Regional Aggregation II

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Reminders

1. First project draft due May 4.

Outline

1. Introduction
2. Hausman, Rhode, and Wieland (2019, AER)
3. Chodorow-Reich, Guren, McQuade (2024, ReStud)
4. Mondragon and Wieland (2022, WP)
5. Acosta, Mueller, Nakamura, Steinsson (2023, WP)

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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).

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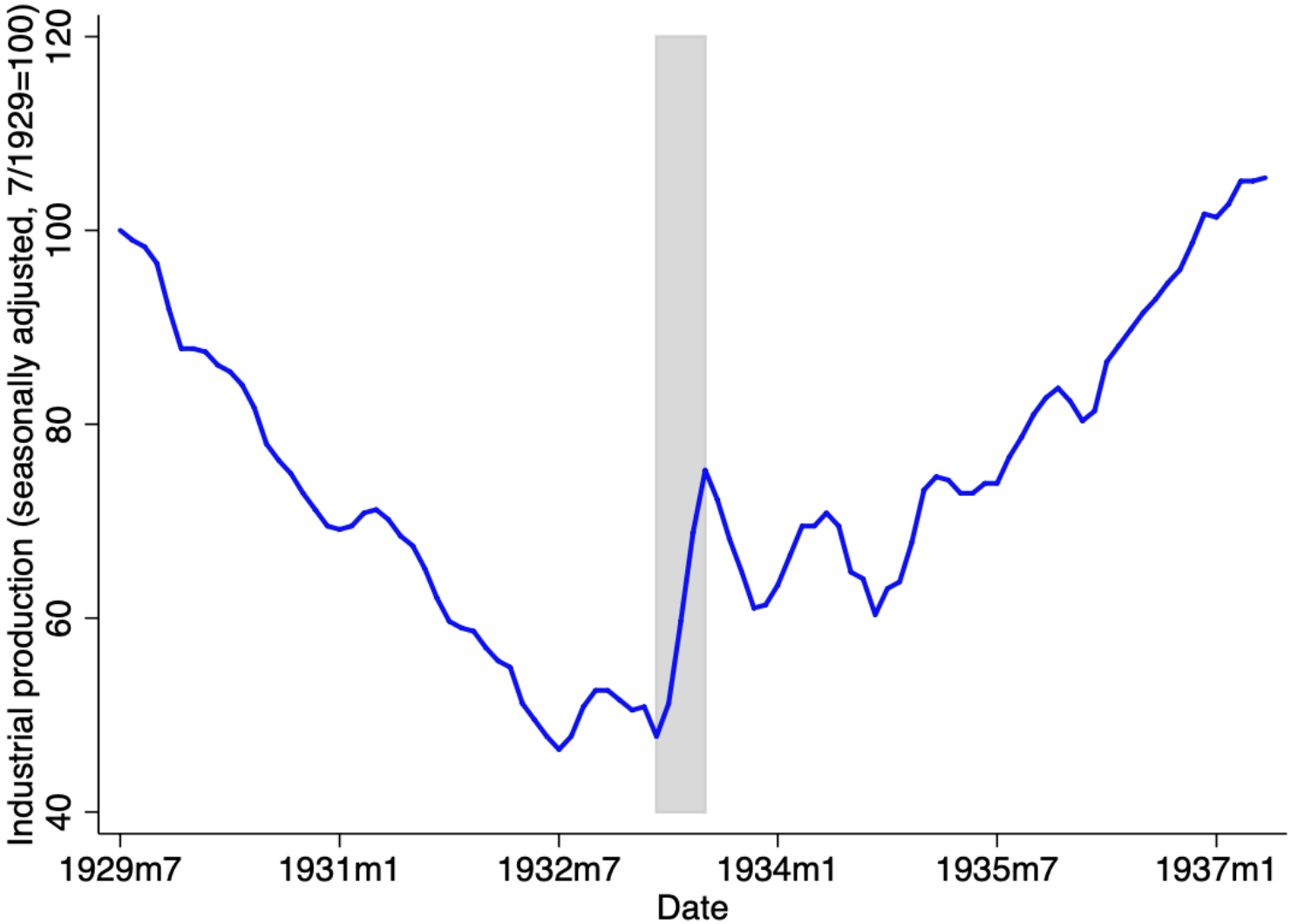
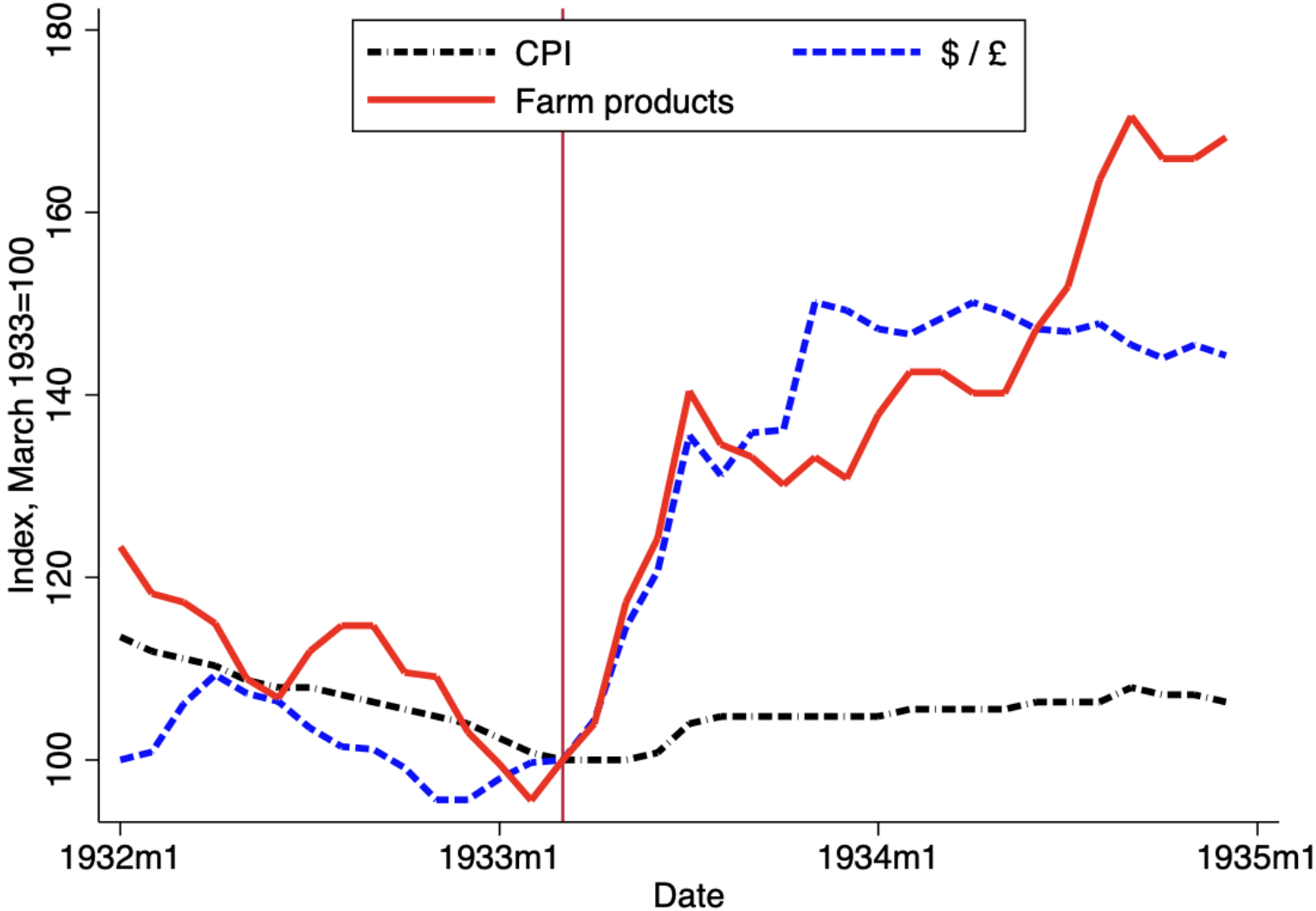
Recovery from the Great Depression

