To Own or To Rent?
The Effects of Transaction Taxes on Housing Markets

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This paper

Examines the impact of transaction taxes along both the extensive margin (renting vs. owning) and the intensive margin (moving & transactions)

- New empirical findings using data from Toronto:
  - Buy-to-own sales fall, while buy-to-rent sales increase
  - Price-rent ratio and sales-lease ratio both fall
  - Time-on-the-market and time-to-move both increase
- A novel search model consistent with the empirical findings
  - Choice of renting vs. owning, endogenous moving, free entry of investors
  - Calibrate the model to quantify the GE effects of real-estate transaction tax
- Quantify welfare loss within and across rental and ownership markets
  - Large deadweight loss of tax, with nearly half related to the rental market

Related literature

- Empirically, study same LTT as Dachis, Duranton & Turner (2012)
  - They estimate effects on prices and transactions within the ownership market and find the welfare loss is 13% of tax revenue
  - We study the full general-equilibrium effects across ownership and rental markets and find the welfare loss is 79% of tax revenue
- Theoretically, our work relates to:
  - Search models with transaction taxes: Lundborg & Skedinger (1999)
    - We allow for endogenous moving and a rental market
  - OLG models of housing with transaction taxes: Cho, Li &, Uren (2021), Kaas, Kocharkov, Preugschat and Siassi (2021)
    - We highlight the indivisible nature of housing, and separate buy-to-rent from buy-to-own transactions

Part I: New Facts

Data

- MLS transaction records in the Greater Toronto Area (2000–2018):
  - Sales: listing and sales price, listing and transaction date, address
  - Leases: monthly rent and lease term, listing and lease date, address
  - For transactions after 2006, observe house characteristics

- Combine sales and lease data to obtain novel transactions measures:
  - Buy-to-rent: followed by being listed for rent within 18 months
  - Buy-to-sell: followed by being listed for sale within 18 months
  - Buy-to-own: all remaining transactions

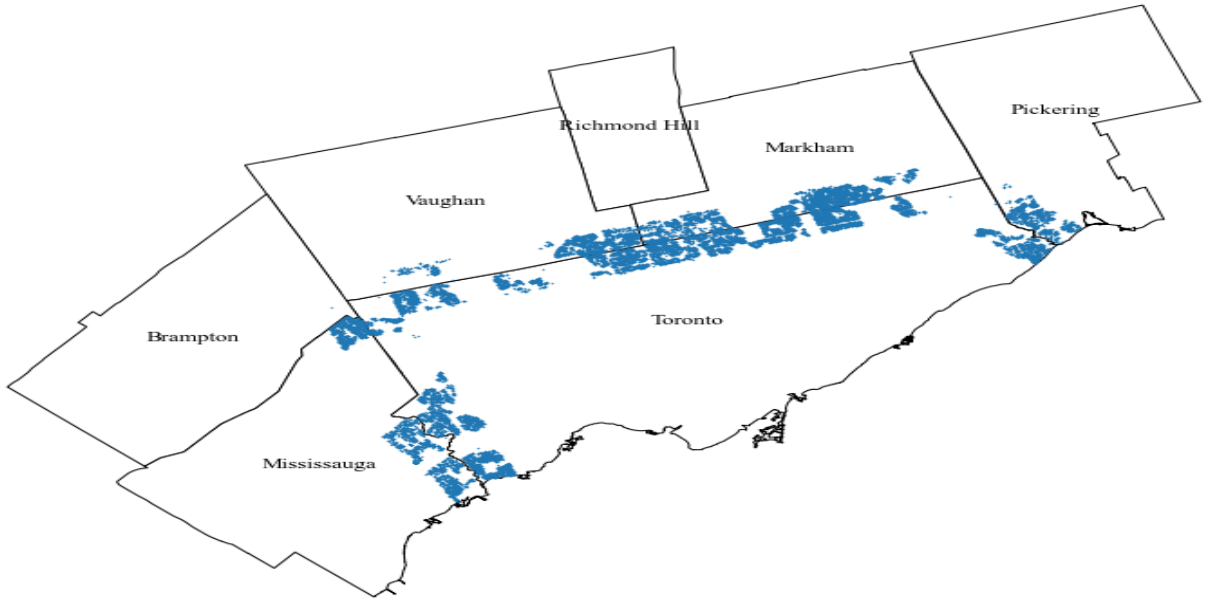
Toronto Land Transfer Tax

In February 2008, the city of Toronto implemented a municipal land transfer tax (LTT) on the top of the existing provincial land transfer tax

