

Education Policy, Structural Transformation and Growth

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- All countries experience during their development history a process of reallocation of economic activity across sectors.
- In this process of structural transformation the labor force share of agriculture decreases sharply while that in services increases.
- As a general rule, value added and labor share in the industry first increase but later decrease.
- In this stage, overall income and growth performance of country driven by services, that end up dominating total VA and labor.

Introduction

- Strong evidence that the low growth in the service sector is the main cause for the stagnation or slowdown of many economies (e.g., Brazil and Latin America).
- In contrast, some economies (e.g. South Korea) went through a similar structural transformation process but aggregate growth did not slow down.
- In these countries growth in the services sector was not small.
- These facts do not fit the usual story - industrial policy - when comparing South East Asia vs. Latin America.

- **More relevant: wide differences in skill-intensity in Services.**
 - *Success growth stories: Services in high skill sectors.*
 - *Services:* designers, researchers, chefs, social workers, inv. bankers.
 - Innovation/adoption/skills in services: drive countries to grow.
 - Examples: Developed countries (late); South Korea.
 - *Not so successful stories: Services in low skill sectors.*
 - *Services:* street vendors, handymen, domestic labor, moneylenders
 - Low skill accumulation/innovation services: ceiling for growth.
 - Examples: Brazil; other Latin American after 1980s.

A Simple *Quantitative* Model:

- **Education and Fertility:** Quantity/Quality of Children.
 - Parents choose number & skills of children (as in Becker).
- **Structural Transformation:**
 - *Sectors and Skills:*
 - *Agriculture:* low skills only.
 - *Manufacturing:* high skills only.
 - *Services:* low and high skills.
 - *Exogenous sectorial productivities.*
 - *Non-homothetic preferences.*

- **Education/Demographic Policies:**

- *Two Policies:*

- Child labor (allowed or not)
- Schooling subsidies (funded with labor taxes).

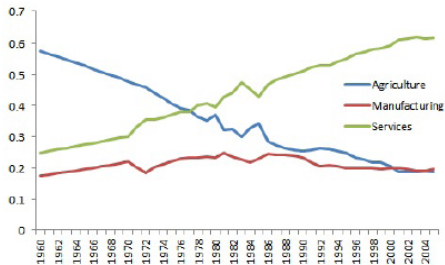
- **Calibration:**

- *Two Countries: South Korea and Brazil, 1960-2005*

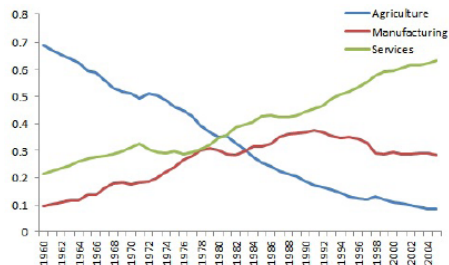
- **Korea:** fast growth after 1980; Services: high productivity/skills
- **Brazil:** slow growth after 1980; Services: low productivity/skills.

- The model reproduces some key stylized facts observed in these economies:
 - The stagnation of Brazil after 1980, and the fast growth of S. Korea.
 - The low (high) productivity of services in Brazil (S. Korea), which is shown to be a function of human capital.
 - The distribution of labor across sectors and demographic transition.
- Education policies/distortions are key to understand a big chunk of the differences.

