

Agglomeration Effects and Liquidity Gradient in Local Rental Housing Markets

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Motivation

- ▶ Market liquidity
 - ▶ cost, quantity, time dimension (Holden et al., 2013)
- ▶ Liquidity in real estate markets
 - ▶ time on the market (Miller, 1978; Haurin, 1988)
- ▶ Contribution of this paper
 - ▶ liquidity in rental housing market
 - ▶ different dimensions of market liquidity
 - ▶ systematic, market-specific component of liquidity
 - ⇒ impact of urban agglomeration centers

Motivation

- ▶ Research questions
 - ▶ Do rental housing markets with a greater distance from the local agglomeration center suffer from a higher illiquidity?
⇒ negative liquidity gradient?
 - ▶ Do urban agglomeration effects have a systematic impact on liquidity in nearby located rental housing markets?
 - ▶ What are implications for property owners and investors?

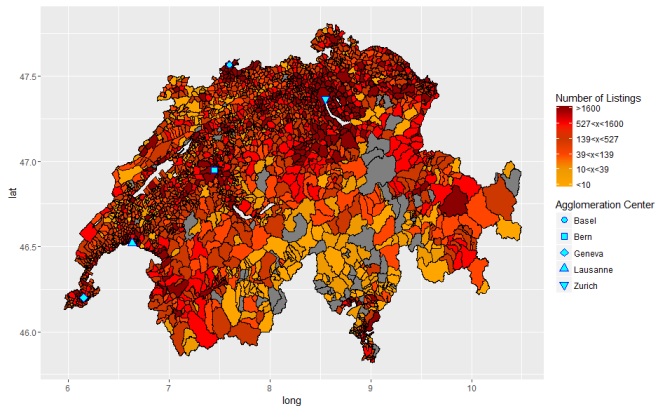
Data

- ▶ Data from Switzerland
 - ▶ low homeownership rate: 44.5%
 - ▶ among 35yr olds: only 22% property-owners (Credit Suisse)
 - ▶ rental units: 60% rented out by private or institutional property owners (Federal Statistical Office)

- ▶ Online rental offer advertisements
 - ▶ total of 2,183,944 listings in 2,746 local municipalities
 - ▶ January 2004 to December 2015
 - ▶ listings: rental price offer, hedonic characteristics, location
 - ▶ compute time on the market (average duration: 53 days)

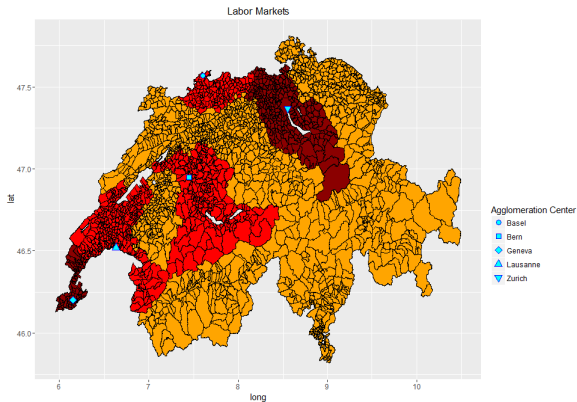
Data

► Cross-sectional distribution of listed rent offers



Data

- ▶ Five largest agglomeration centers
 - ▶ local labor market definition (Federal Statistical Office)



Measures of Market Liquidity

- ▶ Transaction volume
 - ▶ newly generated average rental income
- ▶ Inventory-based measures (Piazzesi et al., 2017)
 - ▶ turnover rate: removed offers per total housing stock
⇒ turnover rate \downarrow → inventory risk \uparrow
 - ▶ inventory share: fraction of local vacant rental space
- ▶ Duration-based illiquidity measures
 - ▶ expected time on the market
 - ▶ duration impact of trading activity
⇒ non-execution risk: unrealized rental cash flows

Research Question 1: Liquidity Gradient?

$$\log(Liquidity_{it}) = \alpha + \beta_1 distance_i + X'_{i,t-1}\gamma + \varepsilon_{it}$$

