

Productivity Growth and Labor Reallocation: Latin America versus East Asia

MURAT ÜNGÖR

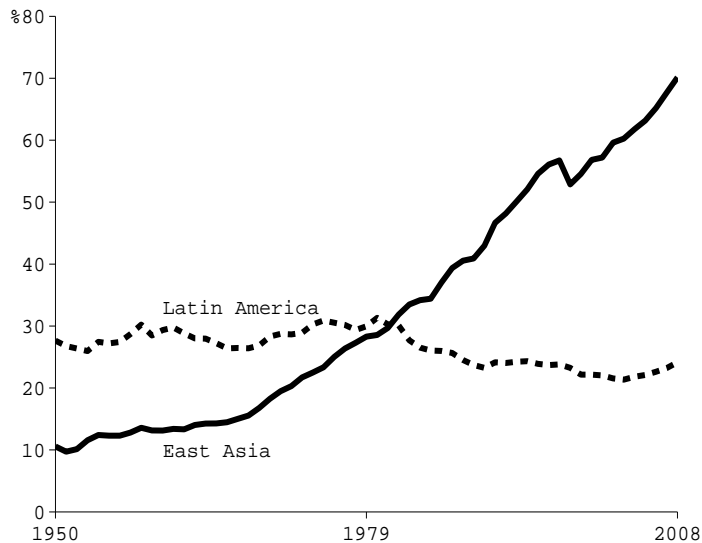
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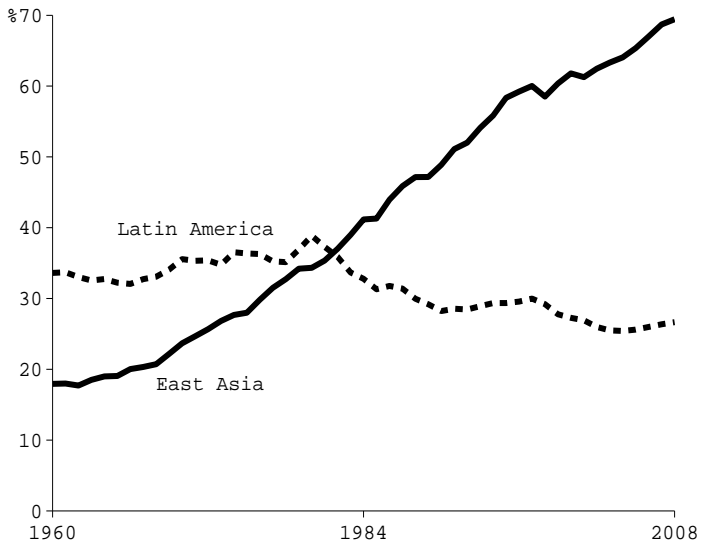
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Growth Miracles vs. Development Outliers

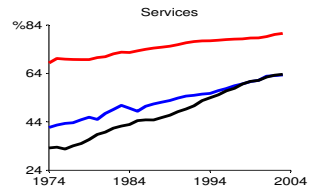
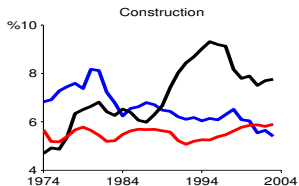
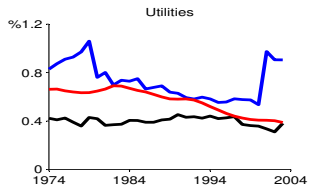
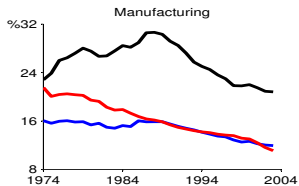
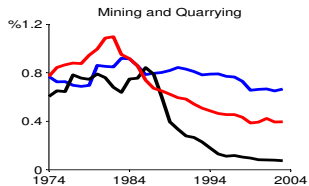
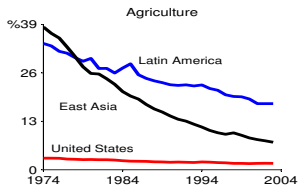
GDP per Capita as a Percentage of the U.S.



Labor Productivity as a Percentage of the U.S.



Sectoral Employment Shares, 1974-2003



Questions

1. Why do we observe higher employment share in agriculture in Latin America compared to the East countries?
2. Why did manufacturing employment share stay almost constant in Latin America?
3. Why did Latin America not follow the East Asian structural transformation?

