WIFO WORKING PAPERS
631/2021

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July 2021

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2021/W/1918

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STRUCTURAL CHANGE TOWARDS SERVICES

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Abstract

This paper examines broad patterns of structural change for a large number of countries on a global scale and for a smaller set of advanced industrialised countries over time. The findings show that structural change over the past decades followed the three-sector hypothesis. The past decades were characterised by the rise of the service sector, driven especially by business services and non-market service. At the same time as manufacturing sectors are declining in terms of shares, they remain the sectors with the highest contributions to aggregate productivity growth. An analysis of determinants of structural change confirms that country competencies related to institutional quality, knowledge generation and industrial application of the new knowledge are an important driving force of structural changes towards services, but that they have a heterogeneous impact on manufacturing subsectors. High technology manufacturing share seems not to be characterized by a tendency to decline with the development of country competencies. Broad policy implications are discussed.

JEL – Codes: O11, O14

Key Words: structural change, service share, manufacturing share

Acknowledgements: This research received funding from the European Commission under the Horizon 2020 Research and Innovation Programme, grant agreement No. 822781 - GROWINPRO.

1. Introduction

Economic development is associated with a process of qualitative change in the economic structure of economies over time. The economic development of the past centuries has shown that economic growth was associated with a gradual shift from agriculture to the manufacturing and service sectors and then from manufacturing sectors towards the service sector. This process was driven by technological change on the supply side and changes in the structure of demand due to income effects on the demand side.

Especially the last decades have seen a rise of service sector and the increasing recognition that knowledge and intangible capital are primary driver of economic growth and structural change. Today the economic competencies of nations and firms are no longer seen to be concentrated in the manufacturing sector alone. Also, because technical change and the increasing national and international division of labour led to a blurring of the sectoral boundaries between manufacturing and service sectors. In fact, the rise of the service sector has been driven by the growth of knowledge-intensive business and non-market services. This process should be considered to be different from a process of de-industrialization and de-skilling. Such a process would be associated with a deterioration of growth potential related to a decline in organizational and technological competencies, while complex knowledge-based services require themselves complex competencies, organisation and skills.

The service sector is in all countries both the main sector of employment and a main source of value-added. However, there are also heterogeneous developments under this smooth aggregate pattern. Differences in the level of economic activity can also be traced back to the structure of the economy and to the distribution of productivity across sectors. The economic weight of manufacturing is decreasing, especially if measured in employment shares. Nevertheless, it seems that the distinction between tradeable and non-tradeable products remains relevant, especially in a world of an internationalised division of labour.

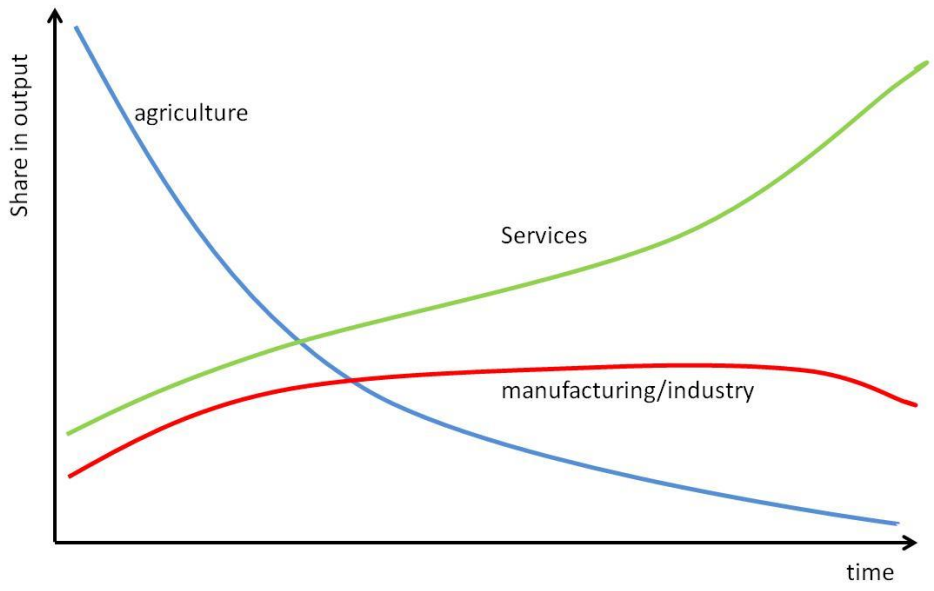
In this paper we look at the recent broad patterns of structural change globally and European economies. The paper starts with a review of the three sector hypothesis and the stylized facts of structural change and reviews that the broad trends of structural change. We look at recent shifts in employment and value added in manufacturing and services in developed countries. The findings show that the secular shift towards is a secular trend driven primarily by changes in demand but also that there exists considerable heterogeneity in shares. The analysis also suggests that structural shifts have an impact on the growth potential. Last but not least the recent structural shifts are linked to institutions and capabilities. There is a close relationship between the secular shifts and country institutions and capabilities. Concluding remarks close the paper.

2. Stylised Facts of structural change: Evidence on three sectors:

Most theoretical explanations of structural change concentrate on the reallocation across three broad sectors, namely agriculture, manufacturing and services. Historically the the take-off of economic growth is the movement of labour from agriculture to manufacturing and finally to the service sector. A sizeable literature on structural change exists, including the early contributions of Fisher (1949), Clark (1940, 1957), Chenery (1960) or Kuznets (1957). The early literature emphasized the shift from agriculture to industry in the course of economic development but said little about the share of services. Kuznets (1957) and Chenery (1960) concluded that the share of services did not vary significantly with per capita income. However, these studies relied on quite incomplete data from a variety of sources. More recent contributions such as Kongsamut et al. (2001), Eichengreen and Gupta (2012) or Herrendorf et al. (2013) find that the share of services is increasing with economic development.

A variety of theoretical approaches that are concerned with the explanation of structural shifts between the main economic sectors and industries have been proposed (cf. Krüger 2008, Buera and Kaboski 2012a, Herrendorf et al. 2013). One of the central theoretical tools is the three sector hypothesis. Most formal theories of structural change are concerned with the explanation of the structural shifts between three sectors (agriculture, manufacturing and services). The three-sector hypothesis is concerned with the uncovering and explaining of stable stylized facts of structural change using a highly aggregate framework.

Figure 1: The three sector hypothesis



Demand and productivity growth are linked by the price elasticity channel. High productivity growth leads to reduced prices and lead to stimulus in demand. With increasing income demand shifts towards other goods, and the structure of Engel curves – the heterogeneity of

demand for particular goods with rising income – can lead to a reallocation of economic activity to low-productivity sectors. Service sectors are generally thought to be characterised by high labour intensity and high-income intensity. Figure 1 presents the three sector hypothesis in a very stylized way. In its modern form the three sector hypothesis states that at the beginning agriculture is the dominant economic sector with respect to both the portion of people employed and the share of production. The secondary and the tertiary sector are very small in comparison. With the advent of industrialization the secondary sector (manufacturing) begin to gain importance together with the tertiary sector, while the primary sector declines in economic importance. Later in economic development there is a process of reallocation of output and labour from both the primary and the secondary sector (manufacturing and industry) to the tertiary sector. In the end the majority of people are employed, and the majority of GDP is produced in the service sector. Recent research has shown that the expansion of services is not uniform but is driven by knowledge-intensive services (e.g. Buera and Kaboski 2012).

Figure 2 shows four sectoral aggregates: agriculture, manufacturing, industry (manufacturing, mining, utilities and construction) and services and three sector aggregates: agriculture, manufacturing, industry (manufacturing, mining, energy and construction). The data is from the National Accounts Dataset collected by the United Nations Statistics Division. This dataset contains sectoral aggregates for 164 countries. The coverage is 1960 to 2018. The line corresponds to a polynomial prediction without country weights.