	Trading Volume	Inventory Share	Turnover Rate	Expected Time on the Market	Duration Impact
Distance	-0.026*** (0.004)	-0.028*** (0.005)	-0.024*** (0.005)	0.007* (0.004)	0.039*** (0.008)
log(Rent)	0.601*** (0.109)	-0.610*** (0.145)	-0.650*** (0.142)	0.857*** (0.119)	1.086*** (0.248)
Vacancy Rate	3.222*** (0.301)	2.448*** (0.489)	2.524*** (0.480)	0.822** (0.371)	-1.732** (0.838)
Δ Population	6.213*** (0.843)	2.047** (1.043)	2.370** (0.998)	2.829*** (0.806)	-0.478 (1.724)
Undevelopable Land	1.628*** (0.290)	5.092*** (0.365)	4.983*** (0.361)	-3.631*** (0.312)	-8.726*** (0.634)
Δ Commuting	0.156*** (0.030)	0.282*** (0.052)	0.278*** (0.045)	-0.140*** (0.037)	-0.454*** (0.082)
Δ Infrastructure	0.052*** (0.014)	0.019 (0.018)	0.022 (0.015)	0.029** (0.012)	-0.0001 (0.025)
Observations	8752	8778	8778	8589	8752
Year dummies	Yes	Yes	Yes	Yes	Yes
Adj.-R ²	0.269	0.379	0.425	0.328	0.383

Research Question 2: Urban Agglomeration Effects?

- ▶ Identify agglomeration effects:
⇒ interaction term between distance and SQI

$$\log(Liquidity_{it}) = \alpha + \beta_1 d_i + \beta_2 SQI_t + \beta_3 d_i \cdot SQI_t + X'_{i,t-1} \gamma + \varepsilon_{it}$$

- ▶ Credit Suisse Site Quality Index (SQI) of urban centers:
 - ▶ how attractive for firms and qualified labor force
 - ▶ infrastructure investments
 - ▶ tax incentives
 - ▶ connectivity to airport

Research Question 2: Urban Agglomeration Effects?

	Trading Volume	Inventory Share	Turnover Rate	Expected Time on the Market	Duration Impact
Distance	-0.019*** (0.007)	-0.024** (0.010)	-0.019** (0.009)	0.006 (0.007)	0.025* (0.014)
SQI	0.384*** (0.116)	0.307* (0.185)	0.335** (0.167)	-0.001 (0.144)	-0.504* (0.298)
SQI · Distance	-0.014*** (0.005)	-0.012* (0.007)	-0.013** (0.007)	0.001 (0.006)	0.021* (0.012)
log(Rent)	0.363*** (0.113)	-0.653*** (0.149)	-0.634*** (0.141)	0.654*** (0.125)	0.887*** (0.245)
Vacancy Rate	2.716*** (0.358)	1.749*** (0.529)	1.793*** (0.500)	1.272*** (0.436)	-0.292 (0.870)
ΔPopulation	3.360*** (0.810)	0.775 (1.100)	0.952 (1.027)	1.188 (0.829)	-0.844 (1.826)
Undevelopable Land	1.502*** (0.263)	4.806*** (0.391)	4.865*** (0.378)	-3.496*** (0.337)	-8.478*** (0.676)
ΔCommuting	0.079** (0.035)	0.160*** (0.056)	0.148*** (0.047)	-0.107*** (0.036)	-0.334*** (0.084)
ΔInfrastructure	0.030** (0.015)	0.018 (0.020)	0.021 (0.016)	0.014 (0.013)	-0.013 (0.030)
Observations	7192	7217	7217	7050	7192
Canton Fixed-Effects	Yes	Yes	Yes	Yes	Yes
Adj.-R ²	0.450	0.447	0.515	0.423	0.476

Research Question 3: Costs of Illiquidity?

