Softening the Blow

U.S. State-Level Banking Deregulation and Sectoral Reallocation after the China Trade Shock

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Background

- COVID 19 & the energy transition as a major reallocation shock, permanently changing the relative importance of entire sectors in the economy.

- What role does access to finance play in dealing with such asymmetric reallocation shocks in a monetary union?

- This paper: Examine role of banking integration for for sectoral reallocation after the China Trade Shock (CTS) in the United States in the late 1990s and early 2000s.

Banking integration in the United States: a state-level laboratory

- Until the late 1970s, interstate banking was barred in most federal states.
- U.S. state-level banking deregulation during the 1980s allowed the creation of banks that were integrated across state-borders, operating internal capital markets to lend to firms and consumers in other states.
- Deregulation took place at different times in different states —> interesting variation to exploit
- Deregulation left a long shadow: early-deregulated states are effectively financially more integrated with the rest of the US than late deregulators — even more than a decade later (Hoffmann and Stewen (JEEA 2020), Mian, Sufi and Verner (JF 2019))

Geography of U.S. state-level banking deregulation

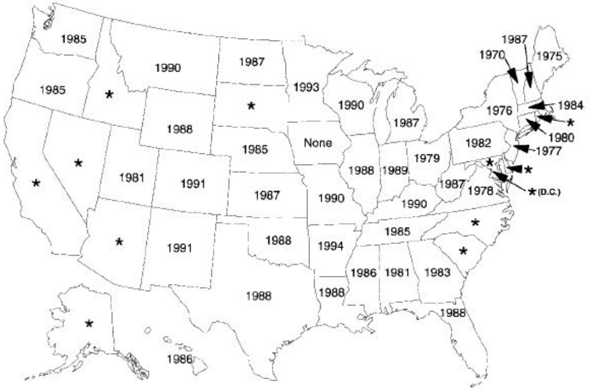
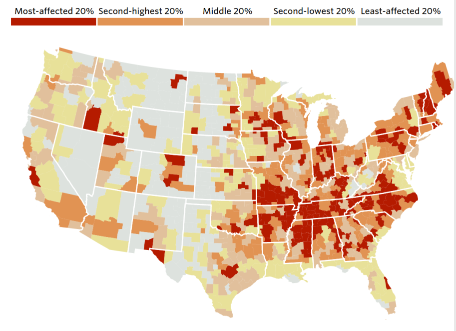


FIGURE I
Deregulation of Restrictions on Intrastate Branching
*Permitted Intrastate Branching before 1970.

Source: Kroszner & Strahan QJE 1999

The China Trade Shock (Autor, Dorn, Hansen 2013)



Source: https://chinashock.info/

- Location-specific import exposure:

$$\Delta \mathrm{IE}^{l}_{ut} = \sum_i \frac{L^{l}_{it-1}}{L^{l}_{t-1}} \cdot \frac{\Delta IM_{ucit}}{L_{uit-1}}$$

- ΔIM_{ucit}: 1990-2007 change in U.S. imports from China in industry i
- L_{uit-1}: U.S. wide employment in industry i
- $\frac{L^{l}_{it-1}}{L^{l}_{t-1}}$: share of industry i in total employment of location l

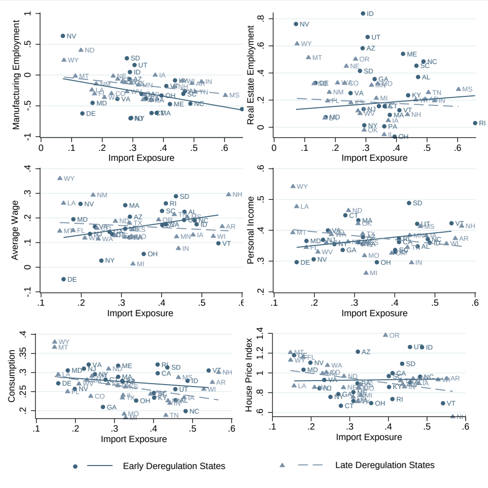
Our story

- China Trade Shock ("CTS") was a major terms of trade shock to U.S. with considerable variation in exposure across local economies (states, CZs)
- Financially more open states (those that had liberalized earlier in the 1980s) coped better with this shock after mid-1990s. Local economies in such states saw …
  - smaller declines in housing prices.
  - smaller declines in wages, income and aggregate employment
  - swifter reallocation of employment from exposed manufacturing towards non-tradeable and service sector
  - More stable consumption, but also higher credit growth

