House Prices, Collateral and Self-Employment

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Motivation

- Role of collateral for easing credit constraints and for economic growth.
  - Hart and Moore (1998); Kiyotaki and Moore (1997); Bernanke, Gertler and Gilchrist (1999); Rampini and Viswanathan (2010).
  - Small firms are especially sensitive to fluctuations in access to financing (e.g. Gertler and Gilchrist, 1992).

- Financial constraints and small business creation (Gentry and Hubbard, 2004; Hurst and Lusardi, 2004; Cagetti and De Nardi, 2006).

- Few settings where we can identify pure shocks to the value of collateral that are uncorrelated with investment opportunities.

Motivation (cont.)

- Ongoing debate about the channels that drove employment dynamics over the last decade.

- Currently two main hypotheses:
  - Aggregate demand induced by home equity based borrowing (Romer, 2011, Mian and Sufi, 2011)

  - Longer term structural unemployment was "masked" by boom in the construction industries, which created demand for construction labor (Kocherlakota, 2010; Charles, Hurst and Notowidigdo, 2012)

This paper

- Increase in house prices between 2002 to 2007 reduced credit constraints on homeowners and dampened unemployment rate
  - Allowed people to start very small businesses
  - Effect is stronger in industries with below median capital needs

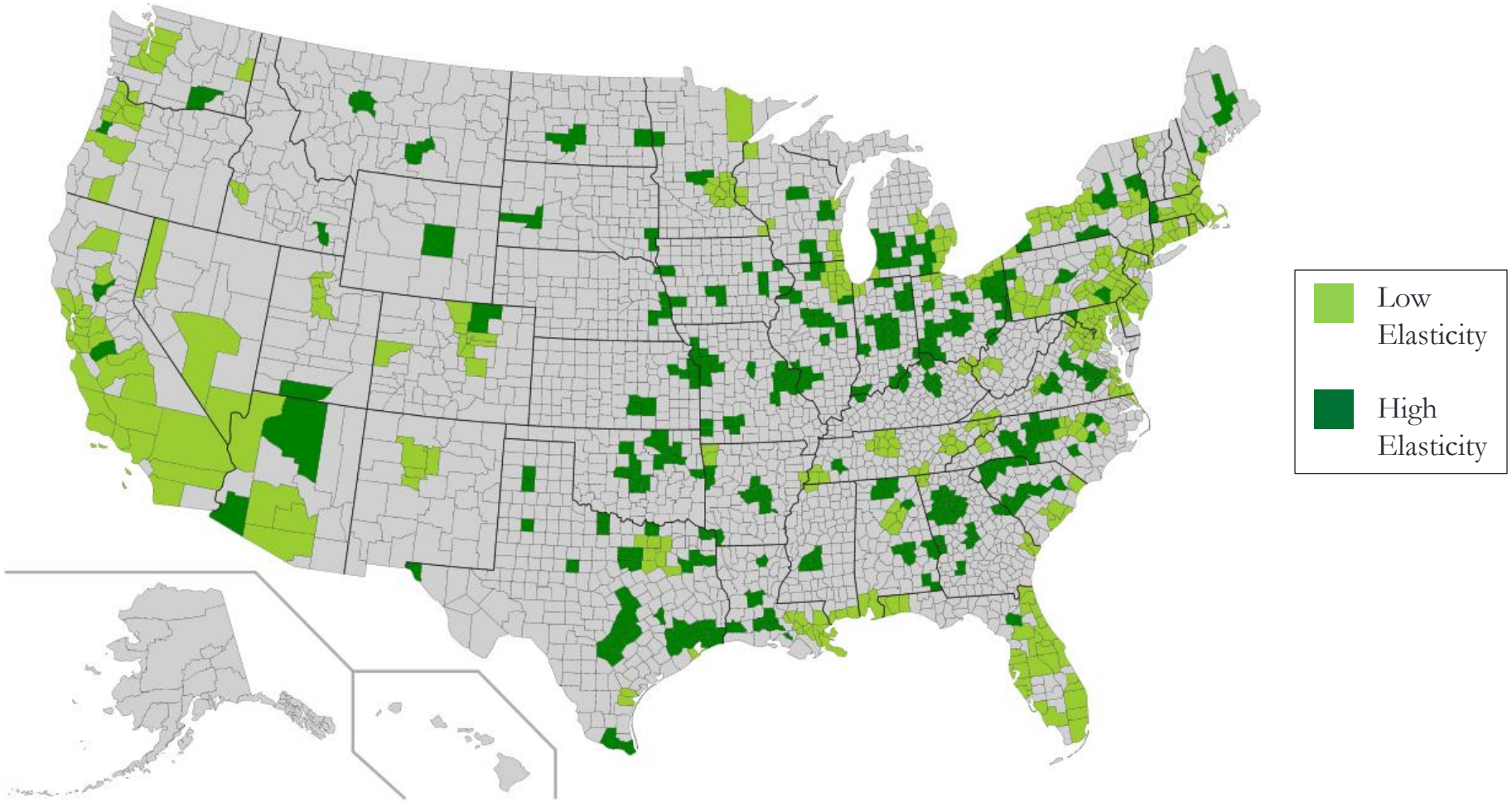
- This mechanism is distinct from the
  - "Aggregate demand" effect – not driven by non-tradable industries
  - Construction industry specific labor demand

