Deindustrialization - opportunity or threat?

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Deindustrialization – Opportunity or Threat?

By Rainer Przywara[*]

The term 'deindustrialization' stands for an element of structural change, indicating some form of decline within the secondary sector of a national economy. Sociologists use relative decline of manufacturing as their standard definition while economists often consider reductions in sectoral output as equally or even more important. There is a variety of other current descriptions. Rigid definitions were constituted and utilized in a model of industrialization and deindustrialization based on compound annual growth rates (CAGRs) of macro-economic indicators. For this article, the scenario model was applied on twelve mature countries (i.e. fully industrialized states beyond their maximum relative employment in manufacturing). The analysis covers the years 1973-2008 with successive 15 + 5 +15-year sub-periods. On the basis of the model-based findings and additional socio-economic analyses, different paths of industrial development (patterns of deindustrialization) were distinguished for mature economies with regard to their final outcome, i.e. the sectoral parameters and the resulting GDP per capita, employment rate and trade indicators.

Introduction

In the 1970s, the rich western economies suffered from the first serious economic draw-backs after the constant growth in the build-up phase after World War II. Moreover, for the first time since the world economic crisis in the late 1920s, unemployment became a real threat. The term 'deindustrialization' came into broad use in the UK which suffered from low growth rates and little productivity gains. In the early 1980s, the term was also used in the USA where the economic situation was tense, characterized by stagflation and a weakening industrial base (Klenner and Watanabe, 2009). Thus, deindustrialization developments became intertwined with rising unemployment and related serious socio-economic problems (Kollmeyer, 2009).

Until today, no accepted standard definition of the term 'deindustrialization' exists. As Blackaby (1979: 2) put it: "De-industrialisation has gate-crashed the literature, thereby avoiding the entrance fee of a definition." Yet, in scientific journal articles (Jaililian and Weiss, 2000) and in (electronic) magazine and newspaper articles for a broader public (Chakrabortty, 2013), 'deindustrialization' is used with a certitude that prompts the assumption that it was an established macro-economic term. Often, the ostensible scientific approach is only a camouflage for a threatening undercurrent in which the 1970s still resonate. In several magazine articles (e.g. Healey, 1994), 'deindustrialization' serves as a trigger for generating feelings of concern. As such an emotional carrier, the term can become the central element of a subtle manipulation of the reader who is intrigued by a certain (either euphemistic or threatening) narrative with

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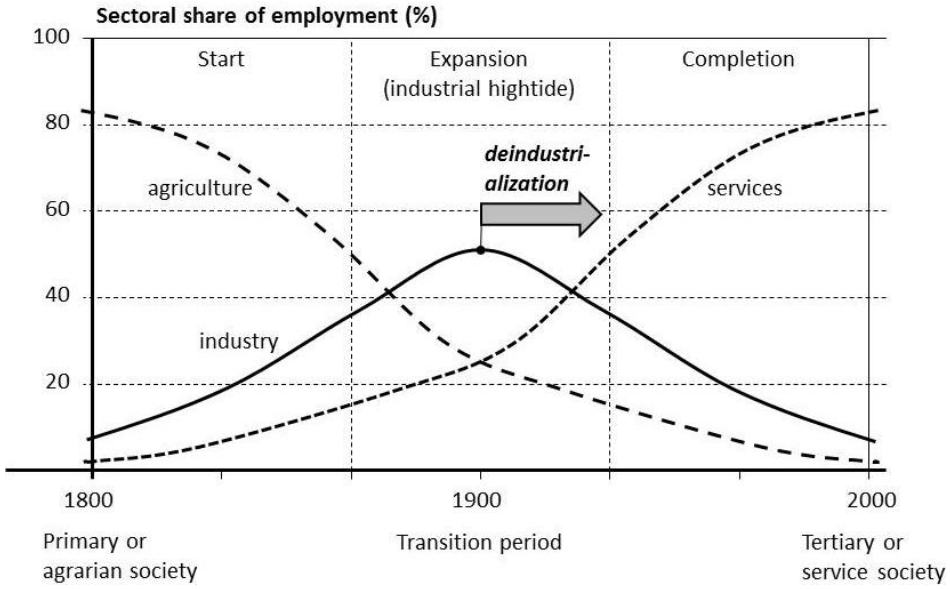
a convenient economic definition and well-adapted economic figures. In a review paper on economic developments in Sub-Saharan Africa, White (1996) discussed the ambiguity of the term 'deindustrialization', pinpointing its negative connotation: "So when is a contraction in manufacturing output 'de-industrialization' (which sounds like a bad thing) and when is it an efficient resource reallocation?" (White, 1996: 598).

This paper deals with both the negative and positive socio-economic consequences of phenomena subsumed as 'deindustrialization'. The starting point will be exact macro-economic definitions derived from a literature review.

Literature Review

The basic idea of deindustrialization was conceived in the course of the development of the three-sector hypothesis. This politico-economic theory is a special case of sectoral structural change of a national economy (Klodt, 2014c). On a low level of development, the primary sector (agriculture) dominates, later the secondary sector (industrial production) and, as the final achievement, the tertiary sector (services) (Klodt, 2014b).

Figure 1. *Standard Pattern of Structural Change*



Source: Own graph, after Henning (1995: 21)

The three-sector theory was introduced by the British economists Allan G. B. Fisher (1935) and Colin G. Clark (1940) and taken further by the French economist Jean Fourastié (1949). After being translated into German in 1954 (Fourastié, 1954), his book was very influential in the German-speaking countries (Pohl, 1970).

Clark (1940) was inspired by a remark of Sir William Petty (Petty, 1690) published posthumously. Petty's idea of labour reallocation from agriculture to

non-agricultural activities, the very ground for the three-sector hypothesis, is often referred to as *Petty's Law*, e.g. by Murata (2008). In Petty's own words, it reads: "There is more to be gained by manufacture than by husbandry and by merchandise than by manufacture" (Hospers and Steenge, 2002: 9).

Unlike his two immediate British predecessors, Fourastié not only provided descriptions of the phenomena, but tried to identify the mechanisms behind them, mainly technology and population growth (Hospers and Steenge, 2002). On this basis, he predicted a transition of all then-developed societies to service societies by millennium. The phenomenon of a relative decline in industrial employment after reaching an all-time peak is considered as 'deindustrialization' (Klodt, 2014b).

Jean Fourastié is relatively little known out of France since his most influential book (Le Grand Espoir du XXe siècle. Progrès technique, progress économique, progrès social, 1949) has never been translated into English (Hospers and Steenge, 2002). As the (French) title reveals, he considers the projected socio-economic developments to be "the great hope of the twentieth century". The developments would lead to a higher quality of life underpinned by flourishing education and culture, generally higher level of qualifications, humanized workplaces and improved social security including eschewal of unemployment. As a consequence of this, until the 1970s, the so-called 'tertiarization' was understood as a natural and welcome process to follow the industrialization process (Scheuer& Zimmermann, 2006).

According to the three-sector hypothesis, the sectoral shift is mainly driven by two influences:

1) Rising income elasticity of demand
   On a low income level, the demand for goods is relatively inelastic and focused on the coverage of basic needs. With rising income, the elasticity of demand rises. Thus, industrial goods and – in the course of development – services become more and more favoured.
2) Different productivity growth rates per sector
   Technical progress leads to different patterns of growth per sector. In the secondary sector (capital-intensive production), the labour content is constantly reduced by innovations (automation), so a relative decline in sectoral employment results. Possibilities for productivity rises in the tertiary sector were considered as rather limited by the authors of the middle 20th century (Klodt, 2014b).

While the outlined pattern of structural change has been demonstrated in general by empirical studies (Pohl, 1970), the presumption of a general backlog in productivity of the tertiary sector did not prove to be appropriate. It was based on the somewhat antiquated notion of services as typically being consumer-oriented. In recent decades, production- or enterprise-oriented services (e.g. financial or technical services) have played an important and still growing role. Modern information and communication technologies (ICT services) have improved the productivity of many other fields of service (Klodt, 2014a).

Therefore, the dominant factor for the advancement of services can be seen in a shift of demand (Klodt, 2014b).

Positive and Negative Deindustrialization

The authors of the mid-20th century who first predicted the post-industrial society (e.g. Fisher, 1935; Clark, 1940; Fourastié, 1949) saw the transition from industry to services as something natural and inevitable due to rising productivity in the manufacturing sector (Kollmeyer, 2009). Their view on deindustrialization was shared by the main authors of the 1960s (e.g. Rostow, 1960; Kuznets, 1966). On the other hand, the very influential scientist and UK policy advisor Nicholas Kaldor was of the opinion that manufacturing played a crucial role inevitable for the blossoming of an economy (Kaldor, 1966) and thus saw deindustrialization processes as harmful.

Based on empirical findings, Rowthorn and Wells (1987) contrasted the negative connotation of the term with a phenomenon that they named 'positive deindustrialization'. According to them, positive deindustrialization "occurs because productivity growth in this sector is so rapid that, despite increasing output, employment in this sector is reduced, either absolutely or as a share of total employment. However, this does not lead to unemployment, because new work is created in the service sector on a scale sufficient to absorb any workers displaced from manufacturing" (Rowthorn and Wells, 1987: 5-6).

