 to -0.034. Using a wider band makes the estimates more stable and decreases the standard errors substantially. With the 30 percent band, the estimates vary from -0.025 to -0.031 and are highly significant. In row 3, using a 40 percent band around the cut-off, results are similar to the second row. We take the specification with the 30 percent band and the 3^{rd} order polynomial of house values as our *preferred specification*. The band is wide enough for reasonably precise estimation but does not use data overly far from the cut-off. The 3^{rd} order polynomial is preferred because adding further polynomials increases the AIC score. Taken at face value, the point estimate of our preferred specification implies that the 2 percentage-point increase in the stamp duty rate reduces the propensity to move by about 2.5 percentage-points in absolute terms or by 35 percent in relative terms.[15] Most of our results are very similar with the 30 percent and 40 percent band, and in the figures describing mobility rates in £10k house value groups and illustrating the effect of the stamp duty, we use the 40 percent band (covering the whole range) and a fourth order polynomial.

The various point estimates vary around our preferred estimate with the attached standard errors also varying around the standard error of the preferred estimate. Overall, our results provide strong supporting evidence that an increase in the stamp duty has a significant negative effect on household mobility.

Distance and type of moves

In the analysis that follows we explore our PROPOSITION 2, which implies that a given increase in the stamp duty should reduce mobility more strongly for homeowners who face gradual changes in their life-cycle circumstances as opposed to momentous shocks.

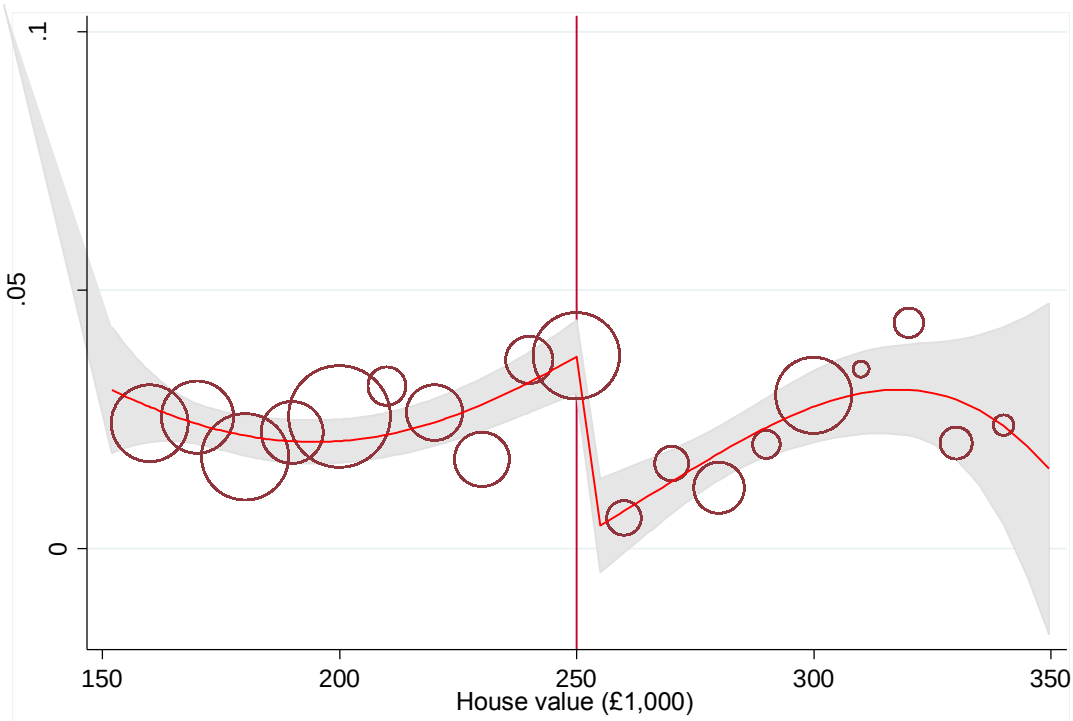
In Figures 5a and 5b, we explore the proposition that an increase in the stamp duty tax rate more strongly adversely affects short distance moves (**Prediction 2**). We divide moves into two groups based on the straight line distance of move: less than 10 kilometers and over 10 kilometers. The shares of these groups in our sample of moves are 56 percent, and 44 percent. Figure 5a illustrates that there is a clear downward shift in short distance mobility at the cut-off, but in Figure 5b (long distance mobility) no such drop is seen, consistent with our theoretical considerations.

[15] The relative decrease in propensity to move was calculated by comparing the treatment effect estimate (2.5 percentage points) in our preferred model specification to the predicted moving propensity (7.2 percentage points) in the treatment group absent of the treatment. The relative reduction in mobility is 2.5/7.2 = 34.7 percent, or, with a treatment effect estimate of 3.0 percentage points; 41.7 percent

Table 4 presents the corresponding econometric results for short and long distance moves with 20, 30 and 40 percent bands around the cutoff and 3rd and 4th order polynomials. The treatment effect estimates on short distance moves (columns 1 and 2) are negative and highly significant in all specifications, apart from the 20 percent band with a 4th order polynomial. The impact on long distance mobility (3rd and 4th columns) is close to zero and insignificant in all specifications.

