

# **Introduction to the Economics of Development**

## **7. Can we manufacture prosperity?**

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## Quiz recap

- Average score 2.87/4
- Only one question caused issues.
- A researcher is interested in estimating the causal effect of natural resource dependency on GDP. They have data for 100 countries in 2010 on GDP per capita ( $Y$ ) and resource dependency ( $RD$ ). They propose running the following regression including country fixed effects.

$$Y_c = \alpha + \beta RD_c + \theta_c + \varepsilon_c$$

What issues do you see with this planned analysis? Tick all that apply.

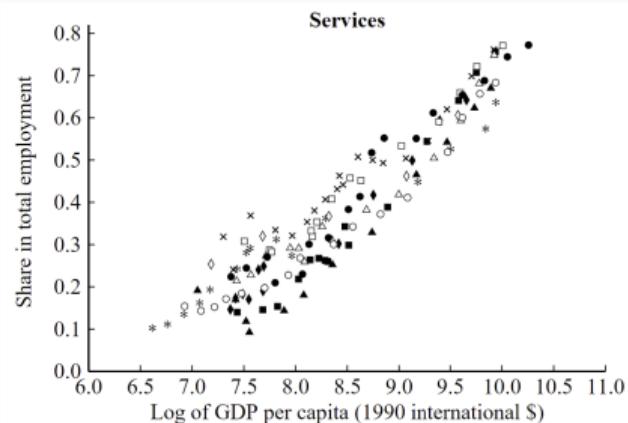
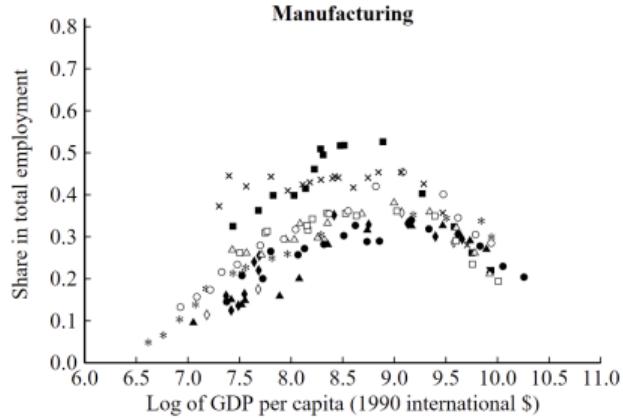
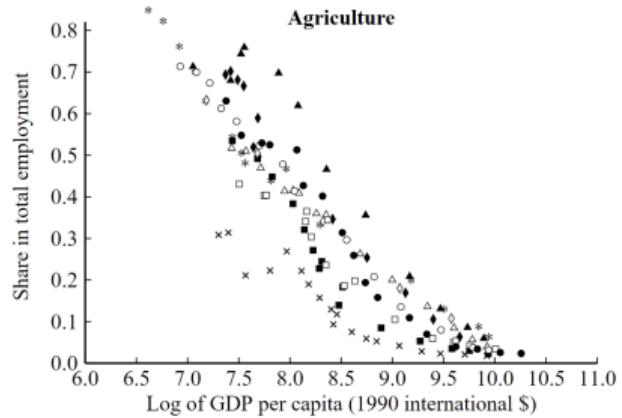
1. Some time-invariant variables such as country size might be endogenous and therefore their omission might cause a spurious relationship.
  2. You will not be able to estimate the coefficient on  $RD$  due to the inclusion of country fixed effects.
  3. 100 countries is too few to generate statistically precise results
- Average score 0.3

## This week

Can we manufacture prosperity

- Theory: Structural transformation, 2-sector model.
- Theory: Some International trade
- Econometrics: fixed effects, time series.
- Main Paper(s): **Rodrik (2016)**, and Herrendorf et al. (2014).

# The argument in a nutshell. Covers the period from 1800 to 2000 (Herrendorf et al. 2014)



## The story

How an economy develops: Agriculture → Manufacturing → Services.

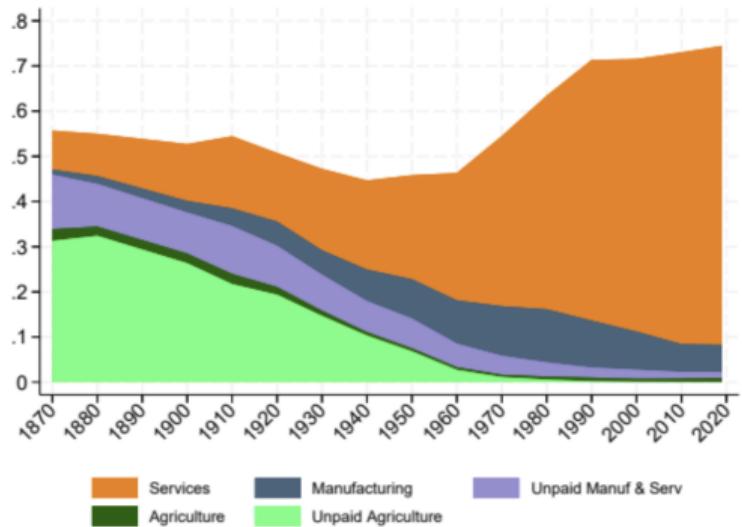
This *is* how it happened for many “developed” countries today.

This process is called **structural transformation**

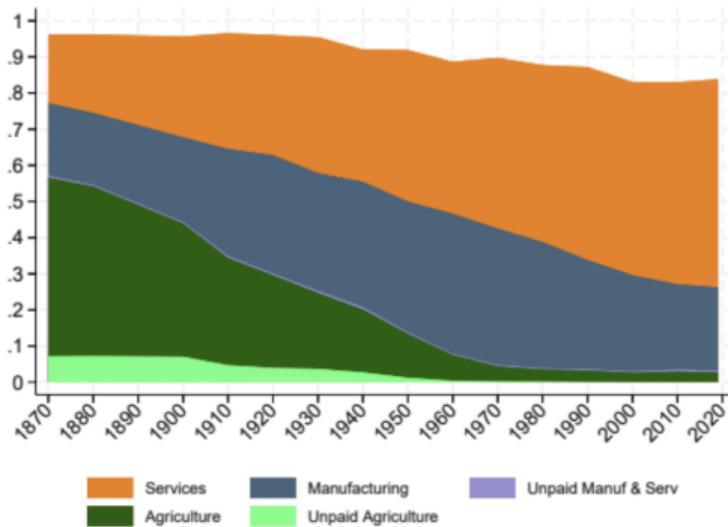
Countries wishing to develop must first move into manufacturing and then services.

## An aside: structural transformation and gender economics (Ngai et al. 2024)

Panel A: Women



Panel B: Men



## A word on measurement

Structural transformation can be defined in many ways, three main ones are:

1. Employment shares.
2. Value added shares.
3. Expenditure shares.

Normally they tell a similar story, and we will mainly focus on employment shares.

## **Industrialisation is not just about GDP per capita**

- Urbanisation
- “Working class” unions, “capitalists”, socialism...
- A whole different way of working and living than in a predominantly agricultural society.

