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

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Motivation

- What determines demand and prices in the housing market?
  - Recent debate about the origins of the current financial crisis

- Academic work has considered the impact of the **cost of homeownership**
  - Real interest rates and other credit market conditions: Mian & Sufi 2009; Glaeser et al. 2010; Adelino et al. 2012
  - Tax subsidies to housing: Poterba 1984, 1992; Rosen 1985; Poterba & Sinai 2008

- A policy that has been largely overlooked by academics
  - **Transaction taxes** on the buying and selling of property

Context and Methodological Advantages

- UK property transaction tax: Stamp Duty Land Tax (SDLT)
- **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 programs** affect houses in specific price ranges

More Literature

- Property transaction taxes (Besley et al. 2011; Slemrod et al. 2012; Kopczuk & Munroe 2013)
- Taxation of capital gains (Feldstein et al. 1980) and housing capital gains (Cunningham & Engelhardt 2008; Shan 2011)
- Micro studies of stimulus policy (Johnson et al. 2006; Agarwal et al. 2007; Mian & Sufi 2012)
- Taxable income literature and bunching approaches (Saez 2010; Chetty et al. 2011; Kleven & Waseem 2013)

Outline

Introduction

Stamp Duty Land Tax

Data

Results

- Static Notches: House Price Responses
- Moving Notches: Dynamics of House Price Responses
- Stimulus: Timing and Extensive Margin Effects

Conclusions

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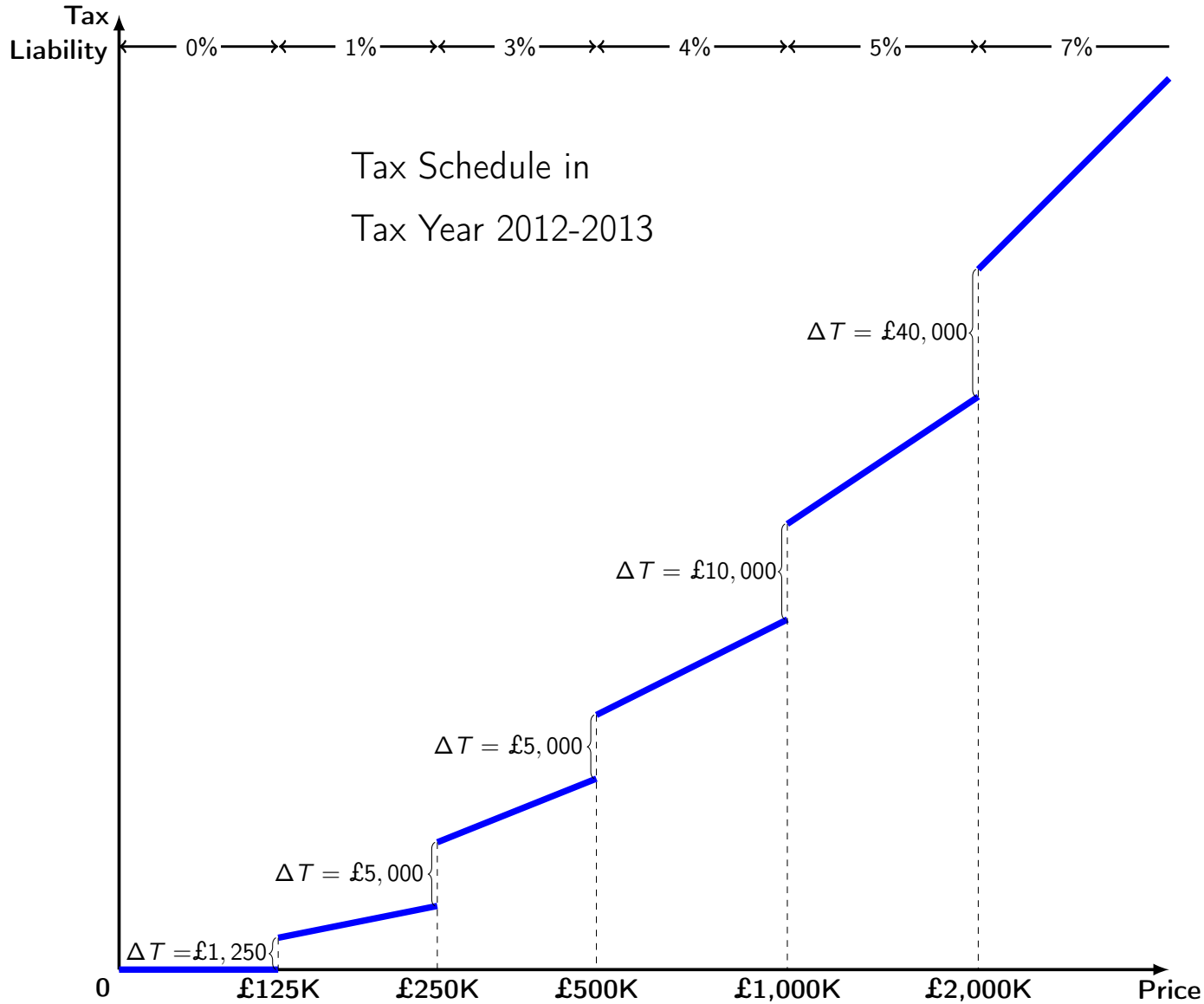
UK Stamp Duty: Notches

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



UK Stamp Duty: Reforms & Stimulus

Price Range \ Date Range	1 Dec 2003 to 16 Mar 2005	17 Mar 2005 to 22 Mar 2006	23 Mar 2006 to 2 Sep 2008	3 Sep 2008 to 31 Dec 2009	1 Jan 2010 to 5 Apr 2011	6 Apr 2011 to 21 Mar 2012	22 Mar 2012 to April 2013
0 - £60K	0	0	0	0	0	0	0
£60K - £120K	1						
£120K - £125K		1					
£125K - £175K			1		1	1	1
£175K - £250K				1			
£250K - £500K	3	3	3	3	3	3	3
£500K - £1000K	4	4	4	4	4	4	4
£1000K - £2000K						5	5
£2000K - ∞							7

UK Stamp Duty: Reforms & Stimulus

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£120K - £125K		1					
£125K - £175K			1	1	1	1	1
£175K - £250K							
£250K - £500K	3	3	3	3	3	3	3
£500K - £1000K	4	4	4	4	4	4	4
£1000K - £2000K						5	5
£2000K - ∞							7

- **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)

▸ Results

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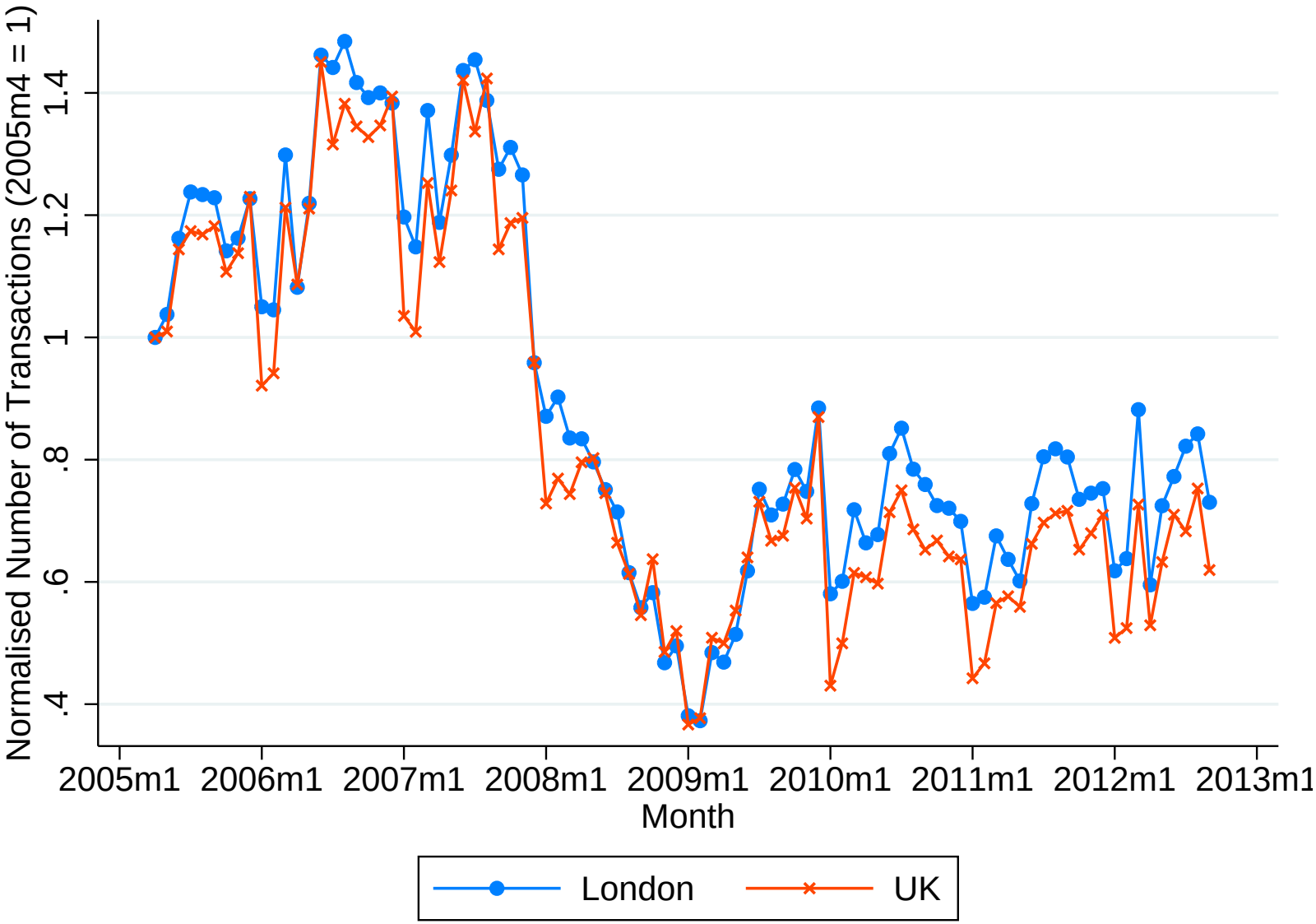
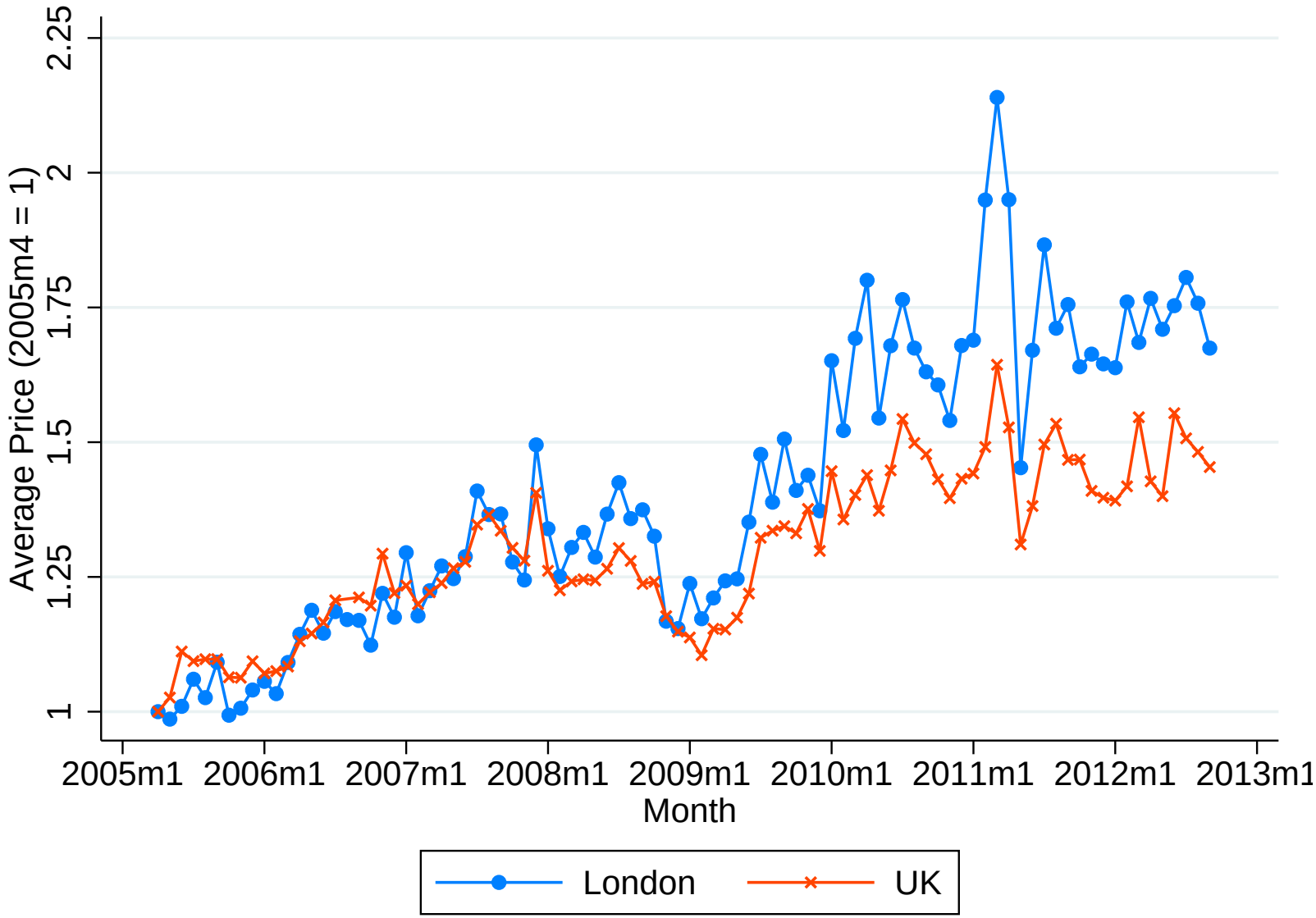
- First-time access to administrative stamp duty records from Her Majesty's Revenue and Customs (HMRC)
- Universe of stamp duty land tax returns ($\approx$ all transactions) in the UK from 2004-2012
- About 10 million transactions
- Rich tax return information; no information outside the return

