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The Global Labor Market Impact of Emerging Giants: a Quantitative Assessment

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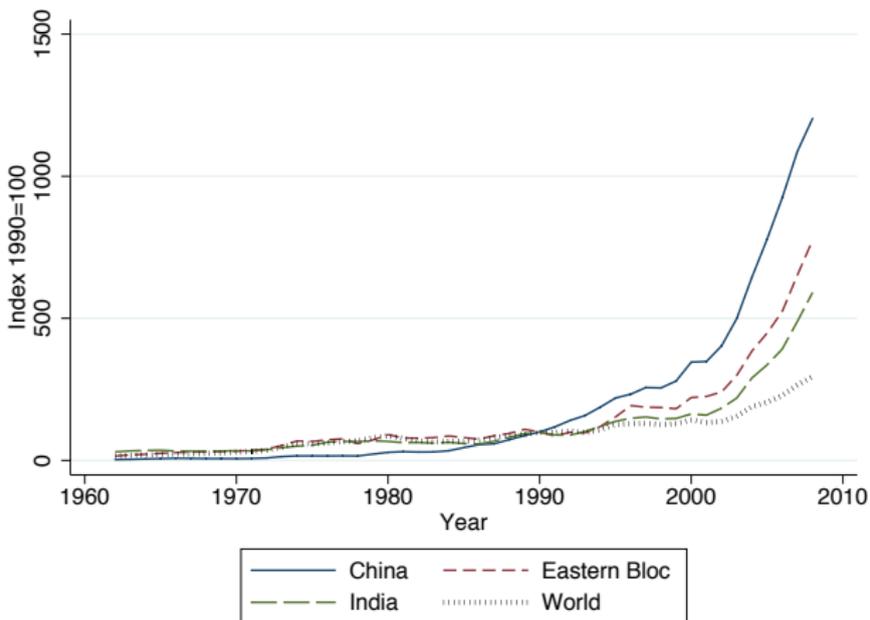
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Motivation

- Rapid trade integration of emerging giants – China, India, Central and Eastern Europe (CEECs)



Labor Market Impact?

- Workers displaced by import competition suffer longer unemployment and lower wages (OECD 2005)
- U.S. workers competing with Chinese imports experience reductions in income and LF participation (Autor, Dorn and Hanson 2012, Autor, Dorn, Hanson and Song 2012)
- Labor share of income in OECD has been falling, partly due to trade with emerging market countries (IMF 2005, OECD 2012)
- More generally, labor market adjustment to trade liberalization is far from frictionless (Artuç 2009, Artuç Chaudhuri and McLaren 2010, Dix-Carneiro 2011)

This Paper

Quantitative assessment of both aggregate and distributional effects of emerging giants' trade integration

- Ricardian-Heckscher-Ohlin model
- 75 countries, 20 sectors
 - A number of realistic features: fully fledged input-output linkages between sectors; a non-tradeable sector; multiple factors of production; both inter- and intra-sectoral trade
- Estimated productivities in each sector and country; match incomes and bilateral/overall trade flows
- Simulate trade opening of emerging giants in global general equilibrium, with and without within-country factor mobility

Main Results: Aggregate

- 1 World gains from trade integration of emerging giants under perfect cross-sectoral factor mobility
 - 0.37% on average
 - Ranging from negative to positive: -0.38% (Honduras) to 2.28% (Sri Lanka)
- 2 Reallocation of factors across sectors contributes relatively little (0.065%) to the *aggregate* gains
- 3 Reallocation of labor and capital are complementary: only one immobile factor (capital or labor) yields largely the same results as when both are immobile

Main Results: Distributional

- ④ Distributional impacts are an order of magnitude larger than aggregate impacts
 - Range -5% to $+5\%$ across sectors in most countries
 - Workers in emerging giants' comparative advantage sectors tend to lose (light manufacturing)
 - Workers in emerging giants' comparative disadvantage sectors tend to gain (high-tech manufacturing)

Preferences

- Countries $n, i = 1, \dots, N$; sectors $j, k = 1, \dots, J + 1$; sector $J + 1$ nontradeable
- Consumption of the final good:

$$Y_n = \left(\sum_{j=1}^J \omega_j^{\frac{1}{\eta}} (Y_n^j)^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1} \xi_n} (Y_n^{J+1})^{1-\xi_n},$$

where Y_n^{J+1} is the nontradable-sector composite good, and Y_n^j is the composite good in tradable sector $j = 1, \dots, J$.

