Industrialization and Structural Transformation

Part 2: Industrialisation as an engine of growth and the nature of industrial development

EE 482: Public Policy and Industrialization
Semester 2 / 2020
Faculty of Economics, Thammasat University

(1) Industrialisation as an engine of growth

Industrialisation as an engine of growth

- Technological **breakthroughs in textile production** and the application of **steam power** to production in **Great Britain** in the second half of the eighteenth century made a deep impression on contemporary and later observers.
- In the nineteenth century the **term industrial revolution was coined** to describe these developments in retrospect.
- Since World War II, manufacturing has emerged as a **major activity** in many developing countries and the shape and **structure of global manufacturing production** and **trade** have **changed fundamentally**.
- The **division of labour** of the late nineteenth century has been stood on its head.
- Large parts of manufacturing have **relocated to developing countries** which supply industrial exports to the rich countries.

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. Structural Change and Economic Dynamics, 23(4). 406-420.

Industrialisation as an engine of growth

- Some developing countries have experienced a process of **rapid catch-up** which was invariably tied up with **successful late industrialisation**.
- It should be noted that an important role for manufacturing in the process of economic development **does not mean** that the **role of other sectors is unimportant**.
- In development economics, **balanced growth path theory** has emphasised that a **dynamic agricultural sector** is **crucial** to **successful industrialisation**.
- **Financial and transport services** also provide key inputs to industrial development.

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. Structural Change and Economic Dynamics, 23(4). 406-420.

Industrialisation as an engine of growth

- **A very rapid growth** is the norm in **catch-up economies since 1950**.
- Per capita growth rates of GDP in the **catch-up economies** vary from **5 to 9 per cent per year**.
- GDP growth varies from **6 to 11.5 per cent**.
- All examples of catch-up are associated with the widespread and rapid emergence of manufacturing.
- **Industrialisation** appears to be a **key driver of catch-up**.

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics*, 23(4). 406-420.

Industrialisation as an engine of growth

- One of the most interesting issues is the way **catch-up has accelerated** since the nineteenth century, due to **increased globalisation**, greater possibilities for **international technology transfer** and increasing **advantages of backwardness**.
- In the nineteenth century, GDP per capita in the **catch-up countries** was growing at **between** 1.4 **and** 1.9 per cent per year, compared to the 5-9 **per cent after** 1950.
- The ratio of per capita GDP growth to that of the **United Kingdom** in the corresponding years **prior to** 1913 was between 1.3 and 2.
- After 1950, the catch-up countries were growing on **average three times as fast as** the world leader the USA.

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. Structural Change and Economic Dynamics, 23(4). 406-420.

Industrialisation as an engine of growth

- In 1950, **41 per cent** of developing country GDP **originated in the agricultural sector**.
- It declined dramatically to **16 per cent in 2005**.
- It is worth noting that the **average share of services** in developing countries was already **40 per cent in 1950**, far higher than the average share of industry.
- Thus, the pattern of **structural change** in developing countries **differs radically from the traditional patterns** of structural change, in which the rise of industry precedes that of the service sector.

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. Structural Change and Economic Dynamics, 23(4). 406-420.

Industrialisation as an engine of growth

- The average share of **manufacturing increased** in all countries between 1950 and 1980, peaking at around 20 per cent in the early eighties.
- Between 1980 and 2005, the share of manufacturing continued to **increase** in many **Asian economies**, but there were **processes of deindustrialisation** in **Latin America** and **Africa**.
- This was most marked in **Latin American** countries where the share of **manufacturing declined** from 24 to 18 per cent on average.
- In the advanced economies, the share of **manufacturing declined** substantially from 31 per cent in 1945 to 17 per cent in 2005.
- The most important sector in 2005 is the **service sector**, accounting for around **70 per cent of GDP**, up from **43 per cent in** 1950.

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. Structural Change and Economic Dynamics, 23(4). 406-420.

Industrialisation as an engine of growth

1. There is an **empirical correlation** between **the degree of industrialisation** and **per capita income** in developing countries.

2. **Productivity is higher** in the **manufacturing sector** than in the agricultural sector. The **transfer of resources from agriculture to manufacturing** provides a **structural change bonus**. A dynamic version of the structural change bonus argument is that **manufacturing has higher rates** of **productivity growth** than other sectors.

3. The transfer of resources **from manufacturing to services** provides a **structural change burden** in the form of *Baumol*'s disease. As the **share of the service sector increases**, aggregate **per capita growth** will tend to **slow down**.

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. Structural Change and Economic Dynamics, 23(4). 406-420.

Industrialisation as an engine of growth

4. Compared to agriculture, the manufacturing sector offers **special opportunities for capital accumulation**. Capital accumulation can be more easily realised in **spatially concentrated manufacturing** than in spatially dispersed agriculture. This is one of the reasons why the emergence of **manufacturing** has been so **important in growth and development**. Capital intensity is high in mining, manufacturing, utilities and transport. It is much lower in agriculture and services. **Capital accumulation** is one of the **aggregate sources of growth**. Thus, an **increasing share of manufacturing** will contribute to **aggregate growth**.

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics*, 23(4). 406-420.

Industrialisation as an engine of growth

5. The manufacturing sector offers special opportunities for **economies of scale**, which are **less available** in **agriculture** or **services**.

6. The manufacturing sector offers special opportunities for both embodied and disembodied technological progress. **Technological advance originates in the manufacturing sector** and diffuses from there to other economic sectors such as the service sector

7. As per capita incomes rise, the **share of agricultural expenditures** in total expenditures **declines** and the share of **expenditures on manufactured goods increases** (**Engel's law**). Countries **specialising in agricultural** and **primary production** will **not profit from this feedback-loop process.**

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics*, 23(4). 406-420.

Industrialisation as an engine of growth

8. **Linkage and spillover effects** are **stronger** in manufacturing than in agriculture or mining. Linkage effects refer to the **direct backward and forward linkages** between different sectors. Linkage effects create **positive externalities** to investments in given sectors. Spillover effects refer to the **disembodied knowledge flows** between sectors. Spillover effects are a special case of externalities which refer to externalities of investment in knowledge and technology. Linkage and spillover effects are presumed to be **stronger within manufacturing** than within other sectors. Linkage and spillover effects **between manufacturing and other sectors** such as services or agriculture are also **very powerful.**

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. Structural Change and Economic Dynamics, 23(4). 406-420.

