Regional Aggregation II

Juan Herreño   Johannes Wieland

UCSD, Spring 2024

REMINDERS

1. First project draft due May 4.

OUTLINE

OUTLINE

# MONETARY TRANSMISSION MECHANISM

- Intertemporal substitution (changes in the real interest rate affect C and I).

- Credit channel: monetary changes affect spreads, ability of banks to make loans, etc. (Jiménez, Ongena, Peydró, and Saurina, AER 2012)

- Relaxing liquidity constraints for some households by raising income (Cloyne, Ferreira, and Surico, ReStud 2020).

- Redistribute income to high MPC consumers (Hausman, Rhode, and Wieland, AER 2019).

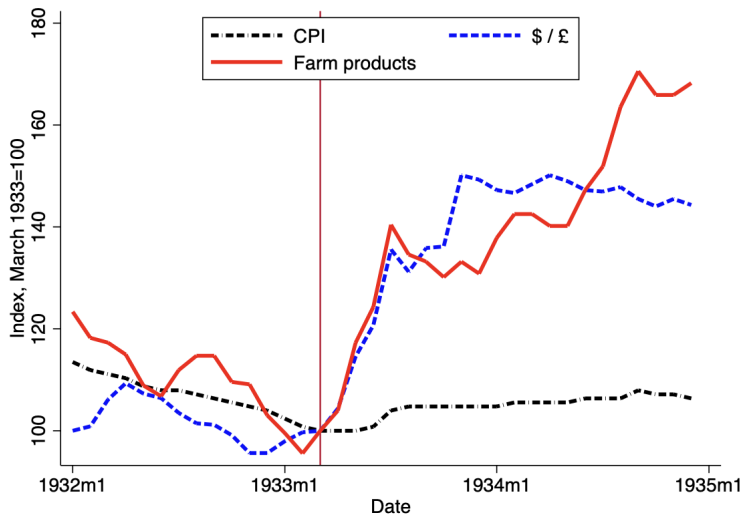- Increases real money balances (Chodorow-Reich, Gopinath, Mishra, Narayanan, QJE 2019).

OUTLINE

Figure 1 – Industrial production, 1929-1937
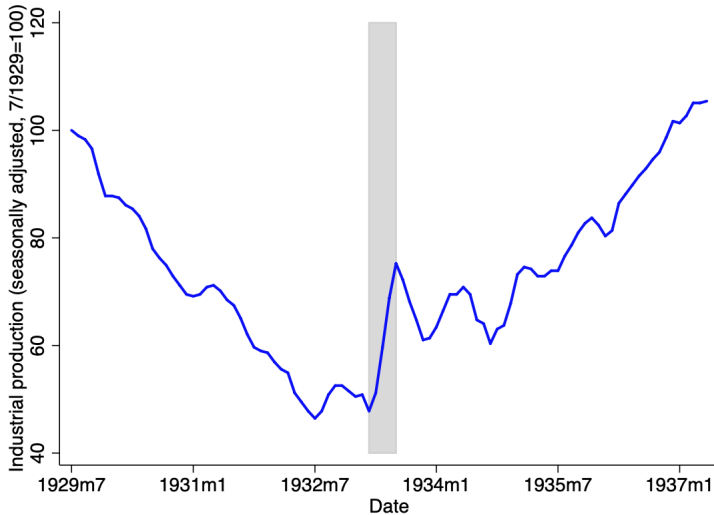
LARGE DEVALUATION FROM LEAVING GOLD STANDARD