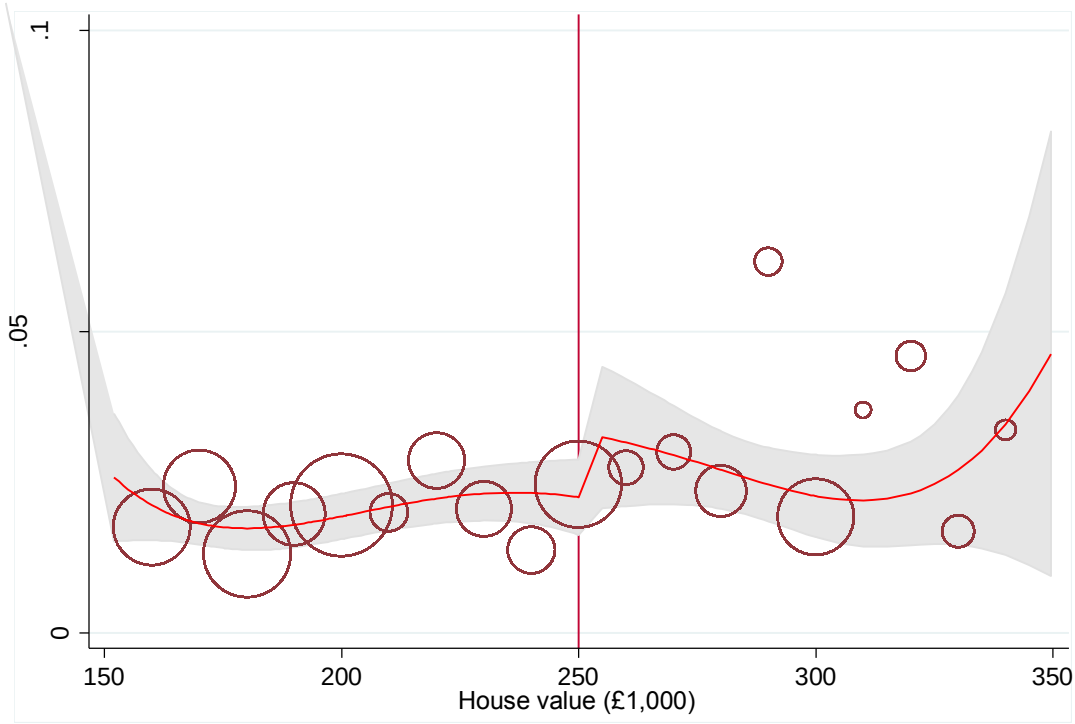
The results imply that the overall effect found in Table 3 is solely driven by short distance mobility (less than 10km). Long distance mobility appears to be unaffected by the stamp duty. Our explanation for this finding is that short distance mobility is closely linked to incremental adjustments of housing consumption. A 2 percentage point increase in the stamp duty may outweigh the benefits of typical incremental housing consumption adjustments, such as buying one room more or less, but it may not outweigh the benefits associated with long distance moves. The latter are typically related to other important decisions, such as changes in employment or family status.[16]

FIGURE 5a
Short distance (<10km) mobility and self-assessed house values



[16] Consistent with this conjecture, Buck (2000) finds that job-related moves in the UK tend to be over longer distances (across rather than within Local Authority Districts).

FIGURE 5b
Long distance (>10km) mobility and self-assessed house value



In Figures 6a-c, we explore the proposition that the stamp duty has a stronger impact on housing-related mobility than on mobility triggered by employment reasons or on major life-events (**Prediction 3**). We use information on the primary reason for moving to divide moves into three groups: 1) housing and area related, 2) employment related, and 3) major life event related. Table A1 describes how we have constructed the categories. The share of moves mainly motivated by job-related reasons is only about 5 percent, which makes it difficult to identify a separate effect on job-motivated moves. This issue notwithstanding, the figures are in line with our interpretation of the distance-of-move results in Table 4. There is a visible drop in mobility at the cut-off in Figure 6a (housing- and area-related mobility). Employment-related mobility (Figure 6b) and major life event-related mobility (Figure 6c) seem to be unaffected by the increase in stamp duty.

The corresponding regression results for different types of mobility are presented in Table 5. Coefficients for housing- and area-motivated moves are always negative and highly statistically significant with 30 and 40 percent bands. The coefficients for job-related moves are close to zero and insignificant, consistent with our theoretical considerations discussed in Section 2. The results for life event related mobility are less clear. The coefficient is negative and significant in two of the six specifications, indicating that part of the negative mobility effect of the stamp duty may be attributable to a reduction in this kind of moves.