Figure 1 – Industrial production, 1929-1937



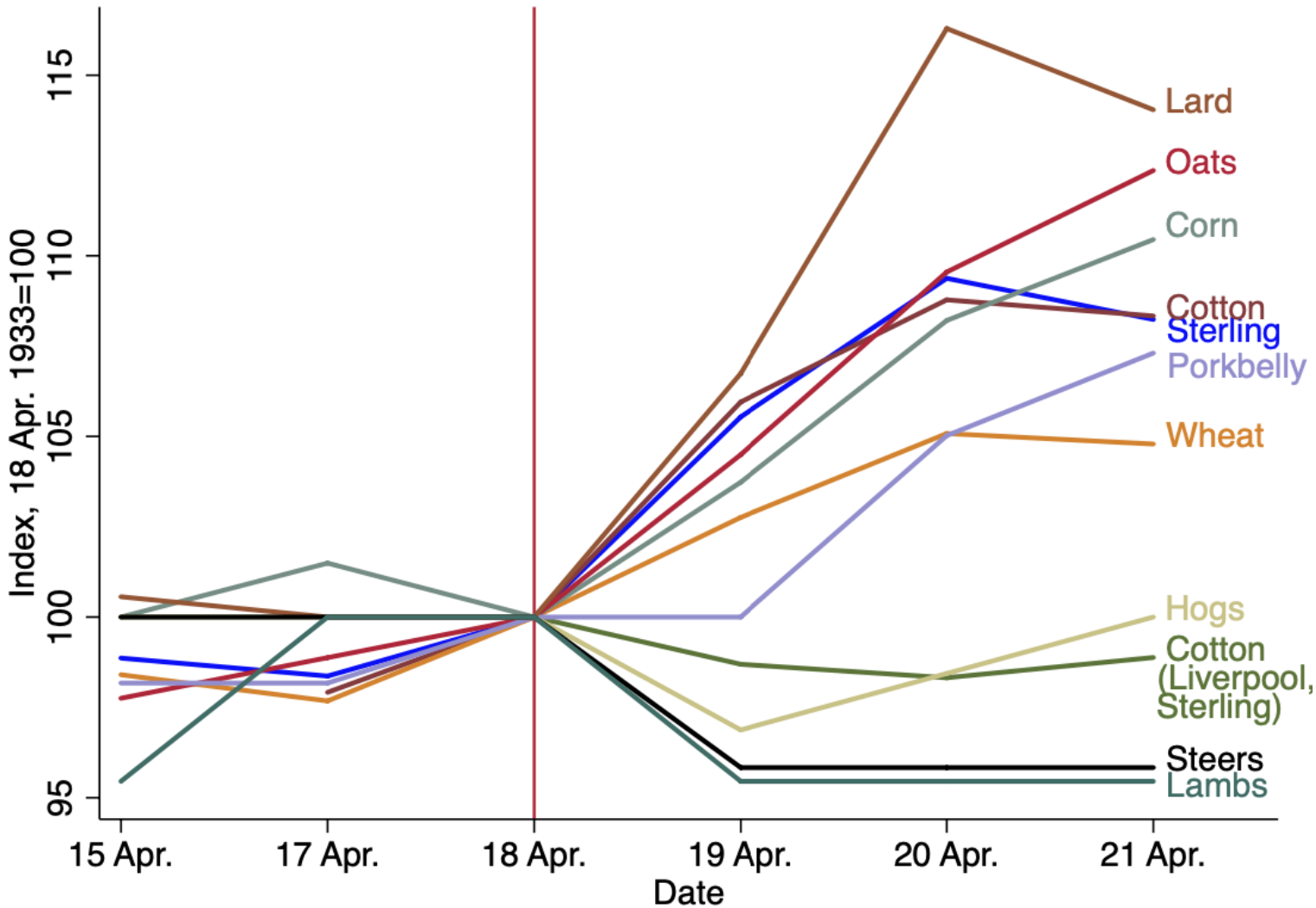
Large Devaluation from Leaving Gold Standard

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



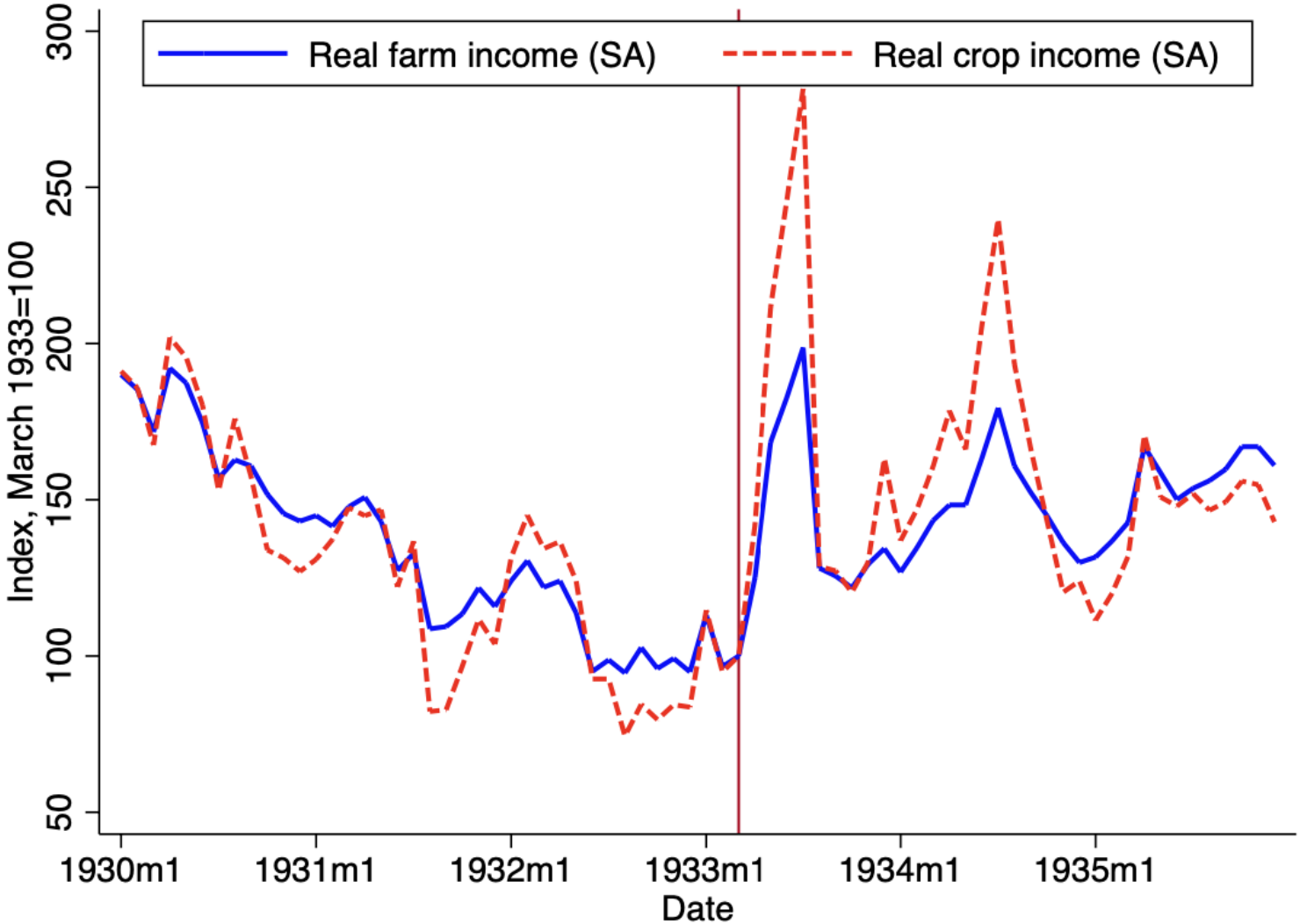
TRADABLE PRICES ROSE

Figure 3 – The exchange rate and farm prices after devaluation



Farm Incomes Rose

Figure 5 – Farm income



Specification

- Cross-sectional regression of the form:

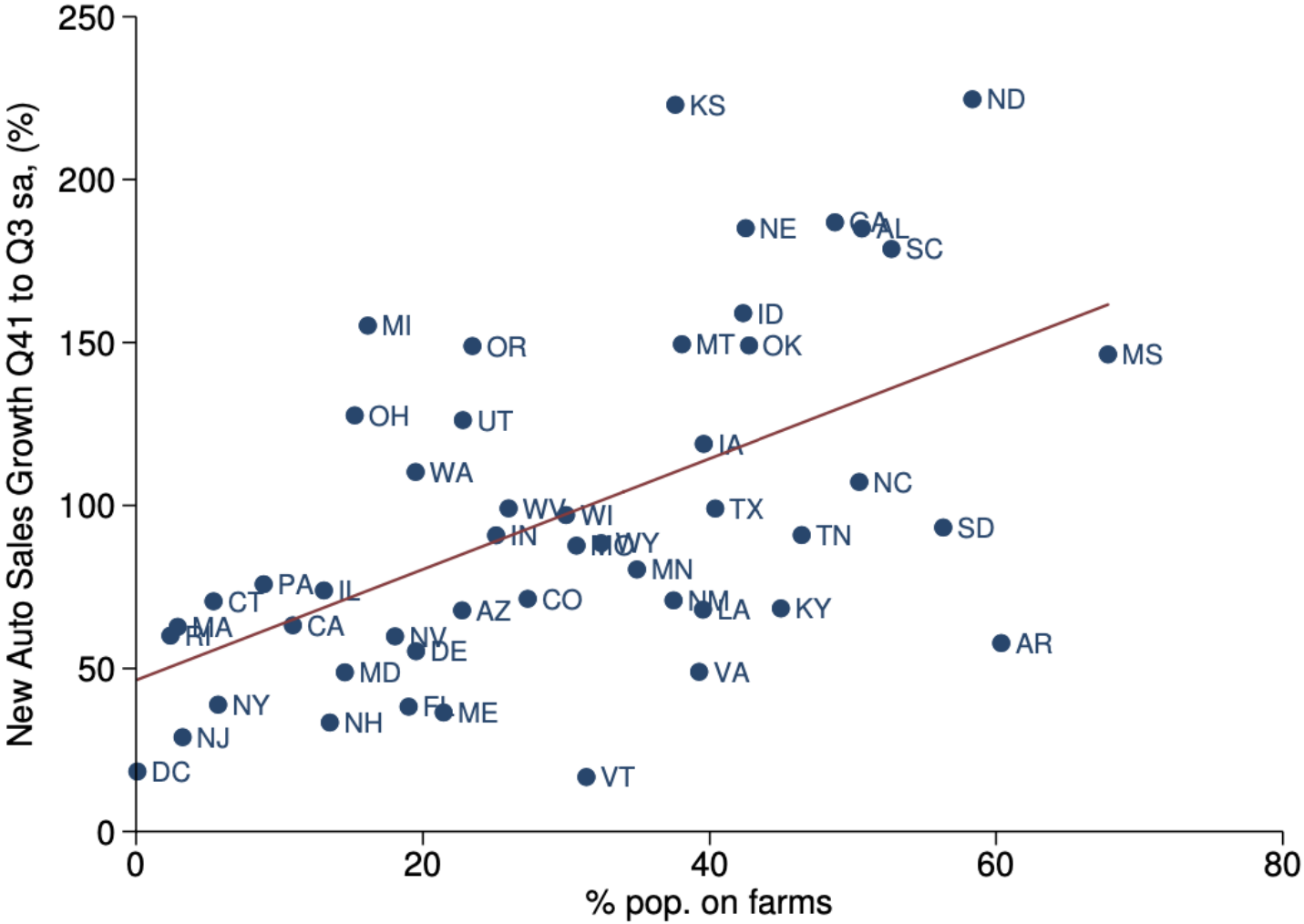
$$\%\Delta\text{Auto sales}_{i,\text{Spring 1933}} = \beta_0 + \beta_1 \text{Agricultural exposure}_i + \gamma' X_i + \varepsilon_i$$

- What is the identifying assumption?

- Comments? Concerns?

