

# A Micro Analysis of the Impact of Information Asymmetry and Regulations on Equilibrium Outcomes in Rental Markets

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May 15, 2016

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  - ▶ Examine lease defaults, but the relation between regulations on lease default is ambiguous
- What kind of regulations?
  - ▶ Tenant-protection laws that increase the cost of tenant default to landlords
  - ▶ Cost-benefit trade-off

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- Tenant quality not directly observable by landlord; instead, landlord receives a signal  $s \in [0, 1]$  of tenant's quality  $\theta$  drawn from this following conditional density function (Quint, 2005)

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- $\alpha$ , the quality of the signal ( $\alpha \geq 1$ ), also measures the landlord's investment in tenant screening; as  $\alpha$  increases, the quality of the signal improves

# Landlord's Problem

$$\max_{\alpha \geq 1} \mathbb{E} [Rent(Regulations)|s] - c(\alpha) - g(\mathbf{x})$$

$\iff$

$$\max_{\alpha \geq 1} \left( \frac{(1-\delta)s^{\alpha-1}}{(1-\delta)s^{\alpha-1} + \delta(1-s)^{\alpha-1}} \right) \cdot Rent(Regulations) - c(\alpha) - g(\mathbf{x})$$

• Where,

- ▶  $c(\alpha)$ , total cost of investment in screening
- ▶  $g(\mathbf{x})$ , rental cost due to a vector  $\mathbf{x}$  of variables

$$Rent(Reg.) = c'(\alpha) \left[ \frac{(1-\delta)^2 s^{2\alpha-2} + 2\delta(1-\delta)[s(1-s)]^{\alpha-1} + \delta^2(1-s)^{2\alpha-2}}{\delta(1-\delta)\ln(s)[s(1-s)]^{\alpha-1} - \delta(1-\delta)\ln(1-s)[s(1-s)]^{\alpha-1}} \right].$$

# Rent and Cost Functions

- Rent assumed strictly increasing and concave function of regulations described by this reduced-form relationship

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$$c(\alpha) = (\alpha - 1)^2$$

- Results are unchanged when we use log for the rent equation or exponential for total screening costs

# Regulations and Tenant Screening

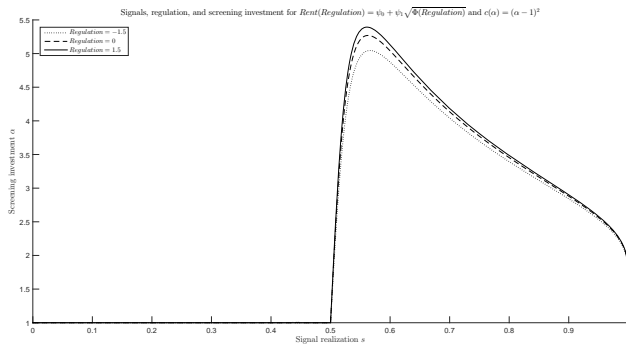


Figure: Regulation and Screening for  $\delta = 0.1$

# Regulations and Tenant Screening

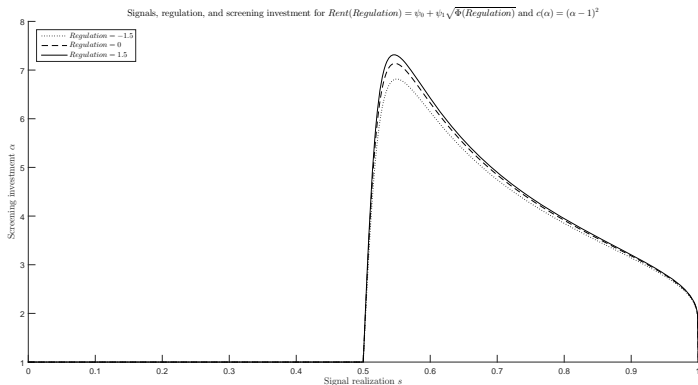


Figure: Regulation and Screening for  $\delta = 0.2$

# Regulations and Tenant Screening

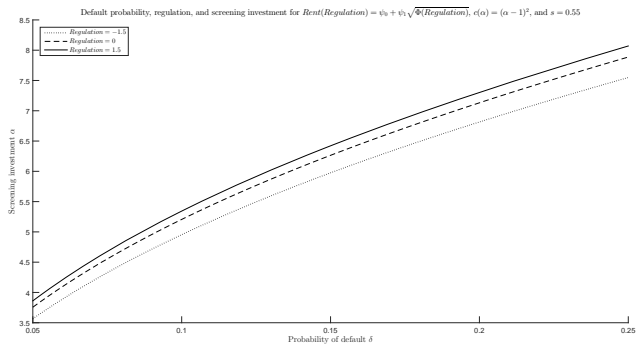


Figure: Screening as a function of probability of default for  $s = 0.55$

# Methodology

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$$\begin{aligned} Rent_{i,t} = & \alpha_R + \beta_R Reg + \zeta_R Def_t + \psi_R (Def_t \times Reg) + \gamma_R Rent_t \\ & + \delta_R X_{,t} + \phi_R Z_t + msa + y_t + \xi_{i,t} \end{aligned} \quad (1)$$