FIGURE 6a
Housing and area related mobility and self-assessed house values

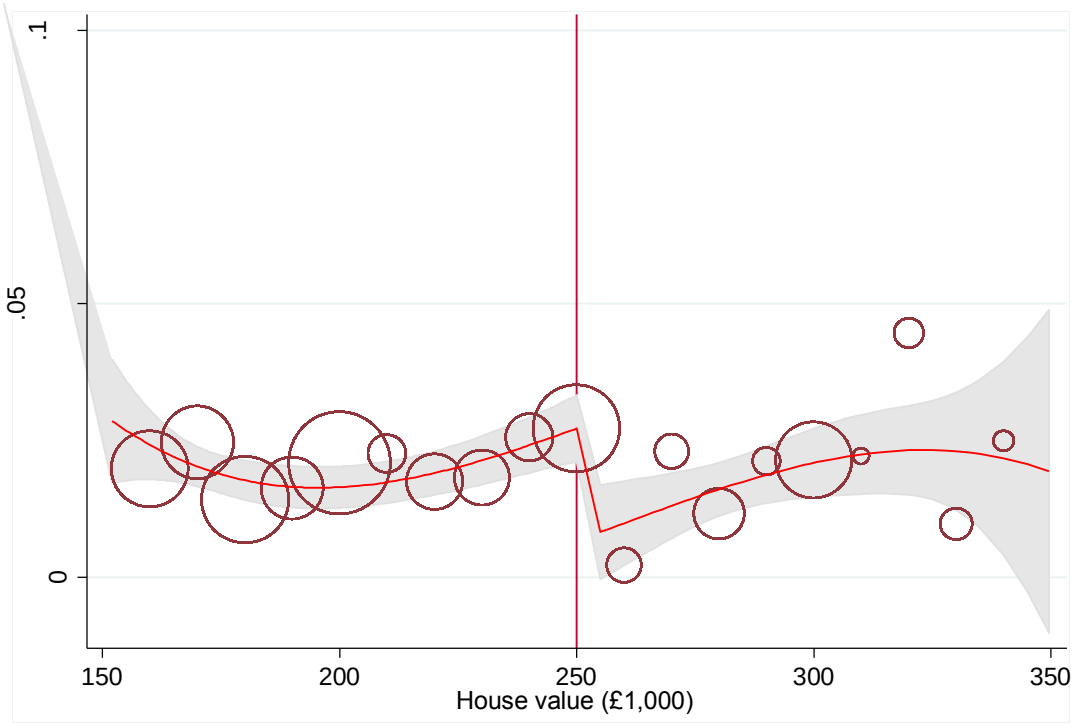


FIGURE 6b
Employment related mobility and self-assessed house values

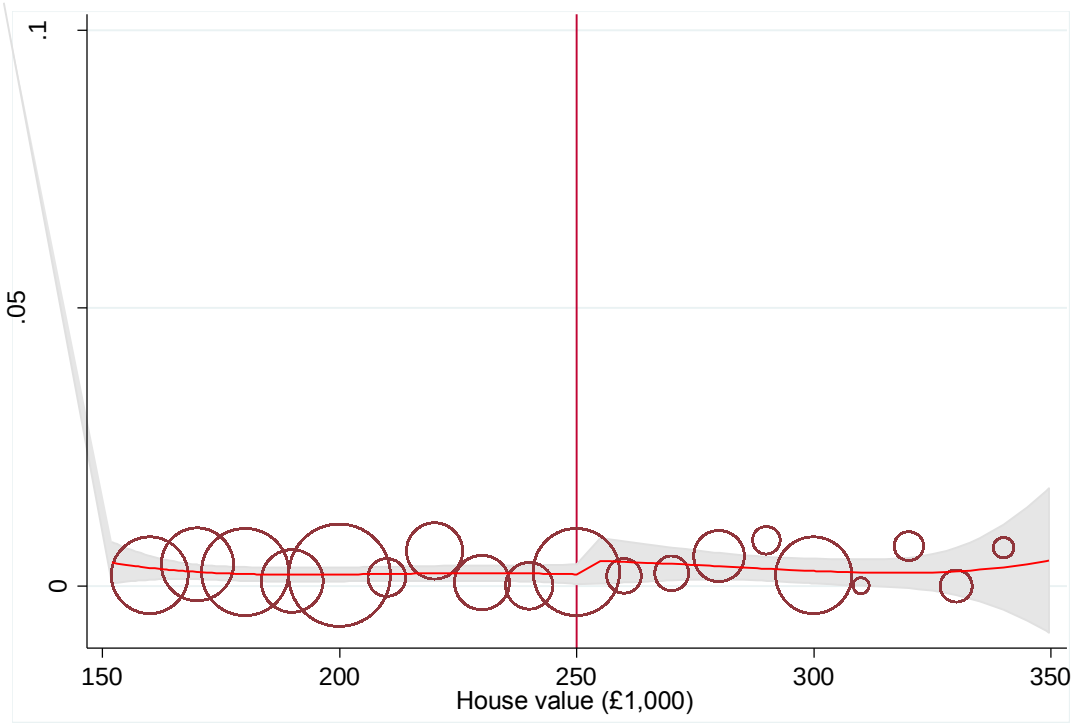
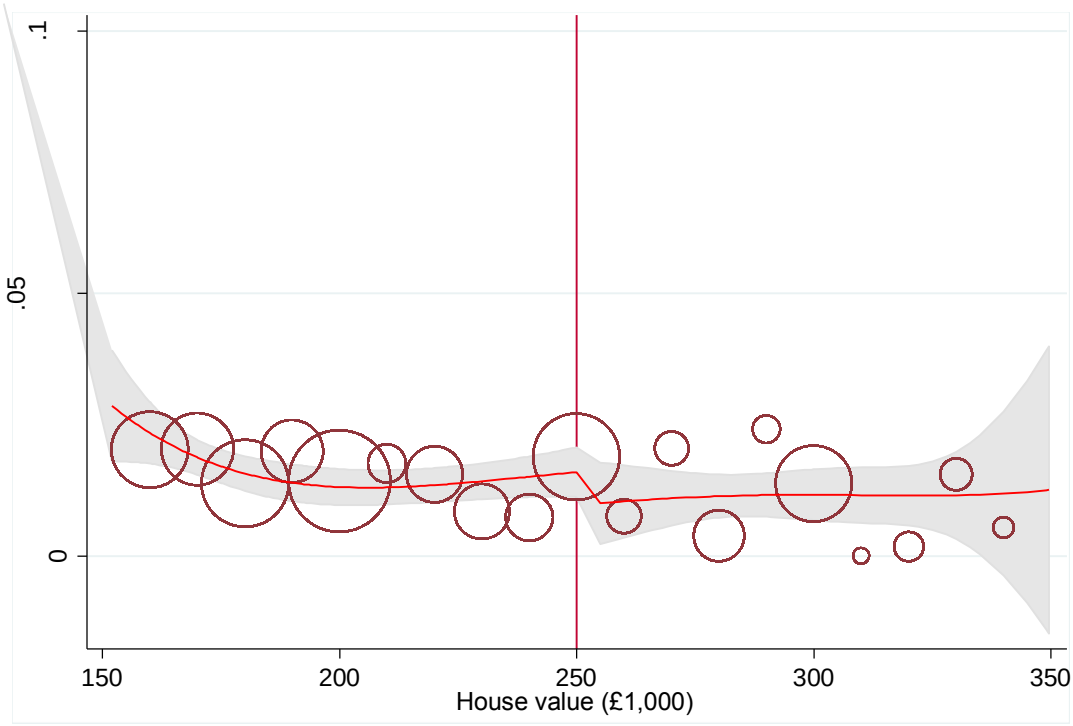