Identification

- Main concern is that common unobserved factors could be driving up real estate prices and new firm starts
  - Expectations about income growth, regional investment opportunities, reverse causality.

- Instrument for exogenous shock to house prices with the Saiz (2010) elasticity measure as an instrument for house prices.
  - In low elasticity areas increases in demand for housing translates into higher prices, in high elasticity areas the main effect is on volume / new construction
  - Used also in Mian and Sufi (2010, 2011), Charles et al (2012), Chaney, Sraer and Thesmar (2011), Cvijanovic (2012) and Kleiner (2013).

County Elasticity of Housing Supply



Identification (cont.)

- Use ex ante distribution of establishment sizes
  - Smaller firms should be more affected under collateral channel, since they are more likely to be constrained and to have limited alternative sources of financing

- But… shock to house prices could affect local demand and smaller establishments may be more sensitive to local demand shocks (Kashyap and Stein, 1994)
  - Heterogeneity of required start up capital
    - Effect should be more pronounced at the low end of distribution
  - Compare across industries:
    - Exclude non-tradable, limit to manufacturing.
    - Within manufacturing, distinguish by amount of capital and by distance shipped.

Data Sources

- Census County Business Patterns:
  - County level establishments by size category and industry level (4-digit NAICS).
  - Size categories are: 1-4 employees, 5-9, 10-19, 20-49, 50-99, 100-249, …
  - We aggregate all establishments above 50 employees into one category.
- House prices at the MSA level from FHFA
  - Elasticity measure from Albert Saiz's website (MSA level).
- Capital needed to start a firm from Survey of Business Owners Public Use Microdata Sample at 2-digit NAICS level.
  - Question: "Amount of start-up or acquisition capital"
- Distance shipped by industry and state from 2007 Commodity Flow Survey
- Births and Deaths of Establishments from the Survey of US Businesses
  - No Establishment size data, industries at the 2-digit level.