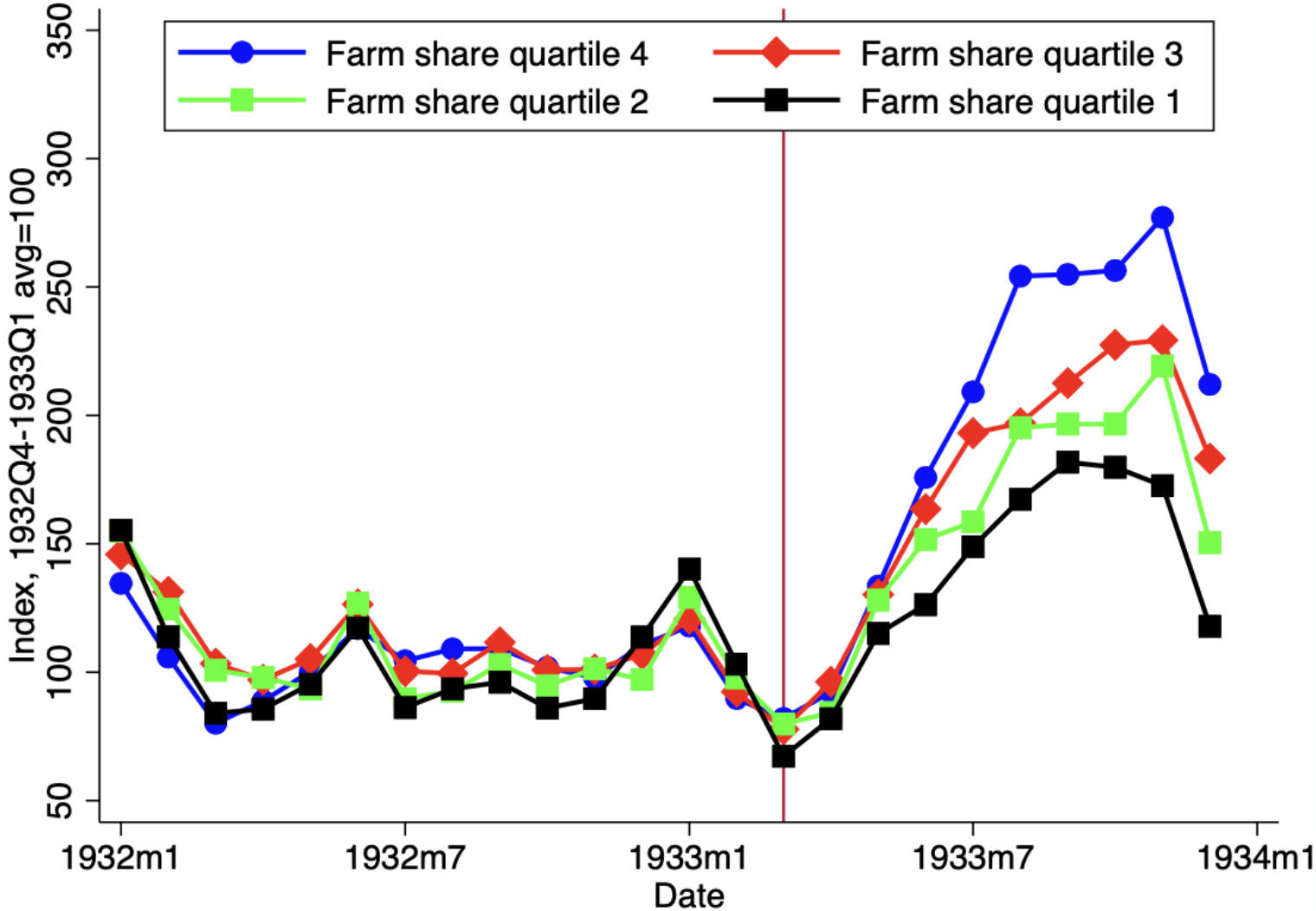
Farm States Grow Faster

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:

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

- What is the identifying assumption?

- Comments? Concerns?

Debt-Interaction Positiv

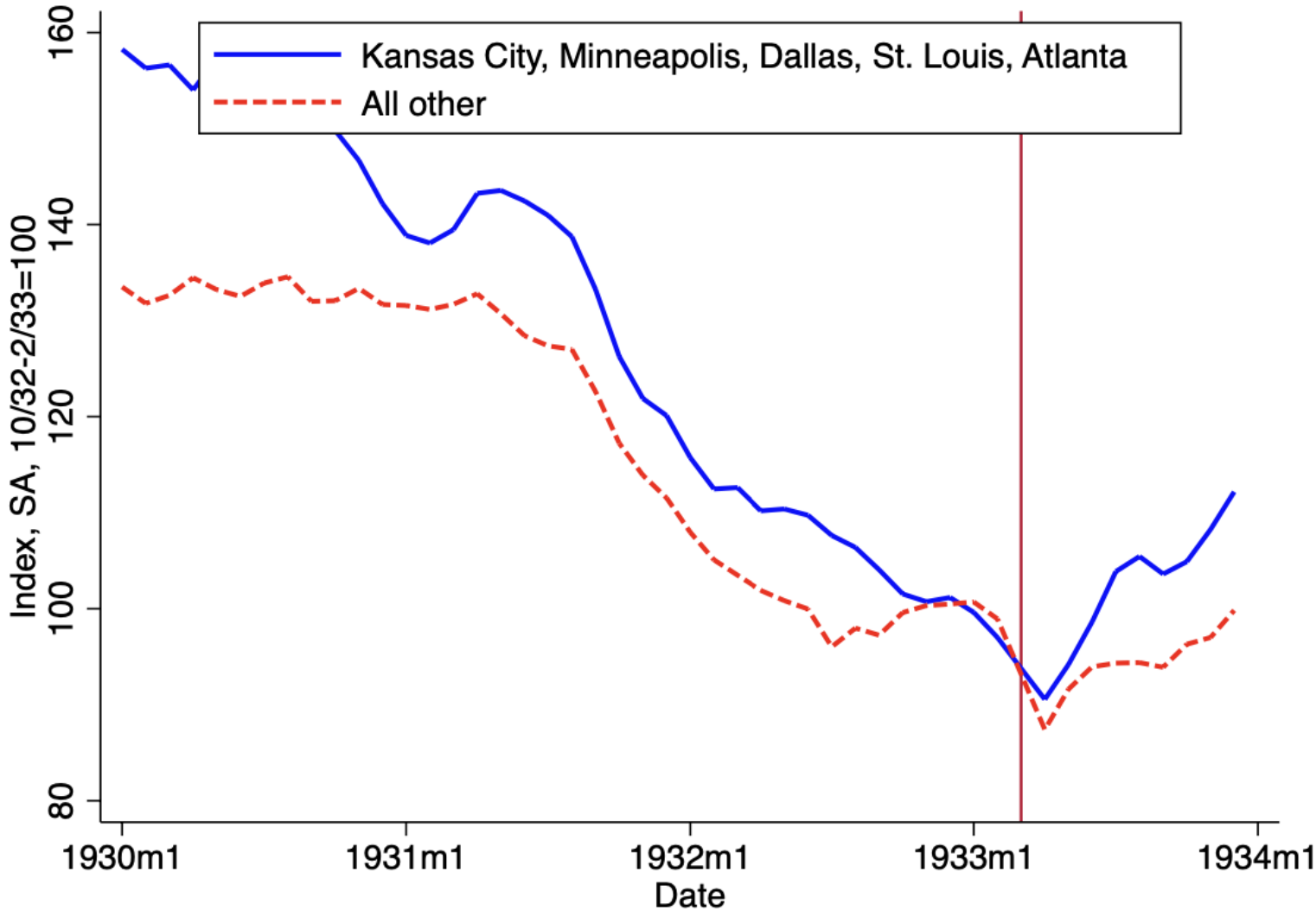
Table 5 – Auto sales growth in spring 1933 (% changes) and farm debt

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: Aggregate Multiplier $\mu=1$	$\mu=2$	$\mu=3$	Fraction of actual %ΔCars: Aggregate Multiplier $\mu=1$	$\mu=2$	$\mu=3$
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?

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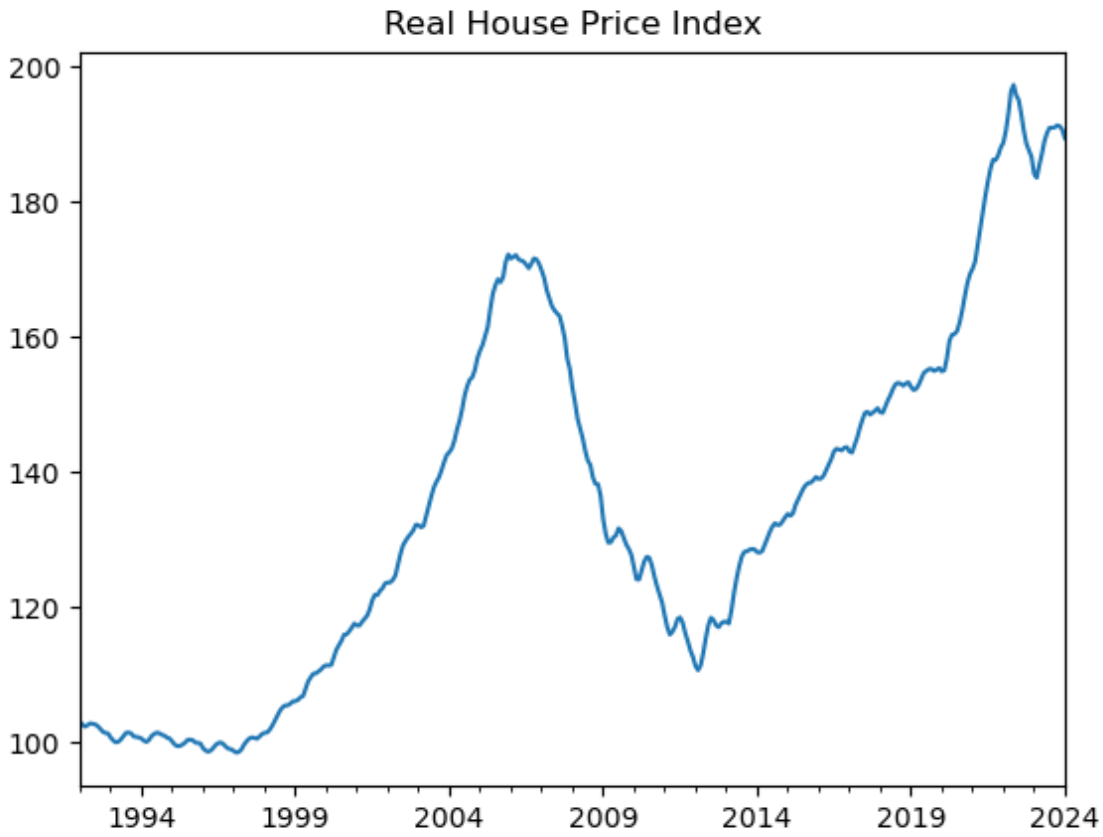
Housing



