Why is the Employment Share in Manufacturing Declining?
Perspectives from Advanced and Developing Countries

Robert Lawrence

WHY IS THE EMPLOYMENT SHARE IN MANUFACTURING DECLINING? PERSPECTIVES FROM ADVANCED AND DEVELOPING COUNTRIES

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Presentation to IATRC Meeting in Washington DC

December 3 2017

Agenda.

- **Motivation.**
- Developed Economies. Long run trends.
- Developed Economies. Recent Experience.
- Developing Economies. Premature Deindustrialization.
- Conclusions.

Manufacturing Employment: Declining Share, Loss of Almost 6 million since 2000

Manufacturing Employment (millions) and Share in Non-Farm Employment 1948-2017
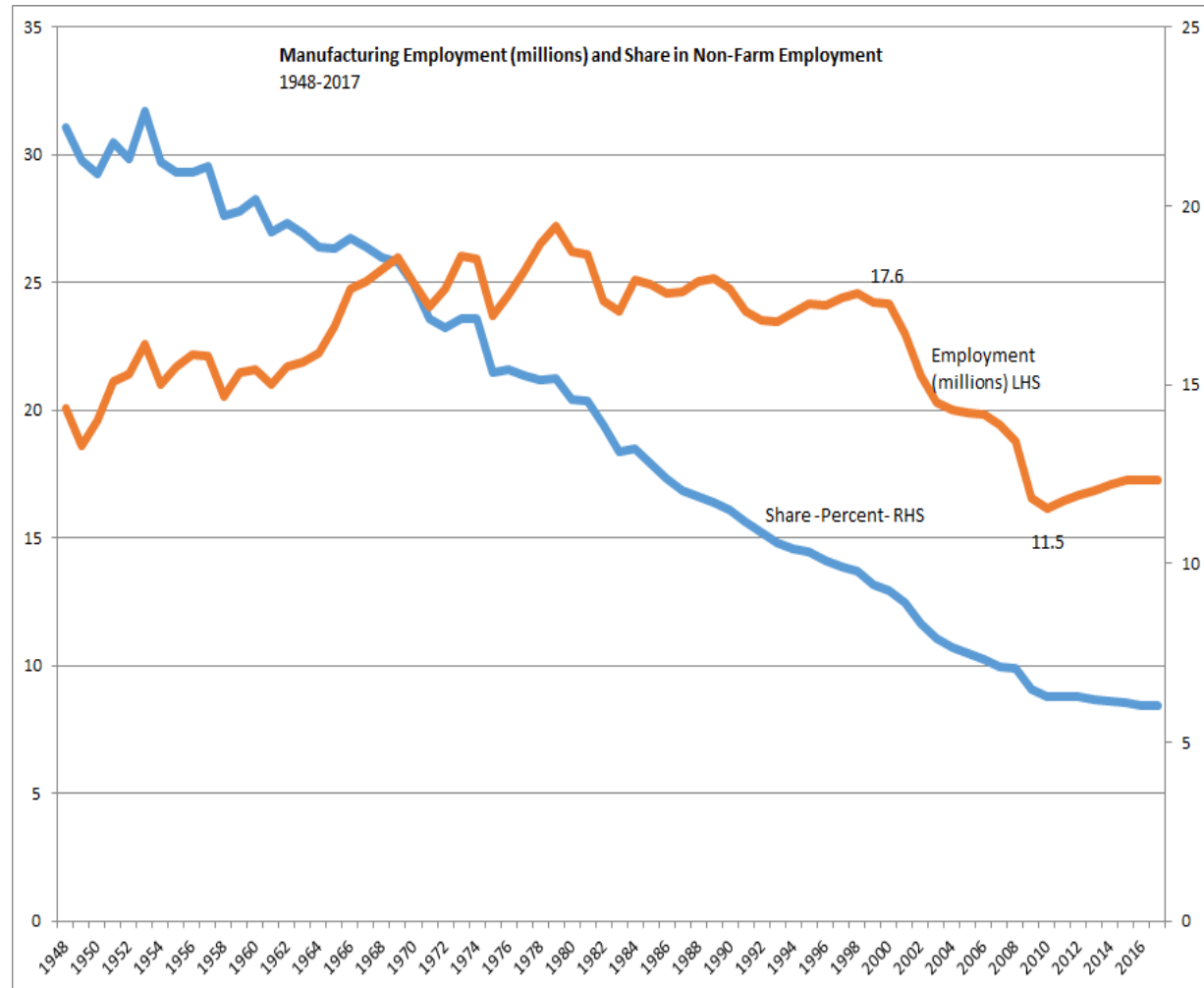
Imports from Emerging Economies Surging.

Ratio to GDP
(current dollars)

US merchandise imports, 1978–2008

Industrial

Non-OPEC other
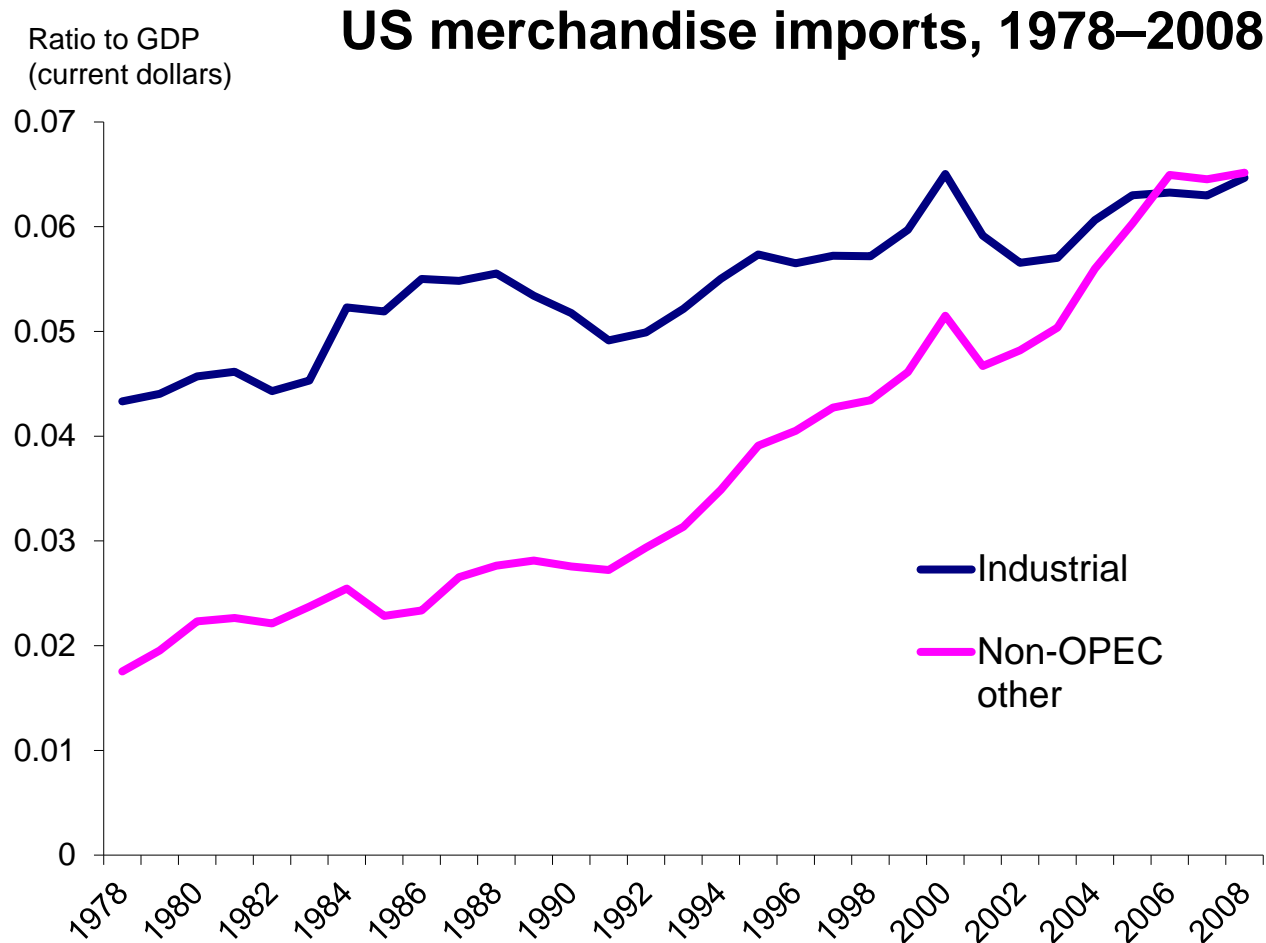
OPEC = Organization of Petroleum Exporting Countries
Source: Bureau of Economic Analysis

The Narrative: Its Trade!
Trump Inaugural Address

- **We must protect our borders from the ravages of other countries making our products, stealing our companies, and destroying our jobs. Protection will lead to great prosperity and strength.**
- **We will follow two simple rules: Buy American and Hire American.**

Manufacturing jobs: important especially men in the USA.

