

# Supply and Demand Responses to a Tax on Rental Housing: Evidence from Iran

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> PRELIMINARY DO NOT CITE

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## Motivation: Who Bears the Tax and at What Cost?

- Incidence of taxes on price of housing services not well understood
  - Identification problems with cross-sectional and panel estimates
    - $\diamond~$  Public services often rise when tax do
    - $\diamond~$  Districts with falling housing prices may raise taxes to meet targets
- Property taxes are important: Key source of revenue for cities
  - Especially important for low- and middle-income countries
    - $\diamond~$  Ability to provide public goods with rapid urbanization
- The incidence of property taxes still unresolved
  - Traditional view: housing capital is supplied elastically
    - ◊ Incidence of tax may fall on consumers
      - ... or residential land
    - $\diamond~$  This matters for how taxes affect housing affordability

▶ GOAL: Examine a tax that applies only to a subset of rental housing

## Methodology

- Administrative dataset on rental and purchase transactions in Tehran
- Uncommon feature of tax code in the Iranian rental market
  - Creates a tax-kink for consuming over a fixed threshold
- Examine predicted distortions to the rental housing market:
  - Bunching of rental units at the threshold
  - Change in rental-size slope at the threshold
- Through a simple model of the rental housing market
  - Pass-through of taxes to rent prices
  - Estimates of local supply and demand responses









4 Empirical Methodology and Results



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# On the Agenda



#### 2 Data

3 Distortions to the Rental Housing Market

4 Empirical Methodology and Results

#### 5 Conclusions

#### Background

- The tax policy on rental properties in Tehran is unusual
- ▶ The tax liability since 2011 depends on:
  - Annual rental income
  - Only on excess of area greater  $150m^2~(pprox 1600ft^2)$
- Separate and specific filing process for rental earnings

The marginal tax rate are:

Bracket (000 Rials)	Marginal Tax Rate		
0 - 30,000	15%		
30,000 - 100,000	20%		
100,000 - 250,000	25%		
250,000 - 1,000,000	30%		
Over 1,000,000	35%		

Note: The IRR to USD exchange rate was between 15,000 to 39,000 during 2012 - 2014.

#### Predictions

- ► In principle PURE TAX KINK
  - Quantity Prediction:
    - $\diamond~$  Reduction in mass everywhere to the right, and bunching before cutoff
  - Price Prediction:
    - $\diamond~$  Slope of the price-housing gradient increases at 150  $\,$
- ▶ Possible TAX NOTCH (e.g. if landlords face a "filing cost"):
  - Quantity Prediction:
    - ◊ Reduction in mass more pronounced right after cut-off
  - Price Prediction:
    - $\diamond~$  Jump in the price-housing gradient at 150

# On the Agenda





3 Distortions to the Rental Housing Market

4 Empirical Methodology and Results

5 Conclusions

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#### Data

- ► Law since 2009: purchasing and rental transactions registered online
- ▶ <u>Usual</u>: Owner leases the rental property through real estate agencies
- ► Rahbar Informatics Services: Information of real estate agencies
  - All rental and purchasing transactions between 2012 and 2014
- Information:
  - Purchase and rent prices, full address, size, age, and contract date
- ▶ 96% of rental properties in data are single owned

#### Self-reports may cause some over-bunching

- Can we rule out biases due to self report of size?
  - Match rental to purchase transactions:
    - ◊ Using address, 10-digit ZIP code, district, and floor number
    - ◊ Matched 26% of rental sample
    - Of these 87% reported same square meters for purchase
    - Matched rent contracts with size between 140 and 150 square meters:
      - ◊ Only 4% reported larger size on purchasing transaction

## Data has slightly better coverage in high-rent areas

Rental Transactions in the Database



Note: The figure shows on the vertical axis the share of rental transactions in the database with respect to the number of households for each of the 22 districts of Tehran during the years 2012 to 2014. The sum of the districts adds up to 260,261 rental transactions. The sum of the districts adds up to 2,597,731 households that add the 8.5 M population (3.3 people per household). The horizontal axis exhibits the (real) average annual rent for each of the 22 districts in 2015.

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## Not all zip codes contain units over $150m^2$

Distribution of Units Larger Than 150 sq. meters



Note: The figure shows on the Lorenz curve of the distribution of units larger than 150 sq. meters using 5 digits zip codes.

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## Average Marginal Tax Rate: 28.5%

Distribution of Marginal Tax Rates



# On the Agenda



#### 2 Data

#### 3 Distortions to the Rental Housing Market

Empirical Methodology and Results

#### 5 Conclusions

## Distribution of Rental Units: Log Vertical Scale



Note: The vertical dashed line shows the point where taxation begins.