Summary Statistics

	All Counties	High Elasticity	Low Elasticity
Total Employment (2002)	113,918	69,057	157,523
	45,454	*33,228*	*63,286*
	(238,831)	(129,569)	(304,041)
Unemployment Rate (2002, percent)	5.4	5.3	5.4
	5.3	*5.2*	*5.4*
	(1.5)	(1.5)	(1.4)
Growth in Total Employment (02-07, percent)	10.6	10.2	11.0
	8.2	*7.5*	*8.9*
	(15.8)	(16.9)	(14.5)
Growth in DTI (02-07, percent)	51.8	36.6	66.3
	42.6	*34.9*	*58.3*
	(36.4)	(23.0)	(40.7)
Growth in Income (02-07, percent)	27.6	27.2	28.0
	23.9	*23.0*	*24.5*
	(21.1)	(24.2)	(17.6)
Growth in House Prices (02-07, percent)	33.9	23.5	43.7
	26.8	*19.4*	*40.9*
	(21.1)	(14.3)	(21.9)
Number of Counties	775	382	393

Empirical Methodology

$$\Delta^{02-07} Employment_{ijz} = \alpha + \beta_1 \Delta HP_j^{02-07} + \beta_2 1_i + \beta_3 1_i \Delta HP_j^{02-07} + \gamma X_j + 1_z + \varepsilon_{i,j}$$

- Establishment Size indexed by *i*, county by *j* and industry by *z*.

- Industry FE address the possibility that the mix of industries affected by the shock is correlated with average establishment size.

All Industries

	First Stage	All Industries (WLS)	All Industries (IV)		
	(1)	(2)	(3)	(4)	(5)
Housing Supply Elasticity	-0.09***				
	(0.02)				
Growth in House Prices		0.19***	0.05	-0.06	0.02
		(0.04)	(0.06)	(0.10)	(0.03)
Growth in House Prices * 1-4 Employees		0.03	0.20***	0.26**	0.16***
		(0.03)	(0.05)	(0.09)	(0.05)
Growth in House Prices * 5-9 Employees		-0.02	0.08**	0.17	0.00
		(0.03)	(0.04)	(0.10)	(0.04)
Growth in House Prices * 10-19 Employees		-0.02	0.01	0.06	-0.05
		(0.02)	(0.04)	(0.09)	(0.04)
Growth in House Prices * 20-49 Employees		0.01	0.00	0.07	-0.07**
		(0.02)	(0.04)	(0.07)	(0.03)
Log of the Population	0.00	-0.02***	-0.02***	-0.04***	
	(0.03)	(0.01)	(0.01)	(0.01)	
Percent College Educated	0.00	0.00**	0.00**	0.00	
	(0.00)	(0.00)	(0.00)	(0.00)	
Percent Employed (2000 Census)	-0.01***	0.00	0.00	0.00	
	(0.00)	(0.00)	(0.00)	(0.00)	
Workforce as a Percentage of Population	-0.69	-1.09***	-1.11***	-0.86***	
	(0.63)	(0.19)	(0.19)	(0.22)	
Percent of Homes Owner-occupied	0.00	0.00**	0.00**	0.00	
	(0.00)	(0.00)	(0.00)	(0.00)	
China Import Share in County (2005)	0.10	0.09	0.12	-0.08	
	(0.91)	(0.23)	(0.23)	(0.32)	
4-Digit Industry Fixed Effects	-	-	-	Y	-
County Fixed Effects	-	-	-	-	Y
Number of Observations	731	3,653	3,653	373,576	21,962
R2	0.30	0.27	0.22	0.30	0.02

Amount of Start-up capital

	Start-up Capital < P50 (IV)			Start-up Capital > P50 (IV)		
	(6)	(7)	(8)	(9)	(10)	(11)
Housing Supply Elasticity						
Growth in House Prices	-0.01	-0.04	-0.11***	0.06	-0.07	0.10**
	(0.07)	(0.13)	(0.04)	(0.07)	(0.10)	(0.04)
Growth in House Prices * 1-4 Employees	0.33***	0.32**	0.31***	0.14**	0.18**	0.10*
	(0.07)	(0.12)	(0.06)	(0.06)	(0.09)	(0.06)
Growth in House Prices * 5-9 Employees	0.19***	0.14	0.17***	0.04	0.19**	-0.10*
	(0.05)	(0.15)	(0.05)	(0.06)	(0.08)	(0.05)
Growth in House Prices * 10-19 Employees	0.14***	0.02	0.10*	-0.07	0.09	-0.12**
	(0.05)	(0.12)	(0.05)	(0.06)	(0.09)	(0.05)
Growth in House Prices * 20-49 Employees	0.13***	0.10	0.06	-0.07	0.02	-0.14***
	(0.05)	(0.10)	(0.05)	(0.05)	(0.08)	(0.04)
4-Digit Industry Fixed Effects	-	Y	-	-	Y	-
County Fixed Effects	-	-	Y	-	-	Y
Number of Observations	3,653	196,027	21,954	3,651	177,549	21,949
R2	0.21	0.39	0.00	0.14	0.10	0.03