## **Three questions**

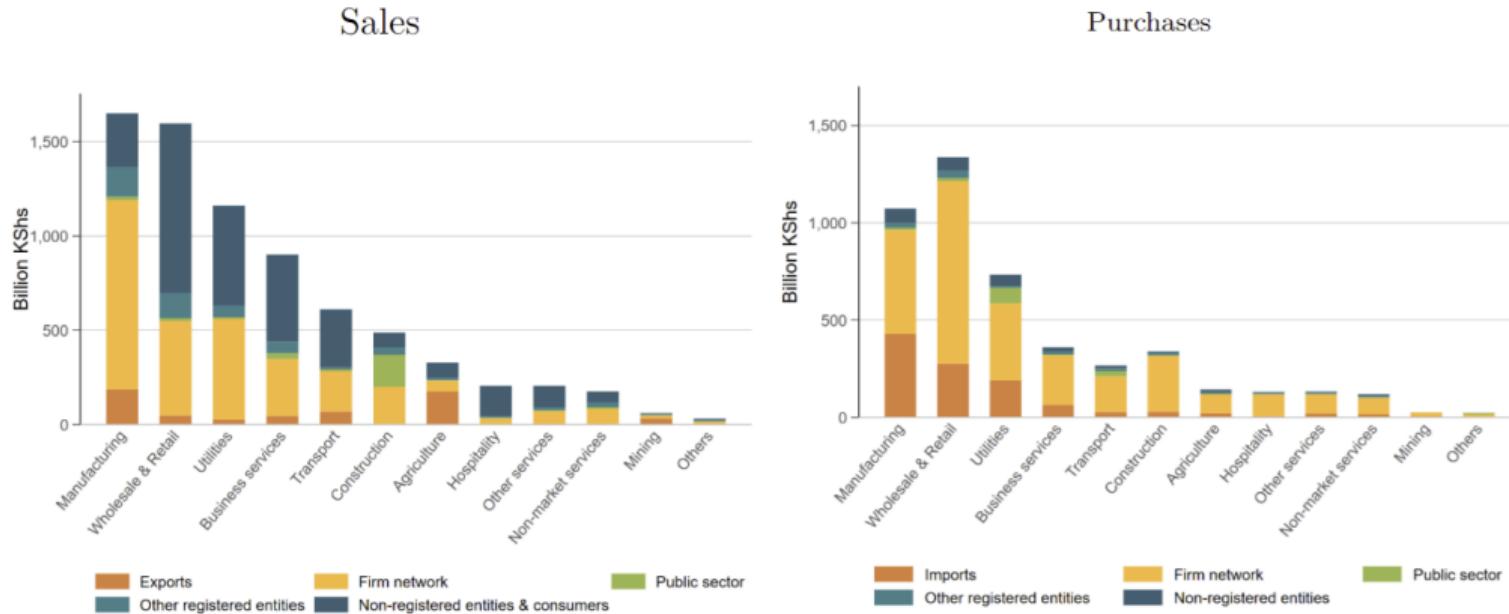
- Why is manufacturing thought of as “good”?
- What causes structural transformation?
- Can the model of the past be applied today?

**Why is manufacturing thought of as “good”?**

## Why is manufacturing thought of as “good”?

- More productive than agriculture
  - More capital intensive
- Has more forward and backward supply-chain linkages than agriculture
- High value tradeability

# Manufacturing is more central in the domestic firm network

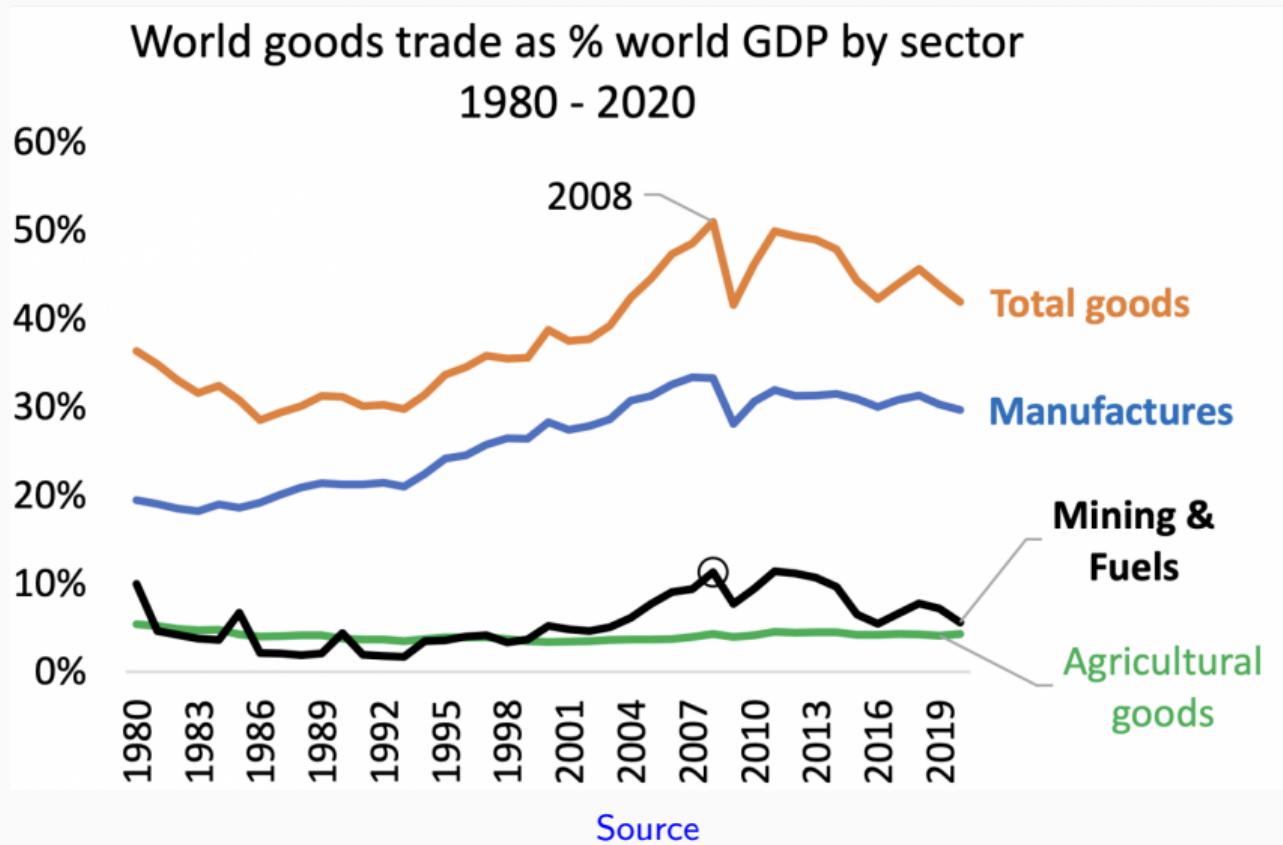


One manufacturing firm's productivity ↑ means cheaper inputs for many other firms.

One manufacturing firm's profits ↑ means greater demand for many other firms.

(Wiedemann et al. 2024)

## Manufacturing has more trade potential



**What causes structural transformation**

## Two possibilities

1. Preferences
2. Productivity

Either people *want* more manufacturing/ services goods OR these goods can now be produced cheaper so their price has fallen.

Both explanations imply that expenditure/ employment/ value-added shifts towards manufacturing/ services.

So we have a **problem of identification**.

## The preferences explanation

- Maybe preferences have changed — people used to not want manufactured goods.
  - A person on minimum wage could afford a peloton bike but doesn't want one. When they become richer their preferences change, now they want a peloton bike.
- Or maybe preferences are non-monotonic  $\Rightarrow$  the fraction of income you spend on goods changes as you become richer.
  - The person wants a peloton bike just as much when they were on minimum wage as when they became richer, but could only devote sufficient funds to it in the latter.
- The second option seems more likely, and is a “nicer” theory.

