Labor Markets, Search Frictions and International Trade: *Assessing the China Shock*

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   - Calibration: Assessing the China Shock
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- Build a model that replicate U.S. data for the 1980s (before the *China Shock*)
- Introduce a new country in the international scene (*China*), and assess quantitatively the impact of this *"shock"*
- This means, try to understand how much of the observed change in the unemployment rate, the share of manufacture employment, production and wages for the U.S. between the 1980s and 2005-2007 is explained by this *shock*

How the Rise of China Affected the U.S. I

- The increasing import penetration had shaped markets in the U.S.

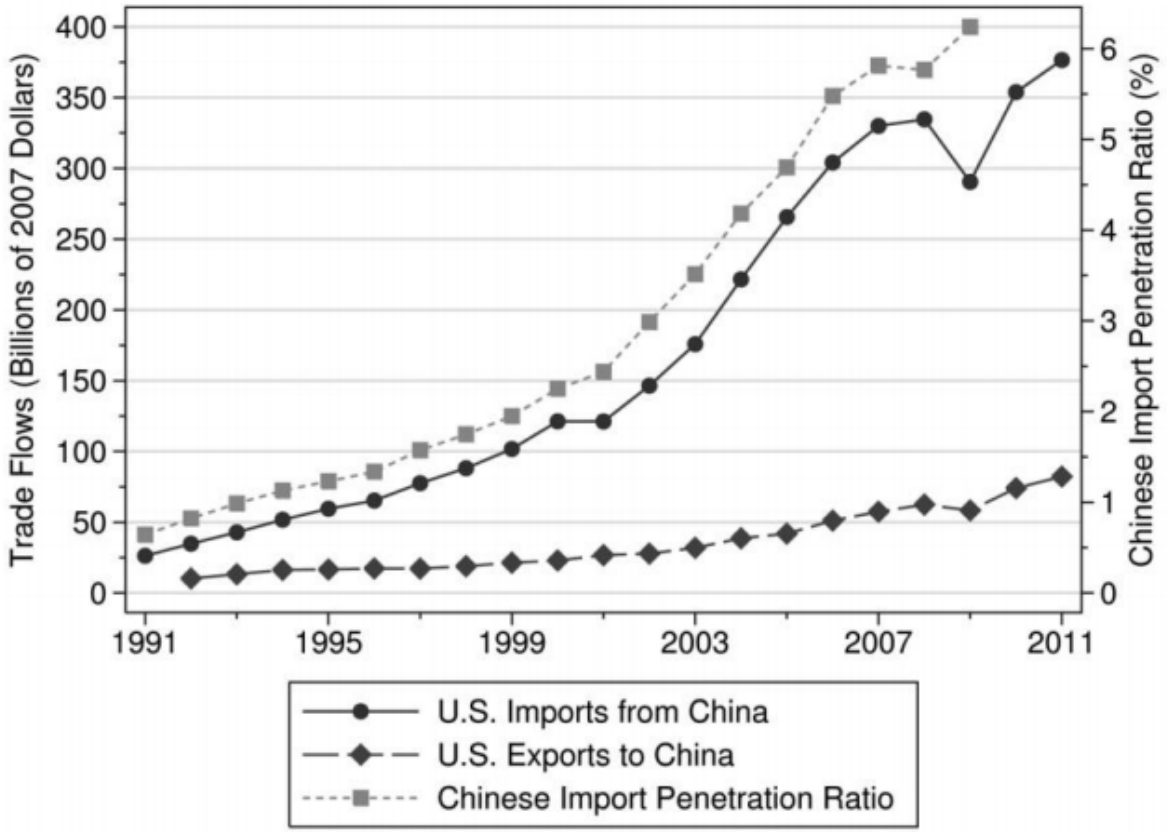

Figure: U.S. Trade with China: 1991-2011

How the Rise of China Affected the U.S. II

- According to Autor et al. (2013), under the most conservative estimation, Chinese import penetration explains 21% of the decline of the U.S. manufacturing employment between 1990 and 2007
- They also found that these import shocks reduce wages not only in the manufacturing sector but also in other sectors and that in the trade-exposed labor markets transfer benefits increased
- Evidence of frictions in the labor market
- Finally, the reduction in employment and wages appear to be persistent

Some Stylized Facts in the U.S.