Answers

1. Had Bolivia experienced the same productivity growth in agriculture that Korea has, then the agricultural employment share in Bolivia would have been 12.0 percent in 2003 rather than 27.4 percent
2. If Argentina had experienced the same productivity growth in the manufacturing sector as Korea, then the manufacturing employment share in Argentina would be 4.3 percent in 2003 instead of 11.5 percent
3. An exploration of policy and institutional factors, i.e., *Direct and Indirect Protection of Agriculture*

A SIX-SECTOR MODEL

Sectoral Classification follows Bernard and Jones (1996)

Studying a six-sector model allows for possible sectoral heterogeneity in industrial activities

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4. Utilities

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1. Agriculture, Forestry, and Fishing
2. Mining and Quarrying
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5. Construction
6. Services

Firm j Problem

$$\max \quad p_j Y_j - \omega N_j$$

s.t.

$$Y_j = \theta_j N_j$$

$$N_j > 0$$

where

p_j is producer price for sector j

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Representative Household's problem

$$\max U(\bar{A}, C)$$

s.t.

$$p_A \bar{A} + p_1 C_1 + p_2 C_2 + \dots + p_5 C_5 = \omega$$

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$$U(\bar{A}, C) = \bar{A} + \log(C)$$

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$$C = (\gamma_1^{1/\eta} C_1^{(\eta-1)/\eta} + \gamma_2^{1/\eta} C_2^{(\eta-1)/\eta} + \dots + \gamma_5^{1/\eta} C_5^{(\eta-1)/\eta})^{\eta/(\eta-1)},$$

where $\eta > 0$ and $\gamma > 0$

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where $\eta > 0$ and $\gamma > 0$

η is substitution elasticity between different goods

γ_j is share of good j in non-agricultural consumption

Competitive Equilibrium

Given a set of prices, a competitive equilibrium consists of consumption decisions that are the household's allocations $\{\bar{A}, C_1, C_2, \dots, C_5\}$, and factor allocations for the firms, $\{N_A, N_1, N_2, \dots, N_5\}$ such that given prices,

1. the firm's allocations solve its profit maximization problem,
2. the household's allocations solve the household's utility maximization problem,
3. all product and factor markets clear

- ▶ The household is endowed with one unit of productive time:

$$N_A + N_1 + N_2 + \dots + N_5 = 1$$

- ▶ There is no international trade or capital accumulation:

$$\bar{A} = Y_A, \quad C_1 = Y_1, \quad \dots, \quad C_5 = Y_5$$

Characterization

Agriculture:

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Non-Agriculture ($j = 1, 2, 3, 4, 5$):

$$N_j = \frac{\gamma_j \theta_j^{\eta-1} (1 - \bar{A}/\theta_A)}{\gamma_1 \theta_1^{\eta-1} + \gamma_2 \theta_2^{\eta-1} + \gamma_3 \theta_3^{\eta-1} + \gamma_4 \theta_4^{\eta-1} + \gamma_5 \theta_5^{\eta-1}}$$

Data and Calibration for the United States

1. Time Path of Exogenous Variables

- ▶ Normalize productivity levels across sectors to 1 in 1974:
- ▶ Use data on sectoral productivity growth to get the time paths:

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- ▶ I match sectoral labor allocations in 1974:

$$\bar{A} = N_{A,1974},$$

$$\gamma_j = \frac{N_{j,1974}}{1 - N_{A,1974}}, \quad j = 1, \dots, 5.$$

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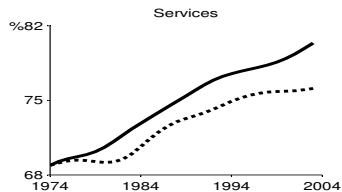
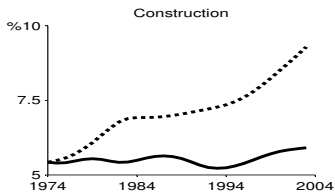
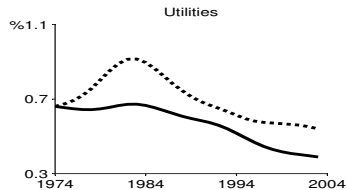
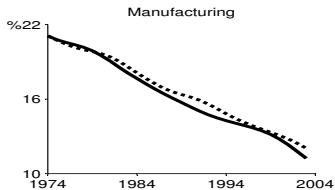
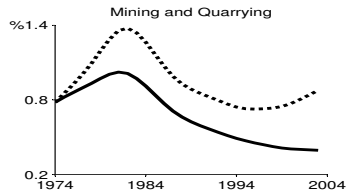
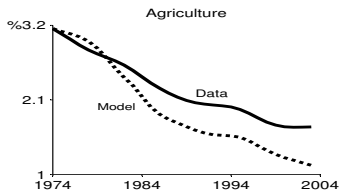
$$\gamma_j = \frac{N_{j,1974}}{1 - N_{A,1974}}, \quad j = 1, \dots, 5.$$

- ▶ I calibrate η to match (roughly) the share of employment in manufacturing over time

Calibration for the United States

Parameter	Value
\bar{A}	0.0315
γ_1	0.0081
γ_2	0.2177
γ_3	0.0068
γ_4	0.0560
γ_5	0.7114
η	0.1000

Sectoral Employment Shares, Data versus Model, U.S.: 1974-2003



Relative Sectoral Productivity Levels in 1974 and Growth Rates

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Relative Sectoral Productivity Levels in 1974 and Growth Rates

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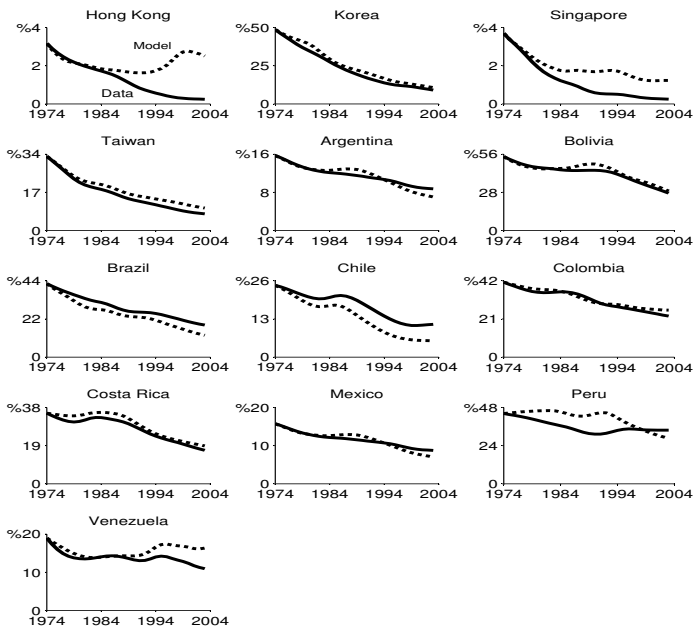
Relative Sectoral Productivity Levels in 1974 and Growth Rates

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 2. Choose labor productivity levels in 1974 to match
 - ▶ sectoral employment shares in each country for in 1974
 - ▶ aggregate labor productivity relative to that of the U.S. in 1974

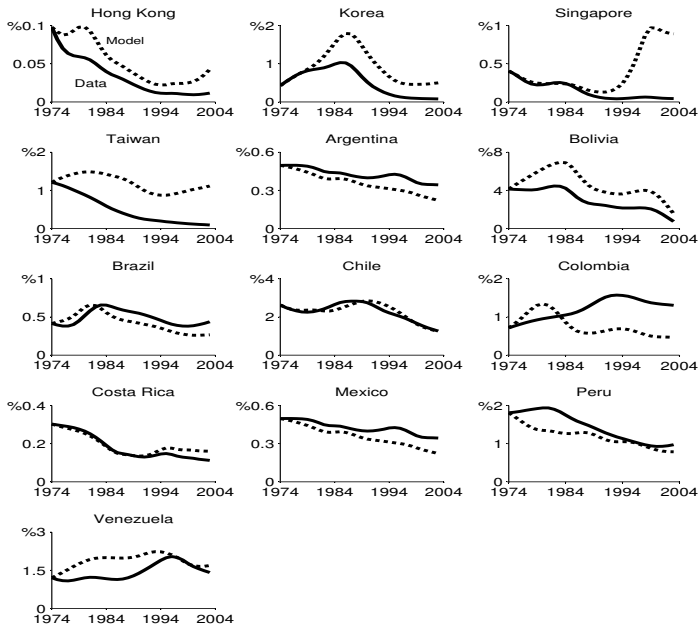
Calibrated Sectoral Productivity Levels in 1974