Manufacturing Employment Shares by Gender 1964-2014
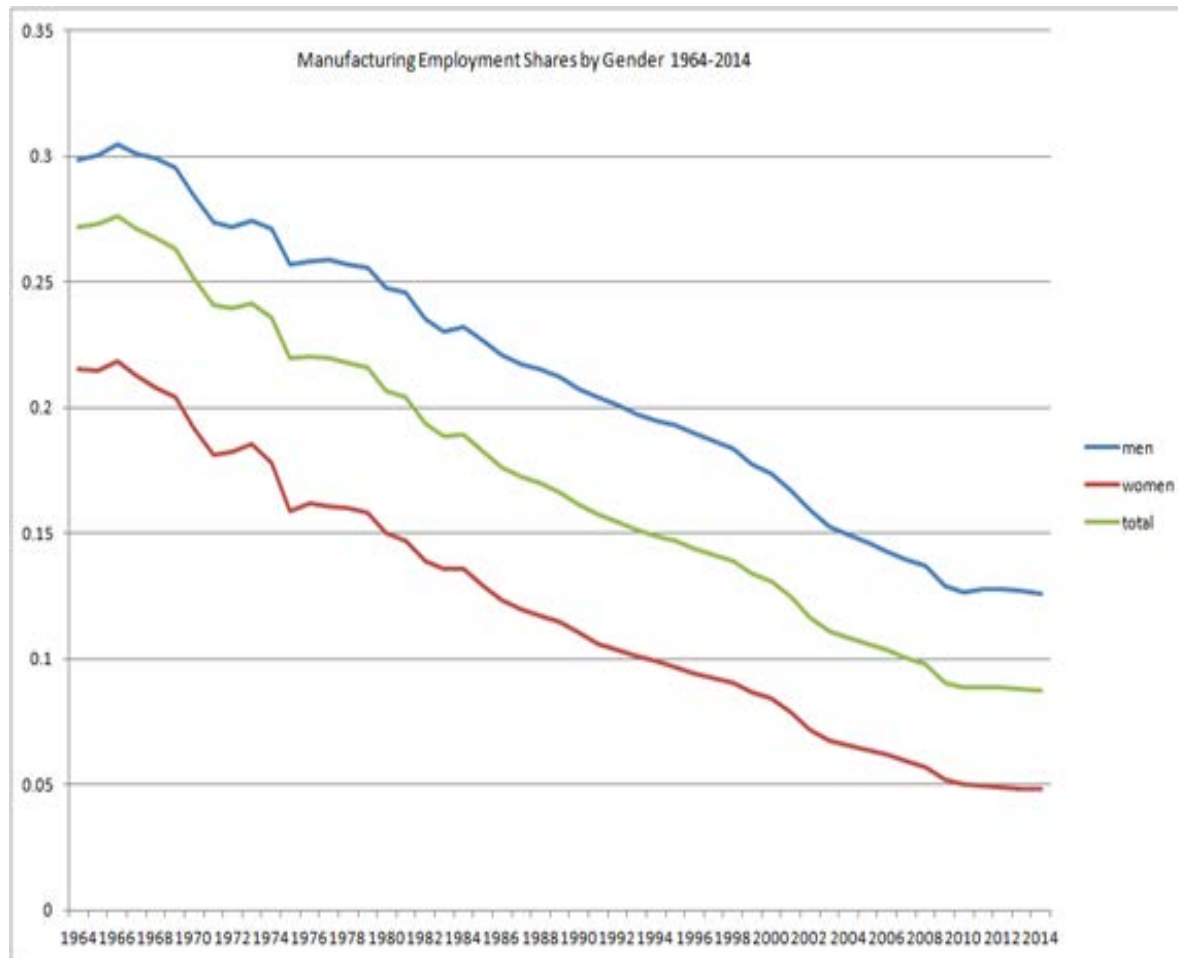
And especially men without college
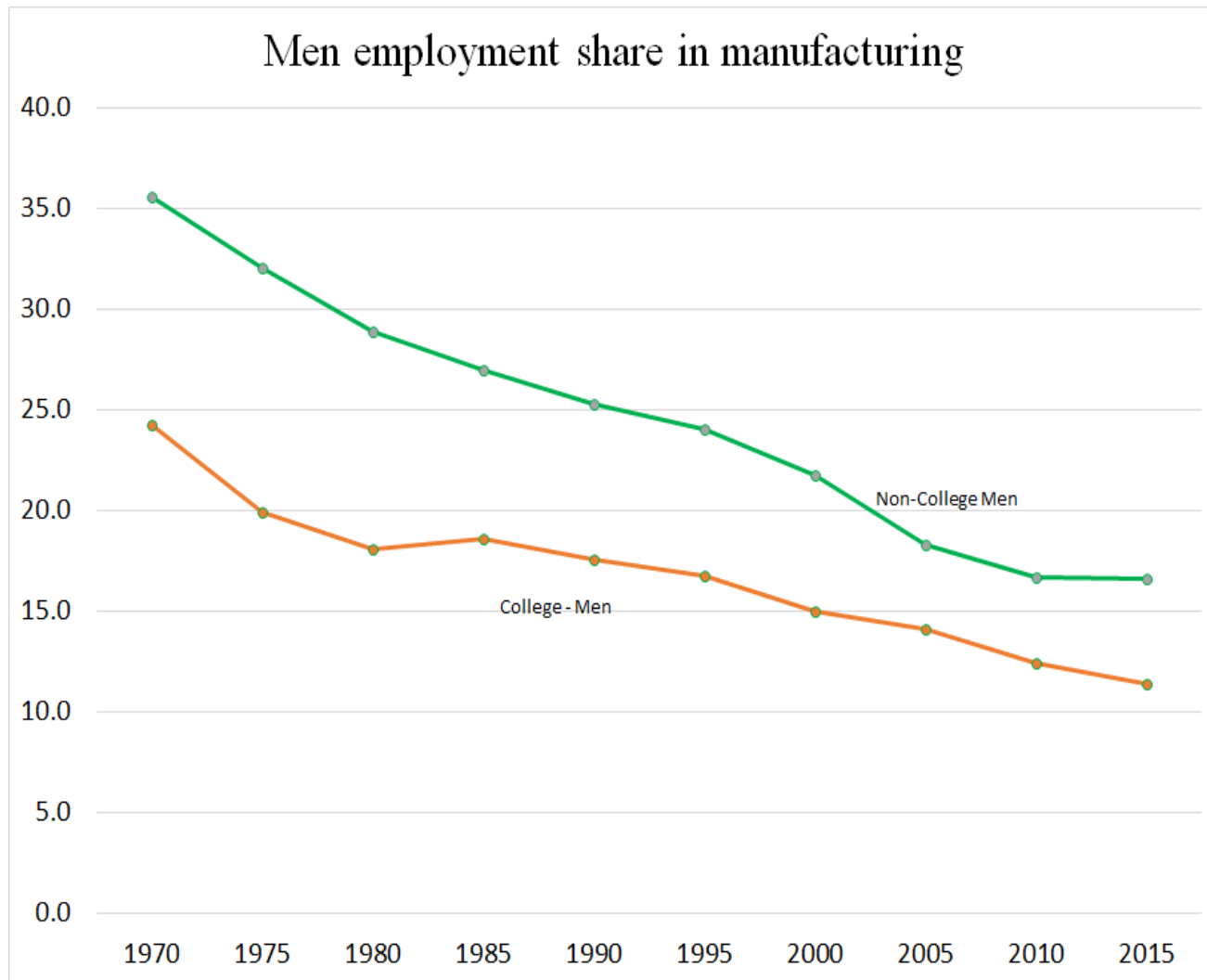
Non-College Male Earnings: Stagnant for Decades

Average-Wage of Median Full Time Worker. 1970 - 2015 (Thousands of 2015 dollars)
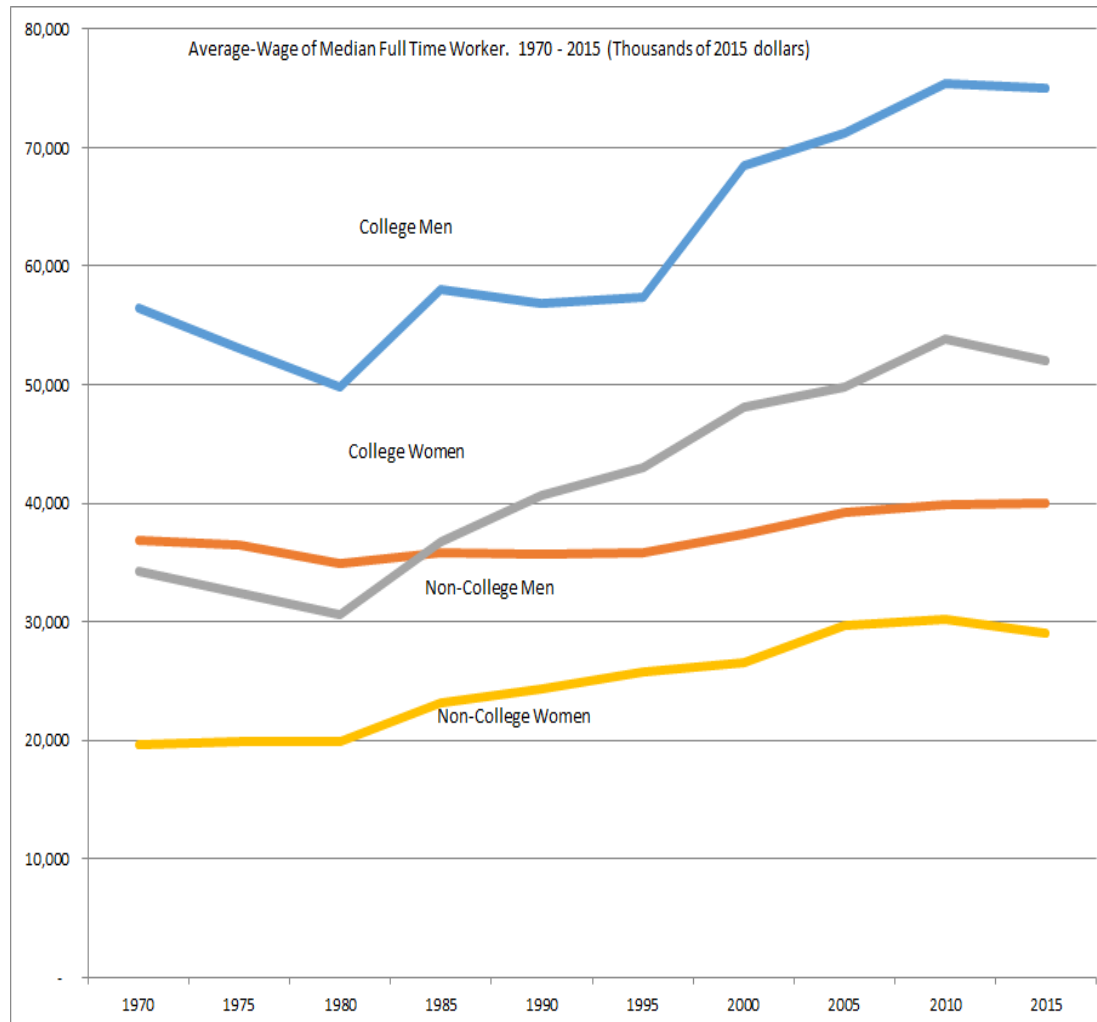
Average Annual Real Wage Growth: 1970 – 2015

College Women 51.7%

Non-College Women 47.6%

College Men 23.8

Non-College Men 8.6%

Non-College Men Dropping Out!