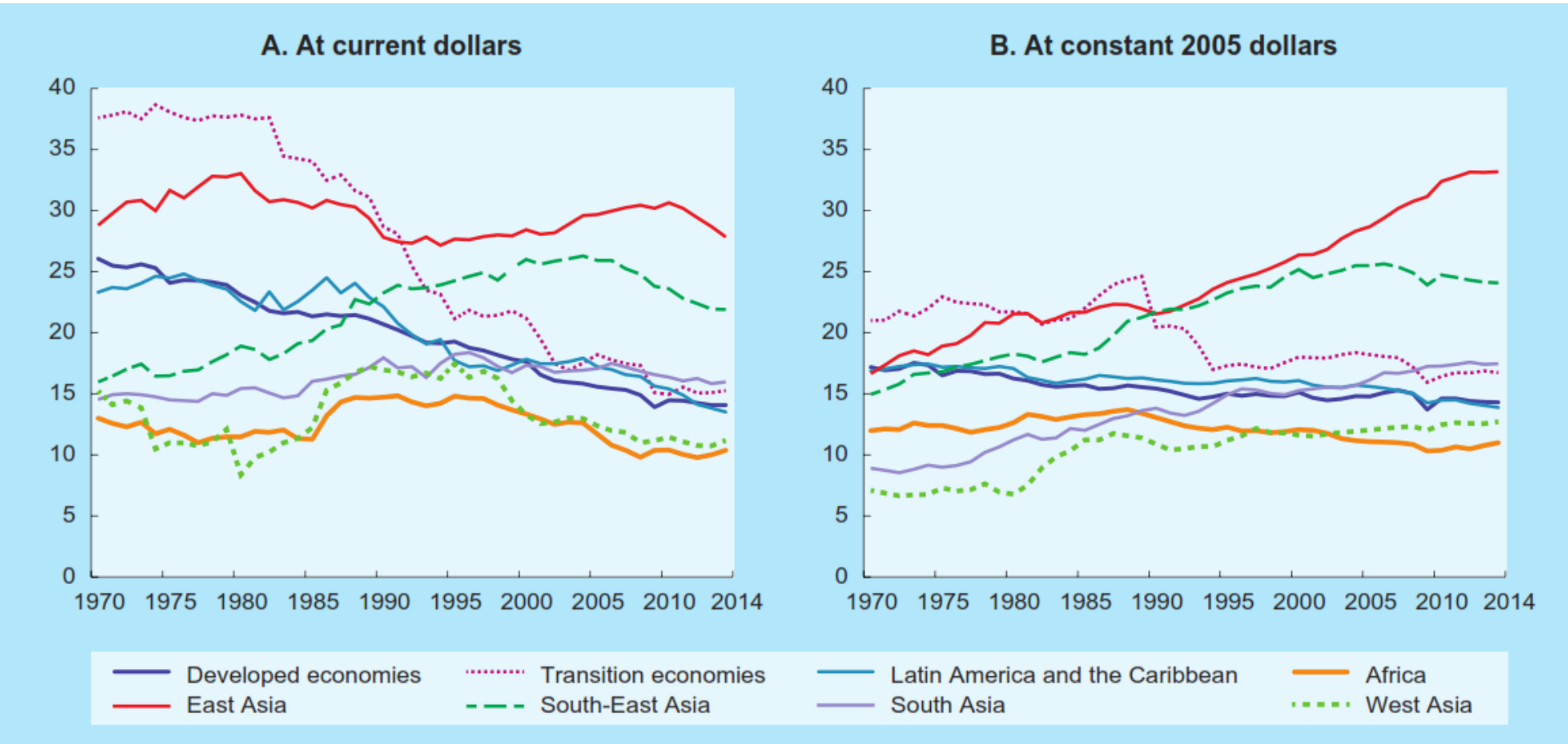
The Engel law

- Demand relationships are also crucial for the argument that **manufacturing** is an **engine of growth**.
- The **lower the per capita income** of a country, the larger the proportion of that income that will be **spent on basic agricultural foodstuffs**.
- This is the famous **Engel law** (Engel, 1857).
- As per capita **income increases**, the **demand for agricultural products** will **decline** and the **demand for industrial products** will tend to **increase**.
- Economic development creates a **mass market for industrial products**.
- This creates dynamic opportunities for manufacturing. If a country **remains in agriculture** and **fails to develop its domestic manufacturing industry**, it will have to **import increasing** amounts of **manufactured goods**.
- However a similar argument can be made for services at higher levels of per capita income. The **elasticity of service consumption** with respect to total consumption is **quite high**.
- This would be an argument for **service-led growth** at higher levels of development.

Source: Szirmai, A. (2012). Industrialisation as an engine of growth in developing countries, 1950–2005. Structural Change and Economic Dynamics, 23(4). 406-420.

(2) The nature of industrial development

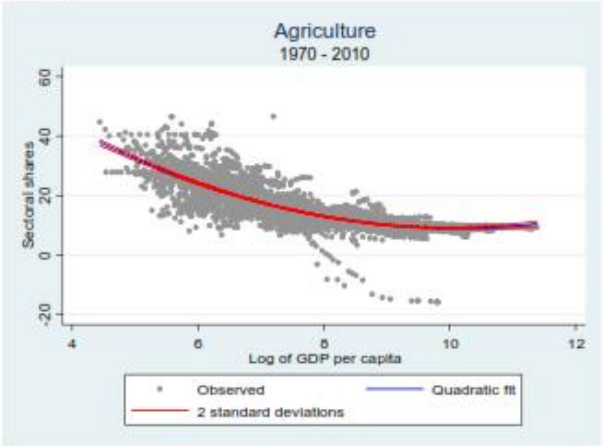
Share of Manufacturing in Total Value Added, By Country Group, 1970-2014

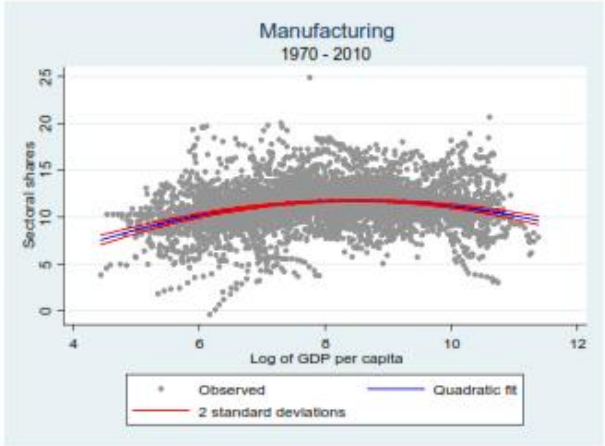


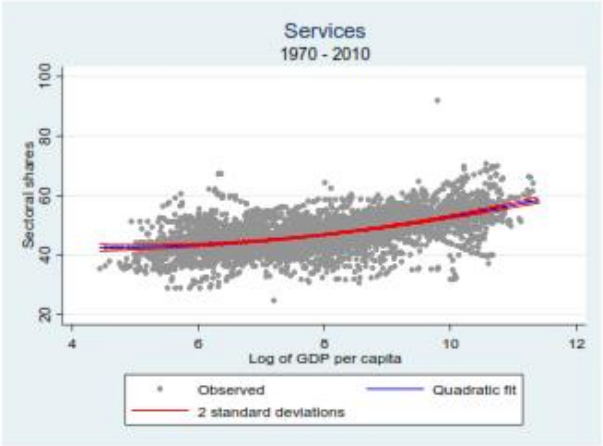
Source: UNCTAD. (2016). The Catch-up Challenge: Industrialization and Structural Change. New York and Geneva: United Nations.

Full Sample

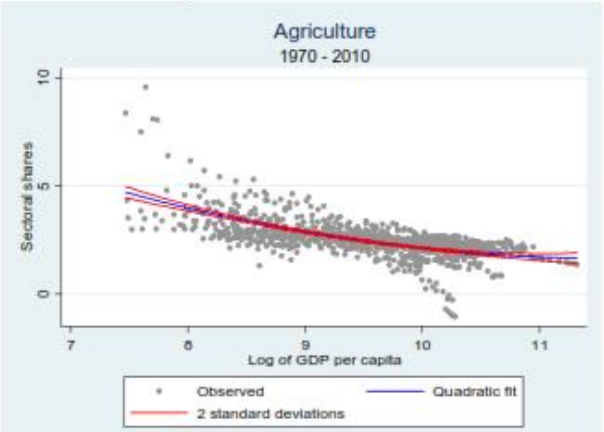
Source: Dabla-Norris, E., Thomas, A., Garcia-Verdu, R., & Chen, Y. (2013). Benchmarking structural transformation across the world. IMF Working Paper WP/13/176.