Figure 2 – The CPI, the exchange rate, and farm prices

TRADABLE PRICES ROSE

Figure 3 – The exchange rate and farm prices after devaluation
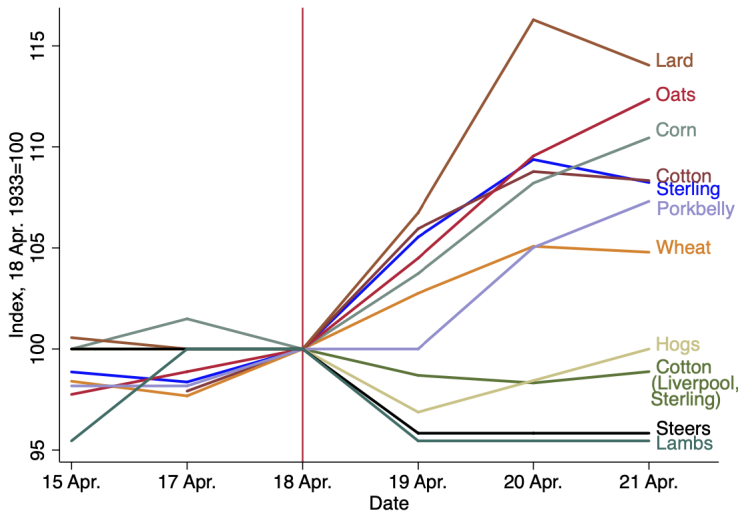
FARM INCOMES ROSE

Figure 5 – Farm income
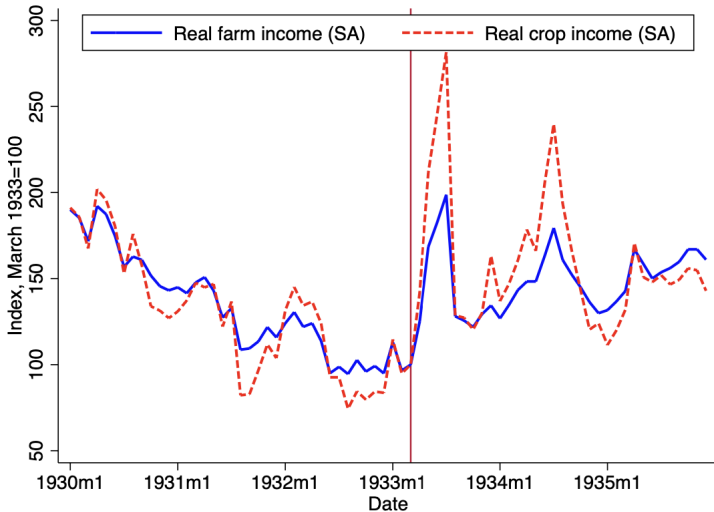
SPECIFICATION

- Cross-sectional regression of the form:

  $$\%\Delta\text{Auto sales}_{i,\text{Spring 1933}} = \beta_0 + \beta_1\text{Agricultural exposure}_i + \gamma'X_i + \varepsilon_i$$

- What is the identifying assumption?

- Comments? Concerns?