City of Toronto LTT Tax Rate by Value ($) (Effective 1 February 2008)		Province of Ontario LTT Tax Rate by Value ($) (Effective 7 May 1997)	
0-55,000	0.5%	0-55,000	0.5%
55,000-400,000	1.0%	55,000-250,000	1.0%
400,000+	2.0%	250,000-400,000	1.5%
		400,000+	2.0%

Figure 3. Study area. Our study area is the City of Toronto and the immediately surrounding municipalities of Mississauga, Brampton, Vaughan, Richmond Hill, Markham and Pickering. Lake Ontario is to the South of Mississauga, Toronto, and Pickering.

Empirical strategy



Exploit two discrete changes:

1. At the city border: limit the sample to properties in close proximity to each other, but on opposite sides of the city border line
2. On the date the city-level LTT is imposed: before/after Feb 2008

Compare changes in housing-market outcomes before and after LTT in 'treated' and 'untreated' market segments

Regression specifications

Baseline specification:

- 3km on each side of the border
- Pre-policy: Jan-06 to Jan-08; post-policy: Feb-08 to Feb-12
- Anticipation effects: indicators for 3 months before/after policy
- Distinct time trends for transactions inside and outside the city

Alternative specifications:

- 5km on each side of the border, and allow homeowners to react to the LTT differently depending on their distance from downtown
- Exclude within 2km of border ('donut' approach)
- Drop all distance restrictions on proximity to the border

Community fixed effects, year fixed effects, month fixed effects, property-type fixed effects, and their interactions. House characteristics in transaction-level regressions.

Summary of findings on LTT effects

- Across ownership and rental markets Table
  - Buy-to-own transactions decline
  - Buy-to-rent transactions increase
  - Total leases increase relative to sales
  - Price-to-rent ratio declines
- Within ownership market Table
  - Homeowners have longer times between moves
  - Houses take longer to sell

Part II: A Search Model with Rental and Ownership Markets

A dual ownership and rental markets search model

- A city with an ownership market and a rental market
- Ex-ante identical properties (measure 1) and households (measure ψ)
  - A household can only occupy one property at a time
  - Households: buy or rent as owner-occupiers or tenants
  - Properties: for sale, for rent, owner-occupied or renter-occupied
- Households exit the city at an exogenous rate ρ
- Free entry of buy-to-rent investors, exit at an exogenous rate ρ_I
- Homeowners and investors sell their properties on exit

Search frictions and credit frictions

(I) Probability of viewings:

- Meeting functions $\Upsilon^i(b_i, u_i)$, $i = o, l$, constant returns-to-scale
- Given market tightness $\theta_i = b_i / u_i$,
  - A buyer/renter views properties at rate $q_i(\theta_i)$
  - A property is viewed at rate $\theta_i q_i(\theta_i)$

(II) Idiosyncratic match quality ε:

- Drawn at the time of a viewing with CDF $G_i(\varepsilon)$, $i = o, l$
- Subject to idiosyncratic shocks arriving at rate a_i
  - For owner-occupiers $\epsilon \to \delta_o \epsilon$, $\delta_o < 1$
  - For renter-occupiers $\epsilon \to 0$

(III) Credit cost χ of household entering the ownership market

- New entrants draw an idiosyncratic cost χ to enter the ownership market with CDF $G_m(\chi)$
- The cost χ is a persistent variable, but is redrawn by renters with probability γ when they receive a match-quality shock

