On Section 3 of "What explains the 2007-09 drop in employment?"

by Atif Mian and Amir Sufi, Econometrica, Nov. 2014.

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From Mian and Sufi's abstract

- Deterioration in household balance sheets, or the *housing net worth channel*, played a significant role in the sharp decline in U.S. employment 2007-09.
- Counties with a larger decline in housing net worth experienced a larger decline in non-tradable employment.
- Result not driven by industry-specific supply side shocks, policy-induced business uncertainty, or credit supply tightening.
- No significant expansion of the tradable sector in counties with the largest decline in housing net worth.
- Little evidence of wage adjustment within or emigration out of the hardest hit counties.

A simple partial-equilibrium model

m counties, $i = 1, 2, \ldots, m$; may differ w.r.t. housing net worth.

Same size $= 1 =$ labor supply in each county.

In each county two sectors:
Sector N produces a *non-tradable good* (only sold at the local market).
- T - *tradable* good (sold economy-wide at one price).

Labor homogeneous, immobile across counties, mobile across sectors within a county.

Production capital not considered.

Houses are treated as non-produced land. Focus is on the channel from a fall in housing net worth to non-tradables production independently of an effect on construction.

Preferences: $U(c^N, c^T) = \alpha \log c^N + (1-\alpha) \log c^T$. Hence,

$$\begin{aligned} P_i^N c_i^N &= \alpha D_i, \\ P^T c_i^T &= (1-\alpha) D_i, \end{aligned}$$

where D_i = nominal consumption demand at i. *Production:*

$$\begin{aligned} y_i^N &= a e_i^N, \\ y_i^T &= b e_i^T. \end{aligned}$$

Walrasian general equilibrium: Households and firms are price takers, markets clear by price adjustment:

$$W_i = P_i^N a = P^T b \equiv W, \quad \text{hence} \quad P_i^N = P^N \ \ \forall i, \ \text{ and } \ P^N / P^T = b/a.$$

$$\begin{aligned} e_i^N + e_i^T &= 1, \qquad \forall i, \\ y_i^N &= c_i^N = \alpha D_i / P_i^N = \alpha D_i / P^N, \qquad \forall i, \\ y_i^T &\neq c_i^T \ \text{ generally, since } D_i\text{'s may differ,} \\ \text{but} \qquad \sum_{i=1}^{m} y_i^T &= \sum_{i=1}^{m} c_i^T = \frac{(1-\alpha)\sum_{i=1}^{m} D_i}{P^T}. \end{aligned}$$

Money neutrality!

Determination of P^T, P^N, and sectoral allocation of employment

$$\begin{aligned}\sum_{i=1}^{m} y_i^T &= \sum_{i=1}^{m} be_i^T = b\sum_{i=1}^{m}(1-e_i^N) = b\sum_{i=1}^{m}(1-\frac{y_i^N}{a}) = b\sum_{i=1}^{m}(1-\frac{\alpha D_i}{aP^N}) \\ &= b\left(m - \frac{\alpha\sum_{i=1}^{m} D_i}{aP^N}\right) = \frac{(1-\alpha)\sum_{i=1}^{m} D_i}{P^T}.\end{aligned}$$

So

$$P^T = \frac{\sum_{i=1}^{m} D_i}{bm}, \qquad P^N = \frac{\sum_{i=1}^{m} D_i}{am}, \qquad W = P^T b = P^N a. \qquad (*)$$

$$e_i^N = \frac{y_i^N}{a} = \frac{\alpha D_i}{aP^N}, \qquad e_i^T = 1 - \frac{\alpha D_i}{aP^N}, \qquad \forall i. \qquad (**)$$

Assume initial symmetry,

$$\begin{aligned} D_i &= D_0, \qquad i = 1, 2, \ldots, m. \qquad \text{Then,} \\ P^{*T} &= \frac{D_0}{b}, \qquad P^{*N} = \frac{D_0}{a}, \qquad W^* = P^{*T} b = D_0, \\ e_i^{*N} &= \frac{\alpha D_0}{aP^{*N}} = \alpha, \qquad e_i^{*T} = 1-\alpha, \qquad \forall i. \end{aligned}$$

Negative demand shock. Suppose, a negative shock to housing net worth occurs, perhaps due to a bursting housing bubble. Suppose further that this triggers a tightening of borrowing constraints on indebted households.

As a result, to a varying degree across counties, households' nominal demand falls.

Let initial uniform demand, D_0, equal 1, so that

$$D_i = 1 - \delta_i, \ \forall i \qquad \delta_i \in (0, 1).$$

Average shock is

$$\frac{\sum_{i=1}^{m} \delta_i}{m} \equiv \bar{\delta}.$$

Non-tradable employment relies heavily on local demand, while tradable employment relies on national or even global demand.