## Non homothetic preferences

- Homothetic preferences: You spend a constant fraction of your income on each good.
  - e.g. you spend 30% on food, 10% on luxuries when earning 10,000 and when earning 100,000
- Non-homothetic preferences: The fraction you spend on different goods changes as you become wealthier.
  - e.g. you spend 40% on food, 0% on luxuries when earning 10,000 and 20% on food and 20% on luxuries when earning 100,000.

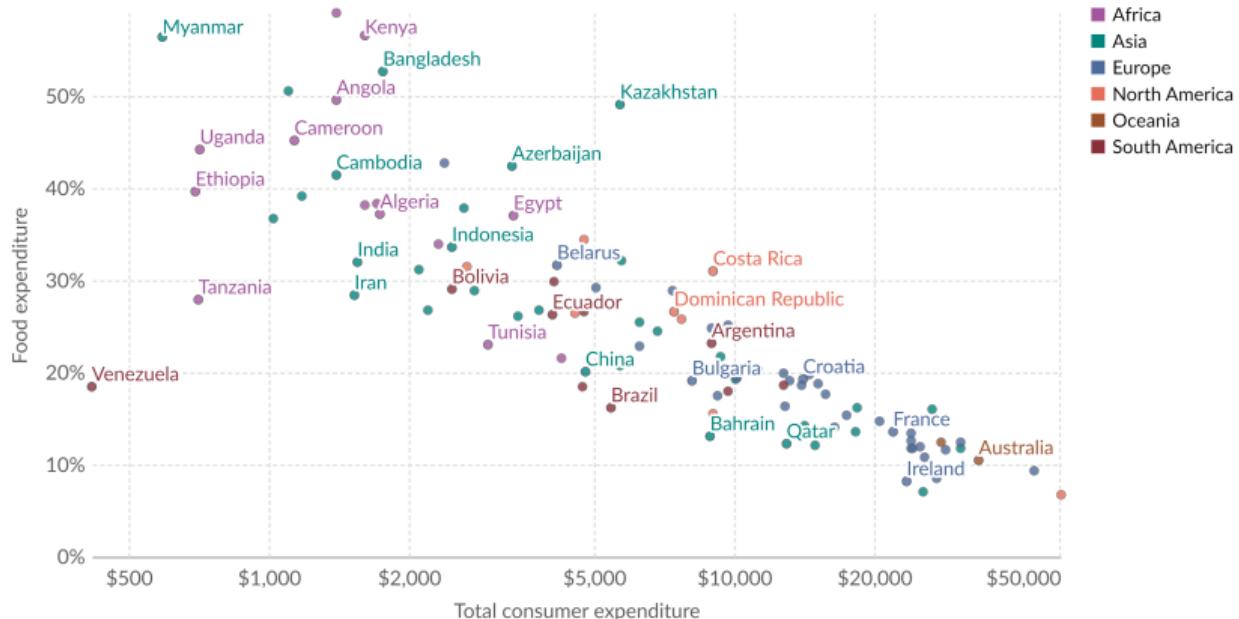
The rich spend more on food, but that spending is a lower proportion of their income.

# Non homotheticities in food expenditure — Engle curve

## Share of expenditure spent on food vs. total consumer expenditure, 2022

Our World  
in Data

Food expenditure only includes food bought for consumption at home. Out-of-home food purchases, alcohol, and tobacco are not included. This data is expressed in US dollars per person. It is not adjusted for inflation or for differences in the cost of living between countries.



## Modelling non-homotheticities

Individuals have preferences over food consumption ( $F$ ) and manufactured goods ( $M$ ).

[Homothetic] Standard Cobb-Douglas:  $U = F^\beta M^{1-\beta}$

[Non-homothetic] Stone-Geary:  $U = (F - f)^\beta M^{1-\beta}$

Individuals require some subsistence level of food consumption  $f$ .

## Preferences vs productivity

So either preferences over manufacturing goods are non-homothetic OR manufacturing productivity has increased.

Which it is matters.

Preferences  $\Rightarrow$  structural change is a **symptom** of growth.

Productivity  $\Rightarrow$  structural change is a **cause** of growth.

## Overcoming the identification problem

- With data on employment shares we cannot separately identify these two possibilities.
- One way to overcome this is to add more data!
- In particular, data on productivity. Normally taken as value added per worker, or wages.

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- With data on employment shares we cannot separately identify these two possibilities.
- One way to overcome this is to add more data!
- In particular, data on productivity. Normally taken as value added per worker, or wages.
- The answer will be setting-specific, and the past is not necessarily the same as the future...
- But, in general, although both are found to be important productivity increases definitely play a role.