FARM STATES GROW FASTER

Figure 6 – Percent change in car sales and farm channel exposure

TEST FOR PRE-TRENDS

Figure 7 – Auto sales by farm share quartile

County-level Analysis

Table 3 – County New Auto Sales 1932-1933

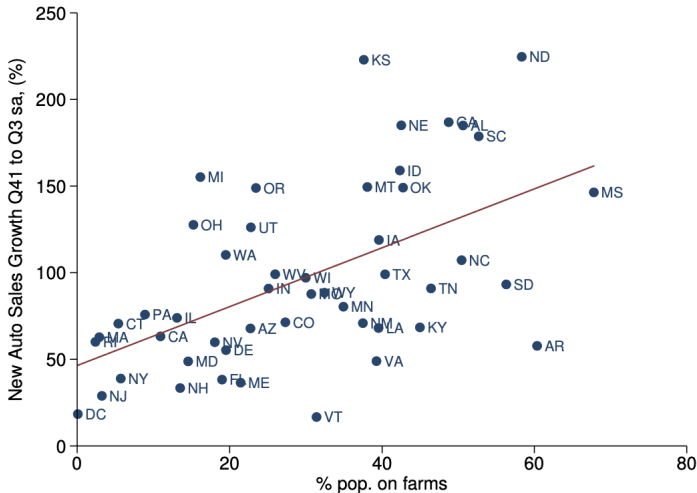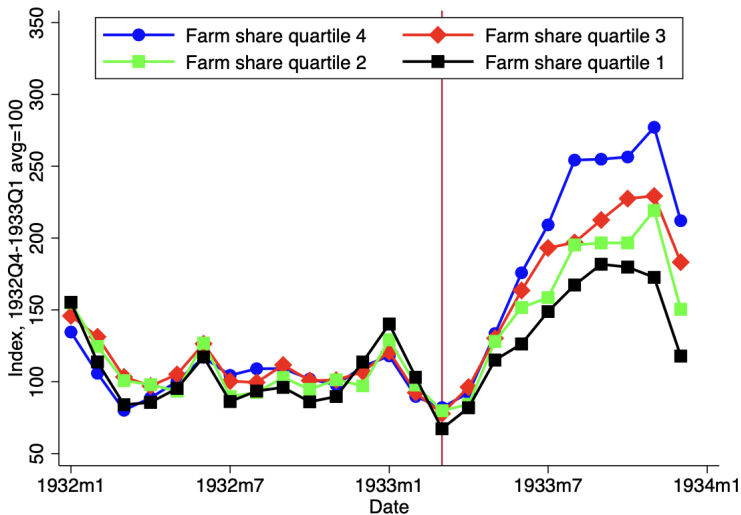| Dependent variable:	New auto sales growth (%)									Change p.c.
Geography:	State		County							County
Frequency:	Q41-Q3	1932-33	1932-33							1932-33
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Right hand side variables (\$ p.c.):										
Change farm product value	1.49**	1.99**	1.54***	1.49***	1.20***	0.84**	1.05***	0.92***		5.30**
	(0.62)	(0.93)	(0.57)	(0.42)	(0.34)	(0.38)	(0.38)	(0.34)		(2.34)
Farm product value 1932	−0.55	−0.40**	−0.26**	−0.33***	−0.25***	−0.023	−0.16**	−0.16***		−1.09**
	(0.42)	(0.16)	(0.098)	(0.081)	(0.058)	(0.034)	(0.061)	(0.058)		(0.44)
AAA Transfers 1933					3.26**		2.66			
					(1.61)		(1.89)			
Cotton, tobacco, and wool value 1932									2.33***	
									(0.23)	
Corn, oats, and wheat value 1932									0.35**	
									(0.13)	
Hay, potato, and fruit value 1932									0.14	
									(0.18)	
Livestock value 1932									−0.11	
									(0.17)	
Milk and egg value 1932									−0.42***	
									(0.10)	
Control Variables	No	No	No	Yes	Yes	No	Yes	Yes	No	No
State Fixed Effects	No	No	No	No	No	Yes	Yes	Yes	No	No
Drought Interactions	No	No	No	Yes	Yes	No	Yes	Yes	No	No
R^2	0.27	0.19	0.09	0.31	0.36	0.31	0.40	0.43	0.26	0.06
Observations	48	48	2,100	2,079	2,079	2,100	2,079	2,079	2,100	2,093

CONVINCING?

AGGREGATE EFFECTS?

- Evidence is about *relative* changes in consumption expenditure.

- Three mechanisms by which it can be expansionary overall:

  1. Redistribution to higher-MPC households.

  2. Improves bank health.

  3. Raises inflation expectations.

TESTING FOR DIFFERENTIAL MPCS

- Cross-sectional regression of the form:

    $\%\Delta$Auto sales$_{i,\text{Spring 1933}} =$
    $\beta_0 + \beta_1 \Delta$farm product value$_i \times \%$farms mortgaged$+$
    $+ \beta_2$farm product value$_i \times \%$farms mortgaged
    $+ \beta_3 \Delta$farm product value$_i + \beta_4 \%$farms mortgaged
    $+ \beta_5 \Delta$farm product value$_i + \gamma' X_i + \varepsilon_i$

- What is the identifying assumption?

- Comments? Concerns?

Debt-Interaction Positiv

Table 5 – Auto sales growth in spring 1933 (% changes) and farm debt

Panel A: Linear interaction with % farms mortgaged				
	(1)	(2)	(3)	(4)
Linear Interaction	0.37*	0.77***	0.57**	0.72***
	(0.19)	(0.24)	(0.23)	(0.24)
Change farm product value p.c. ($)	1.39**	0.089	0.49	0.018
	(0.61)	(0.50)	(0.52)	(0.51)
State Fixed Effects	No	Yes	No	Yes
Control Variables	No	No	Yes	Yes
Drought Interactions	Yes	Yes	Yes	Yes
R^2	0.23	0.40	0.37	0.44
Observations	2,094	2,094	2,073	2,073