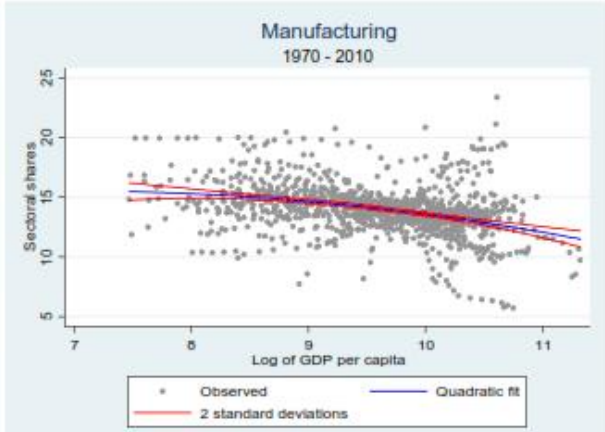


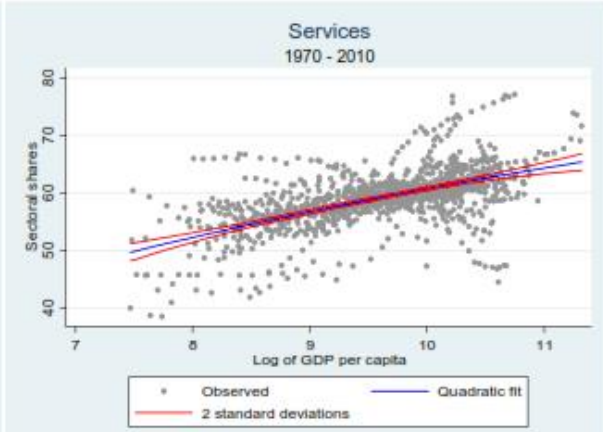




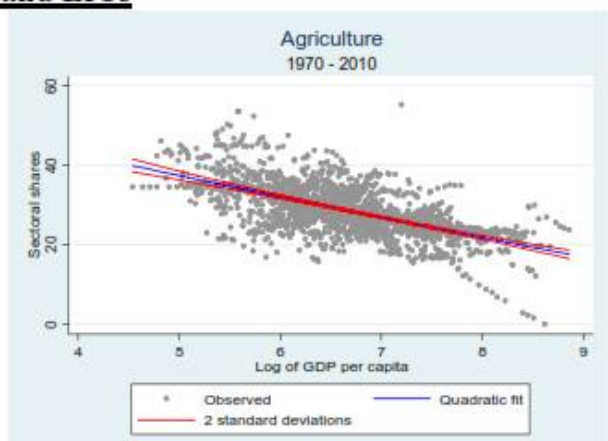
Advanced economies

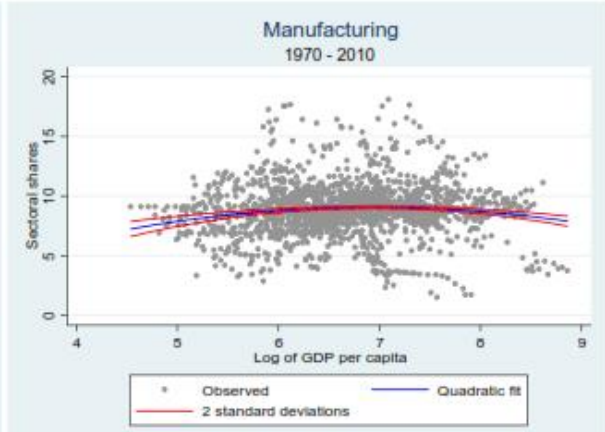


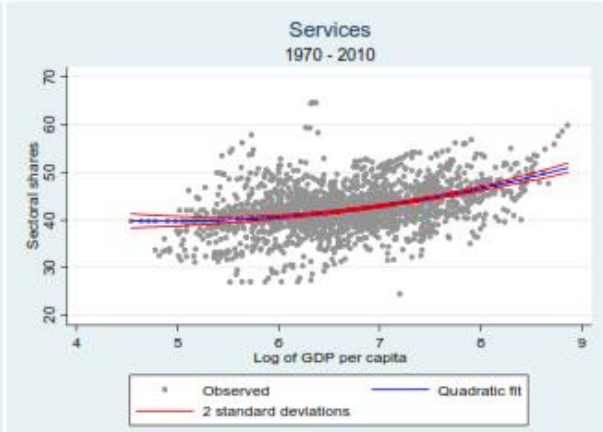