Data Spanning the Collapse of the Housing Market



Prices Have Recovered in London, But Not the UK Overall



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Stamp Duty Land Tax

Data

Results

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House Price Responses to £250K Notch, 2004-2012

▸ Method

▸ Conceptual

▸ Higher Prices

House Price Responses to £125K Notch, 2006-2008

▸ Method

▸ Other Periods

House Price Responses

Summary

- **Bunching and holes:**
  - Large and sharp bunching just below notches
  - Large holes above notches
  - Holes are (weakly) larger than bunching, which suggests extensive margin 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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Introduction

Stamp Duty Land Tax

Data

Results

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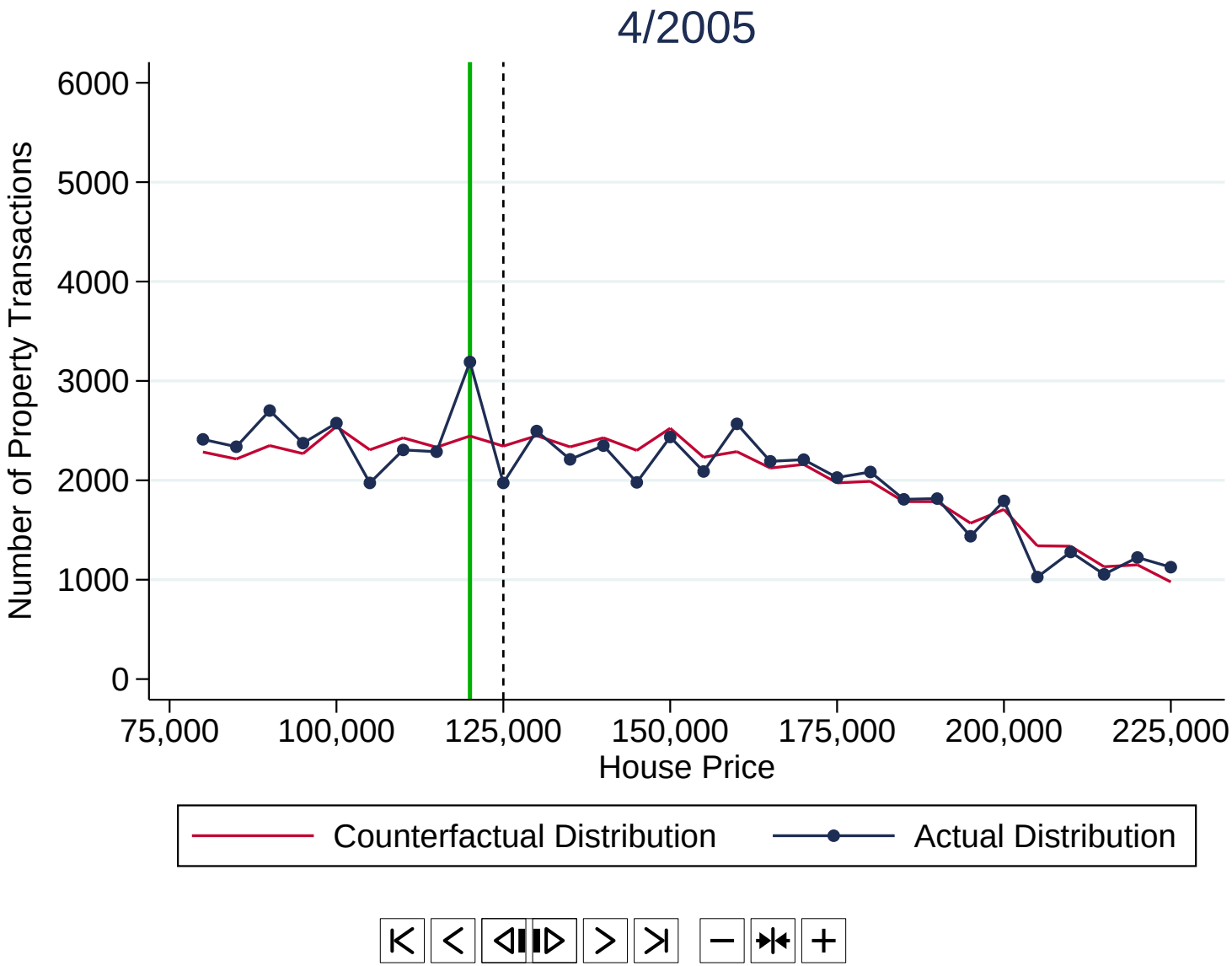
Conclusions