- ▶ price impact of illiquidity
 - ▶ empirical evidence of rental price discount
⇒ illiquidity \uparrow → rent \downarrow
 - ▶ also: lower capitalization rate in illiquid market
$$cap = \frac{Rent}{Price} = f(illiquidity, risk\ premiums) - growth$$
- ▶ liquidity commonality
 - ▶ conditional on hedonic characteristics, duration of rental unit longer in illiquid markets
⇒ non-execution risk \uparrow in illiquid markets

Conclusion

- ▶ What can we learn?
 - ▶ negative liquidity gradient: distance \uparrow \rightarrow market liquidity \downarrow
 - ▶ agglomeration effects on liquidity
 - ▶ positive on rental housing in urban center
 - ▶ lower in nearby located markets (relative to center)
 - ▶ costs of illiquidity
 - ▶ rental price discount in illiquid markets
 - ▶ lower capitalization rates in illiquid markets
 - ▶ liquidity commonality: higher non-execution risk

Thank you for your attention!

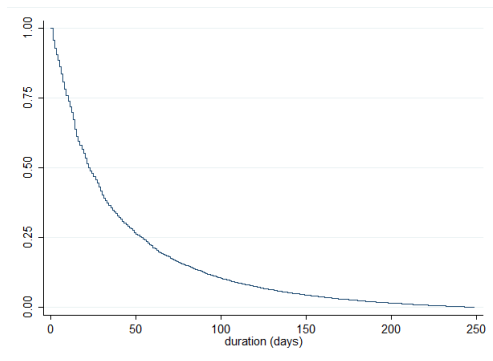
Appendix: Hedonic Characteristics

► Descriptive Summary

Hedonic	Mean	Std.Dev.	Min	Max	Obs.
Rent Offer	1665.97	924.51	201	15000	2,183,944
Duration	53.24	77.36	1	1000	2,183,944
Living Surface	84.78	37.07	11	400	1,707,152
Rooms	3.36	1.28	1	10	2,183,944
Minergie Certificate	0.02	-	0	1	2,183,944
Balcony	0.57	-	0	1	2,183,944
Garden	0.16	-	0	1	2,183,944
Attica	0.03	-	0	1	2,183,944
Studio	0.02	-	0	1	2,183,944
Near Nature	0.19	-	0	1	2,183,944
Furnished	0.05	-	0	1	2,183,944
Wheelchair Access	0.05	-	0	1	2,183,944
Lift	0.30	-	0	1	2,183,944

Appendix: Data

- ▶ Survival of listings in online search markets



Appendix: Liquidity Measures

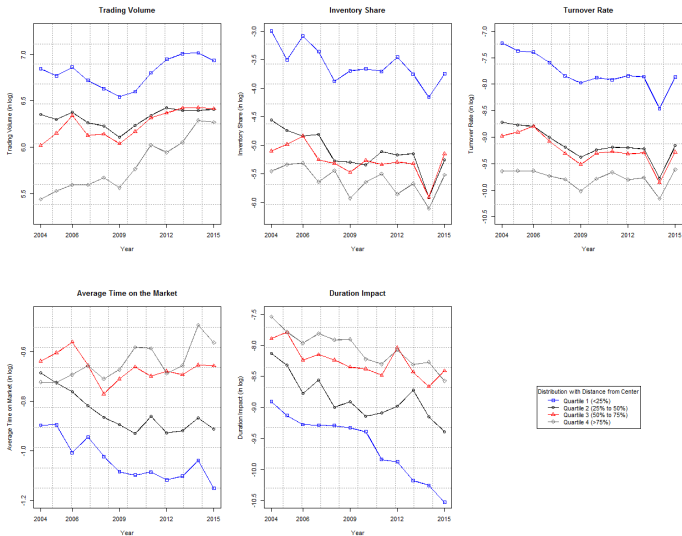
► Descriptive Summary and Correlation Matrix