Brazil and Korea: Structural Transformation Similarities



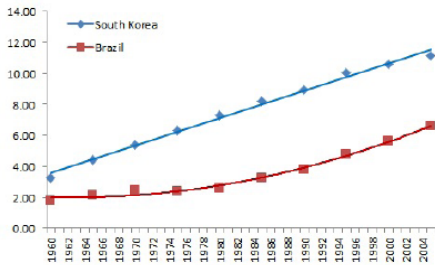
Brazil: Allocation of Labor



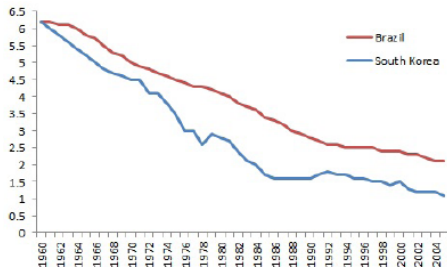
Korea: Allocation of Labor

Sectorial allocation of Labor

Brazil and Korea: Education and Fertility Differences

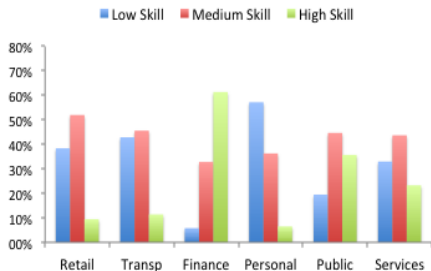


Average years of schooling

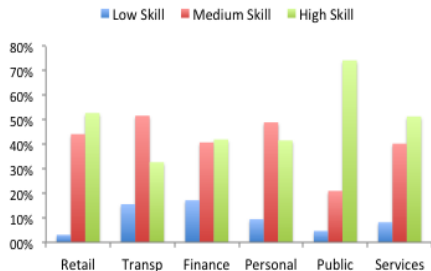


Total Fertility Rates

Brazil and Korea: Skill Distribution in Service Sectors

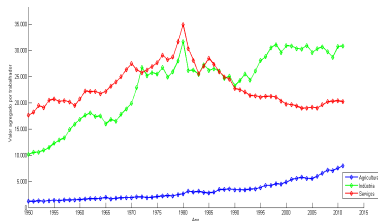


(a) Brazil

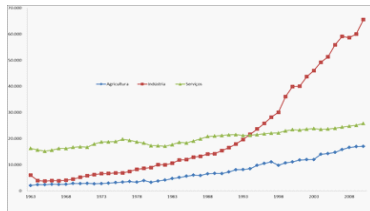


(b) South Korea

Evolution of Sectorial Productivities



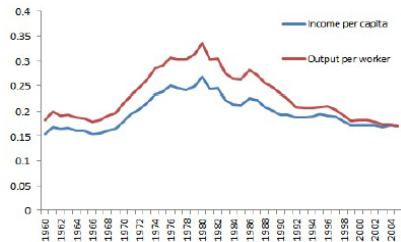
(a) Brazil



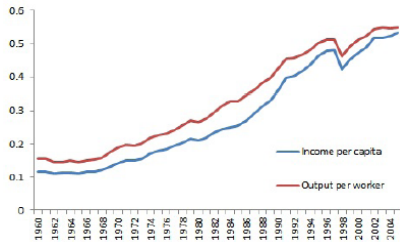
(b) South Korea

Value Added per Worker (2005 domestic prices)

Brazil and Korea: Sharp Differences in Income



(a) Brazil



(b) South Korea

- *Demographics:*

- Two period lived OLG; $t = 0, 1, 2, \dots$
- Lifetime decisions:
 - 1st period: children: work or not; attend school or not.
 - 2nd period: adults: labor market; number and skill of children.

- *Preferences:*

- Altruistic Parents: current utility and utility of offspring.
- Non-homothetic preferences wrt to three goods

- Adults can be of two types:
 - 1 Skilled, if they went to school;
 - 2 Unskilled, if they worked as children.
- N_S : number of skilled adults.
- N_U : number of unskilled adults.

The model: Technology

- Agricultural sector: unskilled labor only

$$Y_A = A_A L_{AU}.$$

- Manufacturing sector: skilled labor only

$$Y_M = A_M L_{MS}.$$

- Services: uses skilled and unskilled labor

$$Y_{Se} = A_{Se} (L_{SeS})^\alpha (L_{SeU})^{1-\alpha}.$$

- Exogenous sectorial productivity:

$$A'_j = (1 + \gamma_j) A_j$$

- Perfect competitive firms in each sector, maximize profit at each period:
- The intertemporal utility of an adult is:

$$U(u, n_S, n_U) = u^\sigma + \beta(n_S + n_U)^{-\varepsilon} [n_S V'_S + n_U V'_U],$$

- The intratemporal utility u is given by:

$$u(c_A, c_M, c_{Se}) = v(\bar{c}_A) + b \log(c_M) + (1 - b) \log(c_{Se} + \bar{c}_{Se})$$

The model: time allocation

- Adults allocate their time between working and raising their children.
- Raising a child takes a fraction of the total time of an adult.
- For a child to become a skilled adult she must attend school.
- This requires a fraction of a teacher time.
- If the child do not attend school, she can ingress in the labor market performing unskilled tasks.
- Her work will be equivalent to a fraction of an unskilled adult.