Sometimes, the industrialization process stops before a country has reached a mature state, i.e. one of full industrial development and a correspondingly high level of national income. 'Negative deindustrialization', as Rowthorn and Wells (1987) called it, can hit economies at all stages of development, also already in a state that Dasgupta and Singh (2006) denominated as 'premature', i.e. before industrializing to full potential and reaching a correspondingly high level of national income. These authors declared that also 'positive deindustrialization' may occur prematurely. Such a state is characterized by generally positive figures of the national economy and driven by other sectors than manufacturing (e.g. knowledge-intensive services).

The above-mentioned phenomena were mostly delineated in stand-alone descriptions which remained unrelated. Moreover, no comprehensive empirical study on deindustrialization phenomena in mature and 'premature' (i.e. emerging) countries was found that relates the course of (de-)industrialization with long-term economic success and evaluates the impact of industrial policies under certain basic conditions. These identified gaps were closed by the author (Przywara, 2016) who conducted research aimed at modelling and evaluating the socio-economic change denominated as 'deindustrialization' in the context of the political and economic developments between 1970 and 2010. Building on the results, guidelines for industrial policies assuring sustainable development, both in mature and emerging countries, were derived from identified best practices. In the course of reaching these aims, the following objectives were met:

- The ambiguity of the term 'deindustrialization' was tackled by building a comprehensive quantitative model,
- Actual macro-economic data and information was condensed both for mature and emerging ('premature') countries, also serving to test the model,
- The socio-economic impact of certain forms of deindustrialization was delineated in terms of economic success or failure and put into relation with industrial policies and best practices.

The analysis reaches from the oil shock and OECD 1 (1973) to the Great Recession (2008).

Definitions of Deindustrialization

Current definitions of deindustrialization of an economy are (Bryson and Taylor, 2008; Lever, 1991):

- long-term contraction of manufacturing (absolute contraction),
- a shift from manufacturing to services (relative contraction).

Both can be measured either in terms of employment or output. The resulting four indicators (Table 1) do not necessarily correlate. With rising productivity, the manufacturing output may increase at the same time as employment declines (def. 1a fulfilled, 1b not fulfilled). Moreover, in a growing economy, absolute growth can go along with a relative decline of the manufacturing sector (def. 1 not fulfilled, def. 2 fulfilled).

Table 1. *Four Standard Indicators for Deindustrialization*

	(a) **Employment**	(b) **Output**
(1) **Absolute contraction** of the manufacturing sector	(1a) Declining absolute value	(1b) Declining absolute value (CU at constant prices)
(2) **Relative contraction** of the manufacturing sector	(2a) Declining sectoral share	(2b) Declining relative value (sectoral share)

Source: Own compilation

An even more relativist position is taken by Pieper (1999) who defines deindustrialization "as a relative loss – with respect to the rest of the economy – of the industrial sector's contribution to overall labor productivity growth" (Cowell, 2014: 14). There are more macro-economic definitions of deindustrialization, some of which involving the trade balance (Jaililian & Weiss, 2000; Lever, 1991).

No cross-disciplinary standard definition of deindustrialization is utilized in the fields of sociology and macro-economy. Kollmeyer's (2009) definition that deindustrialization means a relative decline in manufacturing employment

is quite common in sociology. Yet, it can neither be considered as complete nor universally adequate:

- It does not comprise a time frame for the structural changes.
- This definition only refers to the meaning of manufacturing within a society. It is not well-suited for making international comparisons of the impact of the manufacturing sector.

To illustrate the latter point by an example: If the number of manufacturing employees remains constant, a country of a growing total workforce deindustrializes, following Kollmeyer's (2009) terminology, since its share of manufacturing employment becomes reduced over time. But in comparison to other countries, it would (assuming similar productivity changes in these countries) have about the same economic impact. And simply, the manufacturing industry in this case will neither have reduced its output nor its number of employees. Is that really a case of deindustrialization?

For international comparisons of the economic impact, the absolute output and the productivity of a national economy are of crucial relevance. In this respect, absolute employment figures are the reference parameter while relative employment is of minor interest.

Concluding the findings, there is no such thing as "the only true" definition of deindustrialization, but a variety of definitions. As a starting point of the thesis underlying this contribution (Przywara, 2016), no comprehensive study on the inherent meanings and interpretation of deindustrialization indicators was found to be available, so the resulting ambiguity of the term 'deindustrialization' was tackled.

Methodology: The Scenario Model of Industrialization vs. Deindustrialization

When considering employment changes as an indicator for deindustrialization, there is one statistical factor that may cast doubt on the precision and applicability of these changes: The average work carried out per employee may vary regionally and over time. Employment figures normally refer to the number of jobs in the industry, not to the average workload involved. Since working hours may vary largely from country to country and they may also change over time, this may lead to some statistical distortions. To illustrate that by an example: If from one day to the other all employees of an economic unit would start to work half-time, the number of employees would remain constant. In this situation, the absolute and relative employment figures would remain the same although only (roughly) half of the work would be done.

Labour Content as a Central Indicator

From a sociological standpoint, i.e. following Kollmeyer's (2009) definition, this would not mean too much of a change, since all employees remain in their

social contexts. But economically, the difference is obvious and crucial, and it would also lead to a significant reduction in output.

In practice, workload changes do not occur at such high speed as in the example, but yet they happen in the one or the other direction, i.e. in reductions or increases of working hours. Such workload changes are not covered by conventional statistics on deindustrialization, and this fact can – at least in cases of significant average workload changes – be considered as a major shortcoming. Accordingly, deindustrialization should rather be understood as a decrease in the total labour content of the manufacturing sector than as a reduction of the number of sectoral jobs.

Table 2. *Definitions of Deindustrialization and their Applicability*

	Labour content	**Employment**	**Output**
absolute	**LAB CONT**: describing changes in total sectoral working hours, un-biased by changes in average individual workload	**ME (abs.)**: necessary for productivity considerations; sensitive to changes in average individual workload	**MO (abs.)**: relevant for comparing the power of different economic units, e.g. sectors of national economies
relative	n/a	**ME (rel.)**: sociological standard definition, showing the meaning of manufacturing for a society including its culture	**MO (rel.)**: relevant for describing the economic impact of manufacturing on an economic unit, e.g. a national economy

Source: Own compilation. ME = manufacturing employment, MO = manufacturing output

Mathematically, it equals the product of the average individual workload of all employees, multiplied by their number. It describes the total hours worked in the manufacturing industry. An amended list of definitions of deindustrialization and their application is rendered in (Table 2).

All definitions aim at specific targets. Moreover, they all are incomplete and require some further explanation rendered in the following. First of all, the time frame for analysing deindustrialization needs to be set appropriately. Since structural change is a long-term phenomenon, a minimum period of five years should be taken into consideration. This does not take away from the fact that sometimes unexpected incidents cause rapid changes (e.g. fall of Iron Curtain, 11 September 2001, world economic crisis 2008/9).

The following specific points require additional regard:

- Output measures may vary (e.g. turnover or gross value added).
- Employment figures are subject to definitions (e.g. average or minimum hours per job).
- Labour content is no statistical standard figure but needs to be calculated, involving productivity considerations. Often, there is no sufficient data base for these.

Labour content can well be applied when sufficient information on productivity is available in addition to conventional data on output and employment. While relative and absolute employment figures are altered by changes in individual workload which have an influence on the number of jobs required to carry out a specific amount of labour, labour content by definition is an indicator free from distortions caused by changing working conditions, i.e. increasing part-time employment or reductions of weekly working hours.

Choosing adequate parameters for describing deindustrialization requires mindful consideration of all the aforementioned aspects.

Connecting Economic Growth Rates

To calculate changes in the total labour content, some economic basic considerations are made. The following absolute variables are connected in the basic interrelations of deindustrialization:

- manufacturing output (USD),
- productivity (USD/hour),
- labour content (hours),
- employment (numbers of workers),
- workload per worker (hours worked per time unit and capita).

As absolute values, these variables can hardly be connected because of the different units they are expressed in. A way to overcome this obstacle is to normalize the values, i.e. relate them to a value in a similar unit so the respective units cancel each other out. When utilizing growth rates, i.e. percentage change over time, the units get normalized, i.e. a fraction of actual and past value is generated. The CAGR is the geometric progression ratio that delivers a constant rate of return over the time period. It is defined as (Investopia, 2014):

$$\mathrm{CAGR} = \left(\frac{\text{End Value}}{\text{Start Value}}\right)^{\left(\frac{1}{\#\text{ of years}}\right)} - 1 \qquad (1)$$

The corresponding growth factor is

$$\mathrm{CAGF} = \left(\frac{\text{End Value}}{\text{Start Value}}\right)^{\left(\frac{1}{\#\text{ of years}}\right)} = \mathrm{CAGR} + 1 \qquad (2)$$

The following formulae for describing the demand and supply side of the total labour content can be applied, if growth factors are taken into consideration:[1]

[1] In this work, growth rates are calculated as discrete rates, not as continuous rates. Thus, the indicated results of growth rate additions and subtractions contain a small systematic error given by the product of the summed up rates. Since these rates are normally small (around 1%), only the second decimal place is influenced. This error is neglected. For details see van Suntum (2006).