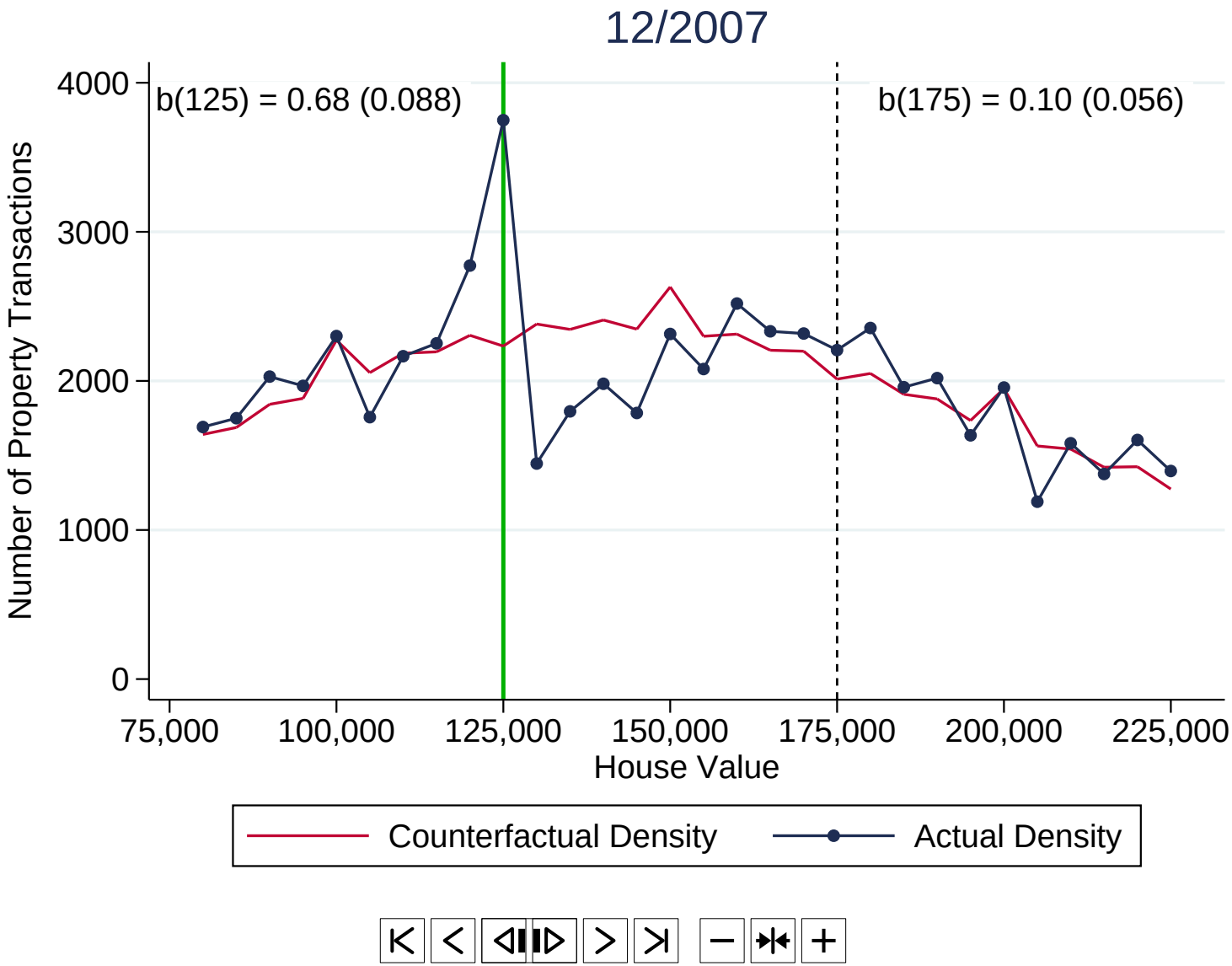
Dynamics of House Price Responses

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



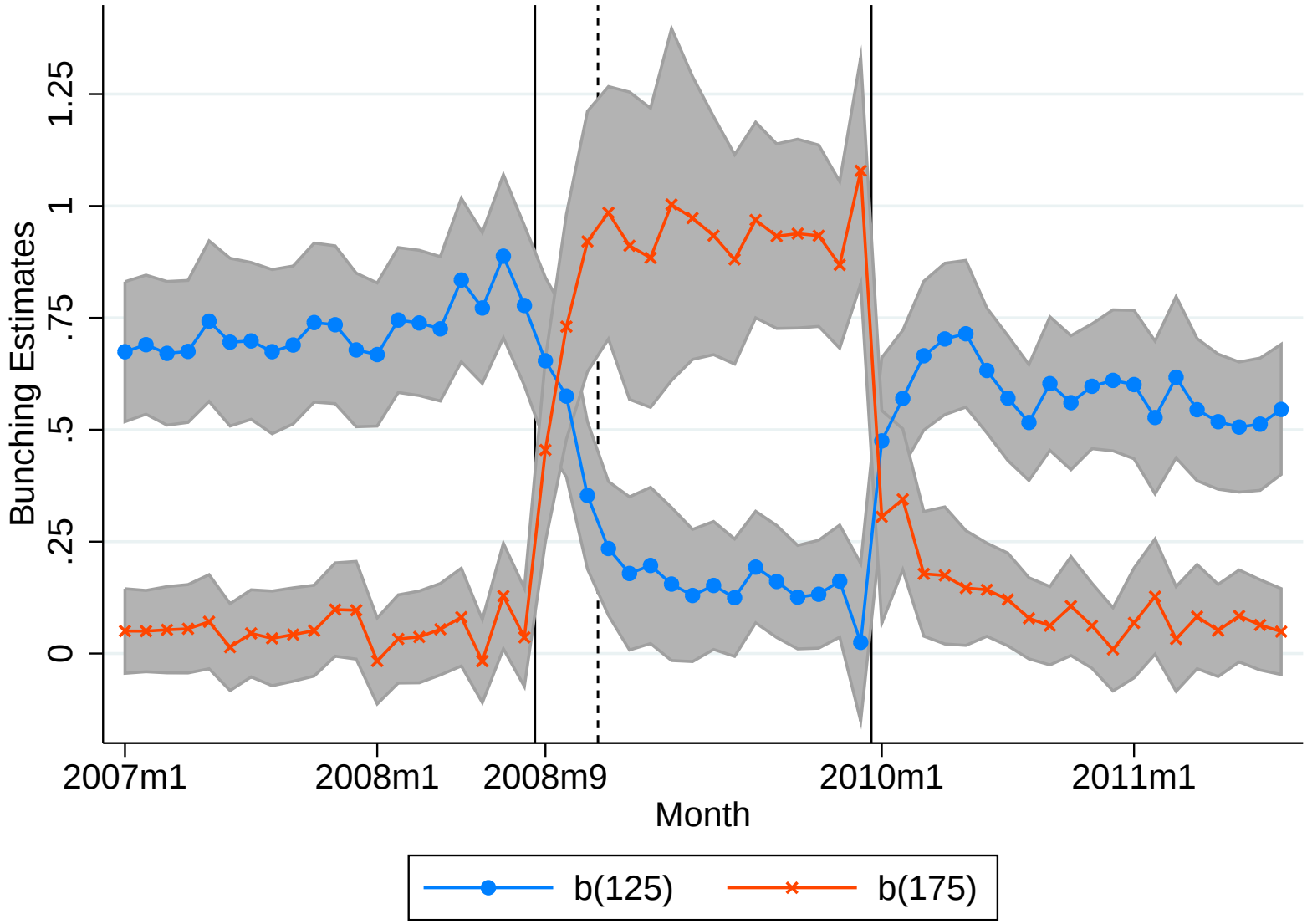
Dynamics of House Price Responses

Notch moving from £125,000 to £175,000 and back again



Dynamics of House Price Responses

Monthly Bunching Estimates Over Time



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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Introduction

Stamp Duty Land Tax

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Stimulus: Timing and Extensive Margin Effects

Conceptual Framework

- The stamp duty holiday was an unanticipated stimulus program with a pre-announced end date
- Unanticipated stimulus in period s has two conceptual effects on house purchases:
  - **Timing effect** by those initially close to indifference between buying in period s and buying in a future period
  - **Extensive margin effect** by those initially close to indifference between buying in period s and not buying at all
- Key macro questions:
  - What is the total stimulus effect?
  - How much of it is driven by timing?
  - How quick is reversal?

▸ Reform

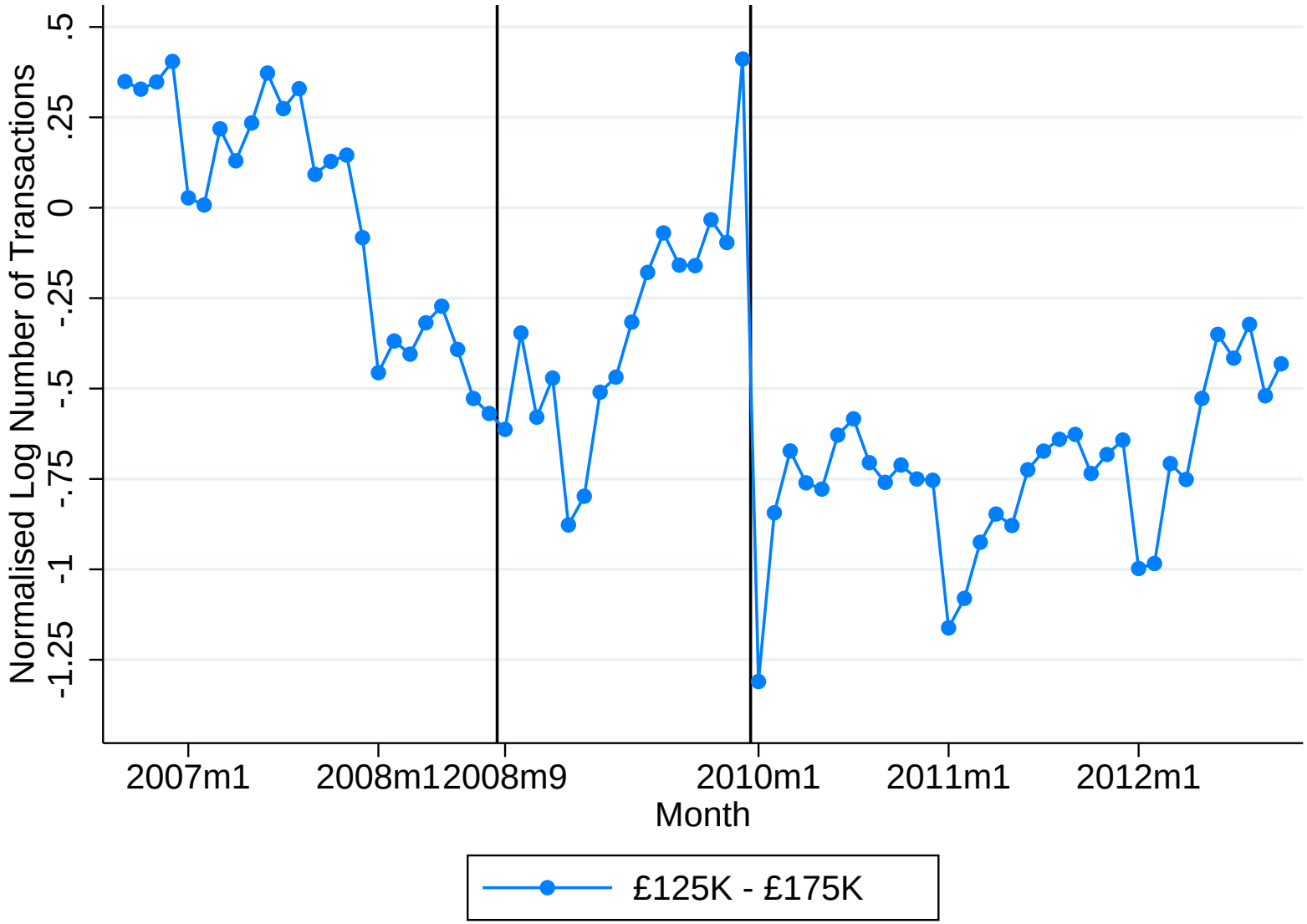
Stimulus: Timing and Extensive Margin Effects

