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Vocational Education, Manufacturing, and Income Distribution: International Evidence and Case Studies

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Abstract

The lower growth rates characterizing the post Global Financial Crisis era, and the concerns about income inequality put to the fore the degree that better targeted investment in human capital may ameliorate the challenges facing the working poor. Using cross-country OEDC data, we confirm the association between the income shares of the working poor and the availability of vocational education. Improved access to better vocational education will probably contribute more than large increase in regular college attainment. Contrasting the US to Germany suggests that pushing more students to BA granting colleges may not be an efficient way to deal with the challenges caused by the decline in manufacturing employment and affecting in particular lower-income households.

1. Introduction

The Global Financial Crisis (GFC) and the resultant growth deceleration eventurally focused attention on increasing inequality, and specifically on the declining real incomes of the working poor. The evidence of the increasing inequality is meticulously documented, most notably by Piketty's (2014) now famous *Capital in the 21st Century*.

At the same time, the role of education and acquired skills in upward mobility and in generating growth has also been well appreciated (e.g., ILO, 2014. Behar, 2016). There has also been some focus on job-related training as a means to achieve growth in incomes and reductions in inequality (e.g., Attanasio et al., 2017). However, lingering questions remain about the types of educational programs associated with the most effective improvement in incomes at the lower end of the income distribution; and what factors shape the effectiveness of these education programs.

This generated a significant debate and disagreement in the recent US elections. "Free college" was an effective rallying cry for Clinton's primary opponent, Bernie Sanders. At the Democratic Convention, Sanders gave a speech endorsing Clinton, in which he said: "We have come together on a proposal that will revolutionize higher education in America. It will guarantee that the children of any family [in] this country with an annual income of $125,000 a year or less…will be able to go to a public college or university tuition-free." Clinton herself also backed universal free community college. Both these two proposed programs taken together are estimated to cost half a trillion dollars if phased in over four years (CRFB, 2016). Obviously, these plans will not be implemented soon given the election results, but the public debate about the cost of higher education in the United States is certainly not diminishing.

In this paper we question this focus on higher education as a solution to the declining low incomes and increasing inequality problems. With limited resources, what should be the focus of subsided education? Is (nearly) free college education the key for a solution to these problems? Will it likely address the problems of the working poor? In order to answer these questions, we examine the data.

Looking at the OECD countries, an observed pattern and a tentative answer is that improved access to better vocational education can probably contribute more than large increases in regular college attainment. Using the OECD data, we confirm an observed quantifiable association between the income shares of the working poor and the availability and take-up

of vocational education. Contrasting the United States and Germany suggests that pushing more students to degree-granting colleges may not be an efficient way to deal with the declining real incomes of the working poor. Such policy may induce private and public overinvestment in higher (degree)education by weaker segments of the population, with little observed economic returns. Before we turn to the evidence (in section 2 and 3), we add a few more observations from the literature that has examined the efficacy of vocational training programs in specific countries.

Previous empirical research on vocational training, from LaLonde (1986) onward, has largely focussed on specific training programs training the under- or un-employed, and more recently usually within the context of randomized control trials methodology for treatment identification. Recent examples include Attanasio et al. (2017) which provides a long-term analysis of such a program in Colombia, Blattman et al. (2014) which focus on a training program in Uganda, and Card et al. (2011) on youth vocational training in the Dominican Republic. The findings from this literature are mixed, with, not surprisingly, differing levels of efficacy associated with different programs.

More similar to our interest, another strand of the literature has posed the question whether public policy should prefer more generally investment in vocational or academic training, but this literature is generally older and also focuses on specific country experiences—e.g., Yang (1998) on China. Moenjak and Worswick (2003), for example, examine individual data from Thailand and the choice between general and vocational education, and finds a financial benefit associated with vocational training. El-Hamidi (2006) examines this choice in Egypt, and arrives at the opposite preference, arguing that general education coupled with on-the-job training provides the highest benefit. Chen (2009) and Newhouse and Suryadarma (2011) using detailed data from the Indonesia household panel survey, find more nuanced differences in the employment outcomes of those who received academic vs. vocational education at the upper-secondary level; heterogeneities appear to depend on the gender, the cohort, and the socio-economic background of the students examined.[1]

In the next section, we describe the previously unexamined cross-country evidence which forms the backbone of our analysis, while we discuss some comparative case studies

[1] Malamod and Pop-Eleches (2010), examining evidence from Romania, conclude that identified differences between those who pursue the academic vs. the vocational track are largely driven by self-selection into these two options, rather than by any impact of the tracks themselves. Meer (2007) finds evidence from US data that accounting for self-selection overturns previous conclusions in favour of vocational tracking.

contrasting the US with Germany and Thailand with Vietnam in Section 3. We end with some concluding remarks in Section 4.

2. Cross-Country Evidence

2.1. Data

We combine data from several sources. We use the World Wealth and Income Database (Top 10% Income Share) and OECD data (S80S20, P90P10, GINI) for measurments of inequality and incomes of the poor. For manufacturing and exports, we use data series from the World Development Indicators: Manufacturing value added as share of GDP, manufacturing exports as share of merchandise exports, high-technology exports as share of manufactured exports, and trade as percent of GDP. For access to vocational education, we use OECD data on the share of vocational programmes as percent of upper secondary education, Eurostat data for the number of enterprises providing continuing vocational training (CVT) as share of all enterprises, percentage of employees from all enterprises participating in CVT courses, and cost of CVT courses as percent of total labour cost. The estimation sample includes at most 21 countries, depending on the variables used in estimation, covering the years 2003-2013. Table 1 provides a country list and summary statistics; the vocational training data is only available for 10 countries, so these constitute our most restricted sample.

For inequality, we see in the data in Table 1 a wide variation across measures and countries. The top 10% income share ranges from 14.6% in Mauritius to 61.0% in South Africa, with a standard deviation of 9.0% for the full 21-countries sample. Our sample drops to 13 OECD countries when we examine the S80S20, P90P10, and gini data. These three measures are very highly correlated with the 13 countries for which we have data, so it is of little importance which of the three is used in the regressions below.[2] According to all three inequality measures for this very limited subset of countries, the most unequal countries are Portugal, Spain and the United Kingdom, while the most equal ones are the Scandinavian countries, the Netherlands, and Germany (the United States is not included because of the lack of vocational training data).

[2] The correlation coefficient between the first two measures in 0.97, while between the second two measures the correlation is 0.92.

On the size of the manufacturing sector, China has the largest in our sample (31.6% of GDP), while Norway has the smallest (8.9%). According to Deloitte (2010, 2013, 2016), four of the biggest five manufacturing countries are in our sample: China, Germany, Japan, and the UK. We also include measures of exports, and the variability in this measure is very high: Some countries hardly export any manufacturing, while others export almost exclusively manufacturing; there is similar variability in the amount of high-tech exports, and the total trade to GDP ratio.