Figure 2: Structural change in three main sectors, 1960 to 2018

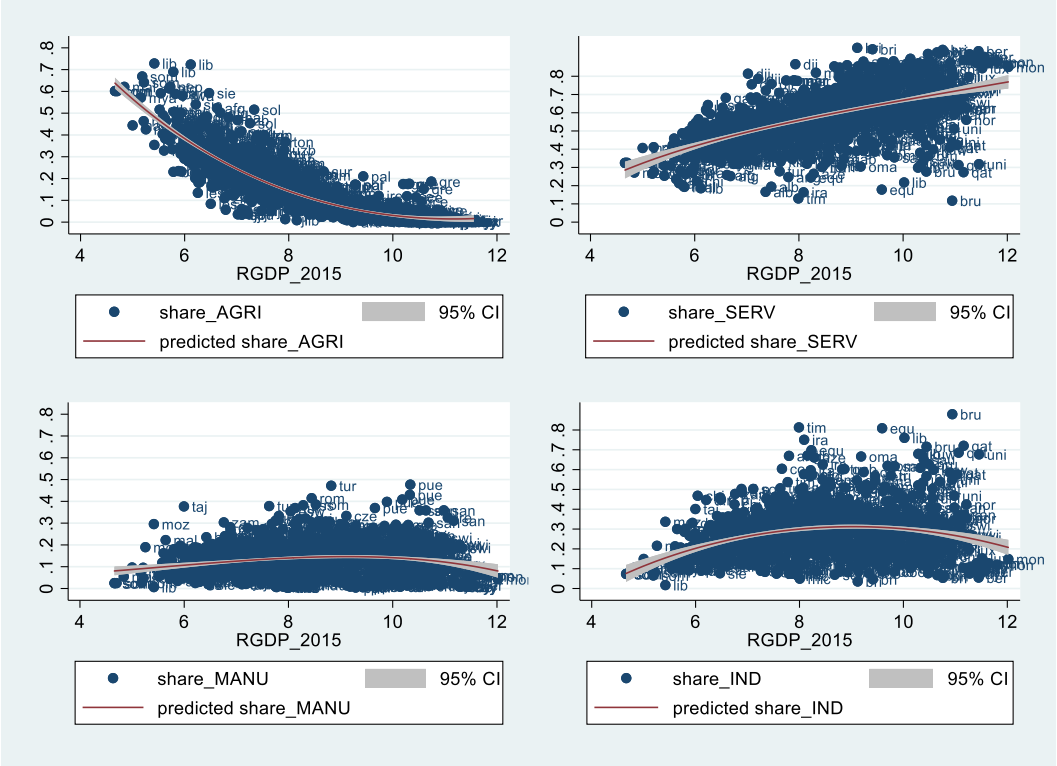
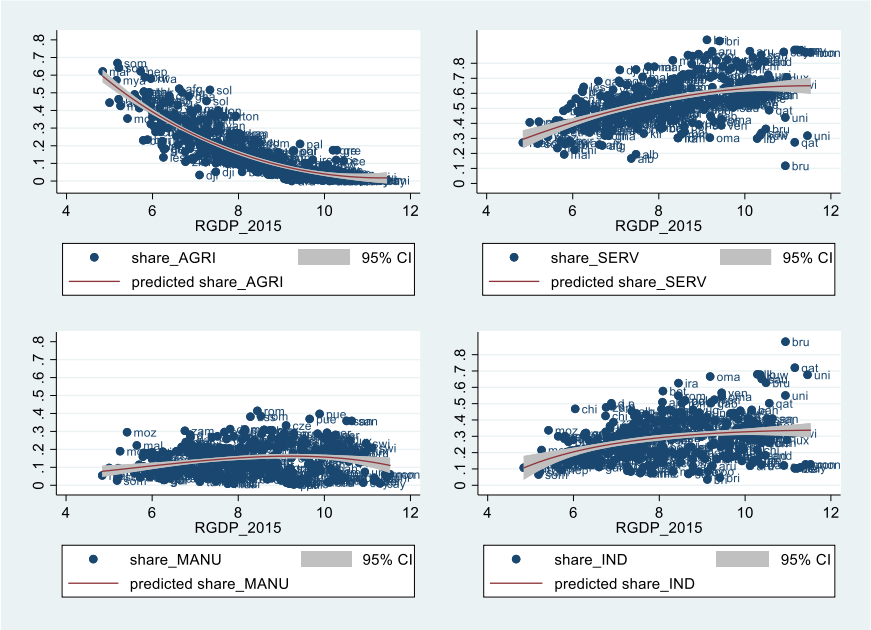


Figure 3: Structural change in three main sectors, 1960 to 2000 and 2000 to 2018

(a) 1960 -2000



(b) 2000 – 2018

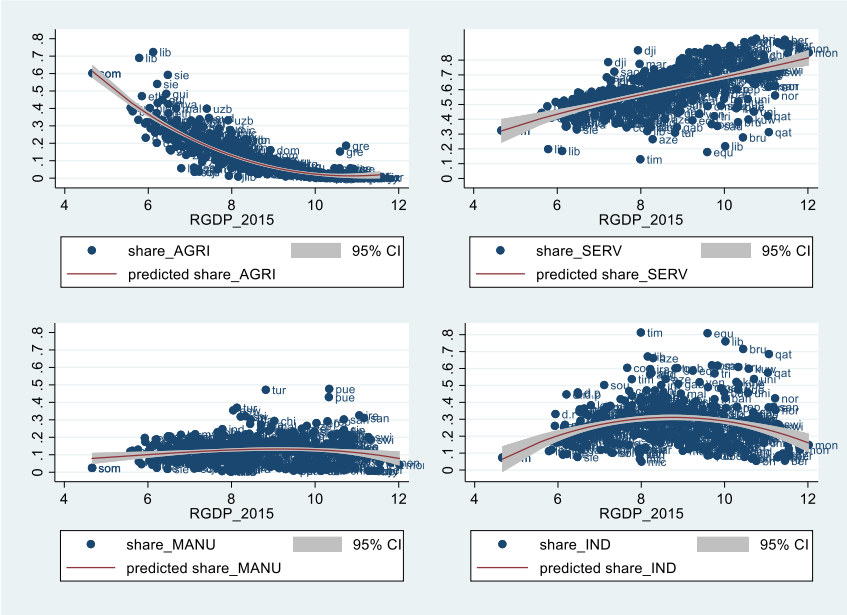


Figure 2 clearly shows that the value added share of agriculture is declining with economic development, measured by real GDP per capita. The service share increases with economic development. The manufacturing and the industry shares show an inverted u-shaped pattern. On average the manufacturing share and the industry share are increasing up to a level of 9 of the log real GDP per capita and then starts to decline. For the industry share we the inverted u-shape pattern is more pronounced. These results confirm in terms of basic regularities the three-sector hypothesis. But the plots also indicate considerable heterogeneity. For example, there are countries in our sample with a share of agriculture of around 80% and the service share is for a few countries as low as 10 %. We observe also countries with high shares in manufacturing and in industry. The results for industry are often driven by countries with important natural resources and, thus, a high share of mining in GDP, e.g. oil-producing countries.

Figure 3 presents the same plots for two sub-periods. First from 1960 to 2000 and from 2000 to 2018. One reason for the presentation of the subsamples is that data quality and national accounts definitions change over time, making it difficult to compare manufacturing shares from the 1960 to manufacturing shares in the 2000s. Moreover, up to the mid-1990s many communist countries are in the sample. Communist countries used different national accounting standards. However, the visual inspection does not reveal massive qualitative differences. The basic patterns remain the same. However, there are also important differences. First the average service share is higher for any level of economic development. The industry share shows a strong u-shaped pattern only the more recent time period, and the manufacturing share shows a stronger decline for high economic development in the more

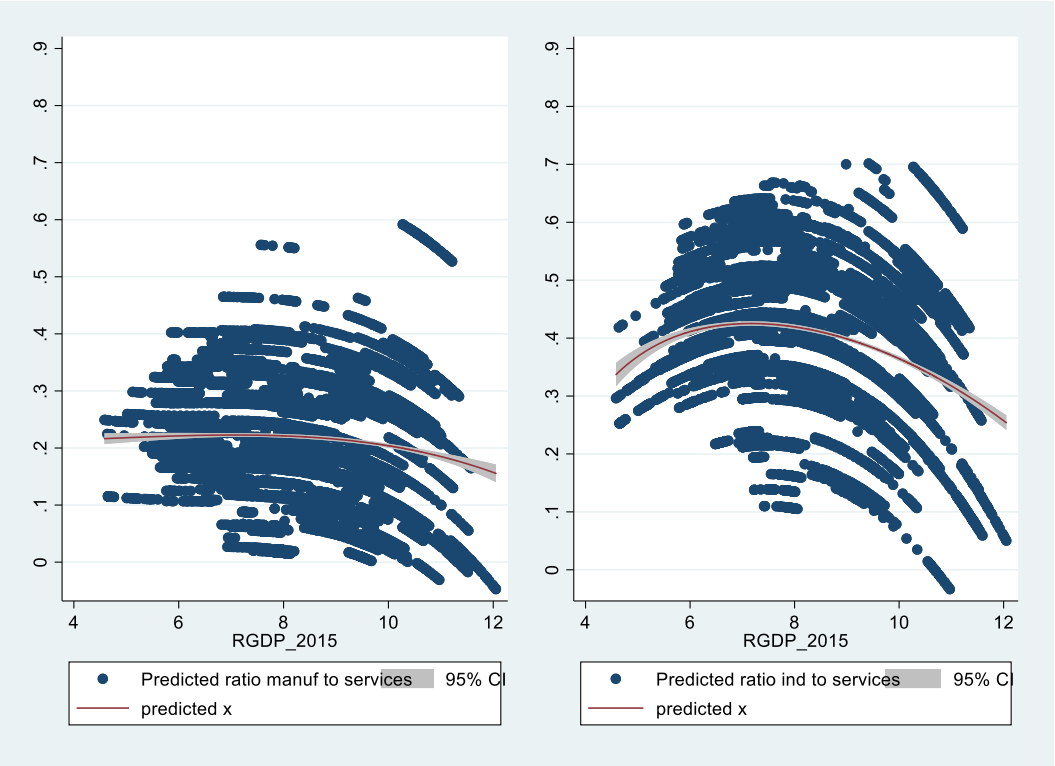
recent time period. Moreover, the maximum manufacturing share is higher in the earlier subsample than in the more recent subsample. This is relevant for catching-up processes of lagging countries, if manufacturing is a key sector in the process of catching-up (Rodrik, 2013). Dosi et al. (2020) document that may also relevant at the industry level, if globalization leads to a situation where the transition towards high technology manufacturing industries becomes hampered and more difficult for lower income countries and they are struck in low-value added manufacturing activities.

Overall, the results confirm that there is large heterogeneity across countries in their value added shares, these differences are not only due to economic development but also related to specialization patterns due to natural resources and to temporal differences. The patterns of structural change changed over the past decade. The most important feature is the rise of the service sector.

3. The rise of services

To further illustrate the rise of services in the past decade we also report results from a regression where we regress the ratio of the value-added in manufacturing to the value-added in services (ratio of the value-added in industry to the value-added in services) on a polynomial of real GDP per capita (real GDP per capita, real GDP per capita squared and cubic real GDP per capita. The regression includes also country-specific fixed effects. Figure 4 presents the regression results in graphic form by plotting the predicted values. Please note that values that correspond to a ratio of the industry share to the service share above 0.7 were classified as outliers. The predicted relationship shows that the ratio between value added in manufacturing and value-added in services peaks at a log real GDP per capita number around 9 while the ratio between value-added in industry and value-added in services peaks at a log real GDP per capita around 6. The non-outlier corrected data suggested a peak at higher values, related to resource-driven economies. Similar patterns have been observed by Eichengreen and Gupta (2012) and Buera and Kaboski (2012a). The evidence in Figure 4 also shows that there is considerable heterogeneity across countries.