**Can the model of the past be applied to today?**

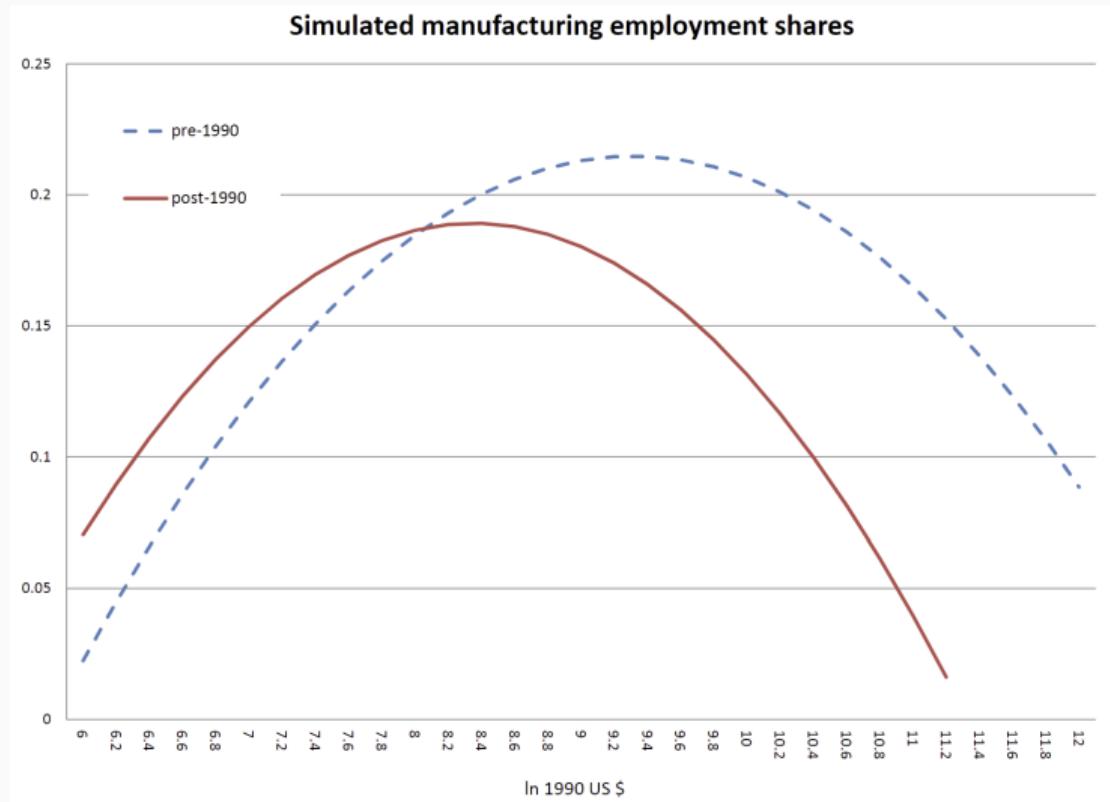
## **Reminder of the story**

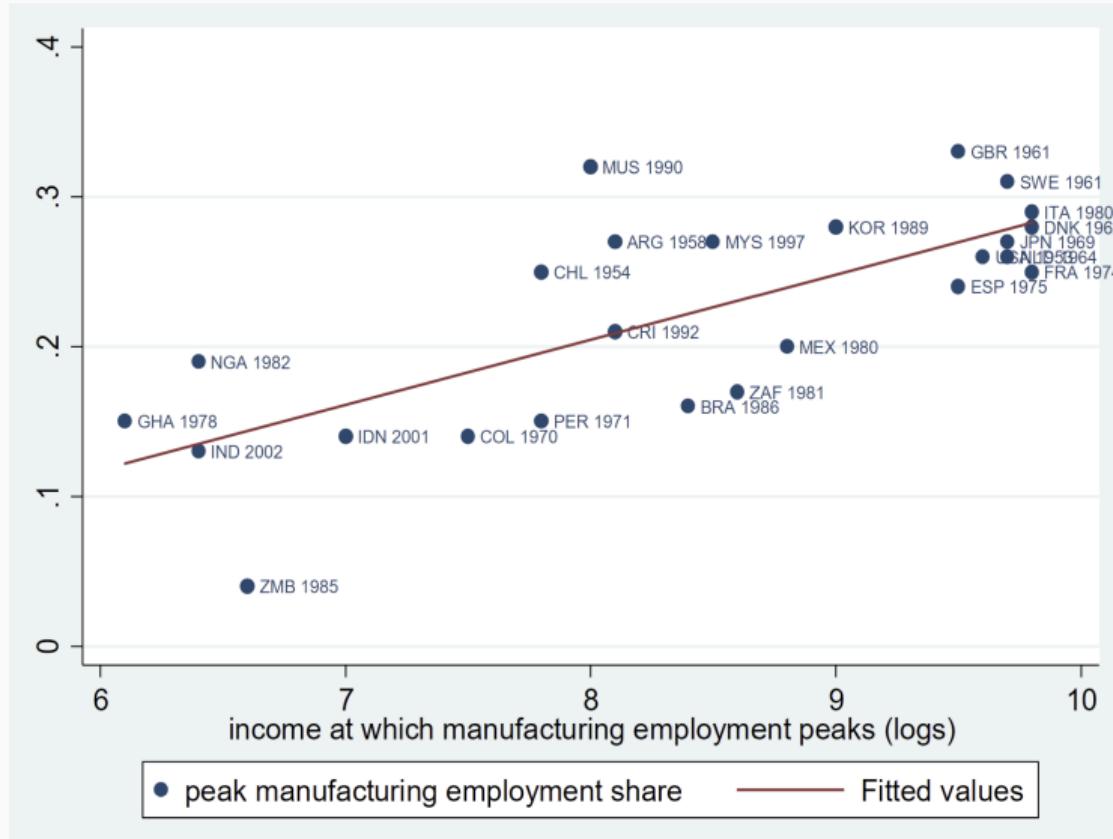
- The path to prosperity is well known, and clearly laid out.
- Mainly agricultural economies first move into manufacturing.
- Then, after they have grown richer countries move into providing high-end services.
  - ... and buy their manufactured products from elsewhere.

Is the same thing happening today?

No

(Rodrik, 2016)





Rodrik, 2016 considers deindustrialization, and **premature deindustrialisation**.

First, we want to test the hypothesis that deindustrialization is accelerating over time.

Regression equation:

$$ManShare_{it} = \beta_0 + \beta_1 \ln(pop_{it}) + \beta_2 (\ln(pop_{it}))^2 + \beta_3 \ln(y_{it}) + \beta_4 (\ln(y_{it}))^2 + \sum_i \gamma_i D_i + \sum_T \psi_T PER_T + \varepsilon_{it} \quad (1)$$

$y$  = GDP per capita,  $PER$  = period dummies,  $D$  = country dummies.

Data: panel, from 1950 to 2010, 42 countries.

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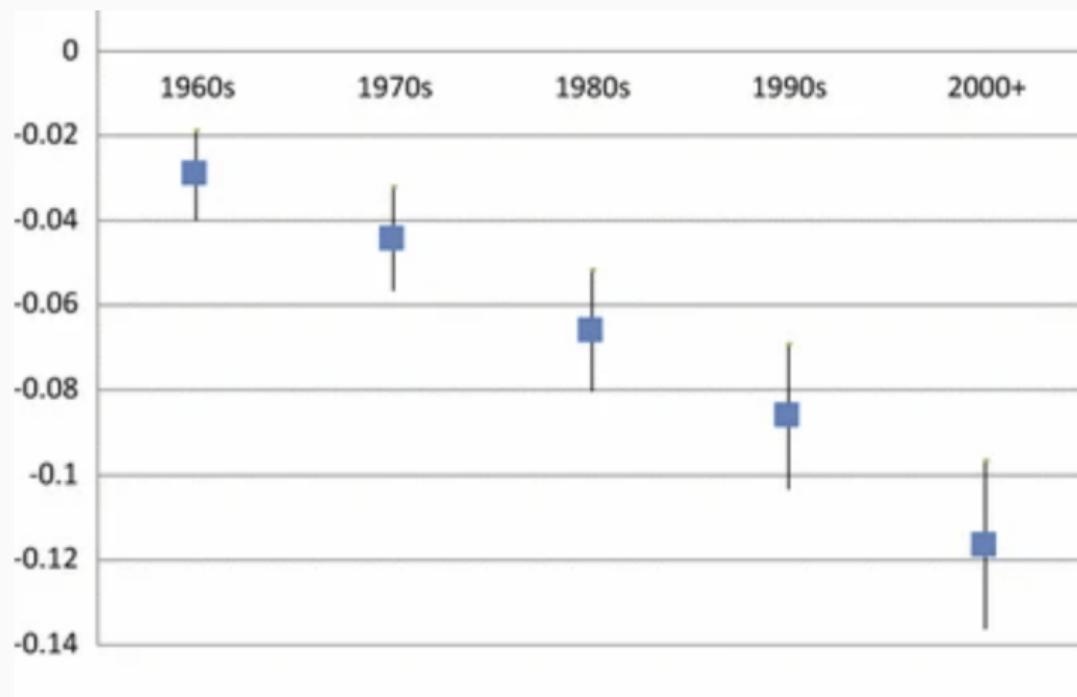
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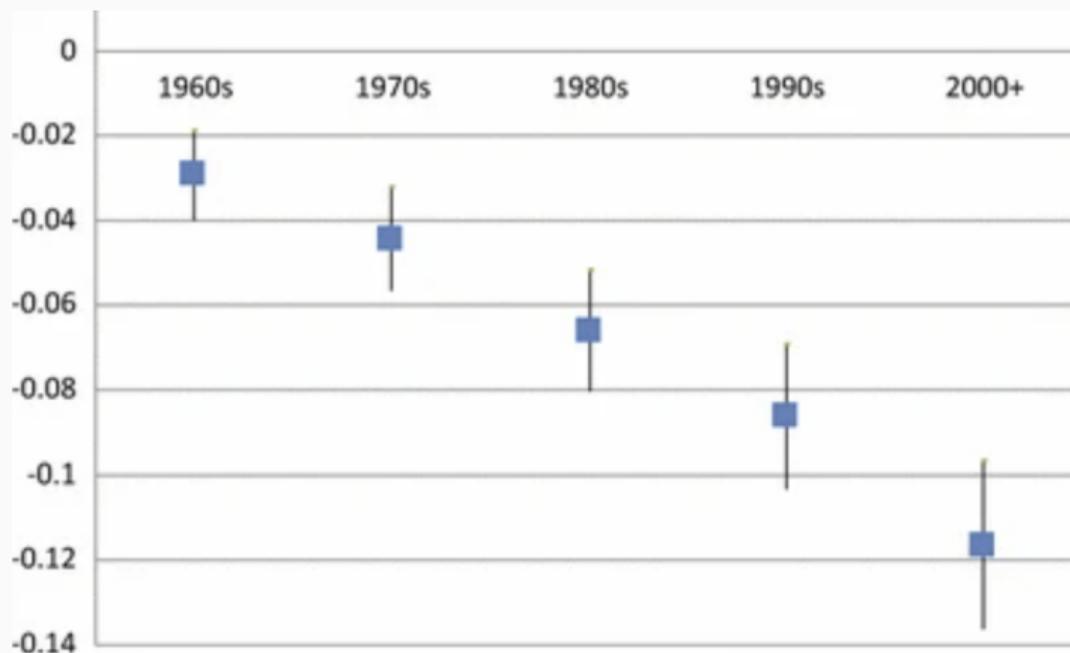
Data: panel, from 1950 to 2010, 42 countries.