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

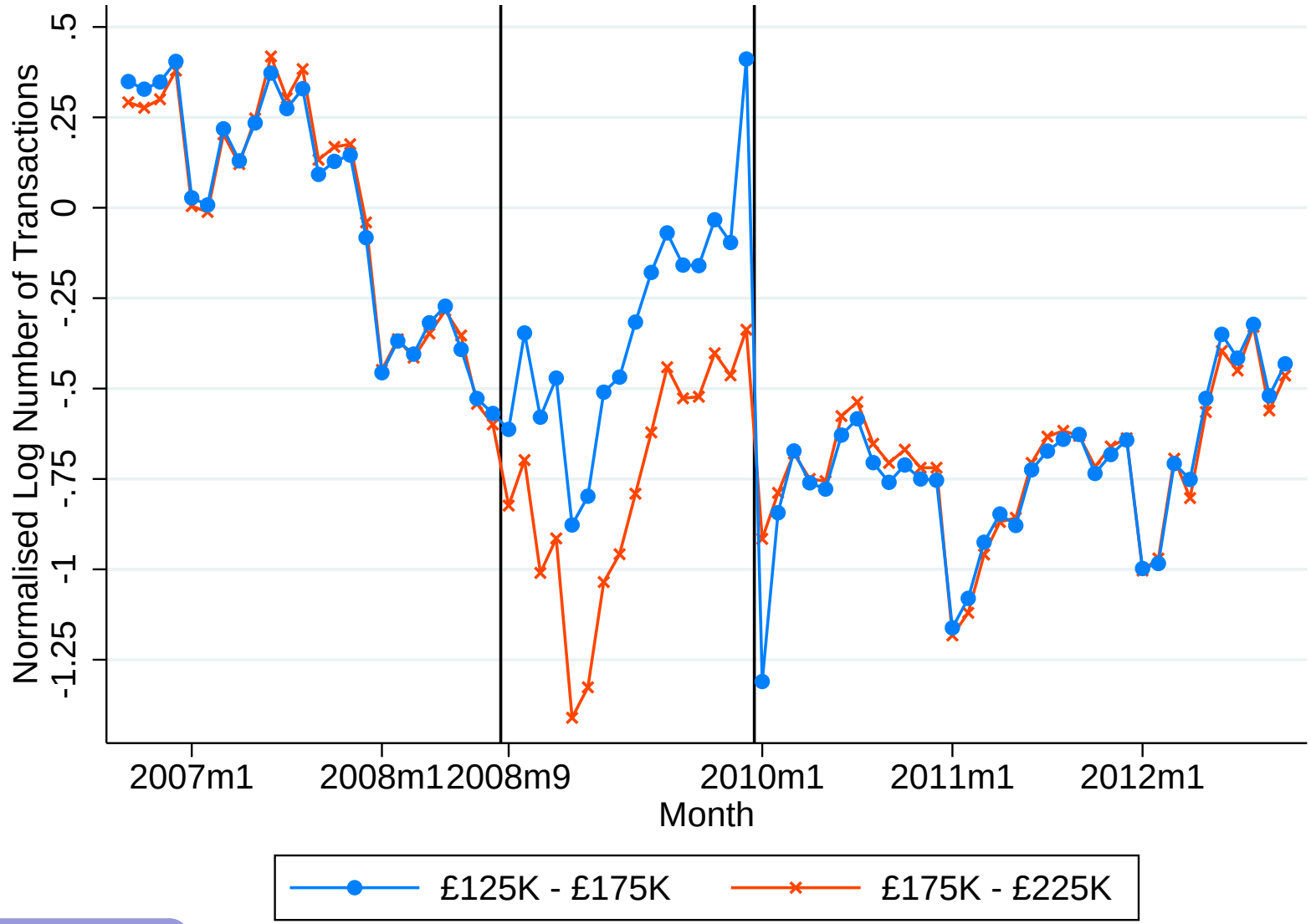
Stimulus: Timing and Extensive Margin Effects