	Agric.	Mining	Manuf.	Util.	Constr.	Services
Hong Kong	0.9945	4.5805	0.2004	0.5209	0.4908	0.6971
Korea	0.0648	0.3754	0.2279	0.4554	0.2848	0.5043
Singapore	0.8524	0.8607	0.3130	0.1356	0.3777	0.4740
Taiwan	0.0953	0.1536	0.1849	0.4121	0.2346	0.5889
Argentina	0.2004	0.8979	0.5224	0.2940	0.3289	0.7360
Bolivia	0.0581	0.0254	0.3515	0.8322	0.2122	0.4649
Brazil	0.0745	0.4226	0.3283	0.1621	0.1790	0.4274
Chile	0.1289	0.1040	0.3838	0.3150	0.2574	0.6915
Colombia	0.0765	0.3166	0.6089	0.3894	0.3935	0.4844
Costa Rica	0.0896	0.9034	0.4458	0.1809	0.2045	0.5758
Mexico	0.2004	0.7625	0.4436	0.2497	0.2793	0.6250
Peru	0.0713	0.1186	0.4630	0.8461	0.2846	0.6673
Venezuela	0.1663	0.5329	1.2768	0.4341	0.5120	1.1054

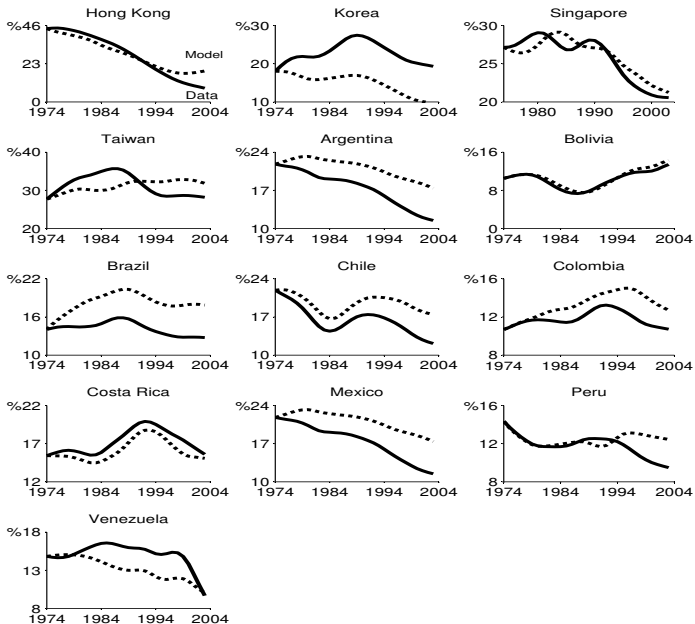
Employment Share in Agriculture, Data versus Model: 1974-2003



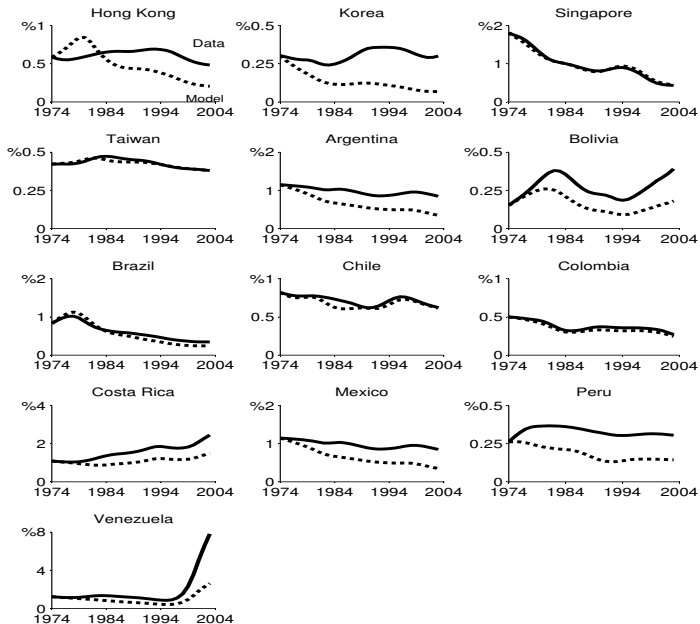
Employment Share in Mining and Quarrying, Data versus Model: 1974-2003