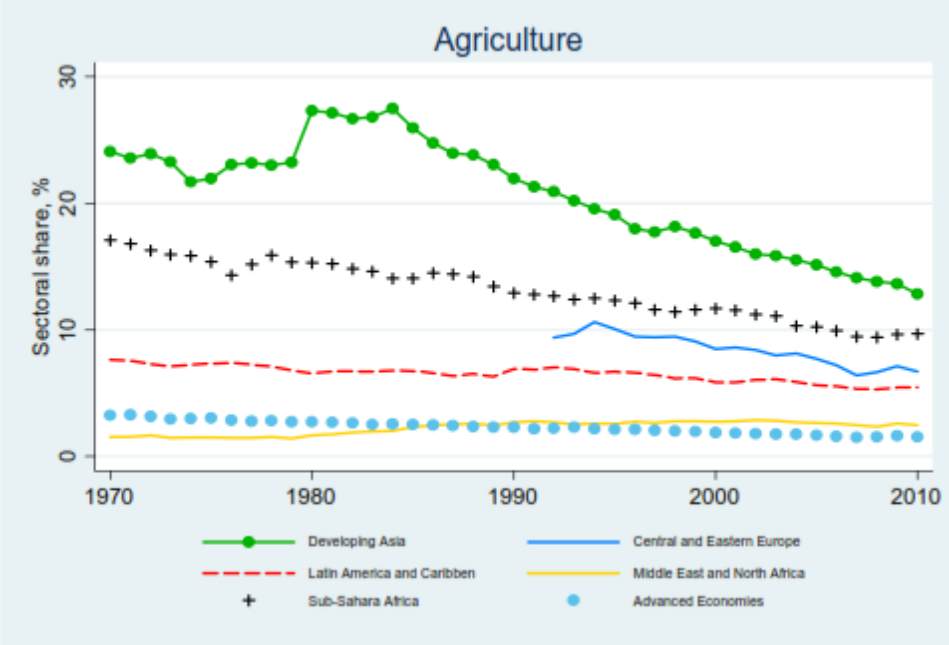


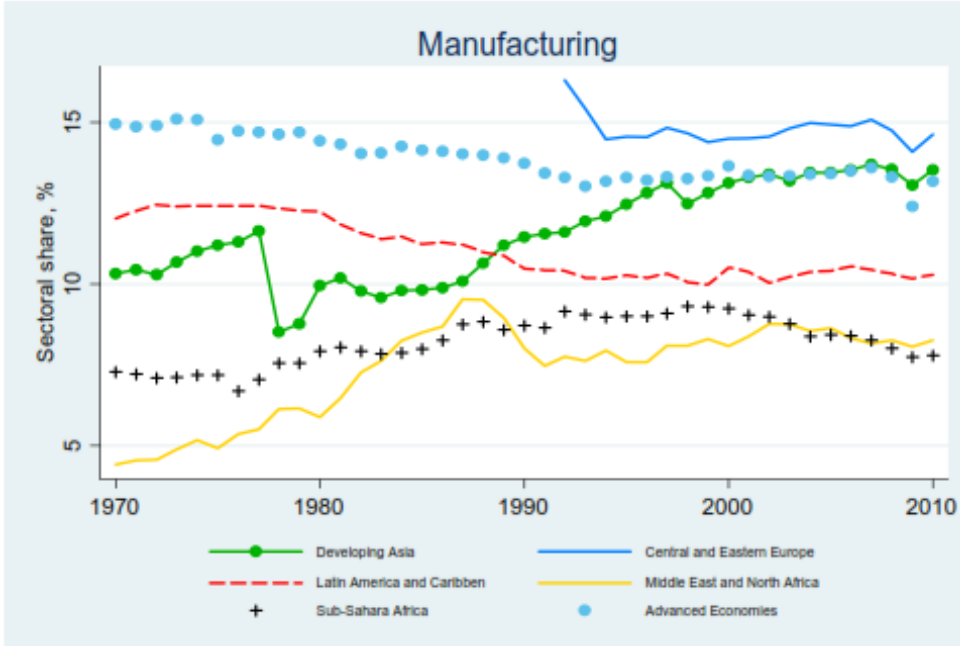
EMEs and LICs

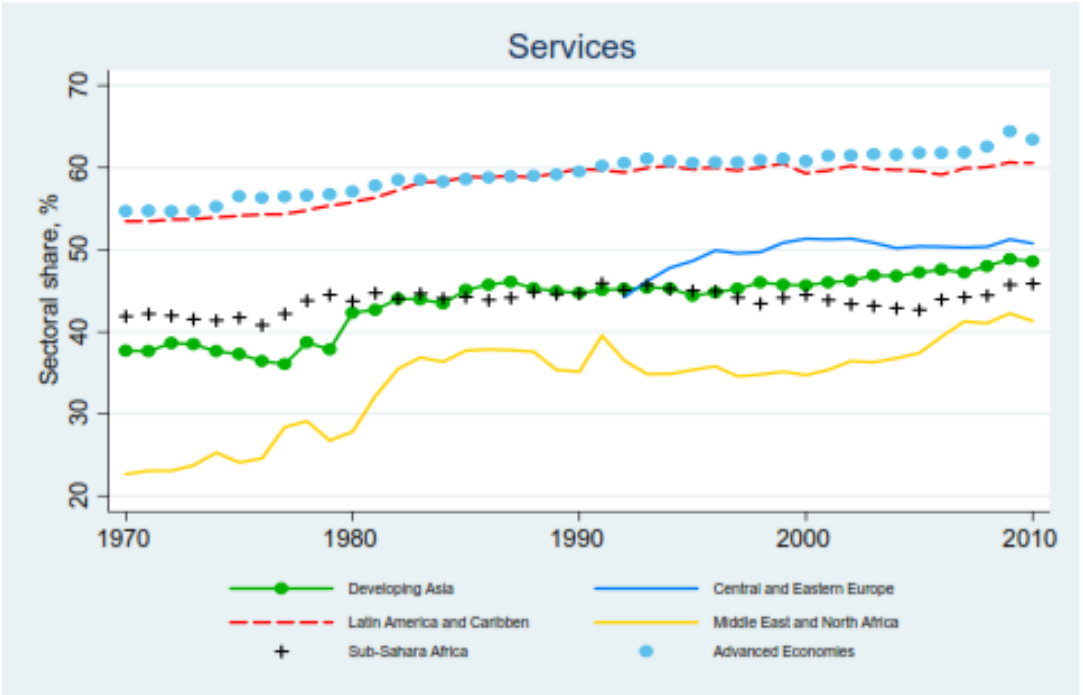












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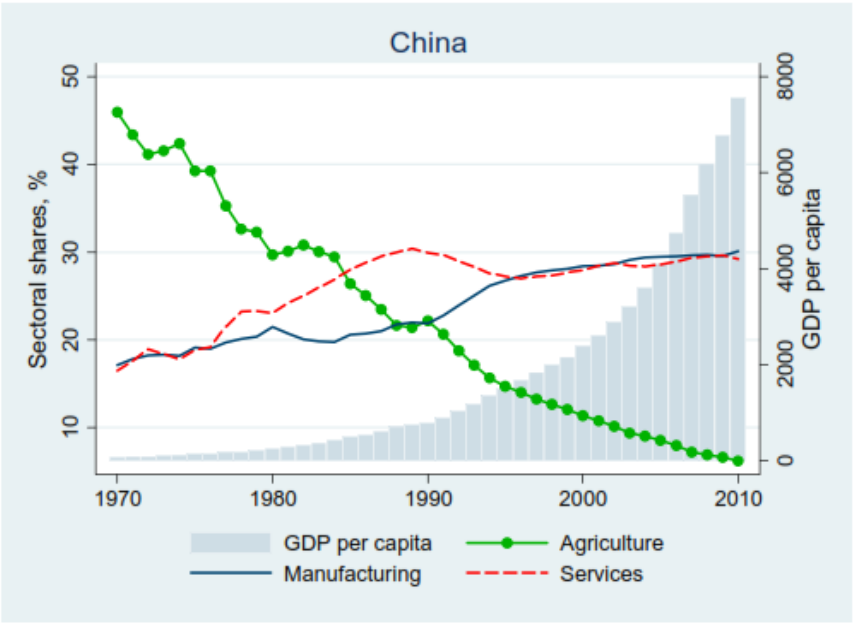