DIFFERENTIAL DEPOSIT GROWTH

Figure 12 – Net demand deposits, 1930-33
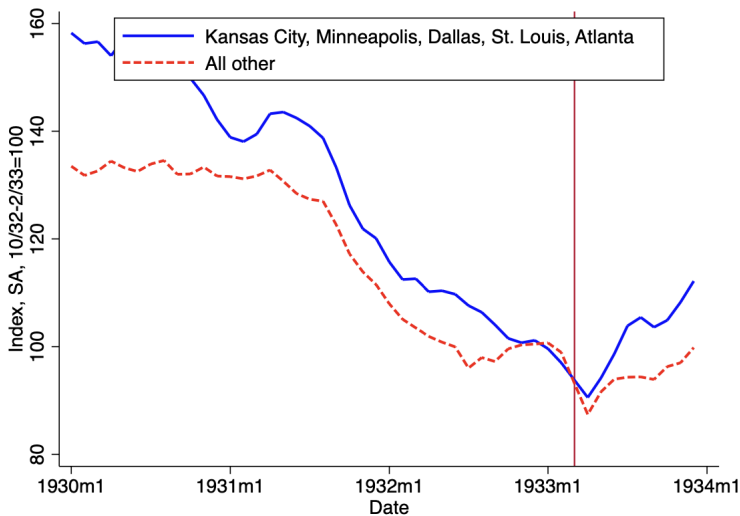
Inflation Expectations?

(b) Tires

AGGREGATION

- Simple framework to examine how cross-sectional estimates map to the aggregate economy.

- Model has heterogeneity on the following three dimensions:

  - Income from farming, labor, or pricing power.

  - Permanent income vs hand-to-mouth.

  - Farm vs urban area.

- Simplifications:

  - Model essentially static.

  - Exogenous relative price movements.

- Who looked at the appendix?

KEY RESULT

$$\%\Delta\text{Cars} = \underbrace{\beta \times \phi^f}_{\substack{\text{``naive''} \\ \text{extrapolation}}} \times \underbrace{\frac{\text{Farm area income per capita}}{\text{National income per capita}}}_{\text{Relative income p.c.}}$$

$$\times \underbrace{\left(1 - \xi\frac{\theta^w}{\theta^f}\right)}_{\substack{\text{Redistribution from} \\ \text{high-MPC consumers}}} \times \underbrace{\mu_t}_{\substack{\text{Aggregate} \\ \text{spending} \\ \text{multiplier}}}$$

$$+ \underbrace{-\sigma d\ln(1 + r_t)}_{\text{Intertemporal Substitution}}$$

- Comments? Concerns?

AGGREGATE EFFECT OF FARM CHANNEL

Table 7 – Implied aggregate effect

Redistribution from high MPC consumers, $\xi \frac{\theta^w}{\theta^f}$	Predicted %ΔCars			Fraction of actual %ΔCars		
	Aggregate Multiplier			Aggregate Multiplier		
	$\mu = 1$	$\mu = 2$	$\mu = 3$	$\mu = 1$	$\mu = 2$	$\mu = 3$
0.7	8.0	15.9	23.9	9.2	18.4	27.6
0.6	10.6	21.2	31.9	12.3	24.6	36.8
0.5	13.3	26.6	39.8	15.4	30.7	46.1
0.4	15.9	31.9	47.8	18.4	36.8	55.3
0.3	18.6	37.2	55.8	21.5	43.0	64.5

Notes: Columns 2-4 display the implied new car sales growth rate from equation (8) given the indicated parameter values, and $\beta = 1.7$, $\phi^f = 0.248$, $\frac{Y_{p.c.,a}}{Y_{p.c.}} = 0.63$. Columns 5-7 show the fraction of actual new car sales growth (86.5%) explained.

- Thoughts? Comments?