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

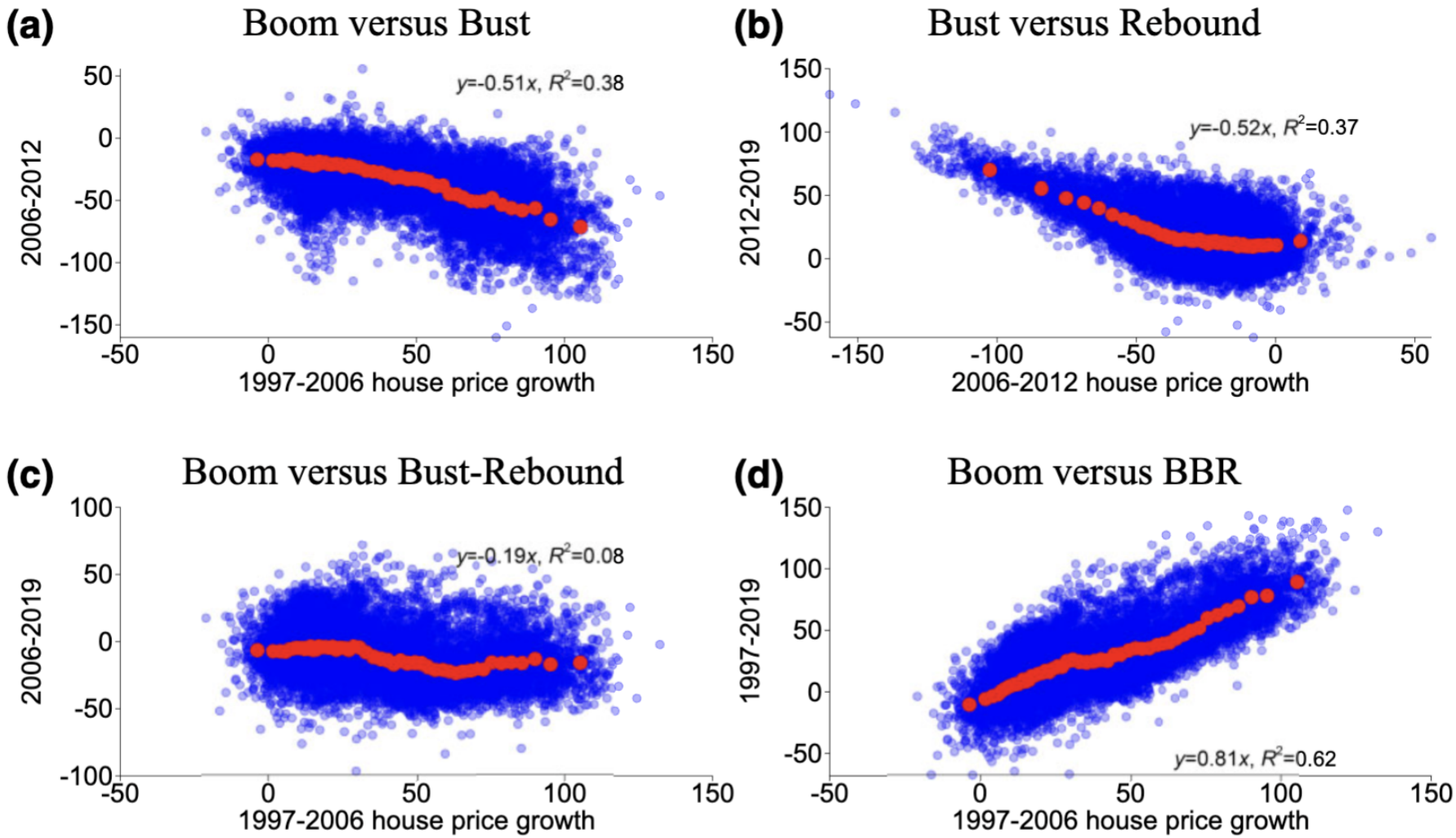
Chodorow-Reich, Guren, McQuade (2024, ReStud)

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



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

$$\Delta p_{it} = c_0 + s_{i,t-1}(\Delta \bar{b}_t - \Delta \bar{a}_t) + \alpha_0 \Delta h_{it} + (\beta_0 - \alpha_0)s_{i,t-1}\Delta h_{it} + \alpha_1 m_i \Delta h_{it} + (\beta_1 - \alpha_1)m_i s_{i,t-1}\Delta h_{it} + s_{i,t-1} b\Delta u_{it} + \varepsilon_{it}$$

Estimating LR Supply

- This becomes the regression equation

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

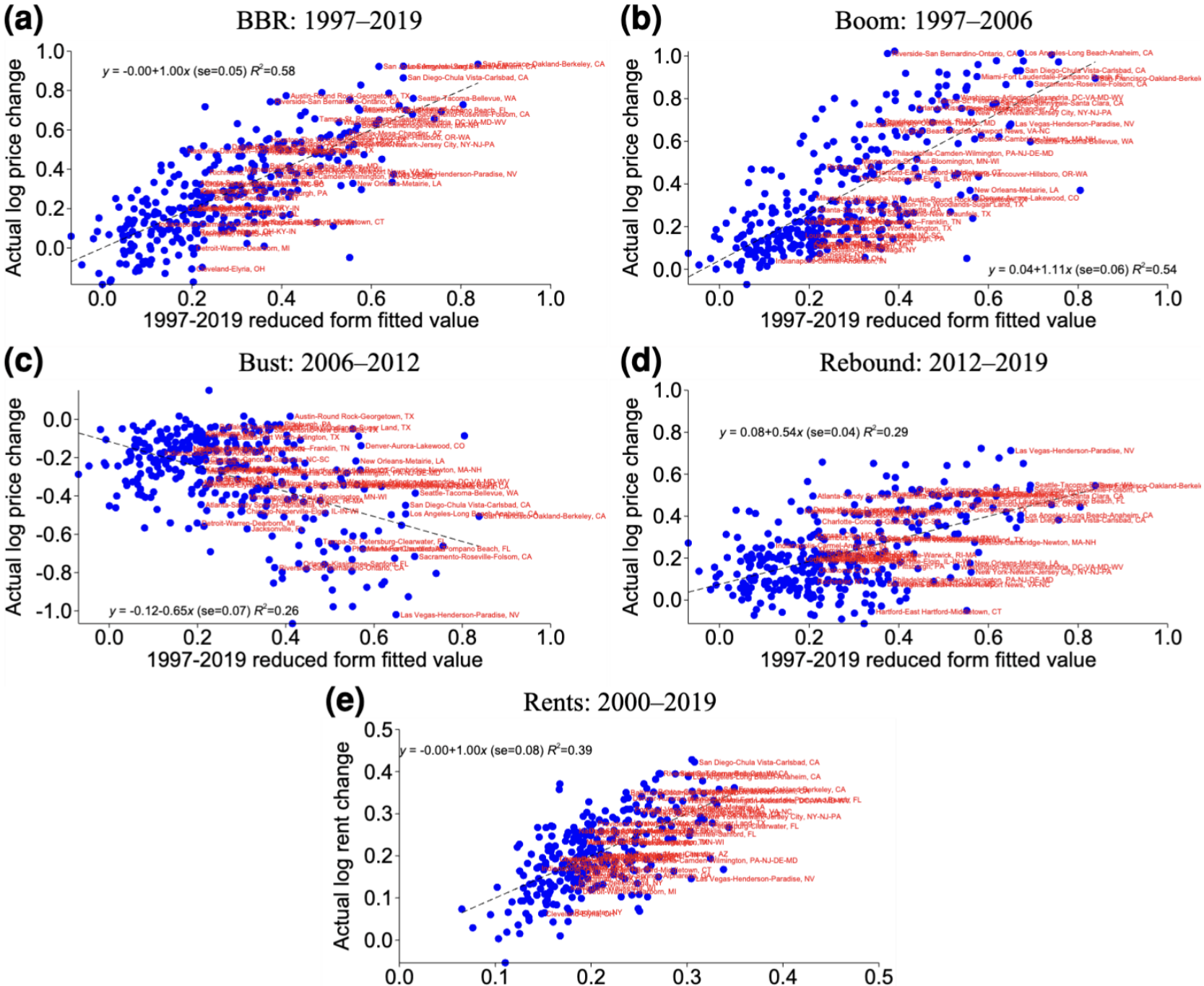
  (where are the t subscripts on the coefficients?)