The following Table summarize the information for the U.S. economy between the period 1980-1990 and 2005-2007

Table: Stylized Facts for the U.S.

Variable	1980-1990	2005-2007	% of variation
Manufacture Employment/Total Employment	18.30%	10.35%	-43.4%
Manufacture Production/GDP	19.03%	13.07%	-31.32%
Share of wages of manufacturing sector	23.14%	13.69%	-40.84%
Unemployment Rate	7.12%	4.77%	-33.01%
Price of imports relative to exports	-	-	-7.92%

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The question to address is: *How much of the variation is explained by the rise of China in the world markets?*

- The Closed Economy

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- There is a continuum of intermediate firms, having an infinte mass.
- Workers and firms discount future at rate β

The Environment (continuation)

- The flow of successful matches in sector i within a period is given by the following matching function $M_i(U_i, V_i) = \frac{U_i V_i}{[U_i^\eta + V_i^\eta]^{\frac{1}{\eta}}}$

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- Wages in each sector are the solution to a Perfect Nash Bargaining Game
- Government collect taxes from wages, provides unemployment insurance and runs a balanced budget

Value Functions

Value of being employed in sector i:

$$E(w_i) = w_i(1-\tau) + \beta[(1-\lambda)E(w_i') + \lambda U(w_i')] \tag{1.i}$$

Value of being unemployed in sector i:

$$U(w_i) = b + \beta[p(\theta_i)E(w_i') + (1-p(\theta_i))U(w_i')] \tag{2.i}$$

Value of a firm with a filled position in sector i:

$$J(w_i) = P_i^I - w_i + \beta[(1-\lambda)J(w_i') + \lambda V_i] \tag{3.i}$$

Value of a firm with an unfilled position in sector i:

$$V_i = -k_i + \beta[q(\theta_i)J_i(w_i') + (1-q(\theta_i))V_i] \tag{4.i}$$

Using the above equations we can get the following equilibrium condition:

$$k_i = \frac{\beta q(\theta_i)[P_i^I - w_i]}{1-\beta(1-\lambda)} \tag{5.i}$$

Moving Probabilities

- At each point of time an unemployed worker decides where to search for a job in the next period
- This decision depends on the value of being unemployed in each of the sectors (standard Logit probabilities from Discrete Choice Theory)
- Since we are not imposing costs of switching islands and also the workers probabilities of finding a job in each island does not depend on where they where working before, we will only have two probabilities

$$\pi_1 = \frac{1}{1 + \exp\{U(w_2) - U(w_1)\}} \tag{6.1}$$

$$\pi_2 = 1 - \pi_1 \tag{6.2}$$

Nash Bargaining in Sector i

Problem:

$$\max_{w} \left\{ \left[E(w_i) - \left(\sum_i \pi_i U(w_i) \right) \right]^{\alpha} \left[J(w_i) - V_i \right]^{1-\alpha} \right\}$$

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Solution:

$$w_i = b + \alpha_i [P_i^I - b + \theta_i k_i] \tag{7.i}$$

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We also know that in equilibirum $(1-\beta)U(w_1) = (1-\beta)U(w_2)$, therefore:

$$\frac{\theta_1 k_1 \alpha_1}{1-\alpha_1} = \frac{\theta_2 k_2 \alpha_2}{1-\alpha_2} \tag{8}$$

Final Goods Market

- Problem of the representative firm in sector 1:

$$\max_{H_1} \left\{ P_1 A_1 H_1^{\phi} - P_1^I H_1 \right\}$$

- Problem of the representative firm in sector 2:

$$\max_{H_2} \left\{ P_2 A_2 H_2^{1-\phi} - P_2^I H_2 \right\}$$

where $0 < \phi < 1$

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- FOCs:

$$P_1^I = P_1 A_1 \phi H_1^{\phi-1} \tag{9.1}$$

$$P_2^I = P_2 A_2 (1-\phi) H_2^{-\phi} \tag{9.2}$$

- Market clearing condition for the labor market:

$$N_i = \int H_i di \tag{10.i}$$

For $i = 1, 2$

Demand for final good

- I will assume that the profits of the final firms are distributed to the workers as dividends, therefore we will have only 5 types of agents consuming
- $r = e_1, e_2, u, f_{I,1}, f_{I,2}$: Employed in sector 1 ($e_1$), employed in sector 2 (e_2), owners of intermediate firms in sector 1 ($f_{I,1}$), owners of intermediate firms in sector 2 ($f_{I,2}$) and unemployed workers (u).