FIGURE 6c
Major life event related mobility and self-assessed house values



Validity tests and robustness checks

A standard way of testing the validity of the RD design is to check if predetermined characteristics of households change significantly at the cut-off. If the flexible but smooth function of the assignment variable (self-assessed house values in our case) adequately captures other relevant factors, we should not observe changes in background characteristics of households at the cut-off. To test this, we estimate model (1) using several observed determinants of mobility as the dependent variable. The variables used are: the age of the household head, dummy for kids, household income, two indicators of education (GCE A-levels or higher and bachelor degree or higher), a dummy for the household head being unemployed, and commute time in minutes. Significant coefficients in these 'balancing tests' would suggest that the model specification is not sufficiently flexible to control for other determinants of mobility, or that households with different characteristics sort into different sides of the cut-off, which could invalidate the research design. The balancing tests for education are particularly important because in addition to being related to mobility, education may also be related to how well the household knows the stamp duty system.

Table 6 presents the results of the balancing tests with a 3rd order polynomial of house values in Panel A and a 4th order polynomial in Panel B. Panel A, indicates that income, the likelihood of having children, education, and the commute time are not correlated with the treatment variable. In the specification with the 40 percent band, age is statistically

significantly higher in the treatment group. However, when we add the 4th order term of house values in Panel B, the coefficient becomes insignificant even with the 40 percent band.

As an additional test of whether our results might be driven by confounding factors correlated with the treatment indicator we include age, a dummy for kids, log of household income, a dummy for GCE A-levels or higher, a dummy for bachelor degree or higher, a dummy for being unemployed and region dummies (19 regions) as control variables in model (1).[17] Table 7 presents the results. The coefficients on the treatment indicator are very similar to the specifications without the additional controls in Table 3. This increases our confidence in the finding that the stamp duty decreases mobility. The robustness of the results to observed determinants of mobility suggests that unobserved omitted variables are unlikely to bias our estimates significantly.

We carried out a number of additional robustness checks, the results of which we report in various Appendix Tables. To begin with, a potential concern related to basing the analysis on self-assessed house values is that households with high underlying propensity to move may be better informed about the stamp duty and may therefore be more likely to report £250k rather than slightly above £250k. As a test for whether possible sorting of households close to the cut-off might drive our results, we re-estimated the model dropping all households that self-report exactly £250k, £245k–£255k or £240k–£260k, respectively. We use the 40 percent band because otherwise the remaining sample size is small. The results reported in Appendix Table A2 are similar to Table 3 (last row) despite losing many observations. Our findings survive even when we limit the sample to households who say they are willing to move. In this subsample, sorting on unobserved propensity to move should not be a problem. The results are shown in Appendix Table A3.