Demand Side

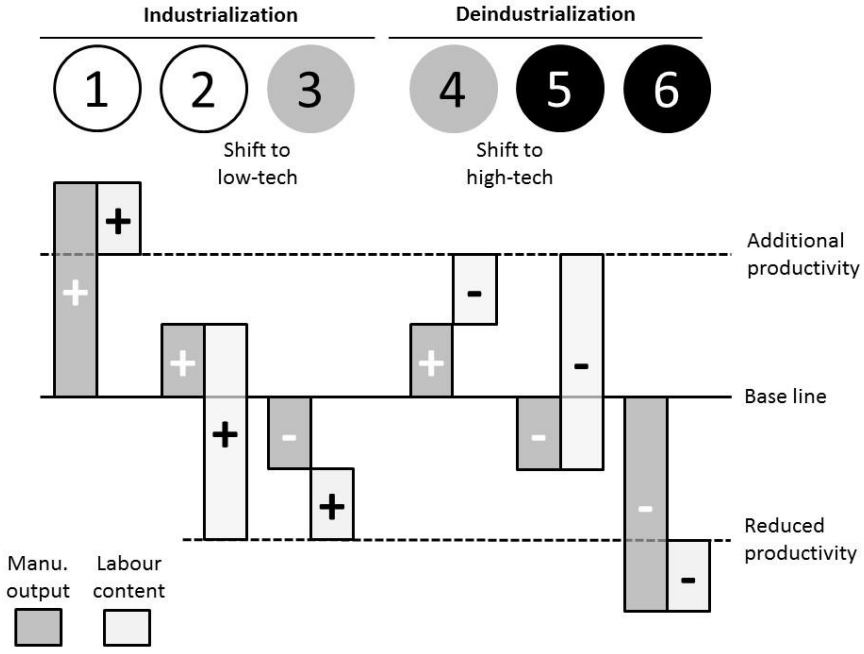
$$\text{labour content (CAGR)} = \text{manufacturing output (CAGR)} - \text{productivity (CAGR)} \quad (3)$$

Supply Side

$$\text{labour content (CAGR)} = \text{workload (CAGR)} + \text{manufacturing employment (CAGR)} \quad (4)$$

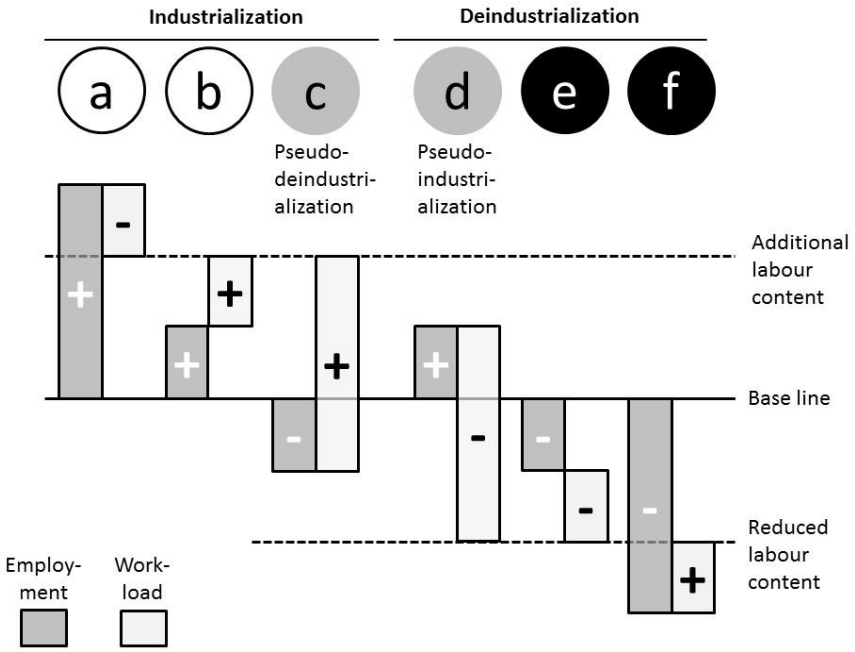
Since all factors involved may have a positive or negative leading sign, there are six scenarios of a national economy that can each be identified for the demand side and the supply side, respectively. These scenarios are graphically displayed in Figure 2 (demand side, scenarios 1-6) and Figure 3 (supply side, scenarios a-f) and will be further explained in the following.

Figure 2. *Demand-Side View of (De-)Industrialization*



Source: Own graph

Figure 3. *Supply-Side View of (De-)Industrialization*



Source: Own graph

Demand-Side Scenarios

Industrialization means growth of labour content, deindustrialization means its reduction. Normally, productivity rises over time. Under these normal circumstances, the following scenarios are possible:

①Output growth exceeds that of productivity, so more labour is required.
④Productivity growth exceeds that of output, so less labour is required.
⑤ Output falls despite of rising productivity, so far less labour is required.

While scenario 1 is one of prosperity, scenario 5 is one of recession and/or sectoral decline. Scenario 4 is ambivalent. It means industrialization in terms of output, but deindustrialization in terms of labour content. A certain share of activity is shifted away from the manufacturing sector.

The remaining scenarios cannot be considered as worthwhile for a healthy national economy since they are all related to reduced productivity.

②Output grows despite of falling productivity, so much more labour is required.
③Productivity reduction exceeds that of output, so more labour is required.
⑥Output reduction exceeds that of productivity, so less labour is required.

Scenario 6 is one of recession and/or sectoral decline, leading to lower capacity utilization and in its course reduced productivity. Scenarios 2 and 3 are also characteristic for economic decline, when state efforts for reducing

unemployment, e.g. sectoral subsidies, lead to job creations in previously unviable areas of the national economy. Since these are less productive, all in all this means a shift to low-tech sectors.

Supply-Side Scenarios

Additional labour might be covered by more workers or more work per employee. The following industrialization scenarios are possible:

(a) Employment growth exceeds that of labour content, so the workload is reduced.
(b) Labour content growth exceeds that of employment, so the workload rises.
(c) Employment is reduced despite of more labour, so the workload rises strongly.

Scenario (c) would be considered a deindustrialization scenario (shrinking employment) under the terminology of Kollmeyer (2009). In fact, it is a scenario of putting pressure on already employed personnel to avoid employing new staff. If the work would be distributed evenly, i.e. the workload would remain the same, no deindustrialization would occur. Thus, this process is named 'pseudo-deindustrialization'.

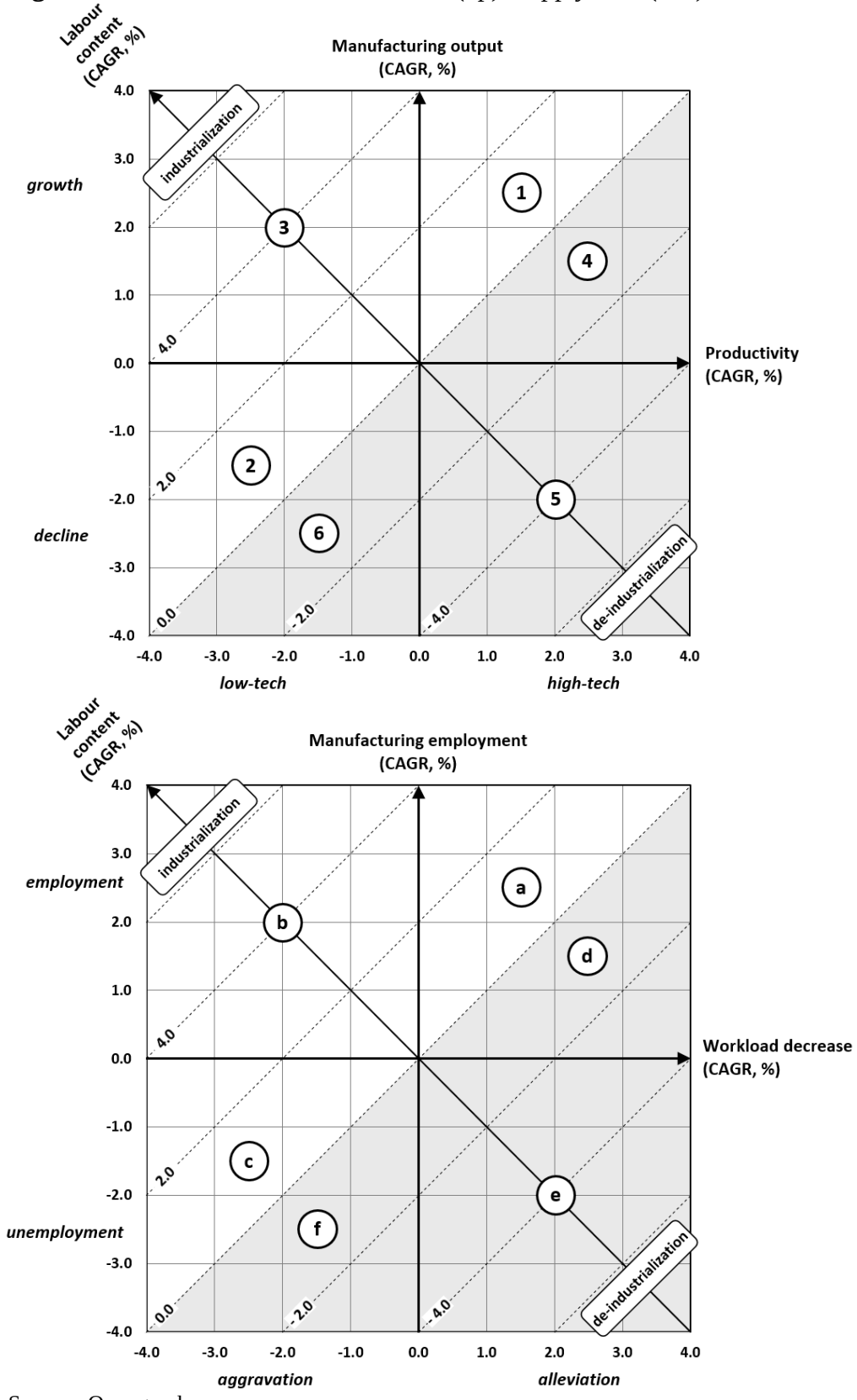
Reduced labour content, i.e. a deindustrialization process, can be covered by reductions of sectoral employment or reduced workload per employee. The following scenarios are possible:

(d) Employment grows despite of reduced labour, so the workload falls rapidly.
(e) Labour content falls faster than employment, so the workload falls.
(f) Employment is reduced faster than the labour content falls, so the workload rises.