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$$\begin{aligned} Def_{i,t} = & \alpha_D + \beta_D \cdot Reg + \gamma_D Rent_t + \delta_D X_{i,t} + \phi_D Z_t \\ & + msa + y_t + \eta_{i,t} \end{aligned} \quad (2)$$

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- Develop ordinal scores for each regulation and aggregate scores into an index

# Descriptive Statistics: Regulations

<b>Regulation Scores</b>	<i>Obs.</i>	<i>Mean</i>	<i>SD.</i>	<i>Min.</i>	<i>Median</i>	<i>Max</i>
Security Deposit Return	41	2.56	0.84	0	3	3
Termination for Lease Violation	41	1.15	1.06	0	1	3
Right to Withhold Rent	41	0.83	0.38	0	1	1
Small-Claims Court Limit	41	1.95	1.16	0	2	3
Regulation Index	41	8.15	2.38	3	8	12
Regulation Index (standardized)	41	0.00	1.00	-2.16	-0.06	1.62

# Regulation Index

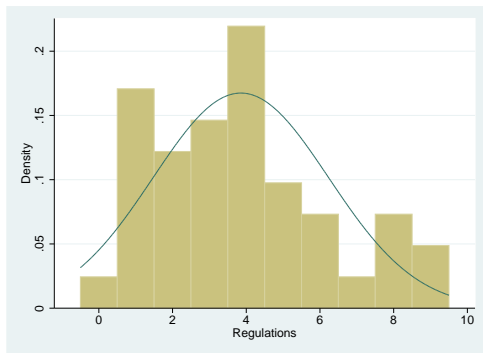


Figure: Raw and standardized regulation index values

# Rent Data

- Data source: Experian RentBureau
- Residential lease performance database from 2000 to 2009
- National database containing millions of records
  - ▶ But limited geographic coverage in the early years
- Sample selection:
  - ▶ Leases with rent between \$250 and \$5,000
  - ▶ MSAs with at least 30 leases in any given year
  - ▶ 1.75 million leases, 2,600 properties, 200 MSAs, and 41 states

# Descriptive Statistics

	<i>2000</i>	<i>2003</i>	<i>2006</i>	<i>2009</i>	<b>Total</b>
Monthly Rent	\$711	\$738	\$917	\$1,004	\$939
N. of Leases	15,343	62,527	206,321	531,563	1,749,981
N. of Properties	477	1063	1986	1957	2601
Avg. Property Size (units)	32	59	104	272	101
N. of MSAs	104	139	169	176	200
Avg. N. Leases / MSA	148	450	1,221	3,020	1,039
Avg. N. of Properties / MSA	5	8	12	11	9
N. of States	30	37	40	40	41
Avg. N. Leases / State	511	1,690	5,158	13,289	4,385
Avg. N. Properties / State	16	29	50	49	36

# Descriptive Statistics: Rent and Lease Default

	<i>Obs.</i>	<i>Mean</i>	<i>SD.</i>	<i>Min.</i>	<i>Median</i>	<i>Max.</i>
<b>Lease-Level</b>						
Monthly Rent	1,749,981	\$939	\$455	\$250	\$800	\$5,000
6-Month Default	1,749,981	0.11	0.31	0	0	1
12-Month Default	1,749,981	0.17	0.38	0	0	1
24 -Month Default	1,749,981	0.23	0.42	0	0	1
<b>Property Level</b>						
6-Month Avg. Default	10,232	0.03	0.04	0	0.02	1
12-Month Avg. Default	10,232	0.03	0.04	0	0.02	1
24-Month Avg. Default	10,232	0.04	0.04	0	0.02	1
<b>MSA Level</b>						
6-Month Avg. Default	1,117	0.02	0.02	0	0.02	0.16
12-Month Avg. Default	1,117	0.03	0.02	0	0.02	0.16
24-Month Avg. Default	1,117	0.03	0.02	0	0.03	0.18