Men labor force participation rate, 25-54
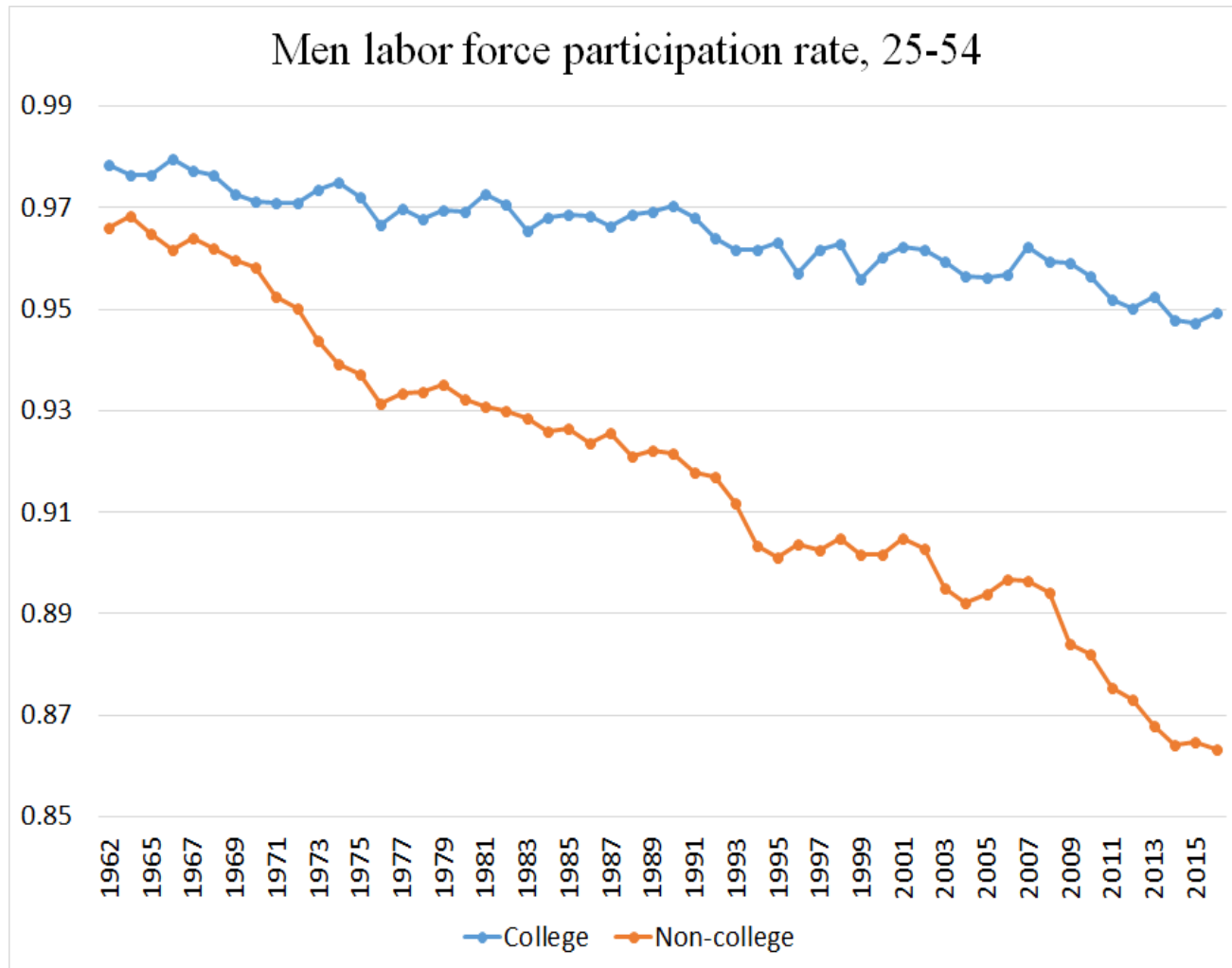
The male college premium increased from 54% in 1970 to 88% percent in 2015 (i.e. 20 log points) 21.9 percent and deindustrialization probably between 25 and 70 percent of the reason.

Table 11. Estimated effect on skill premium, men								
	college	non-colleg	H/L	Total				
2015	35.0	65.0	0.539	100		$\Delta\ln(wH/wL)$		$\Delta\ln(H/L)$
manuf	4.0	10.8	0.369	14.8	19.1	$\sigma=0.5$	$\sigma=1$	$\sigma=1.5$
non-manuf	31.0	54.2	0.573	85.2	0.50	-0.14 -0.07	-0.05	0.070
	college	non-colleg	H/L	Total				
1970	14.8	85.2	0.174	100				
manuf	3.6	30.3	0.119	33.9				
non-manuf	11.2	54.9	0.205	66.1				

The share of non-college men employed in manufacturing declined from 33 to 14.8 percent. Had 33 percent of these men been employed in manufacturing in 2015, with an elasticity of substitution ($\sigma = 1$) equal to unity, the college-premium would have been 7.5 log points power.

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The Trend in US manufacturing share of employment same since 1960's

Manufacturing share in establishment employment, 1961–2010

Source: Bureau of Labor Statistics
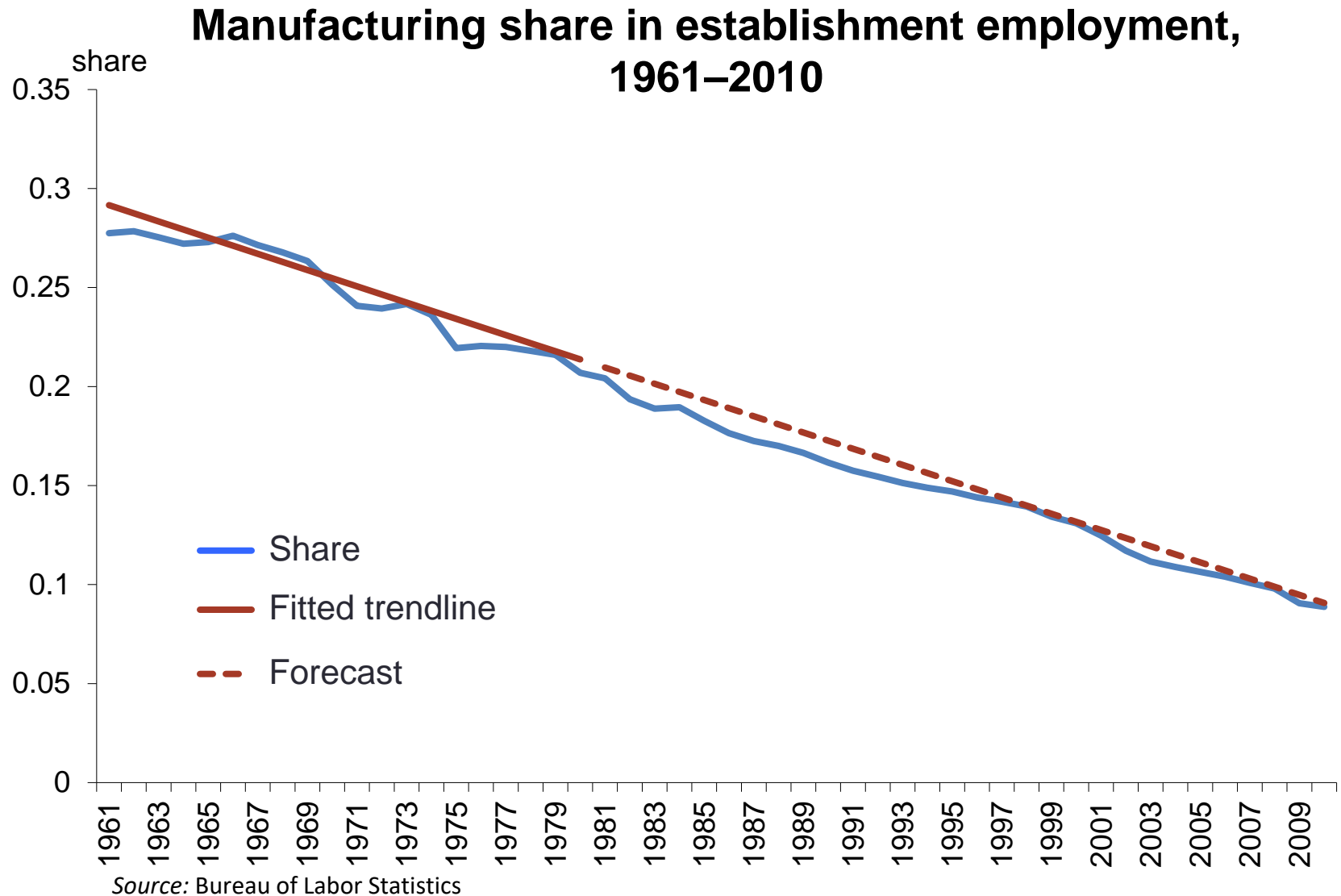
Rapid productivity growth is reflected in prices