Case 1: Complete nominal price flexibility.

$$\sum_{i=1}^{m} D_i = \sum_{i=1}^{m}(1-\delta_i) = m - \sum_{i=1}^{m}\delta_i = m - m\bar{\delta} = m(1-\bar{\delta})$$

Prises fall in proportion to fall in nominal demand:

$$\begin{aligned} P^T &= \frac{1-\bar{\delta}}{b} \quad \text{and} \quad P^N = \frac{1-\bar{\delta}}{a}, \\ W &= aP^N = bP^T = 1-\bar{\delta}. \end{aligned}$$

Still $e_i^N + e_i^T = 1$ (full employment $\forall i$), but with local sectoral reallocation:

$$\begin{aligned} e_i^T &= 1 - \frac{\alpha(1-\delta_i)}{1-\bar{\delta}} \gtreqless e_i^{*T} \ (= 1-\alpha) \ \text{ for } \ \delta_i \gtreqless \bar{\delta}, \ \text{respectively}, \\ e_i^N &= \frac{y_i^N}{a} = \frac{\alpha D_i}{aP^N} = \frac{\alpha(1-\delta_i)}{1-\bar{\delta}} \lesseqgtr e_i^{*N} \ (= \alpha) \ \text{ for } \ \delta_i \gtreqless \bar{\delta}, \ \text{respectively}. \end{aligned}$$

Predictions: Still full emplyment everywhere. In counties faced by a large local shock workers move from N-employment to T-employment. The reverse if shock is small.

Case 2: Complete nominal price rigidity

$$P^T = \frac{D_0}{b} = \frac{1}{b}, \qquad P^N = \frac{D_0}{a} = \frac{1}{a}.$$

From (**):

Tradables:

$$\begin{aligned}\sum_{i=1}^{m} y_i^T &= \frac{(1-\alpha)\sum_{i=1}^{m} D_i}{P^T} = \frac{(1-\alpha)m\bar{D}_i}{P^T} = \frac{(1-\alpha)m(1-\bar{\delta})}{P^T} \\ e_i^T &= \frac{y_i^T}{b} = \frac{\sum_{i=1}^{m} y_i^T}{mb} = \frac{(1-\alpha)(1-\bar{\delta})}{P^T b} = (1-\alpha)(1-\bar{\delta}) \\ &< e_i^{*T} = 1-\alpha, \ \forall i.\end{aligned}$$

$$\text{hence T-fall} \equiv e_i^{*T} - e_i^T = 1-\alpha-(1-\alpha)(1-\bar{\delta}) = (1-\alpha)\bar{\delta}.$$

Non-tradables:

$$\begin{aligned} e_i^N &= \frac{\alpha D_i}{aP^N} = \frac{\alpha(1-\delta_i)}{1} < e_i^{*N} = \alpha, \quad \forall i, \\ \text{hence N-fall} &\equiv e_i^{*N} - e_i^N = \alpha - \alpha(1-\delta_i) = \alpha\delta_i. \end{aligned}$$

Predictions:

1. Fall in total employment.
2. Fall in local T-employment should have no corr. with local shock δ_i.
3. Fall in local N-employment should have pos. corr. with local shock δ_i.

Data complies.

Likely explanation:

Lower housing net worth $\Rightarrow$ lower wealth

$$\Rightarrow \left\{ \begin{array}{l} \text{consumption} \downarrow \\ \text{value of collateral } \downarrow \Rightarrow \text{credit contraction} \end{array} \right\} \Rightarrow \text{consumption} \downarrow\downarrow$$

$\Rightarrow$ investment $\downarrow \Rightarrow$ consumption $\downarrow\downarrow\downarrow$

and so on in a vicious circle.

NOTES

Sizes of the adverse demand shocks are ordered in this way:

$$\delta_i < \delta_{i+1}, \qquad i = 1, 2, \ldots, m-1,$$

but of no use here.

Case 2:

Total employment in county i is

$$e_i = e_i^T + e_i^N = (1-\alpha)(1-\bar{\delta}) + \alpha(1-\delta_i) < 1 = e_i^*.$$

Fall in total employment in county i is

$$1 - e_i = 1 - ((1-\alpha)(1-\bar{\delta}) + \alpha(1-\delta_i)) = (1-\alpha)\bar{\delta} + \alpha\delta_i.$$

Prediction:

Fall in total local employment should have pos. corr. with local shock δ_i.

Data complies (no surprise given the above).