Raw Time Series



Stimulus: Timing and Extensive Margin Effects

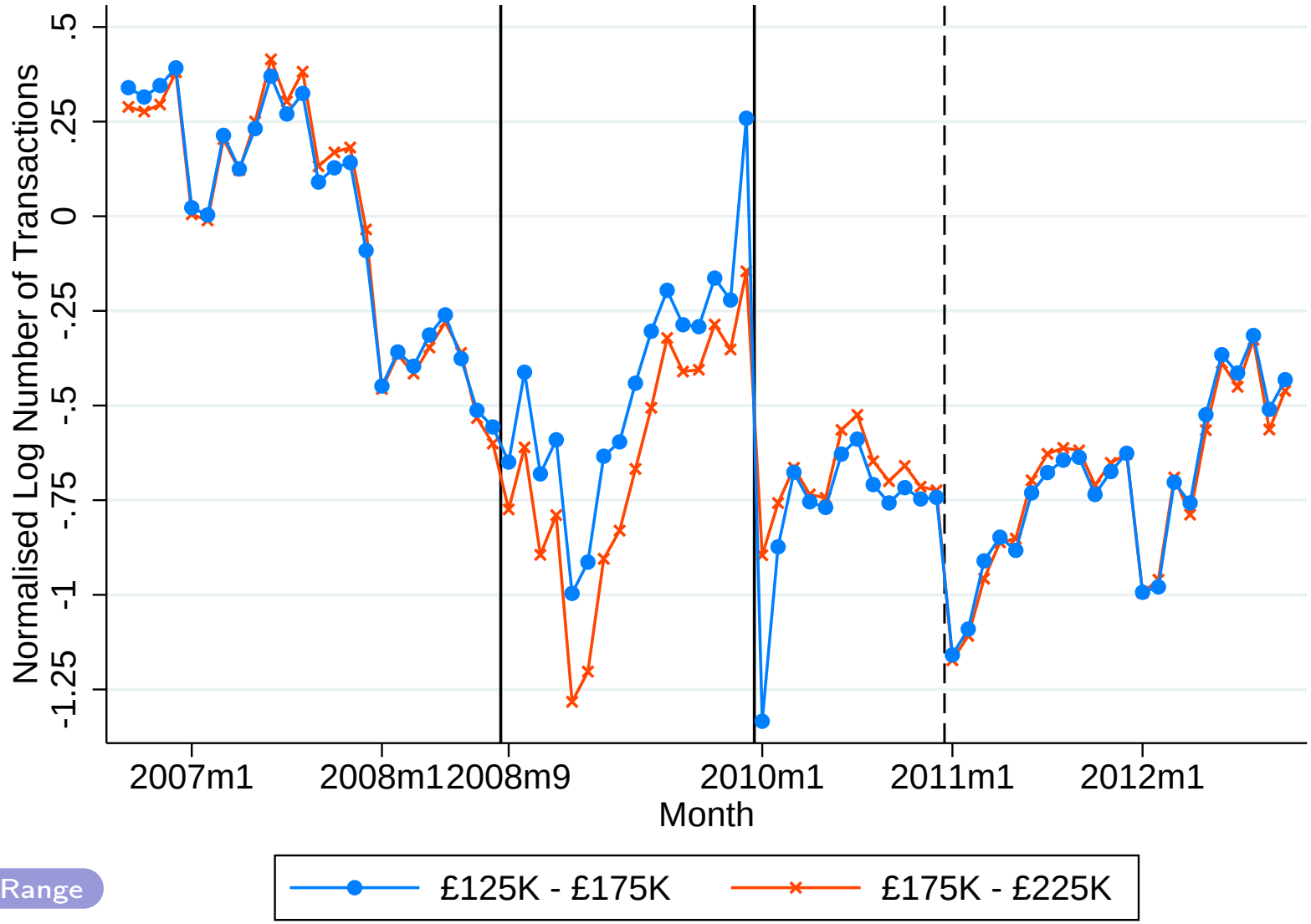
Naive Diff-in-Diff



▸ Short Term Timing

Stimulus: Timing and Extensive Margin Effects

Diff-in-Diff Adjusting for Bunching Responses

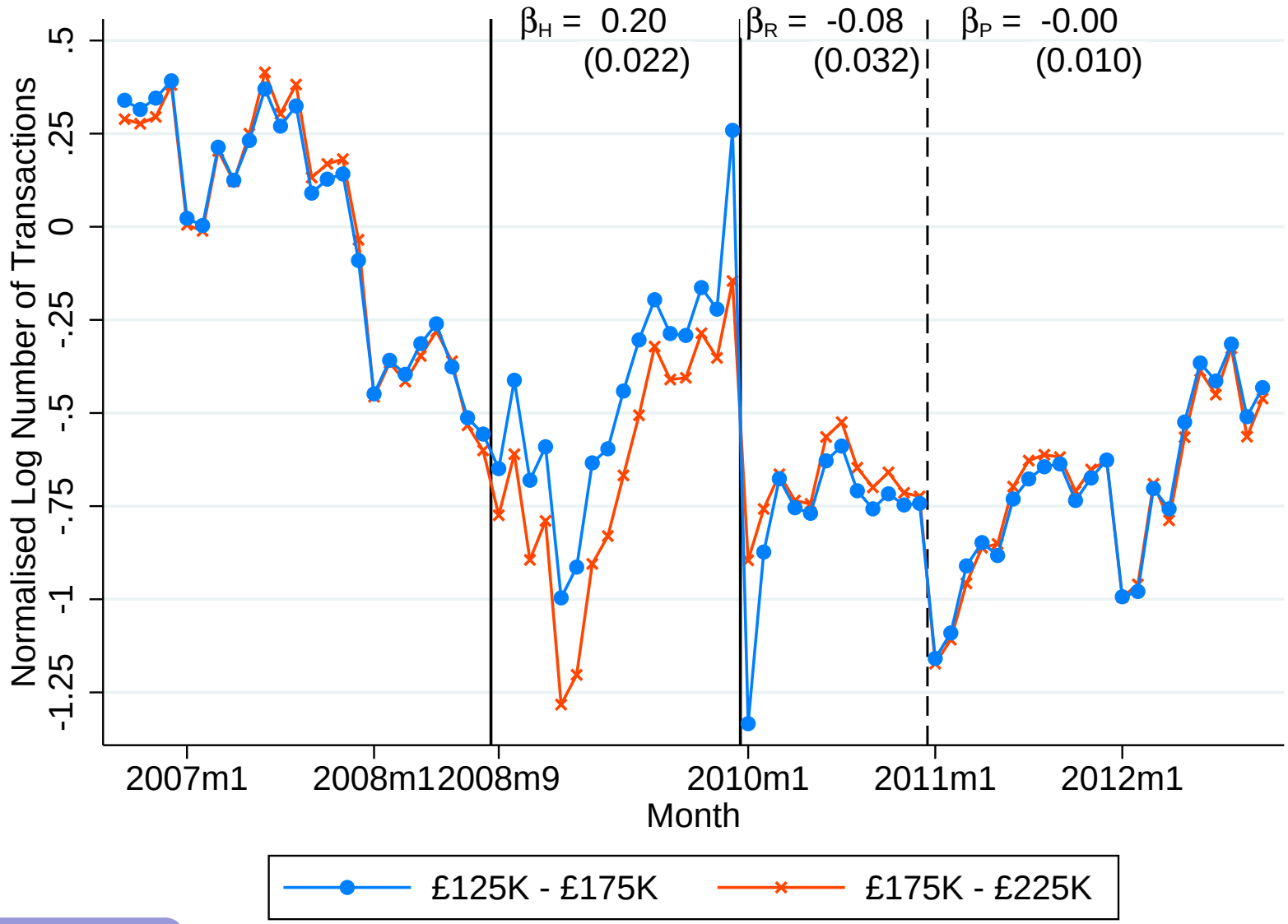


▸ Wider Range

▸ Short Term Timing

Stimulus: Timing and Extensive Margin Effects

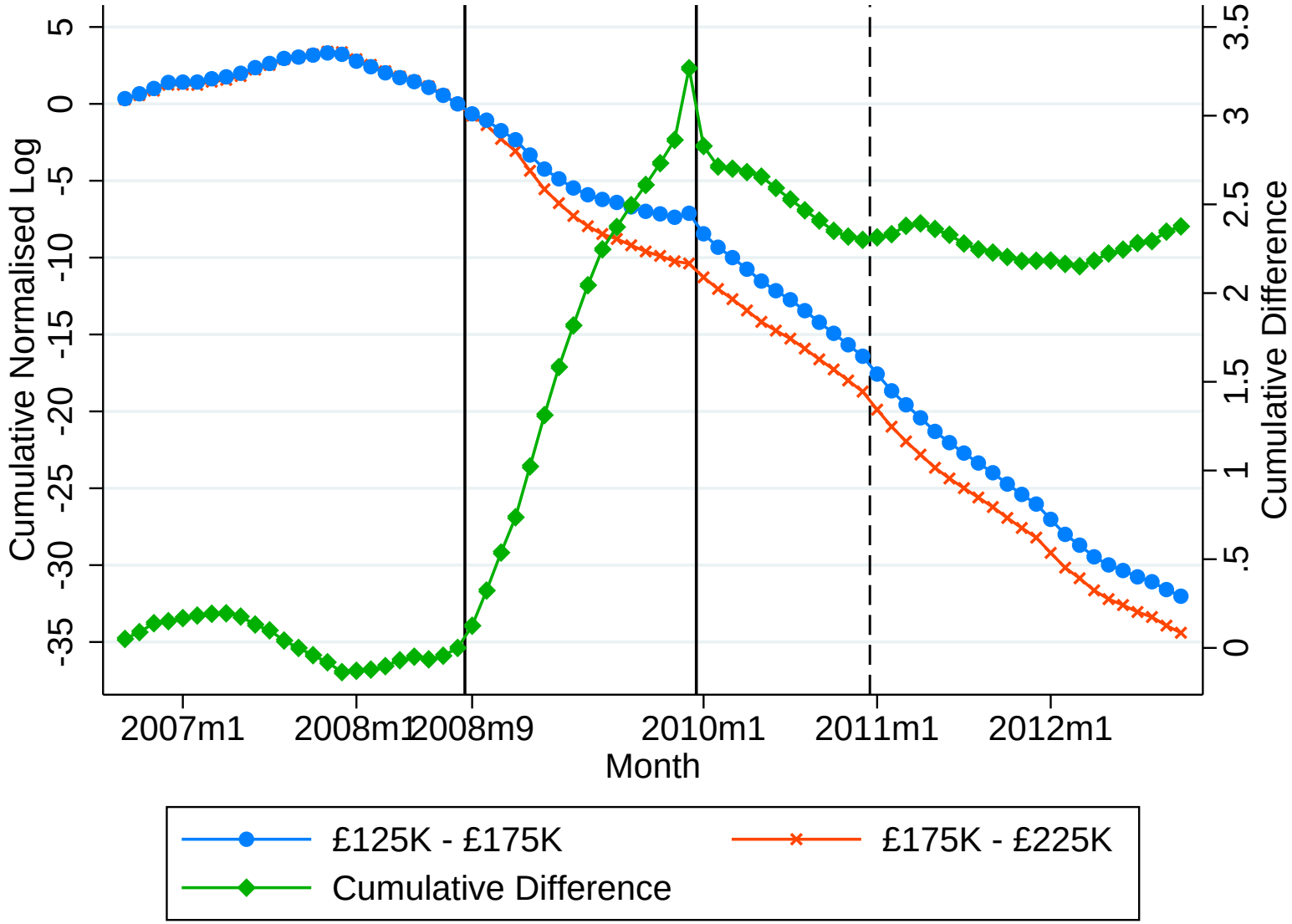
Diff-in-Diff Adjusting for Bunching Responses



▸ Short Term Timing

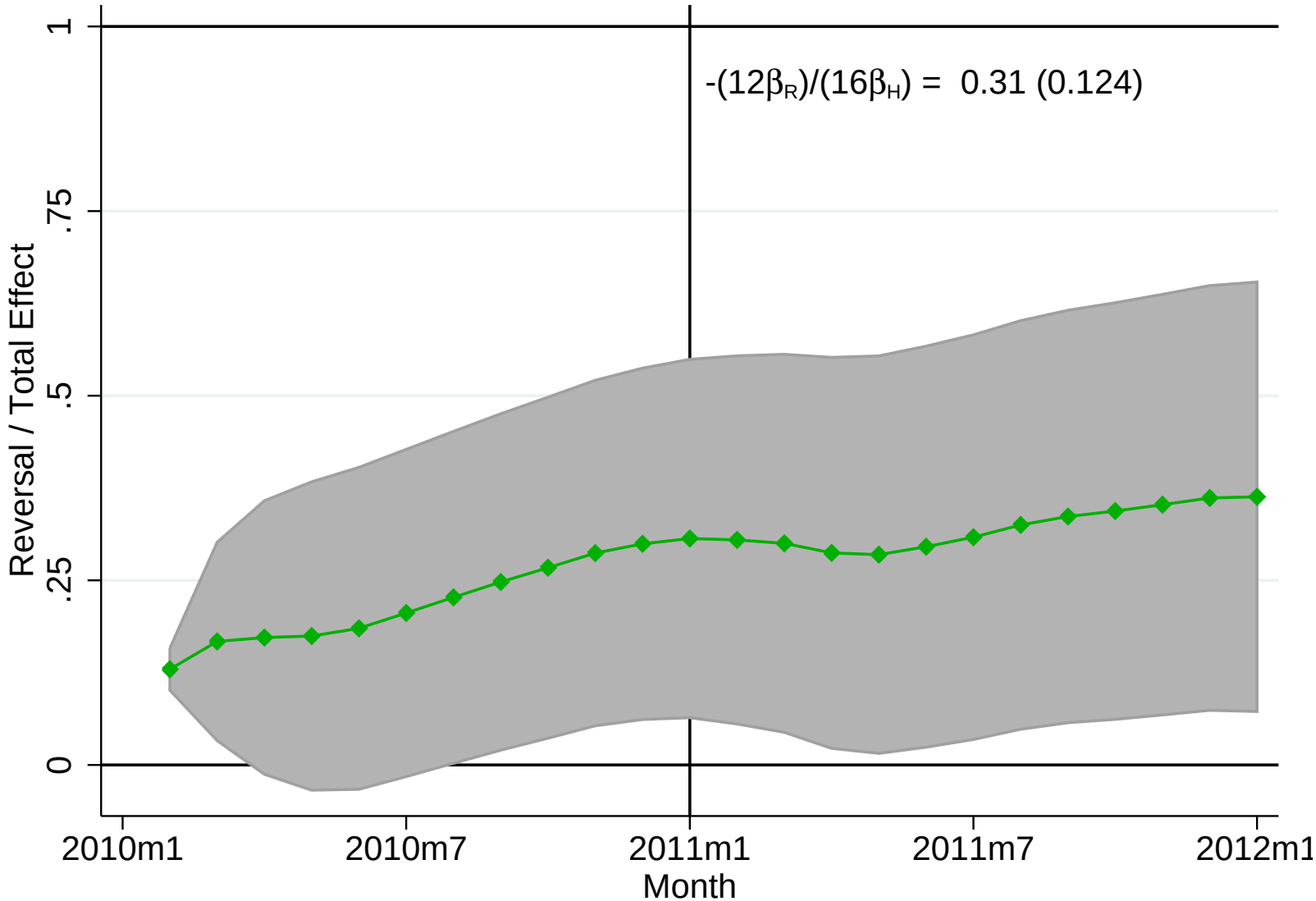
Stimulus: Timing and Extensive Margin Effects

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



Stimulus: Timing and Extensive Margin Effects

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



Stimulus: Timing and Extensive Margin Effects

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 only 30-40% of stimulus effect
- These findings go against Mian and Sufi (2012):
  - **Length of program** is different: 16 months vs 1 month
  - **Market** being stimulated is different: houses vs cars
  - **Empirical approach** is also different

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- Property transaction taxes are widely used, but little studied
- We have benefitted from
  - Unique access to complete UK transaction tax records
  - Compelling variation from notches and stimulus
- We have found
  - Large house price responses to transaction taxes
  - Fast price adjustment to transaction tax changes
  - Sharp short-term timing effects to anticipated tax changes
  - Strong stimulus effects without complete reversal
  - Strong extensive responses to permanent tax reform

Thank You

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Appendix Slides

Appendix

Estimating the Counterfactual Distribution

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

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

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, $\mathcal{R} = \{500, 1000, 5000, 10000, 25000\}$ is a set of round numbers multiples, $I\{\cdot\}$ is the indicator function, and μ_i is the error term.