Measures of relative manufacturing productivity and prices, 1960–2007

Legend:
- Productivity relative to GDP
- Price of goods relative to GDP (inverse)
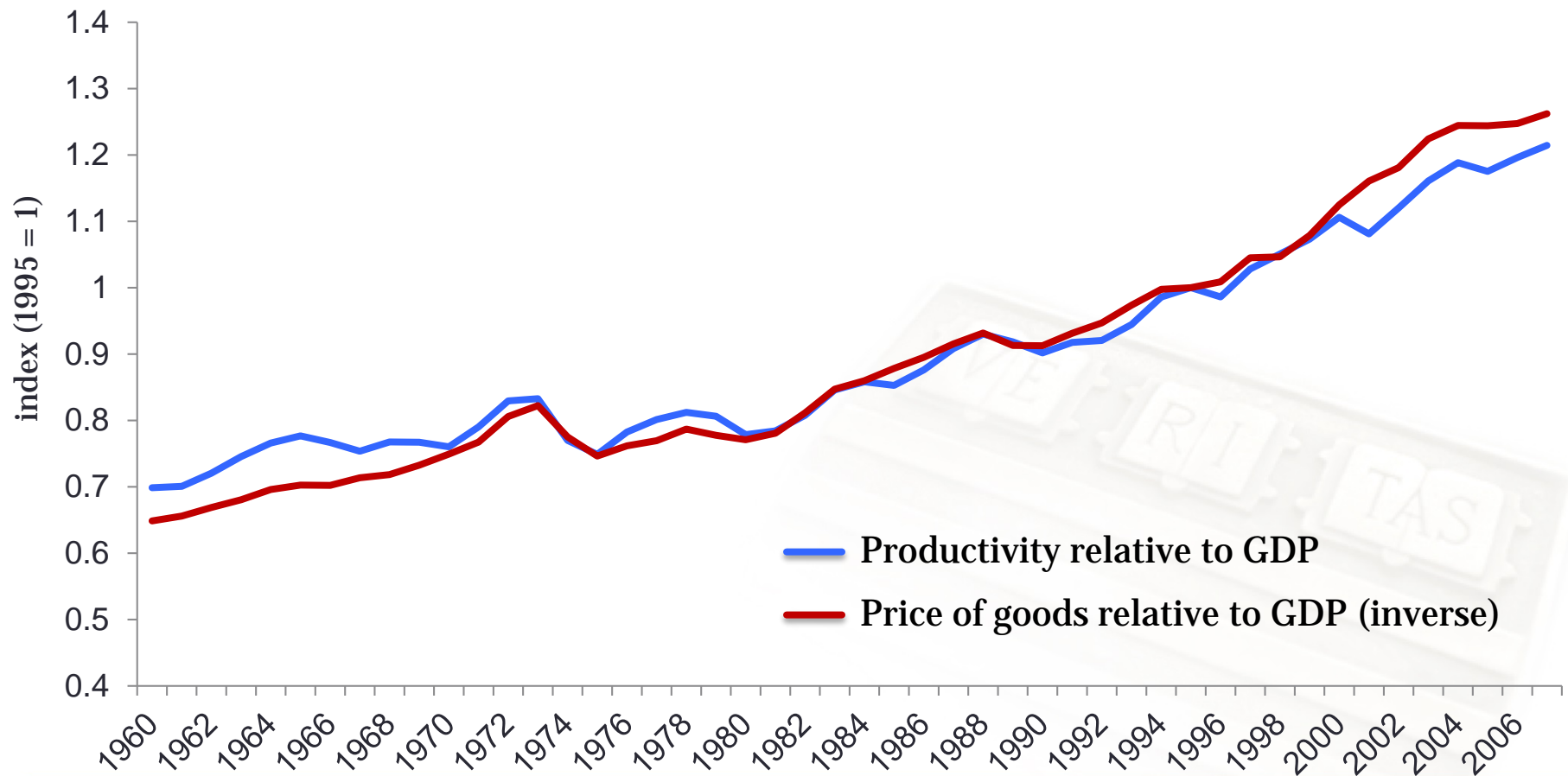
Consumption Spending Share on Goods by Quintile (Income elasticity < 1)
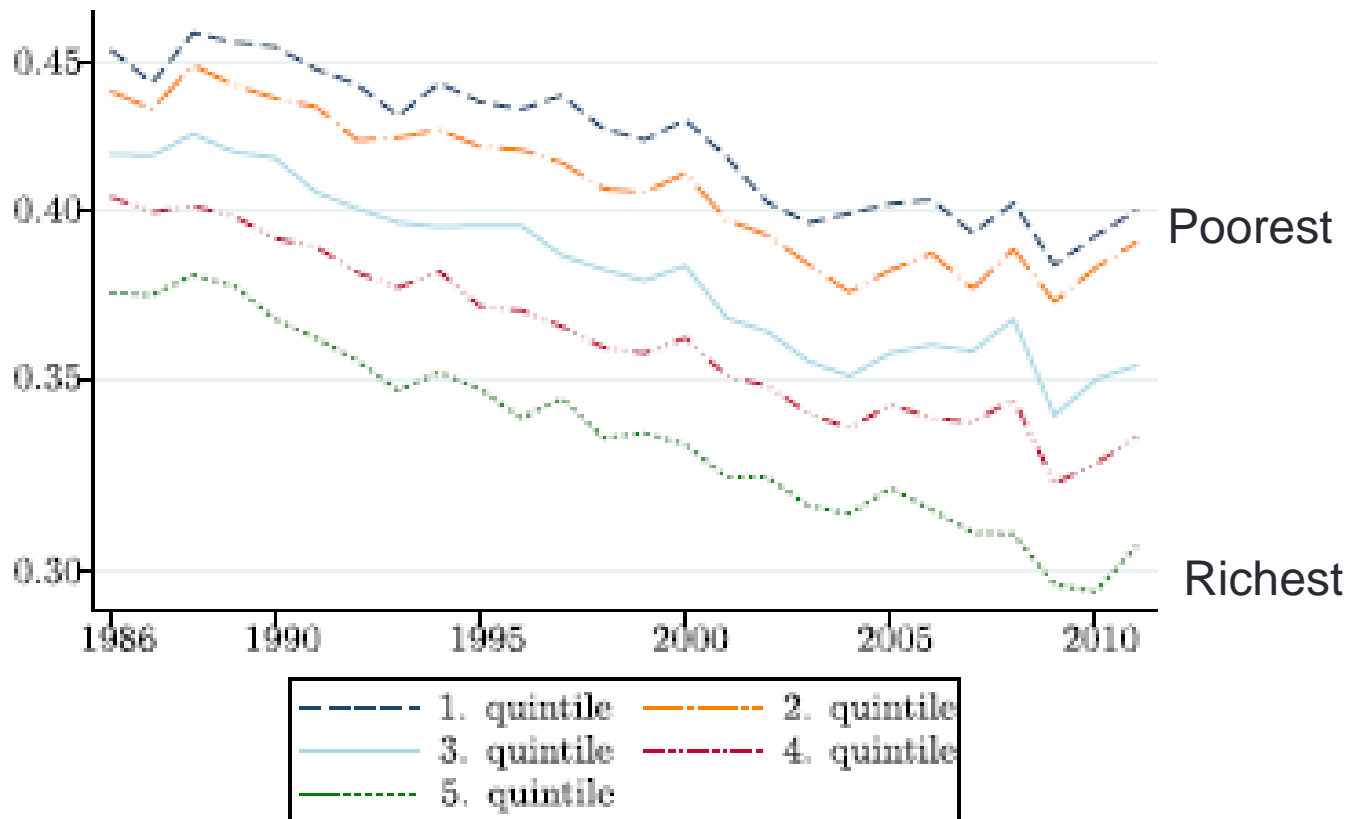
Source: Boppart (2014) Econometrica

Spending on goods relative to services: Prices fall but quantities rise slowly (Demand is inelastic)

US spending on goods relative to services, 1960–2010
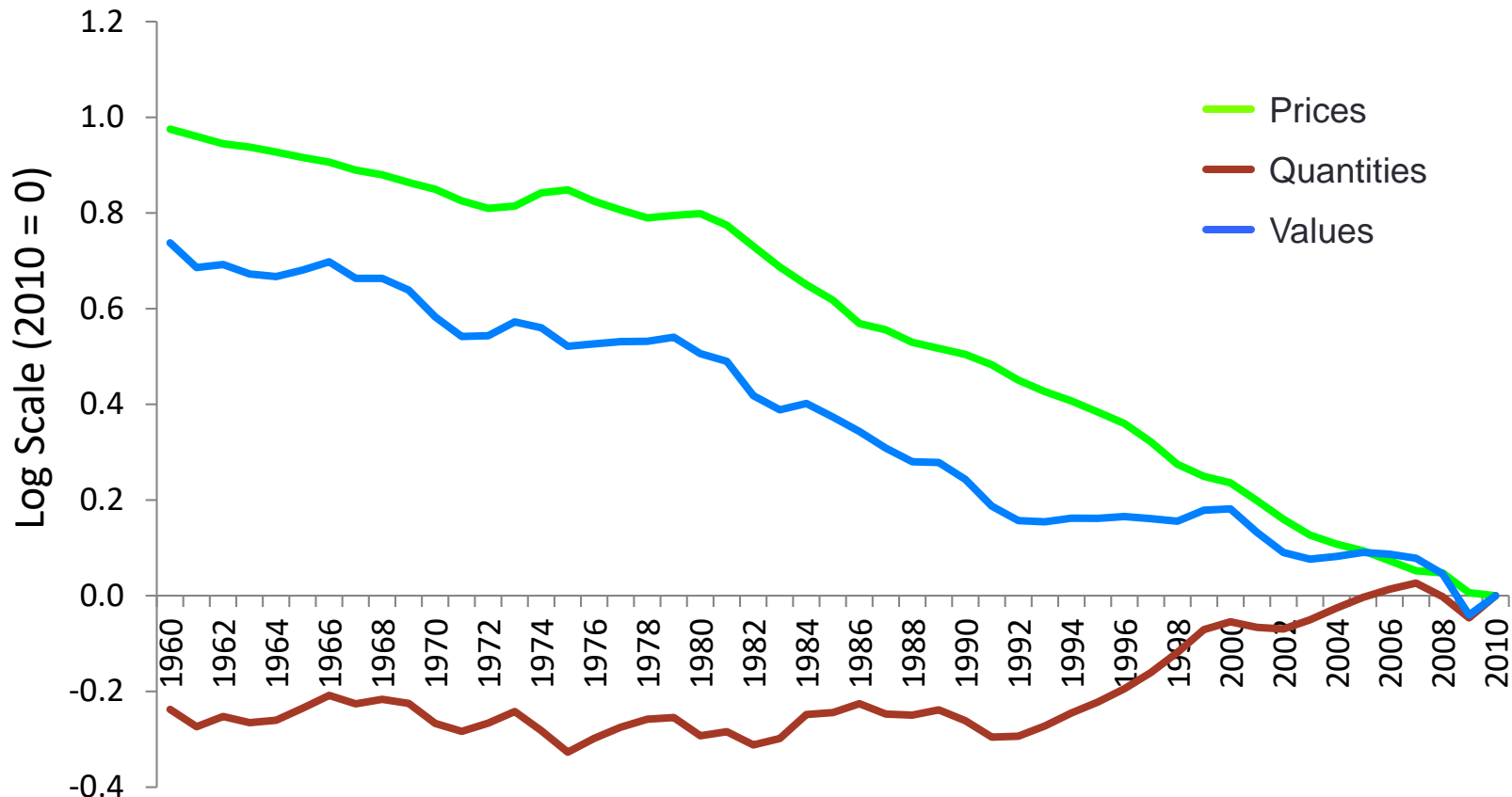
Declining shares of nominal spending on goods relative to services

What about trade? US manufacturing employment, actual and without trade deficit: Different levels, similar decline after 2000

Manufacturing employment, actual and adjusted for the manufacturing trade deficit, 1990–2010

Source: Edwards and Lawrence
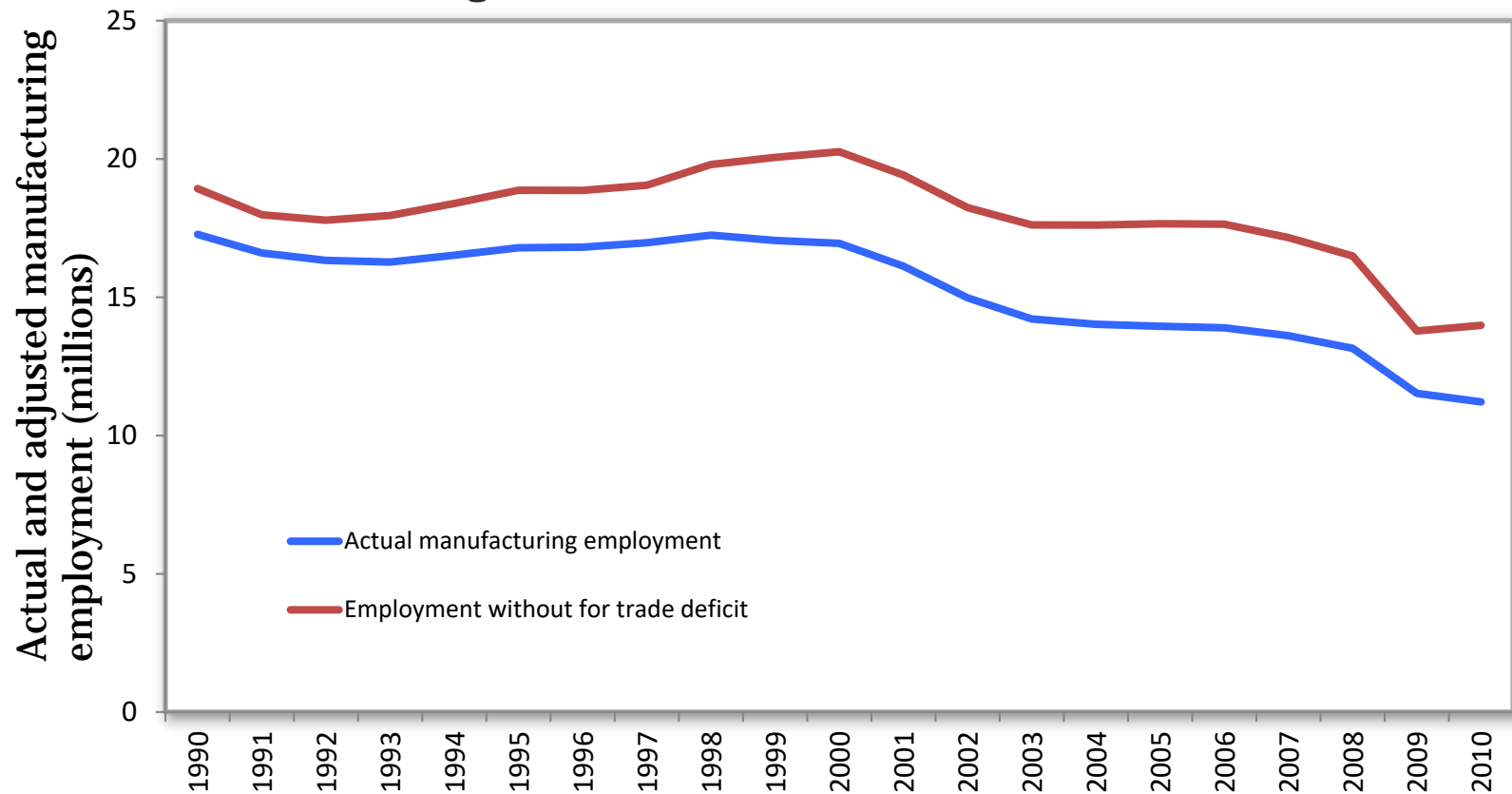
Autor et. al (2013) China explains 1 million i.e. less than 20 percent of job loss