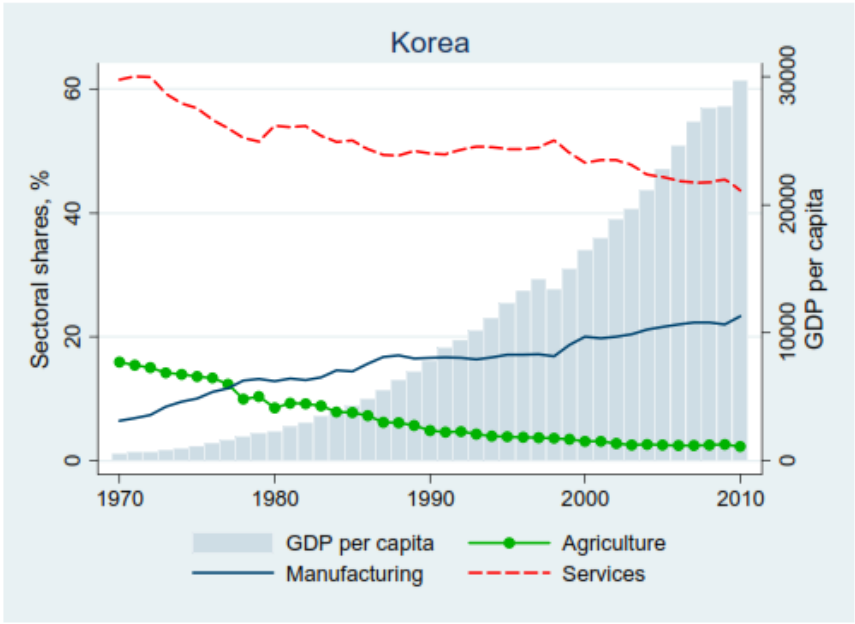

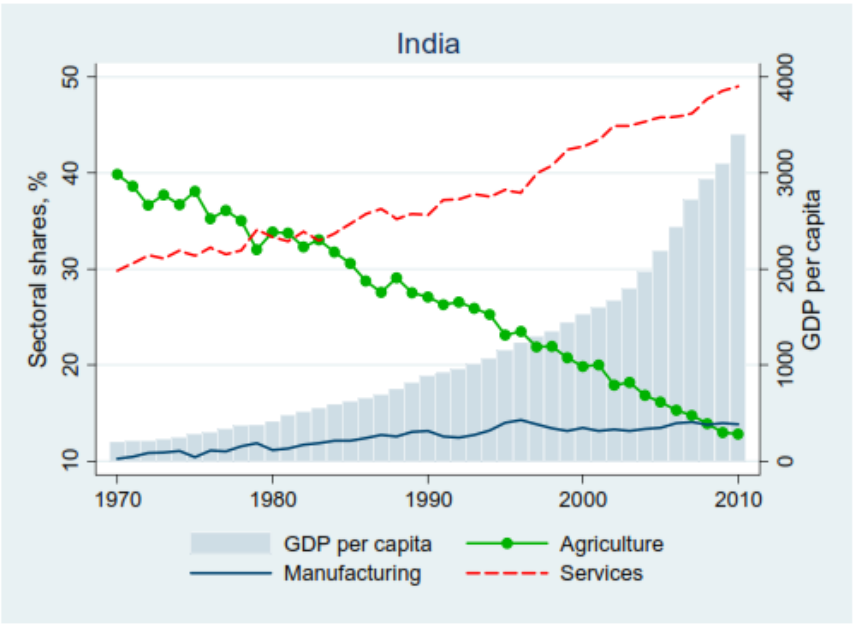

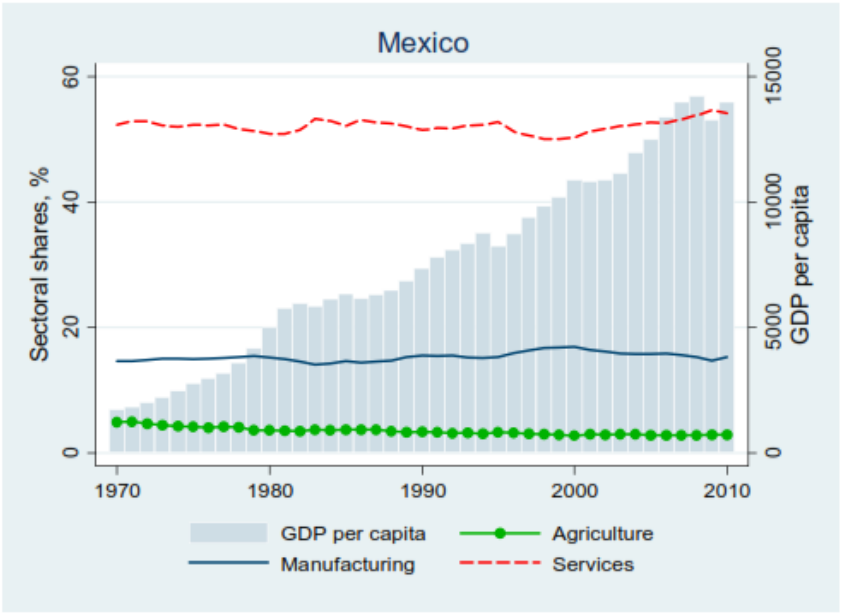

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Dependent Variables	Description	Source
Agriculture, manufacturing, services	The real value added share of agriculture, manufacturing and services sectors in total value added, constructed from the real value added by economic activity series.	UN data
Structural Variables		
Transition [D]	Binary variable equals to 1 if the country is transition economy	
Island [D]	Binary variable equals to 1 if the country is island economy with population less than 1 million	
Mining, % of total value added	Sectoral real value added share of mining, in percent	UNdata
Land Area [log]	Natural log of land area, in sq km	World Bank: World Development Indicators
Population [log]	Natural log of total population	World Bank: World Development Indicators
Arable land, % of total	Percentage of arable land of total land area, in percent	World Bank: World Development Indicators
Age dependency ratio - Young	Age dependency ratio, young, as a percentage of working-age population	World Bank: World Development Indicators
Age dependency ratio - Old	Age dependency ratio, old as a percentage of working-age population	World Bank: World Development Indicators
GDPPC [log]	Natural log of GDP per capita, in constant PPP U.S. dollar	IMF: World Economic Outlook
Square of (GDPPC, [log])	Square term of the natural log of GDP per capita, in constant PPP U.S. dollar	IMF: World Economic Outlook

Source: Dabla-Norris, E., Thomas, A., Garcia-Verdu, R., & Chen, Y. (2013). Benchmarking structural transformation across the world. IMF Working Paper. WP/13/176

	(1) Agriculture	(2) Manufacturing	(3) Services
Transition Economy [Dummy]	-2.156	2.762	-3.174
	[0.406]***	[0.235]***	[0.509]***
Island Economy [Dummy]	0.872	-3.779	6.716
	[0.379]**	[0.220]***	[0.475]***
Mining Output Share	-0.052	-0.192	-0.55
	[0.007]***	[0.004]***	[0.009]***
Land Area [Log]	1.083	-0.254	-0.389
	[0.081]***	[0.047]***	[0.101]***
Population [log]	-1.893	0.983	-0.056
	[0.103]***	[0.060]***	[0.129]
Arable Land	6.831	-1.351	-2.819
	[0.887]***	[0.514]***	[1.113]**
Age dependency ratio - Young	-0.083	-0.027	0.146
	[0.009]***	[0.005]***	[0.011]***
Age dependency ratio - Old	-0.127	-0.214	0.475
	[0.025]***	[0.014]***	[0.031]***
GDPPC [log]	-34.648	7.788	14.33
	[0.714]***	[0.414]***	[0.895]***
Square of (GDPPC [log])	1.54	-0.366	-0.522
	[0.045]***	[0.026]***	[0.056]***
Constant	207.133	-31.149	-34.703
	[3.180]***	[1.843]***	[3.989]***
Observations	5,341	5,341	5,341
R-squared	0.795	0.516	0.661
Number of countries	168	168	168
Time dummies	YES	YES	YES

Robust standard errors in parenthesis. Significance levels: *** 0.01, ** 0.5, * 0.1.

Source: Dabla-Norris, E., Thomas, A., Garcia-Verdu, R., & Chen, Y. (2013). Benchmarking structural transformation across the world. IMF Working Paper. WP/13/176

The nature of industrial development

- The figure shows that there is a **hump-shaped relation** between the **level of industrialization** and **the degree of industrialization** of the overall economy.
- In the early stages of industrial development, the economic system is **increasingly specialized** in the supply of manufacturing output.
- This also implies that an increasing share of inputs is employed in this sector.
- However, as the process continues the **relative importance of manufacturing** in the **economy declines.**