Scenario (d) under the terminology of Kollmeyer (2009) seems to boost the manufacturing sector (since employment grows) while in fact it is shrinking. Typically, this might happen if the state is involved in employment policies and issues laws for working time reduction. Since factually no industrialization occurs, this process is named "pseudo-industrialization".

Scenario (e) is typical for a period of recession or transition, where some employees are retained in firms aiming at not to lose their know-how carriers for envisaged future prosperity. Scenario (f) is a scenario where firms are adding pressure on already employed personnel to avoid employing new staff.

Figure 4. *Scenario Model: Demand Side (up), Supply Side (low)*



Source: Own graph

Combining Labour Demand and Supply (Scenario Model)

Since both markets sides are in equilibrium, they are two sides of the same medal. These two sides can be combined to render a full market picture. Only combinations of industrialization scenarios (i.e. 1-3 with a-c), and deindustrialization scenarios (i.e. 4-6 with d-f), are possible. Thus, a total of nine industrialization scenarios as well as a total of nine deindustrialization scenarios is possible, rendering a total of 18 economic scenarios.

In Figure 4, the supply and demand side of the scenario model are graphically displayed in a stacked way. In the upper graph, the x-axis and y-axis correspond with the two growth rates that determine labour content on the demand side. Similarly, the lower graph deals with the demand side. The workload carries a negative algebraic sign, coding its decrease.

Connecting the Scenario Model with the Socio-Economic Standard Definition

As pointed out in the literature review, in some cases absolute and relative values may deviate (e.g. in the case of strong population growth, a growing absolute manufacturing output may well go along with a relative sectoral decline of employment). Again, these results are not contradictory, but strictly complementary.

When looking at change involving absolute employment, it becomes clear that the resulting change in absolute manufacturing employment positively correlates with output and negatively correlates with average workload and productivity. This result can be derived from equations (3) and (4). When equating both expressions for labour content and subtracting the workload, the obtained result is exactly the one graphically displayed.

From absolute to relative employment, it is only a small step. The reference value is total employment, hence its growth. If it grows faster than manufacturing employment (or falls more slowly), a relative decline of manufacturing employment results.

Total workforce growth has several influencing parameters like the growth or decline of population and the demography (age shares among population), unemployment and the labour participation rate (specifically female participation).

The gross domestic product will rise with rising productivity while a workload decrease acts antagonistically. When calculating the change per capita, the reference value is total population. If it grows, the national wealth will be distributed among more people, so the GDP p/c value will fall.

Manufacturing productivity is only one part of the industrial productivity which again is only one part of the national productivity. Thus, there is no direct proportionality between manufacturing productivity growth and GDP growth. Yet, by trend the influence is as sketched, though it is limited to the sector. According to Kaldor (1966), changes of manufacturing productivity are central for a national economy and in this sense might be considered as a proxy for the total change of productivity.

Similar considerations apply for the average workload which differs from sector to sector, very often also regionally (cf. International Labour Organization, 2014, topic 'Hours of Work').

Productivity rises, just like workload rises, *ceteris paribus* lead to higher GDP and lower employment. By competitive advantages, the general order situation of firms may be improved and so unemployment figures may be improved. Yet, the expectation in a developed society should be that while productivity is rising, the individual average workload may be lowered. This would correspond to a rising marginal utility of individual labour.

Course of Analysis

The analysis was carried out with regard to the long-term developments in mature states. All monetary values were transferred into 2010 US dollars on the basis of exchange rates as utilized by the World Bank (2014a) to assure international comparability over time. For the given purpose, it was found adequate to abstain from the use of purchasing power parities. Utilizing the plain exchange rate, i) is the "simplest option" (Maddison, 1995: 97), ii) was found to be sufficing since this analysis is mainly on structural shifts within an economy, iii) is the adequate method for following trade flows, iv) does not lead to big errors because in general, the parity has converged over time for the examined mature country group.

Periods under Investigation

The original timeframe for the underlying analysis (Przywara, 2016) was the period from 1970 until 2010. This period exactly meets the frame set by a utile statistical database that resulted from an EU research project, the EU KLEMS database (Groningen Growth and Development Centre, 2012). In the course of analysis, both regional scope and time frame were revised. Finally, structural developments were analysed over the following periods of time:

1) Full period (35 years)
   Instead of using the full 1970-2010 period, 1973-2008 was chosen as the standard representation. This was done for reasons of data availability and to leave out the first oil crisis and the economic downturn initiated by the American housing crisis in 2008, the results of which fully visible in 2009. In some cases, the starting and final dates had to be slightly moved due to lacking data for the early 1970s.
2) Long-term trends (15+5+15 years)
   The analysed period is divided by a historical caesura. The fall of the Iron Curtain in 1989/90 changed the political world. By opening the Eastern markets, it brought about the era of globalization. Accordingly, the period from 1973 to 2008 was subdivided into 15 years of pre-transformation (1973-1988), five years of transition (1988-1993) and 15 years of post-transformative globalization (1993-2008). Also here, the starting and final

dates in some cases had to be slightly moved due to lacking data for the early 1970s.

3) Semi-decades (7 x 5 years)
   As the shortest long-term indicator, seven five-year periods were investigated (1973-78, 1978-1983 … 2003-2008). In cases of lacking data for certain years, no calculation was carried out.

In this article, only the long-term trends are revealed. For mature countries, all phases are covered. Due to limited data availability for most emerging countries, the results are only rendered for the period from 1993-2008. Many of these countries only gained independence around 1990, especially the CIS countries which were former members of the Soviet Union.

Country Sample Selection and Data Processing

The original analysis (Przywara, 2016) comprises investigations of 12 mature and 25 emerging countries. In this article, deindustrialization processes of mature countries are in the focus. The 12 evaluated countries are represented in the EU-KLEMS database (Groningen Growth and Development Centre, 2012). A list of the examined countries is given in Table 3.

The EU KLEMS database aims at providing a statistical base for questions related to growth and productivity. Its accounts follow the ISIC 4 classification, with special attention to section C (manufacturing), equalling section D (ISIC 3) and section 3 (ISIC 2) of previous codes (European Commission, 2014; United Nations, 2002; United Nations, 2008).

Table 3. *Analysed Mature Economies*

	Indicator	**Population**	**Pop. density**	**GDP**	**GDP p/c**
Country	**Code**	(million)	(per km²)	(bn USD)	(k USD)
Austria	***AUT***	8.4	101.8	377.7	45.0
Belgium	***BEL***	10.9	360.6	471.1	43.2
Finland	***FIN***	5.4	17.6	236.7	44.1
France	***FRA***	65.0	118.7	2,565.0	39.4
Germany	*DEU* ***(GER)***	81.8	234.6	3,304.4	40.4
Italy	***ITA***	60.5	201.5	2,055.4	34.7
Japan	***JPN***	127.5	349.7	5,495.4	43.1
Netherlands	***NLD***	16.6	492.6	777.2	46.8
Spain	***ESP***	46.6	93.4	1,384.8	29.7
Sweden	***SWE***	9.4	22.9	462.9	49.4
UK	*GBR* ***(UK)***	62.7	259.4	2,285.5	36.6
USA	***USA***	309.3	33.8	14,958.3	48.4

Eurozone Country

Source: World Bank (2014a) data and codes (in brackets: codes utilized in this article), 2010 data (in 2010 USD)

Results

In the following, the results for the scenario model are presented. The analysis of structural shifts aims at clarifying the economic effects in the long-term perspective (1973-2008). Also the three sub-periods (1973-1988, 1988-1993, 1993-2008) will be addressed in more detail. A synthesis and interpretation of the findings is then carried out, leading to key findings presented subsequently.

The development of the manufacturing sector is put in relation with the development of the national economy. In Table 4, some key performance indicators (GDP per capita, unemployment rate, export rate and trade balance) are given.