In our base specification, we fit the same polynomial over the whole range of house values and only allow the intercept to change at the cut-off. Restricting the polynomials to be the same on both sides of the cut-off can be considered intuitively unappealing, because it implies that we use data on the right of the cut-off to estimate the function on the left, and vice versa. We therefore estimate a more flexible specification in which we allow the slope of the regression line to differ by treatment status. That is, we estimate the coefficients on the n^{th} order polynomials of house values separately for the sample below and above the cut-off. We report results with 1^{st} and 2^{nd} order polynomials of house values, so that the maximum number of parameters used is the same as in our base specification. The results are reported in Appendix Table A4. Again, all estimates are negative and some of them are statistically significant. As expected, the standard errors go up in some specifications, especially with the 2^{nd} order polynomial.

Another concern is that our results might be driven by some irregularities related to the reporting of house values around round numbers. In order to test this possibility, we run

[17] The list of controls in Table 7 does not include commute time because there are too many missing observations (see Table 2). However, reassuringly, the results in Table 6 indicate that commute time is not correlated with the treatment variable.

placebo tests with 8 artificial cut-offs set at £150k, £175k, £200k, £225, £275k, £300k, £325k, and £350k. We focus on specifications that use a 30 percent band around the cut-off and a 3rd order polynomial of house values, and a 40 percent band with a 4th order polynomial. The results are shown in Appendix Figures A1 and A2. None of the eight placebo tests gives a negative and significant coefficient. The fact that our method does not give significant negative coefficients at artificial cut-offs increases our confidence in the finding that the decrease in mobility at £250k is indeed caused by the 2 percentage-point increase in the stamp duty at the cut-off.

Finally, standard errors in Table 3 are clustered at the household level to make them robust for correlation in the error term within household. As discussed in Section 3.2., the error terms may, in addition, be correlated within different self-assessed house values. In Appendix Table A5 we report the results with the 30 percent and 40 percent bands using £5k wide house value groups as the assignment variable and two-way clustering. The coefficients on the treatment indicator in Appendix Table A5 are almost identical to those in Table 3. A comparison of standard errors in Appendix Table A5 with the standard errors in Table 3 (30 and 40 percent bands) suggests that the one-way clustered standard errors in Table 3 are only slightly downward biased. Two-way clustering increases standard errors by around 0.002 depending on the specification. With the 40 percent band, significance of some of the coefficients decreases but with the 30 percent band the significance levels do not change.

4. Conclusions

The previous literature suggests two main channels through which transfer taxes on property may have detrimental effects on the functioning of the economy. Firstly, by increasing moving costs, the transfer tax may deter the unemployed from taking up jobs far from their residence or workers from switching to more productive jobs. Secondly, the transfer tax can make households tolerate larger discrepancies between the characteristics of their actual and the desired dwelling before moving. As a result, the match between dwellings and households is on average worse than in the absence of the tax. The increased mismatch on the housing market may lead to 'waste' in the form of misallocation costs due to, for example, large households living in too small apartments and small households living in too large apartments simply because the transfer tax associated with moving outweighs the benefits of moving.

The transfer tax induced increase in moving costs will only have these adverse effects if it actually reduces mobility. Our core estimates indicate that a 2 percentage-point increase in the British stamp duty indeed reduces household mobility considerably; by 2.5 to 3 percentage points[18], implying a reduction in mobility of 35 to 42 percent.

Back-of-the-envelope calculations suggest that the implied welfare loss associated with this reduction is substantial. If we assume a uniform distribution of the benefits of moving between 0 and £5k, our calculations – based on our core estimates – imply a welfare loss associated with the reduction of mobility of between 36 and 47 percent of the additional

[18] This range is based on the 30 percent band around the cut-off and 1st to 4th order polynomials in Table 3.

revenue generated by the tax rate increase.[19] This is about three times as high as the estimated welfare loss in Dachis *et al.* (2012) but of a similar magnitude as in the model simulations of Nordvik (2001).

Our analysis of short and long distance moves indicates that the effect is solely attributable to the stamp duty's adverse impact on short distance moves, which are typically related to adjustments in housing consumption. This implies that the stamp duty may lead predominately to misallocation of dwellings in the housing market. Its impact on the functioning of the labor market may be fairly limited.

One interesting feature of the British housing market is the fact that owner-occupier moves are comparably rare. During our sample period (1996 to 2007) and based on the full BHPS sample (not just our regression sample), the average propensity of a UK owner-occupier household to move during a calendar year was only 5.1 percent. This contrasts to the household mobility in the United States. Owner-occupier households in the US were more than twice as likely to move during our sample period: Based on the Panel Study of Income Dynamics (PSID) the propensity of US owner-occupier households to move during a calendar year was on average 11.5 percent. Both, UK and US owner-occupier households face housing transfer taxes, though in most US states and municipalities this tax is not very substantial. According to our findings, differences in the transfer tax rates alone cannot fully explain this difference in mobility rates. In 2007 the average stamp duty rate faced by homeowners in the UK was 1.25% (based on the BHPS). A simple application of our preferred point estimate to all homeowners suggests that eliminating the stamp duty in the UK would increase mobility by 1.4 percentage-points to 6.5%, which is still much lower than the mobility rate for owner-occupiers in the US.