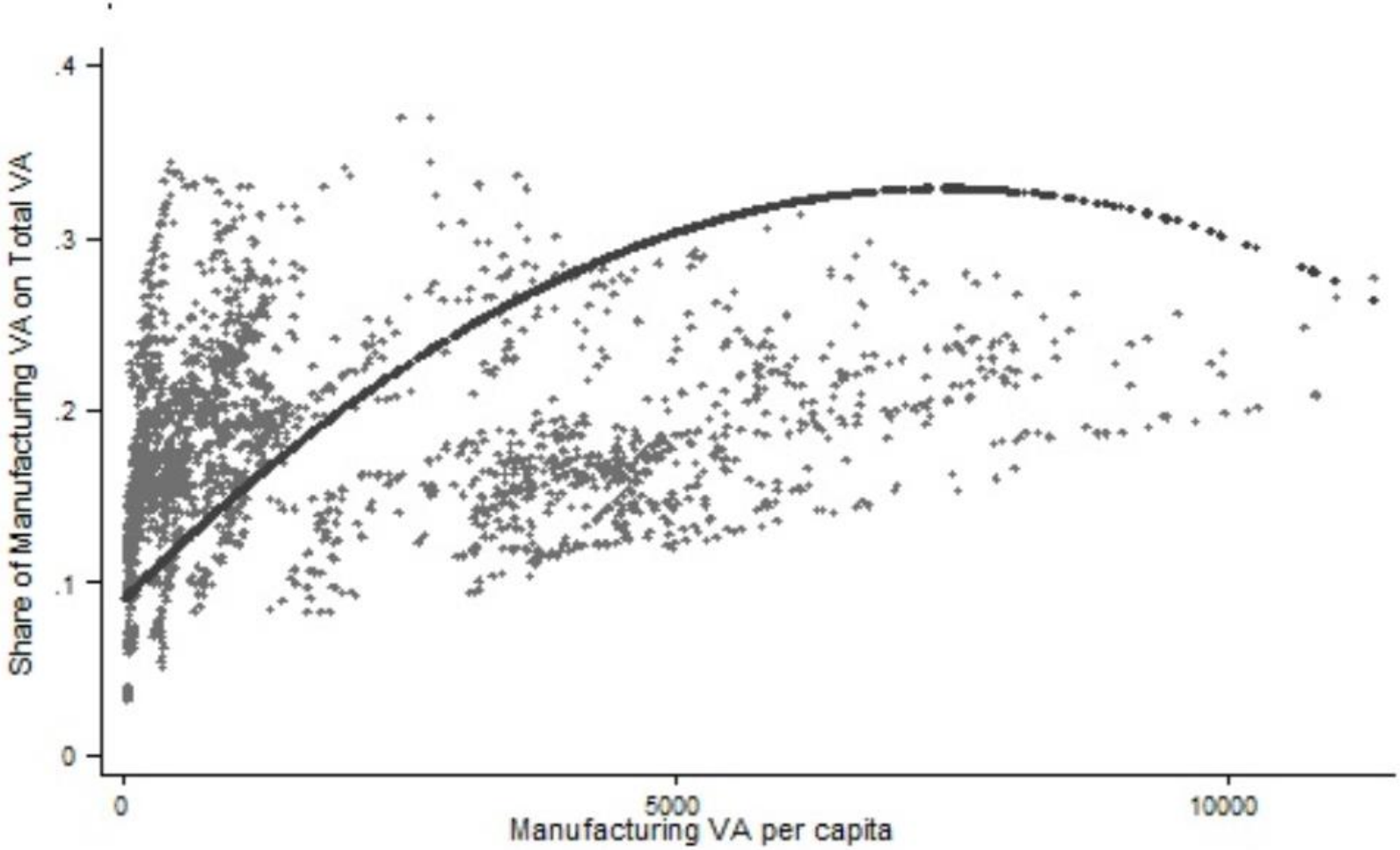
Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change. Structural Change and Economic Dynamics, 42, 26-37.

Country	Man. VA per capita ($)	Country	Man. VA per capita ($)
OECD countries in the '70s*		**ISI countries**	
Australia	2130.5	Argentina	1027.2
Austria	1972.3	Brazil	541.2
Belgium	2070.1	Colombia	335.5
Canada	1982.6	Chile	348.5
Denmark	1915.4	Costa Rica	358.8
Finland	2535.1	Ecuador	282.2
France	2050.3	Mexico	610.2
Germany	4091.3	Panama	327.3
Greece	902.8	Turkey	458.4
Ireland	1158.5	South Africa	563.8
Israel	1195.4		
Italy	1946.3	**Late industrializers**	
Japan	2671.1	Bangladesh	33.5
Netherlands	1766.3	Bolivia	128.9
New Zealand	1700.8	Cameroon	142.8
Norway	1952.0	China	110.7
Portugal	575.9	Egypt	109.1
Spain	1262.5	Honduras	142.3
Sweden	2578.3	India	42.0
Switzerland	3705.6	Indonesia	88.9
United Kingdom	2078.6	Jamaica	237.4
United States	2698.8	Jordan	221.6
		Kenya	68.7
Asian Tigers, East Europe**		Morocco	142.2
Bulgaria	460.8	Pakistan	39.6
Czech Republic	665.2	Peru	130.5
Hungary	592.7	Philippines	209.5
Malaysia	401.8	Senegal	58.6
Poland	584.9	Sri Lanka	44.3
Romania	750.8	Thailand	166.9
South Korea	436.1	Tunisia	159.6
Singapore	1540.2	Vietnam	23.0
Slovakia	647.6	Zimbabwe	248.5

Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change, *Structural Change and Economic Dynamics*, 42, 26-37.

Inter-sectoral structural change and industrial development

(1980-2011,$,real values)



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Inter-sectoral structural change and industrial development

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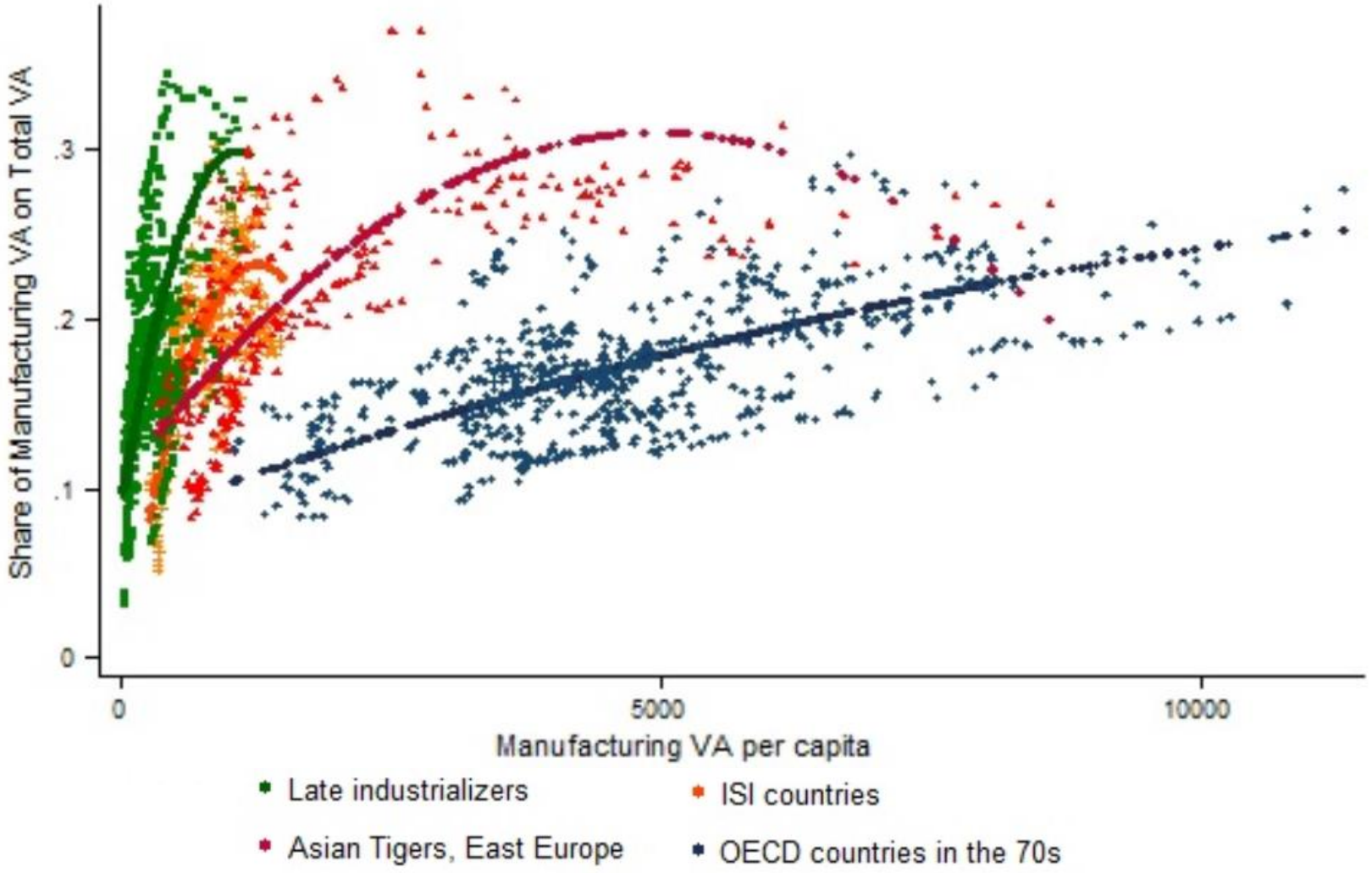