# Main Results: Lease-Level Rent Estimation

<i>Dep. Var.: Log Rent</i>	(1)	(2)	(3)	(4)	(5)	(6)
Regulations	0.0029*** (0.0011)	0.0162*** (0.0013)	0.0029*** (0.0011)	0.0147*** (0.0013)	0.0058*** (0.0010)	0.0077*** (0.0011)
Default (12-mo Forecast)	-0.2403*** (0.0318)	-1.2679*** (0.0612)				
Default (Forecast) × LR		1.3944*** (0.0710)				
Default (12-mo MA)			-0.3917*** (0.0337)	-1.2776*** (0.0636)		
Default (12-mo MA) × LR				1.2386*** (0.0743)		
Default (Mo. Av.)					-0.0709*** (0.0118)	-0.2231*** (0.0234)
Default (Mo. Avg.) × LR						0.2119*** (0.0271)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Lease Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
MSA F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,666,477	1,666,477	1,647,046	1,647,046	1,710,445	1,710,445
Adjusted $R^2$	0.520	0.520	0.520	0.520	0.524	0.524

# Main Results: Property-Level Rent Estimation

<i>Dep. Var.: Log Avg. Rent</i>	(1)	(2)	(3)	(4)	(5)	(6)
Regulations	0.0196*** (0.0031)	0.0197*** (0.0033)	0.0196*** (0.0033)	0.0195*** (0.0032)	0.0146*** (0.0036)	0.0165*** (0.0035)
MSA Default (12-mo Forecast)		-0.4095*** (0.0941)				
MSA Default (12-mo MA)			-0.4624*** (0.1043)			
MSA Default (Mo. Avg)				-0.0637** (0.0294)		
Prop. Default (12-mo MA)					-0.6731*** (0.0360)	
Prop. Default (Mo. Avg.)						-0.2925*** (0.0255)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Lease Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
MSA F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Observations	114,668	105,168	103,250	109,051	76,366	80,243
Adjusted $R^2$	0.542	0.534	0.533	0.539	0.579	0.575



# Main Results: Lease-Level Default Estimation

	(1) 12-mo. Default	(2) 6-mo. Default	(3) 24-mo. Default	(4) 13-24 mo. Default
Regulations	-0.0062*** (0.0022)	-0.0050*** (0.0018)	-0.0087*** (0.0024)	-0.0016 (0.0015)
Inflation	0.0056*** (0.0008)	0.0036*** (0.0007)	0.0094*** (0.0009)	0.0050*** (0.0006)
FMR (MSA)	0.0001*** (0.0000)	0.0001*** (0.0000)	0.0001*** (0.0000)	0.0000*** (0.0000)
Rent (Property)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0002*** (0.0000)	-0.0001*** (0.0000)
Income (MSA)	0.0000*** (0.0000)	0.0000*** (0.0000)	0.0000*** (0.0000)	-0.0000* (0.0000)
Unemployment (MSA)	-0.2162* (0.1139)	-0.2663*** (0.0923)	-0.2774** (0.1248)	0.2552*** (0.0817)
Vacancy Rate (Property)	0.1728*** (0.0056)	0.1262*** (0.0058)	0.1004*** (0.0041)	-0.0955*** (0.0057)
Vacancy Rate (State)	0.3348*** (0.0320)	0.2784*** (0.0268)	0.3900*** (0.0350)	0.1210*** (0.0232)
HOI (MSA)	0.0004*** (0.0001)	0.0001** (0.0000)	0.0005*** (0.0001)	-0.0001** (0.0000)
Growth Rental Supply (State)	0.0163*** (0.0025)	0.0124*** (0.0020)	0.0181*** (0.0027)	0.0012 (0.0017)
Lease Year F.E.	Yes	Yes	Yes	Yes
MSA F.E.	Yes	Yes	Yes	Yes
<i>Observations</i>	1,148,676	1,148,588	1,148,676	1,146,945
<i>Wald <math>\chi^2</math></i>	39,104	18,367	59,697	27,245

