Housing Market Responses to Transaction Taxes: Evidence From Notches and Stimulus in the UK

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Transaction Taxes

- Asset transaction taxes are widely debated, but understudied
  - Poterba 2002; Matheson 2011; European Commission 2013
  - Recent debate motivated by the crisis in financial and housing markets

- Different kinds of asset transaction taxes
  - Securities transaction tax, currency transaction tax, bank transaction tax, house transaction tax

- Housing transaction taxes are by far the most widespread
  - 38 US states, 27 OECD countries, many developing countries
Housing Transaction Taxes

- It has been argued that housing transaction taxes are less distortionary than financial transaction taxes
  - House transactions are less frequent
  - House transactions are less international
  - Enforcement is relatively good
  - May explain the popularity of housing transaction taxes

- Housing transaction taxes often create quasi-experimental variation useful for evaluating its distortionary effects
  - Separates them from financial transaction taxes

- The UK version of this tax: **Stamp Duty Land Tax (SDLT)**
Advantages of our Setting

- **Large administrative dataset:**
  - Universe of stamp duty tax returns in the UK from 2004-2012 (about 10 million property transactions)

- **Quasi-experimental variation:**
  - Tax schedule produces large **price notches** (discrete jumps in tax liability at cutoff prices)
  - Anticipated tax changes create **time notches** (discrete jumps in tax liability at cutoff dates)
  - **Permanent reforms** and **stimulus** (tax holiday) affect houses in specific price ranges
Two Broad Findings

1. Transaction taxes are extremely distortionary
   - Distorts the price, volume, and timing of house transactions
   - Laffer rate of 4–7% (Pareto bound)
   - Marginal cost of funds is orders of magnitude larger than for conventional taxes

2. Temporary transaction tax cuts are enormously effective as fiscal stimulus
   - Large boost during stimulus, smaller slump after stimulus
   - Substantial GDP effects (1 dollar per dollar of tax cut) due to complementarities between moving house and spending
   - Relevant for transaction subsidies (e.g. US homebuyer tax credit)
1. **Transaction taxes**
   - Property transaction taxes
   - Capital gains taxes (stock, housing)
     Feldstein et al. 1980; Auerbach 1988; Burman & Randolph 1994; Cunningham & Engelhardt 2008; Shan 2011

2. **Fiscal stimulus**
   - Stimulus effects of tax rebates
     Shapiro & Slemrod 2003; Johnson et al. 2006; Agarwal et al. 2007
   - Stimulus and reversal effects of car transaction subsidies
     Mian & Sufi 2012
Outline

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  Static Notches: House Price Responses
  Moving Notches: Dynamics of House Price Responses
  Stimulus: Timing and Extensive Responses
  Stimulus: Household Spending & GDP Effects
  Long Run Revenue and Welfare Effects

Conclusions
UK Stamp Duty: Notches

- Tax on the total sale price of property; remitted by the buyer

<table>
<thead>
<tr>
<th>Price</th>
<th>Tax Liability</th>
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<tbody>
<tr>
<td>£125K</td>
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<tr>
<td>£250K</td>
<td>1%</td>
</tr>
<tr>
<td>£500K</td>
<td>3%</td>
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<td>£1,000K</td>
<td>4%</td>
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<td>£2,000K</td>
<td>5%</td>
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\Delta T = \£40,000
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## UK Stamp Duty: Reforms & Stimulus

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<td>£2000K - ∞</td>
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# UK Stamp Duty: Reforms & Stimulus

## Stimulus: Stamp Duty Holiday 3 Sep 2008 - 31 Dec 2009

- First notch moved temporarily from £125K to £175K, eliminating taxes in a 50K range
- Beginning of holiday was unanticipated
- End of holiday was anticipated (time notch at New Year 2010)

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<td>£125K - £175K</td>
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UK Stamp Duty: Compliance

- HMRC estimates put the stamp duty tax gap between 4-5% (lower than for most other taxes in the UK)

- Evasion through side payments associated with substantial risk
  - Collusion between multiple players difficult to sustain (Kleven, Kreiner, and Saez 2009)
  - Lag between agreeing and completing a house contract further complicates evasion

- Tax base includes “everything” except freestanding “extras” → potential evasion by overvaluing such items
Outline