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The nature of industrial development

- The later the **industrialization process started the faster** has been the sectoral **concentration of manufacturing** value added.
- In other words, relative to the **old industrialized countries**, whose industrial development **did not alter significantly the composition of the manufacturing sector** and involved a relatively large number of activities (the Gini coefficient is relatively stable and low along the entire period)
- For all the other groups the **sectoral distribution started concentrating (again) much** earlier.
- For late industrializers and former ISI countries this occurred at around $1000 at constant prices, for Asian Tigers and East European countries between $2000 and $3000.
- The **differentiated pattern of structural change** is consistent with the idea that those manufacturing sectors that **entered global value chains** and had **access to international markets** could grow at a faster rate than the rest of the industry.
- Provided they have gained some **comparative advantage**, **the speed** can be seen as a function of the overall **degree of industrial development**.

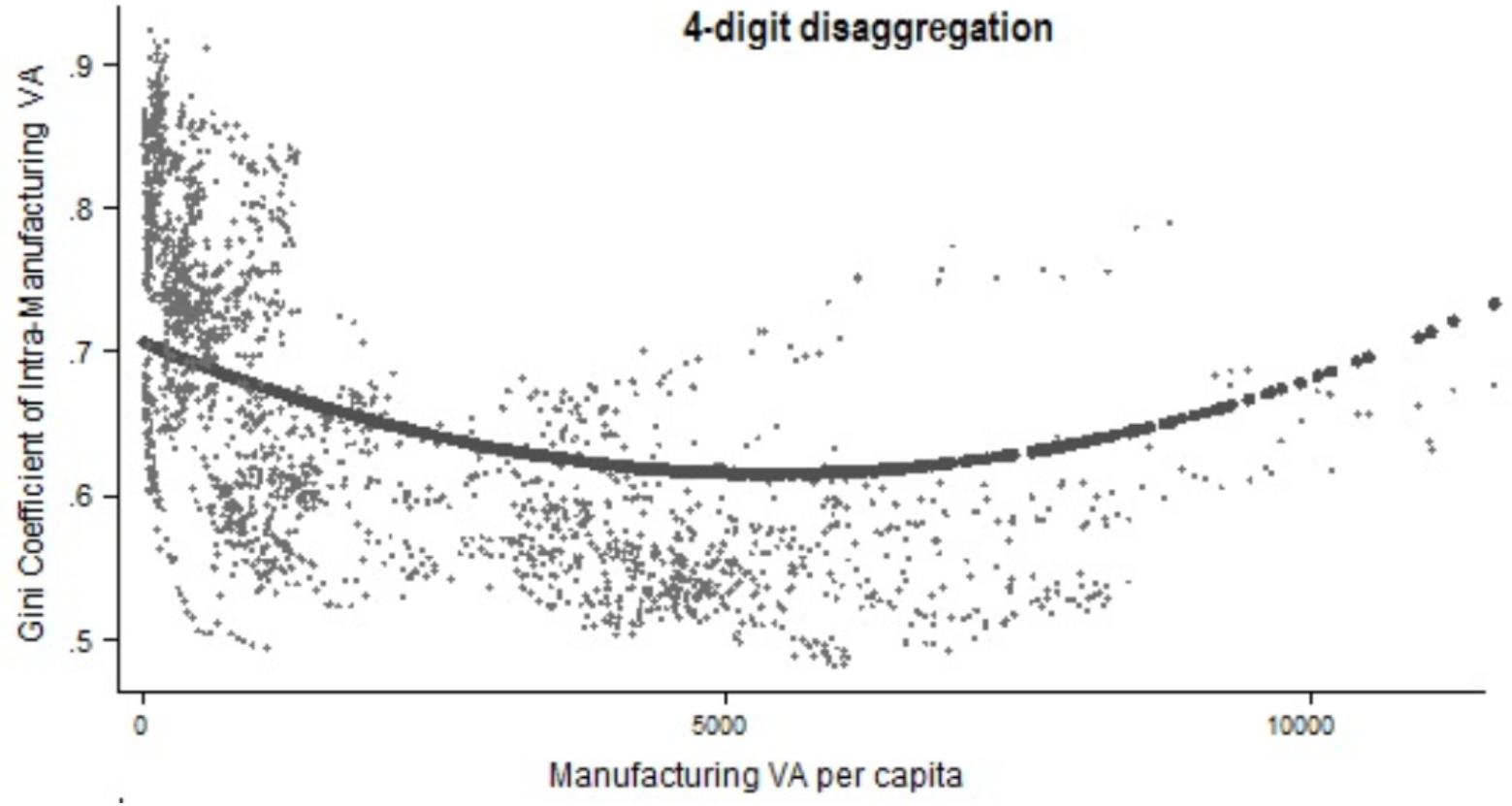
Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change, Structural Change and Economic Dynamics, 42, 26-37.

ISIC code	Industrial sector	ISIC code	Industrial sector
D155	Beverages	D27B	Non-ferrous metals
D15O	Food products	D281	Structural metal products
D16	Tobacco products	D289	Metal coatings, related services
D17	Textiles	D2911	Engines and turbines
D18	Wearing apparel	D2915	Lifting and handling equipmenty
D19	Leather footwear	D291O	Other general industry machinery
D20	Wood products (exclude furniture)	D2921	Agricultural machinery
D21	Paper and pulp	D2922	Machine-tools
D2213	Publishing of recorded media	D2923	Metallurgy machinery and casting
D221O	Other publishing	D2924	Machinery for mining and construction
D222	Printing and related services	D292O	Other special industry machinery
D223	Reproduction of recorded media	D293	Domestic appliances
D231	Manufacture of coke oven products	D30	Computers and office machinery
D232	Refined petroleum products	D311	Electrical motors, generators
D233	Nuclear fuel processing	D312	Electricity distribution and control
D2411	Basic chemical products	D31O	Wire, cables, batteries
D2412	Fertilizers	D321	Semiconductors, circuit boards, LCD
D2413	Synthetic resins	D322	Transmitters and routers
D2421	Pesticides, agro-chemicals	D323	TV radio equipment
D2422	Paints and varnishes	D331	Medical and measurement equipment
D2423	Pharma: drugs and medicines	D332	Optical and photographic equipment
D2424	Soap, cleaning and cosmetics	D333	Watches and clocks
D2429	Other speciality chemicals	D343	Part and accessories for motor vehicles
D243	Synthetic fibers	D34O	Motor vehicles
D251	Rubber products	D351	Shipbuilding
D252	Plastic products	D352	Railway and equipment
D261	Glass and glass products	D353	Aircraft and spacecraft
D2691	Non-refractory ceramic ware	D359	Other transportation equipment
D269C	Cement, concrete, lime	D361	Furniture
D269O	Other mineral products	D369	Jewelry, toys, musical, sporting goods, other
D27A	Iron and steel	D37	Recycling

The manufacturing sector is disaggregated using the Isic Rev.3 classification. *Source*: Global Insight.