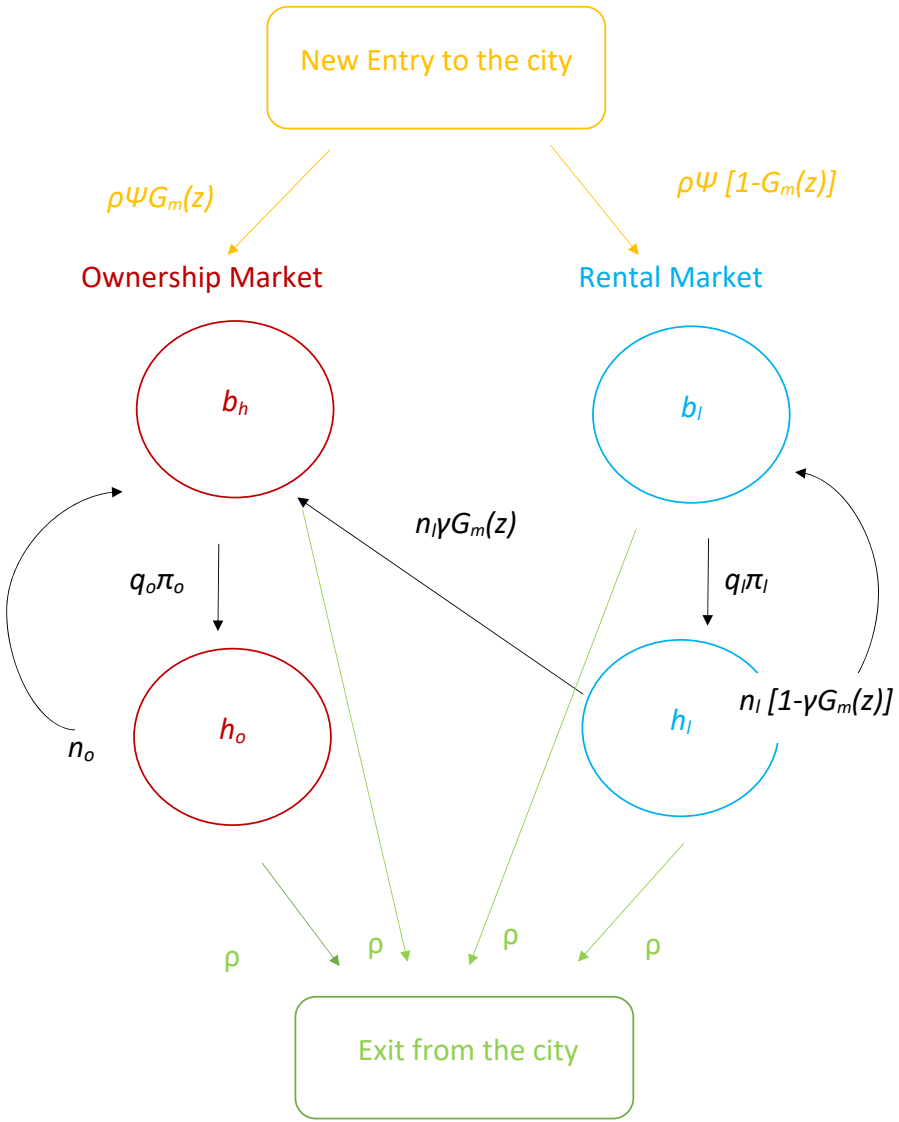
Flows within the ownership and rental markets

- Transactions:
  - Buyers and sellers meet subject to friction and viewings take place
  - Transactions happen (for owner-occupiers and tenants) when match quality is above thresholds y_i, $i = o, l$
- Mobility:
  - Owner-occupiers move if match quality falls below threshold x_o
  - Tenants move after moving shocks
- Equilibrium objects:
  - Transactions (sales and leases)
  - Time-on-the-market
  - Mobility
  - Prices and rents