- Budget constraint/ trade balance in country N :

$$P_n Y_n = w_n L_n + r_n K_n,$$

where $P_n = B_n \left(\sum_{j=1}^J \omega_j (p_n^j)^{1-\eta} \right)^{\frac{1}{1-\eta} \xi_n} (p_n^{J+1})^{1-\xi_n}$

Technology

- Each sector's output Q_n^j aggregates a continuum of varieties $q \in [0, 1]$ unique to each sector:

$$Q_n^j = \left[\int_0^1 Q_n^j(q)^{\frac{\varepsilon-1}{\varepsilon}} dq \right]^{\frac{\varepsilon}{\varepsilon-1}}$$

- Producing one unit of good q in sector j in country n requires $\frac{1}{z_n^j(q)}$ input bundles.
- $z_n^j(q)$ is drawn from the Fréchet distribution with cdf

$$F_n^j(z) = e^{-T_n^j z^{-\theta}},$$

where T_n^j varies by country and sector

- Costly trade: $d_{ni}^j \geq 1$

Production Function

- Input bundle has a cost:

$$c_n^j = ((w_n^j)^{\alpha_j} (r_n^j)^{1-\alpha_j})^{\beta_j} \left(\prod_{k=1}^{J+1} (p_n^k)^{\gamma_{k,j}} \right)^{1-\beta_j},$$

- Production is Cobb-Douglas in L , K , and intermediate inputs coming from sectors $1, \dots, J+1$
- Full set of I-O linkages between all sectors, including nontradeable
- Factor and intermediate input intensities differ by sector – HO feature

Factor Market Equilibria

Factor prices/optimal factor usage:

$$\sum_{i=1}^N \pi_{in}^j p_i^j Q_i^j = \frac{w_n^j L_n^j}{\alpha_j \beta_j} = \frac{r_n^j K_n^j}{(1 - \alpha_j) \beta_j}. \quad (1)$$

Feasibility:

$$\sum_{j=1}^{J+1} L_n^j = L_n \text{ and } \sum_{j=1}^{J+1} K_n^j = K_n, \quad (2)$$

Four assumptions on factor market:

- 1 Flexible factors: L_n^j, K_n^j, w_n, r_n solve (1)-(2)
- 2 Fixed factors: L_n^j, K_n^j fixed, w_n^j, r_n^j solve (1)
- 3 Flexible K : L_n^j fixed, w_n^j, r_n, K_n^j solve (1)-(2)/for K
- 4 Flexible L : K_n^j fixed, w_n^j, r_n, L_n^j solve (1)-(2)/for L

Estimation and Calibration

- 75 countries: China, India, 10 CEECs, 63 ROW; 19 tradeable sectors; 2005-2007
- Estimate: T_n^j, d_{ni}^j
 - Output, wages, value added, α_j, β_j : EUROSTAT, UNIDO
 - Bilateral, sector-level trade: COMTRADE
 - Trade costs, RTA, Currency Union: CEPPII, WTO, Rose (2004)
- Calibrate/directly measure:
 - Input-Output Matrix ($\gamma_{k,j}$), $\alpha_{J+1}, \beta_{J+1}, \omega_j$: U.S. 1997 Benchmark Detailed Make and Use tables
 - L_n, K_n , per capita income: Penn World Tables
 - ξ_n : Yi and Zhang (2010)
 - Remaining parameters: $\theta = 8.28$ (EK preferred value); $\eta = 2$; $\varepsilon = 4$

Sectors

ISIC code	Sector Name	α_j	β_j	$\gamma_{J+1,j}$	ω_j
15	Food and Beverages	0.290	0.290	0.303	0.169
16	Tobacco Products	0.272	0.490	0.527	0.014
17	Textiles	0.444	0.368	0.295	0.019
18	Wearing Apparel, Fur	0.468	0.369	0.320	0.109
19	Leather, Leather Products, Footwear	0.469	0.350	0.330	0.015
20	Wood Products (Excl. Furniture)	0.455	0.368	0.288	0.008
21	Paper and Paper Products	0.351	0.341	0.407	0.012
22	Printing and Publishing	0.484	0.453	0.407	0.005
23	Coke, Refined Petroleum Products, Nuclear Fuel	0.248	0.246	0.246	0.141
24	Chemical and Chemical Products	0.297	0.368	0.479	0.009
25	Rubber and Plastics Products	0.366	0.375	0.350	0.014
26	Non-Metallic Mineral Products	0.350	0.448	0.499	0.073
27	Basic Metals	0.345	0.298	0.451	0.002
28	Fabricated Metal Products	0.424	0.387	0.364	0.013
29C	Office, Accounting, Computing, and Other Machinery	0.481	0.381	0.388	0.051
31A	Electrical Machinery, Communication Equipment	0.369	0.368	0.416	0.022
33	Medical, Precision, and Optical Instruments	0.451	0.428	0.441	0.038
34A	Transport Equipment	0.437	0.329	0.286	0.220
36	Furniture and Other Manufacturing	0.447	0.396	0.397	0.065
4A	Nontradeables	0.561	0.651	0.788	
	Mean	0.414	0.393	0.399	0.053
	Min	0.244	0.243	0.246	0.002
	Max	0.561	0.651	0.788	0.220