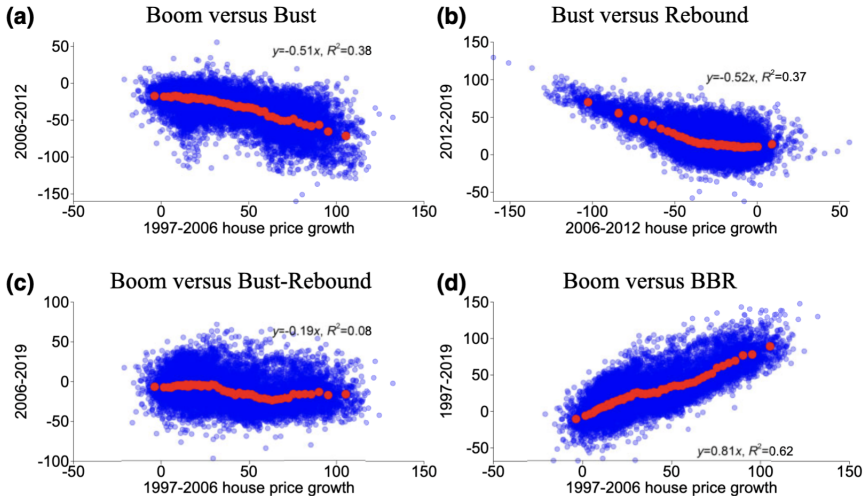# CONVINCING?

OUTLINE

HOUSING

[graph of house prices]

- Bubble or Fundamentals? If fundamentals, demand or supply? (What is a fundamental?)

- Bubble view: Shiller, Charles et al

- Fundamental view: Chodorow-Reich et al, Mondragon and Wieland

CHODOROW-REICH, GUREN, MCQUADE (2024, RESTUD)

1. Document boom-bust-rebound.

2. Fundamentals explain cross-city variation in long-run house price growth.

3. Model that generates boom-bust-rebound from single fundamental shock with endogenous belief overreaction.

BOOM, BUST, AND REBOUND

(a) Boom versus Bust

$y=-0.51x$, $R^2=0.38$

y-axis: 2006-2012
x-axis: 1997-2006 house price growth

(b) Bust versus Rebound

$y=-0.52x$, $R^2=0.37$

y-axis: 2012-2019
x-axis: 2006-2012 house price growth

(c) Boom versus Bust-Rebound

$y=-0.19x$, $R^2=0.08$

y-axis: 2006-2019
x-axis: 1997-2006 house price growth

(d) Boom versus BBR

$y=0.81x$, $R^2=0.62$

y-axis: 1997-2019
x-axis: 1997-2006 house price growth

FRAMEWORK FOR LONG-RUN FUNDAMENTALS

- Good practice: write down the DGP.

- LR supply block:

$$P_{it} = C_{it} + L_{it}$$
$$C_{it} = A_{it} H_{it}^{\alpha_i}$$
$$L_{it} = B_{it} H_{it}^{\beta_i}$$

A, B are cost shifters independent of population.

- LR demand block:

$$\frac{\dot{H}_{it}}{H_{it}} = G_i \left(\frac{V_{it}}{P_{it}} \right) V_{it} \qquad = E_t \int_t^\infty e^{-\rho s} D_{is} ds$$

DERIVING LR SUPPLY

- Taking log differences with s_{it} as the land share in P:

$$\Delta p_{it} = \Delta a_{it} + s_{i,t-1}(\Delta b_{it} - \Delta a_{it}) + (\alpha_i + s_{i,t-1}(\beta_i - \alpha_i))h_{it}$$

- Parameterize:

$$\alpha_i = \alpha_0 + \alpha_1 m_i$$
$$\beta_i = \beta_0 + \beta_1 m_i$$
$$\Delta b_{it} = b\Delta u_{it} + \Delta \bar{b}_t + \Delta \hat{b}_{it}$$
$$\varepsilon_{it} = \Delta \hat{a}_{it} + s_{i,t-1}\Delta(\hat{b}_{it} - \Delta \hat{a}_{it})$$

To get

$$\Delta p_{it} = \Delta \bar{a}_t + s_{i,t-1}(\Delta \bar{b}_t - \Delta \bar{a}_t) + \alpha_0 \Delta h_{it} + (\beta_0 - \alpha_0)s_{i,t-1}\Delta h_{it}$$
$$+ \alpha_1 m_i \Delta h_{it} + (\beta_1 - \alpha_1)m_i s_{i,t-1}\Delta h_{it} + s_{i,t-1}b\Delta u_{it} + \varepsilon_{it}$$