Exclude Non-Tradables, Restrict to Manufacturing

	Drop Construction	Drop Const. and Non-Trad.	Drop Const., Non-Trad. and F.I.R.E.	Manufacturing	Manufacturing (Tradable)
Growth in House Prices	-0.09	-0.12	-0.14	-0.17	-0.16
	(0.10)	(0.10)	(0.10)	(0.11)	(0.12)
Growth in House Prices * 1-4 Employees	0.27***	0.32***	0.35***	0.13*	0.15*
	(0.09)	(0.09)	(0.10)	(0.07)	(0.09)
Growth in House Prices * 5-9 Employees	0.19*	0.21*	0.24**	0.12	0.10
	(0.10)	(0.11)	(0.11)	(0.08)	(0.09)
Growth in House Prices * 10-19 Employees	0.08	0.12	0.12	0.11	0.16
	(0.09)	(0.09)	(0.09)	(0.11)	(0.11)
Growth in House Prices * 20-49 Employees	0.08	0.12*	0.11*	0.01	-0.05
	(0.06)	(0.06)	(0.06)	(0.12)	(0.09)
Controls	Y	Y	Y	Y	Y
4-Digit Industry Fixed Effects	Y	Y	Y	Y	Y
Number of Observations	325,349	264,901	242,510	55,345	44,649
R2	0.29	0.30	0.31	0.02	0.02
Growth HP * 1-4 E. = Growth HP * 5-9 E.	0.04**	0.02**	0.02**	0.95	0.48
Growth HP * 1-4 E. = Growth HP * 10-19 E.	0.00***	0.00***	0.00***	0.85	0.91
Growth HP * 1-4 E. = Growth HP * 20-49 E.	0.00***	0.00***	0.00***	0.33	0.10*

Summary Stats, Distance Shipped

	Industry × State	*Industry*
Average	630.2	651.7
Std. Dev.	368.4	218.3
Percentiles:		
1%	25.0	168.9
25%	378.1	559.3
50%	600.8	620.4
75%	817.7	831.7
99%	1,789.2	1,021.3
Number of Observations	950	21

Subgroups of Manufacturing Industries

	Manufacturing, Low Dep. Ext. Fin.	Manufacturing, High Dep. Ext. Fin.	Manufacturing, Short Distance Shipped <P50	Manufacturing, Long Distance Shipped >P50
Growth in House Prices	-0.24**	-0.09	-0.11	-0.29**
	(0.12)	(0.13)	(0.17)	(0.14)
Growth in House Prices * 1-4 Employees	0.22*	0.04	0.07	0.21**
	(0.13)	(0.13)	(0.14)	(0.09)
Growth in House Prices * 5-9 Employees	0.25**	0.01	0.11	0.20**
	(0.13)	(0.11)	(0.17)	(0.09)
Growth in House Prices * 10-19 Employees	0.10	0.05	-0.03	0.24**
	(0.12)	(0.14)	(0.17)	(0.11)
Growth in House Prices * 20-49 Employees	0.22	-0.15	0.06	0.04
	(0.22)	(0.11)	(0.30)	(0.12)
Controls	Y	Y	Y	Y
4-Digit Industry Fixed Effects	Y	Y	Y	Y
Number of Observations	19,027	34,675	27,599	27,294
R2	0.02	0.02	0.02	0.02

Magnitude of the effect

- First, calculate the "aggregate demand" effect as in Mian and Sufi (2011).
  - Compute effect for non-tradable industries, aggregate for all industries
  - Effect is ~2.5M jobs created, or about 40% of all jobs created in the 660 counties.