- 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



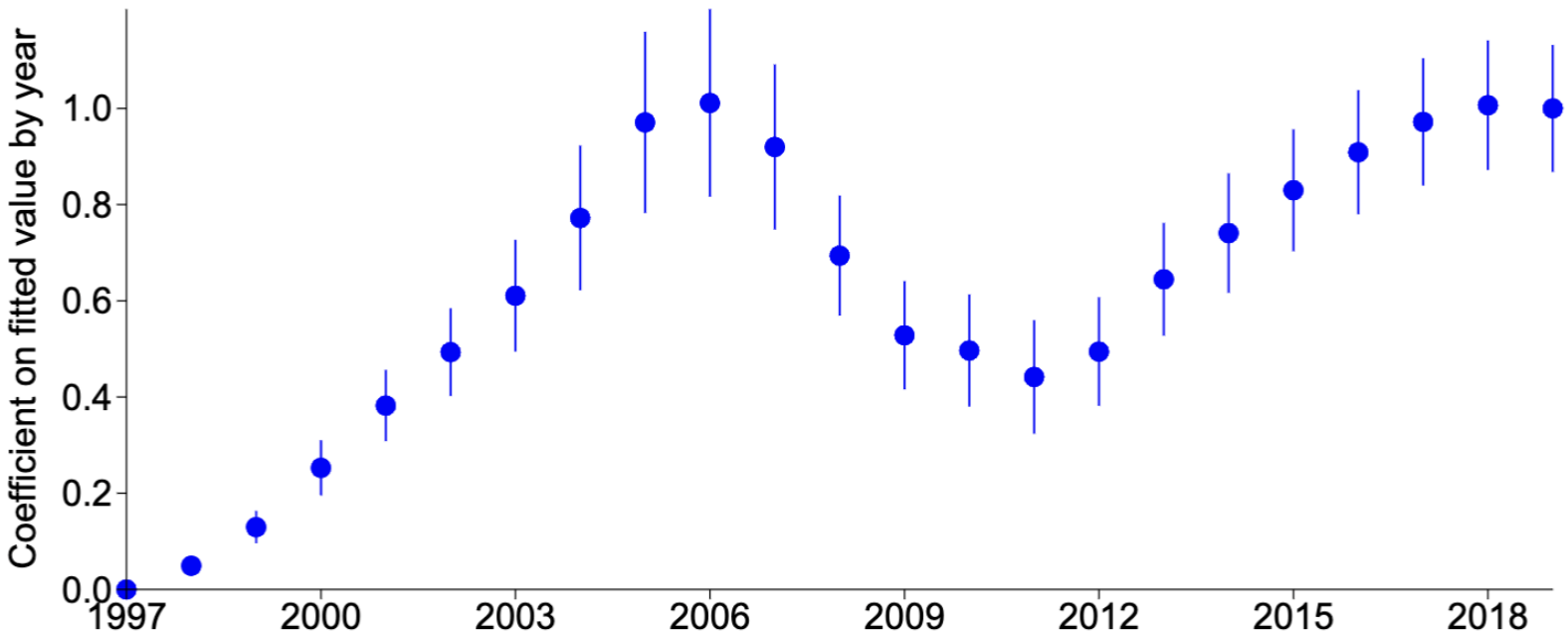
IV

TABLE 1
Long-run OLS and IV results

	House price growth 1997–2019			Rent growth 2000–19
Dep. var.:	(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