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  Long Run Revenue and Welfare Effects

Conclusions
Data

- First-time access to administrative stamp duty records from Her Majesty’s Revenue and Customs (HMRC)

- Universe of stamp duty land tax returns (≈ all transactions) in the UK from 2004-2012

- About 10 million transactions

- Rich tax return information; little information outside the return
Data Spanning the Collapse of the Housing Market

![Graph showing the normalised number of transactions from 2005 to 2013, with data for London and UK. The graph indicates a significant decline in transactions starting in 2007, particularly in London.](image-url)
Prices Have Recovered in London, But Not the UK Overall

![Graph showing the average price (2005m4 = 1) for London and the UK from 2005m1 to 2013m1. The graph demonstrates that prices have recovered in London but not overall in the UK.]
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House Price Responses to Notches

Conceptual Framework

- Notches create **bunching** and **holes** in the house price distribution

- House price = price per unit $\times$ units of quality-adjusted housing

- What drives observed house price bunching?
  - House quality
  - Price bargaining (but not standard price incidence)
  - Timing of transaction (thresholds are nominal)
  - Evasion

- House price elasticity is similar to taxable income elasticity
  - sufficient statistic for revenue; not necessarily for deadweight loss
House Price Responses to £250K Notch, 2004-2012

Method

Conceptual

Mansions

Introduction  Stamp Duty Land Tax  Data  Results  Conclusions
House Price Responses to £250K Notch, 2004-2012

Method
Conceptual
Mansions

Introduction Stamp Duty Land Tax Data Results Conclusions
House Price Responses to £250K Notch, 2004-2012

\[ b = 1.85 \quad (0.340) \]
\[ m = 2.21 \quad (0.365) \]
\[ m - b = 0.36 \quad (0.694) \]

\[ h_v = £10,000 \quad (1,997.0) \]

\[ \text{Tax} = £5,000 \]
House Price Responses to £125K Notch, 2006-2008

\[ b = 0.86 \ (0.144) \]
\[ m = 0.96 \ (0.186) \]
\[ m-b = 0.10 \ (0.320) \]
\[ h_v = £5,000 \ (534.0) \]
\[ Tax = £1,250 \]
House Price Responses

Summary

- **Bunching and holes:**
  - Large and sharp bunching just below notches
  - Large holes above notches
  - Holes are larger than bunching, consistent with the presence of extensive responses

- **House price responses:**
  - Average house price response $= 2-5 \times$ tax jump
  - Largest house price response (end of hole) $\geq 5 \times$ tax jump
  - Liquidity constraints are likely to play an important role
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Dynamics of House Price Responses

Notch moving from £120,000 to £125,000

4/2005
Dynamics of House Price Responses
Notch moving from £125,000 to £175,000 and back again

12/2007

b(125) = 0.68 (0.088)
b(175) = 0.10 (0.056)
Dynamics of House Price Responses

Monthly Bunching Estimates Over Time

Introductions  Stamp Duty  Land Tax  Data  Results  Conclusions

Introduction  Stamp Duty  Land Tax  Data  Results  Conclusions

0 0.25 0.5 0.75 1 1.25

Bunching Estimates

2007m1  2008m1  2008m9  2010m1  2011m1

Month

b(125)  b(175)
Dynamics of House Price Responses

Summary

- **Build-up of bunching** when notches are introduced
  - Holiday start (unanticipated): bunching at £175K builds up in 3 months
  - Holiday end (anticipated): bunching at £125K builds up in 1-2 months

- **Disappearance of bunching** when notches are removed
  - Holiday start (unanticipated): bunching at £125K disappears in 4 months
  - Holiday end (anticipated): bunching at £175K disappears immediately

- **Little indication of optimization frictions**
  - With anticipation, almost zero inertia
  - Without anticipation, small inertia $\approx$ contract completion lag
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  **Stimulus**: Timing and Extensive Responses
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Stimulus: Timing and Extensive Responses

Conceptual Framework

- The stamp duty holiday was an unanticipated stimulus program with a pre-announced end date.

- Such stimulus has two conceptual effects on house purchases:
  - **Timing response:** intertemporal substitution by those who would have purchased a house anyway.
  - **Extensive response:** house purchases that would not have taken place otherwise.