- Use the effect for manufacturing industries as the baseline specification
  - Coefficient of all small firms *relative* to large firms
  - Effect is responsible for 1.7M jobs, or 28% of net job creation in the 660 counties.

Establishment Births and Deaths

	Births of Est.		Deaths of Est.		Net Creation of Est.	
	(1)	(2)	(3)	(4)	(5)	(6)
Growth in House Prices	0.46***	0.46***	0.31***	0.28***	0.16**	0.18***
	(0.12)	(0.12)	(0.07)	(0.08)	(0.06)	(0.06)
Log of the Population	-0.01	-0.01	0.00	0.01	-0.01*	-0.02***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
Percent College Educated	0.01*	0.00	0.00*	0.00	0.00*	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Percent Employed (2000 Census)	0.00	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Workforce as a Percentage of Population	-2.34***	-1.78**	-1.06**	-0.65	-1.28***	-1.13***
	(0.67)	(0.79)	(0.40)	(0.49)	(0.29)	(0.33)
Percent of Homes Owner-occupied	0.00*	0.00*	0.00	0.00	0.00**	0.00**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
China Import Share in County (2005)	-0.62	-0.45	-0.46	-0.60	-0.16	0.16
	(0.57)	(0.67)	(0.35)	(0.40)	(0.29)	(0.35)
2-Digit NAICS Fixed Effects	-	Y	-	Y	-	Y
Number of Observations	731	13,482	731	13,482	731	13,482
R2	0.29	0.20	0.21	0.22	0.31	0.16

Proprietorships

	BEA Data	Census Data	Start-up Capital < P50 (Census)	Start-up Capital > P50 (Census)
Growth in House Prices	0.02	0.03	-0.04	0.05
	(0.06)	(0.06)	(0.07)	(0.07)
Growth in House Prices * Proprietorships	0.14**	0.06	0.12*	0.07
	(0.07)	(0.06)	(0.06)	(0.08)
Growth in House Prices * 1-4 Employees	0.20***	0.20***	0.33***	0.13**
	(0.05)	(0.05)	(0.07)	(0.06)
Growth in House Prices * 5-9 Employees	0.08**	0.08**	0.19***	0.04
	(0.04)	(0.04)	(0.05)	(0.06)
Growth in House Prices * 10-19 Employees	0.01	0.01	0.14***	-0.07
	(0.04)	(0.04)	(0.05)	(0.06)
Growth in House Prices * 20-49 Employees	0.00	0.00	0.13***	-0.07
	(0.04)	(0.04)	(0.05)	(0.05)
Controls	Y	Y	Y	Y
Number of Observations	4,381	4,384	4,384	4,382
R2	0.48	0.38	0.31	0.28

Denial Rates

- Higher house prices could make banks more "lax" on all their lending, including small business lending
- Consider denial rates of mortgages for home purchase in this period
  - Are banks approving a higher percentage of loans in low elasticity areas?

	Low Elasticity	High Elasticity	Difference
Denial Rate (2002)	0.10	0.13	
Change in Denial Rate (02-07)	0.01	-0.01	0.026***
	(0.05)	(0.05)	
Number of applications (2002)	10,807	4,329	
Applications per Household (2002)	0.08	0.07	
Change in Volume (02-07)	-0.02	0.07	.-0.095***
	(0.26)	(0.21)	
Number of Counties	394	382	