We're interested in the coefficients  $\psi_T$ , how would you interpret these?

## Results



## Results

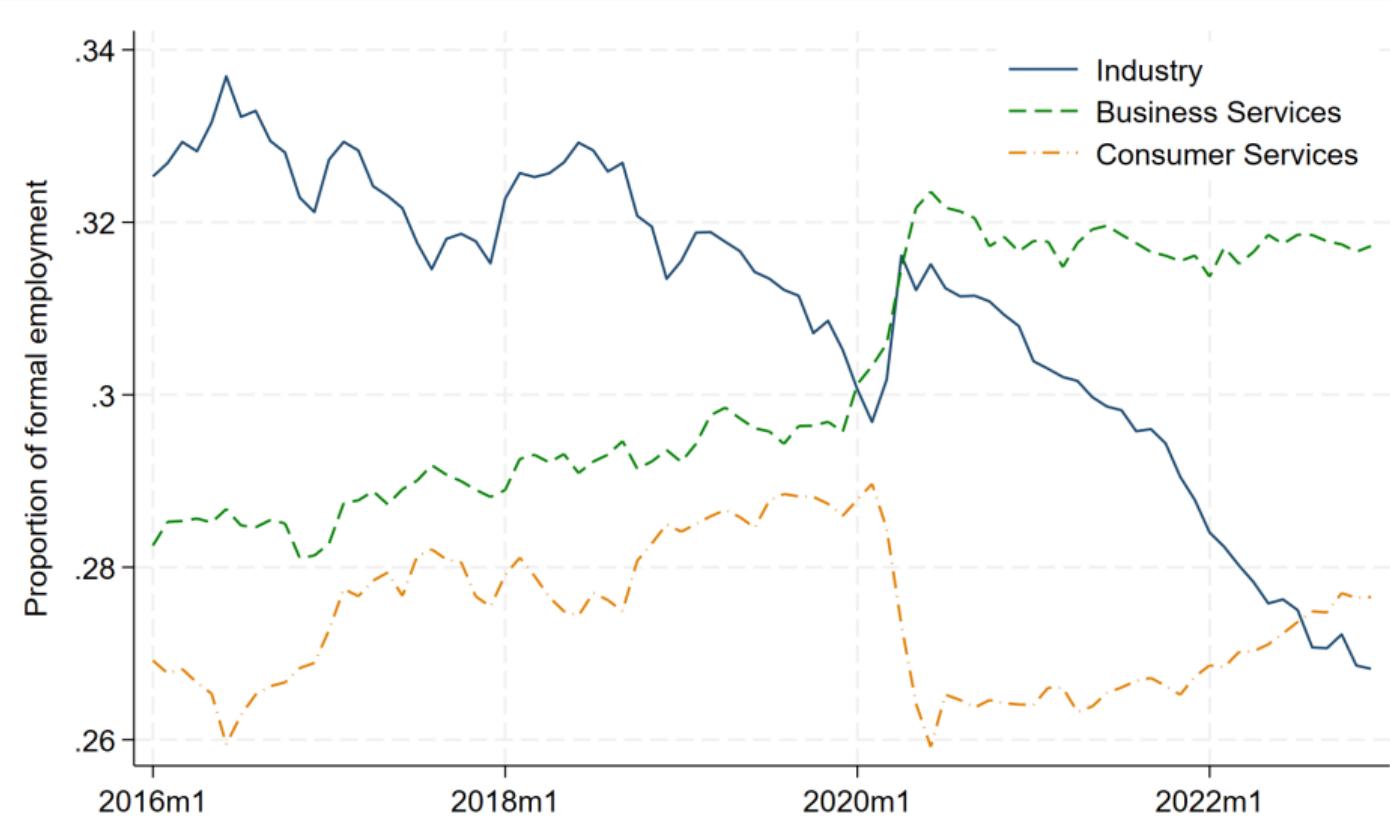


So, deindustrialization is speeding up! But maybe this is expected as rich countries should be in the "services" stage.

## Are relatively poorer countries deindustrialising too?

	<i>all countries</i>	<i>developed countries</i>	<i>Latin America</i>	<i>Asia</i>	<i>Sub-Saharan Africa</i>	<i>Sub-Saharan Africa (excl. Mauritius)</i>
In population	<b>0.122*</b> (0.021)	<b>-0.652*</b> (0.122)	<b>0.191*</b> (0.032)	<b>0.789*</b> (0.102)	<b>0.199*</b> (0.019)	<b>0.178*</b> (0.014)
In population squared	<b>-0.001</b> (0.001)	<b>0.017*</b> (0.003)	<b>-0.003*</b> (0.001)	<b>-0.025*</b> (0.003)	<b>-0.005*</b> (0.001)	<b>-0.004*</b> (0.000)
In GDP per capita	<b>0.316*</b> (0.026)	<b>1.070*</b> (0.088)	<b>0.902*</b> (0.071)	<b>0.912*</b> (0.071)	<b>0.190*</b> (0.024)	<b>0.148*</b> (0.018)
In GDP per capita squared	<b>-0.018*</b> (0.002)	<b>-0.057*</b> (0.005)	<b>-0.052*</b> (0.004)	<b>-0.051*</b> (0.004)	<b>-0.014*</b> (0.002)	<b>-0.011*</b> (0.001)
1960s	<b>-0.018*</b> (0.004)	<b>-0.004</b> (0.004)	<b>-0.027*</b> (0.004)	<b>-0.003</b> (0.013)	n.a.	n.a.
1970s	<b>-0.033*</b> (0.005)	<b>-0.021*</b> (0.006)	<b>-0.050*</b> (0.006)	<b>0.016</b> (0.016)	<b>0.002</b> (0.004)	<b>-0.003</b> (0.003)
1980s	<b>-0.054*</b> (0.006)	<b>-0.052*</b> (0.007)	<b>-0.079*</b> (0.008)	<b>0.022</b> (0.019)	<b>0.004</b> (0.007)	<b>-0.021*</b> (0.005)
1990s	<b>-0.074*</b> (0.008)	<b>-0.072*</b> (0.009)	<b>-0.096*</b> (0.010)	<b>0.013</b> (0.022)	<b>0.007</b> (0.012)	<b>-0.033*</b> (0.007)
2000s+	<b>-0.105*</b> (0.009)	<b>-0.096*</b> (0.010)	<b>-0.131*</b> (0.012)	<b>0.004</b> (0.026)	<b>0.007</b> (0.014)	<b>-0.035*</b> (0.008)
country fixed effects	yes	yes	yes	yes	yes	yes
number of countries	42	10	9	11	11	10
number of observations	2,209	575	545	519	524	481