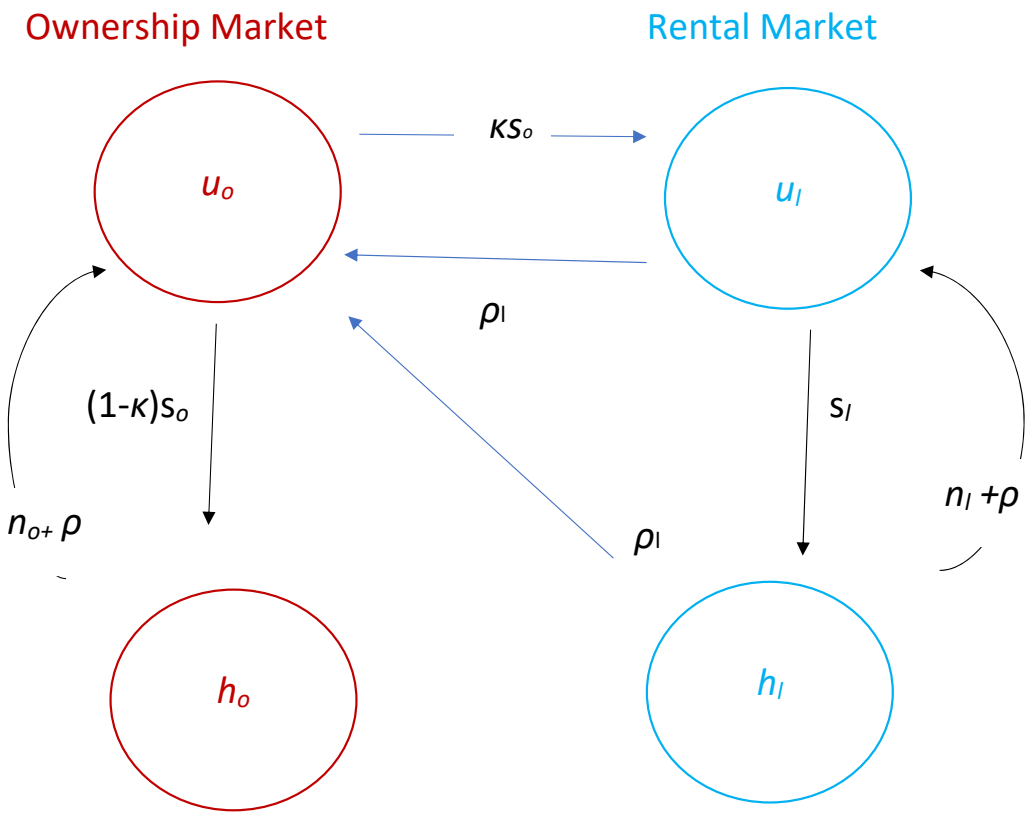
Flows across the ownership and rental markets

- Properties:
  - Investors buy properties from ownership market to let in rental market
  - Free entry of investors
  - Investors sell rental properties in ownership market if they exit
- Households:
  - A household becomes a buyer if credit cost χ is below a threshold Z
- Equilibrium objects:
  - Buy-to-rent transactions
  - Homeownership rate

Flows and stocks: Households



Flows and stocks: Properties



κ is the equilibrium fraction of buy-to-rent transactions

s_o is the sales rate in the ownership market

Effects of higher transaction taxes: Household behaviour

1. Less incentive to be owner-occupier ($Z \downarrow$) $\rightarrow$ fewer first-time buyers
   - Higher tax reduces the joint surplus in the ownership market
2. Homeowners become more tolerant ($x_o \downarrow$) $\rightarrow$ longer time-to-move
   - Higher tax increases the cost of moving
3. Home-buyers become pickier ($y_o \uparrow$) $\rightarrow$ longer time-to-sell
   - Start with a higher match quality to reduce future incidence of moving

Fewer first-time buyers, longer times between moves, and longer time taken to sell all reduce the number of buy-to-own transactions

Effects of higher transaction taxes: Investor behaviour

- Direct effect: higher tax discourages entry of investors
- Equilibrium effects: lower price-to-rent ratio encourages entry
  - Higher rent: more demand for rental properties due to households' reduced incentive to become homeowners
  - Lower price: capitalization effect of higher tax paid by owner-occupiers

Unlike homeowners, landlords do not have to sell and buy when tenants move, which gives buy-to-rent investors an implicit tax advantage:

- Equilibrium effects dominate direct effect: buy-to-rent transactions up

Household and investor behaviour imply a lower homeownership rate

Calibration

- Calibrate to Toronto in 2007, before the LTT change
- Three broad sets of targets:
  1. Extensive margin across ownership and rental markets:
     - Homeownership rate, buy-to-rent as fraction of all transactions, fraction of first-time buyers, age difference between owners and renters, price-rent ratio, mortgage interest rate spreads
  2. Search behavior and associated costs:
     - Time-on-the-market, viewings per sale, time between moves, transaction costs relative to prices and rents
     - Match the model-implied moving-rate response to the LTT change to the empirical estimate
  3. Functional forms and directly set some parameters
     - Equal numbers of properties and households, no incentive for entry of more households, Cobb-Douglas meeting functions, Nash bargaining with bargaining powers equal to meeting-function elasticities, Pareto distribution of match quality, log Normal distribution of credit costs