On the share of vocational education, Netherlands has the highest indicator (68.3%), while South Africa has the lowest (8.9%). As we noted previously, South Africa has the highest top 10% income share, and the lowest share of vocational education, while the Nethrlands has almost the opposite. Across countries, the correlation between a measure of inequality (top 10% income share) and measures of vocational education is always negative. It is about -0.3 for the share of vocational education, -0.5 for the share of continuing vocational training (CVT) enterprises, -0.4 for the share of CVT employees, and -0.4 for the CVT costs. While the CVT shares are informative and are the focus of our hypotheses, they are of limited use, as they are available for just 10 countries.

3. Empirical Specification

Most of our regressions are limited to the10 countries for which there is CVT data, so we choose to exploit the time dimension of the available data for countries for which the CVT is available. We estimate a panel model, and use a fixed-effects estimation:

$$Inequal_{it} = \alpha + \beta manuf_{it} + \gamma edu_{it} + \delta(manuf_{it} * edu_{it}) + \mu_i + \varepsilon_{it} \qquad (1)$$

where $\alpha, \beta, \gamma, \delta$ denote parameters for estimation; μ_i is the country fixed-effects, and ε_{it} is the vector of regression residuals (assumed iid).

Table 2 reports coefficient estimates for equation (1). In column (1), we find that both the relative size of the manufacturing sector and the share of vocational education are positively associated with the top 10% income share. In a standard trade model, both terms-of-trade adjustment and technological bias for skilled labor can give rise to the increasing inequality. Interestingly, we find that an interaction of the relative size of the manufacturing sector and the share of vocational education is negatively associated with the top 10% income share. As manufacturing sector becomes more important in a country's income, relatively unskilled

labors benefit from access to vocational education, thereby closing up the income inequality gap with skilled labor. Alternative specifications using manufacturing/GDP and high-tech exports/total exports provide the same qualitative results.

Table 3 provides coefficient estimates using alternative measures of inequality and educational access to vocational training. As we have previously observed that these measures of inequality are highly correlated in our sample, these robustness checks are largely supportive of the baseline estimates. There is less variation in other measures of inequality relative to the top 10% income share (as shown in the summary statistics), but the effects of manufacturing sector and share of vocational education remain statistically significant also for S80S20, P90P10, and GINI.

Most importantly, the alternative measures of educational access to vocational training—share of vocational education in upper education, the cost of vocational training, the share of employees participating in vocational training—all yield consistent results to our main findings.[3]

4. Case Studies

4.1. Germany versus USA

The post GFC dynamics in the US put to the fore the decline in manufacturing employment in the US. A narrative gaining political momentum (and the presidency) has been that US manufacturing employment decline is the outcome of globalization. Accordingly, NAFTA, the WTO, and other trade agreements, and the sizable current account deficits of the US were the key drivers for the downhill manufacturing employment trends in the U.S. In contrast, according to this narrative China and Germany are prime examples of countries benefiting from globalization. This section reflects on these arguments, focusing on the contrast between Germany and the USA.

To put these claims in the longer-term perspective, Figure 1a reports the manufacturing employment shares, 1970-2012, vividly showing that the declining trend of manufacturing employment is common to both Germany and the US. While Germany's level of manufacturing employment remains well above that of the US—higher by 13% in 1970 and

[3] These results are consistent with micro-econometric case studies dealing with emerging markets—e.g., Moenjak and Worswick (2003) for Thailand, and Attanasio et al. (2011 and 2017) for Colombia.

about 10% in 2012—both countries experienced continuing employment declines, at annual rate of loss of 0.47% in Germany, and 0.38% in the US. Indeed, similar trends apply across most OECD countries, and even beyond the high income countries to many emerging markets (see Figure 1b). Thus, globalization is not a zero sum game of winners and losers in the struggle for trade. It hard to see how globalization can explain the global declining trend in manufacturing employment.

Figure 2 provides pertinent information on the main driving factor, reporting the manufacturing value added/GDP for Germany and the US during 1997-2015. Remarkably, despite the decline in manufacturing employment share in Germany, the manufacturing GDP value added share in Germany has been stable, at about 23%, recovering fully after a V shape adjustment during and after the GFC. In contrast, during that past two decades, the US experienced a drop of about 5% in the manufacturing value added, at the same time that manufacturing employment share dropped by 6%.

These trends are in line with the view that technological changes were the key drivers affecting both the US and Germany, though German overall increases in labor productivity outperformed the US. Figure 3 shows that in the US, manufacturing real output per person increased by more than 10% in the five years after 2007, yet it has stagnated during the past five years. Figure 4 reports the index of real Unit Labor Costs in the Manufacturing Sector, 2000-2014. The chart is consistent with the superior performance of manufacturing in Germany relative to the US: the real unit labor cost in the US dropped by about 10% in the US relative to Germany, at times that the manufacturing value added declined significantly in the US, while it was constant in Germany.

The differential manufacturing performance of these two key global trading countries may be the outcome of structural factors, as well as policies. While we do not attempt to provide a causal interpretation, we note several structural differences between these countries that we think are important. The educational attainment aggregate numbers of the two countries differ sharply. The labor force in Germany is relatively more replete with workers with upper-secondary education, and the labor force in the US with those who have tertiary education credentials. The share of workers with upper secondary in Germany exceeds that of the US by about 15% points, and share of workers with tertiary education in the US exceeds that of Germany by about 17% points (see Table 4). On its face, therefore, the US labor force is more educated or more highly skilled.

Other noteworthy difference are the design of public policies more generally and specifically the patterns of inequality and redistribution. The safety net in Germany is deeper and wider than in the US, covering more people and with more resources, and the income inequality in the US is substantially higher than that in Germany (see Table 4). Given the relative success of German manufacturing value added in recent decades, it is likely that Germany's education system fits better the needs of modern manufacturing. It is likely, as had been hypothesised before, that modern manufacturing requires more upper-secondary and vocationally trained labor rather than more workers with tertiary education.

The public policy concern about over-investment in four year colleges in the US largely concentrates on the newer for-profit and online sectors (e.g., Deming, Goldin, and Katz, 2012). Yet, the rise in the cost of college education at rates that are out of out of line with the expected employability and the financial return associated with college education are found in all the different components of the tertiary education system—from two-year public institutions that are the cheapest, to the four-year private non-profits that are generally the most expensive per annum. The very large system of tertiary education in the US is very heterogenous, but it puts the main emphasis on the four-year college system (both private and public, and for- and non-profit).

Other concerns, beyond escalating costs and overinvestment, are the limited information available to students from lower socio-economic backgrounds regarding the alternatives available to them. There are also concerns about the information regarding co-funding with federally subsidized loans, which allows many colleges to survive despite delivering a low-quality education with clearly negative financial returns. These funding models saddle the working poor with high debt burden that appears unjustified by low return on their investment.