**Evidence from my own work (join with Peter Wankuru Chacha, Benard Kipyegon Kirui, and Verena Wiedemann) on Kenya**



## Summary thus far

- In the past structural transformation, from agriculture to manufacturing to services was an iron rule of development.
- Moving to manufacturing was a critical factor in causing development because...
  - manufacturing is more productive than agriculture
  - manufacturing is more central in the domestic trade network
  - manufacturing is highly tradeable
- But this is not what is happening in relatively poorer countries today, instead on the whole they are deindustrialising.

Next:

- Why is this happening?
- Is this a problem?
- Is there an alternative model of structural transformation and growth?

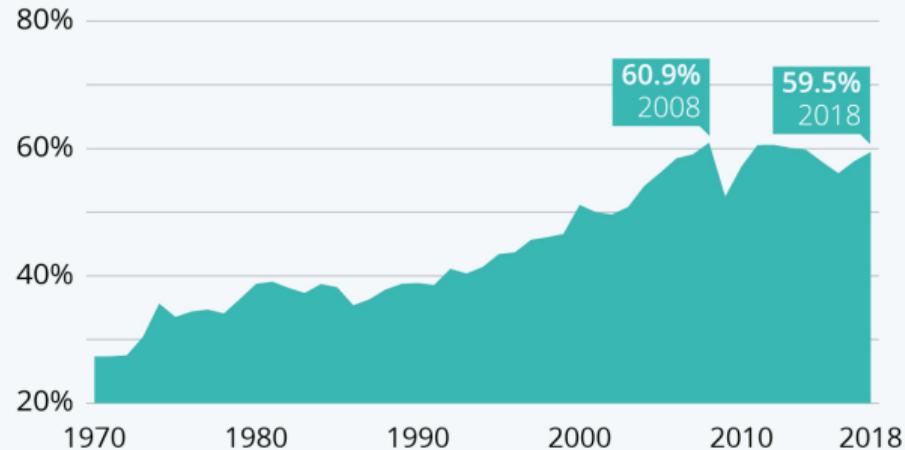
**Why is this happening?**

## Why does the standard pattern no longer appear to hold?

- Explanation one: Because it has already happened.
  - SSA countries have to compete with already well-established industrial economies — Europe, US, China etc. These countries are very productive when it comes to manufacturing.
  - Globalisation ⇒ countries specialise in their comparative advantage. Relatively poorer countries must compete with the world.
  - Bottom line: Today the global economy looks very different from before, and this may make old paths to prosperity no longer possible.
- Explanation two: Manufacturing is becoming more productive and so can employ fewer people.
  - Often given as one of the main reasons behind the decline in richer countries.
  - Increases in productivity cause reductions in prices and so falls in employment.

## Has Globalization Passed Its Peak?

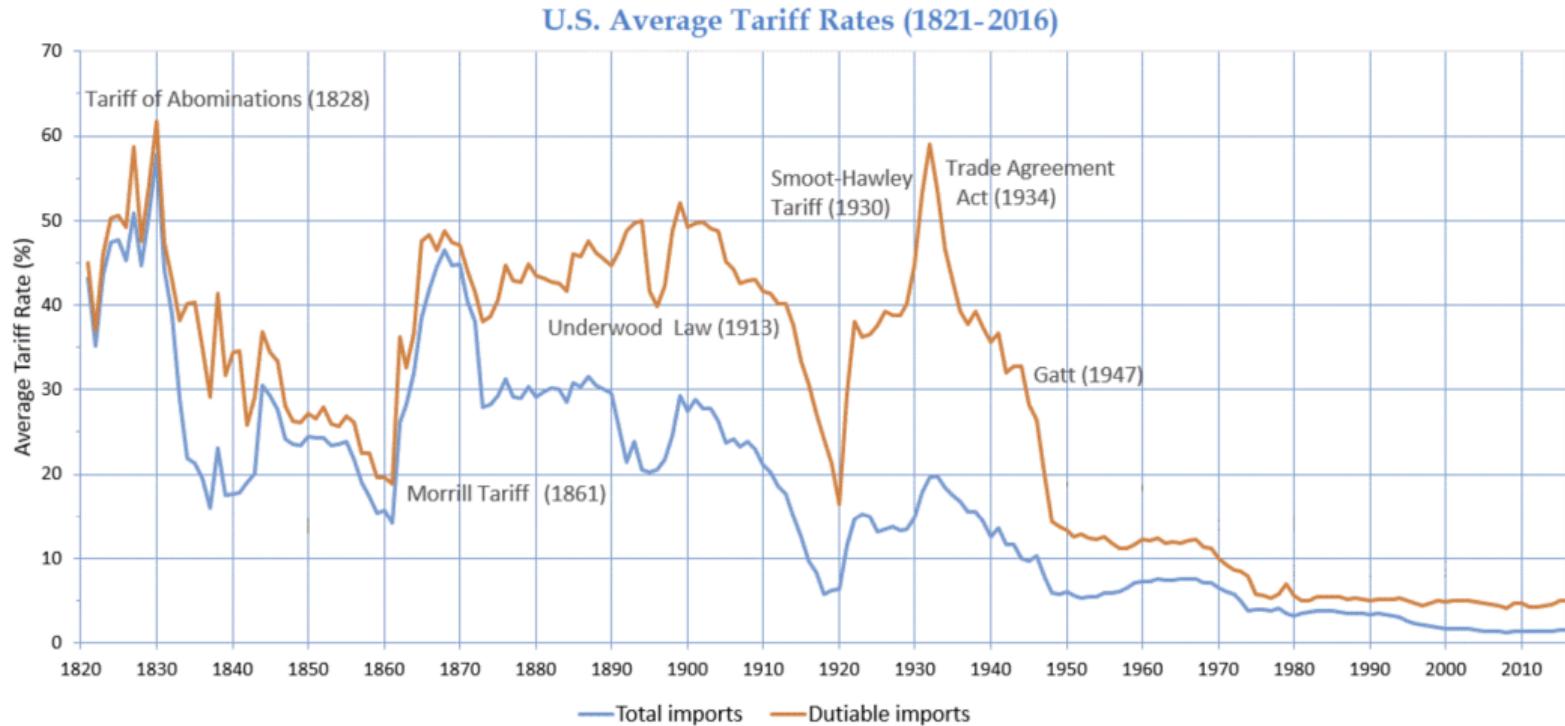
Global trade volume as a percentage of GDP since 1970\*



\* Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.