Table 4. *Overview on Macro-economic Indicators (1973-2008)*

Indicator		AUT	BEL	FIN	FRA	GER	ITA	NLD	ESP	SWE	UK	JPN	USA
GDP p/c (k USD)	1973	21.7	23.1	21.0	22.9	21.1	19.0	24.7	15.8	26.6	18.3	21.2	25.9
	1988	30.4	31.2	31.1	30.6	29.0	28.3	31.0	20.4	34.9	24.5	33.4	35.0
	1993	33.5	33.4	28.9	32.6	32.4	30.2	34.4	22.4	33.4	25.8	38.1	37.0
	2008	46.3	44.2	47.1	40.4	40.8	35.7	48.3	31.4	49.6	38.4	43.5	49.4
Unem-ploy-ment (%)	1973	1.0	2.4	2.3	2.0	0.8	6.3	2.0	2.6	2.5	2.7	1.3	4.9
	1988	4.7	8.8	4.2	10.1	5.7	9.7	6.2	18.7	1.8	8.5	2.5	5.5
	1993	4.2	8.6	16.3	11.8	7.8	9.7	5.5	20.8	9.1	10.2	2.5	6.9
	2008	3.8	7.0	6.4	7.4	7.5	6.7	3.1	11.3	6.2	5.6	4.0	5.8
Export rate (%)	1973	28.0	52.2	23.9	17.6	16.7	18.8	46.8	13.7	26.9	23.1	9.8	6.7
	1988	34.4	64.6	24.0	20.8	22.9	18.3	53.7	17.8	32.1	22.9	9.8	8.5
	1993	32.7	61.0	31.8	21.2	22.0	21.3	54.6	18.2	32.7	25.6	9.1	9.5
	2008	59.3	84.4	46.8	26.9	48.2	28.5	76.3	26.5	53.5	29.4	17.7	12.5
Trade balance (%)	1973	-0.4	1.9	-1.3	0.8	-1.0	-1.9	3.9	-0.8	3.5	-2.2	0.0	0.3
	1988	-0.2	2.3	-0.6	-0.8	-0.2	0.1	2.5	-1.2	2.2	-3.2	2.1	-2.1
	1993	-0.1	3.2	4.6	1.6	0.2	3.2	5.4	-0.6	3.7	-0.1	2.2	-0.9
	2008	5.8	0.9	3.8	-2.1	6.3	-0.8	8.3	-5.8	6.8	-2.2	0.2	-4.8

Source: World Bank (2014a) data (in 2010 USD); national, OECD (2015) and European Commission (2014) data on unemployment

Some basic conclusions in relation to the KPIs may be drawn from comparing the national figures and adding some additional information.

GDP per Capita

All investigated states roughly managed to double their national income. Austria, Finland and the Netherlands were the outperformers in terms of growth rates, Sweden and the USA took the absolute lead in 2008.

Unemployment

Unemployment was no big issue in 1973 but continuously started to grow. It became quite severe (two-digit rates) around 1990. Most states managed to

confine the problem. Spain, to a lesser extent France, still has high unemployment rates, with very high rates concerning young persons.

Export Orientation

The exposition of a country to global markets is indicated by the export and import rates, i.e. the ratio between goods and services exported respectively imported and the country's gross domestic product. Exports are, apart from nations massively exporting natural resources, largely determined by manufactured goods. Thus, the export rate is a meaningful indicator for the competitiveness of the manufacturing sector.

Export rate results cannot easily be interpreted, since high export values can mean three things or even two or all of them:

1) A country is very focussed on manufacturing technology.
2) A country is very much involved in international trade.
3) A country is very involved in international manufacturing value chains. Sometimes, certain pre-fabricates are exported, value is added by processing, then these products are re-imported and finally sold (exported) as part of a finished product. Thus, their initial value is counted double for the export balance, and imports are also accounted.

When utilizing the trade balance, i.e. exports minus imports, this problem does not occur, since the double count of export is compensated by the re-import. Yet, the trade balance does not render sufficient information on the magnitude of industrial production and exports. In any case, both data need to be considered jointly.

All states have significantly increased their international activities over time, especially after the fall of the Iron Curtain. But there are big differences between countries. A grouping by intervals of 20 % of exports leads to the following results:

- Countries of very high export orientation (export rate 60+ %):
  Belgium, Netherlands
  Based on their favourable location in the heart of Europe and equipped with high-capacity North Sea ports, their common region has been the traditional centre of European trade. Both have a positive trade balance. While the Dutch balance has become more and more positive, the Belgian has recently almost become neutral.
- Countries of high export orientation (export rate 40-60 %):
  Austria, Finland, Germany, Sweden.
  All these are countries with a high affinity towards technology and of rich engineering traditions. Three countries of this group have managed to change from a negative to a positive balance over time; Sweden has traditionally had one.

- Countries of medium export orientation (export rate 20-40 %):
  France, Italy, Spain, UK.
  These are countries with a certain industrial tradition, but no real deep-routed cultural affinity towards technology. All have a negative trade balance.
- Countries of low export orientation (export rate 0-20 %):
  Japan, USA
  Despite of their sizeable industries, both Japan and the USA are mainly producing for their large domestic markets, the by far largest in the investigated group of developed countries. The USA has turned from a positive to a very negative trade balance over the years, while Japan, starting around neutral, for a long time generated a trade surplus. In recent years, this surplus has almost vanished.

The Long-Term Perspective: 1973-2008

When comparing the change of the national economies with special regard to the manufacturing sector over the full 35 years (Table 4), it is noticeable that the founding members of the EU (BEL, FRA, GER, ITA, NLD since 1 January 1958) had a quite smooth development, also Austria (since 1 January 1995) due to its specific political conditions (long-term cooperation between social-democrats and conservatives) and Japan and the USA due to their size and government.

The later EU accessors had a more irregular road to go. The reasons can be well explained by large swings in the political direction of these countries:

- Finland (EU member since 1 January 1995) re-adjusted its policies from rather socialist with certain influence from Moscow to Western liberal policies as soon as it was possible.
- Spain (EU member since 1 January 1986) had to cope with the transition from dictatorship to democracy and rather radical political swings due to its electoral system.
- Sweden (EU member since 1 January 1995) left its quite socialist way of social democracy in the 1980s and never returned to it, even when the social democrats returned to power.
- The United Kingdom (EU member since 1 January 1973) pursued a radical swing from rather socialist to consequent neo-liberal policies around 1980 under Margaret Thatcher (European Union, 2015).

In Table 5, the key figures of the manufacturing sectors of the investigated country sample are listed. They reveal that all countries have deindustrialized in a sociological sense in the last four decades. In declining order, the UK, the USA, Belgium, the Netherlands and France have headed this structural change. Germany, Spain and Sweden are in the midfield, while Italy, Japan, Finland and Austria have retained the highest percentage of workers in the manufacturing sector.

Table 5. *Overview on Manufacturing Indicators (1973-2008)*

Indicator		AUT	BEL	FIN	FRA	GER	ITA	NLD	ESP	SWE	UK	JPN	USA
Empl. (%)	**1973**	25.1	31.1	24.0	24.1	32.8	27.3	21.8	22.0	26.8	24.8	25.8	20.5
	2008	15.3	13.2	16.8	11.8	18.2	19.3	10.2	12.2	15.4	7.9	16.9	9.5
GVA p/c (k USD)	**1973**	23.3	29.0	23.9	25.1	24.2	26.5	31.8	31.3	24.8	19.3	23.9	28.9
	2008	61.4	68.0	69.3	54.3	62.3	40.2	65.2	42.4	55.5	41.1	52.6	51.9
CAGR (%)	**Empl. (rel.)**	-1.4	-2.4	-1.1	-2.0	-1.7	-1.0	-2.1	-1.7	-1.6	-3.2	-1.2	-2.5
	Empl. (abs.)	-0.8	-1.9	-0.8	-1.4	-1.1	-0.3	-0.8	-0.2	-1.2	-2.7	-0.8	-1.0
	Output	1.6	0.2	2.1	0.2	0.9	0.7	0.8	0.3	1.6	-0.7	1.1	1.0
	Output/cap.	2.4	2.1	2.9	1.6	2.0	1.0	1.6	0.5	2.8	2.0	1.9	2.0
	Productivity	2.8	2.5	3.3	2.2	2.7	1.2	2.1	0.9	2.5	2.2	2.3	1.9
	Workload	-0.4	-0.4	-0.3	-0.6	-0.7	-0.1	-0.5	-0.3	0.2	-0.2	-0.3	0.1
	Labour	-1.3	-2.3	-1.1	-2.0	-1.8	-0.5	-1.3	-0.6	-1.0	-2.9	-1.1	-0.9