- This becomes the regression equation

$$\Delta p_{it} = c_0 + s_{i,t-1}(\Delta \bar{b}_t - \Delta \bar{a}_t) + \alpha_0 \Delta h_{it} + (\beta_0 - \alpha_0)s_{i,t-1}\Delta h_{it}$$
$$+ \alpha_1 m_i \Delta h_{it}$$

ESTIMATING LR SUPPLY

- This becomes the regression equation

$$\Delta p_{it} = c_0 + c_1 s_i + c_2 \Delta h_{it} + c_3 s_i \Delta h_{it}$$
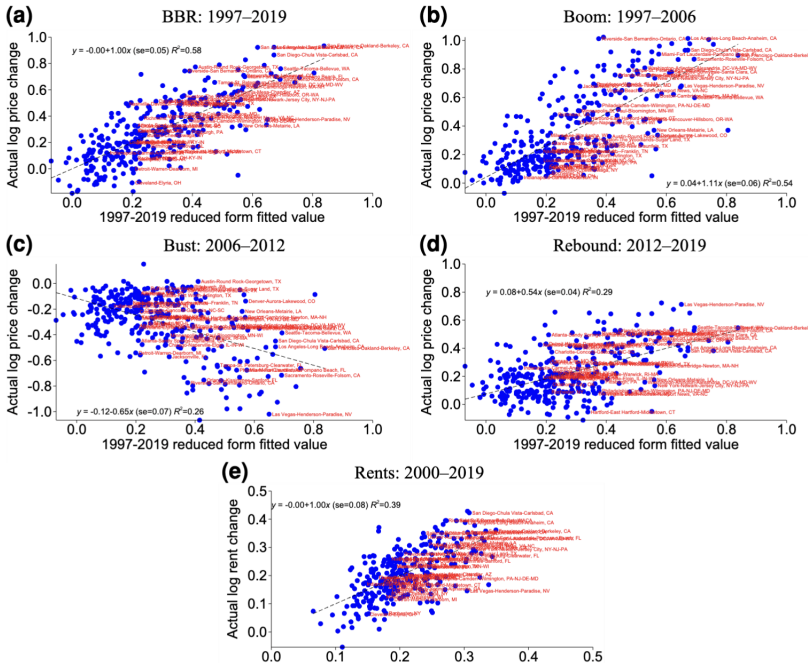$$+ c_4 m_i \Delta h_{it} + c_5 m_i s_{i,t-1} \Delta h_{it} + c_6 s_i \Delta$$

  (where are the t subscripts on the coefficients?)

- Can we estimate this supply equation using OLS?

INSTRUMENTS

- Endogenous variables:
  - Population growth Δh_{it}
  - Land share s_i
  - Regulatory strictness m_i
  - Urbanization Δu_{it}
- Instruments:
  - Shift-share of employment growth and wage growth.
  - January temperature and sunlight, July humidity.
  - Share of employment in restaurants in 1997.
  - Fraction of land available for development and 1997 population density.
  - Ratio of public expenditure on protective inspection to total tax revenue in 1992, and share of Christians in non-traditional denominations in 1990.
  - The interaction of the pre-boom (1990) share of college workers in the CBSA and pre-boom urban amenities; the interaction of the pre-boom relative likelihood of living downtown for college and non-college residents and the predicted change in the CBSA college share using a Bartik shift-share.
- Thoughts? Comments?