# Main Results: Property-Level Default Estimation

	(1)	(2)	(3)	(4)
	12-mo. Default	12-mo. Default	6-mo. Default	6-mo. Default
Regulations	-0.0031*** (0.0009)	-0.0039*** (0.0014)	-0.0029*** (0.0009)	-0.0042*** (0.0014)
Rent (Property) to Income	-0.6966*** (0.0661)	-0.8375*** (0.0952)	-0.6057*** (0.0655)	-0.7008*** (0.0930)
FMR to Income (MSA)	0.0971 (0.2940)	0.3458 (0.4601)	0.2469 (0.2929)	0.5176 (0.4471)
Inflation (Region)		0.0013* (0.0007)		0.0015** (0.0007)
Unemployment (MSA)		-0.0915 (0.1368)		-0.2039 (0.1420)
Vacancy Rate (State)		0.0245 (0.0370)		0.0299 (0.0368)
HOI (MSA)		-0.0001* (0.0001)		-0.0001 (0.0001)
Growth Rental Supply (State)		0.0000 (0.0031)		-0.0005 (0.0031)
Constant	0.0334*** (0.0070)	-0.1690* (0.1024)	0.0341*** (0.0069)	-0.2073** (0.1054)
Lease Year F.E.	Yes	Yes	Yes	Yes
MSA F.E.	Yes	Yes	Yes	Yes
Observations	9,444	6,513	9,444	6,513
Adjusted $R^2$	0.107	0.092	0.086	0.074

# Joint Rent-Default Estimation

<b>Panel A</b> <i>Dep. Variable:</i>	(1) <i>Log Rent</i>	(2) <i>Log Rent</i>	(3) <i>Log Rent</i>
Regulations	0.0219*** (0.0011)	0.0222*** (0.0011)	0.0239*** (0.0010)
MSA Default (12-mo Forecast)	-0.2789*** (0.0318)		
MSA Default (12-mo MA)		-0.4323*** (0.0338)	
MSA Default ( Mo. Avg.)			-0.0962*** (0.0119)
Control Variables	Yes	Yes	Yes
<b>Panel B</b> <i>Dep. Variable:</i>	<i>12-mo. Default</i>	<i>12-mo. Default</i>	<i>12-mo. Default</i>
Regulations	-0.0088*** (0.0020)	-0.0088*** (0.0020)	-0.0088*** (0.0020)
FMR (MSA)	0.0001*** (0.0000)	0.0001*** (0.0000)	0.0001*** (0.0000)
Rent (Property)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0001*** (0.0000)
Control Variables	Yes	Yes	Yes
Lease Year F.E.	Yes	Yes	Yes
MSA F.E.	Yes	Yes	Yes
Covar. Log Rent - 12-mo. Default	0.0006*** (0.0001)	0.0005*** (0.0001)	0.0005*** (0.0001)
Observations	1692576	1682713	1716328

# IV: 2001 State Legislature

## Rent Estimation

<i>Dep. Variable: Log Rent</i>	<i>OLS</i>	<i>2SLS</i>	<i>2SLS</i>
Regulations	0.0219*** (0.0011)	0.0372*** (0.0026)	0.0372*** (0.0026)
MSA Default (12-mo Forecast)	-0.2767*** (0.0318)	-0.2851*** (0.0319)	
MSA Default (12-mo MA)			-0.4380*** (0.0338)
FMR to Income (MSA)	6.8506*** (0.2055)	6.7673*** (0.2061)	6.2502*** (0.2078)
Inflation (Region)	0.0167*** (0.0004)	0.0165*** (0.0004)	0.0170*** (0.0004)
Unemployment (MSA)	-2.8264*** (0.0560)	-2.7226*** (0.0584)	-2.6994*** (0.0590)
Vacancy Rate (State)	-0.2109*** (0.0215)	-0.1794*** (0.0219)	-0.1562*** (0.0223)
Growth Renter Demand (State)	1.2416*** (0.0563)	1.2057*** (0.0567)	1.2003*** (0.0580)
Growth Rental Supply (State)	-0.0204*** (0.0014)	-0.0148*** (0.0017)	-0.0135*** (0.0017)
Constant	3.7936*** (0.0644)	3.7717*** (0.0648)	3.6847*** (0.0655)
Lease Year F.E.	Yes	Yes	Yes
MSA F.E.	Yes	Yes	Yes
Observations	1,663,592	1,659,088	1,639,790
$R^2$	0.515	0.515	0.515