Intra-sectoral structural change and industrial development

(1980-2011,$,real values)



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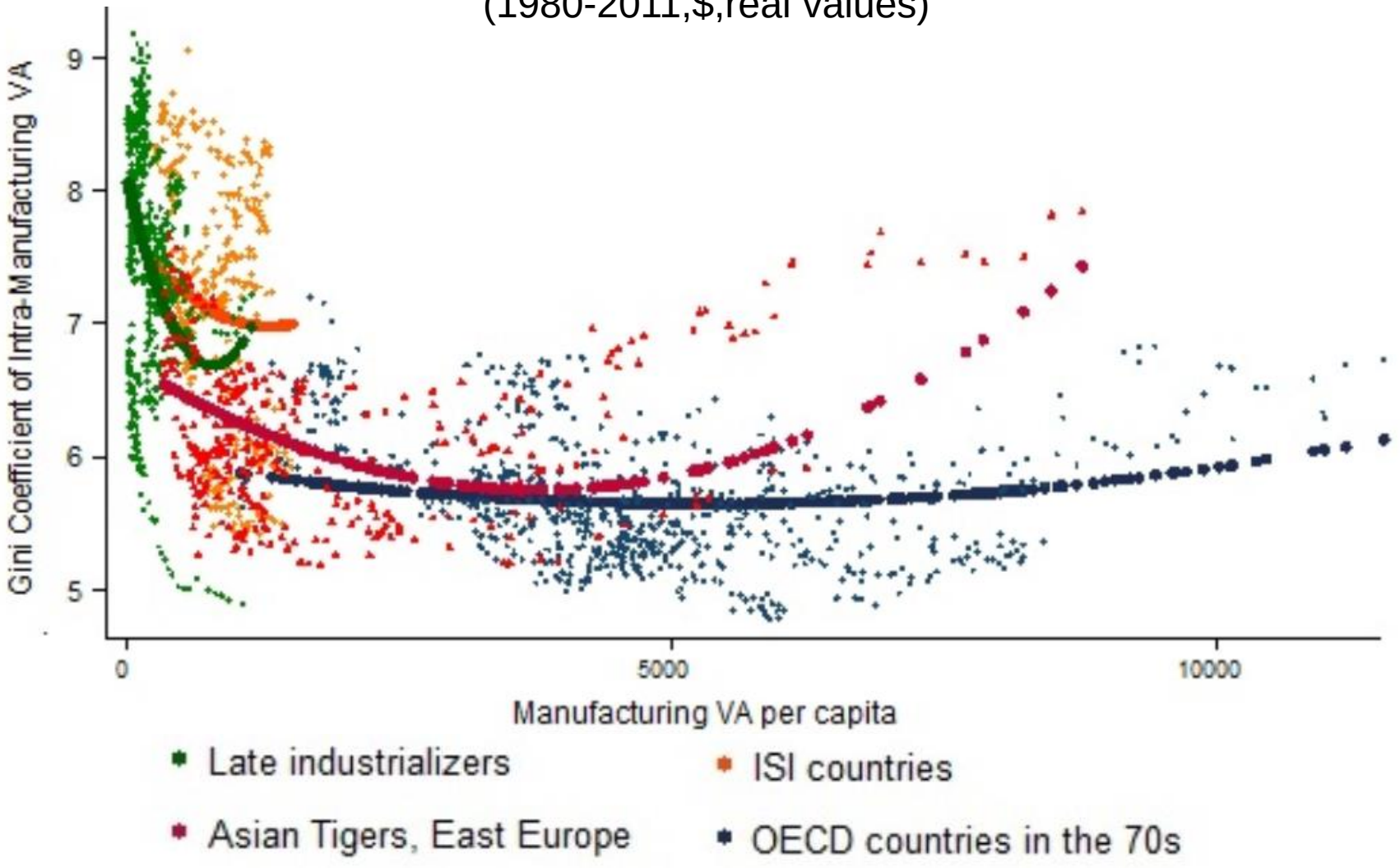
Intra-sectoral structural change and industrial development

(1980-2011,$,real values)



Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change. Structural Change and Economic Dynamics, 42, 26-37.

The nature of industrial development

- In other words, after a certain level of manufacturing value added per capita, the **industrialization process** is **increasingly dominated by the development of the rest of the economy**.
- Moreover, it emerges that the slope of the curve is steeper the bigger the lag in the industrialization process.
- Starting from the same level of industrial development, the process of inter-sectoral output shift towards manufacturing reaches its maximum in the group of late industrializers and former ISI countries first (at around $1200 at constant prices), then in the intermediate group represented by the Asian Tigers and the East European countries (at around $4800), while for the group of old industrialized countries the maximum is not observed yet.

Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change. *Structural Change and Economic Dynamics*, 42, 26-37.

The nature of industrial development

- Thus, while for **OECD countries industrialization** took place over a **long period of time**, largely as an endogenous process occurring in a world of segmented markets where the **opportunities for trade and specialization where limited**, at the other extreme **late industrializers experienced an export-led growth** that, in the few decades under our scrutiny, increased the **scale of the market for manufacturing productions** of a different order of magnitude compared to the other sectors of the economy.

Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change. Structural Change and Economic Dynamics, 42, 26-37.

The nature of industrial development

- The Asian Tigers and the East European countries represent an **intermediate case** between these two extremes, because their **industrialization process is rooted**, for different historical reasons, in a pre-globalized world.
- Consistently, the slope of the relation between **structural change and industrial development is steeper** than that observed for old industrial countries but **flatter than the one characterizing late industrializers**.

Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change. *Structural Change and Economic Dynamics*, 42, 26-37.

The nature of industrial development

- It is also interesting to notice that the two curves referred to late industrializers and to former ISI countries are almost identical, despite the fact that the latter group experienced industrialization well before the globalization process, simultaneously to that occurring in East Asia.
- This last piece of evidence strongly supports the idea that **inward-oriented import-substitution strategies** have mostly been an **unsuccessful story** of industrialization, that **did not survive international competition**.

Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change. *Structural Change and Economic Dynamics*, 42, 26-37.

The nature of industrial development

- Industrial development is accompanied by **shifts of economic activities both across and within sectors**, determining the **overall specialization of the economy** and ultimately the country's relative **competitiveness**.
- Globalization has played a crucial role in shaping this process.
- Sectors with a **comparative advantage** could expand at unprecedented pace, joining **international markets**, **attracting labor and capital** from the **rest of the economy**.

Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change. Structural Change and Economic Dynamics, 42, 26-37.

The nature of industrial development

- The **intensity and the speed** of this **change differed dramatically across countries**, depending on **how far** they have been **integrating into the global economy**, due in particular to the timing of the industrialization process.
- The effect was moderate for those economies in which the advent of the industrialization process came **before international integration** and that were able to build their **industrial system mostly on endogenous bases**.
- At the opposite, the effect was maximum for those developing countries that **industrialized at the same time as globalization took place**, by **joining international value chains** and becoming prominent destinations for production offshoring.

Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change. Structural Change and Economic Dynamics, 42, 26-37.

The nature of industrial development

- In a few years (and at a still very low level of industrial development) they **became industrial economies** and **acquired competencies and technologies** in newly-established manufacturing industries.
- Yet, these same countries are already facing symptoms of what can be considered an **early de-industrialization**, as their share of manufacturing activity on the total economy has already begun to fall and their manufacturing output has remained concentrated to a few sectors.

Source: Livio, R. & Traù, F. (2017). The nature of industrial development and the speed of structural change. Structural Change and Economic Dynamics, 42, 26-37.