The total outstanding student loan debt in the U.S. is US$ 1.2 trillion, the second-highest level of consumer debt behind only mortgages. Most of these loans are held by the federal government.[4] These facts are consistent with the mismatch hypothesis -- there are too many four-year colleges serving too many students, and too few institutions with greater focus on

[4] Marketwatch (2016) reported that about 40 million Americans hold student loans and about 70% of bachelor's degree recipients graduate with debt. One in four student loan borrowers are either in delinquency or default on their student loans, according the Consumer Financial Protection Bureau. Helpfully for creditors, student loans are not erased when debtors declare bankruptcy (unlike, for example, credit card debt). http://www.marketwatch.com/story/americas-growing-student-loan-debt-crisis-2016-01-15 . An overview of the heterogeneity of the US college system can be found in http://nces.ed.gov/programs/coe/indicator_csa.asp.

vocational education and training. This mismatch is sustained by a skewed assistance scheme that is largely facilitated by the federal government. A Brookings study, Looney and Yannelis (2015), found that a large share of the growth in the number of students struggling to pay off their student loans is from students borrowing to attend for-profit schools.[5]

While manufacturing employment share has declined substantially in both countries, the shallower safety net in the US may explain why this issue has generated greater social impact in the US than in Germany. The first-ever decline in life expectancy in some parts of the US, and the growing despair of the displaced less educated workers in the US, idenfied by Case and Deaton (2015 and 2017), probably reflects these shallower safety net. It may resemble more the dynamics in Russia after the collapse of the Soviet Union and its own de-industrialization, rather than the dynamics observed in Germany.[6]

The vocational employment training (VET) in Germany is much more developed. The CESifo database on Instituional Comparisons in Europe (DICE) includes a lot of institutional detail about the VET found in many European countries (and where the data is available, also the US).[7] For example, Germany starts identifying students who are struggling in the 'academic' track in middle school (7th grade), and has various mechanisms in place to assist these students to succeed in VET prgroams, while in the US, any assistance that is available, is only for students once they drop out of a 'normal' high-school, and can get assistance to receive a GED (a certificate that is considered equivalent to completing high-school). Vocational training even after that (post-secondary) is still rare, and is almost only found if it is organised privately for specific professions.

Rebalancing the post-secondary education system in the US with more vocational training may not be a panacea.[8] Yet, overlooking the need to align the education system with the

[5] These public policy concerns are magnified by the fact that student debt in the US is not erased if one declares bankruptcy, unlike credit card debt. Mortgage debt is even easier to walk away from. Hence, student debt is especially pernicious and damaging as it is more long-lasting.

[6] Germany had its fair share of socially costly dislocation associated with the unification of East and West Germany. The contrasting dynamics between the US and Germany validate Rodrik (2011)'s conjecture that deeper safety is conducive towards smoother globalization and the adjustment to new technologies.

[7] http://www.cesifo-group.de/ifoHome/facts/DICE/Labour-Market/Labour-Market/Training.html.

[8] Notably, Hanushek et al. (2016) concluded that vocational education is harmful in the later phases of work careers - vocationally qualified workers are the first to be laid off after the age of 50 because their specific skills are likely to be outdated. Yet, Forster et al. (2016) noted that, while it may be true that people with vocational qualifications are less likely to be employed later in their career, this pattern may be unrelated to the way that vocational education is organized. Specifically, they argue that the warning of Hanushek et al. (2016) to the proponents of a German style vocational training system should imply that the late career disadvantage of vocational degrees would be more pronounced in countries with a large dual system (i.e., work and school based). Looking at the data, they did not find evidence of that difference. On the contrary, German-like

demands of the real economy comes with growing private and social costs. We close this case study by noting that the US mortgage debt crisis of 2008-2010, and the education debt overhang in the US may both be indicative of structural differences that led to over-investment in both real estate and in college education in the US relative to Germany.[9]

3.2 Thailand versus Vietnam

Thailand and Vietnam are middle-income countries striving for export-led manufacturing success in global markets.[10] For the past three decades, cheap labour and proximity to Japan, Korea, and China have contributed to their performance in manufacturing exports. The past decade, however, saw even cheaper labour, from other middle-income countries, eroding the comparative advantage of both Thailand and Vietnam, while the learning-by-doing increasing returns dynamics that are sometimes associated with participation in global supply chains has proved to be rather elusive for these two emerging economies.[11]

Figures 6.a and 6.b illustrate the structure of the educational system in Thailand and Vietnam, respectively. With regards to the technical and vocational training, an earlier start of tracking and differentiation in Vietnam (lower secondary) than in Thailand (upper secondary) is a notable difference. For Thailand, the vocational programmes are under the Ministry of Education, while Vietnam legislated its two institutions (Ministry of Education and Training, and Ministry of Labour-Invalids and Social Affairs) to oversee the technical training. In both countries, there is a lack of micro-level evidence on the effectiveness of vocational training. The preference for university education in both countries also stigmatizes the acquisition of vocational certification and reduces the desirability of vocational degrees. This, of course, implies that those who self-select into the vocational track may do so not out of a preference but because the academic track is closed for them.

The contrasts between Thailand and Vietnam is noticable in the budget allocation for education. Both countries spent close to 5% of GDP on education, similar to more advanced

education systems with a strong emphasis on dual tracks are characterized by less disadvantage late in the careers of vocationally qualified workers. The negative effect of vocational training at the end of the career are observable statistically only in countries that do not have dual-track systems, like the United States and Canada.

[9] This over-investment may reflect structural factors such as the differential use in leverage in funding housing and education services in the two countries, the differential tax system, and the greater role of private and for-profits education in the US (see Aizenman and Noy, 2012).

[10] According to the World Bank's Development Indicators, in 2015, GDP per capita in Thailand was almost USD 6000, while in Vietnam it was about USD 2100.

[11] At least partially, this difficulty is surly rooted in the political challenges Thailand and Vietnam are facing. The former is currently ruled by the military, following a coup in 2014, the latter is under the absolute rule of the Communist Party of Vietnam.

economies such as Germany and the United States. Yet, as shown in Figures 7.a and 7.b, Vietnam allocated almost 20% of the education budget on upper-secondary education (vocational training included), while Thailand expensed only 10% for the upper-secondary level. Perhaps its investment in vocational training explain the forecast that Vietnam is about to overtake Thailand for its global manufacturing competitiveness. Figures 8.b and 8.b provide the level of manufacturing competitiveness together with some underlying factors. Based on the survey of CEOs by Deloitte (2010, 2013, 2016), by the next decade Vietnam is expected to rise to be the 12th among the top manufacturing exporters globally, while Thailand will stagnate at the 14th place.

Currently, not enough data is available to determine if indeed Vietnam's additional investment in technical and vocational training, and its add-on effects to the manufacturing sector, would eventually translate into lower income inequality in Vietnam (and to a lesser extent in Thailand). Currently, the richest 20% have more than 40% of national income in both countries. Shown in Figures 9.a and 9.b, the gap between the top 20% and the bottom 20% has been fairly constant for the past three decades. How to reduce this high inequality remain a puzzle. Vocational training and equal access to education can be one of many possible strategies for achieving that goal.