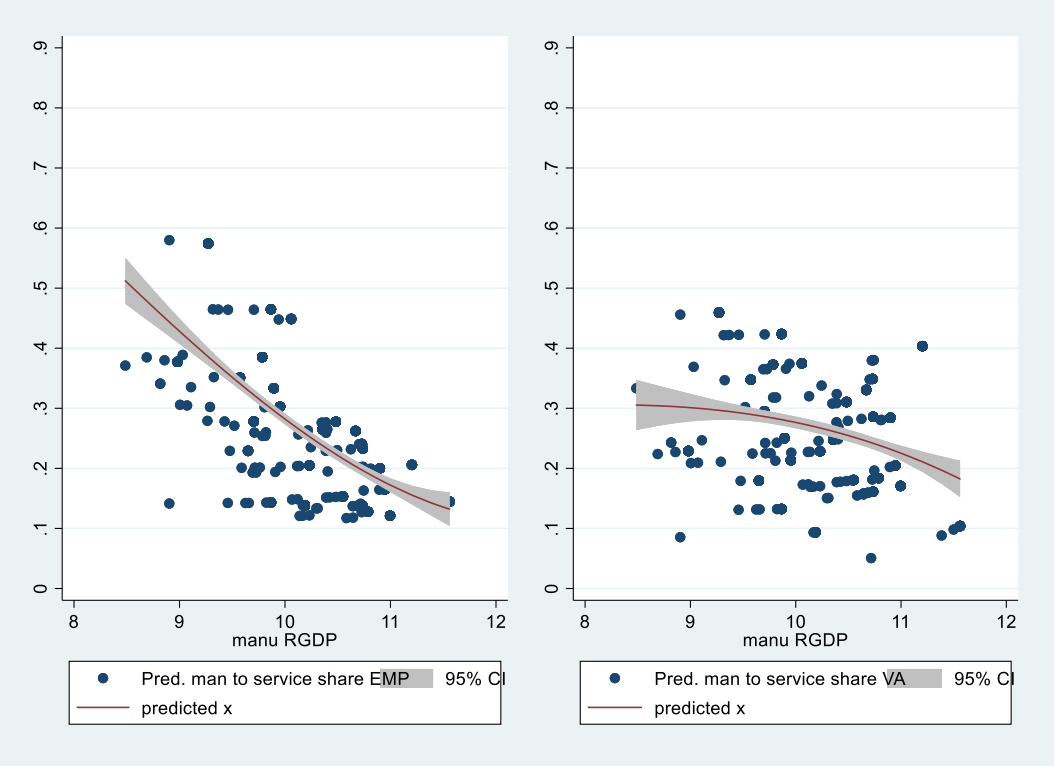
Figure 4: Predicted ratio of manufacturing to services value-added and industry to services value added vs. log GDP per capita



Notes: Predicted values of a fixed effect regression of the ratio of the manufacturing share to the service share (left panel) and the industry share to the service share (right panel) on real GDP per capita (2015 prices). The line provides a linear prediction of the predicted values. Extreme observations where the ratio of industry to service share was above 0.7 were excluded as outliers.

It is important to note that sector shares can behave quite differently, when considered in value added and in employment terms. Kuznets (1957) showed that in the early history of US development the employment share of services increased considerably while the value added share of services remained almost constant. More recently Buera and Kaboski (2012b) document that there is a puzzling discrepancy between sector output and employment shares for the US before 1950 and emphasize that "raw labour shares" may not always be a good measure of structural change, especially if the analytical emphasis is on competencies of the working population. For this reason and to gauge the robustness of the results we use also EUKLEMS data for 1995 to 2017. The sample consists of developed countries only (EU-countries plus Japan and the US) and covers a much shorter time period. Again we regress the ratio of the manufacturing share to the service share on a polynomial of real GDP per capita in constant prices (2015). Figure 5 shows that the behaviour of employment and value added shares can differ considerably. The left panel displays the predicted ratio of the manufacturing and service employment shares and the right panel value added shares. The dynamics are very different. With increasing per capita GDP the ratio of the employment shares declines considerably faster than the ratio of the value added shares.

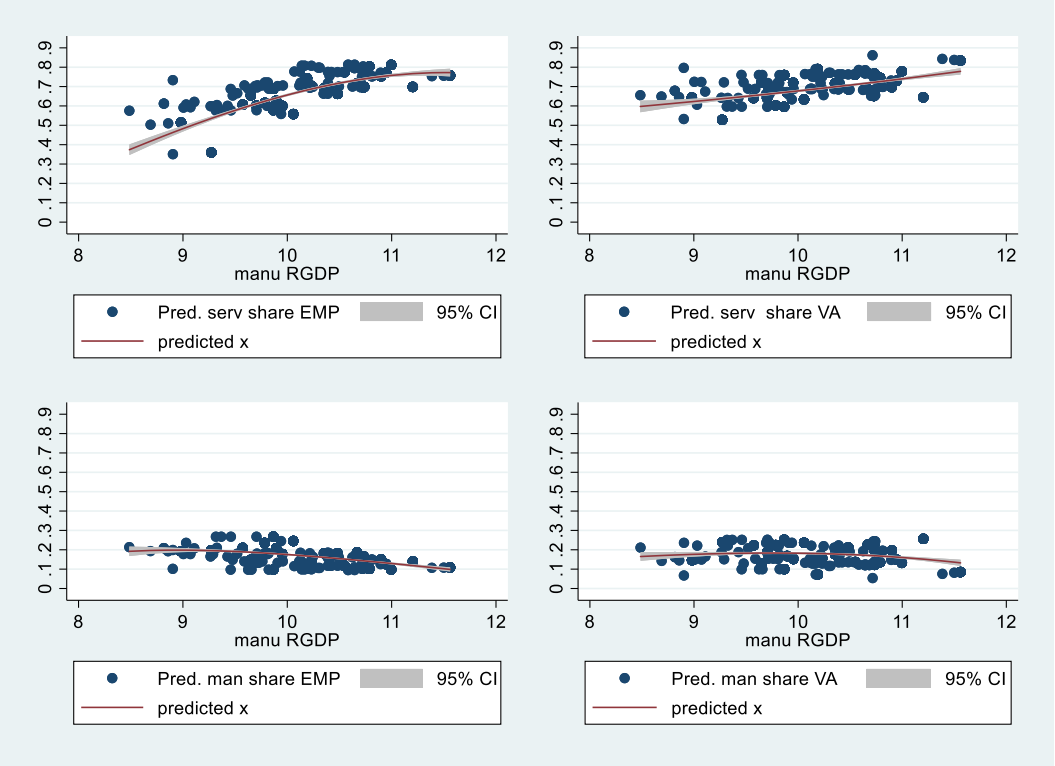
Figure 5: Predicted ratio of manufacturing to services shares vs. log per capita, EUKLEMS data



Notes: Predicted values of a fixed effect regression of the ratio of the employment manufacturing share to the employment service share (left panel) and the value added manufacturing share to the value added service share (right panel) on real GDP per capita (2015 prices). The line provides a linear prediction of the predicted values. Observations for Belgium, Croatia. Poland and Latvia were dropped as information on some sectors is missing.

The results in Figure 6 suggest that this is due both to a decline in the manufacturing shares and the rise of the service shares, and that service employment shares increased considerably more than the service value added shares. The rise in of services seems to be associated with a stronger rise in employment shares than in value added shares and confirms that service sectors are employment-absorbing sectors. This warrants a more detailed look at the heterogeneity of structural change. Is the rise of services associated primarily with the low productivity growth in services compared to manufacturing and points towards a deterioration of growth potentials or is the rise of services itself require skills and competencies and is therefore the outcome of economic development?

Figure 6: Predicted manufacturing and services shares vs. log per capita, EUKLEMS data



Notes: Predicted values of regression of the service share (upper panels) and the service share (lower panels) in employment terms (left panels) and value added terms (right panels) on real GDP per capita (2015 prices). The line provides a linear prediction of the predicted values. Observations for Belgium, Croatia. Poland and Latvia were dropped as information on some sectors is missing.

4. Implications of the rise of services: a closer look at advanced economies

The service sector itself is very heterogeneous. As early as in the 1970s Katouzian (1970) divided services into three categories: new, complementary, and old. Old services included providers of domestic services, such as cleaning employees, and drivers. The relative importance of old services, according to Katouzian, declines with economic development and industrialization. Complementary services such as trade, transportation and storage increase with industrialization but are unrelated to changes in per capita income. New services such as education and health services rise with increasing income and increasing leisure time (non-homothetic preferences). Buera and Kaboski (2012b) followed up and distinguished services primarily on the basis of their skill intensity. Their skill intensity- corresponds primarily to business services (engineering, finance and other business services) and non-market services (education, health and hospitals) in our classification of service sector. The results obtained by Buera and Kaboski (2012) and Eichengreen and Gupta (2012) show that modern skill-based services are the main driver behind the structural change towards services.

Table 1 provides an overview of the patterns of structural change in the years 2000 to 2016. Two subperiods are considered 2000 to 2007 (before the financial crisis) and 2010 to 2016 (after the financial crisis).