US not unusual! Decline in manufacturing share of employment is similar across advanced economies

Share of employment in manufacturing, 1973–2010 (percent)

Country	1973 (1)	1990 (2)	2000 (3)	2010 (4)	Change (4) - (1)
United States	24.8	18.0	14.4	10.1	-14.7
Canada	22.0	15.8	15.3	10.3	-11.7
Australia	23.3	14.4	12.0	8.9	-14.4
Japan	27.8	24.3	20.7	16.9	-10.9
France	28.8	21.0	17.6	13.1	-15.7
Germany	36.7	31.6	23.9	21.2	-15.5
Italy	27.9	22.6	23.6	18.8	-9.1
Netherlands	25.3	19.1	14.8	10.6	-14.7
Sweden	27.6	21.0	18.0	12.7	-14.9

Source: Bureau of Labor Statistics.

Consumption Shares in Goods: Falling In all industrial countries

Table 3 Share of consumption spending on goods in total consumption, advanced economies, 1970-2010 (percent)

Country	1970	1980	1990	2000	2010	Annual change, 1980-2010
Australia	53	50	44	40	37	-0.45
Canada	58	56	51	47	46	-0.36
Denmark		57	51	50	47	-0.35
France	62	60	54	51	47	-0.42
Italy	68	66	59	54	49	-0.56
Korea	69	66	54	46	42	-0.8
Netherlands		59	57	51	49	-0.34
United Kingdom		69	61	56	53	-0.54
United States	50	46	40	37	34	-0.42
Average						-0.46

Source: OECD National Income Accounts.

Manufacturing and Services are complements. Cheaper manufactured goods increases demand for services!

Note: Even countries with large trade surpluses in manufacturing experience declining shares

Table 2 Manufacturing trade balance as share of GDP, advanced economies, 1973-2010 (percent)

Country	1973	1978	1986	1994	2002	2010	Average
Australia	-4.6	-5.5	-8.3	-7.7	-8.1	-8.2	-7.1
Canada	-4.0	-3.1	-3.1	-2.3	-1.3	-5.8	-3.3
Denmark	-7.4	-5.7	-5.4	0.3	-0.2	1.0	-2.9
France	0.9	2.0	0.2	0.8	1.1	-1.2	0.6
Germany				4.3	8.7	9.9	7.6
Italy	2.9	7.3	4.5	5.3	3.5	2.6	4.3
Japan	5.6	7.5	7.8	4.9	5.0	6.5	6.2
Netherlands	-1.8	-3.7	-2.7	0.3	4.0	5.5	0.3
Korea	2.3	4.4	10.3	4.3	8.8	16.5	7.8
United Kingdom	2.3	2.6	-2.0	-1.6	-4.2	-5.0	-1.3
United States	0.0	-0.4	-3.1	-2.1	-3.8	-3.2	-2.1

Sources: UN Comtrade Database; World Bank GDP data.

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After 2010 quite different: It's the exception that proves the rule

Share of Manufacturing in US Non-Farm Employment (Trend 1960 to 1980 forecaste through 2017)

Source: BLS Current Employment Survey
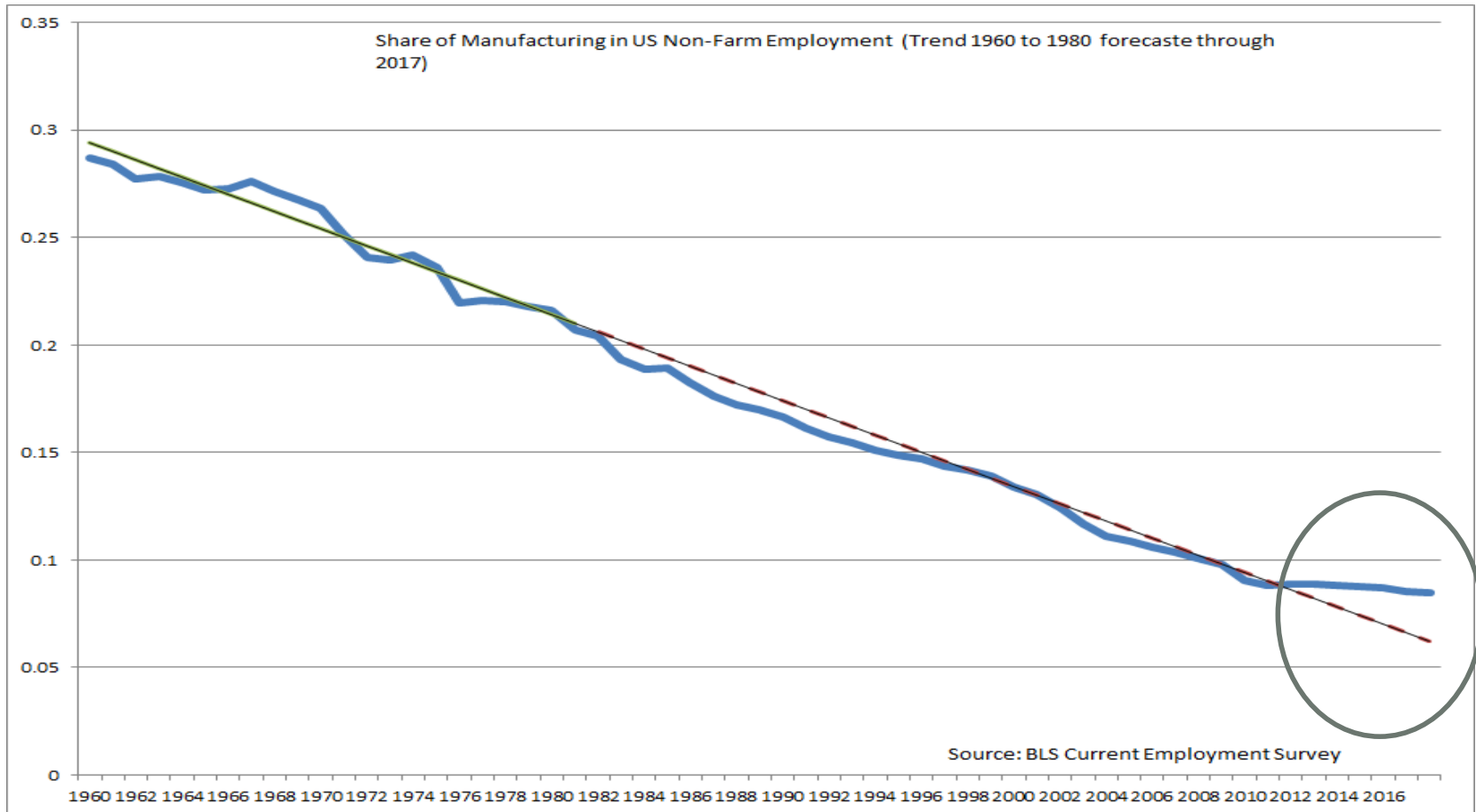
Measured productivity growth in manufacturing has slumped