Panel A: Summary Statistics (measures in logs)					
	Mean	Std.Dev.	Min	Max	Obs.
Vol_{it}	5.54	1.26	-0.03	10.66	21877
I_{it}	-6.48	1.82	-13.51	1.79	22116
V_{it}	-10.41	1.69	-13.51	-3.06	24357
\widehat{TOM}_{it}	-1.37	1.18	-7.73	3.81	20785
$ILLQ_{it}$	-10.95	2.86	-24.78	-2.40	21877

Panel B: Correlation Matrix					
	Vol_{it}	I_{it}	V_{it}	\widehat{TOM}_{it}	$ILLQ_{it}$
Vol_{it}	1.000				
I_{it}	0.592	1.000			
V_{it}	0.660	0.920	1.000		
\widehat{TOM}_{it}	-0.044	-0.675	-0.723	1.000	
$ILLQ_{it}$	-0.079	-0.823	-0.903	0.855	1.000

Appendix: Liquidity Measures

► Market-wide liquidity (e.g., Pastor and Stambaugh, 2003)



Appendix: Liquidity Gradient

► Robustness: propensity score matching

	Trading Volume			Inventory Share			Turnover Rate		
	HI	pCBPS	npCBPS	HI	pCBPS	npCBPS	HI	pCBPS	npCBPS
Distance	-0.035*** (0.001)	-0.020*** (0.002)	-0.032*** (0.004)	-0.058*** (0.002)	-0.025*** (0.002)	-0.062*** (0.006)	-0.054*** (0.002)	-0.019*** (0.002)	-0.035*** (0.002)
log(Rent)		0.743*** (0.070)	0.486*** (0.086)		-0.511*** (0.081)	-0.878*** (0.110)		-0.492*** (0.076)	-0.772*** (0.078)
Vacancy Rate		2.939*** (0.151)	3.119*** (0.198)		2.359*** (0.255)	3.301*** (0.378)		2.338*** (0.239)	2.630*** (0.265)
Δ Population		6.825*** (0.520)	7.071*** (0.590)		1.954*** (0.736)	1.719*** (0.920)		2.070*** (0.663)	2.495*** (0.740)
Undevelopable Land		2.416*** (0.087)	2.042*** (0.109)		5.894*** (0.126)	5.098*** (0.161)		5.906*** (0.113)	5.469*** (0.113)
Δ Commuting		0.191*** (0.029)	0.218*** (0.031)		0.269*** (0.050)	0.340*** (0.055)		0.254*** (0.043)	0.287*** (0.044)
Δ Infrastructure		0.054*** (0.014)	0.045*** (0.017)		0.024 (0.021)	-0.058 (0.043)		0.026 (0.019)	0.004 (0.024)
Propensity Score	-3.469** (1.362)			-23.974*** (2.095)			-22.025*** (1.916)		
Observations	8752	8751	8751	8778	8770	8770	8778	8770	8770
Adj.-R ²	0.110			0.112			0.113		
AIC		25742	26145		32632	33615		30243	30496