The results in the table shows three interesting results. First, the shift from agriculture, manufacturing and agriculture to services is on average much stronger for employment shares than for value added shares. In the time period 2000 to 2016 the employment share declines by 3.62 percentage points while the value added share declines by 1.72 pp, for manufacturing we observe declines by 3.6 pp in the employment share and 2.01 in the value added share. The increase of the employment share for the service sectors is 8.19 pp while the increase of the value added share is 4.85 pp. This confirms that the reallocation from manufacturing and agriculture towards services is towards more labour-intensive sectors. Aggregate labour productivity growth declines due to these shifts. Second, we observe quite some heterogeneity for the subperiods 2000 to 2007 (before the financial crisis) and 2010 to 2016 (after the financial crisis). The behaviour in the first time period is very similar to the behaviour over the whole time period, while in the second time period the pace of structural change seems to be a slower, especially when one considers manufacturing: While the employment share declines 1.76 pp during the time period 2000 to 2007 it declines only by 0.31 pp in 2010-2016. The value added share declines by 1.31 pp in the first period and increases by 0.73 in the second period. This is very close to the increase in the value added share of services in 2010-2016 (0.82 pp). This result indicates that after the financial crisis structural change slowed down, especially the reallocation of economic activity from manufacturing towards services. This evidence is important, as it suggests that the patterns of structural change may not be stable over time. Whether this is due to the adjustment dynamics after the financial crisis or is related to a change in the dynamics of structural change remains to be seen. The evidence for the construction sector a large increase in both employment and value added terms in the pre-crisis period and a decrease of both employment and value added shares after the crisis hints towards an explanation based on transitional dynamics. Third both the manufacturing sector and the service sectors are by themselves heterogenous. When we look at the manufacturing sector and distinguish between low, medium technology and high technology manufacturing (sectoral allocation is based on the EUROSTAT distinction of manufacturing industries according to technology intensity and listed in the appendix), we see quite different dynamics for the subsectors with different technology intensity. The losses of the manufacturing sector with regard to both value added and employment shares are concentrated in low technology manufacturing, while high technology manufacturing is able to increase its value added share in all time periods considered. The medium technology sector is located somewhere in-between. This suggests that sectoral specialisation matters for the changes of the aggregate manufacturing share. Countries with a specialization in high technology manufacturing are experiencing a lower decline of the manufacturing share than countries with a specialization in low technology manufacturing. Also, for the service sectors we observe important heterogeneity: The rise of the service sector is associated primarily with the rise of the business

services. The share of business services increases in all three time periods considered. For distribution we observe also increases in the employment share but only for the last time period (2010-2016) we observe also an increase in the value added share. The rise of non-market services is lower.

Table 1: Changes in employment and value added shares 2000 to 2016, 2000-2007 and 2010-2016

	employment shares			value added shares		
	2000-2016	2000-2007	2010-2016	2000-2016	2000-2007	2010-2016
agriculture	**-3.62**	**-2.68**	**-0.85**	**-1.72**	**-1.55**	**0.07**
	4.73	*3.39*	*1.67*	*2.10*	*1.80*	*0.50*
mining + energy	**-0.54**	**-0.43**	**-0.17**	**0.11**	**0.25**	**-0.98**
	0.95	*0.57*	*0.37*	*1.41*	*1.27*	*1.79*
construction	**-0.58**	**1.16**	**-0.92**	**-0.98**	**1.29**	**-0.92**
	2.07	*1.63*	*1.22*	*1.75*	*1.89*	*1.43*
manufacturing	**-3.63**	**-1.76**	**-0.31**	**-2.01**	**-1.31**	**0.73**
	1.79	1.50	0.93	2.87	1.67	1.73
low tech	**-2.66**	**-1.49**	**-0.41**	**-1.92**	**-1.52**	**-0.10**
	1.38	*1.16*	*0.31*	*1.31*	*1.07*	*0.91*
med tech	**-0.53**	**-0.09**	**-0.07**	**-0.43**	**0.14**	**0.39**
	0.67	*0.46*	*0.37*	*0.80*	*0.64*	*0.75*
high tech	**-0.43**	**-0.18**	**0.16**	**0.33**	**0.07**	**0.44**
	1.25	*0.87*	*0.63*	*2.36*	*1.08*	*1.32*
serv	**8.19**	**3.54**	**2.20**	**4.85**	**1.42**	**0.82**
	3.86	*2.06*	*1.82*	*2.52*	*1.66*	*2.71*
distribution	**2.01**	**0.96**	**0.77**	**-0.15**	**-0.53**	**0.88**
	2.66	1.61	1.00	2.17	1.61	1.97
business	**3.62**	**1.75**	**1.22**	**3.93**	**2.13**	**0.64**
	1.34	*0.83*	*0.71*	*2.48*	*1.52*	*1.86*
personal	**0.95**	**0.48**	**0.17**	**0.17**	**-0.02**	**0.03**
	0.70	*0.47*	*0.36*	*0.45*	*0.34*	*0.21*
nonmarket	**1.61**	**0.36**	**0.04**	**0.92**	**-0.16**	**-0.73**
	2.24	*1.61*	*0.99*	*1.88*	*1.75*	*0.77*

Notes: EUKLEMS Data, Average changes es in sector shares in percentage points. The data covers. Observations for Belgium, Croatia. Poland, Sweden, Ireland, Luxembourg, Japan and Latvia were dropped as information on some sectors was missing.

For the explanation of the large shift towards services Schettkatt and Yokarini (2006) emphasize the importance of demand side. They argue that shifts in demand associated with income effects are the driving force of the expansion of service employment in the past decades. But the differential productivity developments between services and manufacturing is also important. Price trends in some services support this view (e.g. Schettkat and Yocarini 2006). Prices of services generally rose more than prices for manufactured output. However, as emphasized by Peneder (2003) some of the service sectors are obviously technologically progressive.

Let us consider first prices, that are one important element that con drive a wedge between the development of sectoral employment and value added shares. As we are concerned primarily with the production side of economies, we use sectoral Value added deflators. We measure the price development by the ratio of changes in sectoral value added deflators compared to changes in the GDP deflator over the same time period. The changes are expressed as ratios of the implicit price deflators for the period (VD(t)/VD(s)), where VD denotes a sectoral valued added deflator and t and s are the two comparison years, where t>s. The changes of the GDP deflators are also expressed as ratios (GD(t)/GD(s)), where GD is the GDP deflator and t and s are the same comparison years. Time. A value below 1 indicates that sectoral price developments were below the aggregate price developments (GDP deflator). Conversely a value above 1 indicates that prices rose faster than average. Table 2 presents the results. The table displays average values for 21 countries and the associated standard deviation.

Table 2: Relative price developments 2000 to 2016, 2000-2007 and 2010-2016, ratios of sectoral deflators to GDP deflators,

	2000-2016		2000-2007		2010-2016	
	mean	s.d.	mean	s.d.	mean	s.d.
Agriculture	0.84	0.09	0.97	0.15	0.96	0.15
Mining + energy	1.17	0.23	1.22	0.15	0.93	0.20
Construction	1.31	0.20	1.24	0.13	1.07	0.09
Manufacturing	0.87	0.09	0.86	0.07	1.02	0.05
low tech	0.96	0.10	0.89	0.08	1.05	0.07
med tech	0.96	0.15	1.04	0.12	0.96	0.10
high tech	0.81	0.13	0.81	0.12	1.01	0.07
Services	1.03	0.04	1.02	0.02	1.00	0.02
distribution	0.90	0.07	0.93	0.03	0.97	0.02
business	1.05	0.06	1.03	0.07	1.02	0.03
personal	1.20	0.21	1.07	0.07	1.06	0.07
nonmarket	1.18	0.24	1.11	0.13	1.02	0.06

Notes: Average changes es in sector shares in percentage points. The data covers observations for Belgium, Croatia. Poland, Sweden, Ireland, Luxembourg, Japan and Latvia were dropped as information on some sectors was missing.

The results clearly indicate that for the time period 2000 to 2016 the input price developments that affect value added are below average for agriculture (0.84) and manufacturing (0.87) and above average in services (1.03), construction (1.31) and mining and energy (1.17). This confirms the basic intuition. If we consider subsectors, we see that the largest price decreases are observed in high technology manufacturing, while low technology and medium technology manufacturing, do display a lower price dynamics compared to the aggregate. In services the price increases are largest in personal and non-market services, while the price development in business services is close to that of the aggregate. Distribution services in contrast behave very differently than the other service. This confirms Jorgenson and Timmer (2011), who show that price and productivity developments in distribution sectors are very different from other service sectors.

The results from the sub-time periods show one interesting feature. For manufacturing as a whole an also for high technology manufacturing, we observe for the post-crisis period an above-aggregate price development (value above 1). The opposite is observed for mining, energy and water. The construction sector shows an above average price development over all three time periods.

The evidence of the price developments confirms that structural shifts towards services (except for distribution services) are associated with shifts towards sectors that have an above average price development and thereby weaken the price-elasticity channel of structural change, where structural shifts are associated with declining prices. The structural shift towards services is in general not associated with reducing producer prices of domestically produced service. This seems to hold true even if it is important to note that these price series are themselves subject to considerable composition bias, as it is very unlikely that the structure of these quite aggregate sectors remained identical over time.[1]

The evidence thus shows that the rise of the service economy has been distributed quite heterogeneously across sectors. Distribution, personal service, business services and non-market services show very different patterns of development over time. The expansion of distribution services was accompanied by dynamic price improvements, while price improvements in business, personal and non-market services were clearly less dynamic. This evidence suggests that the rise of the service economy is over the past decades is associated with increased employment and value-added share of business and non-market services (especially health care and education) but driven mostly by the expansion of business services. These sectors are especially problematic with regard to the measurement of output and prices. For some of the sectors the contribution to national accounts is estimated using input data (non-market services) or is controversial (e.g. financial and insurance services). Thus, the measurement of productivity may be problematic in these sectors. Nevertheless, it is important to know whether structural shifts affect productivity growth, even if the heterogeneity across countries (measured by the standard deviation in tables 1 and 2) is large. The evidence so far suggests that structural change at the level of the single countries seems to be indeed driven by economic development but there are important idiosyncratic elements that affect the development of sectoral shares over time.