Model Fit

	model	data
Wages:		
mean	0.463	0.413
median	0.149	0.154
corr(model, data)	<i>0.994</i>	
Return to capital:		
mean	1.035	1.074
median	0.767	0.758
corr(model, data)	<i>0.938</i>	
π_{nn}^j		
mean	0.620	0.565
median	0.678	0.607
corr(model, data)	<i>0.914</i>	
$\pi_{ni}^j, i \neq n$		
mean	0.0055	0.0059
median	0.0002	0.0002
corr(model, data)	<i>0.886</i>	

The Welfare Impact of Emerging Giants' Trade Integration

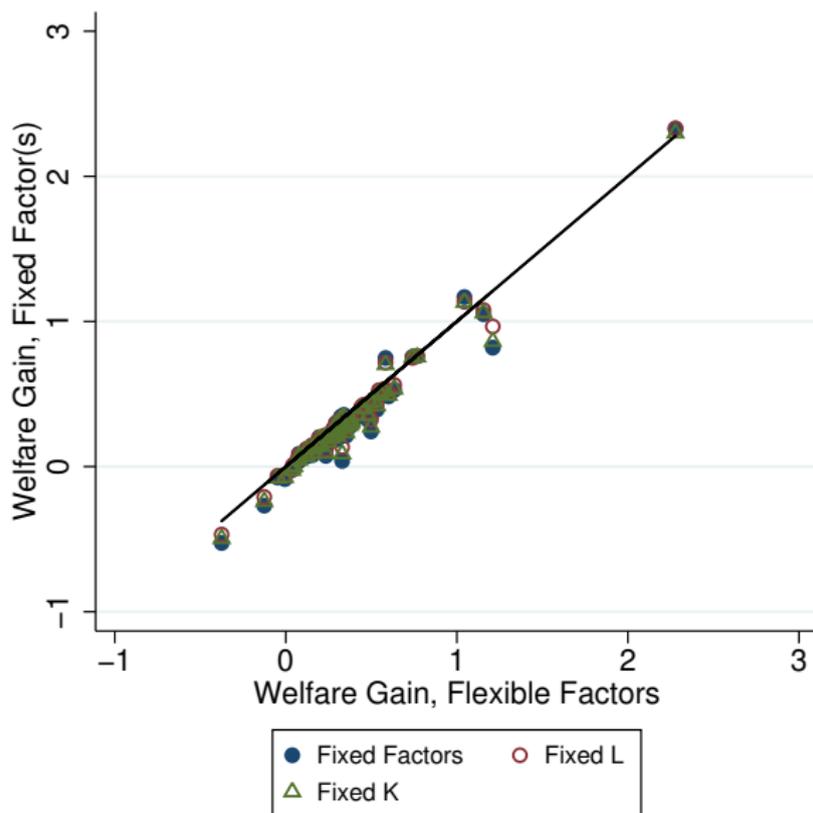
Flexible Factors

	Mean	Median	Min	Max	Countries
China	3.48				
India	1.63				
CEECs	7.26	7.18	2.75	13.36	10
OECD	0.28	0.30	-0.01	0.57	22
East and South Asia	0.70	0.58	-0.05	2.28	11
Latin America and Caribbean	0.16	0.15	-0.38	0.54	15
Middle East and North Africa	0.44	0.49	0.25	0.60	7
Sub-Saharan Africa	0.48	0.29	0.12	1.21	8

Technological Similarity and Trade Costs

	Difference with Respect to Flexible Factors			Countries
	Fixed Factors	Fixed Labor	Fixed Capital	
China	-0.35	-0.25	-0.28	
India	-0.23	-0.15	-0.19	
CEECs	-0.78	-0.50	-0.65	10
OECD	-0.05	-0.04	-0.05	22
East and South Asia	-0.03	-0.02	-0.04	11
Latin America and Caribbean	-0.06	-0.04	-0.05	15
Middle East and North Africa	-0.15	-0.10	-0.13	7
Sub-Saharan Africa	-0.08	-0.05	-0.07	8