Output per Full Time Equivalent Employee (Manufacturing, Total and Non-Manufacturing)
Log points 2016 = 0.
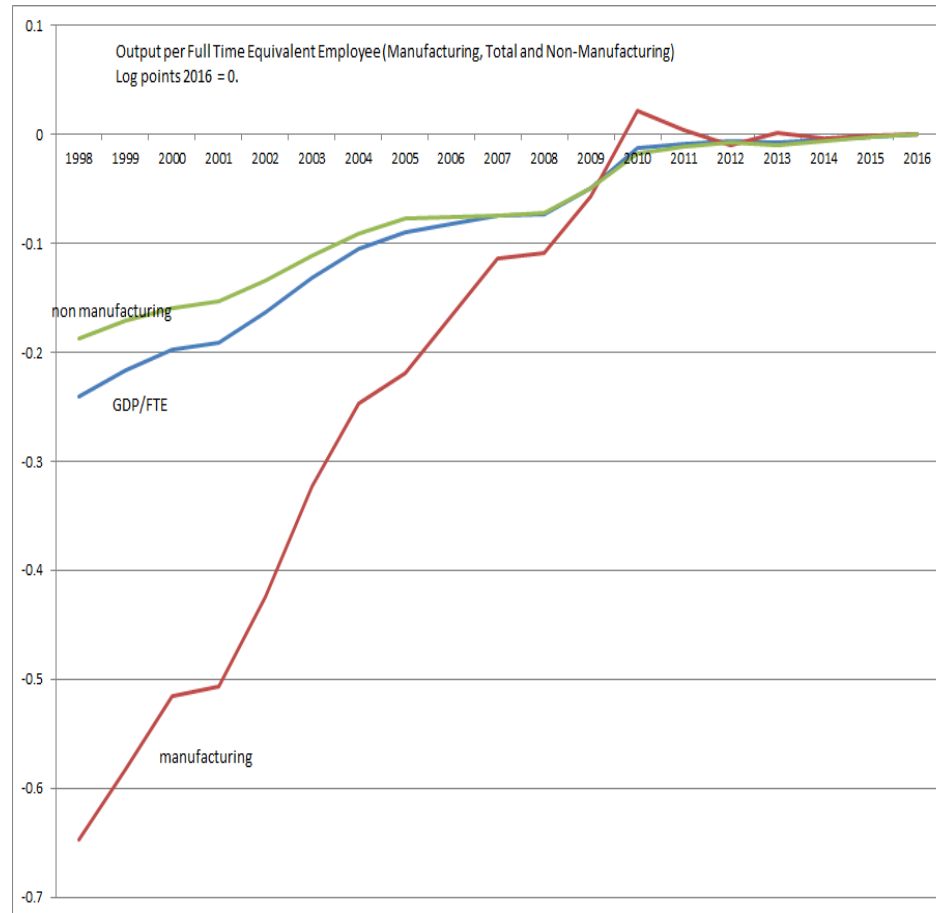
Since 2010: Manufacturing prices stopped falling!
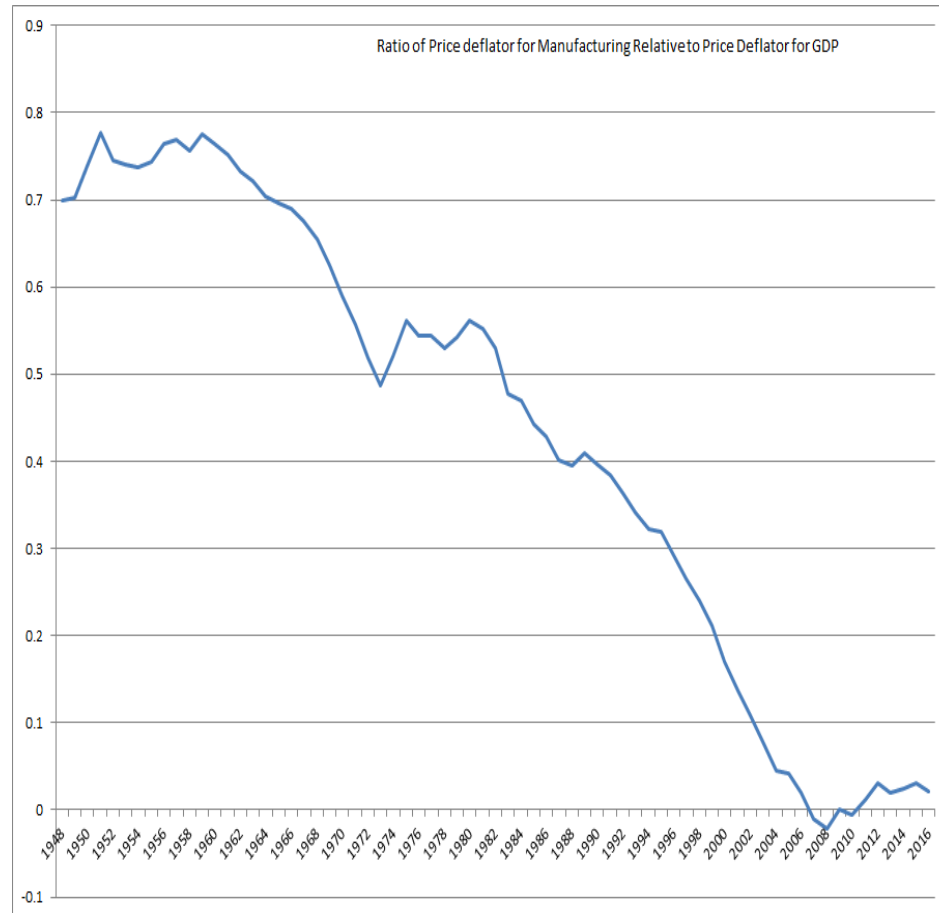
Since 2010: Much smaller declines in manufacturing employment shares in industrial countries

Table 1 Share of Employment in Manufacturing

	USA	Aus	Canda	France	Germany	Italy	Japan	Netherla	UK	Average
1973	24.75	23.35	22.00	28.88	36.74	27.86	27.78	25.29	32.06	27.63
1990	16.77	14.42	15.79	21.27	31.62	22.56	24.33	19.08	22.13	20.88
2000	14.35	12.05	15.26	17.87	23.86	22.91	20.66	14.85	14.82	17.40
2010	10.13	8.90	10.27	13.32	20.10	18.87	16.95	10.64	9.85	13.23
2016	10.17	7.51	9.37	12.15	19.15	18.23	16.10	9.52	9.46	12.41

Average Annual Change in Percentage Points

		USA	Aus	Canda	France	Germany	Italy	Japan	Netherla	UK	Average
(1)	2010-197	-0.40	-0.39	-0.32	-0.42	-0.45	-0.24	-0.29	-0.40	-0.60	-0.39
(2)	2016-201	0.01	-0.23	-0.15	-0.19	-0.16	-0.11	-0.14	-0.19	-0.07	-0.14
(2)/(1)	ratio	-0.02	0.59	0.47	0.46	0.35	0.44	0.49	0.47	0.11	0.35

Average Annual Percentage Change in Employment Share

		USA	Aus	Canda	France	Germany	Italy	Japan	Netherla	UK	Average
(1)	2010-197	-2.4	-2.6	-2.0	-2.1	-1.6	-1.0	-1.3	-2.3	-3.1	-2.0
(2)	2016-201	0.1	-2.8	-1.5	-1.5	-0.8	-0.6	-0.9	-1.8	-0.7	-1.1
(2)/(1)	ratio	0.0	1.1	0.7	0.7	0.5	0.5	0.6	0.8	0.2	0.5

Source: OECD and BLS

And average share of consumption spending on goods now rising rather than falling!

Table 2: Share of Consumption Spending on Goods

	1995	2010	2014	Average Annual Change 1995-2010	Average Annual Change 2010-2014
USA	37	34	35	-0.62	0.59
CANADA	47	43	43	-0.64	0.05
FRANCE	45	43	46	-0.25	1.35
GERMANY	49	47	47	-0.25	-0.20
ITALY	46	40	40	-0.97	0.37
JAPAN	58	50	49	-0.90	-0.54
KOREA	51	47	47	-0.46	-0.02
NETHERLANDS	51	47	47	-0.60	0.15
UK	47	45	44	-0.37	-0.36
AVERAGE	48	44	44	-0.56	0.15

Source: OECD NATIONAL INCOME ACCOUNTS

So what are they doing with the robots?

- Buyers should not be fooled by productivity improvements. If productivity continued to be rapid, nominal spending shares should be falling.

- Implication: The productivity slowdown in manufacturing is real, not mismeasurement.

- Painful Implication: We can have faster growth, or increased manufacturing employment but not both!

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Manufacturing Employment Share is humped shaped relative to GDP (42 countries)

Employment Share of Manufacturing vs. GDP (1950-2012)
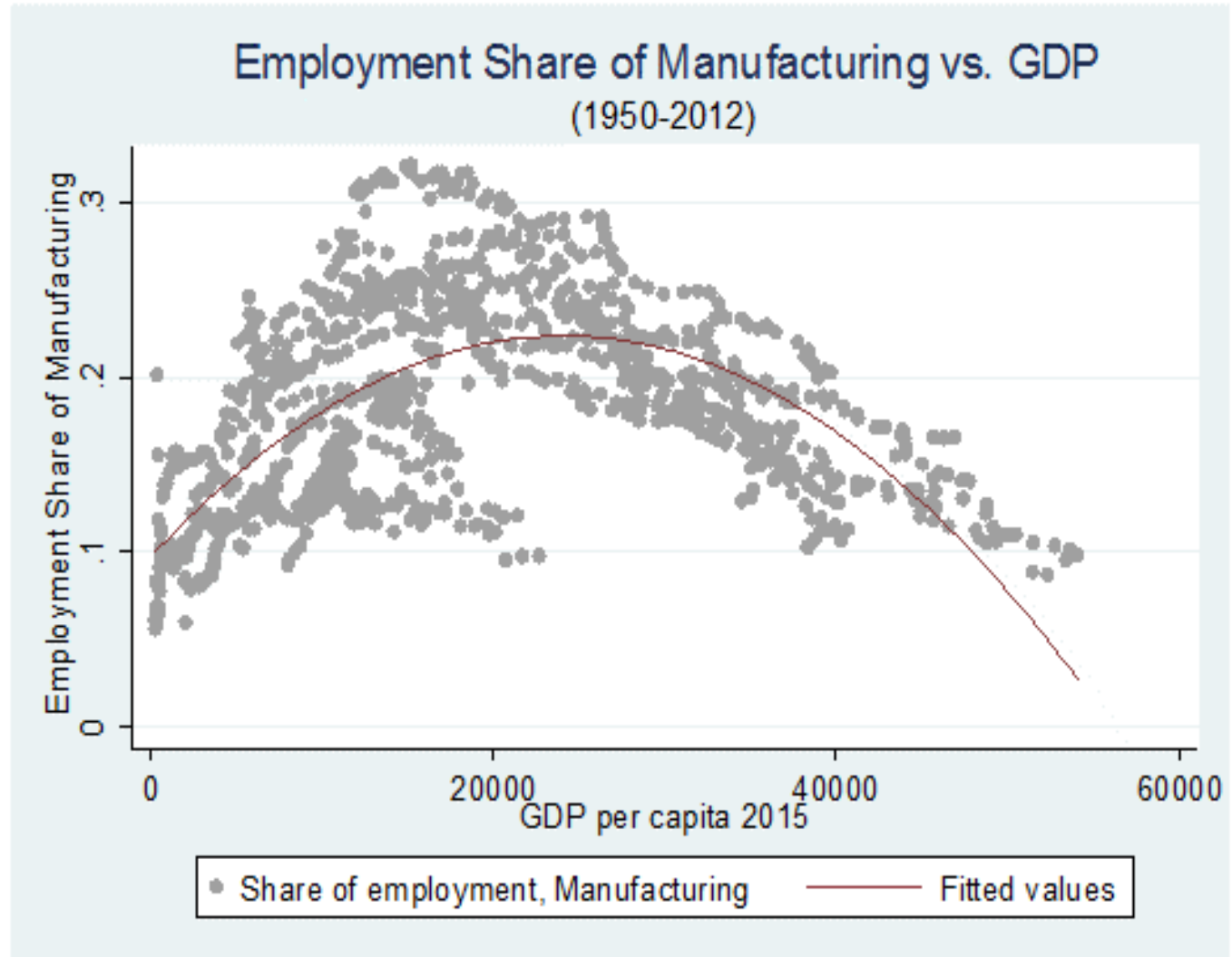
Why Hump Shaped? The role of agriculture is crucial

- **Simple explanations for closed economy with constant income and price elasticities. At low levels of income per capita agriculture has a high share in GDP with manufacturing and services sectors small.**

- **Force 1: Price and income elasticity of demand for agriculture very low. Productivity and income growth in agriculture increases demand for output and employment in manufactured goods and services.**

- **Force2: productivity and income growth in manufacturing, reduces employment in manufacturing and increases demand for output and employment in services.**

- **When agriculture is large, Force 1 dominates and manufacturing (and services employment grow).**

- **When agriculture small, Force2 dominates.**

- **In an open economy trade could mitigate these pressures if price demand elasticity is greater than unity!**

Growth and Structural Change: 1950-2012 Really "Servicization" rather than Industrialization!