Appendix

Estimates of the Counterfactual Distribution, Bunching, and Holes

- Estimate of counterfactual distribution:

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

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

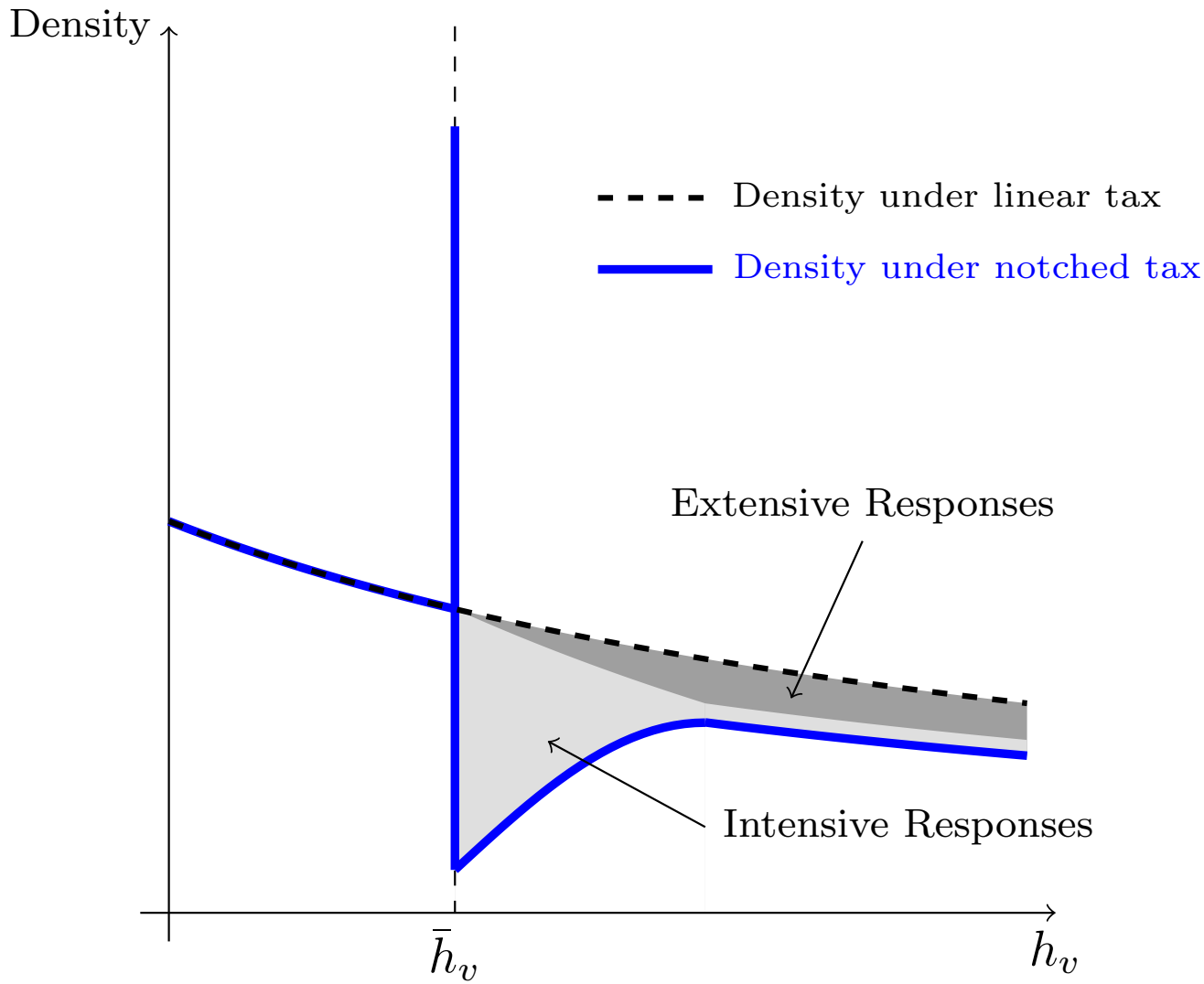
$$\hat{B}\left(\bar{h}_v\right) = \sum_{i=\bar{h}_v^-}^{\bar{h}_v} \left(c_i - \hat{c}_i\right) \qquad \text{and} \qquad \hat{M}\left(\bar{h}_v\right) = \sum_{i>\bar{h}_v}^{\bar{h}_v^+} \left(\hat{c}_i - c_i\right)$$