Appendix: Liquidity Gradient

► Robustness: different number of rooms

	Trading Volume			Inventory Share			Turnover Rate		
	(Q1)	(Q2)	(Q3)	(Q1)	(Q2)	(Q3)	(Q1)	(Q2)	(Q3)
Distance	-0.018*** (0.004)	-0.023*** (0.004)	-0.025*** (0.004)	-0.017*** (0.005)	-0.022*** (0.005)	-0.025*** (0.005)	-0.017** (0.005)	-0.023*** (0.005)	-0.023*** (0.005)
log(Rent)	0.034 (0.126)	0.250** (0.110)	1.192*** (0.116)	-1.016*** (0.197)	-0.796*** (0.164)	-0.042 (0.148)	-1.028*** (0.184)	-0.954*** (0.162)	-0.156 (0.144)
Vacancy Rate	2.666*** (0.335)	3.161*** (0.301)	3.024*** (0.315)	1.629*** (0.540)	2.074*** (0.491)	2.448*** (0.501)	1.560*** (0.500)	2.268*** (0.488)	2.455*** (0.476)
ΔPopulation	5.062*** (0.926)	4.881*** (0.872)	6.003*** (0.902)	1.362 (1.276)	0.005 (1.152)	2.037* (1.099)	1.552 (1.153)	0.813 (1.065)	2.011** (0.994)
Undevelopable Land	1.313*** (0.335)	1.394*** (0.284)	0.990*** (0.297)	4.866*** (0.396)	4.777*** (0.342)	4.252*** (0.374)	4.624*** (0.385)	4.639*** (0.361)	4.052*** (0.352)
ΔCommuting	0.092*** (0.031)	0.131*** (0.028)	0.159*** (0.032)	0.219*** (0.060)	0.244*** (0.055)	0.279*** (0.055)	0.216*** (0.051)	0.251*** (0.048)	0.277*** (0.046)
ΔInfrastructure	0.029** (0.013)	0.050*** (0.013)	0.040*** (0.015)	-0.021 (0.021)	-0.002 (0.018)	0.005 (0.022)	0.005 (0.016)	0.010 (0.014)	0.002 (0.018)
Observations	7545	8105	8075	7623	8172	8134	7623	8172	8134
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.-R ²	0.191	0.241	0.238	0.342	0.347	0.319	0.410	0.420	0.375

Appendix: Liquidity Gradient

► Robustness: different price segments

	Trading Volume				Inventory Share			
	(Q1)	(Q2)	(Q3)	(Q4)	(Q1)	(Q2)	(Q3)	(Q4)
Distance	0.001 (0.004)	-0.005 (0.004)	-0.017*** (0.004)	-0.033*** (0.005)	-0.005 (0.005)	-0.013*** (0.005)	-0.023*** (0.005)	-0.017*** (0.005)
log(Rent)	-0.588*** (0.113)	-0.653*** (0.120)	-0.102 (0.106)	1.706*** (0.153)	-1.232*** (0.198)	-1.537*** (0.200)	-0.923*** (0.188)	-1.370*** (0.247)
Vacancy Rate	2.550*** (0.323)	3.815*** (0.312)	3.696*** (0.335)	1.619*** (0.380)	1.442*** (0.502)	2.472*** (0.552)	2.519*** (0.503)	2.434*** (0.528)
ΔPopulation	2.942*** (0.885)	2.994*** (0.824)	4.226*** (0.903)	6.408*** (1.049)	0.164 (1.354)	-1.335 (1.253)	0.535 (1.210)	-1.335 (1.433)
Undevelopable Land	0.508** (0.239)	0.346 (0.270)	0.384 (0.286)	1.279*** (0.315)	3.914*** (0.398)	3.804*** (0.390)	3.879*** (0.379)	3.757*** (0.404)
ΔCommuting	0.005 (0.030)	0.052* (0.030)	0.094*** (0.029)	0.165*** (0.038)	0.167*** (0.061)	0.244*** (0.061)	0.206*** (0.057)	0.192*** (0.064)
ΔInfrastructure	0.030** (0.014)	0.040*** (0.013)	0.035*** (0.014)	0.043** (0.018)	0.015 (0.024)	-0.004 (0.023)	-0.008 (0.023)	0.022 (0.028)
Observations	7350	7534	7627	7131	7350	7534	7627	6546
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.-R ²	0.129	0.175	0.164	0.273	0.285	0.304	0.303	0.295

Appendix: Urban Agglomeration Effects

$$\log(Liquidity_{it}) = \alpha + \beta_1 SQI_t + X'_{i,t-1}\gamma + \eta_i + \varepsilon_{it}$$

- ▶ exclude urban centers from the sample
- ▶ within-estimator: variation over time within local market