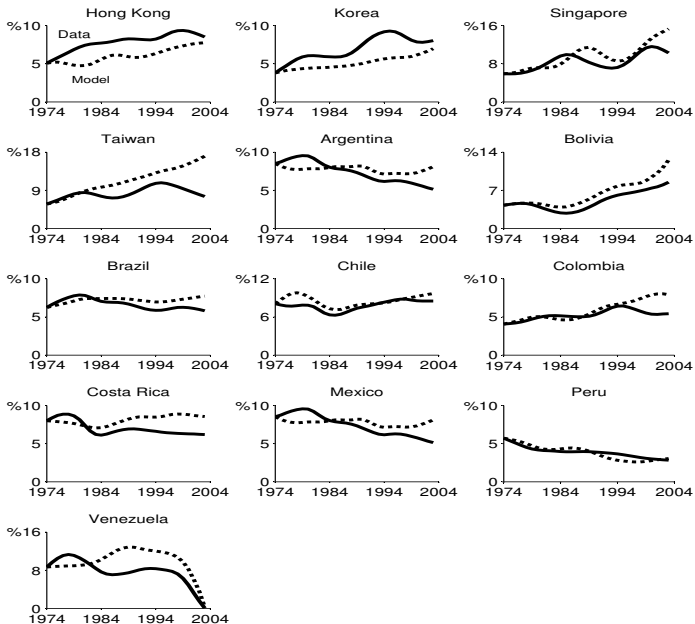
Employment Share in Manufacturing, Data versus Model: 1974-2003



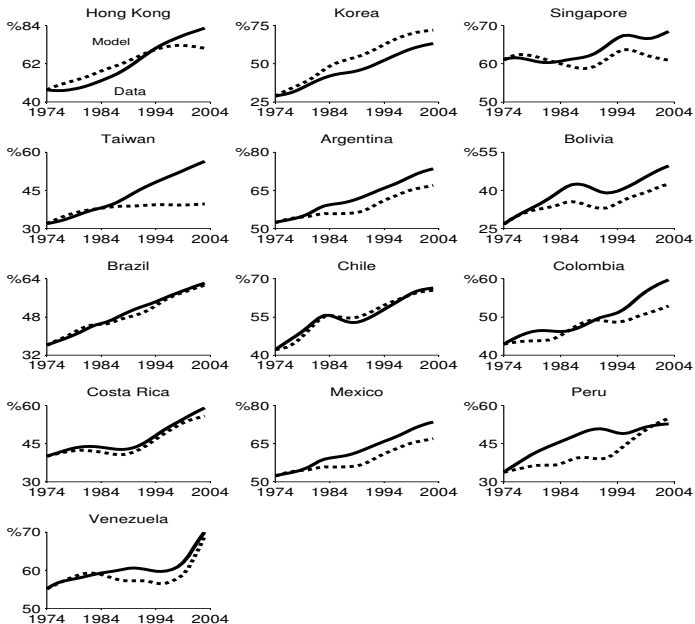
Employment Share in Utilities, Data versus Model: 1974-2003



Employment Share in Construction, Data versus Model: 1974-2003



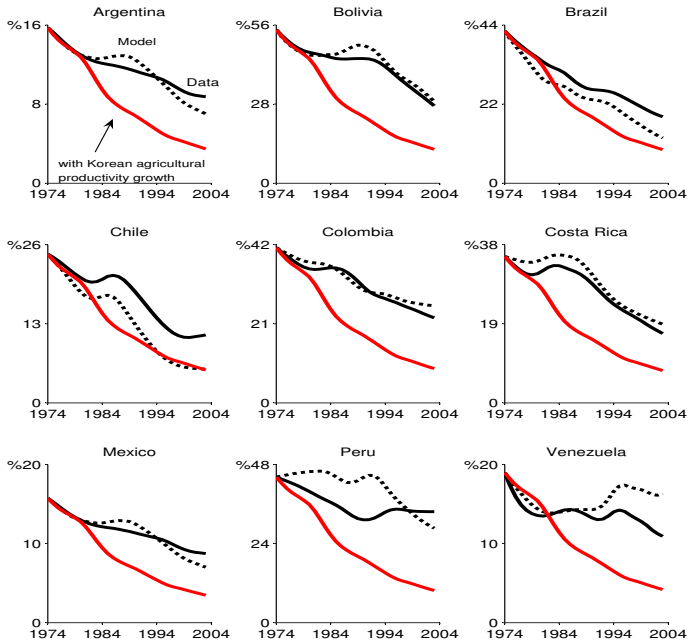
Employment Share in Services, Data versus Model: 1974-2003