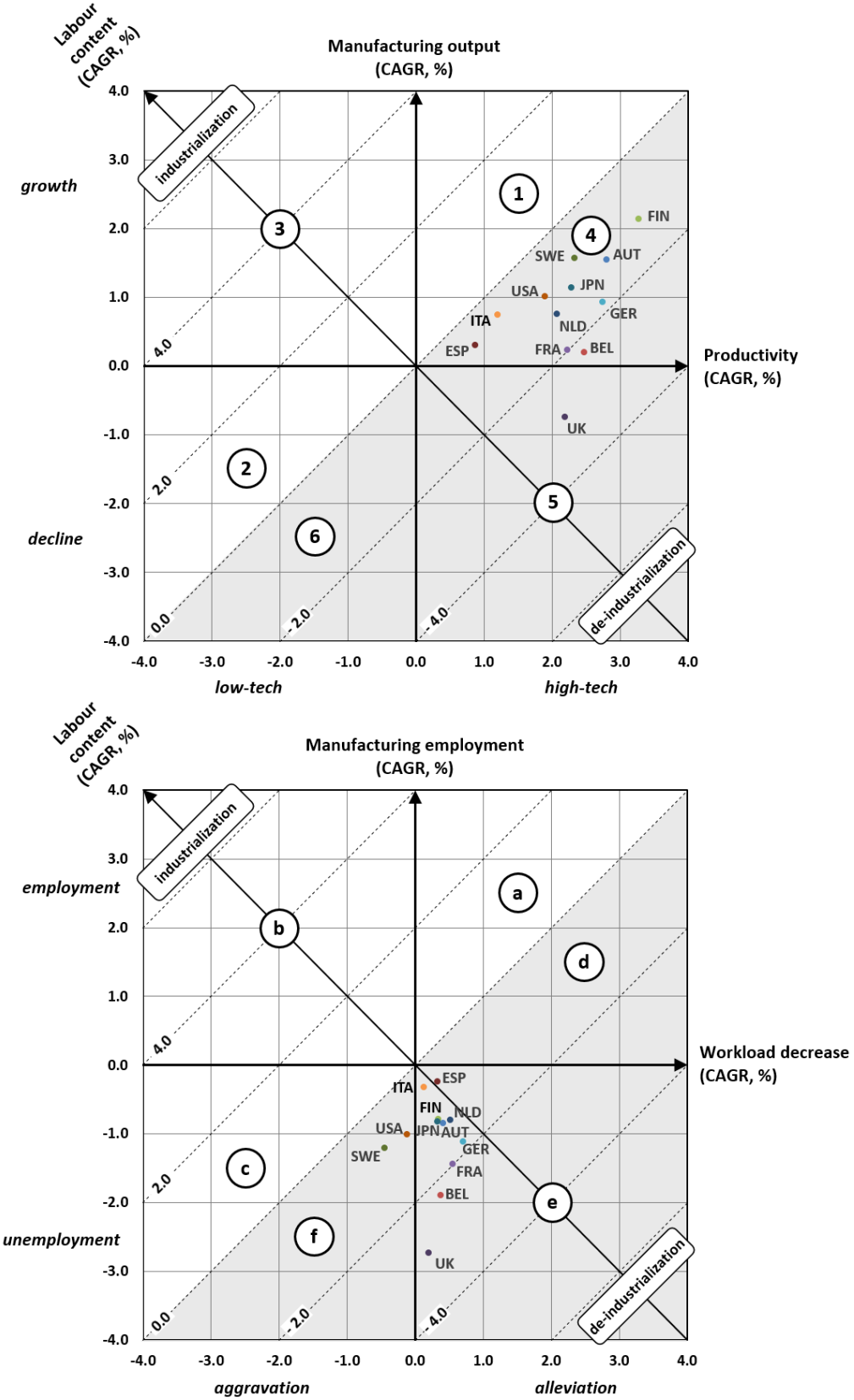
Source: Calculations based on Groningen Growth and Development Centre (2012) data (in 2010 USD). Finland: 1975-1988; USA: 1977-1988

All countries followed individual paths, based on individual comparative advantages or dis-advantages. There is no such thing as the standard pattern of industrial decline. The individual paths are explained on the basis of the graphical display of the calculated long-term scenarios (Figure 5).

The scenario for most countries is the 4e type. Productivity gains lead to higher output, but also to reduced employment. The latter effect is to a certain extent reduced by a decreased workload. Only three countries deviate from this standard scenario:

- The United Kingdom even had to record reductions of the manufacturing output.
- The USA and Sweden increased the average workload. The USA did so in the course of its swing to neo-liberal policies, Sweden in correcting former socialist exaggerations that hampered market success.

Figure 5. *Scenarios (1973-2008): Demand Side (up), Supply Side (down)*



Source: Own graph, based on Groningen Growth and Development Centre (2012) data

Additional analyses (Przywara, 2016) have shown that the manufacturing sectors in most states are characterized by a shift to high-tech manufacturing, i.e. a higher growth rate of high-tech products than of less advanced production. Such a development did not take place in France and the UK – a clear sign of technological backlog.

Italy and Spain did not push their manufacturing productivity as hard as the other states. Presumably, such policies were aimed at short-term avoidance of social hardships (unemployment).In international comparison, they resulted in a weakened competitive position.

Summarizing the findings, four indicators of deindustrialization were fulfilled by all states, so the relative contribution of manufacturing to each national economy declined. Still, the total value of manufactured goods increased in all states but in the United Kingdom (Table 6).

Table 6. *Fulfilment of Deindustrialization Definitions (1973-2008)*

	Labour content	**Employment**	**Output**
absolute	**LAB CONT** CAGR < 0.0 %: all	**ME (abs.)** CAGR < 0.0 %: all	**MO (abs.)** CAGR < 0.0 %: UK
relative		**ME (rel.)**: CAGR < 0.0 %: all CAGR ≤ -1.0 %: all w/o ITA	**MO (rel.)**: CAGR < 0.0 %: all

Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data. Finland: 1975-2008; USA: 1977-2008

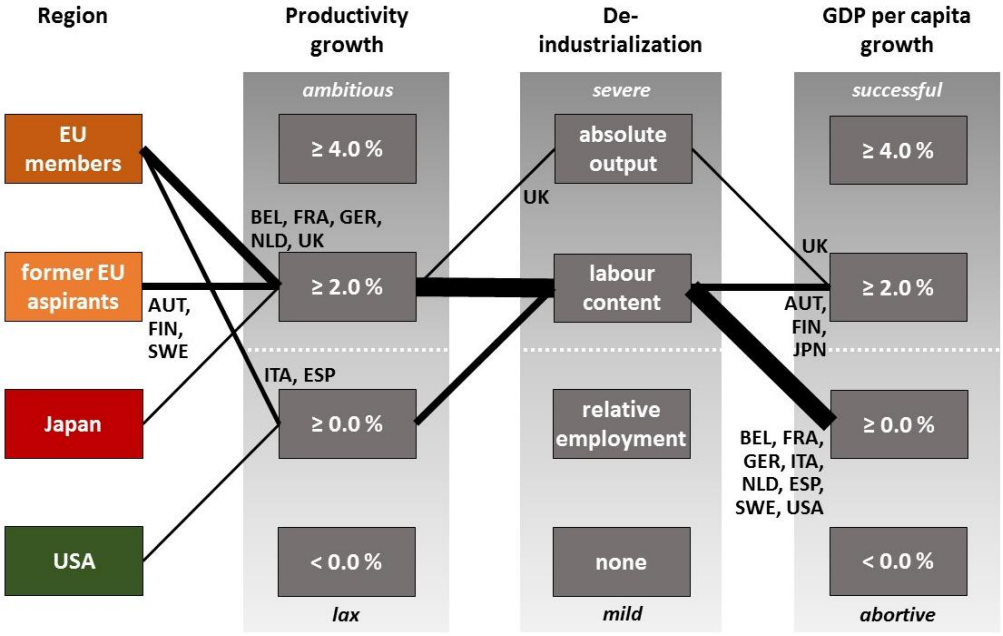
In most Western economies, the total workforce has risen in recent decades because of a higher share of female employment. Thus, even in an economy with a constant absolute employment in manufacturing, the relative employment would sink. The 'normal' behaviour would also be sinking absolute numbers in manufacturing employment due to productivity rises exceeding those of labour participation. The total number of hours worked would normally decrease even a little faster than absolute employment because of a certain diminished average workload of the employees. While absolute output would in the 'normal' case still be rising due to elevated manufacturing productivity, the sectoral contribution will be lowered due to the over-proportional growth of the service sector.

As a result of these considerations, there is a ranking of deindustrialization scenarios. When only taking into account the most critical and relevant indicators, the ranking from uncritical to most critical deindustrialization is: 1. none; 2. reduced relative manufacturing employment; 3. reduced labour content; 4. reduced manufacturing output.

In Figure 6, this ranking is utilized. The graph connects a key input factor (productivity growth) with the most severe country-specific manifestation of deindustrialization (highest position in the ranking) and a key indicator for the performance of a national economy (GDP per capita). In addition, for reasons

of clarity, the categories are dyed and descripted; the upper two and the lower two values of each category are separated by a white dotted line.

Figure 6. *Key Features of Deindustrialization (1973-2008)*



Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data

For the 35-year period from 1973 to 2008, there is a typical pattern that the Western states followed. Apart from Italy, Spain and the USA, they all arrived at medium-high income per capita productivity rises which resulted in reductions of the total hours worked (labour content) in the manufacturing industry. The UK even went further and was facing significant output losses.

With this course, the UK could achieve medium-high rises of the income per capita, a success that could only be met by Austria, Finland and Japan. All other states remained below the two percent hurdle. Among these were Italy and Spain, the two states that followed a less ambitious course in raising productivity.

In the very long run, the large tidal difference evened up. The UK apparently did not suffer from its fast deindustrialization but was able to compensate it on the basis of knowledge-intensive business services (KIBS).

Behind the long-term trends, there are certain developments that will only become clear when taking a closer look at the sub-periods, especially the 15-year periods before and after the fall of the Iron Curtain.

Analysis of Sub-Periods

The Prelude to Globalization: 1973-1988

In most countries, the manufacturing industry pushed productivity very hard (2.0% and more). Since output only followed at a certain distance, a labour

content gap opened. Most countries answered with some workload reduction. The only exceptions were Sweden, the UK and the USA:

- The UK and Sweden increased the workload despite of a severe reduction in the labour content.
- The USA followed a totally different path. Their productivity rose only modestly while they were able to increase their output, so their total labour content increased. This output increase roughly equals its population growth. The American industry seems to have not done much to assure its future but rather rested on its laurels. The USA realized this extra demand of work by increasing the workload while keeping absolute employment figures more or less constant.