	Trading Volume	Inventory Share	Turnover Rate	Expected Time on the Market	Duration Impact
SQI	-0.175*** (0.035)	-0.137** (0.053)	-0.148*** (0.029)	0.031** (0.013)	0.233*** (0.056)
log(Rent)	0.017 (0.065)	0.013 (0.082)	0.011 (0.059)	-0.049*** (0.017)	-0.118 (0.094)
Vacancy Rate	0.700*** (0.171)	0.526* (0.282)	0.453*** (0.153)	0.255*** (0.073)	0.142 (0.245)
Δ Unemployment	-0.225*** (0.041)	-0.128* (0.070)	-0.109*** (0.037)	-0.014 (0.015)	0.153** (0.077)
Δ Population	0.239 (0.519)	0.904 (0.755)	0.314 (0.453)	-0.274* (0.146)	-0.920 (0.712)
Δ Infrastructure	0.024** (0.012)	0.030* (0.016)	0.022** (0.011)	0.005 (0.003)	-0.016 (0.016)
Interest Rate	-0.098*** (0.008)	-0.037*** (0.011)	-0.038*** (0.007)	0.035*** (0.003)	0.164*** (0.012)
Δ Commuting	-0.016 (0.020)	-0.022 (0.035)	-0.008 (0.019)	-0.007 (0.007)	0.009 (0.035)
Δ Migration	-0.948 (1.029)	-12.167*** (1.425)	-11.696*** (0.920)	-9.700*** (0.361)	-17.565*** (1.503)
Observations	7630	7656	7656	7471	7630
Fixed-Effects	Yes	Yes	Yes	Yes	Yes
Adj.-R ²	0.068	0.033	0.083	0.263	0.101

Appendix: Urban Agglomeration Effects

- Proxy: number of burglaries per 1,000 residents in center

	Trading Volume	Inventory Share	Turnover Rate	Expected Time on the Market	Duration Impact
Distance	-0.052*** (0.010)	-0.070*** (0.019)	-0.060*** (0.017)	0.013 (0.013)	0.079*** (0.028)
Burglary	-0.137*** (0.042)	-0.130** (0.060)	-0.137*** (0.052)	0.011 (0.044)	0.178* (0.093)
Burglary · Distance	0.004** (0.002)	0.006** (0.003)	0.005** (0.002)	-0.001 (0.002)	-0.007* (0.004)
log(Rent)	0.514** (0.200)	-0.467* (0.266)	-0.505** (0.257)	0.707*** (0.226)	0.758 (0.467)
Vacancy Rate	3.146*** (0.548)	1.437 (0.894)	1.405 (0.867)	1.804*** (0.626)	0.430 (1.532)
ΔPopulation	3.994*** (1.503)	2.547 (1.966)	2.655 (1.802)	0.789 (1.459)	-2.815 (3.262)
Undevelopable Land	1.570*** (0.374)	5.205*** (0.554)	5.136*** (0.523)	-3.809*** (0.483)	-9.221*** (0.952)
ΔCommuting	0.075 (0.055)	0.151* (0.091)	0.171** (0.074)	-0.106* (0.060)	-0.254* (0.135)
ΔInfrastructure	0.041 (0.033)	0.011 (0.047)	0.022 (0.039)	0.017 (0.025)	-0.001 (0.064)
Observations	3663	3671	3671	3619	3663
Canton Fixed Effects	Yes	Yes	Yes	Yes	Yes
Adj.-R ²	0.450	0.467	0.523	0.457	0.490

Appendix: Urban Agglomeration Effects

- ▶ Evidence from an exogenous shock
 - ▶ corporate tax decline in subset of agglomeration centers
 - ▶ 2009: ↓ by 5.6%-points in Geneva, 4.73%-points in Lausanne
 - ▶ stable in other centers between 2007 and 2011 with minor fluctuations (less than $< 1\%$ -point)
 - ▶ difference-in-difference setup:
 - treatment variable: commuting areas of Lausanne, Geneva
 - controls: commuting areas of Zurich, Bern, Basel
 - periods after tax cut: 2010, 2011

Appendix: Urban Agglomeration Effects

- ▶ liquidity increases in local markets that are closest to centers in which tax cut occurs
- ▶ for different quartile ranges
 $Q1 (< 25\%)$, $Q2 (25\% - 50\%)$, $Q3 (50\% - 75\%)$, $Q4 (> 75\%)$
of local markets along distance distribution