5. Conclusions

Labour saving technological innovations probably account for the decline in manufacturing employment share more than international trade. The declining employment share in manufacturing resembles the collapse of employment share in agriculture in the past 200 years. Yet, the speed of the adjustment has accelerated substantially. As information technology and more recently artificial intelligence impact more sectors, there is no evidence that the new disruptive technologies will open up new lines of employment at a rate that will be sufficient to compensate for the dissapearnce of employment in old industries (Acemoglu and Restrepo, 2017). Furthermore, it is not clear that the skills required for these new jobs will be matched with those workers whose jobs disappeared. This renewed need for better matching of skills between older workers and new jobs will most definitely be affected, to a certain extent, by the quantity and quality of vocational training avaialbe in each country. It is this vocational training that we see as playing a central role in determining the outcomes for the low-skilled, low-wage, workers that populate the lower part of the income distribution.

The quantitiative evidence on the role of vocational training is imperfect, but both the limited cross-country evidence, and the comparisons we make convince us that well-resourced and well-targeted vocational training can prove to be a better long-term invesmtnet in skill acquisition and can assist in ameliorating the difficulties faced by those people whose jobs are currently disappearing and whose prospects look, in many cases, to be quite bleak.

A key challenge for the countries on the technological frontier will therefore to provide this vocational training and re-training that will hopefully prevent the jobless future whose consequences we do not yet quite understand. Failing to do this, countries will either have to rapidly upgrade their safety net to avoid increasing destitution, or to face the consequences of the greater political instability and the social costs associated with the hollowing-out of the middle class—political instability that is most likely associated with such anomalies as the Brexit vote, the US election of 2016, and other recent electoral surprises.

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Table 1. Country List and Summary Statistics.

Country	Top Income 10%	S80 S20	P90 P10	GINI	Manu/ GDP	Manu/ EXP	Hitech/ EXP	Trade/ GDP	VET Share	CVT Enterpr	CVT Employ	CVT Cost
Australia	29.8	5.5	4.4	0.33	9.7	21.1	12.4	40.9	52.2			
Switzerland	32.6				19.7	88.1	24.5	105.2	65.0			
China	38.7				31.6	93.0	27.1	52.9	43.0			
Germany	38.5	4.4	3.5	0.29	22.3	83.4	15.8	74.4	56.8	73.0	39.0	1.5
Denmark	25.8				14.1	63.8	17.8	92.0	53.4	91.0	37.0	1.8
Spain	34.0	5.9	4.8	0.33	14.6	74.0	6.5	54.7	42.7	75.0	48.0	1.6
France	30.5	4.6	3.6	0.30	12.3	78.7	22.0	54.7	47.1	76.0	45.0	2.5
United Kingdom	40.7	6.2	4.4	0.36	10.5	71.5	23.9	55.4	28.5	80.0	31.0	1.1
Ireland	36.3	4.9	4.0	0.31	21.7	85.3	30.1	155.2	33.1			
Italy	33.6	5.4	4.3	0.32	17.2	84.8	7.4	50.3	55.6	56.0	36.0	1.1
Japan	42.1	6.2	5.2	0.34	18.8	90.7	20.8	27.9	24.3			
Korea	41.5				28.8	89.5	30.2	83.8	26.4			
Mauritius	14.6				20.4	62.7	3.2	118.1	14.1			
Malaysia	24.2				25.2	68.8	48.6	170.2	15.6			
Netherlands	30.7	4.2	3.3	0.28	13.0	59.5	24.6	130.8	68.3	79.0	39.0	2.2
Norway	29.6	3.8	2.9	0.26	8.9	17.9	16.4	70.3	57.1	97.0	46.0	1.7
New Zealand	30.4	5.3	4.2	0.33	11.8	20.9	9.3	57.4	31.6			
Portugal	37.6	7.0	5.3	0.38	14.9	78.7	8.7	61.9	30.4	65.0	40.0	1.9
Singapore	40.9				22.1	73.7	47.6	399.5	11.2			
Sweden	30.1	4.1	3.3	0.28	19.1	76.5	14.3	85.6	55.9	87.0	47.0	1.7
South Africa	61.0				14.3	48.4	5.1	61.1	8.9			

Table 2. Baseline Results

	Top Income 10%	Top Income 10%	Top Income 10%	Top Income 10%
	(1)	(2)	(3)	(4)
Manufacturing/GDP	.50884 (.15161)***			
Manufacturing/EXP		.06819 (.05216)	.38807 (.21808)*	
High-Tech/EXP				.21272 (.08356)**
Vocational Share in Upper Secondary	.18984 (.06830)***	.18946 (.08565)**		.06935 (.03728)*
Vocational Training Cost/Total Labor Cost			Time-Invariant; 2010 Value	
x Manufacturing/GDP	−.01212 (.00384)***			
x Manufacturing/EXP		−.00269 (.00113)**	−.23071 (.13286)*	
x High-Tech/EXP				−.00502 (.00180)***

Note: Fixed-effects estimation. ***, **, * denotes statistically significance at 1, 5, 10 percent. Countries included: AUS, CHE, CHN, DEU, DNK, ESP, FRA, GBR, IRL, ITA, JPN, KOR, MUS, MYS, NLD, NOR, NZL, PRT, SGP, SWE, ZAF. Years covered but with some missing observations: 2003-2013. Sources: Top Income 10% from WID; Manufacturing/GDP, Manufacturing/Exports, High-Tech/Exports from WDI; Vocational Share in Upper Secondary Education from OECD; Vocational Training Cost and Share of Employees participating in Vocational Training from Eurostat.

Table 3. Alternative Inequality Measures

	S80/S20	P90/P10	P90/P10	GINI Index
	(1)	(2)	(3)	(4)
Manufacturing/GDP		.31086 (.15937)*		
Manufacturing/EXP	.13475 (.05629)**		.06430 (.02498)**	.00121 (.00104)
Vocational Share in Upper Secondary				.00378 (.00149)**
Share of Employees Participating	Time-Invariant; 2010 Value	Time-Invariant; 2010 Value		
Vocational Training Cost/Total Labor Cost			Time-Invariant; 2010 Value	
x Manufacturing/GDP		-.00819 (.00374)**		
x Manufacturing/EXP	-.00380 (.00151)**		-.04531 (.01727)**	-.00005 (.00002)**
x High-Tech/EXP				

Note: Fixed-effects estimation. ***, **, * denotes statistically significance at 1, 5, 10 percent. Countries included: AUS, CHE, CHN, DEU, DNK, ESP, FRA, GBR, IRL, ITA, JPN, KOR, MUS, MYS, NLD, NOR, NZL, PRT, SGP, SWE, ZAF. Years covered but with some missing observations: 2003-2013; 51 observations. Sources: S80/S20, P90/P10 from OECD; Manufacturing/GDP, Manufacturing/Exports, High-Tech/Exports from WDI; Vocational Share in Upper Secondary Education from OECD; Vocational Training Cost and Share of Employees Participating in Vocational Training from Eurostat.

Table 4: Education: Germany versus the USA (% of population)

	USA	Germany	Difference
Below upper secondary	10.5	13.2	-2.7
Upper secondary	44.9	59.2	-14.3
Tertiary	44.6	27.6	17
S80/S20	18.6	11.0	
Gini	0.45	0.27	
Manufacturing/GDP	12	22	

Source: ?