- Key questions:
  - What is the total stimulus effect?
  - How much of it is driven by timing?
  - How quick is reversal?
Stimulus: Timing and Extensive Responses
Empirical Approach

- Difference-in-differences approach

- Naive baseline:
  - Compare treated range 125K-175K to nearby control range
  - Treatment is endogenous to price responses to notches

- Dealing with endogeneity:
  - Widen treated range to include responding ranges on each side (intent-to-treat)
  - Adjust for price responses to notches using bunching estimates
Stimulus: Timing and Extensive Responses

Raw Time Series

-1.25 -1 -0.75 -0.5 -0.25 0 0.25 0.5

Normalised Log Number of Transactions

Month

2007m1 2008m1 2008m9 2010m1 2011m1 2012m1

£125K - £175K

Short Term Timing

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Stimulus: Timing and Extensive Responses

Naive Diff-in-Diff

### Short Term Timing

- Introduction
- Stamp Duty Land Tax
- Data
- Results
- Conclusions

<table>
<thead>
<tr>
<th>Month</th>
<th>£125K - £175K</th>
<th>£175K - £225K</th>
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<td>2007m1</td>
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<tr>
<td>2008m1</td>
<td></td>
<td></td>
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<tr>
<td>2008m9</td>
<td></td>
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<tr>
<td>2010m1</td>
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<tr>
<td>2011m1</td>
<td></td>
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<tr>
<td>2012m1</td>
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</table>
Stimulus: Timing and Extensive Responses

Diff-in-Diff Adjusting for Bunching Responses

Normalised Log Number of Transactions

Month

£125K - £175K
£175K - £225K

Short Term Timing

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Stimulus: Timing and Extensive Responses

Diff-in-Diff Adjusting for Bunching Responses

\[ b_H = 0.20 \]
\[ b_R = -0.08 \]
\[ b_P = -0.00 \]

(0.022) (0.032) (0.010)

Short Term Timing

2007m1 2008m1 2008m9 2010m1 2011m1 2012m1

Month

£125K - £175K
£175K - £225K
Stimulus: Timing and Extensive Responses

Diff-in-Diff Adjusting for Bunching Responses (Cumulative Effect)
Stimulus: Timing and Extensive Responses

Reversal / Total Stimulus Effect (Sensitivity to Reversal End Date)

\[-\frac{12_R}{16_H} = 0.31 (0.124)\]
Stimulus: Timing and Extensive Responses

Summary

▶ Housing stimulus increases activity during the 16 months of the program (timing + extensive margin) [20% per month]

▶ But reduces activity for about 12 months after the program (timing) [8% per month]

▶ Reversal is less than 50% of stimulus effect
  ▶ Differ from Mian and Sufi (2012) on US car market stimulus

▶ Why stimulate house purchases during crisis?
  ▶ Homeowner mobility too low during crisis
  ▶ Moving house triggers spending on repairs, renovations, durable goods and commissions → increase in GDP
  ▶ Other housing market spillovers (including house prices)
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Immediate Effect of Stimulus on Real Economy

- Lower-bound: stimulus effect only through moving-related spending (not including multiplier effects)

- Using consumption data, we estimate that a house purchase triggers spending of 5% of the house value

- Effect on GDP per dollar of tax cut $\frac{\Delta GDP}{\Delta Tax} \approx 1$

- Work on fiscal stimulus through income tax rebates find smaller effects ($\frac{\Delta GDP}{\Delta Tax} \approx 0.2 - 0.7$)

  - Success of stamp duty holiday relies on (i) strong responsiveness of house purchases to this tax, (ii) strong complementarities between moving house and spending
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Marginal cost of public funds

\[ MCF = - \frac{dW}{dT} = \frac{1}{1 - \frac{t}{1+t} (\bar{\epsilon} + \bar{\eta})} \]

Laffer rate (Pareto Bound)

\[ t_L = \frac{1}{\bar{\epsilon} + \bar{\eta} - 1} \]

\( \bar{\epsilon} \equiv \) intensive margin elasticity wrt \( 1 + t \)
- \( \bar{\epsilon} \) from house price notches (upper bound)