Panel A: Liquidity	Trading Volume				Inventory Share				Turnover Share			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Treated	-0.658*** (0.113)	-0.141 (0.152)	0.435** (0.146)	0.280 (0.190)	-1.266*** (0.178)	-0.834*** (0.228)	-0.586** (0.249)	-0.032 (0.278)	-1.371*** (0.167)	-0.814*** (0.219)	-0.392* (0.223)	-0.043 (0.258)
Period _{Tax Cut}	-0.037 (0.033)	0.102** (0.043)	0.207*** (0.055)	0.217*** (0.084)	-0.113* (0.060)	-0.014 (0.066)	-0.020 (0.074)	0.048 (0.113)	-0.128*** (0.037)	-0.037 (0.046)	0.007 (0.057)	0.018 (0.084)
Treated · Period _{Tax Cut}	0.401*** (0.066)	0.249** (0.118)	-0.124 (0.096)	0.197 (0.149)	0.564*** (0.107)	0.252 (0.161)	0.139 (0.146)	0.010 (0.174)	0.567*** (0.066)	0.359*** (0.123)	0.057 (0.098)	0.192 (0.129)
Observations	1279	1082	1058	884	1285	1085	1062	890	1285	1085	1062	890
Market Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.-R ²	0.218	0.296	0.327	0.133	0.454	0.415	0.303	0.093	0.533	0.480	0.375	0.134

Appendix: Urban Agglomeration Effects

- ▶ Different quartile ranges
 - ▶ Q1(< 25%), Q2(25% – 50%), Q3(50% – 75%), Q4(> 75%) of local markets along distance distribution

Panel B: Illiquidity	Expected Time on the Market				Duration Impact			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Treated	0.676*** (0.152)	0.570*** (0.165)	0.638*** (0.179)	0.311 (0.226)	2.146*** (0.308)	1.260*** (0.370)	0.818** (0.359)	0.331 (0.461)
Period _{Tax Cut}	-0.088*** (0.024)	-0.082*** (0.027)	-0.058** (0.029)	-0.019 (0.042)	-0.175** (0.076)	-0.252*** (0.084)	-0.294*** (0.101)	-0.252* (0.136)
Treated · Period _{Tax Cut}	-0.014 (0.041)	0.013 (0.066)	0.093 (0.070)	0.168* (0.100)	-0.468*** (0.117)	-0.272 (0.198)	0.166 (0.191)	0.103 (0.220)
Observations	1270	1056	1038	857	1279	1082	1058	884
Market Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj.-R ²	0.476	0.330	0.234	0.172	0.492	0.495	0.326	0.137

Appendix: Costs of Illiquidity

► Price impact of illiquidity

$$\log(Rent_{ijt}) = \alpha + \beta_1 \log(Liquidity_{i,t-1}) + X'_{i,t-1} \gamma + Hedonics'_{jt} \delta + \varepsilon_{it}$$

	Trading Volume	Inventory Share	Turnover Rate	Expected Time on the Market	Duration Impact
	0.073*** (0.001)	0.041*** (0.0003)	0.047*** (0.0004)	-0.044*** (0.007)	-0.025*** (0.0002)
Hedonic Controls	Yes	Yes	Yes	Yes	Yes
Market Controls	Yes	Yes	Yes	Yes	Yes
OCC Controls	Yes	Yes	Yes	Yes	Yes
Observations	669311	669381	669381	668645	669311
Adj.-R ²	0.624	0.6429	0.6435	0.6415	0.650

Appendix: Costs of Illiquidity

- Capitalization rate: $cap_{ijt} = \frac{Rent_{ijt}}{P_{ijt}}$

$$\log(cap_{ijt}) = \alpha + \beta_1 \log(Liquidity_{i,t-1}) + X'_{i,t-1}\gamma + Hedonics'_{jt}\delta + \varepsilon_{it}$$