Earlier literature: role of banking liberalization for *credit supply.*

Our focus here: financial integration helps cushion the fallout from a major shock to *credit demand.*

Banking deregulation and long-term effects of the CTS



Import exposure and key macro outcomes in early/late deregulation states

A simple model: firms

We consider a currency union with many local economies, $l = 1, \ldots, L$, each producing goods in the tradable (manufacturing: M) and housing (H) sectors:

$$Y_{M,t} = A_M N_{M,t}^{\alpha}$$

The stock of housing evolves according to

$$H_t = (1 - \delta) H_{t-1} + Y_{H,t},$$

and gross housing investment is

$$Y_{H,t} = A_H N_{H,t}^{\eta}$$

Labor is mobile between sectors, so wages equalize.

Model: households

Households maximize

$$U_0 = \mathbb{E}_0 \left\{ \sum_{t=0}^{\infty} \beta^t \left(\frac{X_t^{1-\sigma}}{1-\sigma} - \frac{N_t^{1+\nu}}{1+\nu} \right) \right\}$$

where

$$X_t = \left[\gamma^{\frac{1}{\theta}} C_t^{\frac{\theta-1}{\theta}} + (1-\gamma)^{\frac{1}{\theta}} H_t^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}$$

is CES-bundle of traded consumption goods and housing services

Model: tradable consumption and the terms of trade

Tradable consumption consists of imported and locally produced imported goods:

$$C_t = \left[\varphi^{\frac{1}{\vartheta}} C_{M,t}^{\frac{\vartheta-1}{\vartheta}} + (1-\varphi)^{\frac{1}{\vartheta}} C_{I,t}^{\frac{\vartheta-1}{\vartheta}} \right]^{\frac{\vartheta}{\vartheta-1}}$$

and the associated price index is

$$P_{C,t} = \left[\varphi P_{M,t}^{1-\vartheta} + (1-\varphi) P_{I,t}^{1-\vartheta} \right]^{\frac{1}{1-\vartheta}}$$

Normalizing $P_{I,t} = 1$, we can think of $P_{M,t}$ as the terms of trade.

Increased import competition = $P_{M,t} \downarrow$

Model: banking sector and financial openness

We consider a risk neutral bank that maximizes profit under a Value-at-Risk (VaR) constraint. The bank captures funds at rate r^* in the US wide money/deposit market and intermediates them to local economies.

The FOC of the bank then implies that leverage is given by

$$\frac{L}{E} = \frac{1 + r^*}{\Phi \sigma_n - (r^e - r^*)}$$

where L is lending, E bank equity, r^e is the bank's expected portfolio return and σ_n its standard deviation. Φ is the distance to default.

We assume that $\sigma_n = \frac{\sigma}{\sqrt{n}}$ where n is the number of locations in which the bank is active. An increase in r^e due to a positive credit demand shock changes bank lending as

$$\frac{dL/L}{dr^e} = \frac{1}{\Phi \sigma_n - (r_t^e - r^*)}$$

Hence, a more diversified bank (higher n) will be more elastic in its lending response!

Closing the small open-economy model

Assume that the bank is active in n equally sized local markets, so that $L = nB$. Then

$$r^e(n) = r^* + \frac{\Phi\sigma}{\sqrt{n}} - \frac{E(1+r^*)}{nB}$$

And log-linearizing around B and r^e we obtain for local interest rates and lending

$$r_t^l = r^e(n) + \frac{E(1+r^*)}{nB} \times \frac{B_t^l - B}{B} = r^* + \frac{\Phi\sigma}{\sqrt{n}} + \omega \times \left[exp\left(\frac{B_t^l}{B} - 1\right) - 1 \right]$$

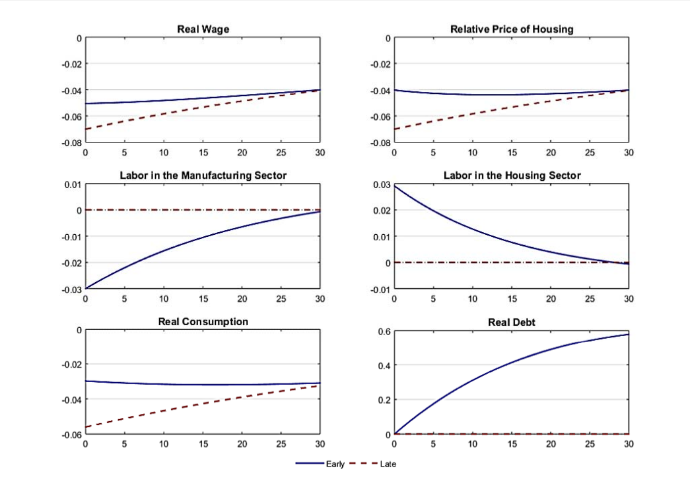
where

$$\omega = \omega(l) = 1/\text{elasticity of credit supply in location } l$$

and the lending supply elasticity of the bank is increasing in its geographical diversification, n.