The model: Government

- Two types of education policies: schooling subsidies & child labor restrictions.
- **Child labor policies:** limit the number of hours that a child can work.
- **Education subsidies:** The government subsidizes a fraction δ of the educational costs.

The model: analytical results

- Only corner solutions: parents choose only one type of child
- Number of children trivially determined by comparing solutions with only one type of child.
- Parents of different skills cannot simultaneously be indifferent between the two types of children
- In our calibration: equilibrium with intergenerational upward mobility.
 - High-skilled parents: only high-skilled children.
 - Low-skilled parents: indifferent between the two types of children.

Results: Growth Rates

- *Calibrated model*: large gaps in the Korea vs. Brazil growth rates.

Growth: Output per worker	Brazil	Korea
PWT: $\frac{\text{avg. } 83-05}{\text{avg. } 60-82}$	18%	210%
Model:	36%	232%

Results: Allocation of workers across sectors

- **Initial:** 1960-1982; **Final:** 1983-2005

Variable	Brazil				Korea			
	Initial		Final		Initial		Final	
	Data	Model	Data	Model	Data	Model	Data	Model
L_{SL}/L_L	0.36	0.37	0.65	0.64	0.35	0.35	0.73	0.72
L_{SH}/L_H	0.26	0.23	0.33	0.34	0.19	0.18	0.26	0.31

- Overall: model matches share of skilled labor in Korea and Brazil for both periods.
- Model also matches shares of unskilled labor for both periods.

- **Initial:** 1960-1982; **Final:** 1983-2005

Variable	Brazil				Korea			
	Initial		Final		Initial		Final	
	Data	Model	Data	Model	Data	Model	Data	Model
N_S	0.10	0.31	0.27	0.35	0.29	0.49	0.70	0.74

- Model overestimates skilled workers (b.c. only skilled labor in M)

Results: Demographic Transitions

Total Fertility rate	Brazil		Korea	
	Data	Model	Data	Model
1982	3.8	2.3	2.4	2.2
2005	2.1	2.1	1.1	1.2

- Model close to the data in Korea.
 - Underestimates initial fertility in Brazil.

Counterfactuals: Education Policies and Growth

Brazil		Korea	
	Growth		Growth
Benchmark	36%	Benchmark	232%
Brazil: Korean policies	57%	Korea: Brazilian policies	112%

- Korea with Brazilian policies: **growth less than half.**
- Brazil with Korean policies: **growth 60% more.**
- why: share of skilled labor in Brazil (Korea) would be 70% (43%) higher (lower).

Counterfactual Policies: Fertility & Allocation

Variable	Brazil				Korea			
	Benchmark		Korean Policies		Benchmark		Brazilian Policies	
	Initial	Final	Initial	Final	Initial	Final	Initial	Final
TFR	2.3	2.1	2.5	1.2	2.2	1.2	2.1	1.9
N_H	0.31	0.35	0.38	0.60	0.49	0.74	0.37	0.42

- **Brazil with Korean policies:**

- Fertility rates way below the observed in the second period
- Large increase (70%) in skilled workers in second period.

- **Korea with Brazilian policies:**

- Fertility rate would remain high (1.9 instead of 1.2).
- Skilled workers would decrease by almost 50%

Concluding Remarks

- We incorporate fertility and education decisions to a structural transformation model.
- Calibrated the model to Korea and Brazil.
 - Model matches growth paths, fertility and labor allocation across skills and sectors.
- We use the model to understand impact of education policies.
 - Model helps explain the differences between Korea and Brazil.
 - Education subsidies and restrictions on child labor: help explain a large part of growth, human capital accumulation and structural transformation.
- Next: better calibration, 3 types of skills and human capital function.