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- Then the problem of the r type consumer is:

$$\max_{C_1^r, C_2^r} \left\{ U(C_1^r, C_2^r) = [\delta (C_1^r)^\rho + (1-\delta)(C_2^r)^\rho]^{1/\rho} \right\}$$

$s.t.$

$$INC^r = P_1 C_1^r + P_2 C_2^r$$

Demand for final good (continuation II)

Income for each type r is given by:

- Income of employed in sector 1 is: $INC_{e_1} = w_1(1-\tau) + div_{e_1}$
- Income of employed in sector 2 is: $INC_{e_2} = w_2(1-\tau) + div_{e_2}$
- Income of an intermediate firm in sector 1 is: $INC_{f_{I,1}} = P_1^I - w_1$
- Income of an intermediate firm in sector 2 is: $INC_{f_{I,2}} = P_2^I - w_2$
  Income of an unemployed worker is: $INC_u = b + div_u$

Demand for final good (continuation III)

- Defining $d = \frac{\rho}{\rho - 1}$, then the First Order Conditions for agent r are given by:

$$C_1^r = \frac{INC^r(1 - P_a)}{P_1\left[P_2 + P_1^d P_2^{1-d}\left(\frac{\delta}{1-\delta}\right)\right]}$$

$$C_2^r = \frac{INC^r}{P_2 + P_1^d P_2^{1-d}\left(\frac{\delta}{1-\delta}\right)}$$

for $r = e_1, e_2, u, f_{I,1}, f_{I,2}$.

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- The aggregate demand for good i will be given by the integral over the consumption of good i of each of the agents:

$$C_i = \int C_i^r \, dr \qquad (11.i)$$

for $i = 1, 2$.

Market Clearing Condition Final Good Market

- Market for final good a will clear *iff*:

$$Y_1 = C_1 \tag{12.1}$$

- By Walras Law, the market for final good b will also clear:

$$Y_2 = C_2$$

Government

- Government runs a balanced budget at each period of time, implying:

$$ub = \tau(w_1 N_1 + w_2 N_2) \tag{13}$$

for all t, where u is the mass of unemployed workers in the economy

Steady State Competitive Equilibrium of the Closed Economy

Steady State Competitive Equilibrium of the Closed Economy (SSCECE)

A SSCECE consist on a list $\{w_i, \theta_i, \pi_i, P_i^I, N_i, H_i, P_i, Y_i, C_i\}$, for $i = 1, 2$, such that:

1. Free-entry conditions (5.1) and (5.2) are satisfied
2. Wage conditions (7.1) and (7.2) are satisfied
3. Indifference condition (8) is satisfied
4. Equations (11.i) are satisfied for $i = 1, 2$
5. Workers, firms and consumers make choices optimally
6. Government runs a balanced budget so that (13) is satisfied
7. And market clear conditions (10.1), (10.2) and (12.1) holds

Data

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- Data for the share of wages of the manufacturing sector and the share of the value added of the manufacturing sector was taken from the U.S. Bureau of Economic Activity
- I took averages of these variables for the periods 1980-1990 and 2005-2007, except for the unemployment rate of the manufacturing sector and the labor market tightness for which data is available only after the year 2000

Calibration: The U.S. during the 1980s

Table: Calibration

Variable	Description	Value	Source
λ	separation rate	36.80%	Davis et al. (1996)
θ_2	labor market tightness manufacturing sector	0.6338	den Haan et al. (2000)
η	parameter of matching function	1.27	den Haan et al. (2000)
$\alpha_1 = \alpha_2$	bargaining power of worker in both sectors	0.5	den Haan et al. (2000)
b	unemployment insurance	0.48	Shimer (2005)
$k_1 = k_2$	vacancy cost in both sectors	1.1	match data
ρ	parameter utility function	0.7	match data
δ	taste parameter	0.5	match data
β	discount factor	0.9966	Krusell et al. (2010)
ϕ	share of labor income in sector 1	0.6	match data
A_1	total factor productivity sector 1	1.05	match data
A_2	total factor productivity sector 2	2.7266	match data