▸ 250K

▸ 125K

Effect of Notch on House Price Distribution

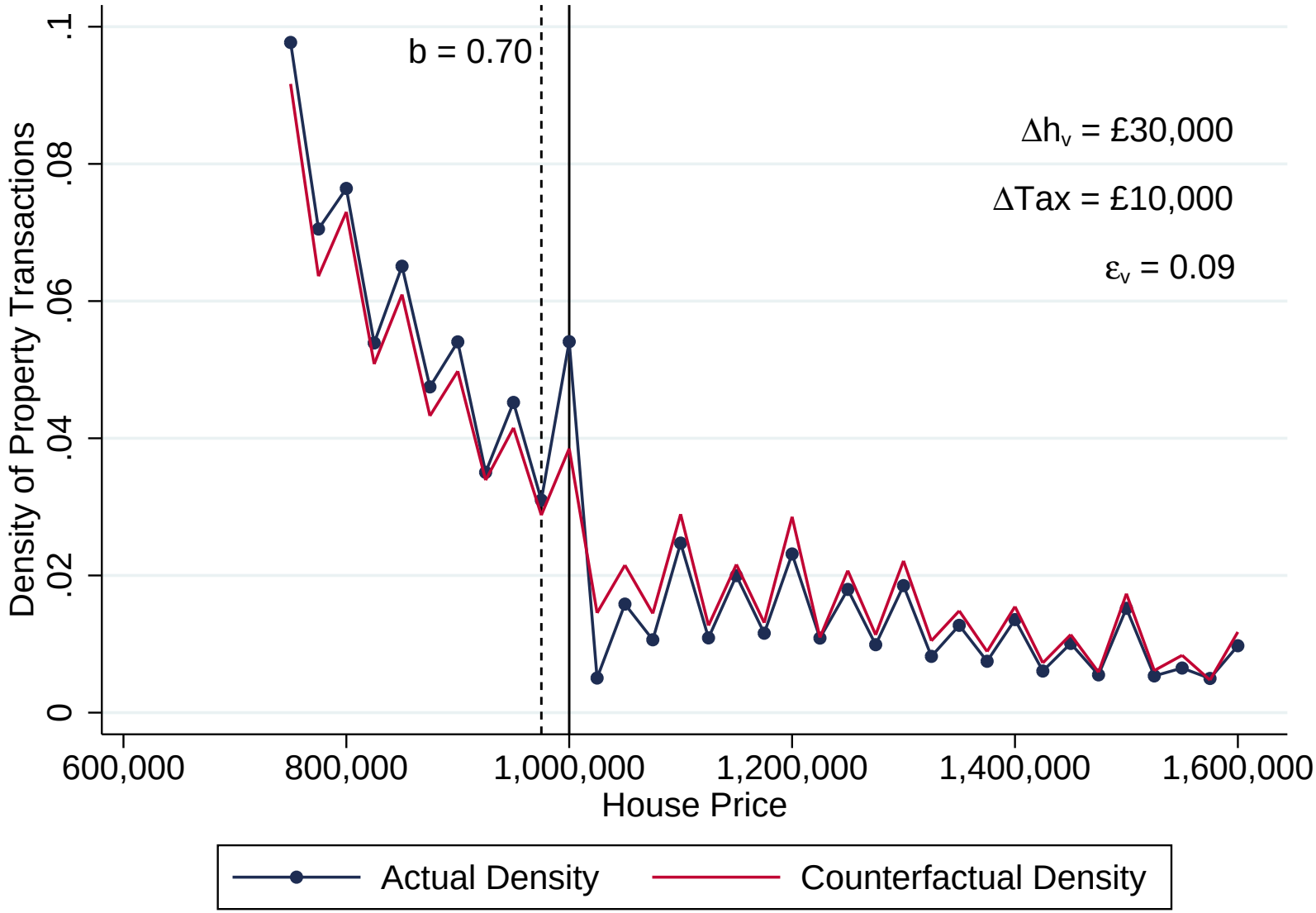
Intensive & Extensive Responses



▸ 250K

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

House Price Responses to £1 Million Notch 2011-2012

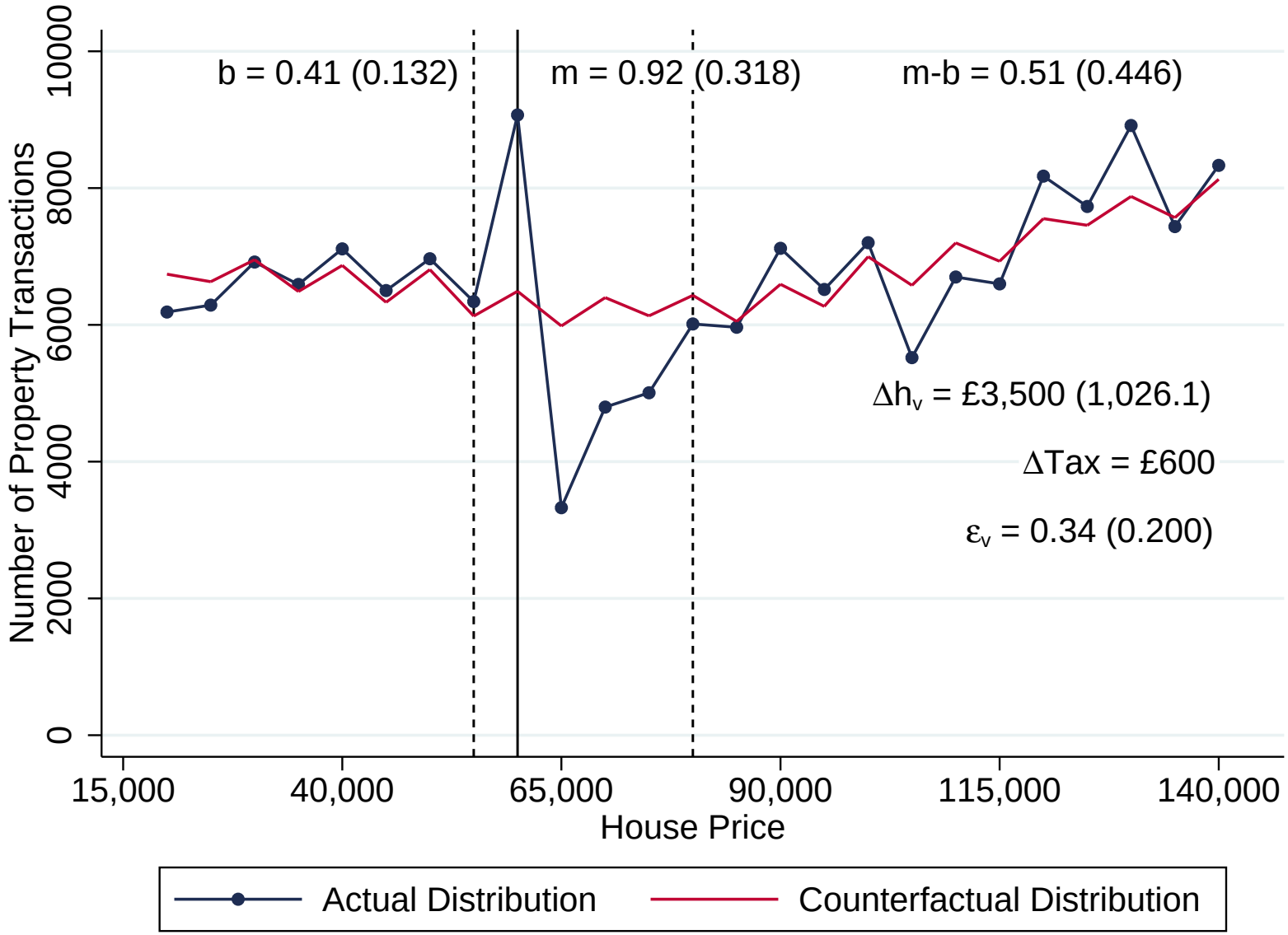


House Price Responses to £2 Million Notch 2012

▸ 250K

Static Price Notches: Bunching and Holes

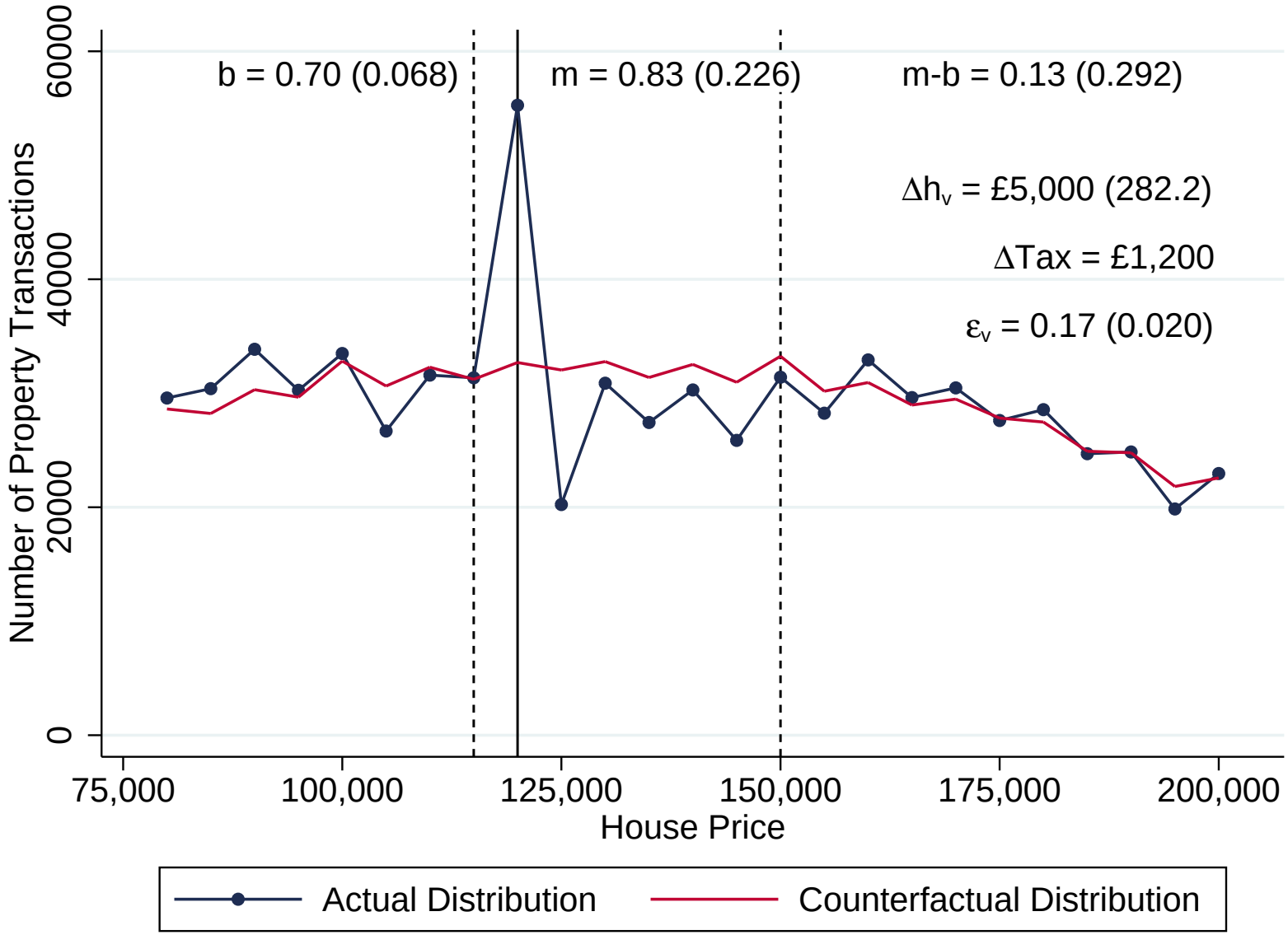
Notch at £60,000; 1 Nov 2004 - 16 Mar 2005



Back

Static Price Notches: Bunching and Holes

Notch at £120,000; 17 Mar 2005 - 22 Mar 2006



Back

Static Price Notches: Bunching and Holes

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

Back

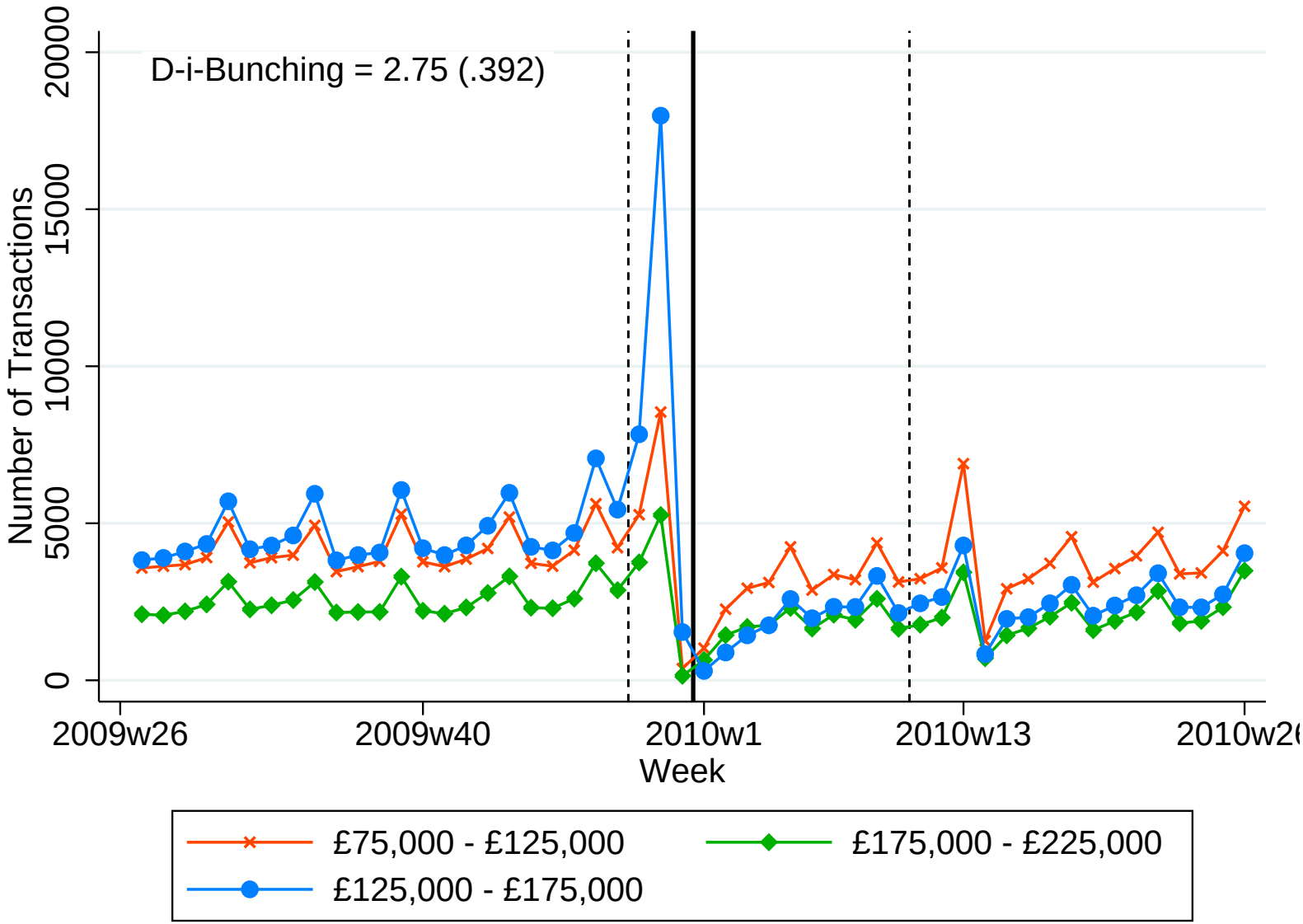
Static Price Notches: Bunching and Holes