\( \bar{\eta} \equiv \) extensive margin elasticity wrt \( 1 + t \)
- \( \bar{\eta} = 14.3 \) from stamp duty holiday (permanent effect)
- \( \bar{\eta} = 23.2 \) from earlier permanent reform
## Long Run Revenue and Welfare Effects

### Results

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<th>Bracket (£000s)</th>
<th>Rate (%)</th>
<th>$\bar{e}$</th>
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<th>Laffer Rate $t_L$</th>
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<td>0.13</td>
<td>17.86</td>
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- UK income tax: MCF = 1.2 overall; 1.1–2.7 across distribution
- US income tax: MCF = 1.1 overall
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Conclusions
Conclusions

- First comprehensive study of the distortions created by property transaction taxes (which are ubiquitous)

- We have benefitted from
  - First-time access to complete UK transaction tax records
  - Compelling variation from notches, reforms, and stimulus

- We find that property transaction taxes are extremely distortionary
  - Bad long run policy
  - Transaction tax cuts / subsidies provide effective stimulus
  - Note: this is not about notches

- Remaining question: effects on asset-price bubbles and volatility
  - Difficult to identify; our study increases the burden of proof
Appendix

Appendix Slides
Effect of Notch on House Price Distribution

Intensive & Extensive Responses

Density

- - - Density under linear tax

Density under notched tax

Extensive Responses

Intensive Responses

House Price Responses

250K
Use a flexible polynomial to estimate $g_0(h_v)$, excluding data around the notch:

$$c_i = \sum_{j=0}^{q} \beta_j (z_i)^j + \sum_{r \in R} \eta_r I \left\{ \frac{\bar{h}_v + z_i}{r} \in \mathbb{N} \right\} + \sum_{k=\bar{h}_v^-}^{\bar{h}_v^+} \gamma_k I \{i = k\} + \mu_i$$

where $c_i$ is count of transactions in price bin $i$, $q$ is the order of the polynomial, $z_i$ is the distance between bin $i$ and the cutoff $\bar{h}_v$, $\bar{h}_v^-$ is the lower bound of the excluded range, $\bar{h}_v^+$ is the upper bound of the excluded range, $\mathbb{N}$ is the set of natural numbers, $R = \{500, 1000, 5000, 10000, 25000\}$ is a set of round numbers multiples, $I \{\cdot\}$ is the indicator function, and $\mu_i$ is the error term.
Appendix

Estimates of the Counterfactual Distribution, Bunching, and Holes

- Estimate of counterfactual distribution:

\[
\hat{c}_i = \sum_{j=0}^{q} \hat{\beta}_j (z_i)^j + \sum_{r \in R} \hat{\eta}_r I \left\{ \frac{\bar{h}_v + z_i}{r} \in \mathbb{N} \right\}
\]

- Estimates of excess bunching and hole (missing mass):

\[
\hat{B} (\bar{h}_v) = \sum_{i=\bar{h}_v^-} (c_i - \hat{c}_i) \quad \text{and} \quad \hat{M} (\bar{h}_v) = \sum_{i>\bar{h}_v} (\hat{c}_i - c_i)
\]

Results
House Price Responses to £500K Notch, 2004-2012

\[ b = 1.64 \ (0.510) \]

\[ m = 2.27 \ (0.387) \]

\[ m - b = 0.63 \ (0.855) \]

\[ h_v = £10,000 \ (3,808.7) \]

\[ \text{Tax} = £5,000 \]
House Price Responses to £1,000K Notch, 2011-2012

- $b = 0.70$
- $h_v = £30,000$
- Tax = £10,000
- $e_v = 0.09$

Density of Property Transactions
- 600,000
- 800,000
- 1,000,000
- 1,200,000
- 1,400,000
- 1,600,000

House Price
- Actual Density
- Counterfactual Density

Diagram shows the density of property transactions against house price with actual and counterfactual densities compared.
House Price Responses to £2,000K Notch, 2012

\[ b = 1.26 \]

\[ h_v = £100,000 \]

\[ \text{Tax} = £40,000 \]

\[ v = 0.13 \]
Static Price Notches: Bunching and Holes
Notch at £60,000; 1 Nov 2004 - 16 Mar 2005

\[ b = 0.41 \ (0.132) \]
\[ m = 0.92 \ (0.318) \]
\[ m-b = 0.51 \ (0.446) \]
\[ h_v = £3,500 \ (1,026.1) \]
\[ D_Tax = £600 \]
Static Price Notches: Bunching and Holes
Notch at £120,000; 17 Mar 2005 - 22 Mar 2006