Question

What would have happened to the agricultural employment share in Latin America if the Latin America countries had had the same productivity growth in agriculture as Korea?

Experiment: De-agriculturalization in Latin America



GDP per worker relative to the United States in 1985

Restuccia, Yang, and Zhu (2008): A decomposition of aggregate labor productivity based on internationally comparable data reveals that a high share of employment and low labor productivity in agriculture are mainly responsible for low aggregate productivity in poor countries.

Country	Aggregate	Non-agriculture	Agriculture
Argentina	0.44	0.46	0.47
Bolivia	0.17	0.27	0.04
Brazil	0.32	0.42	0.09
Chile	0.29	0.32	0.12
Colombia	0.27	0.37	0.07
Costa Rica	0.27	0.35	0.10
Mexico	0.50	0.74	0.06
Peru	0.24	0.37	0.03
Venezuela	0.54	0.61	0.11

Source: Restuccia, Yang, and Zhu (2008).

http://www.economics.utoronto.ca/diegor/research/RYZ_data.xls

Direct and Indirect Protection of Agriculture

Dennis and İşcan (2010) find that the rate of structural transformation is slow in those countries that discriminated against their agriculture; and document that in countries with relatively heavy taxes on their agriculture.

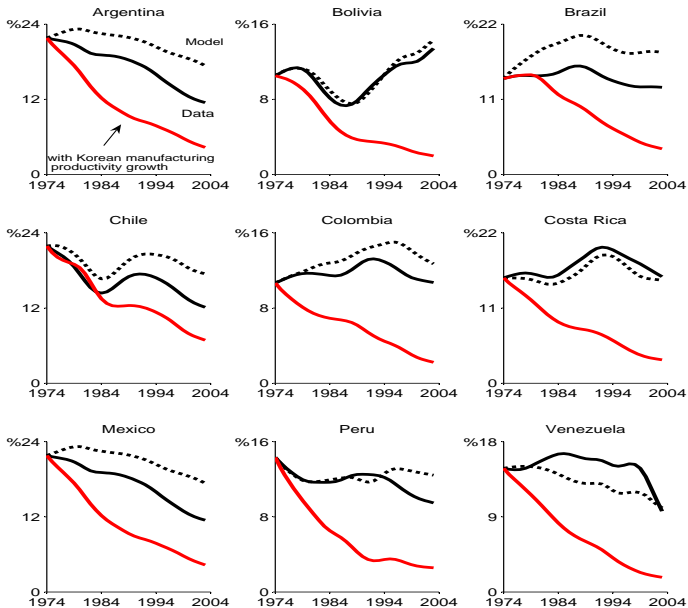
		<i>Period averages in percentages</i>			
Country	Period	Indirect protect.	Tax due to ind. protect.	Direct protect.	Total protect.
Argentina	1960-84	-21.3	-39.5	-17.8	-39.1
Brazil	1969-83	-18.4	-21.4	10.1	-8.3
Chile	1960-83	-20.4	-37.4	-1.2	-21.6
Colombia	1960-83	-25.2	-37.8	-4.8	-30.0
Korea	1960-84	-25.8	-26.7	39.0	13.2

Source: Schiff and Valdés 1992, Table 2.1.

Question

What would have happened to the manufacturing employment share in Latin America if the Latin America countries had had the same productivity growth in the manufacturing sector as Korea?

Experiment: Manufacturing Employment in Latin America



Concluding Remarks

- ▶ Productivity growth in agriculture in Latin America has not been high enough to release labor from agriculture as we observe in East Asian countries
- ▶ Productivity growth in manufacturing in Latin America has not been high enough to avoid the stagnation of the manufacturing sector
- ▶ We need to look deeper into policies that have affected sectoral productivities over time