# McCrary Test: Evidence of Discontinuity at $150m^2$



Note: The vertical dashed line shows the point where taxation begins. Using the default bin size calculation, bin size = .138. Usint the default bandwidth calculation, bandwidth = 49.8. Discontinuity estimate (log difference in height): -.4387

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11 / 19

## Evidence of a Regression Kink: Linear Throughout



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# On the Agenda

#### Background

#### 2 Data

3 Distortions to the Rental Housing Market

4 Empirical Methodology and Results

#### 5 Conclusions

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## Bunching Estimator

To estimate the size responses, s̄, we use

$$B = \int_{\underline{s}}^{\overline{s}} h(s) ds \approx h(\underline{s}) \Delta s,$$

where  $h(\underline{s})$  is the counterfactual density of s without taxation

Properties are grouped into small size bins and we estimate the following regression:

$$N_i = \sum_{j=0}^5 b_j s_i^j + \sum_{r \in \mathcal{R}} \rho_r \cdot \mathbb{1}\left(\frac{s_i}{5} \in \mathbb{N}\right) + \sum_{s=s_o}^{\underline{s}+\Delta s} e_s \cdot \mathbb{1}\left(s_i = s\right) + \nu_i,$$

where  $\sum_{j=0}^{k} b_j s_i^j$  is a 5-polynomial on the size, and  $\mathbb{1}\left(\frac{s_i}{5} \in \mathbb{N}\right)$  control for rounding effects

# Bunching: Visual Inspection



Note A: The vertical dashed line shows the point where taxation begins.

Note B: We are currently working on the implementation of Diamond and Persson (2016) Wald estimator using Bernstein polynomials using constrained nonlinear-least squares.

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## Model of Total Monthly Rent by Unit Size

Linear Model of Rents with Zip-Code Fixed Effects

$$\begin{split} R_{ijt} = & \beta_1 \underbrace{(s - 150)}_{\text{slope}} + \beta_2 \underbrace{\mathbb{1}(s > 150)}_{jump} + \beta_3 \underbrace{\mathbb{1}(s > 150) \times (s - 150)}_{\text{slope change}} \\ & + X_{ijt}\gamma + \eta_j + \zeta_t + \varepsilon_{ijt} \end{split}$$

X includes constant, quadratic in age, and quarter dummies.

- Ratio of  $\beta_3/\beta_1$  indicates pass-through to consumer
- $\beta_2 > 0$  evidence (?) of filing costs

Sample Restrictions

- Units sizes from 100 to 250  $m^2$
- Onit built before tax reform in 2001
- **③** Only from zip codes with at least one unit over 150  $m^2$

## Slope of Rent-Size Relationship Rises at Tax Kink

- No robust evidence of price jump
- Slope change insignificant in units built after reform

	Jump	Slope	Jump	Include	Include
	Only	Only	& Slope	50-100 <i>m</i> <sup>2</sup>	New Units
	(1)	(2)	(3)	(4)	(5)
Slope $\beta_1$	2,927	2,637	2,648	4,311	2,348
Jump $\beta_2$	(106) 1,543 (6,583)	(100)	(100) -1,079 (6,894)	(101) 4,164 (8,631)	(37) 7,884 (6,355)
Slope $eta_3$	(0,000)	624	628	359	945
Change		(210)	(218)	(363)	(197)
Implied Pass-Through $(eta_3/eta_1)/28.5\%$		.831 (.302)	.832 (.303)	.292 (.298)	1.413 (.297)
Obs.	20,572	20,572	20,572	25,016	62,587
R-squared	0.51	0.51	0.51	0.58	0.63

Note: First three models restrict to old units within 100 and 250 sq. meters. Model 4 restricts to units within 100 and 250 sq. meters. Model 5 restricts to old units. In all the models we remove the zipcodes that don't have units larger than 150 sq.

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#### Estimated Price Responses

Housing Demand (1)	Housing Supply (2)	Pass-Through Rate (3)
-0.172	1.368	0.886
-0.211	1.794	0.895
(0.002)	(0.051)	(0.017)
-0.302 (0.003)	(0.122)	0.908 (0.001)
-0.365	3.765 (0.174)	0.912 (0.001)
	Housing Demand (1) -0.172 (0.002) -0.211 (0.002) -0.302 (0.003) -0.365 (0.003)	Housing Demand Housing Supply (2)   -0.172 1.368   (0.002) (0.041)   -0.211 1.794   (0.002) (0.051)   -0.302 2.913   (0.003) (0.122)   -0.365 3.765   (0.003) (0.174)

# On the Agenda

#### 1 Background

#### 2 Data

3 Distortions to the Rental Housing Market

4 Empirical Methodology and Results

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## Conclusions

Distortions to the rental housing market:

- Heterogeneous bunching responses across different types of housing
- Structural parameters:
  - Elasticity of rental housing size supply of about 2
  - Elasticity of rental housing size demand of about -0.2
- ▶ High but incomplete pass-through of of about 90%
- Renters pay most of the size-based property tax

# Thank you!

questions, comments, suggestion: churtado@richmond.edu

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