Given the magnitude of the negative effect of the British stamp duty, particularly on short distance and housing-related mobility, we conclude that transfer taxes likely have very substantial detrimental effects on the functioning of the housing market. This implies that transfer taxes on residential properties are an inefficient way of collecting tax revenue. Taxes on land (and housing) consumption that apply independently of whether a household moves also have real property as the basis of taxation but are less distorting.

[19] In our data the mobility rate in the treatment group is 0.047 (40 percent band). The mobility rate in the absence of the tax rate hike is 0.047 plus the estimated effect. Assuming a 2.5 percentage point effect for the tax rate increase implies a counterfactual mobility rate of 0.072. Denote the number of potential movers in the treatment group by M and assume each house sells for V. The additional revenue due to the tax rate increase from 1 to 3 percent is $0.03 \times V \times 0.047 \times M - 0.01 \times V \times 0.072 \times M$. Assuming the welfare loss from the prevented moves is half of the increase in moving costs due to the tax rate increase, we get that the additional welfare loss is $0.025 \times M \times (0.02 \times V)/2$. Thus the welfare loss is 36 percent of the additional revenue. Assuming a 3.0 percentage point effect of the tax rate increase on the mobility rate, we obtain a counterfactual mobility rate of 0.077. Replicating the calculations from above, this implies a welfare loss of 47 percent of the additional revenue.

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Tables

TABLE 1
Stamp duty schedule – During sample period

Purchase price	Stamp duty rate
Up to £125,000	0%
Over £125,000 to £250,000	1%
Over £250,000 to £500,000	3%
Over £500,000 to £1 million	4%
Over £1 million	5%

TABLE 2
Summary statistics – 40 percent band around £250k cut-off

Variable	Obs.	Mean	Std. Dev.
House value	21737	219.5	47.5
Moved between t and t+1	21737	0.046	0.210
Distance of move less than 10 km	21737	0.025	0.156
Distance of move 10km or more	21737	0.021	0.144
Moved mainly for employment reasons	21737	0.002	0.050
Moved mainly for housing or area reasons	21737	0.020	0.140
Moved mainly for life-event reasons	21737	0.015	0.122
Round house value (£200k, £250k or £300k)	21737	0.353	0.478
Children (0/1)	21737	0.327	0.469
Annual household income	21303	38122	26743
Age	21434	52.7	14.3
General Certificate of Education (GCE) A-levels or higher	20952	0.643	0.479
Bachelor degree or higher	20952	0.203	0.402
Unemployed	21735	0.009	0.095
Commute time in minutes	10683	26.7	22.8

TABLE 3

Stamp duty and mobility

Dependent variable: household moved (0/1)					
Band around	Order of polynomial of house value				
£250k cutoff	1st	2nd	3rd	4th	N
20 %	-0.012	-0.025	-0.034	-0.017	7592
	[0.017]	[0.018]	[0.026]	[0.027]	
	-1213	*-1219*	*-1217*	*-1218*	
30 %	-0.026***	-0.031***	-0.025***	-0.028***	16848
	[0.007]	[0.009]	[0.009]	[0.010]	
	-5758	*-5757*	*-5760*	*-5758*	
40 %	-0.014**	-0.021***	-0.030***	-0.025**	21737
	[0.007]	[0.008]	[0.008]	[0.011]	
	-6205	*-6206*	*-6212*	*-6211*	

Notes: Table shows coefficients on the treatment indicator (house value>$250k). Additional control variables: dummy for round house value divisible by £50k. Standard errors clustered at household level in brackets. * p<0.1, ** p<0.05, *** p<0.01. Akaike Information Criterion is shown in *italics*.

TABLE 4

Stamp duty and mobility – Differential effects by distance of move

Type of move	Distance of move < 10km		Distance of move >10km	
Band around	Order of polynomial of house value			
£250k cutoff	3rd	4th	3rd	4th
20 %	-0.054***	-0.036*	0.020	0.019
	[0.020]	[0.020]	[0.017]	[0.018]
	-5915	*-5929*	*-6651*	*-6649*
30 %	-0.032***	-0.041***	0.007	0.013
	[0.006]	[0.009]	[0.007]	[0.010]
	-15995	*-15995*	*-18127*	*-18126*
40 %	-0.032***	-0.035***	0.001	0.011
	[0.006]	[0.007]	[0.006]	[0.008]
	-19118	*-19117*	*-22472*	*-22474*

Notes: Table shows coefficients on the treatment indicator (house value>$250k). Additional control variables: dummy for round house value divisible by £50k. Standard errors clustered at household level in brackets. * p<0.1, ** p<0.05, *** p<0.01. Akaike Information Criterion is shown in *italics*.