Productivity decomposition analyses generally show that the within sector productivity dimension dominates the structural shift effects (e.g. Peneder 2003, Duarte and Restucchia 2010, Glocker and Friesenbichler 2019). This is related the fact that the industries are heterogeneous and technological change is sector-specific and localized (Dosi et al. 2020). This suggests that if differences in sectoral productivity developments may affect aggregate

[1] This remark is important for the comparison of real shares over time. Structural change is a process that changes the weights of economic activities in the aggregate. Moreover, structural change is driven by differences in demand and productivity that react or determine prices. Thus, this data do not only identify a price effect but also a quantity effect associated with the changing weight of economic activities.

productivity. In order to illustrate this, we present results on the relationship between aggregate per capita GDP growth and sectoral productivity indicators. We run a regression that link sectoral productivity growth to aggregate per capita growth in the following form:

$$\text{Sectoral productivity growth}(i) = a + b\ \text{GDP per capita growth}(i) + c\ \text{Initial}(i) + e(i)$$

where i denotes countries, Initial(i) is the sectoral labour productivity level at the beginning of the considered period, a is an intercept, c the coefficient on Initial(i), b the coefficient on GDP per capita and e is an error term.

Cognizant of endogeneity issues, we use this regression as a descriptive tool showing that industrial structure is relevant for aggregate productivity growth. The coefficient of interest is b. This coefficient provides an indication whether sectoral shifts affect the aggregate productivity potential (or how aggregate growth affects sectoral productivity) and whether this relationship is systematic. When we use sectoral productivity growth a coefficient of b=1 indicates that aggregate productivity and sectoral productivity move hand in hand. A coefficient b below 1 suggests that sectoral shifts that increase this sector affect the growth potential negatively and a coefficient b above 1 indicates that shifts towards this sector have the potential to increase growth potential. Here it is important to note that sectoral shifts themselves are driven by productivity and demand. With changing income, the consumption baskets of households also tend to change affecting the direction of structural change.

Table 3: Relationship of sectoral productivity growth to GDP per capita growth, 2000 to 2016 EUKLEMS

VARIABLES	(1) agr	(2) minut	(3) cons	(4) manu	(5) low	(6) med	(7) high	(8) serv	(9) dist	(10) buss	(11) pers	(12) nms
					(a) dependent variable labour productivity growth; 2000 to 2016							
g(GDPpc)	0.977***	0.905***	0.861***	1.025***	0.916***	1.114***	1.094***	0.847***	0.859***	0.784***	0.883***	0.812***
	(0.14)	(0.11)	(0.10)	(0.06)	(0.07)	(0.06)	(0.07)	(0.02)	(0.04)	(0.06)	(0.10)	(0.04)
Observations	21	21	21	21	21	21	21	21	21	21	21	21
R-squared	0.76	0.85	0.81	0.95	0.91	0.96	0.94	0.99	0.97	0.92	0.84	0.96
					(b) dependent variable total factor productivity growth; 2000 to 2016							
g(GDPpc)	0.812	-0.148	0.577*	1.383***	0.285	1.217	1.466***	-0.130	-0.323	0.018	0.459*	0.298*
	(0.46)	(0.82)	(0.30)	(0.21)	(0.20)	(1.02)	(0.21)	(0.12)	(0.24)	(0.19)	(0.24)	(0.15)
Observations	12	12	12	12	12	12	12	12	12	12	11	12
R-squared	0.28	0.36	0.30	0.84	0.30	0.48	0.85	0.25	0.26	0.00	0.40	0.30
					(c) dependent variable labour productivity growth; 2000 to 2007							
g(GDPpc)	1.044***	0.815***	1.012***	0.977***	0.924***	0.990***	1.029***	0.852***	0.922***	0.800***	0.826***	0.753***
	(0.15)	(0.13)	(0.06)	(0.05)	(0.07)	(0.07)	(0.08)	(0.02)	(0.04)	(0.05)	(0.10)	(0.04)
Observations	21	21	21	21	21	21	21	21	21	21	21	21
R-squared	0.75	0.75	0.95	0.96	0.92	0.94	0.92	0.99	0.97	0.93	0.81	0.96
					(d) dependent variable labour productivity growth; 2010 to 2016							
g(GDPpc)	0.756**	0.161	0.855**	0.370*	0.362*	1.189***	-0.311	1.083***	1.373***	0.890***	0.812***	0.947***
	(0.30)	(0.31)	(0.32)	(0.19)	(0.19)	(0.39)	(0.24)	(0.06)	(0.09)	(0.15)	(0.12)	(0.13)
Observations	21	21	21	21	21	21	21	21	21	21	21	21
R-squared	0.28	0.16	0.29	0.19	0.16	0.35	0.16	0.95	0.93	0.67	0.73	0.75

The results are collected in table 3 and shows that for the time horizon 2000 to 2016 only for the manufacturing sector and manufacturing subsectors - except for the low tech sectors - coefficients above 1 are observed. A statistically significant coefficient indicates that this relationship is systematic. For labour productivity we observe that all other sectors display a coefficient below 1. This suggests that structural shifts from manufacturing towards services reduce the growth potential of economies. The evidence for TFP – covering a much smaller set of countries – is less conclusive but again the observed coefficients suggest a similar basic pattern. Above average productivity growth takes place in the manufacturing sectors and service sectors are characterized by below average productivity growth.

The results for the subsamples that cover the time before the financial crisis (2000 to 2007) and after the financial crisis (2010 – 2016) shows very different patterns, that are likely related to the time-specific developments. For the first period we observe above average productivity growth in high technology manufacturing, agriculture and construction and below average productivity growth in many service sectors except distribution. For the second time period (2010 to 2016) we observe above average productivity growth for medium tech manufacturing and the service sectors. The latter are driven primarily by distribution but also the coefficient close to 1 of the non-market services. This opens the question whether patterns of productivity growth are changing or that these results mirror primarily specific developments after the crisis.

These results suggest that sectoral shifts are associated with changes in growth potential. These connect to the findings of Herrendorf and Valentinyi (2012) who find that sectoral TFP differences matter more economic development and of Friesenbichler and Glocker (2019) who study the relationship to GDP growth for tradeable and non-tradable sectors and find regression coefficients below 1 for nontradable sectors and regression coefficients above 1 for tradeable sectors and that country-specific effects are much more relevant for nontradable than for tradable sectors.

Aggregate labour productivity is thus affected by the sectoral composition of the economy. This suggests that structural change may be important element for the explanation why countries have such large differences in GDP per capita. These results suggest that different patterns of structural change should be associated with different patterns of aggregate productivity growth. Specialization and the division of labour are driving forces, amplified by international trade. Shifts towards high-productivity sectors (especially in manufacturing) should decrease the gap in aggregate income for laggard countries, while shifts towards low productivity activities are likely growth-reducing (see also McMillan and Rodrik 2011).

5. Competencies and Institutions as drivers of structural change?

The importance of sectoral change for economic development suggests that the reallocation of resources across sectors is an important driver of economic development. Reallocation barriers and country competencies may be important factors that constrain structural change. Restuccia and Rogerson (2013) survey the evidence and show that structural change can be limited by the existence of regulations and other frictions that inhibit the reallocation of resources across sectors. This can be costly in a static sense, as the resources are not used in the most efficient way. However, even more importantly the dynamic impact may affect the adoption of new technology and further development of capabilities. McMillan and Rodrick (2011) provide evidence that countries with more flexible labour markets experience growth-enhancing structural change. Bartelsman et al. (2013) provide an overall analysis that compares the United States to seven European economies for the 1992 to 2001 period and finds that idiosyncratic distortions play an important role in the allocation of resources across enterprises. Their results suggest that output could be increased up to 15% in some countries if the allocation of resources is improved. However, it is very difficult to identify the sources of the misallocation. Microeconomic evidence suggests that credit market imperfections are important sources of differences in productivity across countries. Inefficient financial sectors can significantly impede the creation of new businesses and the growth of enterprises. In particular, sectors with larger scale (e.g. manufacturing) and industries that have high costs of product development (e.g. biotechnology) are disproportionally affected by financial frictions. However, financial repression that directs finance towards certain sectors is not a force that supports growth-enhancing structural change (Johansson and Wang, 2011). Institutional aspects such as government effectiveness, low corruption and the efficiency of the legal system are important to competitiveness in terms of foreign direct investment (Alfaro et al. 2004). Thus, institutional quality is likely to affect specialisation patterns and technological competencies.

The literature on institutions and economic development suggests that many institutional indicators are highly correlated and usually correlated with economic development and economic competencies (e.g. Laura and Knack 2010). A few studies have provided evidence of causality running from institutions to economic performance (Acemoglu et al. 2001, Rodrik et al. 2004). Hidalgo and Hausmann (2009) show that the complexity of export baskets of countries is closely associated to economic and development. Reinstaller et al. (2012) confirm that these indicators are closely correlated with institutional quality and high knowledge intensity. However, in this literature the relationship between structural change and institutional quality is not made very explicit, as it is not possible to measure institutions and structural change in an unambiguous way. The problem is that structural change can be growth-enhancing and growth-reducing. In the presence of international trade, the reallocation of resources (e.g. labour and capital) can lean towards high-productivity sectors or in the opposite direction. Latin America is usually cited as a primary example of a larger region experiencing growth-reducing structural change. In the 1960s and 1970s in particular

economic policy driven by macroeconomic populism and protectionist import -substitution policies provided the basis for this outcome (e.g. McMillan and Rodrick 2011). This suggests that two different types of institutions and policies are central to fostering growth-enhancing structural change: institutions and policies that promote the efficient reallocation of resources across sectors and institutions and policies that encourage the development of capabilities that allow enterprises to innovate.