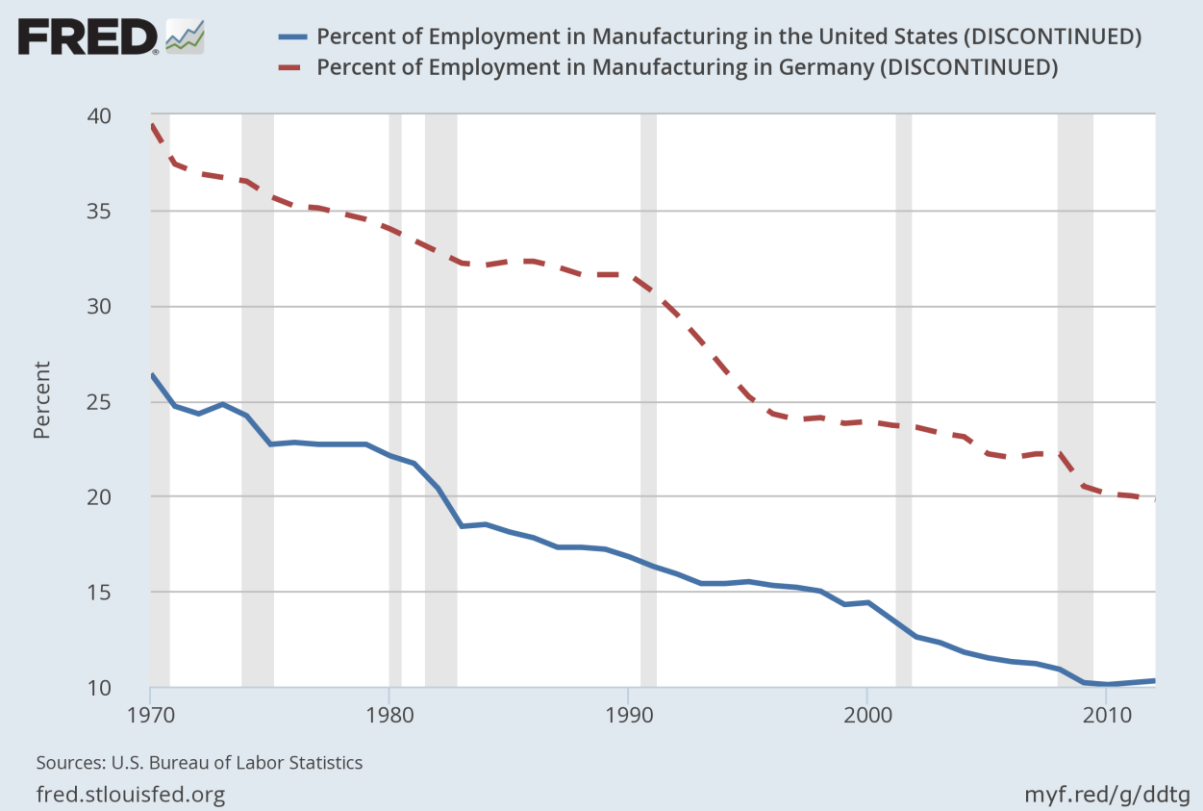


Figure 1a. manufacturing employment share, 1970-2014, Germany [dashed] and US [solid]

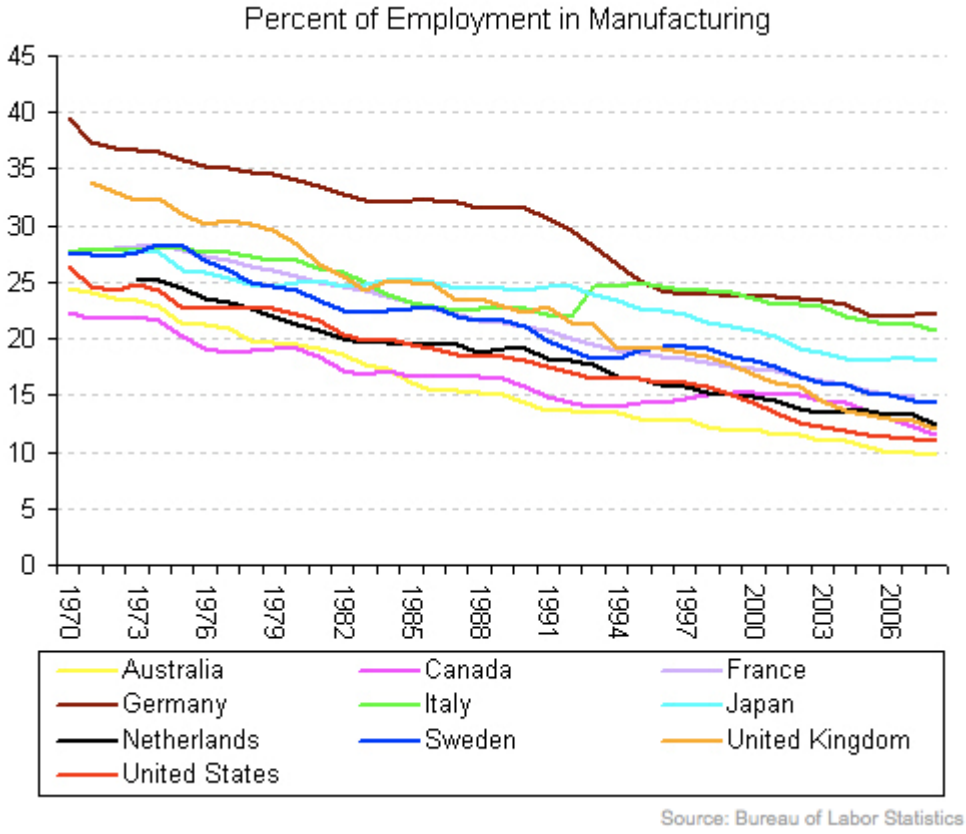
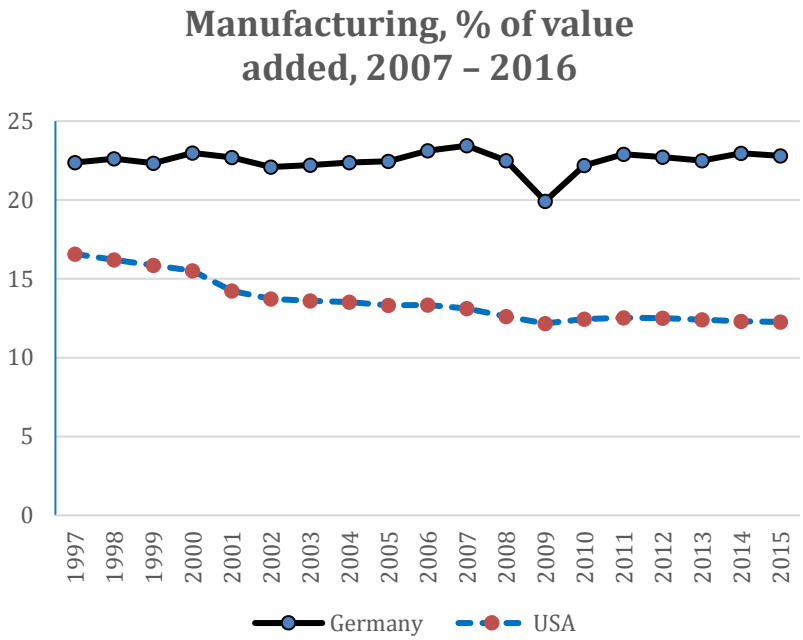