Think: early-deregulated states have low ω (high n), late-deregulated states high ω (low n).

Model Predictions



Impulse responses of key variables

Empirical Analysis: Data

- County Business Patterns, U.S. Census Bureau: annual payroll, number of employees, and number of establishments by county and industry
- Regional Economic Accounts, U.S. Bureau of Economic Analysis: Personal income, consumption, population
- Import data by manufacturing sector from ADH 2013.
- House prices from FHFA (county, czone) and Lincoln Institute of Land Policy (state).
- Data on mortgage applications and mortgage refinancing and equity withdrawal by bank and county aggregated from HMDA.

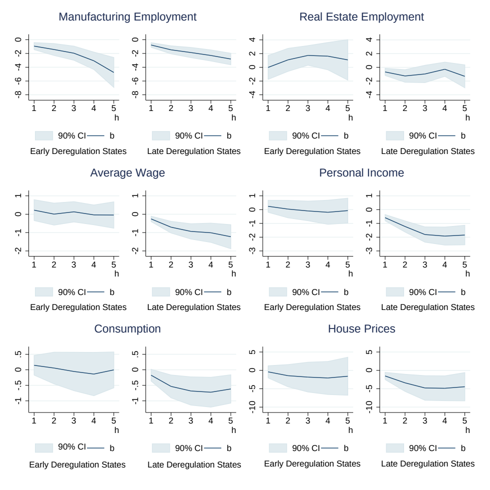
Empirical Analysis: Measuring (state-level) financial openness

$$DI = 1995 - \text{Year of banking liberalization in state } s$$

- Liberalization usually happened on a reciprocal basis
- Hence, more time elapsed since libearlization gives home banks more time to establish themselves in other states…
- … and out-of-state banks a longer time to build up a presence in state s.
- Empirically, early-liberalized states have higher presence of "integrated" banks (see Hoffmann & Stewen, JEEA 2020)).
- Advantage: DI clearly pre-determined w.r.t to China shock from the mid-1990.s Conditional on controlling for pre-1997 characteristics, should be exogenous.
- … but DI still only varies at state-level in our CZ-level regs.

State-level results: dynamic responses

$$\ln Y^l_{t+h} - \ln Y^l_t = \beta_h \Delta \mathrm{IE}^l_t + \alpha^l + \tau_t + \epsilon^l_{t+h}$$



LLPs of state-level outcomes

CZ-level results: long-term ("decadal") regressions

$$\overline{\Delta Y}^{l}_{d} = \beta \overline{\Delta \mathrm{IE}}^{l}_{d} + \delta \overline{\Delta \mathrm{IE}}^{l}_{d} \times \mathrm{DI}^{s(l)} + \mathrm{CONTROLS} + \alpha^{l} + \tau_{d} + \epsilon^{l}_{t+h}$$

where d stands in turn for the two periods 1991-2000 and 2001-2007.

	Dependent variable: period-average change in											
	log house price		manufacturing emp. share		non-tradable emp. share		*log* wages		*log* employment		*log* income	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\overline{\Delta \mathrm{IE}}^{l}_{d}$	-0.2935***	-0.2507***	-0.0353	-0.0001	-0.0209	-0.0401*	-0.0336***	-0.0226**	-0.0472**	-0.0319	-0.0270**	-0.0158
	(-4.979)	(-3.832)	(-1.229)	(-0.0041)	(-0.8673)	(-1.773)	(-4.592)	(-2.405)	(-2.434)	(-1.539)	(-2.206)	(-1.269)
$\mathrm{DI} \times \overline{\Delta \mathrm{IE}}^{l}_{d}$	0.0217***	0.0200***	-0.0042*	-0.0041***	0.0036*	0.0035**	0.0020**	0.0018***	0.0045***	0.0040***	0.0015*	0.0016**
	(2.929)	(3.023)	(-1.819)	(-2.876)	(1.893)	(2.491)	(2.429)	(2.856)	(3.812)	(3.787)	(1.781)	(2.178)
$\mathbf{PRE91}^{l} \times \overline{\Delta \mathrm{IE}}^{l}_{d}$		Yes		Yes		Yes		Yes		Yes		Yes
Fixed-effects												
czone	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics												
Observations	1,294	1,294	1,436	1,436	1,436	1,436	1,436	1,436	1,436	1,436	1,436	1,436
R^2	0.65220	0.68160	0.97758	0.98018	0.97584	0.97804	0.77475	0.80331	0.75611	0.76561	0.48317	0.49921
Within R^2	0.34154	0.39719	0.04622	0.15669	0.02403	0.11294	0.15709	0.26398	0.08630	0.12190	0.02490	0.05514