Notch at £125,000; 1 Jan 2010 - 31 Oct 2012

Back

Time Notch: Short-Term Timing Effects

Difference-in-Bunching with Price Range Counterfactuals



▸ Naive DiD ▸ Bunching DiD ▸ DiD Estimates

Introduction Stamp Duty Land Tax Data Results Conclusions

Time Notch: Short-Term Timing Effects

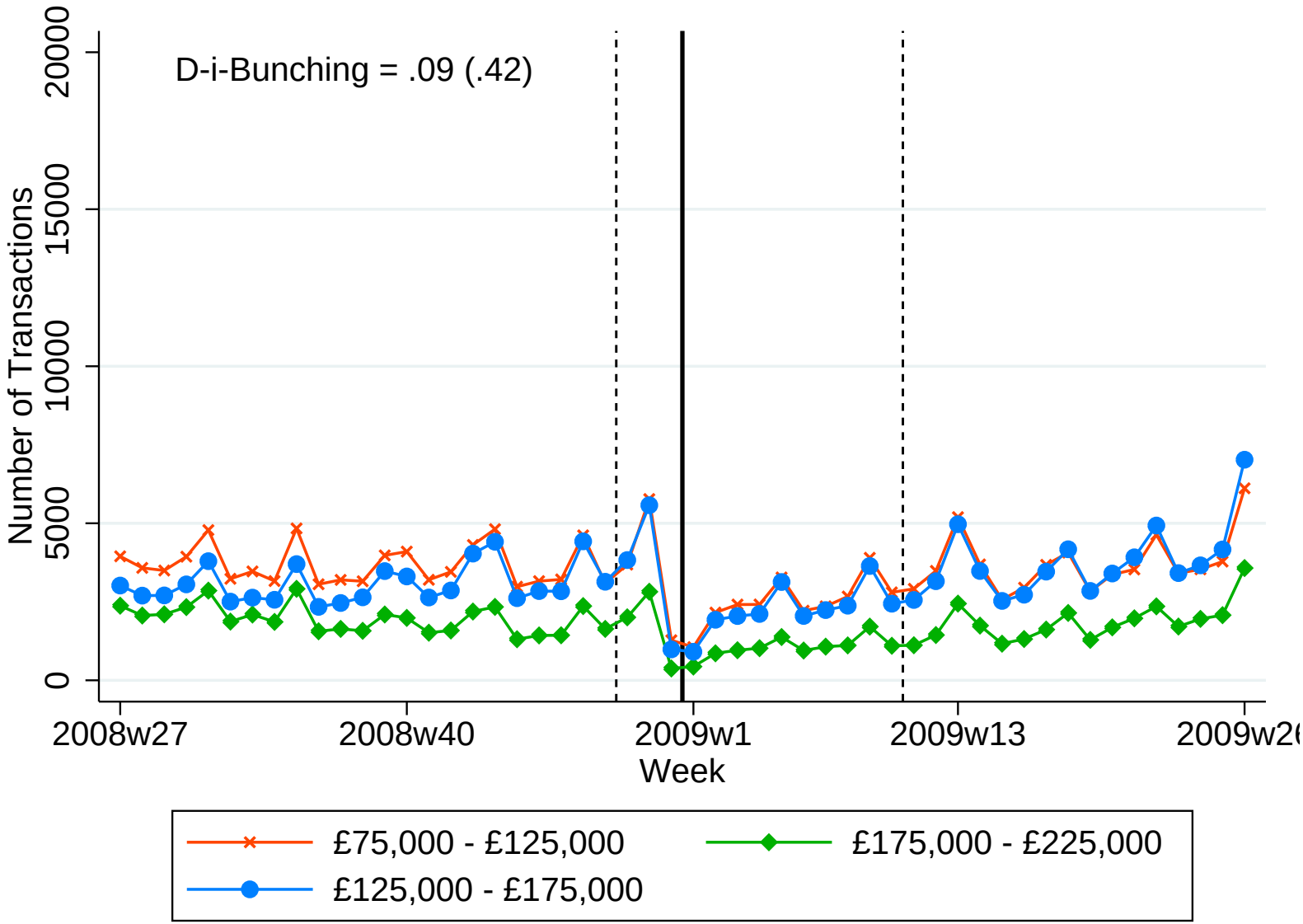
Difference-in-Bunching with Time Period Counterfactuals

▸ Naive DiD ▸ Bunching DiD ▸ DiD Estimates

Introduction Stamp Duty Land Tax Data Results Conclusions

Time Notch: Short-Term Timing Effects

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

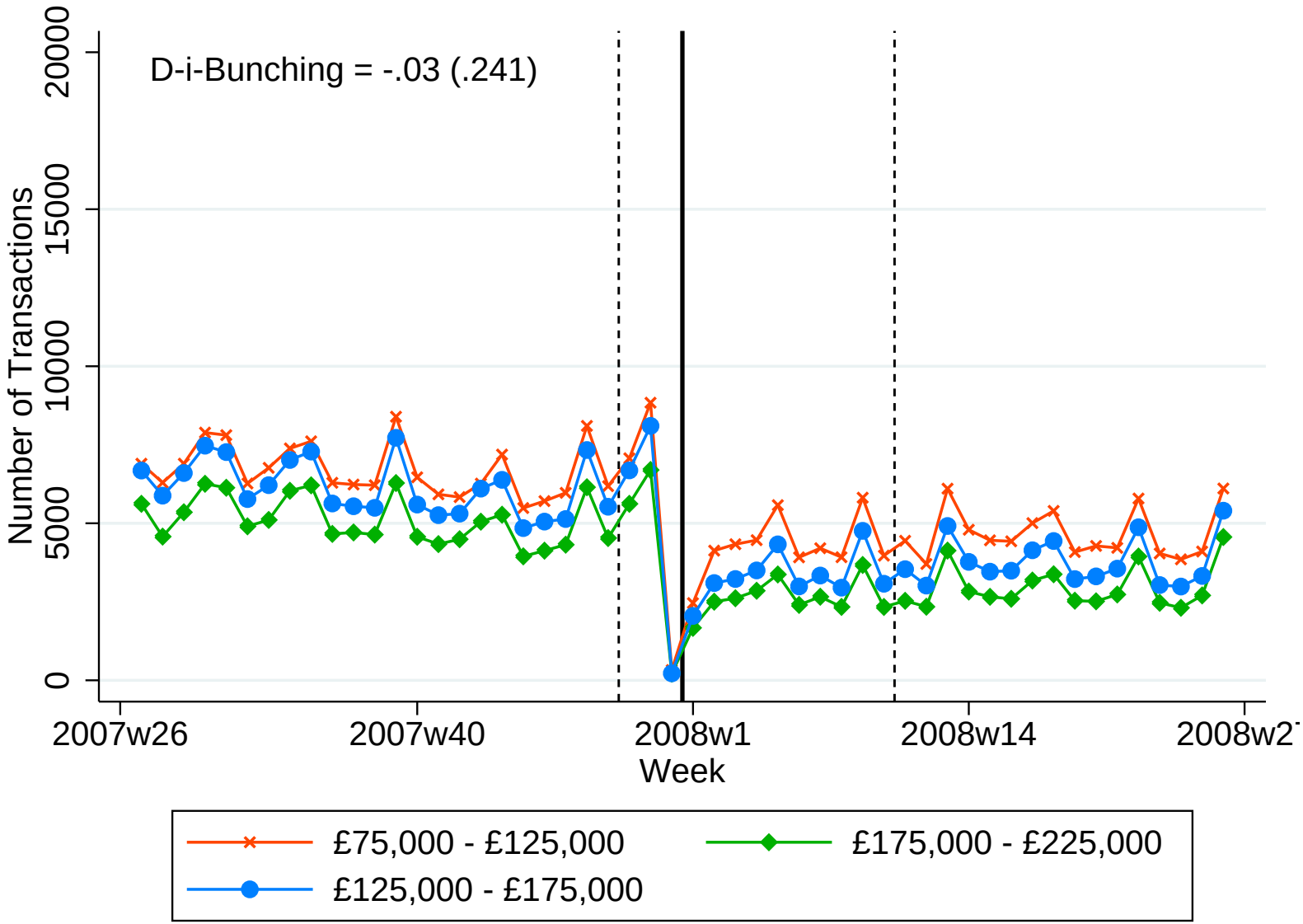


▸ Naive DiD ▸ Bunching DiD ▸ DiD Estimates

Introduction Stamp Duty Land Tax Data Results Conclusions

Time Notch: Short-Term Timing Effects

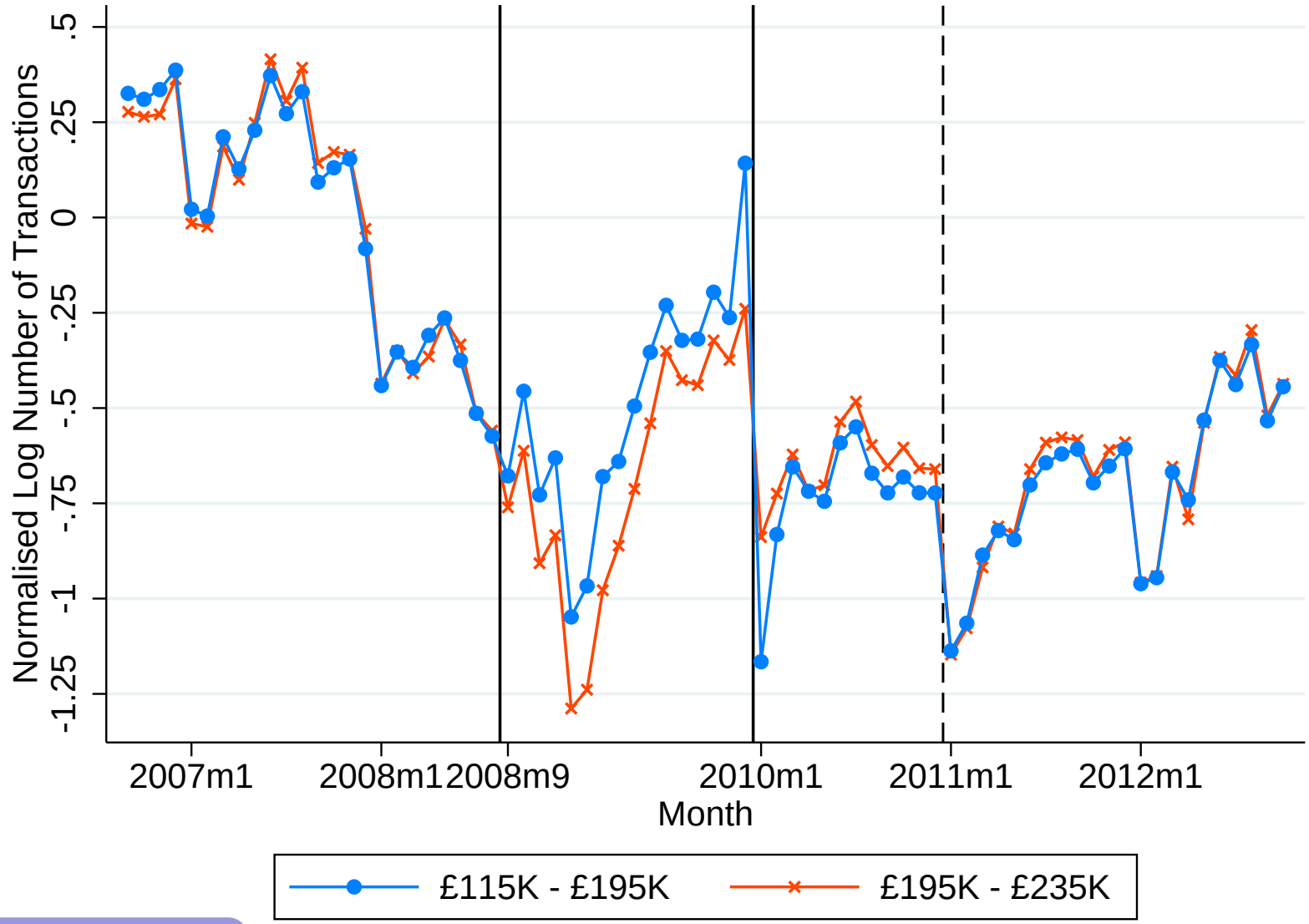
Placebo Difference-in-Bunching 2: Price Range Counterfactuals 2 Years Earlier



▸ Naive DiD ▸ Bunching DiD ▸ DiD Estimates

Stimulus: Timing and Extensive Margin Effects

Diff-in-Diff with Wider Treatment Range



▸ Bunching-Adjusted DiD