Source: World Bank

## Rich countries impose much lower tariffs than when they were “developing”



Source: US Department of Commerce, Bureau of the Census, Historical Statistics of the United States 1789-1945, U.S. International Trade Commission, dataweb.usitc.gov

## Distinguishing between the two explanations — an argument by formal theory

Rodrik (2016) lays out the conditions under which each of the explanations is likely to occur in a simple theory.

In this theory, we need:

- Two production sectors, manufacturing, and non-manufacturing.
- Some notion of structural change, most likely in terms of employment.
- Consumers who demand both types of goods.
- Some notion of an “open” economy.

## Production

- There are two sectors manufacturing  $m$  and non-manufacturing  $n$ .
- Denote the share employed in manufacturing by  $\alpha$ .
- Suppose that production in each sector can be written as follows:

$$q_m^s = \theta_m \alpha^{\beta_m}$$

$$q_n^s = \theta_n (1 - \alpha)^{\beta_n}$$

- $q_m^s$  is the quantity of manufactured goods supplied.
- $\theta_m$  is the productivity in the manufacturing sector.
- $\alpha$  is the share of workers in manufacturing.
- $\beta_m$  is a number capturing the production function.

## Demand side (consumers)

- Consumers demand both manufacturing and non-manufacturing goods.
- They will demand more of a good if the price ( $p_m$  or  $p_n$ ) is lower.
- But consumers may also prefer one good or the other.
- To allow for this, we introduce the elasticity of substitution  $\sigma$ .
- If the price of  $m$  increases by 1 percentage point relative to the price of  $n$  then demand for  $m$  goods will decrease by  $\sigma$  percentage points relative to demand for  $n$  goods.

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- In symbols:  $\hat{q}_m^d - \hat{q}_n^d = -\sigma(\hat{p}_m - \hat{p}_n)$
- Where  $\hat{q} = dq/q$  denotes proportional change.

## Market clearing

- Markets have to clear, meaning demand has to equal supply.
- In manufacturing we allow for imports/ exports meaning that domestic supply does not have to meet domestic demand. For non-manufacturing assume net exports are 0.
- In symbols:

$$q_m^s = q_m^d + x$$

$$q_n^s = q_n^d$$

- Where  $x$  denotes exports.

## Small or large economy

- We distinguish between a small open economy (developing country) and a large open economy (US).
- In a small open economy you have no power over  $p_m$  it is set on global markets.
- In a large open economy you have complete price-setting power over  $p_m$ .
- These are of course extremes, the truth lies somewhere in between.

## Small open economy

After some algebra, you arrive at:

$$d\alpha = A(\hat{p}_m + \hat{\theta}_m - \hat{\theta}_n)$$

So to prevent deindustrialisation we need that  $\hat{\theta}_m > \hat{\theta}_n - \hat{p}_m$ .

In words: manufacturing productivity must grow faster than non-manufacturing productivity plus the rate of global price falls for manufacturing goods.

## Large open economy

- Now changes in local productivity can affect prices.
- $\hat{\theta}_m > 0$  now also implies than  $\hat{p}_m$  falls. This does two things.
  1. Increases demand, so  $\alpha$  increases.
  2. Decreases supply, so  $\alpha$  falls.
- The decrease in supply is mechanical, but how much will demand increase? Is it enough to offset the fall in supply?
- Demand will increase by more if they are willing to switch quickly from non-manufactured goods, i.e. if demand is elastic,  $\sigma > 1$ .

## What does the model tell us

- In a developing country setting (small open economy) domestic manufacturing productivity increases cannot explain deindustrialization.
- But in large developed economies it could be a perfectly reasonable explanation.
- Instead in a developing setting reductions in world prices of manufacturing goods are likely to be having a negative effect.
- Model also hints at a solution — if domestic actions affect domestic prices  $p_m$  you are less likely to deindustrialize.