Employment Share vs. GDP per capita
Qudratic Fit,1950-2012
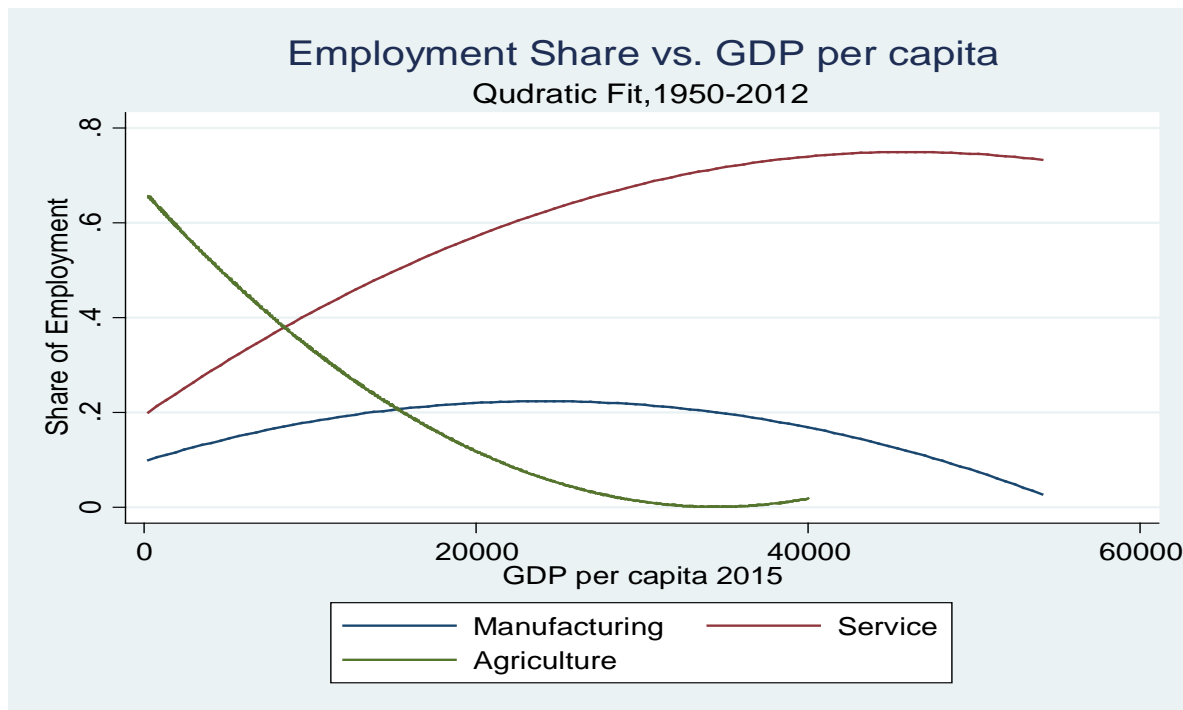
Countries: 18 in total. `"ARG"' `"BRA"' `"CHL"' `"CHN"' `"DNK"' `"ESP"' `"FRA"' `"GBR"' `"IDN"' `"IND"' `"ITA"' `"JPN"' `"KOR"' `"MEX"' `"NLD"' `"SWE"' `"USA"'

But "Premature Deindustrialization:" The curve shifts downward over time

At each level of real income the share of manufacturing in employment is lower. It is becoming harder for countries that industrialize later to achieve the employment levels that were achieved earlier

Share of Employment, Manufacutirng
emp=gpd+gdp^2+decade_dummy
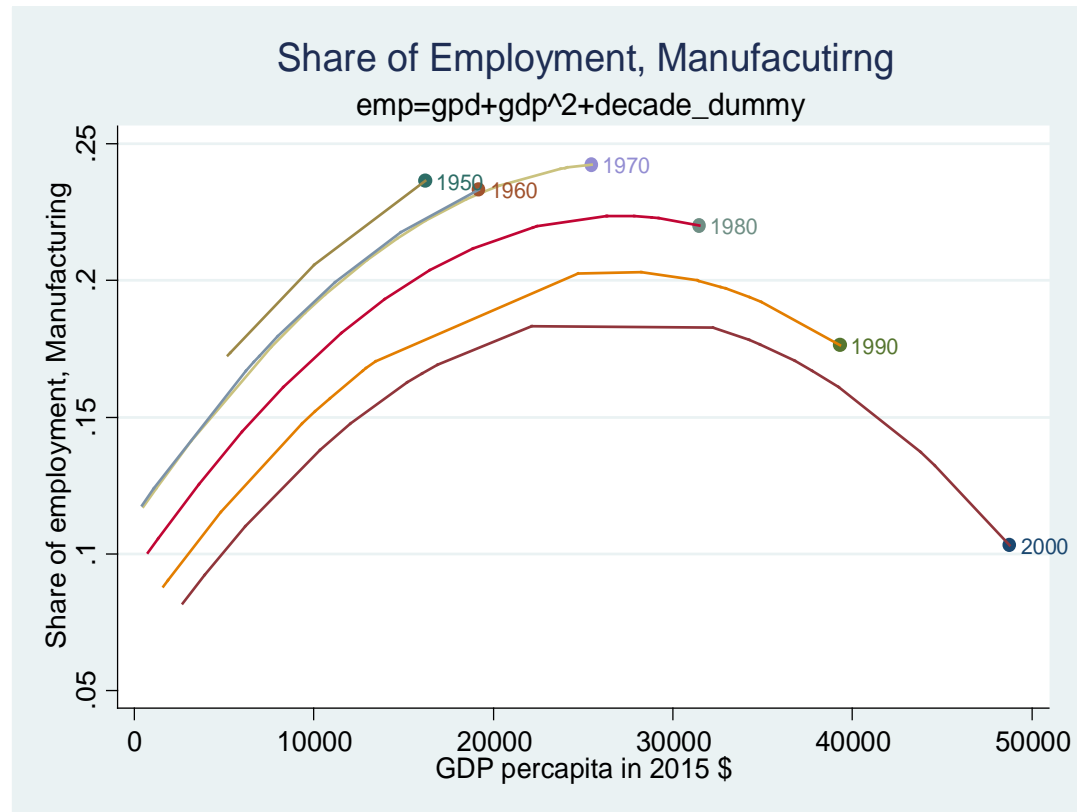
Examples of peak manufacturing shares

	Peak	Share	Per capita Income
USA	1953	25%	$17,977
UK	1961	32%	$15,214
South Africa	1981	17%	$11,776
Brazil	1986	15.4%	$11,492
China	2010	19.2%	$9,876

One explanation: Technological progress and international diffusion

Example

- Belgium in 1950:
  - Income $10,000--Small Car requires 100 hours labor

- China in 2010:
  - Income $10,000--Small Car requires 15 hours

Downward shift in employment: higher productivity, inelastic demand

Leftward shift: now more spent on services

Relative Productivity of Manufacturing: Shifting Upwards

Relative Productivity of Manufacutirng
rel_prod=gpd+gdp^2+t
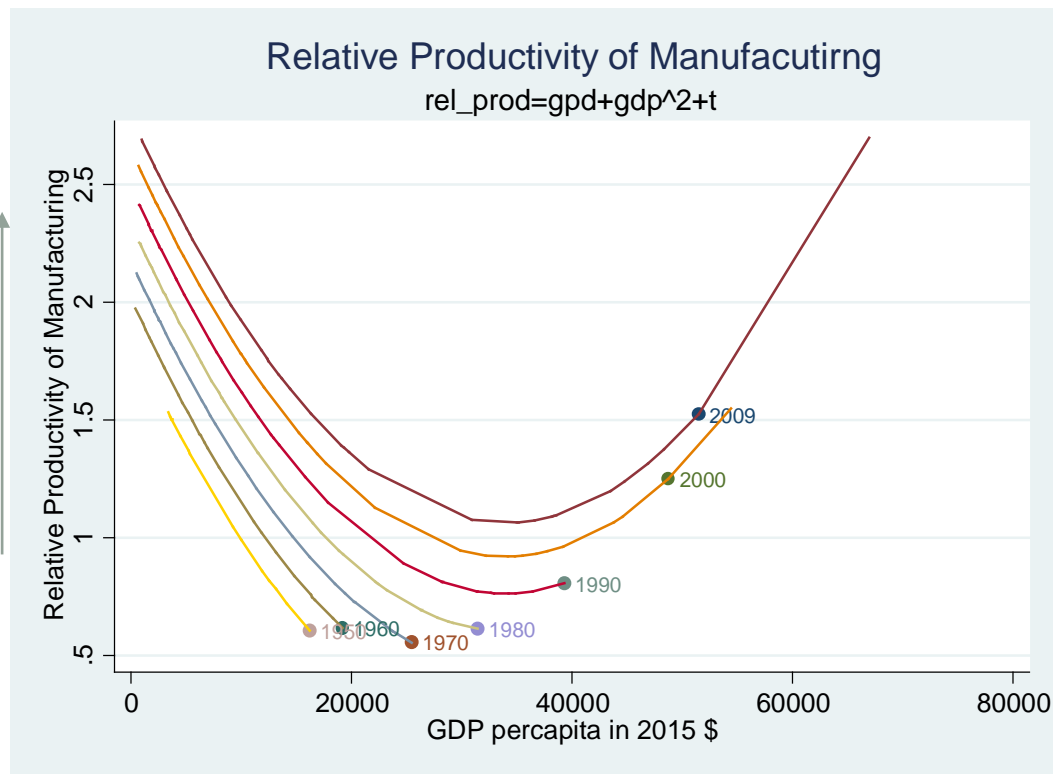
Downward slope actually reflects changing sector shares in GDP in addition to productivity growth.

Relative Price of Manufactured Goods: Shifting   Downwards

Relative Price of Manufacutured Goods to GDP
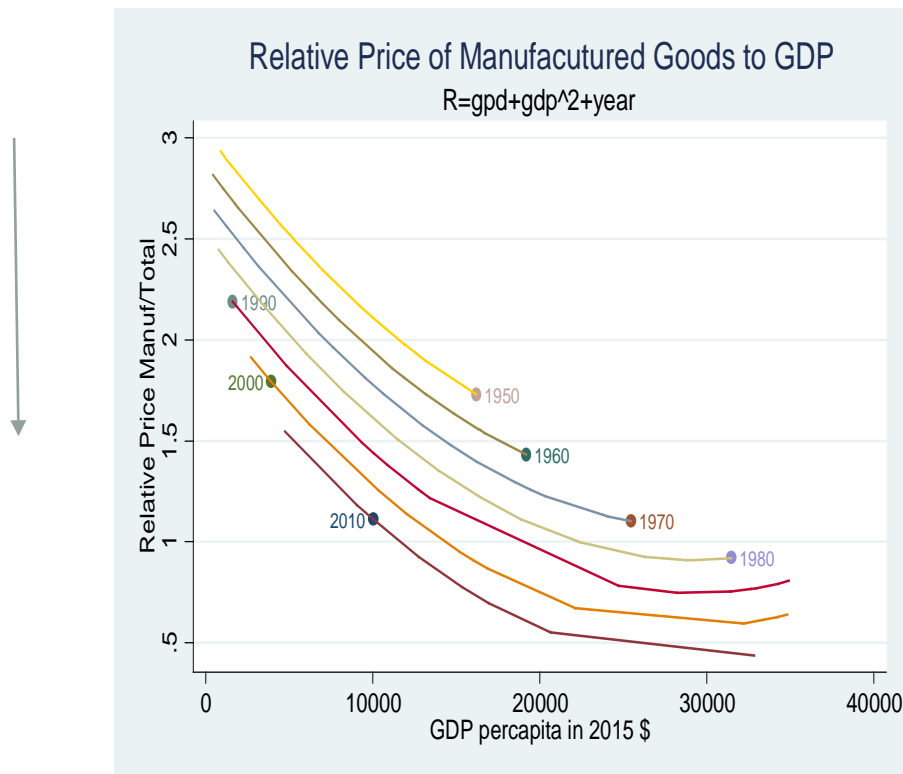
Trade Balances have an impact but deindustrialization due to productivity also important