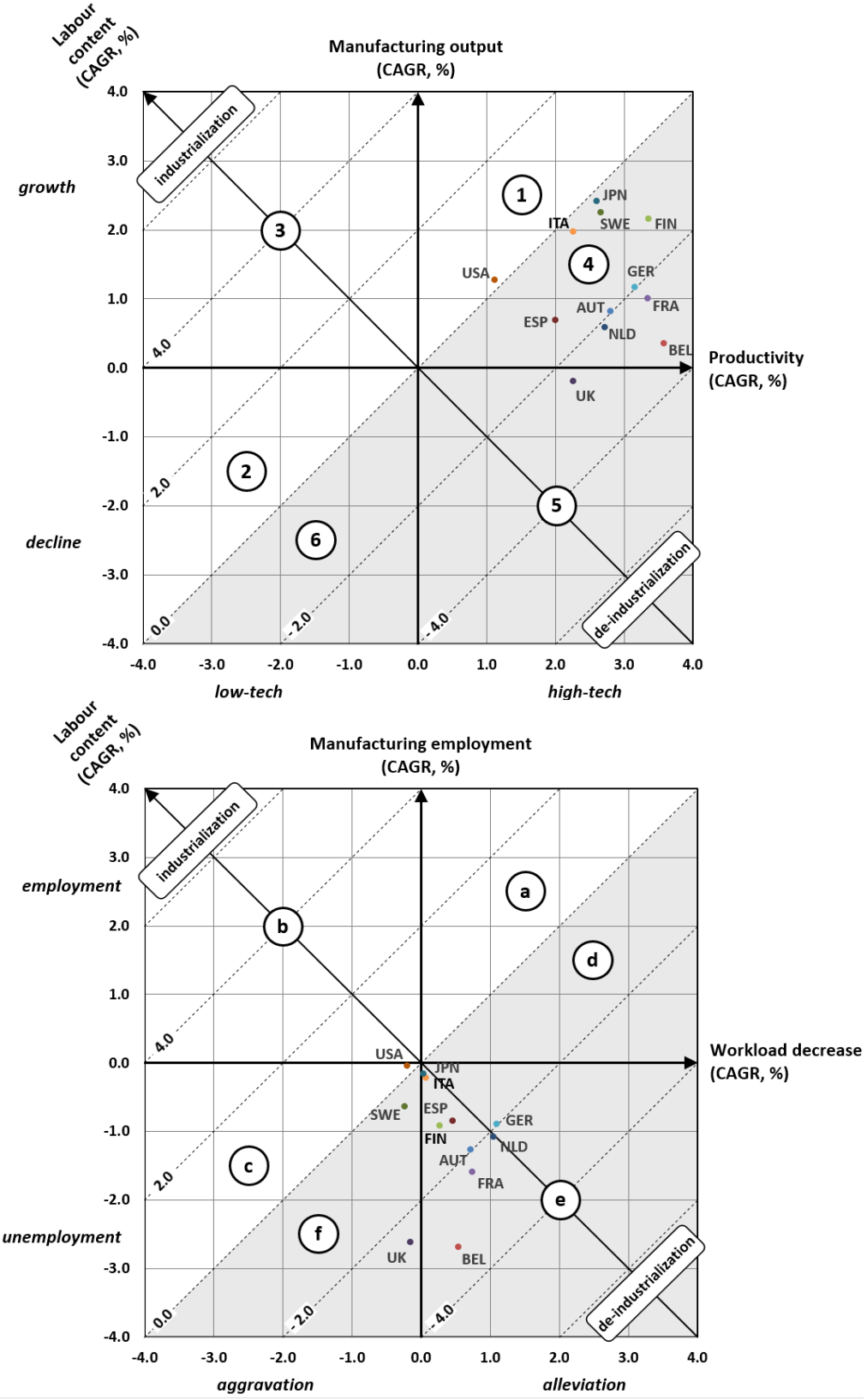
Table 7. *Overview on Manufacturing Indicators (1973-1988)*

Indicator		AUT	BEL	FIN	FRA	GER	ITA	NLD	ESP	SWE	UK	JPN	USA
Employ-ment (%)	1973	25.1	31.1	24.0	24.1	32.8	27.3	21.8	22.0	26.8	24.8	25.8	20.5
	1988	20.6	20.4	20.0	18.0	26.6	23.9	15.9	19.0	21.5	16.5	22.7	16.1
GVA p/c (k USD)	1973	23.3	29.0	23.9	25.1	24.2	26.5	31.8	31.3	24.8	19.3	23.9	28.9
	1988	35.3	49.1	36.7	41.1	38.5	37.0	47.5	42.1	36.8	28.3	35.1	32.7
CAGR (%)	Empl. (rel.)	-1.3	-2.8	-1.4	-1.9	-1.4	-0.9	-2.1	-1.0	-1.4	-2.7	-0.8	-2.1
	Empl. (abs.)	-1.3	-2.7	-0.9	-1.6	-0.9	-0.2	-1.1	-0.9	-0.6	-2.6	-0.2	-0.0
	Output	0.8	0.3	2.2	1.0	1.2	2.0	0.6	0.7	2.3	-0.2	2.4	1.3
	Output p/c	2.1	3.0	3.1	2.6	2.1	2.2	1.7	1.6	2.9	2.4	2.6	1.3
	Productivity	2.8	3.6	3.4	3.3	3.2	2.3	2.7	2.0	2.9	2.3	2.6	1.1
	Workload	-0.7	-0.5	-0.3	-0.7	-1.1	-0.1	-1.1	-0.5	-0.0	0.2	-0.0	0.2
	Labour	-2.0	-3.2	-1.2	-2.3	-2.0	-0.3	-2.1	-1.3	-0.7	-2.5	-0.2	0.2

Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data. Finland: 1975-1988; USA: 1977-1988

When transferring the figures into the scenario graph (Figure 7), the standard 4e pattern listed in the previous section is taken as the reference point. Most states are in that group, with Belgium accounting the biggest losses in total labour content (difference in y-direction to the dotted line). Moreover, in this period, Belgium and France did not shift to high-tech (Przywara, 2016).

Figure 7. *Scenarios (1973-1988): Demand/supply Side (up/down)*



Source: Own graph, based on Groningen Growth and Development Centre (2012) data

Three countries follow very different paths of deindustrialization.

- Sweden
  Sweden followed the very ambitious 4f scenario, with workload increases despite of sinking labour content, so additional lay-offs result. Yet, this lead to a positive economic development, including a reduction of unemployment, so increasing the workload is very likely the result of increasing total labour demand in the national economy.
- United Kingdom
  The UK, unlike all other states, had losses in output. Like Sweden, it increased the workload, but unlike Sweden, it did despite of a severe growth of unemployment, resulting in a 5f type scenario. On the basis of North Sea oil, a shift to primary products took place, probably crowding out the manufacturing sector (Przywara, 2016).
- USA
  A rare 1c type scenario (pseudo-deindustrialization) is noted, meaning that employment was (slightly) reduced while in fact, the labour content grew. The gap was closed by increasing the workload. Despite of more work to be done, this scenario leaves the sociological impression of being one of deindustrialization.

As a whole, the Western manufacturing industry was rather successful in the investigated period. Relatively high raises of productivity could be achieved, leading to labour content reductions that were, except of the USA, not fully compensated by increased output. A test of deindustrialization standard indicators for the period 1973-1988 (Table 8) shows almost exactly the same picture as the long-term analysis 1973-2008 (Table 6).

The differences lie in the fact that i) Japan de-industrialized a little slower in terms of relative manufacturing employment and ii) the USA did not de-industrialize in terms of labour content despite of decreasing absolute manufacturing employment. This means that the average workload per employee was increased, a rather unusual behaviour that is easily explicable by neoliberal policies picked up in the Reagan era.

The industrial policies resulted in a quite uniform medium high productivity growth with the USA as the only exception. The modest US change of productivity led to very modest deindustrialization that only showed in relative employment. All other states observed labour content reductions, the UK even had to face a reduction of its absolute manufacturing output.