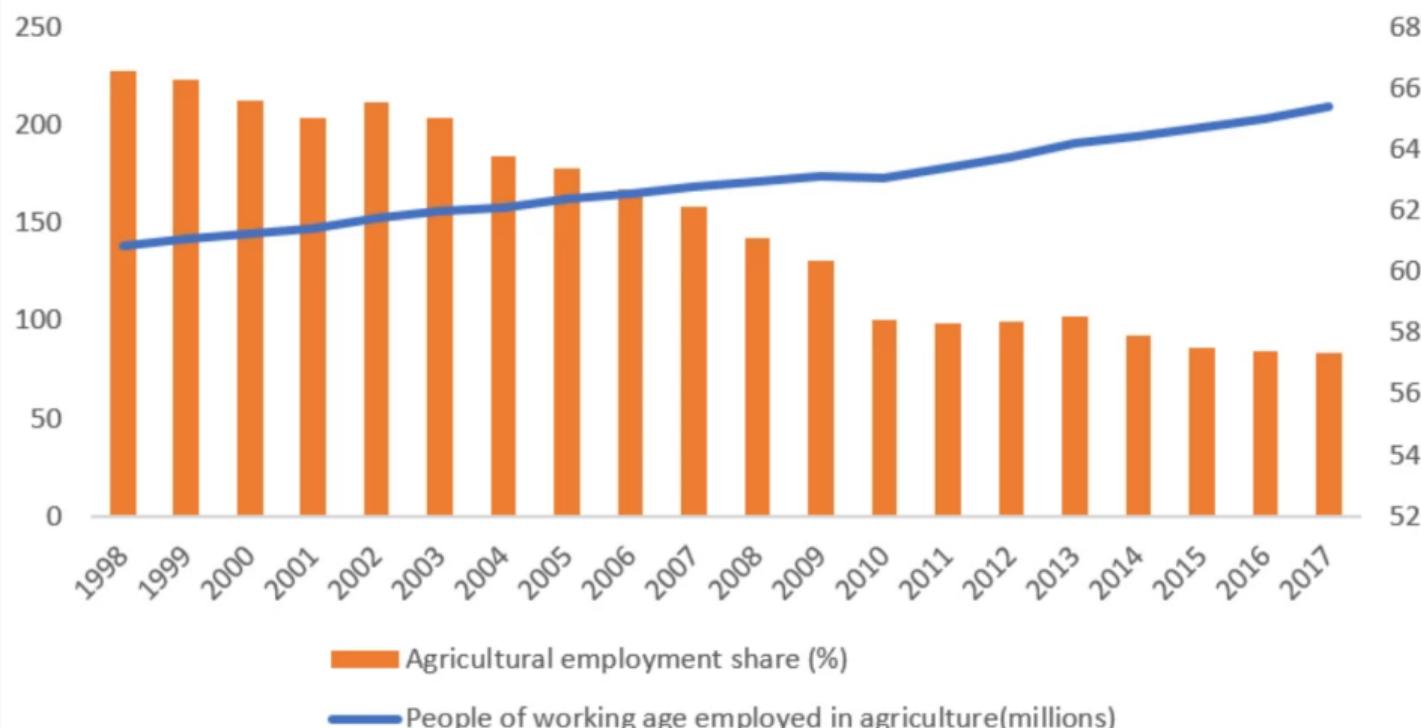
**What is the alternative?**

## If not industrialization, then what?

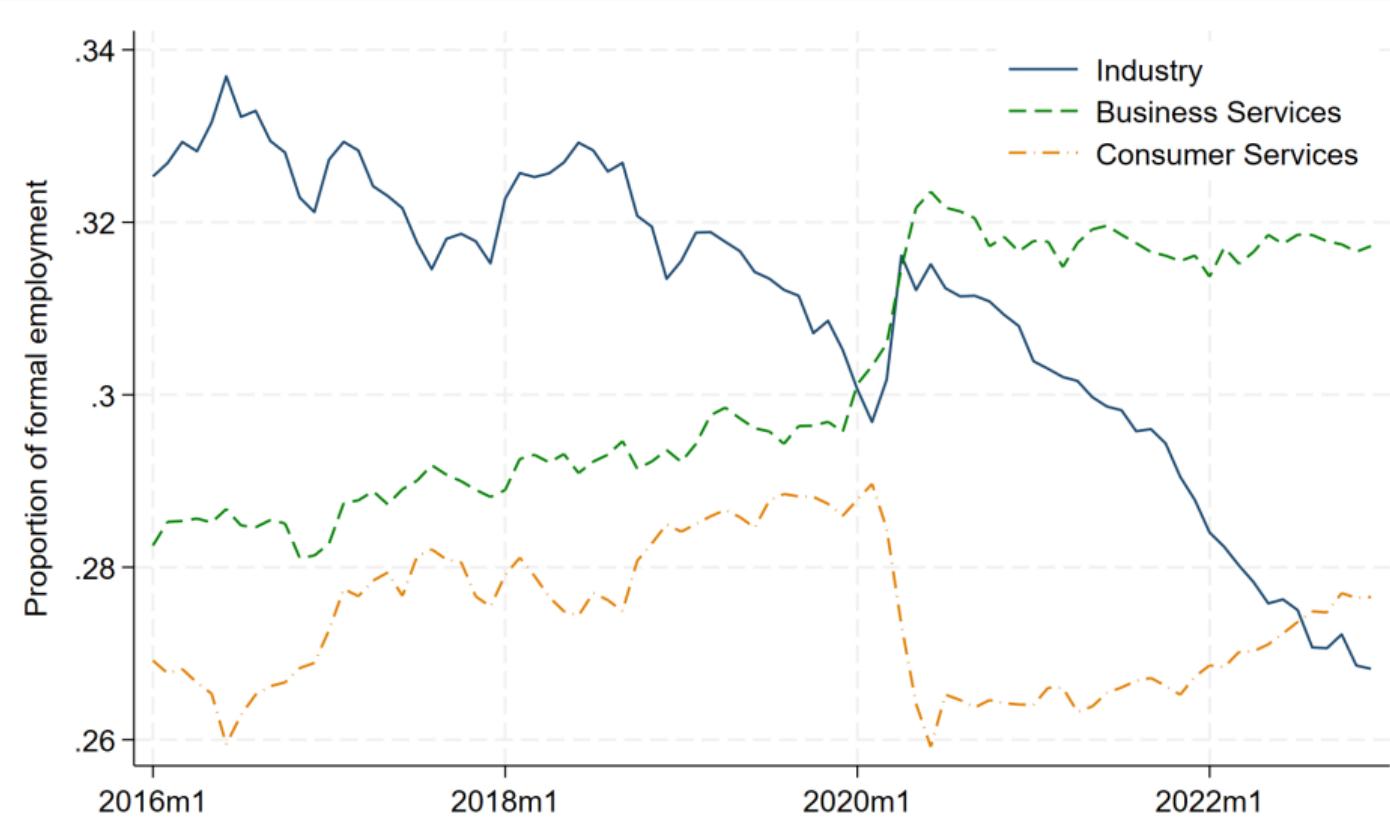
- Two options
  - No structural transformation — stay a mainly agricultural economy
  - Transform into services
- What's happening — look at the data

## Agricultural employment in SSA (World Bank)

Employment in agriculture in Sub-Saharan Africa: rising numbers,  
declining shares



**Evidence from my own work (join with Peter Wankuru Chacha, Benard Kipyegon Kirui, and Verena Wiedemann) on Kenya**



## Case study: India

### Employment in services (% of total employment) (modeled ILO estimate) - India

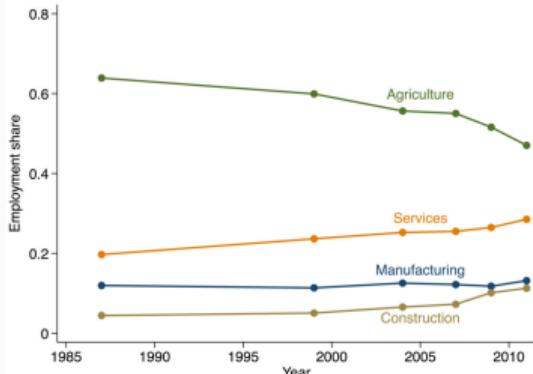
International Labour Organization. "ILO modelled estimates database" ILOSTAT. Accessed February 07, 2024. [ilo.org/ilostat](http://ilo.org/ilostat).

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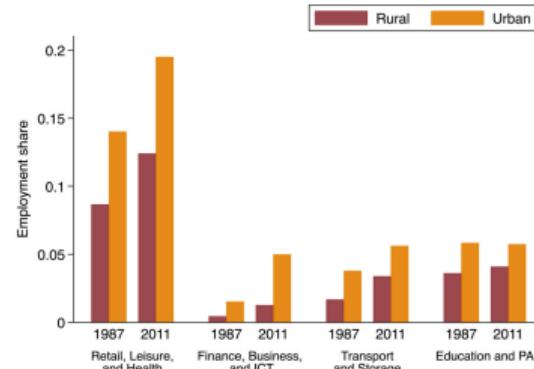


# Fan et al. 2023, “Growing like India”

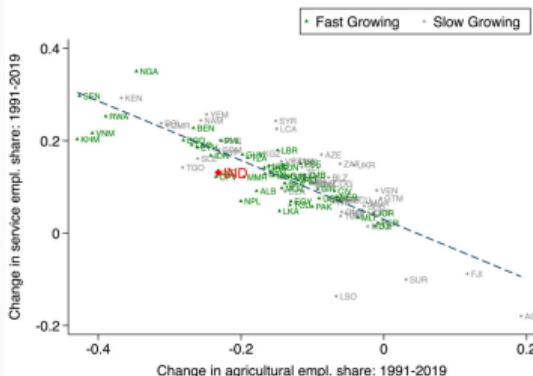
PANEL a: STRUCTURAL CHANGE IN INDIA



PANEL b: EXPANSION OF THE SERVICE SECTOR IN INDIA



PANEL c: DEVELOPING WORLD: SERVICE GROWTH



- Find that productivity growth in (nontradeable) services is an important part of the story.
- Caused structural transformation towards services and increases in living standards.
- However, welfare gains are highly skewed towards relatively richer urbanites.

## **Big open question**

If industrialization is no longer an option, could services be an alternative?

## **Summary**

## Summing up this week

- Question: Can we manufacture prosperity?
- Past patterns of structural transformation: agriculture - manufacturing - services.
- Why manufacturing is good.
- What causes structural transformation? Model of Rodrik 2016.
- Patterns of deindustrialization, why this might be happening.
- Patterns of structural transformation in developing countries today.

## **Answering the question**

Can we manufacture prosperity?

## Next week

Institutions!