In this line of thinking capabilities that affect specialisation and structural change and are associated with the knowledge base of countries, are of greater importance. The national innovation system perspective also provides a useful view on these issues as systemic failures are significant to an explanation of the innovative performance of firms and countries. The national system of innovation is defined as a "network of institutions in the public and private sectors whose activities and interactions initiate, import, modify and diffuse new technologies" (Freeman 1987). Systemic failures, such as the lack of interaction between the actors in the innovation system, mismatches between basic research in universities and applied research in industry, malfunctioning of technology transfer institutions, and deficiencies in the absorptive capacity of enterprises may all contribute to poor innovation performance. Powell and Grodal (2005) show that innovation networks have a positive impact on innovation activity, but network failures can cause barriers to innovation. Other evidence suggests that differences in the patterns of technology diffusion may account for a sizable part of the divergence in incomes between rich and poor countries (e.g. Comin and Mestieri Ferrer 2013). Differences in the time lags of the adoption of new technologies and the penetrations rates once new technologies are adopted are important in determining differences in economic structure. The lesson of the national systems of innovation indicates that successful technology policy that supports the development of technologies must take into account arguments of systemic and institutional failures. Growth traps and catch-up failures are most often related to policy failures to select the right set of institutions. For example, Acemoglu et al. (2006) emphasize the different need for policy institutions (educational systems, firm dynamics, innovation policies) in countries that are close or far away from the world technological frontier. Catching-up does not depend on a particular institutional configuration, but on the interlocking complementarities within the institutional arrangements of the national innovation system, - an aspect that von Tunzelmann (2004) calls network alignment. Structural change is thus dependent on growth-enhancing policies and institutions that allow the efficient allocation of resources within economies. Policies and institutions that hinder such reallocation processes are a primary source of inefficiency and economic backwardness.

Indicators of institutions and capabilities at the country level are often interrelated and highly correlated among each other. This presents a challenge to the analysis of country-level country capabilities. Simple scatter plots and regression analysis are unlikely to be informative for uncovering robust associations between these country capability indicators and HGF shares at the country level. For this reason, principal component analysis is used. Principal component analysis allows constructing new summary variables that capture and summarize different

aspects of national capabilities. The set of variables used is depicted in . The first three indicators (Government effectiveness, regulatory quality and rule of law) capture broad institutional characteristics and the efficiency of public administration of countries. The second set of indicators captures innovation capabilities related to R&D (R&D intensity and researcher intensity). The third set of indicators captures education outputs (labour force with secondary education and labour force with tertiary education). The indicator on FDI inflows (in % of GDP) measures the attractiveness of a country for foreign direct investment. Domestic credit to the private sector (% of GDP) provides a measure of the quality of the financial system. Urban population (% of total population) captures the hypothesis that advanced technologies require conglomeration economies. Trade in services (% of GDP) covers the export share of services of countries and can be considered as a country characteristic. As can be the fraction of international tourism receipts. Last but not least we use the indicator of sophistication of exports derived from the product space literature. This indicator captures latent information on both the depth and the breadth of the knowledge base of countries that are associated with their exports.

Table 4: Variable list for analysing the relationship between high growth firm shares and indicators of country capabilities

Variable	Source
Government effectiveness	Worldwide governance indicator database, World Bank
Regulatory quality	Worldwide governance indicator database, World Bank
Rule of Law	Worldwide governance indicator database, World Bank
R&D intensity (% of GDP)	World Bank
Researcher intensity (per mio. people)	World Bank
labour force with secondary education	World Bank
labour force with tertiary education	World Bank
FDI inflows in % of GDP	World Bank
Domestic credit to private sector (% of GDP)	World Bank
Urban population (% of total population)	World Bank
Trade in services (% of GDP)	World Bank
International tourism, receipts (% of total exports)	World Bank
High-technology exports (% of manufactured exports)	World Bank
Sophistication of Exports	WIFO calculations (Reinstaller et al. 2012)

Table 5 and 6 present the results of the principal component analysis using time-aggregated indicators for the period 2006 to 2015. The analysis leads to the identification of three distinct principal components that summarize the information contained in the 14 indicators of country capabilities. The components are ranked according to their ability to explain most of the variation of the variation in the data. For the subsequent analysis we use the first three of the identified principal components. These explain around 70% of the overall variation in the data.

Table 5: Identified principal components of country capabilities

Component	Eigenvalue	Difference	Proportion	Cumulative
PC1	**7.18**	**5.60**	**0.51**	**0.51**
PC2	**1.59**	**0.58**	**0.11**	**0.63**
PC3	**1.01**	**0.11**	**0.07**	**0.70**
PC4	0.90	0.08	0.06	0.76
PC5	0.82	0.16	0.06	0.82
PC6	0.66	0.10	0.05	0.87
PC7	0.56	0.11	0.04	0.91
PC8	0.45	0.11	0.03	0.94
PC9	0.34	0.13	0.02	0.96
PC10	0.21	0.03	0.02	0.98
PC11	0.18	0.13	0.01	0.99
PC12	0.05	0.01	0.00	1.00
PC13	0.04	0.02	0.00	1.00
PC14	0.02	.	0.00	1.00

Table 6: Principal components capturing important characteristics of country capabilities

	Factor loadings				Correlation		
	PC1	PC2	PC3	Unexplained	PC1	PC2	PC3
Government effectiveness	0,38	0,09	-0,10	0,06	**0,95**	0,52	0,29
Regulatory quality	0,39	0,06	-0,16	0,10	**0,93**	0,48	0,22
Rule of Law	0,38	0,07	-0,11	0,10	**0,93**	0,48	0,27
R&D intensity (% of GDP)	0,33	-0,14	0,15	0,24	**0,84**	0,17	0,54
Researcher intensity (per mio. people)	0,35	-0,10	0,08	0,19	**0,89**	0,25	0,48
labour force with secondary education	0,32	-0,41	-0,12	0,51	0,51	-0,20	0,17
labour force with tertiary education	0,22	-0,02	0,21	0,49	0,67	0,22	0,51
FDI inflows in % of GDP	0,03	0,17	0,39	0,63	0,39	0,28	0,55
Domestic credit to private sector (% of GDP)	0,26	0,25	-0,10	0,34	0,74	0,59	0,17
Urban population (% of total population)	0,17	0,24	0,13	0,51	0,63	0,50	0,36
Trade in services (% of GDP)	0,02	0,64	-0,21	0,24	0,27	**0,83**	-0,22
International tourism, receipts (% of total exports)	0,05	0,10	-0,69	0,28	-0,20	0,15	**-0,82**
High-technology exports (% of manufactured exports)	0,05	0,46	0,32	0,32	0,56	0,67	0,49
Sophistication of Exports	0,30	-0,07	0,23	0,20	**0,84**	0,24	0,62

Notes: Correlation coefficients above 0.8 are in bold.

Of the three components only the first has a clear clear interpretation:

- Principal component 1 (PC1) can be interpreted as a stage of development indicator that combines institutional quality with high innovative capacity. The factor loadings and the correlation analysis in Table 6 show that PC1 is highly correlated with the governance indicators, R&D intensity, researcher intensity and complexity of exports. This confirms that institutional variables and R&D indicators are highly correlated at the country level. The first principal component explains around 50% of the total variation of the 14 indicators of country capabilities.
- Principal component 2 (PC2) captures trade in services. Interestingly PC2 (manufacturing base) is weakly correlated to knowledge indicators such as

R&D intensity and researcher intensity. This suggests that PC2 captures primarily the specialisation in non-knowledge intensive activities. This principal component accounts for 11 % of the total variation of the 14 indicators of country capabilities.

- Principal component 3 (PC3) captures the negative impact of the international tourism. Interestingly the correlation analysis shows that PC3 is largely independent of institutional quality that is often emphasized in the literature. This principal component accounts for 7 % of the total variation of the 14 indicators of country capabilities.

Figure 7 shows the relationship between the value added shares (2000 to 2016) and the principal components of country capabilities identified with the principal component analysis. We observe no strong systematic relationship between the manufacturing share and the three indicators of country competencies. For the service shares we observe an increasing relationship with all of the principal components of country capabilities. This suggests that the rise of services is related to differences in institutions and innovation capabilities but not the decline in the manufacturing share and suggest that the rise of the service sector does not take place in an institutional vacuum independent of R&D and government effectiveness but is associated with institutional quality and technological capabilities.

Figure 7: Principal components of country capabilities and sector Value added shares 2016, UN data