Main Results

Table: The Closed Economy

1980-1990		
Variable	U.S. Data	Model
Manufacture Employment/Total Employment	18.30%	17.47%
Manufacture Production/GDP	19.03%	18.63%
Share of wages of manufacturing sector	23.14%	19.10%
Unemployment Rate	7.12%	7.05%
Labor Market Tightness in manufacturing sector (theta)	0.6330	0.3347
Relative Price	1.04	1.5337

- The Open Economy

International Trade

- The environment is the same as in the closed economy, but now there are two countries, denoted by $j = a, b$
- Define the trade balance for final good i of country j as:

$$T_i^j = Y_i^j - C_i^j$$

- Since countries are not allowed to borrow at the international market, trade must be balanced at each point in time for both countries, then market clearing condition become:

$$T_1^a + T_1^b = 0 \tag{14.1}$$

- Which, by Walras Law, implies that:

$$T_2^a + T_2^b = 0$$

Steady State Competitive Equilibrium of the Open Economy

Steady State Competitive Equilibrium of the Open Economy (SSCEOE)

An SSCEOE consist on a list $\{P_1, P_2\}$, and a list $\{w_i^j, \theta_i^j, \pi_i^j, (P_i^I)^j, N_i^j, H_i^j, Y_i^j, C_i^j\}$, for $i = 1, 2$ and $j = a, b$, such that:

1. Free-entry conditions $(5.1)^j$, $(5.2)^j$ are satisfied for $j = a, b$
2. Wage conditions $(7.1)^j$, $(7.2)^j$ are satisfied for $j = a, b$
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4. Equations $(11.i)^j$ are satisfied for $i = 1, 2$ and $j = a, b$
5. Agents make choices optimally in both countries
6. Governments in both countries run a balanced budget so that $(13)^j$ is satisfied for $j = a, b$
7. Market clear condition (14.1) and $(10.1)^j$, $(10.2)^j$ holds for $j = a, b$

Calibration for the Open Economy: Assessing the *China Shock*

Two strategies to assess the *China Shock*

1. Calibrate the parameters for China such that the variation of the average relative price of imports to exports between 1980-1990 and 2005-2007 for the U.S. is matched
2. Calibrate the parameters for China such that the model matches more than 50% of the variation in the share of manufacture employment, production and wages

Results I

Table: % of variation of observed data explained by using the model

Variable	Calibration (i)	Calibration (ii)
Manufacture Employment/Total Employment	26.35%	86.04%
Manufacture Production/GDP	16.28%	58.96%
Share of wages of manufacturing sector	27.44%	93.08%
Unemployment Rate	-0.43%	53.29%
Price of imports relative to exports	100%	347.60%

Results II

Table: Variation in Real Wages

Real Wages	Calibration(i)	Calibration (ii)
$\frac{w_1}{p_1}$	-1.25%	-3.79%
$\frac{w_2}{p_1}$	-1.02%	-3.60%
$\frac{w_1}{p_2}$	7.24%	32.78%
$\frac{w_2}{p_2}$	7.47%	33.04%

- Real wages in terms of the import good increase and decrease in terms of the export good
- This is not consistent with findings in Autor et al. (2013)

- Other Results

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$$\max_{b^a} W[U^{u^a}, U^{e_1{}^a}, U^{e_2{}^a}] = U^a U[C_1^{u^a}, C_2^{u^a}] + N_1^a U[C_1^{e_1{}^a}, C_2^{e_1{}^a}] + N_2^a U[C_1^{e_2{}^a}, C_2^{e_2{}^a}]$$

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2. Non traditional source of comparative advantage arises from differences in the *relative bargaining power of workers*

- Final Conclusions

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1. The *China Shock* in the model explains 26.38% of the variation in the share of employment in the manufacturing sector (in line with findings in Autor et al (2013)), 16.28% of the variation in the share of manufacturing production and 27.40% of the variation in the share of wages of the manufacturing sector

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The End