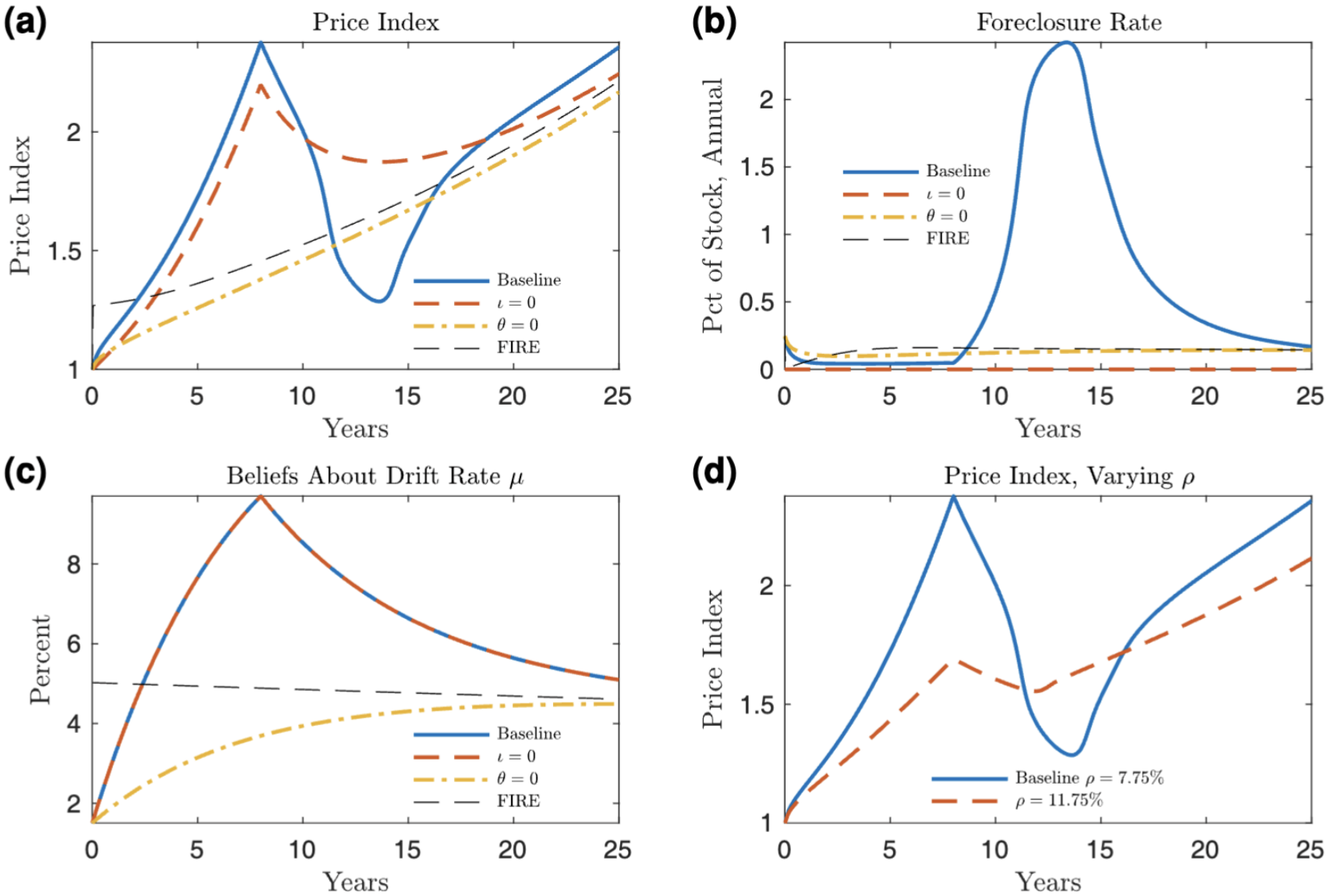


- What do we learn?

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


(a)
Price Index
Price Index
Years
Baseline
$\iota = 0$
$\theta = 0$
FIRE
(b)
Foreclosure Rate
Pct of Stock, Annual
Years
Baseline
$\iota = 0$
$\theta = 0$
FIRE
(c)
Beliefs About Drift Rate μ
Percent
Years
Baseline
$\iota = 0$
$\theta = 0$
FIRE
(d)
Price Index, Varying ρ
Price Index
Years
Baseline $\rho = 7.75\%$
$\rho = 11.75\%$

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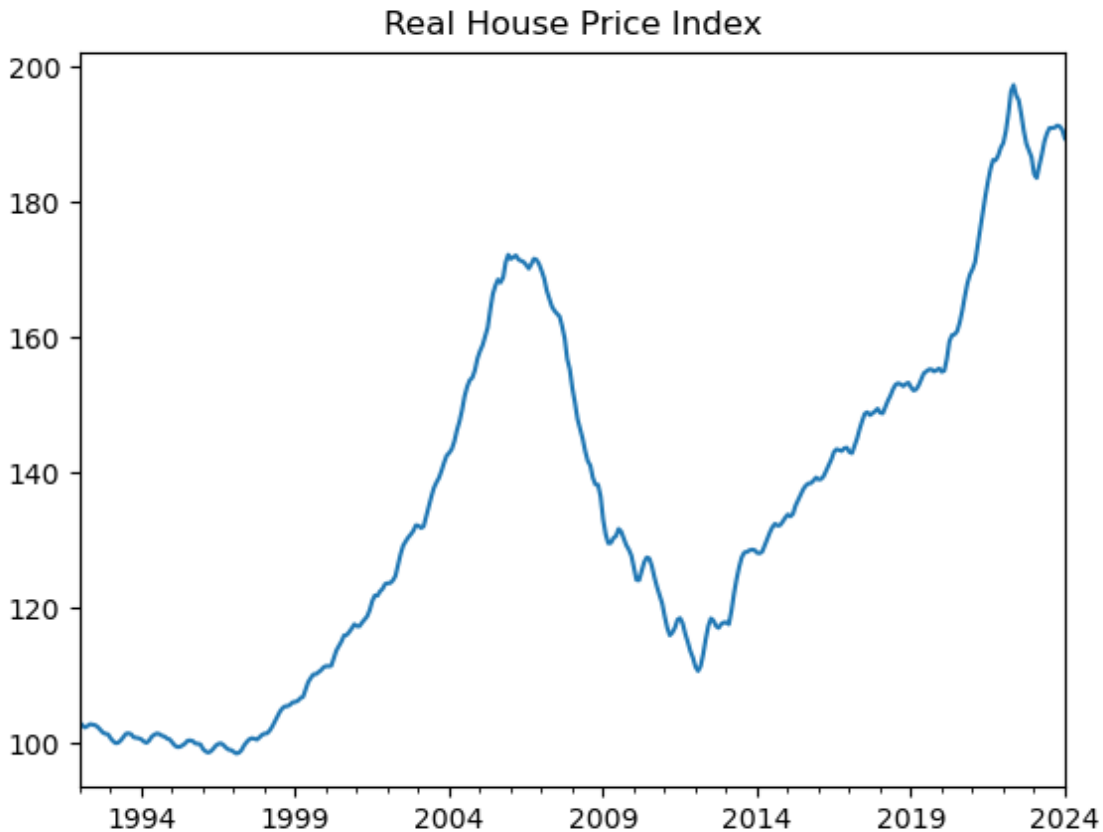
Pandemic Housing Market



Empirical Strategy

- Baseline regression:

$$\text{Remote Work 2020}_i = \kappa + X_i'\theta + \gamma \text{Remote Work 2015-19}_i + \zeta_i$$

$$\text{House Price Growth}_i = \alpha + X_i'\delta + \beta \widehat{\text{Remote Work 2020}}_i + \zeta_i$$

- What problem does the instrument solve?

- What problems does the instrument not solve?