[b = 0.70 (0.068)
m = 0.83 (0.226)
m-b = 0.13 (0.292)

\[ h_v = £5,000 (282.2) \]

\[ \text{Tax} = £1,200 \]
Static Price Notches: Bunching and Holes

Notch at £175,000; 3 Sep 2008 - 31 Dec 2009

\[ b = 1.00 \ (0.270) \]

\[ m = 0.50 \ (0.267) \]

\[ m - b = -0.50 \ (0.520) \]

\[ D_h v = £5,000 \ (1,981.8) \]

\[ D_T ax = £1,750 \]

---

**Graph:**

- **Y-axis:** Number of Property Transactions
- **X-axis:** House Price
- **Legend:**
  - **Actual Distribution**
  - **Counterfactual Distribution**

---

**Key Statistics:**

- **Number of Property Transactions**
  - 125,000
  - 150,000
  - 175,000
  - 200,000
  - 225,000
  - 250,000

- **House Price Range:**
  - £125,000 to £250,000

- **Statistical Values:**
  - **b:** 1.00 (0.270)
  - **m:** 0.50 (0.267)
  - **m - b:** -0.50 (0.520)
  - **$D_h v$:** £5,000 (1,981.8)
  - **$D_T ax$:** £1,750

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**Notes:**

- The graph illustrates the actual and counterfactual distribution of property transactions over the specified price range.
- The statistical values indicate the parameters that influence the distribution, such as the bunching and hole effects at £175,000.

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**Back**
Static Price Notches: Bunching and Holes
Notch at £125,000; 1 Jan 2010 - 31 Oct 2012

\[ b = 0.78 \quad (0.121) \]
\[ m = 0.73 \quad (0.179) \]
\[ m - b = -0.05 \quad (0.288) \]
\[ h_v = £5,000 \quad (274.6) \]
\[ \text{Tax} = £1,250 \]

Number of Property Transactions

House Price

Actual Distribution

Counterfactual Distribution

Back
Time Notch: Short-Term Timing Effects

Difference-in-Bunching with Price Range Counterfactuals

D-i-Bunching = 2.75 (.392)

Week

2010w13

2010w26

2010w1

2009w40

2009w26

£75,000 - £125,000

£175,000 - £225,000

£125,000 - £175,000

Number of Transactions

0

5000

10000

15000

20000

2009w26

2009w40

2010w1

Back to Stimulus
Time Notch: Short-Term Timing Effects
Difference-in-Bunching with Time Period Counterfactuals

D-i-Bunching = 3.44 (.381)

Back to Stimulus
Time Notch: Short-Term Timing Effects

Placebo Difference-in-Bunching 1: Price Range Counterfactuals 1 Year Earlier

D-i-Bunching = .09 (.42)

Week

2008w27 2008w40 2009w1 2009w13 2009w26

Price Range

£75,000 - £125,000
£125,000 - £175,000
£175,000 - £225,000
£225,000 - £275,000

Number of Transactions

0 5000 10000 15000 20000 25000 30000

Back to Stimulus
Time Notch: Short-Term Timing Effects
Placebo Difference-in-Bunching 2: Price Range Counterfactuals 2 Years Earlier

D-i-Bunching = -0.03 (0.241)

Number of Transactions

Week

2007w26 2007w40 2008w1 2008w14 2008w27

£75,000 - £125,000 £175,000 - £225,000 £125,000 - £175,000

Back to Stimulus
Permanent Reform: Extensive Responses

Diff-in-Diff Adjusting for Bunching Responses

$P = 0.23 \pm 0.018$

Month

- £60K - £120K
- £120K - £180K

Normalised Log Number of Transactions

2005m1 2005m4 2005m7 2005m10 2006m1
Permanent Reform: Extensive Responses

Diff-in-Diff Adjusting for Bunching Responses (Cumulative Effect)

Back to Conceptual Framework