Calibration targets Parameters

Quantitative effects of a higher transaction tax

Variable	Model prediction	Econometric evidence
Time-to-move for homeowners	13% (matched)	13%
Buy-to-own (BTO) transactions	−15%	−10.1%
Buy-to-rent (BTR) transactions	1.9%	8.9%
Time-to-sell	8.6%	16.5%
Leases-to-sales ratio	15%	23%
Price-to-rent ratio	−1.8%	−3.9%
Average sales price	−1.9%	−2.0%
Homeownership rate	−1.6% (−0.9 p.p.)	-
Transaction tax revenue	46%	-
Effective LTT tax rate	Increased from 1.5% to 2.8% (1.3 p.p.)	

Welfare effects of the transaction tax

Variable	Result
Welfare loss relative to increase in tax revenue	79%
(1) Across markets	25%
(2) Within rental market	5%
(3) Within ownership market	49%

- Across-market loss: fall in homeownership rate
  - Magnitude depends mainly on the distribution of credit costs, which is calibrated using data on mortgage interest spreads
- Within-market loss: match quality and non-tax transaction costs
  - Ownership market: large, indivisibility of housing — tax on whole value of property, not only the marginal improvement from moving
  - Rental market: more non-tax transaction costs are incurred

Summary of the paper

- Document three novel effects of transaction taxes:

  (i) Buy-to-rent transactions rise while owner-occupier transactions fall

  (ii) Lower price-to-rent ratio and lower sales-to-leases ratio

  (iii) Increase in time taken for properties to sell

- Build a search model with free entry of investors, and where households choose renting or owning, and make moving decisions
- A higher transaction tax distorts the allocation of properties across the two markets by reducing the homeownership rate, and within the ownership market by reducing mobility
- Find a large welfare loss (79% of the increase in tax revenue), with 40% due to accounting for the presence of the rental market

Additional Slides

Estimated LTT effects across rental and ownership markets

Dependent variable	(1)	(2)	(3)	(4)
log (*#Leases/#Sales*)	0.234**	0.242***	0.236**	0.264***
	(0.117)	(0.082)	(0.100)	(0.063)
Observations	1355	2660	1782	7730
log (*Price/Rent*)	-0.039**	-0.026*	-0.031*	-0.037**
	(0.019)	(0.015)	(0.017)	(0.013)
Observations	1355	2660	1782	7730
log (*#BTO sales*)	-0.101**	-0.097**	-0.087*	-0.122***
	(0.047)	(0.044)	(0.049)	(0.033)
Observations	3736	6363	3811	17190
log (*#BTR sales*)	0.089*	0.099**	0.117**	0.110*
	(0.047)	(0.045)	(0.053)	(0.058)
Observations	531	1031	670	2857
Distance threshold	3km	5km	5km	All
City indicators ± 3 m.	Yes	Yes	Yes	Yes
City time trends	Yes	Yes	Yes	Yes
Distance LTT trends		Yes	Yes	Yes
Donut hole			2km	

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Estimated LTT effects on mobility and time-on-the-market

	(1)	(2)	(3)	(4)
	Dependent variable: The event of moving			
LTT	-0.130**	-0.194***	-0.232***	-0.228***
	(0.064)	(0.053)	(0.088)	(0.042)
log(*Original purchase price*)	-0.095**	-0.076*	-0.103**	-0.079***
	(0.046)	(0.043)	(0.048)	(0.023)
log φ	0.513***	0.523***	0.519***	0.526***
	(0.010)	(0.007)	(0.010)	(0.005)
Observations	1,691,369	2,831,897	1,651,935	5,719,326
	Dependent variable: log (*Time-on-the-market*)			
LTT	0.165***	0.163***	0.162***	0.131***
	(0.028)	(0.028)	(0.051)	(0.019)
Observations	20,937	37,397	24,569	185,080
Distance threshold	3km	5km	5km	All
House characteristics	Yes	Yes	Yes	Yes
City indicators ± 3 m.	Yes	Yes	Yes	Yes
City time trends	Yes	Yes	Yes	Yes
Distance LTT trends		Yes	Yes	Yes
Donut hole			2km	