Figure 1b. manufacturing employment share, 1970-2014, OECD



Source: OECD

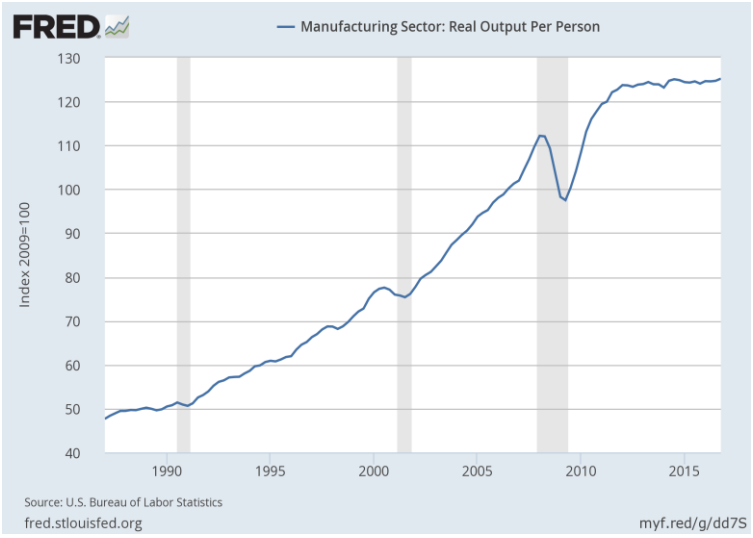


Figure 3: US manufacturing real output per person

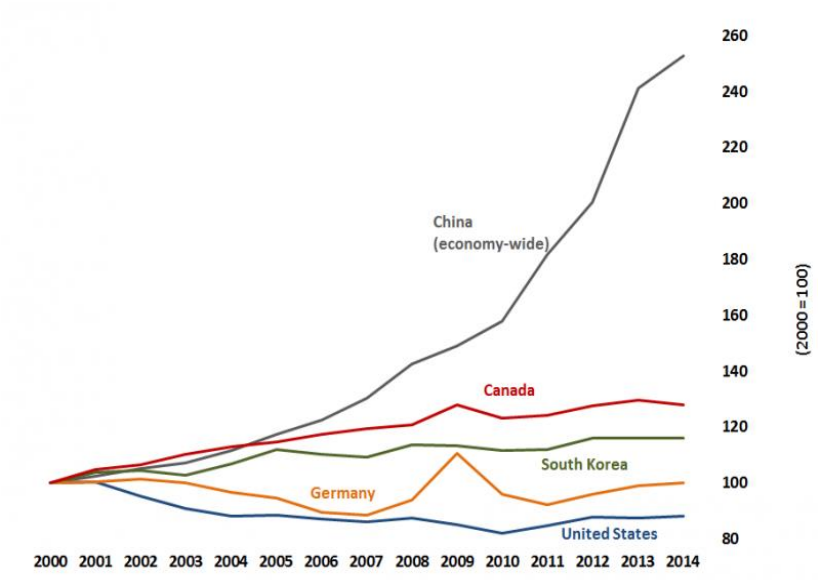


Figure 4 Indexed Unit Labor Costs in the Manufacturing Sector of Selected Countries, 2000-2014 Source: Economics and Statistics Administration analysis of data from Bureau of Labor Statistics, International Labor Comparisons program and National Bureau of Statistics of China.

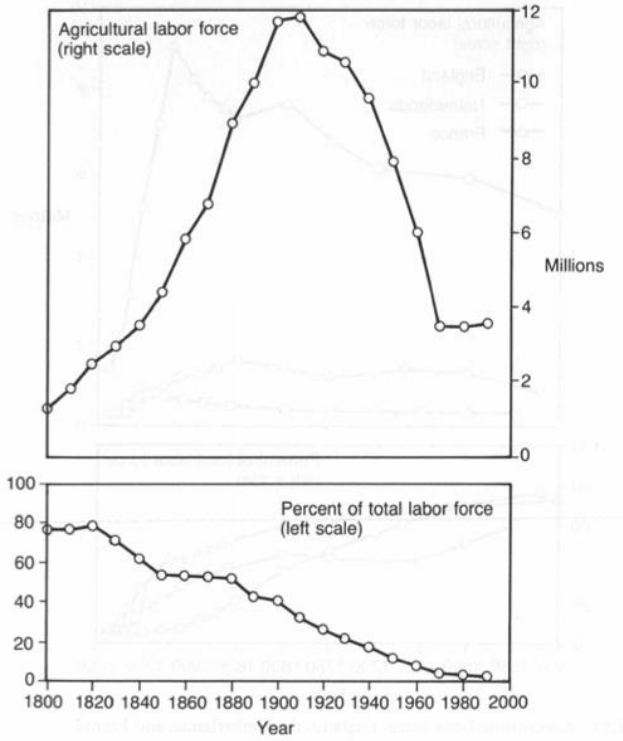
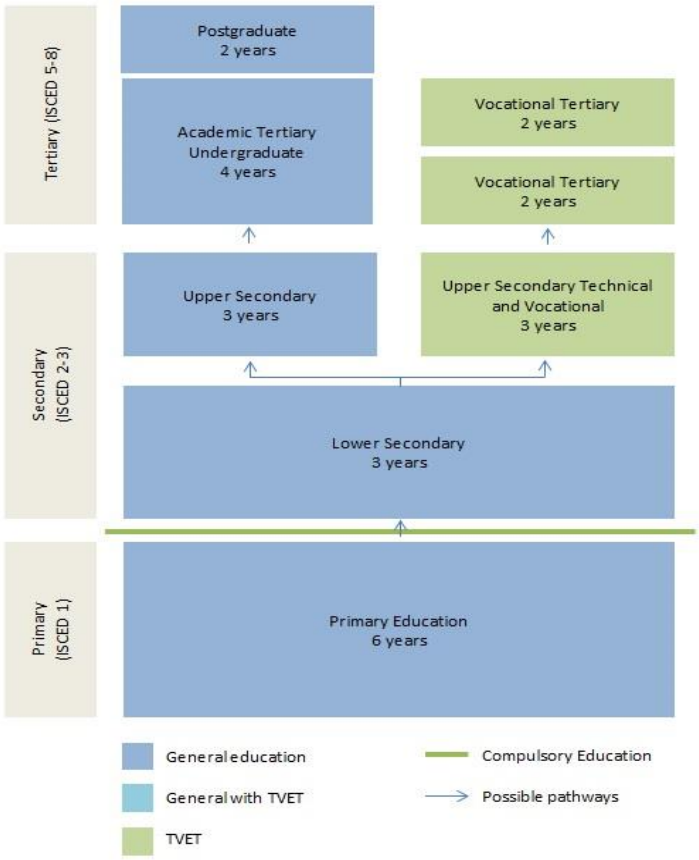
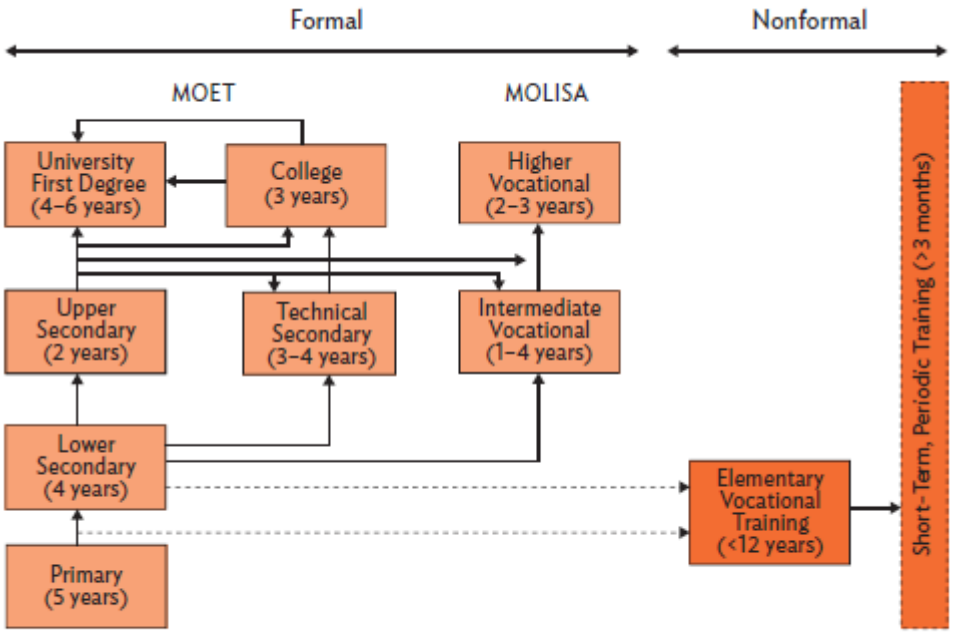