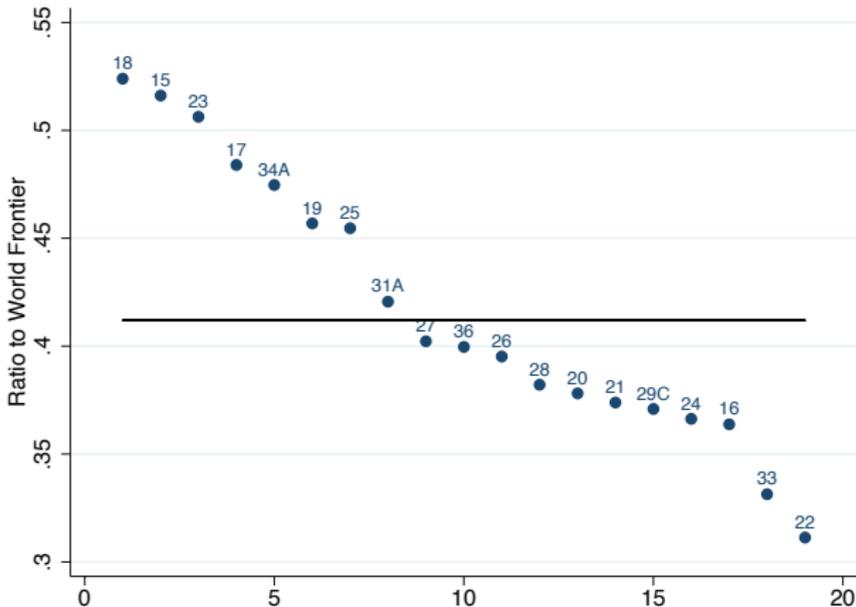
Gains and Factor Mobility



Sectoral Wage Changes, Fixed Factor Equilibrium

ISIC code	Sector Name	Emerging Giants	Rest of World
15	Food and Beverages	0.57	0.67
16	Tobacco Products	0.92	-0.40
17	Textiles	9.97	-2.27
18	Wearing Apparel, Fur	10.81	-3.64
19	Leather, Leather Products, Footwear	16.67	-1.29
20	Wood Products (Excl. Furniture)	18.35	-0.65
21	Paper and Paper Products	-0.99	1.30
22	Printing and Publishing	2.12	0.15
23	Coke, Refined Petroleum Products, Nuclear Fuel	10.61	-0.53
24	Chemical and Chemical Products	0.86	0.56
25	Rubber and Plastics Products	9.91	-0.91
26	Non-Metallic Mineral Products	6.83	-0.82
27	Basic Metals	13.91	0.37
28	Fabricated Metal Products	3.79	-0.30
29C	Office, Accounting, Computing, and Other Machinery	0.53	1.52
31A	Electrical Machinery, Communication Equipment	5.89	-0.19
33	Medical, Precision, and Optical Instruments	-2.56	1.55
34A	Transport Equipment	2.22	0.85
36	Furniture and Other Manufacturing	7.45	-1.43
4A	Nontradeables	6.03	0.28

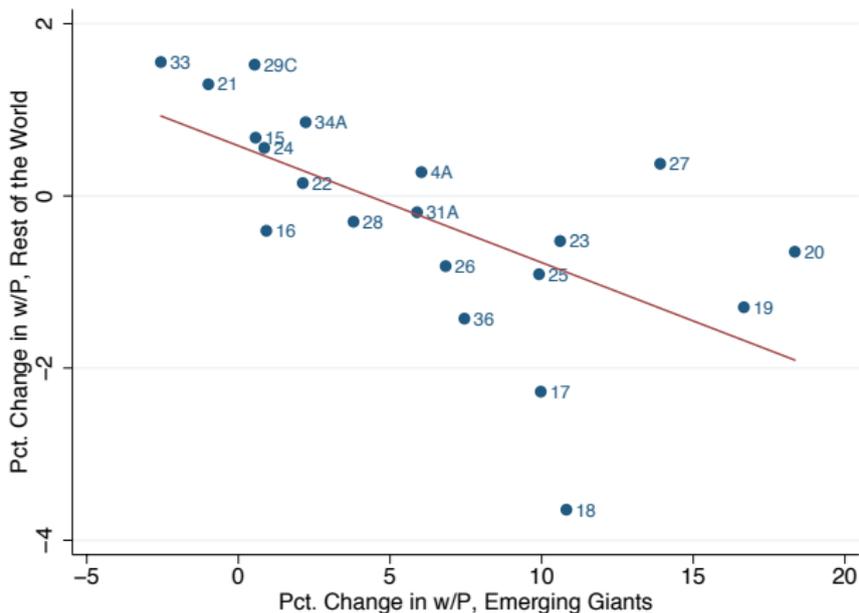
Emerging Giants' Comparative Advantage



Comp. Adv.: Apparel, Food, Fuel, Textiles;

Comp. Disadv.: Printing/Publishing, Precision Machinery

Sectoral Wage Changes: Emerging Giants vs. ROW



NB: $\text{Corr} = -0.63$

Conclusion: Emerging giants's trade integration

- Modest aggregate effects (fraction of 1%), gains not driven by cross-sectoral reallocation of factors
- Much more substantial distributional effects
 - -5% to $+5\%$ in most countries
 - As expected, factors in EGs' comparative advantage sectors lost (light manufacturing)
 - Complete heterogeneity of country/sector experiences