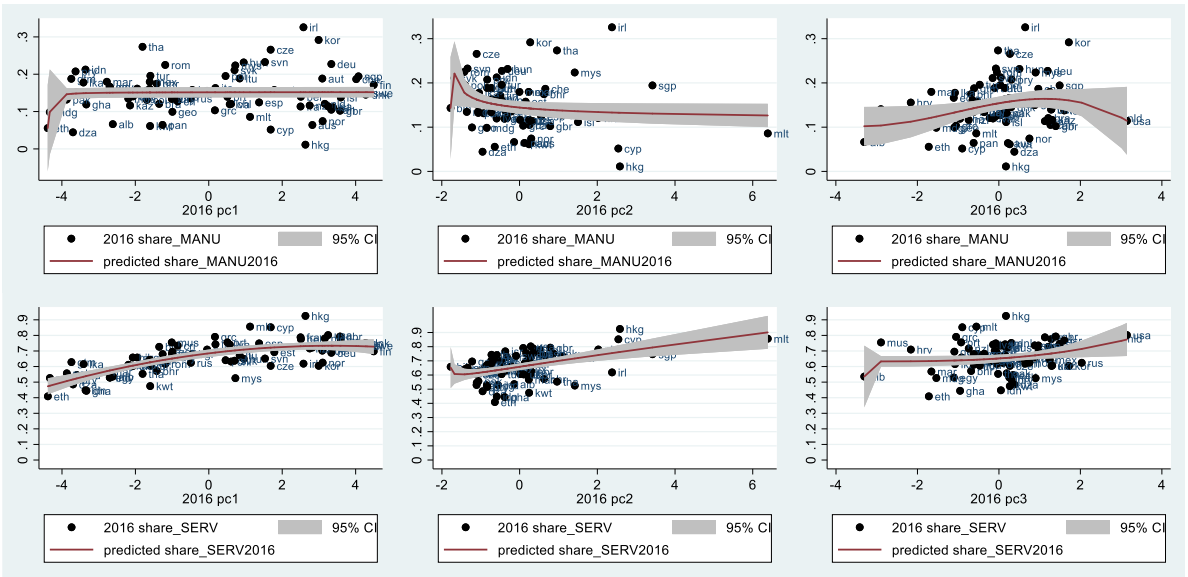
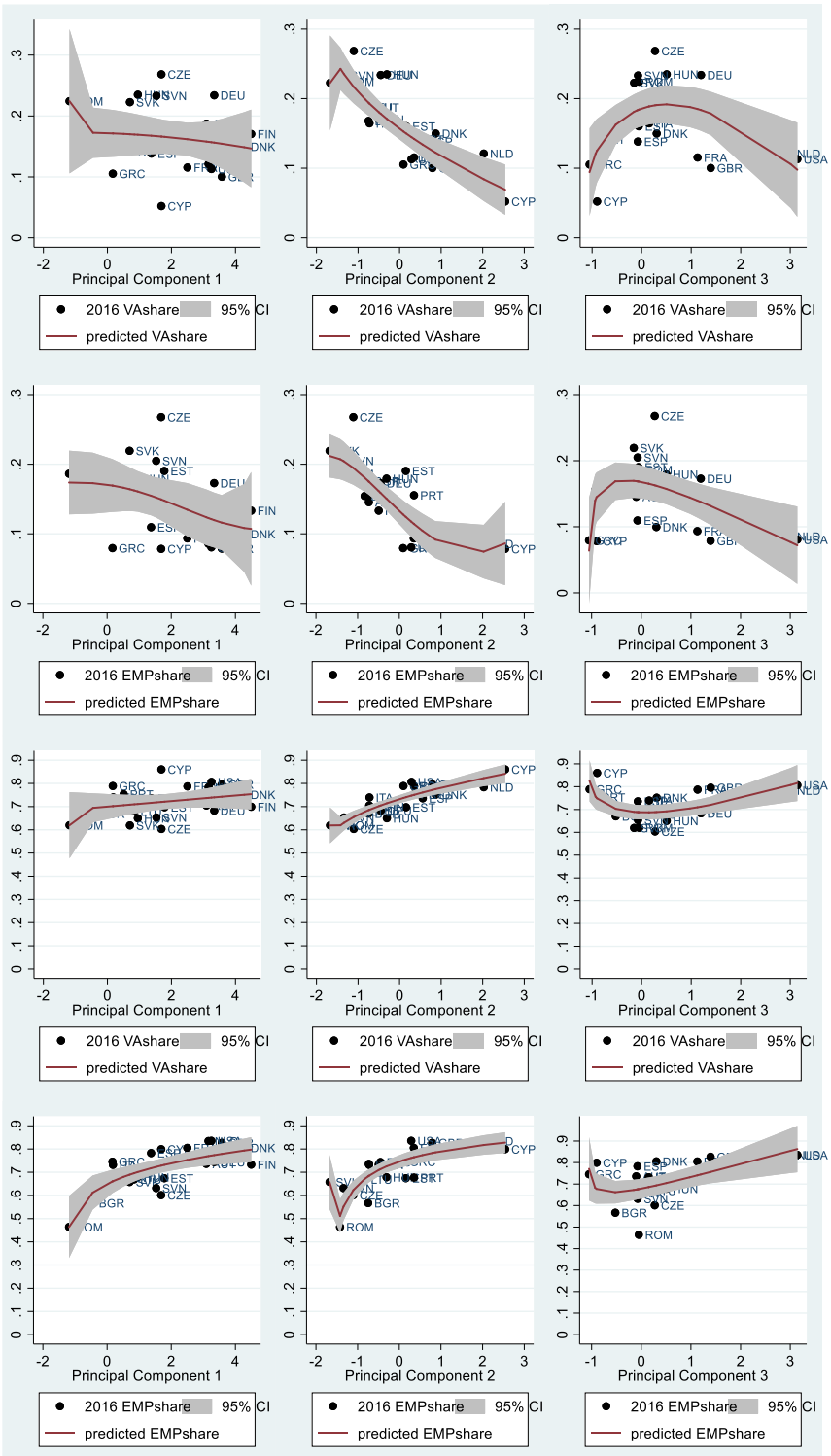


Figure 8: Principal components of country capabilities and sector value added and employment shares 2016, EUKLEMS



For the industrialised countries using the EUKLEMS data for 21 countries, figure 8 presents a clearer pattern of relationship for sector shares measured in 2016. At this level of disaggregation we still observe substantial country heterogeneity and a weakly negative relationship (stronger for the employment share than for the value added share) between principal component 1 and the manufacturing share and a stronger negative relationship between the manufacturing share (both the value added and the employment share). The evidence for PC2 suggests that a strong specialisation in service exports and capabilities associated much more with institutional quality than with R&D and innovation is associated with a lower manufacturing share.

The relationship is less ambiguously positive for the service shares, for all of the principal components we can observe a positive relationship between the employment and value added service shares. This confirms that even for the smaller sets of advanced countries, a higher institutional quality, higher R&D and innovation capabilities as well as a higher complexity of exported products is associated with a higher service share.

Table 7 presents the correlation coefficients between the principal components and the value added and employment shares for the service and manufacturing subsectors. The disaggregation into subsectors provides a better picture and shows quite some sectoral heterogeneity. The correlation analysis confirms that the employment share of services is positively related to the three principal components. But the subsector analysis shows that this is mainly due to the correlation patterns for business and non-market services for PC1 and PC2. For the distribution share and the personal service share we do not uncover such a relationship for PC1 and PC2. Interestingly for PC2 we find a positive relationship for all service sectors.

Similarly we obtain heterogeneous results for manufacturing subsectors. The correlation between the country capability indicators and value added and employment shares is negative and statistically significant for the low technology sector suggesting that the decline a higher institutional quality and R&D intensity is associated with a declining low technology share. In contrast for high technology manufacturing, the correlation analysis does not uncover a systematic negative relationship, except for PC2.

These findings suggest that the decline of the manufacturing share often associated with economic development is in recent time periods and for developed countries associated with a decline of low technology manufacturing but not with a decline of high tech manufacturing.

This result connects to the findings of Dosi et al. (2020) which find a declining share of manufacturing with economic development only for "supplier-dominated" and "scale-intensive" sectors but not for "science-based" sectors.

Table 7: Correlation between Principal components of country capabilities and sector value added and employment shares 2016, EUKLEMS

Sector	share	PC1	PC2	PC3
Services	EMP share	**0.70**	**0.73**	**0.49**
	VA share	0.36	**0.85**	0.23
distribution	EMP share	-0.05	**0.53**	-0.31
	VA share	**-0.42**	0.17	-0.39
business	EMP share	**0.69**	**0.54**	**0.73**
	VA share	**0.40**	**0.71**	0.37
personal	EMP share	0.08	**0.47**	-0.09
	VA share	0.04	0.29	-0.13
non-market	EMP share	**0.84**	**0.45**	**0.60**
	VA share	**0.66**	**0.66**	0.41
Manufacturing	EMP share	-0.40	**-0.77**	-0.32
	VA share	-0.22	**-0.82**	-0.11
low tech	EMP share	**-0.69**	**-0.48**	**-0.53**
	VA share	**-0.59**	**-0.53**	-0.39
medium tech	EMP share	-0.20	**-0.70**	-0.24
	VA share	**-0.45**	**-0.85**	-0.31
high tech	EMP share	-0.02	**-0.67**	0.01
	VA share	0.23	**-0.51**	0.21

Critical values 1%: 0.537 and 5% 0.413.

International trade and globalisation play an important role in these patterns. Globalization is an important factor that helps to explain differences in economic structure and performance across countries. The patterns of globalisation today associated with trade by tasks makes the international division of labour more fragmented, with new dangers of structural adjustments associated with tradables and non-tradables. Structural change towards non-tradable sectors may lead to costly structural imbalances and growth traps if competencies for the production of new tradables are missing. Here the ongoing structural change may indeed lead to a deindustrialization and growth traps if the structural change hardens existing "comparative advantages". Driver of this process are innovation, i.e. the creation of new varieties of products, market selection and changes in demand at the product level.

To shed a bit more light on these issues we link the manufacturing and service shares to the sophistication score embedded in the previous analysis. This indicator is from the product space literature, that conceives globally traded products either i) as a bipartite network linking successful exporters to products (see Hidalgo - Hausmann, 2009) or ii) as a network of products

that are related through a common knowledge base (Hidalgo et al., 2007).[2] The analysis of these networks reveals unobserved information on the capabilities of countries, the characteristics of products and the structure of the economies. The product mix exported by countries provides information to construct an indicator of competitiveness of countries. One summary indicator that comes out of the analysis of the network linking products to successful exporters is sophistication score (also called the product complexity). It is constructed using information on how many countries produce a specific product and on how diversified these countries are. For this reason it can be interpreted as capturing latent information on the depth (capability to produce exclusive products due to high levels of accumulated knowledge) and the breadth of the knowledge base (capability to produce many products with different knowledge bases) needed to produce products in a specific product class. Various contributions have shown that the process of economic upgrading and structural change is closely related to the adoption of more complex products across countries. Product sophistication can be interpreted as capturing latent information on both the depth (capability to produce exclusive products due to high levels of accumulated knowledge) and the breadth of the knowledge base (capability to produce many products with different knowledge bases) needed to produce products in a specific product class or sector.[3]

Figure 9 presents the results for the manufacturing and the service sector shares for 2010 countries. The evidence over all countries suggests that a higher degree of sophistication of export (product complexity) is associated with a higher manufacturing and a higher service share.