Figure 5: the US employment in agriculture, 1980-2000. Source: Chapter 12 (authored by Richard J. Sullivan) in Simon(Editor) (1996) – *The State of Humanity*. Wiley-Blackwell.



6.a Thailand

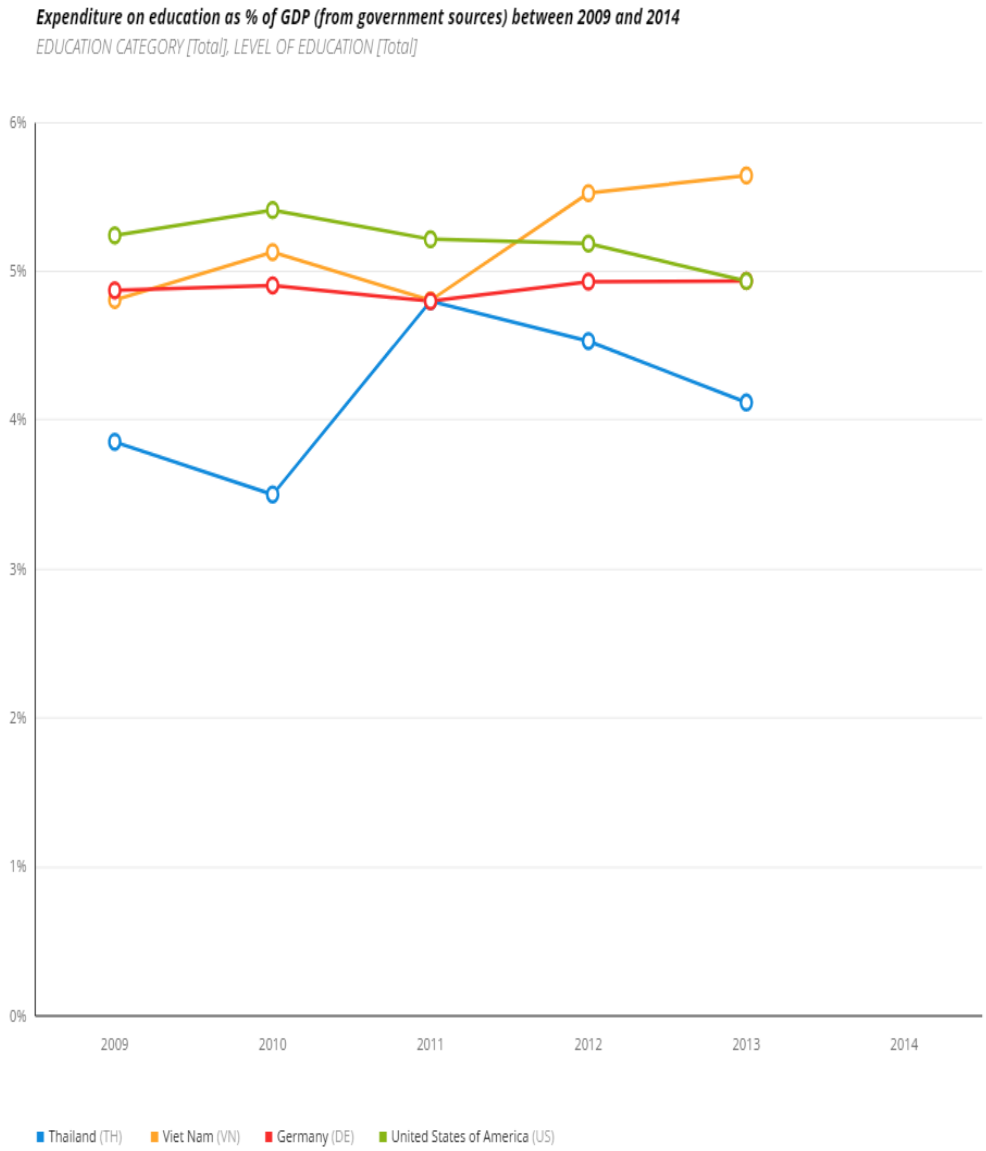


MOET = Ministry of Education and Training; MOLISA = Ministry of Labour–Invalids and Social Affairs.
Source: Ministry of Labour–Invalids and Social Affairs (MOLISA).