TABLE 5

Stamp duty and mobility – Differential effects by primary reason of move

Type of move	Housing and area		Employment		Life-events	
Band around	Order of polynomial of house value					
£250k cutoff	3rd	4th	3rd	4th	3rd	4th
20 %	-0.035**	-0.022	0.008*	0.005	-0.007	-0.001
	[0.017]	[0.018]	[0.005]	[0.005]	[0.014]	[0.014]
	-7696	*-7707*	*-22839*	*-22845*	*-10917*	*-10921*
30 %	-0.020***	-0.021***	0.002	0.003	-0.006	-0.019***
	[0.006]	[0.008]	[0.002]	[0.003]	[0.005]	[0.007]
	-19965	*-19963*	*-55811*	*-55812*	*-25432*	*-25436*
40 %	-0.021***	-0.021***	0.001	0.002	-0.009**	-0.006
	[0.005]	[0.006]	[0.002]	[0.003]	[0.004]	[0.006]
	-23822	*-23820*	*-68739*	*-68740*	*-29831*	*-29830*

Notes: Table shows coefficients on the treatment indicator (house value>$250k). Additional control variables: dummy for round house value divisible by £50k. Standard errors clustered at household level in brackets. * p<0.1, ** p<0.05, *** p<0.01. Akaike Information Criterion is shown in *italics.*

TABLE 6

Balance of covariates tests

Panel A: 3rd order polynomial of house value							
Band around £250k cutoff	Age	Kids (0/1)	Ln(hh income)	GCE A-levels or higher	Bachelor degree or higher	Un-employed	Commute in minutes
30 %	0.618	0.021	0.040	0.021	0.031	-0.002	-0.753
	[0.638]	[0.022]	[0.034]	[0.022]	[0.020]	[0.004]	[1.476]
40 %	1.988***	-0.001	-0.000	0.000	0.007	-0.001	-0.679
	[0.571]	[0.020]	[0.030]	[0.020]	[0.018]	[0.004]	[1.317]
Panel B: 4th order polynomial of house value							
Band around £250k cutoff	Age	Kids (0/1)	Ln(hh income)	GCE A-levels or higher	Bachelor degree or higher	Un-employed	Commute in minutes
30 %	0.125	0.052*	0.030	0.028	0.044	-0.004	1.922
	[0.887]	[0.031]	[0.048]	[0.031]	[0.028]	[0.006]	[1.773]
40 %	0.079	0.040	0.031	0.017	0.031	-0.004	-0.826
	[0.715]	[0.025]	[0.038]	[0.025]	[0.023]	[0.005]	[1.610]

Notes: Table shows coefficients on the treatment indicator (house value>$250k). Additional control variables: dummy for round house value divisible by £50k. Standard errors clustered at household level in brackets*. p<0.1, ** p<0.05, *** p<0.01.

TABLE 7
Stamp duty and mobility – Controls added

Dependent variable: household moved (0/1)					
Band around	Order of polynomial of house value				
£250k cutoff	1st	2nd	3rd	4th	N
20 %	-0.015	-0.030	-0.047*	-0.028	7222
	[0.018]	[0.019]	[0.027]	[0.028]	
	-1126	*-1134*	*-1133*	*-1146*	
30 %	-0.025***	-0.030***	-0.025***	-0.027**	16064
	[0.007]	[0.010]	[0.010]	[0.014]	
	-5509	*-5508*	*-5508*	*-5508*	
40 %	-0.015**	-0.019**	-0.028***	-0.026**	20769
	[0.007]	[0.008]	[0.008]	[0.011]	
	-6129	*-6128*	*-6133*	*-6131*	

Notes: Table shows coefficients on the treatment indicator (house value>$250k). Additional control variables: year dummies, dummy for round house value, age, dummy for kids, 18 region dummies, dummy for GCE A-levels, dummy for bachelor degree or higher and dummy for unemployed. Standard errors clustered at household level in brackets. * p<0.1, ** p<0.05, *** p<0.01. Akaike Information Criterion is shown in *italics.*

Appendix

TABLE A1
Construction of type of move variables

Job-related moves	Housing- and area-related moves	Major life event-related moves
Did you move for reasons that were wholly or partly to do with your own job, or employment opportunities?		
YES	NO	NO
and/or	and	and
What were your (other) main reasons for moving?		
Job reason, self	Larger accommodation	Move in with partner
Job reason, other	Smaller accommodation	Split from partner
	Own accommodation	Move in with family
(If other than job reasons given,	Buy accommodation	Move from family
not included in any category)	No stairs	Move in with friend
	Another type	Closer to family or friends
	Disliked previous accommodation	Move to college
	Better accommodation	Left college
	Privacy	Retirement
	Wants change	Evicted, repossessed
	Disliked isolation	Health reasons
	To rural environment	
	From rural environment	
	Traffic	
	Area unsafe	
	Noise	
	Area unfriendly	
	To specific place	
	Disliked area	

TABLE A2

Stamp duty and mobility – Observations close to £250k dropped

Dependent variable: household moved (0/1)						
Excluded house values	£250k		£245k-£255k		£240k-£260k	
Band around	Order of polynomial of house value					
£250k cutoff	3rd	4th	3rd	4th	3rd	4th
40 %	-0.031**	-0.027*	-0.026**	-0.021	-0.051***	-0.041*
	[0.013]	[0.014]	[0.013]	[0.014]	[0.019]	[0.021]
	-5333	*-5331*	*-5373*	*-5372*	*-5055*	*-5054*

Notes: Table shows coefficients on the treatment indicator (house value>$250k). Additional control variables: dummy for round house value divisible by £50k. Standard errors clustered at household level in brackets. * p<0.1, ** p<0.05, *** p<0.01. Akaike Information Criterion is shown in *italics*.