REDUCED FORM

(a) BBR: 1997–2019

$y = -0.00+1.00x \ (se=0.05) \ R^2=0.58$

(b) Boom: 1997–2006

$y = 0.04+1.11x \ (se=0.06) \ R^2=0.54$

(c) Bust: 2006–2012

$y = -0.12-0.65x \ (se=0.07) \ R^2=0.26$

(d) Rebound: 2012–2019

$y = 0.08+0.54x \ (se=0.04) \ R^2=0.29$

(e) Rents: 2000–2019

$y = -0.00+1.00x \ (se=0.08) \ R^2=0.39$

TABLE 1
Long-run OLS and IV results

Dep. var.:	House price growth 1997–2019			Rent growth 2000–19
	(1)	(2)	(3)	(4)
Land share	0.64**	0.91*	0.78**	0.17*
	(0.24)	(0.37)	(0.20)	(0.08)
Units growth	0.34	0.81	0.63**	0.16**
	(0.26)	(0.49)	(0.10)	(0.04)
Land share × Units growth	0.72	−0.64		
	(0.92)	(1.63)		
WRLURI × Units growth	−0.01	0.32		
	(0.12)	(0.23)		
Land share × WRLURI × Units growth	0.79*	0.34	1.30**	0.34**
	(0.37)	(0.75)	(0.28)	(0.11)
Land share × Urbanization	1.22**	1.42**	1.40**	0.40**
	(0.19)	(0.37)	(0.38)	(0.14)
Constant	−0.05	−0.13	−0.11+	0.11**
	(0.06)	(0.11)	(0.06)	(0.02)
Estimator	OLS	2sls	2sls	2sls
Elasticity at $\bar{s}_j$	0.54	0.63	0.63	
Standard error of elasticity	0.26	0.50	0.10	
R^2	0.49	0.43	0.45	0.17
Observations	308	308	308	272

Notes: The table reports OLS (column 1) and IV (columns 2–4) regressions of real CBSA house price growth over 1997–2019 or rent growth over 2000–10 on land share, housing unit growth over 1997–2019, their interactions with WRLURI and each other, and the interaction of land share and the change in the downtown price premium, as in equation (8). The standard error of the elasticity at the mean of land share is computed using the delta method. Heteroskedastic-robust

LOADING ON FUNDAMENTAL

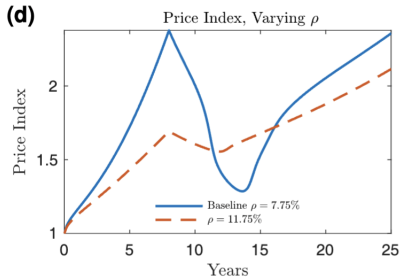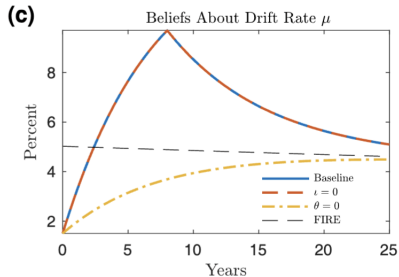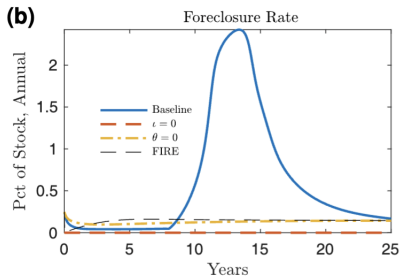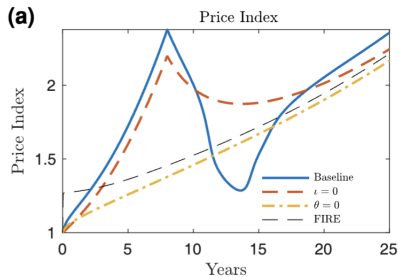798   REVIEW OF ECONOMIC STUDIES
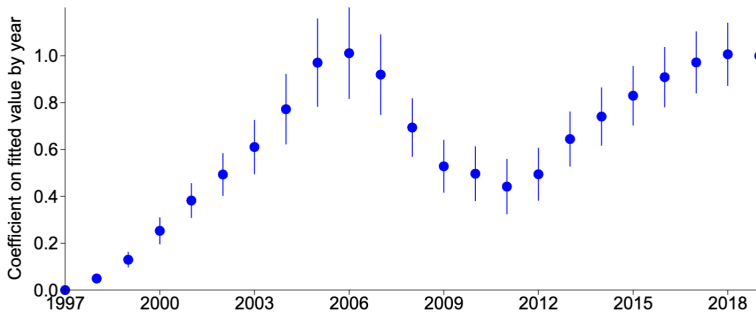
- What do we learn?

MODEL

- What is the purpose of the model?

- What do we learn from the model that we do not learn from the empirics?

- How well does the paper address the premise: fundamentals or bubbles?

MODEL

OUTLINE