Denial Rates

	Denial Rates		Volume	
Elasticity	-0.026***	-0.016***	0.072***	0.058***
	(0.004)	(0.003)	(0.024)	(0.016)
Log of the Population		0.014***		-0.065**
		(0.003)		(0.029)
Percent College Educated		-0.001**		0.002
		(0.000)		(0.002)
Percent Employed (2000 Census)		-0.001		-0.002
		(0.001)		(0.003)
Workforce as a Percentage of Population		-0.199**		-0.460
		(0.090)		(0.645)
Percent of Homes Owner-occupied		-0.001*		-0.007***
		(0.000)		(0.002)
China Import Share in County (2005)		-0.339***		-0.010
		(0.102)		(0.974)
Number of Observations	776	774	776	774
R2	0.30	0.49	0.10	0.19

Employment, Unemployment and Migration

	Total Employment	Unemp.	Unemp. Rate	Net Migration	Inflows	Outflows
Growth in House Prices	0.09	-0.20	-1.29**	-0.16	0.19	0.34**
	(0.06)	(0.14)	(0.66)	(0.12)	(0.12)	(0.17)
Log of the Population	-0.02***	-0.01	0.03	0.00	-0.07***	-0.07***
	(0.01)	(0.02)	(0.10)	(0.01)	(0.01)	(0.01)
Percent College Educated	0.00**	-0.01***	-0.03***	0.00	0.01***	0.00***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
Percent Employed (2000 Census)	0.00	0.00	0.04**	0.00	0.00	0.00
	(0.00)	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)
Workforce as a Percentage of Populatior	-1.15***	-0.13	3.94	-0.01	-0.63*	-0.62**
	(0.23)	(0.52)	(2.67)	(0.19)	(0.34)	(0.26)
Percent of Homes Owner-occupied	0.00**	0.00***	0.03***	0.00**	0.00***	-0.01***
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
China Import Share in County (2005)	-0.23	-0.60	-4.76	0.19	-1.08***	-1.27***
	(0.28)	(0.64)	(3.65)	(0.29)	(0.28)	(0.44)
Number of Observations	731	721	721	731	731	731
R2	0.24	0.26	0.33		0.41	0.18

Effect on Non-Tradable Industries

	Non-Tradable Industries
Growth in House Prices	0.21*
	(0.12)
Growth in House Prices * 1-4 Employees	-0.12
	(0.11)
Growth in House Prices * 5-9 Employees	-0.12
	(0.11)
Growth in House Prices * 10-19 Employees	-0.25*
	(0.14)
Growth in House Prices * 20-49 Employees	-0.22*
	(0.12)
Controls	Y
4-Digit Industry Fixed Effects	Y
Number of Observations	60,448
R2	0.07
Growth HP * 1-4 E. = Growth HP * 5-9 E.	0.95
Growth HP * 1-4 E. = Growth HP * 10-19 E.	0.10*
Growth HP * 1-4 E. = Growth HP * 20-49 E.	0.20

Conclusion

- Employment at very small establishments responded strongly to the increase in house prices between 2002 and 2007.
  - Large firms do not experience a similar effect.
  - Results are stronger for industries where the amount of capital needed is lower.
- Results are not concentrated in non-tradable industries or in construction.
- Evidence that the availability of collateral is important for small business creation.

Start-up capital by industry

Industry	NAICS2	Average Start-Up Amount (USD)	Above/Below Median
Construction	23	78,372	0
Professional, Scientific, and Technical Services	54	87,879	0
Admin. and Supp. and Waste Mgmt and Remediation Svcs	56	91,278	0
Transportation and Warehousing	48	131,893	0
Agriculture, Forestry, Fishing and Hunting	11	146,033	0
Educational Services	61	156,893	0
Other Services (except Public Administration)	81	161,995	0
Wholesale Trade	42	188,085	0
Finance and Insurance	52	203,799	0
Health Care and Social Assistance	62	214,889	0
Retail Trade	44	216,302	1
Arts, Entertainment, and Recreation	71	218,061	1
Real Estate and Rental and Leasing	53	220,691	1
Information	51	236,126	1
Accommodation and Food Services	72	273,186	1
Manufacturing	31	363,166	1
Management of Companies and Enterprises	55	488,681	1
Utilities	22	601,149	1
Mining, Quarrying, and Oil and Gas Extraction	21	673,609	1