TABLE A3

Stamp duty and mobility – Sample includes only households saying they would like to move

Dependent variable: household moved (0/1)					
Band around	Order of polynomial of house value				
£250k cutoff	1st	2nd	3rd	4th	N
20 %	0.007	-0.014	-0.049	-0.006	1582
	[0.051]	[0.056]	[0.080]	[0.085]	
	1209	*1210*	*1212*	*1206*	
30 %	-0.069***	-0.077**	-0.068*	-0.040	3239
	[0.025]	[0.034]	[0.035]	[0.048]	
	1903	*1905*	*1906*	*1907*	
40 %	-0.030	-0.066**	-0.096***	-0.050	4412
	[0.023]	[0.029]	[0.031]	[0.039]	
	2777	*2774*	*2769*	*2767*	

Notes: Table shows coefficients on the treatment indicator (house value>$250k). Additional control variables: dummy for round house value divisible by £50k. Standard errors clustered at household level in brackets. * p<0.1, ** p<0.05, *** p<0.01. Akaike Information Criterion is shown in *italics*.

TABLE A4

Stamp duty and mobility – Coefficients on n^{th} order polynomials allowed to vary on different sides of cut-off

Band around	Order of polynomial of house value		
£250k cutoff	1st	2nd	3rd
20 %	-0.022	-0.017	-0.100
	[0.018]	[0.033]	[0.075]
	-1215	*-1221*	*-1220*
30 %	-0.034***	-0.014	-0.034
	[0.011]	[0.017]	[0.026]
	-5758	*-5756*	*-5765*
40 %	-0.018**	-0.034**	-0.016
	[0.009]	[0.014]	[0.023]
	-6204	*-6209*	*-6209*

Notes: Table shows coefficients on the treatment indicator (house value>$250k). Additional control variables: dummy for round house value divisible by £50k. Standard errors clustered at household level in brackets. * p<0.1, ** p<0.05, *** p<0.01. Akaike Information Criterion is shown in *italics*.

TABLE A5

Stamp duty and mobility – Standard errors clustered at household and £5k house value group level

Dependent variable: household moved (0/1)				
Band around	Order of polynomial of house value (rounded up to closest £5k)			
£250k cutoff	1st	2nd	3rd	4th
30 %	-0.027***	-0.032***	-0.025***	-0.031***
	[0.009]	[0.009]	[0.010]	[0.012]
	-5760	-5759	-5764	-5763
40 %	-0.016	-0.022**	-0.030***	-0.027**
	[0.010]	[0.009]	[0.010]	[0.011]
	-6207	-6207	-6214	-6212

Notes: Table shows coefficients on the treatment indicator (house value>$250k). Additional control variables: dummy for round house value divisible by £50k. Standard errors clustered at household level and £5k house value group level in brackets. * p<0.1, ** p<0.05, *** p<0.01.

FIGURE A1
Placebo tests with artificial cut-offs
(Specification: 30% band and 3rd order polynomial, Outcome: all moves)

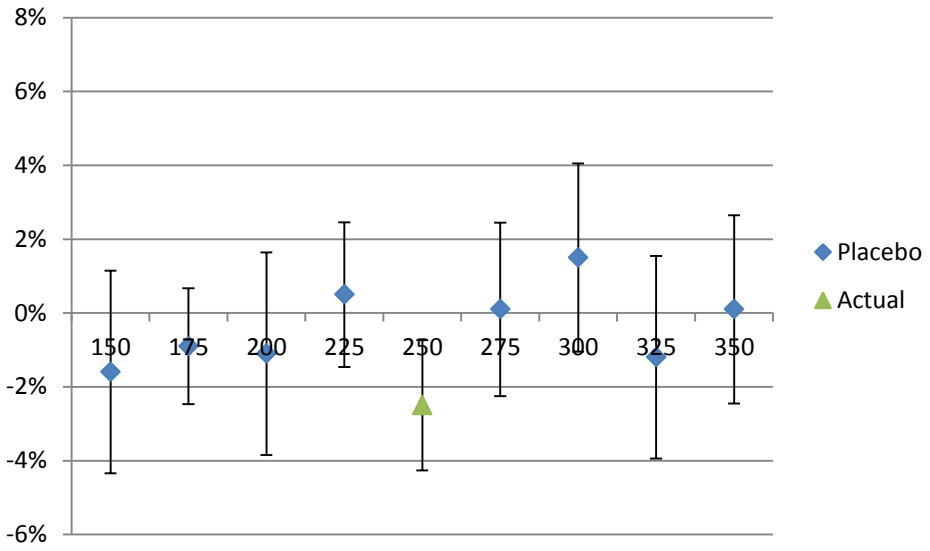

FIGURE A2
Placebo tests with artificial cut-offs
(Specification: 40% band and 4th order polynomial, Outcome: all moves)