

# Middle income trap in a model of industrialization

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15th Annual Conference on  
Economic Growth and  
Development

Indian Statistical Institute, Delhi

19 December 2019

Failure of economies to realize their full potential: a dominant theme of development economics

Coordination failure: Rosenstein-Rodan (1943), Murphy, Schleifer, Vishny (1989)

Several countries that achieved high rates of growth in the recent past experiencing slowdown

The notion of “middle income trap” has come up in development discourse

Agenor (2017): middle income trap  
“generally characterized by a sharp deceleration in growth, following a period of sustained increases in per capita income”

Discusses contrast between South Korea and Brazil

1965-1980: average annual growth rate of income per capita 5.6% for Brazil, 6.5% for South Korea

For the next 20 years: South Korea continued with an average annual growth rate of 5.5%, Brazil averaging 0.7%

Interview of economist Rathin Roy (then member of PM's economic advisory council) last May received media attention

According to Roy: India could be headed towards a middle income trap, income inequality a key factor

Chancel and Piketty (2019) document income inequality in India for 1922-2015, top 1% earners have 22% of the total income in recent years

This paper: in the theoretical framework of Murphy et al. (1989) explores the role of income inequality in explaining middle income trap

A specific aspect of inequality: concentrated ownership of resources for investment

Distorted incentive to invest, owners might find it best to invest only in a limited way (in some but not all sectors)

This paper: looks at middle income trap in the theoretical framework of poverty trap literature

Agenor (2017) points out the distinction between the two:

“...a poverty trap is defined as a self-reinforcing mechanism...associated with stagnation...in income over time...By contrast, a middle-income trap typically occurs *after* a country has been growing rapidly for a sustained period of time...so that the question is more about explaining a slowdown in growth, rather than why it is low in the first place.”

# The model

An economy with  $n$  sectors  $1, \dots, n$ ,  
sector  $i$  produces good  $i$

Representative consumer:

utility function  $u(x_1, \dots, x_n) = x_1 \dots x_n$   
where  $x_i =$  quantity of good  $i$

supplies  $L$  units of labour

when income is  $y$  and good  $i$  has price  
 $p_i$  demand of good  $i$ :  $y/n p_i$

# Initial state

each sector has a competitive fringe of firms

any firm in the fringe uses the existing technology: 1 unit of labour  $\rightarrow$  1 unit of good, wage 1

marginal cost of each firm is 1, price of any good 1, firms obtain zero profit

income  $y$  of the economy: labour income  $L$

demand of each good  $y/np_i = L/n$

# Modern mode

One modern firm in each sector that has a new technology:

- 1 unit of labour  $\rightarrow a > 1$  unit of good
- wage  $1 + v$
- to set up modern mode: an initial employment of  $F$  units of labour needed

“entry cost”  $(1 + v)F$

marginal cost  $(1 + v)/a$

Assume  $(1 + v)/a < 1$  and  $L > nF$

Post entry problem of a modern firm

competes with the fringe

any firm in fringe has marginal cost 1,  
modern firm's marginal cost  $(1 + v)/a < 1$

optimal for modern firm to set price 1  
(limit pricing), drives fringe out of the  
market

modern firm becomes a monopolist, for  
each unit, its profit  $b = 1 - (1 + v)/a$

units it sells: demand at price 1 =  $y/np_i =$   
 $y/n$

post entry profit of modern firm  $by/n$

profit of modern firm  $by/n - (1 + v)F$

A sector is “industrialized” if modern firm makes entry in that sector

Let  $k =$  no. of industrialized sectors,  $k = 0, 1, \dots, n$

$y(k) =$  income of economy when  $k$  sectors are industrialized

$y(k)$ : sum of labour income and profits

- labour income from non industrialized sectors  $(n - k)y(k)/n$
- labour income from industrialized sectors  $(1 + v)[L - (n - k)y(k)]$
- sum of profits  $k[by(k)/n - (1 + v)F]$

Solving this we can find  $y(k)$  and  $\pi(k)$  (profit of a modern firm that makes entry when  $k$  modern firms make entry)

## Strategic interaction among $n$ modern firms

Each firm decides: make entry or stay out

stay out: zero profit

entry: profit is  $\pi(k)$  if  $k$  firms make entry

### Equilibrium industrialization structure

- $k = 0$  (no industrialization) is an equilibrium if  $\pi(1) \leq 0$
- $k = n$  (full industrialization) is an equilibrium if  $\pi(n) \geq 0$
- $1 \leq k \leq n - 1$  (partial industrialization) is an equilibrium if  $\pi(k) \geq 0$  and  $\pi(k + 1) \leq 0$

In the Murphy et al. model only possible equilibrium structures:

- unique equilibrium  $k = 0$
- unique equilibrium  $k = n$
- two equilibria:  $k = 0$  and  $k = n$

$k$  with  $1 \leq k \leq n - 1$  never an equilibrium

Middle income trap: economy achieves partial but not full industrialization

Factors outside of Murphy et al. model can result in such situation

One such factor: inequality in initial endowments modeled as concentrated ownership of modern mode

Relatively few firms own the modern mode

We look at the case of extreme concentrated ownership: only one firm owns modern mode for all sectors

Not strategic interaction of entry choices

A single firm makes entry choice for all sectors with the objective of maximizing sum of profits from entry

Result: Suppose a single firm owns modern mode of all sectors and it seeks to maximize the sum of profits of all entrants. Then there are parameters of the model under which it is optimal for the firm to set up the modern mode in some but not all sectors.

Specifically if  $(b + bv)L/(1 + bv) < nF$  , then there exists  $0 < v^* < a - 1$  such that for  $0 < v < v^*$ , it is optimal for the firm to set up modern mode in  $k$  sectors where  $1 \leq k \leq n - 1$ .