Table 8 report the correlation patterns for the EUKLEMS data for the time period 2000 to 2016 for manufacturing and service shares with the export sophistication measure. The results confirm the important heterogeneity of subsectors in both manufacturing and services. A higher export complexity is associated with higher employment shares of business and non-market services but not for distribution services. In fact, distribution service shares display a negative relationship to export sophistication for both the employment and the value added shares. For manufacturing we observe a negative association between export sophistication and low technology manufacturing shares for both employment and value added, for medium technology manufacturing a positive relationship of value added and employment shares with economic sophistication. Not surprisingly perhaps, the relationship between high technology manufacturing and export sophistication is positive and significant, indicating a systematic

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[2] Following Klimek et al (2012) the complexity score of any product can be obtained by defining a bipartite Matrix $M(c,i)$ of products and countries where each cell $m(c,i) = 1$ if a country c exports product i with comparative advantage, and $m(c,i) = 0$ otherwise. The product complexity score is then then obtained from the eigenvector associated with the second largest eigenvalue of Matrix $\tilde{M}(i,j) = M^T M\ /k_{c,0}k_{i,o}$ with $k_{c,0} = \sum_i M(c,i)$ and $k_{i,0} = \sum_c M(c,i)$. This is a generalisation of the method presented in Hidalgo – Hausmann (2009) and is applied here.

[3] For details on the calculation of the indictor see e.g., Reinstaller et al. (2012). The data to construct these indicators comes from the BACI database on bilateral trade flows compiled by CEPII. It contains data for 232 countries and 5,109 product categories. A detailed description of the data is provided by Gaulier and Zignago (2010).

relationship. This evidence provides a further indication that structural change can affect the long-run growth potential of economies.

Figure 9: Export sophistication and structural change, 2000-2016, UN Data

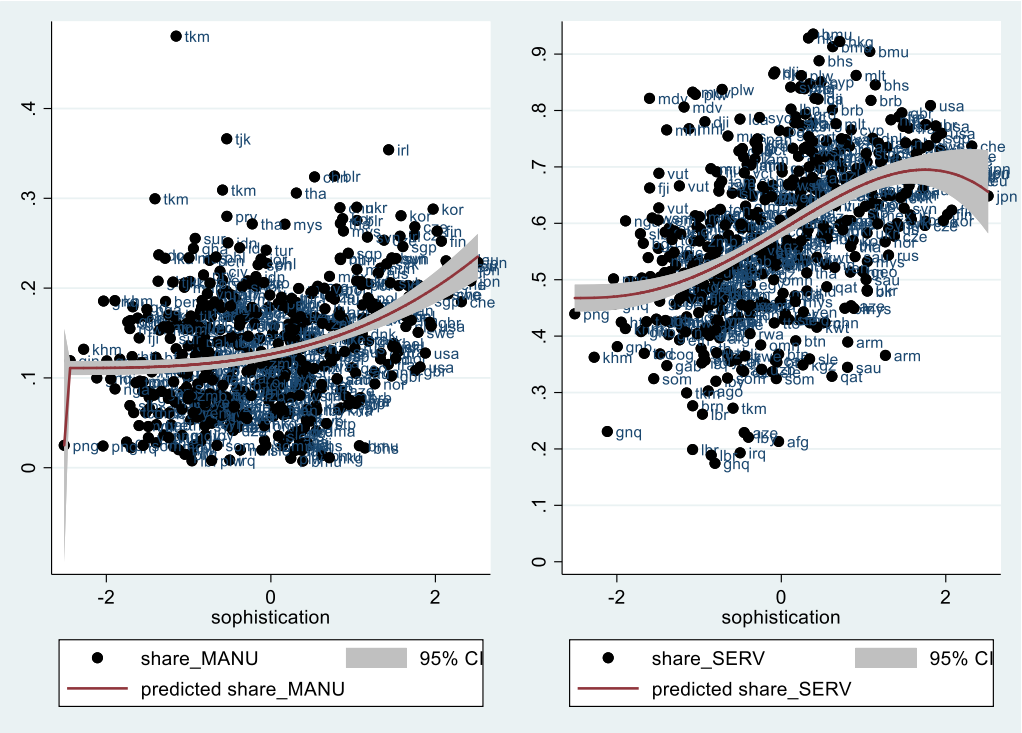

Table 8 Export sophistication and structural change, 2000 – 2016, EUKLEMS data

Sector	EMP share	VA share
Services	0.29	-0.22
distribution	**-0.42**	**-0.71**
business	**0.54**	0.10
personal	-0.13	0.00
non-market	**0.40**	0.05
Manufacturing	0.17	**0.49**
low tech	**-0.45**	**-0.31**
medium tech	**0.32**	0.25
high tech	**0.62**	**0.76**

6. Discussion and Conclusions

The recent financial crisis has shown that financial structural change can create unfavourable economic adjustment processes and suggests that unbalanced growth in certain sectors is unlikely to be advantageous and followed by adjustments. Our findings show that the systematic structural changes in the manufacturing and service shares are related to economic development and the outcome of the underlying structural change driven by productivity improvements and changes in demand. While these patterns are similar across countries and data bases; it is equally important to realize that there is quite a substantial heterogeneity in the structure of economies across countries. The working of the process of structural change is also mediated through specialization patterns, international trade, institutions, and international and domestic competition.

Our results confirm that structural change towards is driven primarily by the expansion of business services and non-market services (that include education and health services) that require themselves complex knowledge. We confirm that this shift is stronger in employment shares than in value added shares, thus that service sectors are employment absorbing sectors with high labour intensity. Structural change towards services impacts the growth potential. The results confirm that aggregate productivity growth is affected by structural changes. Manufacturing and manufacturing subsectors (except for low technology manufacturing) have a higher labour productivity and TFP growth. This confirms that manufacturing and the sectoral share of tradable goods in general remains relevant for economic development. For the most recent time period studied (2010 to 2016) we observe a weakening of this relationship.

At the same time our analysis clearly shows that the rise of business and non-market services is related to country capabilities proxied by indicators of institutional quality, innovation capabilities, sophistication of exports and the qualification of the workforce. However, we observe also, a heterogeneous impact on manufacturing subsectors. While the share low technology manufacturing is negatively associated with these indicators, no negative relationship is observed for the medium and high technology manufacturing shares (especially for export sophistication).

This suggests that with the rise of globalization stepping up the ladder of economic development may get harder and harder for middle and high income countries, as entering complex product classes and the upgrading of existing products requires technological competencies, skilled labour and administrative capabilities at the business and government levels. Thus, it should not come as a surprise that the share of services (non-government services such as education and business services) starts to rise once countries achieve income levels where the nature of international competition changes from a pure cost-driven to a more resource-intensive quality competition. Upgrading possibilities in tradable production are not distributed evenly in the product space, these seem to be concentrated in higher technology sectors and complex products. Given the path-dependent development of economic structures and comparative advantage (as indicated by the product space literature), this

suggests that countries with low and medium-low technology manufacturing industries will find it increasingly difficult to increase their manufacturing share and their growth potential.

As the upgrading of structures is a cumulative process implies that is difficult to develop new specialisation patterns out of the blue. Economic development is highly path-dependent and cumulative. Any change is rooted in present knowledge bases and constrained by existing specialisation patterns and institutions. Thus, policies to support structural change should always start by considering the existing production structures of countries and regions, as well as the knowledge bases and supporting institutions. Appropriate policies to foster structural change are therefore likely to be country- and region-specific taking into account existing specialisation patterns. The main role for economic policy to support growth-enhancing structural change arises from the fact that complementary capabilities and institutions need to be built up. The importance of institutional quality leads to a view that policies that foster structural adjustments should therefore be conceived in a broad way and cover such different areas as education, research, technology and innovation policies, while also focusing on the general quality of economic governance. 4

7. References

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8. Appendix

Table 9: Sector classification and groupings

NACE rev. 2	sector	sector detail
A Agriculture, forestry and fishing	AGRI	
B Mining and quarrying	MINUT	
C Manufacturing	MANU	
C10-C12 Food products, beverages and tobacco	MANU	LOW TECH
C13-C15 Textiles, wearing apparel, leather and related products	MANU	LOW TECH
C16-C18 Wood and paper products; printing and reproduction of recorded media	MANU	LOW TECH
C19 Coke and refined petroleum products	MANU	MED TECH
C20 Chemicals and chemical products	MANU	HIGH TECH
C21 Basic pharmaceutical products and pharmaceutical preparations	MANU	HIGH TECH
C22_C23 Rubber and plastics products, and other non-metallic mineral products	MANU	MED TECH
C24_C25 Basic metals and fabricated metal products, except machinery and equipmen	MANU	MED TECH
C26 Computer, electronic and optical products	MANU	HIGH TECH
C27 Electrical equipment	MANU	HIGH TECH
C28 Machinery and equipment n.e.c.	MANU	HIGH TECH
C29_C30 Transport equipment	MANU	HIGH TECH
C31-C33 Other manufacturing; repair and installation of machinery and equipment	MANU	LOW TECH
D Electricity, gas, steam and air cond.supply	MINUT	
E Water supply, sewerage, waste manag.,etc	MINUT	
F Construction	CONS	
G Wholesale, retail trade, repair of motor veh.	SERV	DIST
H Transportation and storage	SERV	DIST
I Accommodation and food service activities	SERV	DIST
J Information and communication	SERV	DIST
K Financial and insurance activities	SERV	BUSS
L Real estate activities	SERV	BUSS
M Professional, scientific and techn.activities	SERV	BUSS
N Administrative and support service activ.	SERV	BUSS
O Public admin., defence, compuls.soc.sec.	SERV	NMS
P Education	SERV	NMS
Q Human health and social work activities	SERV	NMS
R Arts, entertainment and recreation	SERV	PERS
S Other service activities	SERV	PERS
T Activ.of househ.as employers & for own use	SERV	PERS
U Activ.of extraterritorial organisat.& bodies	excluded	excluded