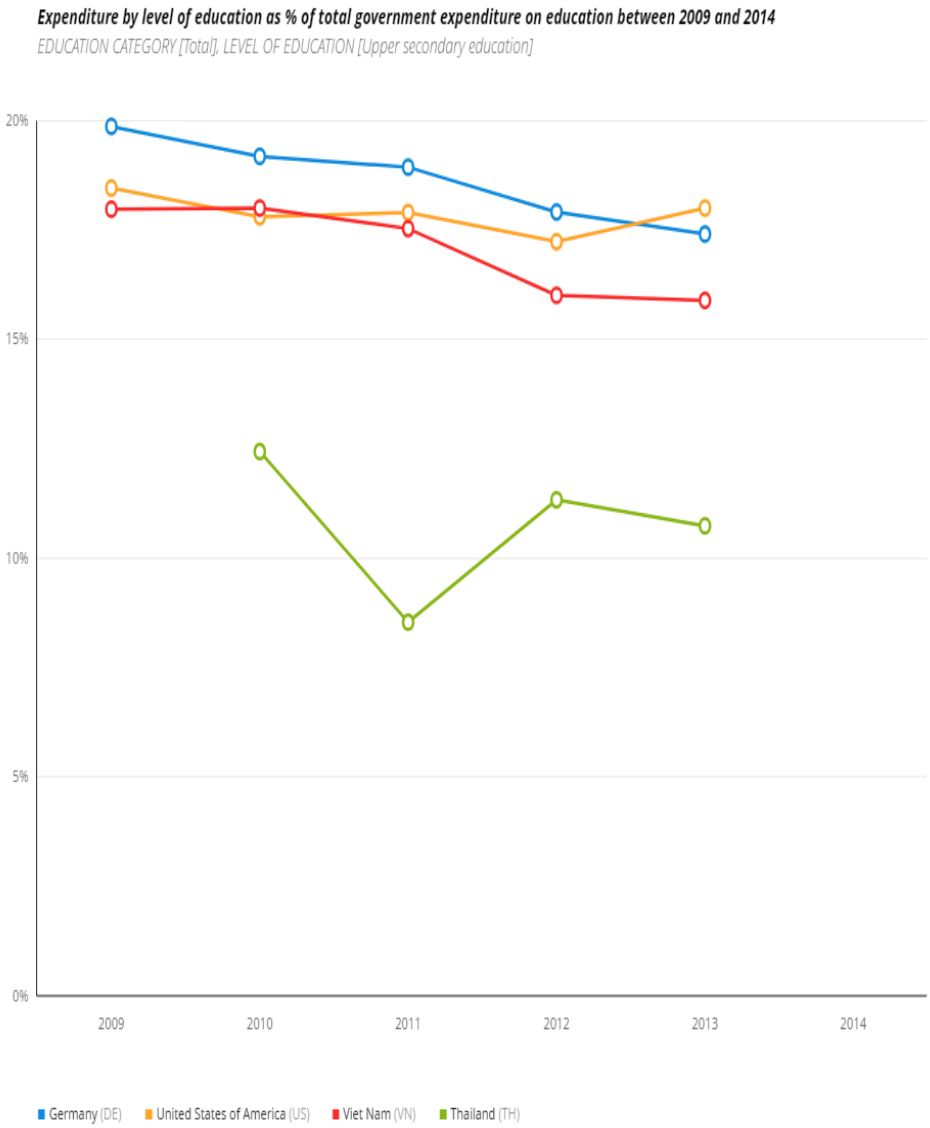
6.b Vietnam

Figure 6 Structure of Educational System in Thailand and Vietnam

Source: UNESCO-UNEVOC and ADB



7.a Education Budget/GDP



7.b Upper Secondary Education/Total Education Budget

Figure 7 Education Budget

Source: UNESCO Institute for Statistics

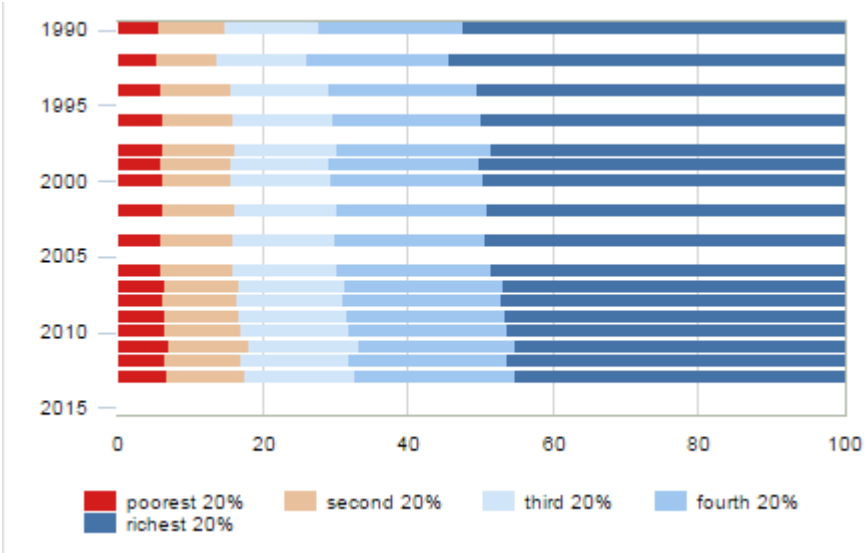
8.a Overall Competitiveness

		Thailand	Vietnam
Manufacturing Size (2013)	bil.$	71.9	21.3
	%GDP	25.7	17.5
	3-Year Growth (%)	0.7	8.1
Manufacturing Labour Cost (2015)	per hour ($)	2.78	1.96
Productivity (2014)	GDP/person ($)	23,862.70	8,935.90
Manufacturing Exports	bil. $	167.1	107.9

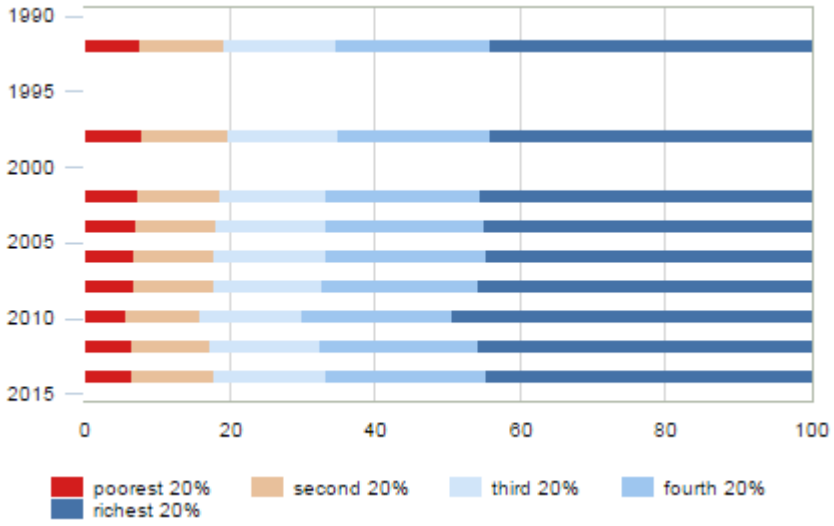
8.b Competitiveness Factors

Figure 8 Manufacturing Competitiveness

Source: Deloitte



9.a Thailand



9.b Vietnam

Figure 9 Distribution of Income

Source: World Bank