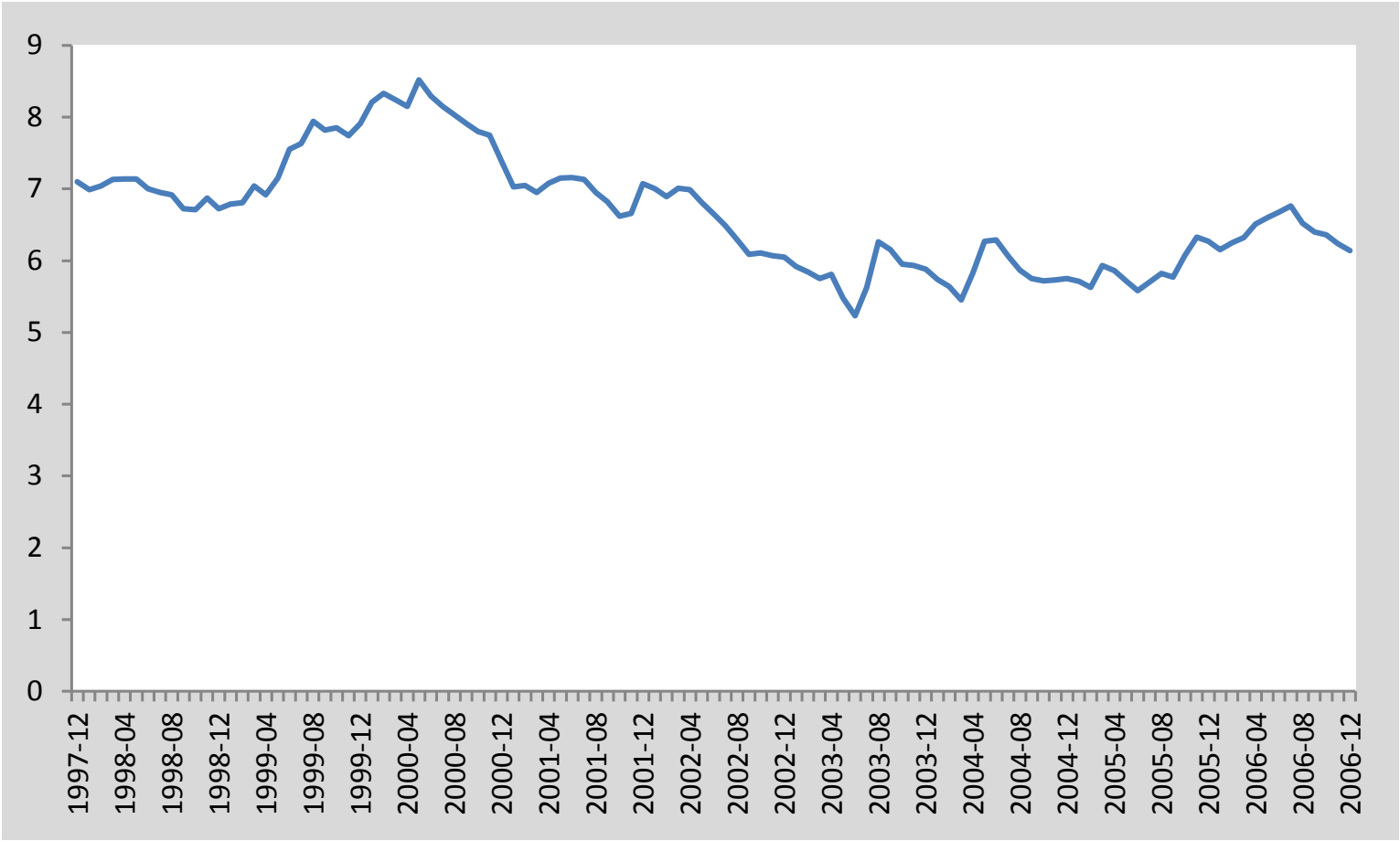
Percentage of Employment by Employment Size Category