	Trading Volume	Inventory Share	Turnover Rate	Expected Time on the Market	Duration Impact
	0.069*** (0.002)	0.047*** (0.001)	0.056*** (0.001)	-0.045*** (0.001)	-0.027*** (0.000)
Hedonic Controls	Yes	Yes	Yes	Yes	Yes
Market Controls	Yes	Yes	Yes	Yes	Yes
OCC Controls	Yes	Yes	Yes	Yes	Yes
Observations	286175	286175	286175	286175	286175
Adj.-R ²	0.063	0.091	0.095	0.084	0.095

Appendix: Costs of Illiquidity

- ▶ Apartments for sale (offered purchase price)

$$\log(\text{price}_{ijt}) = \alpha + \beta_1 \log(\text{Liquidity}_{i,t-1}) + X'_{i,t-1} \gamma + \text{Hedonics}'_{jt} \delta + \varepsilon_{it}$$

Illiquidity Discount on Offered Purchase Prices					
	Trading Volume	Inventory Share	Turnover Rate	Expected Time on the Market	Duration Impact
	0.080*** (0.002)	0.059*** (0.001)	0.070*** (0.001)	-0.069*** (0.001)	-0.039*** (0.0004)
Observations	225785	225918	225924	225173	225785
Adj.-R ²	0.556	0.577	0.582	0.582	0.593
Hedonic Controls	Yes	Yes	Yes	Yes	Yes
Market Controls	Yes	Yes	Yes	Yes	Yes
OCC Controls	Yes	Yes	Yes	Yes	Yes

Appendix: Costs of Illiquidity

- ▶ Liquidity commonality in local markets

$$\log(\text{Duration}_{ijt}) = \alpha + \beta_1 D_{\text{Illiquid}} + X'_{i,t-1} \gamma + \text{Hedonics}'_{jt} \delta + \varepsilon_{it}$$

$D_{\text{Illiquid}} = 1$ for 25% markets with lowest liquidity
(relative to 25% markets with highest liquidity)

	Trading Volume	Inventory Share	Turnover Rate	Expected Time on the Market	Duration Impact
D_{Illiquid}	0.106*** (0.005)	0.318*** (0.005)	0.376*** (0.005)	0.397*** (0.005)	0.436*** (0.005)
log(Offer Price)	0.348*** (0.007)	0.309*** (0.007)	0.329*** (0.007)	0.397*** (0.005)	0.369*** (0.007)
Depth	-0.000*** (0.000)	0.0001*** (0.000)	0.0001*** (0.000)	0.0001*** (0.000)	0.0001*** (0.000)
Hedonic Controls	Yes	Yes	Yes	Yes	Yes
Market Controls	Yes	Yes	Yes	Yes	Yes
OCC Controls	Yes	Yes	Yes	Yes	Yes
Observations	670102	674689	668473	678832	673669
Adj.- R^2	0.062	0.069	0.073	0.077	0.079

Appendix: Hedonic Regressions (Snapshot)

	log(offer price)	log(duration)
Living surface	0.006*** (0.000)	0.002** (0.000)
Rooms	0.079*** (0.000)	0.123*** (0.002)
Minergie certificate	0.105*** (0.002)	0.195*** (0.007)
Balcony	0.027*** (0.0005)	-0.006*** (0.002)
Terrace	0.090*** (0.001)	-0.017*** (0.003)
Garden	0.033*** (0.001)	-0.067*** (0.003)
Shared apartment	-0.280*** (0.006)	0.061** (0.028)
Near nature	0.105*** (0.001)	-0.131*** (0.003)
Duplex	0.009*** (0.001)	0.044*** (0.005)
Rooftop	0.001 (0.001)	0.105*** (0.005)
Furnished	0.185*** (0.001)	0.091*** (0.005)
Wheelchair access	0.035*** (0.001)	0.107*** (0.004)
Lift	0.089*** (0.001)	0.037*** (0.002)
Seasonality	-0.001*** (0.000)	0.009*** (0.001)
Observations	1610047	1670611
Adj.-R ²	0.595	0.031