Table 2. Manufacturing sector: deficit vs. surplus countries

VARIABLES	(1) emps	(2) VA05s	(3) Vas	(4) relative productivity
GDPpc	0.0106***	0.00502***	0.00683***	-0.00684***
	(0.000257)	(0.000328)	(0.000325)	(0.00100)
GDPpc2	-0.000164***	-8.54e-05***	-0.000117***	
	(5.43e-06)	(6.82e-06)	(6.70e-06)	
deficit	-0.00896***	-0.0254***	-0.0281***	-0.252***
	(0.00240)	(0.00314)	(0.00313)	(0.0250)
decade00	-0.0643***	0.0137***	-0.0358***	0.676***
	(0.00403)	(0.00513)	(0.00537)	(0.0423)
decade90	-0.0477***	0.0136**	-0.0159***	0.491***
	(0.00416)	(0.00532)	(0.00557)	(0.0438)
decade80	-0.0290***	0.00991*	0.000427	0.352***
	(0.00410)	(0.00526)	(0.00553)	(0.0435)
decade70	-0.0145***	0.00915*	0.00527	0.206***
	(0.00411)	(0.00526)	(0.00551)	(0.0436)
decade60	-0.00879**	-0.0141***	-0.00820	0.0332
	(0.00433)	(0.00545)	(0.00601)	(0.0459)
Constant	0.0972***	0.143***	0.177***	0.969***
	(0.00371)	(0.00453)	(0.00477)	(0.0355)
Observations	2,121	2,166	2,032	2,061
R-squared	0.558	0.176	0.278	0.181

Standard errors in parentheses.*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Note: relative productivity is relative to services sector.

Source: Lawrence Regressions

Rodrik: Similar:

Table 6: Results by manufacturing specialization

|	non-manufactures exporters				manufactures exporters			
	manufactured exports < 75%		share of manufactured exports < share of other exports		manufactured exports > 75%		share of manufactured exports > share of other exports	
	manemp	realmva	manemp	realmva	manemp	realmva	manemp	realmva
ln population	0.215*	0.166*	0.184*	0.130*	0.324*	0.034	0.443*	0.183*
	(0.025)	(0.032)	(0.028)	(0.035)	(0.031)	(0.033)	(0.025)	(0.033)
ln population squared	-0.004*	-0.002**	-0.002*	-0.001	-0.009*	-0.002**	-0.014*	-0.008*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln GDP per capita	0.189*	0.376*	0.177*	0.383*	0.702*	0.640*	0.771*	0.624*
	(0.024)	(0.057)	(0.025)	(0.058)	(0.043)	(0.021)	(0.042)	(0.025)
ln GDP per capita squared	-0.011*	-0.021*	-0.010*	-0.022*	-0.038*	-0.033*	-0.042*	-0.031*
	(0.002)	(0.004)	(0.002)	(0.004)	(0.003)	(0.001)	(0.003)	(0.002)
1960s	-0.031*	-0.054*	-0.028*	-0.056*	-0.006	0.003	-0.004	0.007***
	(0.004)	(0.011)	(0.004)	(0.011)	(0.006)	(0.003)	(0.006)	(0.004)
1970s	-0.056*	-0.070*	-0.054*	-0.072*	-0.004	0.027*	-0.002	0.033*
	(0.005)	(0.013)	(0.005)	(0.013)	(0.008)	(0.005)	(0.008)	(0.006)
1980s	-0.080*	-0.086*	-0.078*	-0.090*	-0.024**	0.019*	-0.019**	0.027*
	(0.006)	(0.015)	(0.006)	(0.015)	(0.010)	(0.007)	(0.009)	(0.007)
1990s	-0.092*	-0.095*	-0.092*	-0.099*	-0.057*	0.017***	-0.050*	0.023*
	(0.008)	(0.016)	(0.008)	(0.017)	(0.011)	(0.009)	(0.012)	(0.009)
2000s+	-0.119*	-0.119*	-0.122*	-0.123*	-0.089*	0.016	-0.079*	0.019***
	(0.009)	(0.018)	(0.009)	(0.019)	(0.014)	(0.010)	(0.014)	(0.011)
country fixed effects	yes	yes	yes	yes	yes	yes	yes	yes
number of countries	25	25	25	25	15	15	15	15
number of observations	1,315	1,374	1,327	1,373	801	834	789	835

Robust standard errors are reported in parentheses.
Levels of statistical significance: *: 99%; **: 95%; ***: 90%.

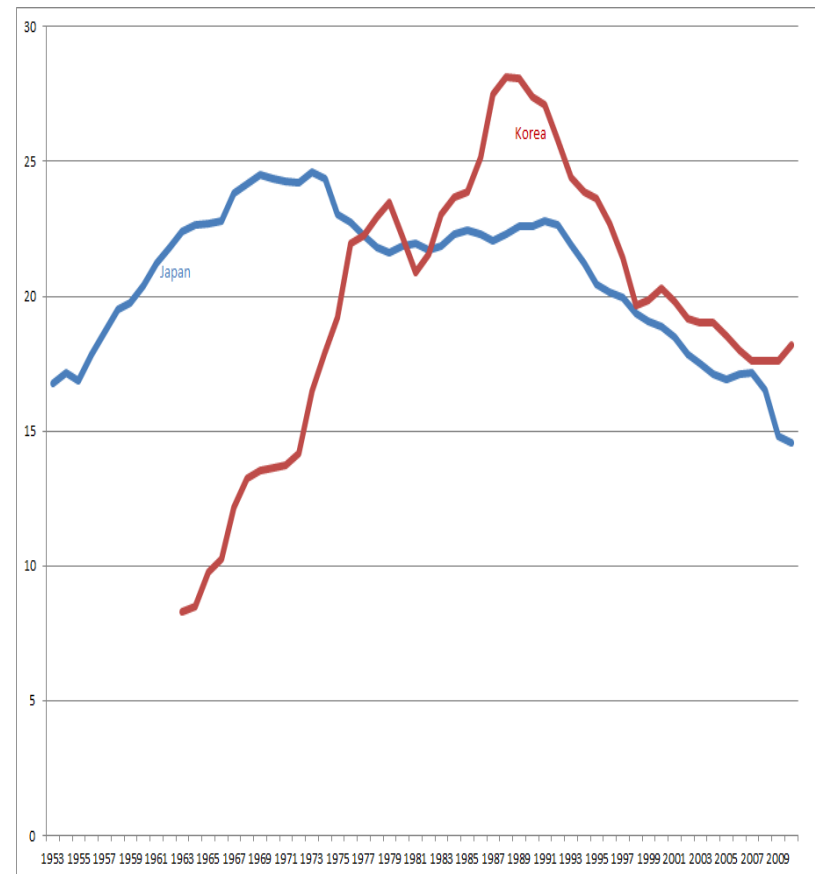Manufactured exports matter but deindustrialization still present after trade taken into account

Source: Dani Rodrik: Deindustrialization

Trade does impact timing and levels: But the hump due to productivity remains

Africans and Latin American's lower levels, earlier humps.
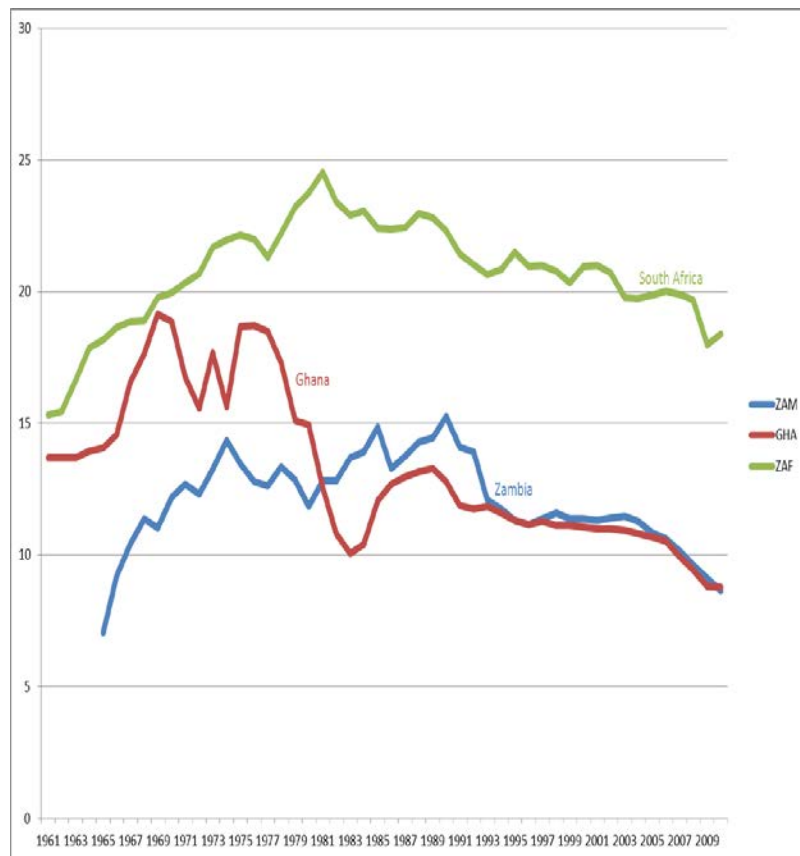
Asians with manufacturing trade surpluses: higher levels. Later humps:

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- **Conclusions.**

Why premature deindustrialization?

- In many cases, its not trade – though globalization in the sense of international diffusion of technology perhaps through FDI and perhaps through embodiment in equipment.

- But its relatively rapid technological change in manufacturing diffused internationally combined with inelastic demand. And eventually all countries will deindustrialize.

- .

Conclusions

- Deindustrialization important in plight of non-college men in USA.

- Foreign trade has had some adverse effects on particular workers, causing dislocation and wage loss.

- But trade accounts for just a small part of overall decline in manufacturing employment.

- The declining trend in all develop-country manufacturing employment is driven by the combination of a shift in domestic demand away from spending on goods and faster productivity growth in manufacturing.

- Manufacturing Share has a hump as Countries Develop. (Agricultural sector plays crucial role)

- But the hump is shifting down and to the left over time, in some countries due to trade but globally because of the relatively rapid technological diffusion in manufacturing.

- Implication: Jobs of the future will increasingly be in services in both developed and developing countries, and jobs in manufacturing increasingly skilled.