	1-4 Employees	5-9 Employees	10-19 Employees	20-49 Employees	50+ Employees
Employment in All Sectors					
Total	9,101	9,122	12,819	21,466	72,939
Growth (02-07)	9.4	8.0	12.5	10.6	13.3
Percentage of Total	8.9	9.0	12.1	18.3	51.7
Employment in Firms <P50 of Start-Up Capital					
Total	6,213	5,566	7,350	11,012	39,921
Growth (02-07)	10.9	11.1	13.4	14.2	25.0
Percentage of Total	12.1	10.8	12.8	16.6	47.7
Employment in Firms >P50 of Start-Up Capital					
Total	2,888	3,556	5,468	10,453	33,018
Growth (02-07)	6.6	4.3	13.0	9.4	9.3
Percentage of Total	5.8	7.4	11.7	20.5	54.6

Distance shipped by industry

		Industry-State Deciles									
NAICS	Description	1	2	3	4	5	6	7	8	9	10
311	Food Manuf.	1	2	7	10	13	2	6	4	4	1
312	Beverage & Tobacco Product Manuf.	15	16	8	3			2	1	2	
313	Textile Mills	2	1	4	4	3	6	5		8	3
314	Textile Product Mills	3	2	8	2	3	4	4	4	6	7
315	Apparel Manuf.	1	1	2	1	3		4	5	3	4
316	Leather & Allied Product Manuf.	1		2			3	2	2	3	11
321	Wood Product Manuf.	8	12	13	4	4	3		2	3	1
322	Paper Manuf.	2	3	7	9	6	8	6	3	3	1
323	Printing & Related Support Activities	5	11	5	13	5	2	6	1	1	1
324	Petroleum & Coal Products Manuf.	27	10	4		2	1				1
325	Chemical Manuf.		1	1	2	11	9	8	4	6	7
326	Plastics & Rubber Products Manuf.	1	1	3	7	8	12	8	8	2	
327	Nonmetallic Mineral Product Manuf.	16	20	12	3						
331	Primary Metal Manuf.		2	4	9	8	7	2	5	5	4
332	Fabricated Metal Product Manuf.	3	2	3	11	10	7	7	2	6	
333	Machinery Manuf.	1	1			1	7	7	12	10	9
334	Computer & Electronic Product Manuf.		3	1	1	5	5	5	10	3	15
335	Electrical Eq., App., & Component Manuf.	2	1		2		5	5	6	15	10
336	Transportation Equipment Manuf.	2	4	1	3	6	6	2	10	4	9
337	Furniture & Related Product Manuf.	5	2	8	11	6	3	7	3	2	1
339	Miscellaneous Manuf.			2		1	5	9	13	9	10

Effect of one σ change in independent variable

	1-4 Employees	5-9 Employees	10-19 Employees	20-49 Employees	50+ Employees
Employment in All Sectors					
Effect of 1σ change in HP	5.2	2.7	1.3	1.1	1.1
Growth (02-07)	9.4	8.0	12.5	10.6	13.3
Employment as of 2002	9,101	9,122	12,819	21,466	72,939
Employment in Firms <P50 of Start-Up Capital					
Effect of 1σ change in HP	6.8	3.9	2.9	2.7	-0.1
Growth (02-07)	10.9	11.1	13.4	14.2	25.0
Employment as of 2002	6,213	5,566	7,350	11,012	39,921
Employment in Firms >P50 of Start-Up Capital					
Effect of 1σ change in HP	4.2	2.1	-0.1	-0.2	1.3
Growth (02-07)	6.6	4.3	13.0	9.4	9.3
Employment as of 2002	2,888	3,556	5,468	10,453	33,018

Conventional Mortgage Rates, 1997-2006