CZ-level results: annual panel regressions

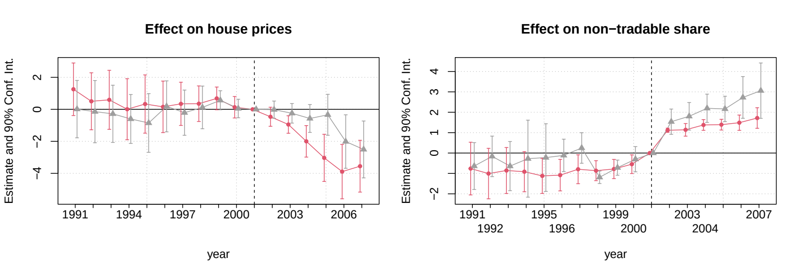
$$\Delta Y^l_{t+1} = \beta \Delta \mathrm{IE}^l_t + \delta \Delta \mathrm{IE}^l_t \times \mathrm{DI}^{s(l)} + \mathrm{CONTROLS} + \alpha^l + \tau_t + \nu^l_t$$

	Dependent variable: Annual change in ...					
	log house price (1)	manufacturing share (2)	non-tradable share (3)	*log* wages (4)	*log* employment (5)	*log* income (6)
ΔIE	-0.3171***	-0.0943***	0.0643**	0.0116	-0.0534	-0.0187
	(-3.688)	(-3.694)	(2.421)	(0.2302)	(-1.585)	(-0.5383)
DI × ΔIE	0.0190**	-0.0036**	0.0041**	0.0044	0.0028	0.0036*
	(2.431)	(-2.140)	(2.271)	(1.273)	(0.8247)	(1.893)
PRE91 × ΔIE	Yes	Yes	Yes	Yes	Yes	YES
Aggregate × ΔIE	Yes	Yes	Yes	Yes	Yes	YES
Fixed-effects						
czone	Yes	Yes	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics						
Observations	9,963	11,493	11,493	11,493	11,493	11,493
R^2	0.28150	0.10062	0.17805	0.14616	0.17813	0.15293
Within R^2	0.03881	0.00789	0.00444	0.00449	0.00160	0.00458

Pre-trends and dynamics of CTS over time

Split sample by early/late deregulation states.Then estimate

$$Y_{t+1}^{l} = \beta_t \times year_t \times \Delta \mathrm{IE}^{l} + \alpha_l + \tau_t^{s(l)} + \epsilon_t^{l}$$



Was the CTS really a credit demand shock?

- Dynamics line up with model predictions.But what's the mechanism?
- Was credit more easily available in early-deregulated states? Why?
- Shed some light on these issues using bank-county level data obtained from the Home Mortgage Disclosure Act Data base (HMDA)

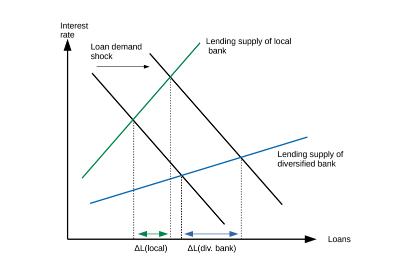
$\longrightarrow$ show that CTS was a positive credit demand shock, i.e it increased mortgage lending for refinancing and equity withdrawal.

$\longrightarrow$ Early-liberalized states have larger presence of geographically diversified banks.

$\longrightarrow$ Response to credit demand shock by geographically diversified banks was more elastic.

$\longrightarrow$ The more elastic this response, the less house prices declined.