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Calibration targets

Homeownership rate	h	54%
Fraction of purchases made by buy-to-rent investors	κ	5.4%
Fraction of first-time buyers among all home-buyers	ϕ	40%
Difference in average ages of owner-occupiers and renters	α	8.3
Average price-rent ratio for same properties	P_k/R	14.5
Price paid by investors relative to average paid by home-buyers	P_k/P	99%
Non-tax transaction costs of buyers relative to price	$C_h/P = C_k/P_k$	0%
Property maintenance costs relative to price	M/P	2.6%
Landlords' extra maintenance/management costs relative to rent	M_l/R	8%
Seller transaction costs relative to price	C_u/P	4.5%
Landlord transaction costs relative to rent	C_l/R	8.3%
Fraction of landlord transaction costs charged to tenant	Π/C_l	0%
Flow search costs of home-buyers relative to price	F_h/P	3.1%
Flow search costs of investors relative to home-buyers	F_k/F_h	1
Flow search costs of tenants relative to home-buyers	F_w/F_h	1.1
Sellers' average time on the market	T_{so}	0.161
Buyers' average time on the market	T_{bo}	0.206
Landlords' average time on the rental market	T_{sl}	0.066
Average viewings per sale	ν_o	20.6
Average viewings per lease	ν_l	10.3
Average time between moves for owner-occupiers	T_{mo}	9.25
Average time between moves for tenants	T_{ml}	3.04
Percentage decline of owner-occupier moving rate after new LTT	β	13%
Capitalized credit costs of marginal home-buyer relative to price	Z/P	0.48
Ratio of credit costs of marginal and average home-buyers	$Z/\bar{\chi}$	2.11
Risk-free real interest rate	r_f	1.86%
Average real mortgage interest rate	$\bar{r}_c$	4.93%
Real mortgage interest rate of the marginal home-buyer	r_c	7.93%
Initial loan-to-value ratio of first-time buyers	ℓ	80%
Mortgage term	T_c	25

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Calibrated parameters

Number of households relative to the number of properties	ψ	1
Discount rate for future housing-market payoffs	r	3.3%
Households' exit rate from the city	ρ	4.3%
Investors' exit rate	ρ_I	0.7%
Property maintenance cost	M	10.4
Landlords' extra maintenance/management costs	M_I	2.2
Minimum new match quality in the ownership market	ζ_o	34.1
Minimum new match quality in the rental market	ζ_I	21.2
Home-buyer shape parameter of new match quality distribution	λ_o	30.3
Tenant shape parameter of new match quality distribution	λ_I	31.5
Arrival rate of match quality shocks in the ownership market	a_o	8.3%
Arrival rate of match quality shocks in the rental market	a_I	27.9%
Size of match quality shock in ownership market	δ_o	0.858
Fraction of tenants drawing new credit cost after moving shock	γ	8.3%
Parameter for mean of the distribution of credit costs	μ	5.5
Parameter for standard deviation of the distribution of credit costs	σ	1.3
Transaction costs of buyers excluding taxes	$C_k = C_h$	0
Transaction costs of sellers	C_u	18.1
Transaction costs of landlords	C_l	2.3
Transaction costs of tenants	C_w	0.7
Flow search costs of home-buyers and investors	$F_k = F_h$	12.6
Flow search costs of prospective tenants in the rental market	F_w	13.6
Viewing productivity parameter in the ownership market	A_o	111
Viewing productivity parameter in the rental market	A_I	169
Elasticity of ownership-market meetings with respect to sellers	η_o	0.434
Elasticity of rental-market meetings with respect to landlords	η_I	0.762
Bargaining power of sellers meeting a home-buyer	ω_o	0.434
Bargaining power of sellers meeting an investor	ω_k	0.218
Bargaining power of landlords meeting a prospective tenant	ω_I	0.762

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