# IV: 2001 State Legislature

## Default Estimation

<i>Dep. Variable: 12-mo. Default</i>	<i>OLS</i>	<i>2SLS</i>	<i>Probit</i>	<i>IV Probit</i>
Regulations	-0.0088*** (0.0020)	-0.0068*** (0.0021)	-0.0254*** (0.0089)	-0.0177* (0.0095)
FMR (MSA)	0.0001*** (0.0000)	0.0001*** (0.0000)	0.0004*** (0.0000)	0.0004*** (0.0000)
Income (MSA)	0.0000*** (0.0000)	0.0000*** (0.0000)	0.0000*** (0.0000)	0.0000*** (0.0000)
Rent (Property)	-0.0001*** (0.0000)	-0.0001*** (0.0000)	-0.0006*** (0.0000)	-0.0006*** (0.0000)
Inflation	0.0033*** (0.0007)	0.0032*** (0.0007)	0.0230*** (0.0029)	0.0227*** (0.0029)
Unemployment (MSA)	-0.5544*** (0.1169)	-0.5340*** (0.1171)	-0.8798* (0.4654)	-0.8046* (0.4667)
Vacancy Rate (Property)	0.1962*** (0.0036)	0.1963*** (0.0036)	0.7032*** (0.0130)	0.7034*** (0.0130)
Vacancy Rate (State)	0.1582*** (0.0310)	0.1611*** (0.0310)	1.3624*** (0.1304)	1.3721*** (0.1304)
HOI (MSA)	0.0006*** (0.0000)	0.0006*** (0.0000)	0.0015*** (0.0002)	0.0015*** (0.0002)
Growty Rental Supply (State)	0.0110*** (0.0026)	0.0117*** (0.0026)	0.0662*** (0.0102)	0.0690*** (0.0103)
Lease Year F.E.	Yes	Yes	Yes	Yes
MSA F.E.	Yes	Yes	Yes	Yes
Observations	1,148,680	1,148,680	1,148,676	1,148,676
Adjusted $R^2$ / Wald $\chi^2$	0.039	0.039	39,105	3,095

# Using 2000 MSAs

	(1)	(2)	(3)	(4)
	<i>Log Rent</i>	<i>Log Rent</i>	<i>6-mo. Default</i>	<i>12-mo. Default</i>
Regulations	0.0090*** (0.0011)	0.0239*** (0.0013)	-0.0052*** (0.0018)	-0.0061*** (0.0022)
Default (12-Mo. Forecast MSA)	-0.2080*** (0.0346)	-1.3227*** (0.0655)		
Default (12-Mo. Forecast MSA) x LR		1.5298*** (0.0766)		
FMR (MSA)			0.0001*** (0.0000)	0.0001*** (0.0000)
FMR to Income (MSA)	9.0671*** (0.2193)	8.5686*** (0.2209)		
Rent (Property)			-0.0001*** (0.0000)	-0.0001*** (0.0000)
Control Variables	Yes	Yes	Yes	Yes
Lease Year F.E.	Yes	Yes	Yes	Yes
MSA F.E.	Yes	Yes	Yes	Yes
Observations	1,543,475	1,543,475	1,069,438	1,069,438
Adjusted $R^2$ / Wald $\chi^2$	0.518	0.518	17,117	36,114

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- But an alternative view is that rent decreases with size because of scale economies in management and administrative costs
- Cannot identify landlord size in our data

# Landlord Size and Rent

<i>Dep. Var.: Log Rent</i>	<i>(1)</i>	<i>(2)</i>
Regulations	0.0193*** (0.0011)	0.0373*** (0.0011)
Property Size Dummy	0.0724*** (0.0006)	0.0607*** (0.0006)
Property Size Dummy × Regulations		-0.0243*** (0.0005)
MSA Lease Default (12-mo Forecast)	-0.1621*** (0.0317)	-0.1264*** (0.0317)
FMR to Income (MSA)	6.9988*** (0.2038)	7.0011*** (0.2039)
Control Variables	Yes	Yes
Lease Year F.E.	Yes	Yes
MSA F.E.	Yes	Yes
Observations	1,663,592	1,663,592
$R^2$	0.519	0.520

# Effect of Landlord Size on Screening

<i>Dep. Var.: 12-mo. Default</i>	(1)	(2)
Regulations	-0.0075*** (0.0020)	-0.0148*** (0.0021)
Property Size Dummy	-0.0142*** (0.0010)	-0.0094*** (0.0010)
Property Size Dummy x Regulations		0.0097*** (0.0009)
FMR (MSA)	0.0001*** (0.0000)	0.0001*** (0.0000)
Income (MSA)	0.0000*** (0.0000)	0.0000*** (0.0000)
Rent (Property)	-0.0001*** (0.0000)	-0.0001*** (0.0000)
Control Variables	Yes	Yes
Lease Year F.E.	Yes	Yes
MSA F.E.	Yes	Yes
Observations	1,148,680	1,148,680
$R^2$	0.039	0.039

# Conclusions

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- 1 Using micro-level lease performance data, we confirm the pricing of regulations into rent
- 2 More importantly, we present strong evidence that stricter regulations are likely to increase screening of lease applicants by landlords
- 3 This increased screening by landlords may lower the supply of rental units in the long run, negatively affecting the intended beneficiaries of the regulations in the first place.