Intuition: local credit supply and bank's geographic diversification



Lending responses of diversified and local banks

- Early liberalized states have many geographically diversified banks .
- Our simple VaR model of banks implies diversified banks are more elastic in their credit supply in each location (see also Hoffmann and Stewen JEEA (2020)).
- Hence,they provide more lending than local banks in response to a local credit demand shock.

First evidence: bank-county level regressions

$$\frac{L_t^{b,c} - L_{t-1}^{b,c}}{L_{t-1}^{b,c}} = \alpha \times \Delta \mathrm{IE}_t^{\mathcal{CZ}(c)} + \delta \times \Delta \mathrm{IE}_t^{\mathcal{CZ}(c)} \times \mathrm{DIV}_{t-1}^{b} + \mathrm{CONTROLS}$$

HMDA data allows us to distinguish between

a) home purchase and improvement loans $\longrightarrow$ reflect long-run investment into a durable asset. Likely to be negatively associated with CTS.

b) refinancing / equity withdrawal loans $\longrightarrow$ reflect consumption smoothing, likely positively associated with the CTS.

Bank-level lending responses

Dependent Variables:	refinancing & equity withdrawal			purchase & home improvement		
	(1)	(2)	(3)	(4)	(5)	(6)
Diversification level =	county	czone	state	county	czone	state
ΔIE_t^c	1.902	1.769	2.720	-10.98**	-10.81**	-8.839
	(0.5153)	(0.4714)	(0.6546)	(-2.159)	(-2.083)	(-1.529)
$\text{DIV}_{t-1} \times \Delta \text{IE}_t^c$	4,243.4	2,483.9**	875.0***	2,986.1	2,076.2	806.0*
	(1.426)	(2.422)	(3.158)	(0.4703)	(0.8172)	(1.890)
DIV_{t-1}	-893.1***	-274.2*	-123.6***	-1,445.0	-323.4	-178.6***
	(-2.602)	(-1.931)	(-4.850)	(-1.618)	(-1.324)	(-2.928)
Fixed-effects						
bank-county	Yes	Yes	Yes	Yes	Yes	Yes
czone-year	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics						
Observations	391,077	391,077	391,077	423,647	423,647	423,647
R^2	0.20141	0.20131	0.20171	0.24774	0.24762	0.24801

Identifying credit demand shocks

Build on Amiti & Weinstein (JPE 2018) and Hoffmann and Stewen (JEEA 2020) to decompose bank-county level mortgage growth.

Our theory suggests that demand shocks load more on more diversified banks.

$$\frac{L_t^{b,c} - L_{t-1}^{b,c}}{L_{t-1}^{b,c}} = \beta_t^b + \mathrm{DIV}_t^b \gamma_t^c + \nu_t^{b,c}$$

β_t^b : bank supply shock common to all counties c where bank b is active

γ_t^c : county-level demand shock common to all banks b in county c

Solving for local credit demand shocks

Then there is a unique solution $\{\beta_t^b\}_{b,t}$ and $\{\gamma_t^c\}_{t,c}$ such that lending adds up across banks and counties:

$$\mathrm{MG}_t^b = \frac{L_t^b - L_{t-1}^b}{L_{t-1}^b} = \sum_c \phi_{t-1}^{b,c} \frac{L_t^{b,c} - L_{t-1}^{b,c}}{L_{t-1}^{b,c}} = \beta_t^b + \mathrm{DIV}_{t-1}^b \sum_c \phi_{t-1}^{b,c} \gamma_t^c$$

$$\mathrm{MG}_t^c = \frac{L_t^c - L_{t-1}^c}{L_{t-1}^c} = \sum_b \omega_{t-1}^{b,c} \frac{L_t^{b,c} - L_{t-1}^{b,c}}{L_{t-1}^{b,c}} = \overline{\mathrm{DIV}}_{t-1}^c \gamma_t^c + \sum_b \omega_{t-1}^{b,c} \beta_t^b$$

where

$$\overline{\mathrm{DIV}}_{t-1}^c = \sum_b \omega_{t-1}^{b,c} \mathrm{DIV}_{t-1}^b$$

Aggregating up: cz-level regs again

We construct the commuter-zone level aggregate lending response to the credit demand shocks as

$$\mathrm{LR}_t^z = \sum_{c \in \mathcal{C}(z)} \mu_{t-1}^c \overline{\mathrm{DIV}}_{t-1}^c \gamma_t^c$$

where μ_{t-1}^c is the lending share of county c in the commuter zone.