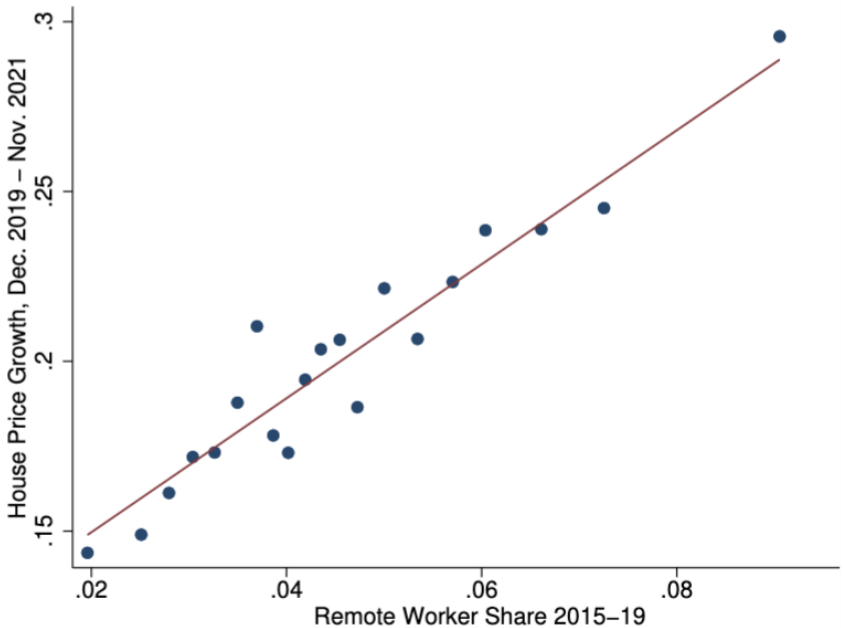
Instrument Variation

TABLE 2
Sources of Pre-Pandemic Remote Work Variation

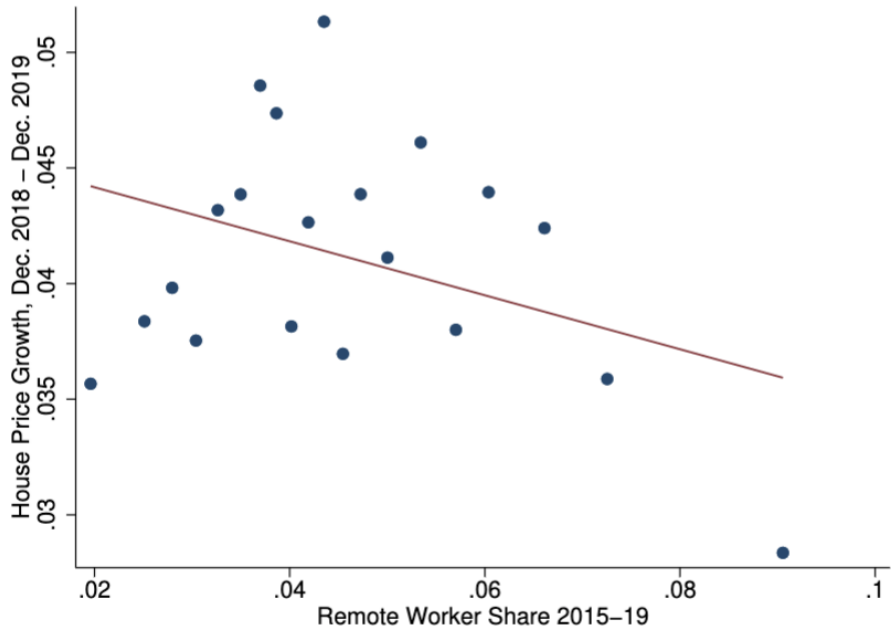
Dependent Variable:	Remote Worker Share 2015-19
	(1)
RHS variables:	
Predicted Remote Worker Share 2015-19	1.81***
	(0.19)
Share College	0.036
	(0.026)
Log Median Income	0.0046
	(0.0049)
Unemp. Rate 2019	−0.019
	(0.045)
Wage Growth Pre-Pandemic	−0.0075
	(0.015)
Total Dividends / AGI	0.046**
	(0.022)
Log Density	−0.00087
	(0.00072)
Share 65+	0.084***
	(0.021)
January Temperature	0.00037***
	(0.000092)
July Temperature	−0.00068***
	(0.00014)
July Humidity	−0.00019**
	(0.000073)
Race Controls	Yes
CBSA Clusters	50

Reduced Form

A. House Price Growth from Dec. 2019 - Nov. 2021



B. House Price Growth from Dec. 2018 - Dec. 2019



- Concerns?

IV

Dependent Variable:	House Price Growth, Dec. 2019 - Nov. 2021							
	OLS				IV			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RHS variables:								
Remote Worker Share 2015-19	1.97***	2.05***	2.08***	1.98***				
	(0.31)	(0.29)	(0.26)	(0.24)				
Remote Worker Share 2020					1.14***	1.20***	1.30***	1.37***
					(0.17)	(0.16)	(0.16)	(0.16)
HP Growth Pre-Pandemic		0.62**	0.78***	0.74***		0.87***	0.89***	0.83***
		(0.24)	(0.22)	(0.22)		(0.22)	(0.23)	(0.22)
Nonparametric Density Control	No	No	Yes	Yes	No	No	Yes	Yes
Demographic Controls	No	No	Yes	Yes	No	No	Yes	Yes
Wage & Unemployment Controls	No	No	No	Yes	No	No	No	Yes
Stock Exposure Control	No	No	No	Yes	No	No	No	Yes
F-Statistic					248.11	222.47	356.56	346.96
CBSA Clusters	50	50	50	50	50	50	50	50
R^2	0.17	0.20	0.34	0.39	0.11	0.15	0.19	0.23
Observations	895	895	895	895	895	895	895	895

- Concerns?

Other Outcomes

TABLE 5
Effect of Remote Work on Broader Outcomes, Dec. 2019 - Nov. 2021

	Coeff.	S.E.	F-Stat	N
Residential Rent				
(1) Rent Growth	1.09***	(0.33)	120.7	178
(2) House Price Growth (Rent Sample)	1.03***	(0.28)	133.2	178
Commercial Rent (Reduced Form)				
(3) Commercial Rent Growth	−0.26*	(0.13)		25
(4) House Price Growth (Com. Rent Sample)	2.37***	(0.65)		25
Local Inflation (Reduced Form)				
(5) Inflation excl. Shelter	0.44	(0.33)		22
(6) House Price Growth (Inflation Sample)	2.98***	(0.70)		22
Housing Supply				
(7) Permit Growth	2.03**	(0.91)	352.1	714
(8) Growth of Cumulative Homes Sold	−0.16	(0.35)	260.8	544

- Concerns?

Why Control for Migration?

Dependent Variable:	House Price Growth, Dec. 2019 - Nov. 2021							
	OLS				IV			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
RHS variables:								
Remote Worker Share 2015-19	1.31***	1.38***	1.47***	1.43***				
	(0.23)	(0.23)	(0.17)	(0.15)				
Remote Worker Share 2020					0.73***	0.78***	1.00***	0.98***
					(0.11)	(0.11)	(0.11)	(0.11)
HP Growth Pre-Pandemic		0.38*	0.49***	0.46***		0.53***	0.55***	0.52***
		(0.20)	(0.16)	(0.16)		(0.18)	(0.17)	(0.16)
Net Inflow Rate Pandemic	1.16***	1.12***	1.06***		1.29***	1.25***	1.15***	
	(0.24)	(0.22)	(0.24)		(0.22)	(0.20)	(0.22)	
Net Inflow Rate Pre-Pandemic	0.93***	0.84***	0.81***		0.88***	0.74***	0.71***	
	(0.27)	(0.26)	(0.23)		(0.25)	(0.25)	(0.22)	
Nonparametric Density Control	No	No	Yes	Yes	No	No	Yes	Yes
Demographic Controls	No	No	Yes	Yes	No	No	Yes	Yes
Wage & Unemployment Controls	No	No	Yes	Yes	No	No	Yes	Yes
Stock Exposure Control	No	No	Yes	Yes	No	No	Yes	Yes
Nonparametric Migration Control	No	No	No	Yes	No	No	No	Yes
F-Statistic					220.19	211.26	297.60	300.62
CBSA Clusters	50	50	50	50	50	50	50	50
R^2	0.33	0.34	0.50	0.53	0.37	0.39	0.44	0.47
Observations	895	895	895	895	895	895	895	895

Model

- What is the purpose of the model?
- What do we learn from the model that we do not learn from the empirics?
- What did you think of the model structure?

Outline

1. Introduction
2. Hausman, Rhode, and Wieland (2019, AER)
3. Chodorow-Reich, Guren, McQuade (2024, ReStud)
4. Mondragon and Wieland (2022, WP)
5. Acosta, Mueller, Nakamura, Steinsson (2023, WP)

Unemployment Benefit Extensions

- What is the effect of extending unemployment benefits?
- Popular tool during recessions. Benefits extended in 2008, 2020 from 26 to 99 weeks.
- What is the effect on employment?
- Most of the existing work focusses on Great Recession.
- This paper: all recessions since 1973-5.

Variation (1)

[FIGURE 1]

- What is valid variation?

Variation (2)

[TABLE 1]

- What is valid variation?

Variation (3)

[FIGURE 2]

- What is valid variation?

Variation (4)

[TABLE 2]

- What is valid variation?

Variation (5)

[FIGURE 3]

- What is valid variation?

Variation (5)

[FIGURE 4]

- What is begin identified?

Empirical Strategy

- Estimation equation:

$$x$$

Treatment Effect

[FIGURE 5]

Treatment Effect

[TABLE 5]

Treatment Effect

[FIGURE 6]

Model

- What is the purpose of the model?
- What do we learn from the model that we do not learn from the empirics?
- What did you think of the model structure?