We then run cz-level regs of the form

$$\Delta hpi_t^z = a \times \mathrm{MG}_t^z + b \times \Delta \mathrm{IE}_t^z + \mathrm{CONTROLS}$$

in which we use LR^z as an instrument.

Constructing exogenous weights

$\longrightarrow$ Banks' local market and portfolio shares are endogenous. We build on Hoffmann and Stewen (2020 JEEA) in constructing "as-if"-weights using the regulatory history of banks' host and origin states:

$$\omega_{t-1}^{b,c} = \frac{\text{Number of years bank } b \text{ can enter county } c}{\sum_{b \in \mathcal{B}_{t-1}(c)} \text{Number of years bank } b \text{ can enter county } c}$$

$$\phi_{t-1}^{b,c} = \frac{\text{Number of years bank } b \text{ can enter county } c}{\sum_{c \in \mathcal{C}_{t-1}(b)} \text{Number of years bank } b \text{ can enter county } c}$$

Use these de-iure weights in constructing the instrument LR^z

CZ-level IV regressions for house prices and other outcomes

Dependent Variables:	Mortgage Growth	HP growth	man.-share	nt-share
IV stages	First	Second	Second	Second
Model:	(1)	(2)	(8)	(14)
Variables				
$\Delta \mathrm{IE}_t^{\mathcal{CZ}}$	0.0382	-0.9557***	-0.4188***	0.2308
	(0.0172)	(-4.185)	(-2.869)	(1.040)
LR(de iure)	0.0010***			
	(3.201)			
Mortgage Growth		0.0689***	-0.0174**	0.0040
		(3.383)	(-2.062)	(0.3585)
Fixed-effects				
czone	Yes	Yes	Yes	Yes
year	Yes	Yes	Yes	Yes
Fit statistics				
Observations	6,876	6,876	8,541	8,541
R^2	0.70359	-0.13062	0.93307	0.95180

$$\Delta hpi_t^c = a \times \mathrm{LR}_t^c + b \times \Delta \mathrm{IE}_t^{\mathcal{CZ}(c)} + \mathrm{CONTROLS}$$

Credit demand shock and import exposure

In our model, HH-credit demand shocks reflect shocks to transitory income. A positive transitory income shock lowers credit demand and vice versa.

We construct measures of transitory income as follows:

$$\Delta inc^c_{t+1} = \rho \times \Delta inc^c_t + \delta \Delta \mathrm{IE}^c_{t+1} + \varepsilon^c_{t+1}$$

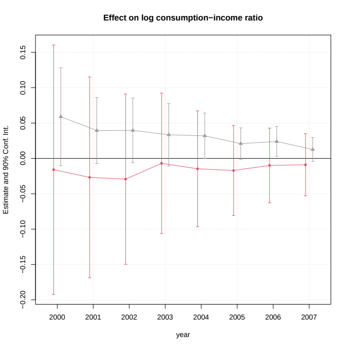
Then the (shock to the) BN-transitory component of income is

$$\Delta inc^T_{t+1} = -\left(\mathbb{E}_{t+1} - \mathbb{E}_t\right) \sum_{h=1}^{\infty} \Delta inc^c_{t+h} = -\frac{\delta \Delta \mathrm{IE}_{t+1}}{1-\rho}$$

A regression of γ^c_t on Δinc^T_t reveals a strongly negative coefficient.

HH-level evidence: consumption responses

Our mechanisms rotates around the consumption smoothing (CS) of households. CS only possible if the shock is transitory (or perceived to be so ex ante)



Responses of consumption-income ratios to CTS in HH-data (CEX)

Conclusion

- Differences in financial (banking) market integration were important for how strongly the China trade shock affected local economies in the U.S. over the period 1991-2007.
- States that liberalized earlier had a higher presence of integrated banks which faciliated access to finance.
- HH access to finance seems key in explaining this effect.
- HH access to credit allows consumption smoothing and stabilizes local demand for non-tradeable goods.
- This keeps non-tradeable prices and wages higher and facilitates the sectoral reallocation.

Lessons for European Monetary Union in a Post-COVID world

- CTS in the U.S: was a major reallocation shock
- …so is COVID19, … or the energy transition, … !
- Our results show that HH-finance (and not only firm-finance) is important for such reallocations to work
- This bodes badly for EMU today: its banking union is still incomplete, retail banking markets remain nationally segmented
- The unfinished homework of Europe's policymakers remains: finish the banking union, get a common deposit insurance system, encourage cross-border consolidation in banking …