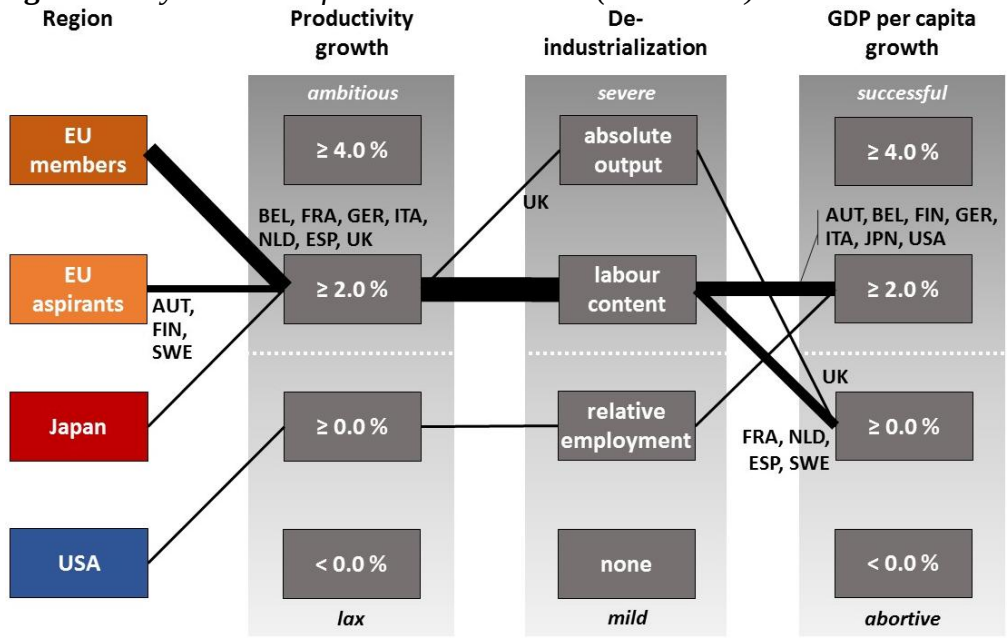
Table 8. *Fulfilment of Deindustrialization Definitions (1973-1988)*

	Labour content	Employment	Output
absolute	**LAB CONT** CAGR < 0.0 %: all w/o USA	**ME (abs.)** CAGR < 0.0 %: all	**MO (abs.)** CAGR < 0.0 %: UK
relative		**ME (rel.)**: CAGR < 0.0 %: all CAGR ≤ -1.0 %: all w/o ITA, JPN, ESP	**MO (rel.)**: CAGR < 0.0 %: all

Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data. Finland: 1975-1988, USA: 1977-1988

The relative winners and losers by increases in income per capita were partly different to those of the full 35 years (Figure 8). The UK could finally change for the better, Belgium, Germany, Italy and the USA changed for the worse. All other states were in the identical category over the first 15 and full 35 years.

Figure 8. *Key Features of Deindustrialization (1973-1988)*



Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data

The Wind of Change: 1988-1993

A quick view on the five-year epoch-making change shows the dramatics of the development (Table 9). Almost all European countries apart from Austria and the Netherlands suffered from reduced output.

Finland and Sweden, traditional trade partners of the Soviet Union, were facing the deepest cuts. Despite of these negative trends, both countries raised their productivity, Finland even at record levels. In fact, this drastic treatment

led to a record in labour content reduction, compensated by very high increases in unemployment and also significant workload reductions. The United Kingdom also pursued a very consequent strive for increased productivity.

Italy and Spain followed an opposite strategy. They compensated output losses by losses in productivity, i.e. they kept much of their workforce despite of less work to do (reduced labour content).

Table 9. *Overview on Manufacturing Indicators (1988-1993)*

Indicator		AUT	BEL	FIN	FRA	GER	ITA	NLD	ESP	SWE	UK	JPN	USA
Employ-ment (%)	1988	20.6	20.4	20.0	18.0	26.6	23.9	15.9	19.0	21.5	16.5	22.7	16.1
	1993	18.7	18.4	18.2	16.3	23.0	22.5	14.5	17.4	18.0	12.5	21.9	14.4
GVA p/c (k USD)	1988	35.3	49.1	36.7	41.1	38.5	37.0	47.5	42.1	36.8	27.0	35.1	32.7
	1993	38.4	51.4	46.7	45.3	41.2	36.3	49.8	36.5	38.7	31.3	39.0	35.6
CAGR (%)	Empl. (rel.)	-2.0	-2.1	-1.9	-2.0	-2.9	-1.2	-1.8	-1.7	-3.5	-5.4	-0.8	-2.3
	Empl. (abs.)	-0.9	-1.5	-5.5	-1.8	-1.9	-1.0	0.1	-0.8	-5.4	-4.0	0.6	-1.4
	Output	0.6	-1.3	-2.1	-0.2	-1.1	-1.6	0.7	-3.4	-3.8	-2.3	0.7	0.3
	Output p/c	1.5	0.2	3.4	1.6	0.8	-0.6	0.6	-2.6	1.6	1.7	1.3	1.7
	Productivity	1.7	1.0	4.9	1.9	1.3	-0.4	0.9	-2.8	1.3	3.0	2.1	1.7
	Workload	-0.2	-0.7	-1.5	-0.3	-0.6	-0.2	-0.3	0.2	0.3	-1.3	-2.0	-0.0
	Labour	-1.1	-2.2	-7.0	-2.1	-2.5	-1.2	-0.2	-0.6	-5.1	-5.3	-1.4	-1.4

Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data (in 2010 USD)

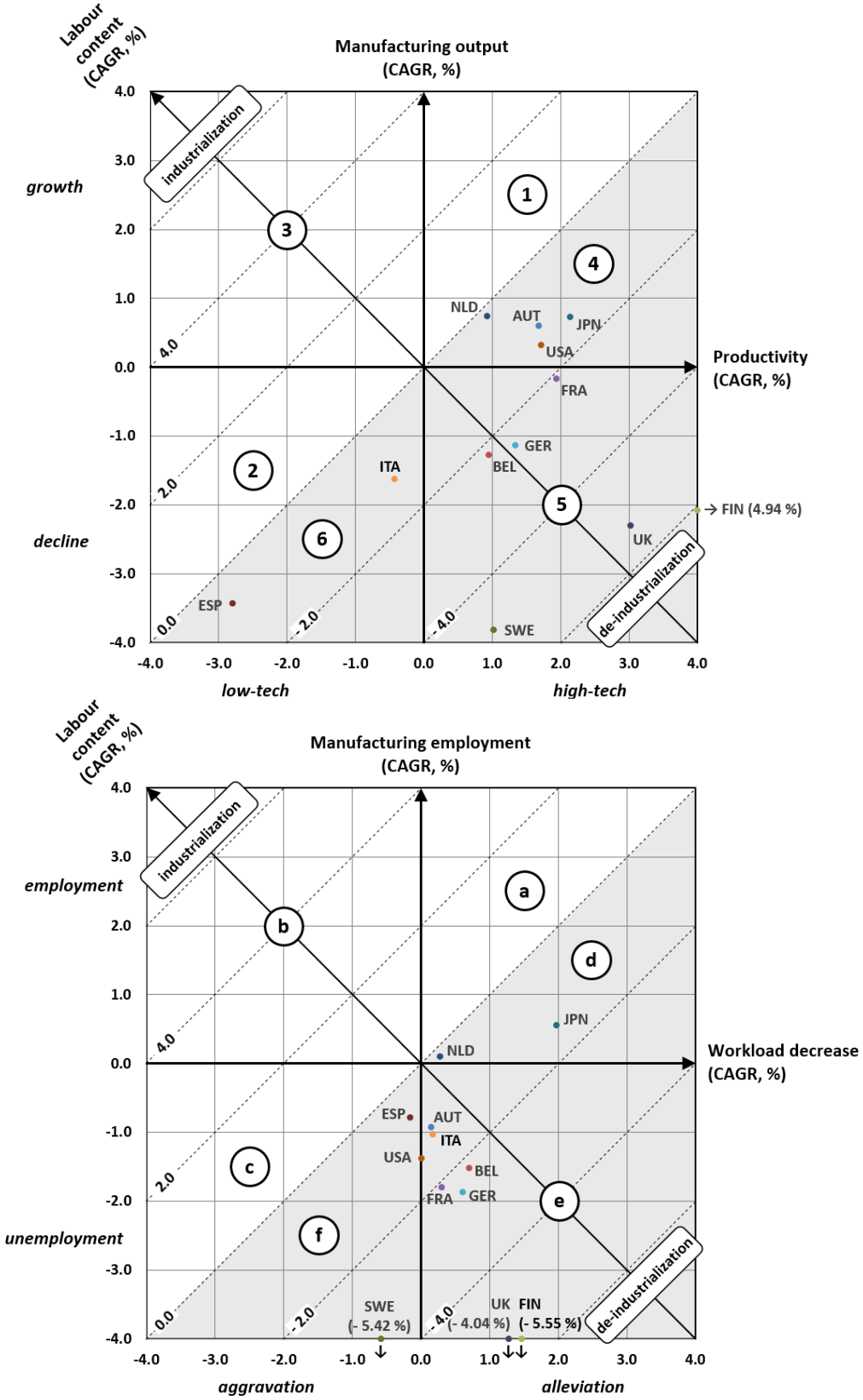
Apart from Japan, all countries de-industrialized by relative employment. Times were so turbulent that no country only Austria and the USA managed to follow a 4e type scenario (Figure 9). Due to output losses, the standard scenario is 5e. Sweden, coming from very socialist post-war years, stuck to its previous increases in the workload and pursued a 5f scenario. The national economy was in a crisis, with losses in wealth and very high unemployment.

In Italy and especially Spain, the situation was even worse because all key factors (productivity, output and labour content) were in the negative range. While Italy fought the situation with workload reductions, Spain even increased the workload, probably to fight the losses in productivity at least to a certain extent.

Apart from Austria and the USA, no shifts to high-tech products were found (Przywara, 2016), so the situation was really unusual.

The period-specific tests of deindustrialization indicators (Table 10) clearly show the economic turbulences that most European states were part of. Apart from four states, all were even facing losses in absolute output, i.e. the most severe form of deindustrialization. All countries had reduced numbers of total hours worked. Due to workload releases, these did not lead to reductions in absolute employment in Japan and the Netherlands. The national economies of both countries boomed.

Figure 9. *Scenarios (1988-1993): Demand Side (up), Supply Side (down)*



Source: Own graph, based on Groningen Growth and Development Centre (2012) data

Table 10. *Fulfilment of Deindustrialization Definitions (1988-1993)*

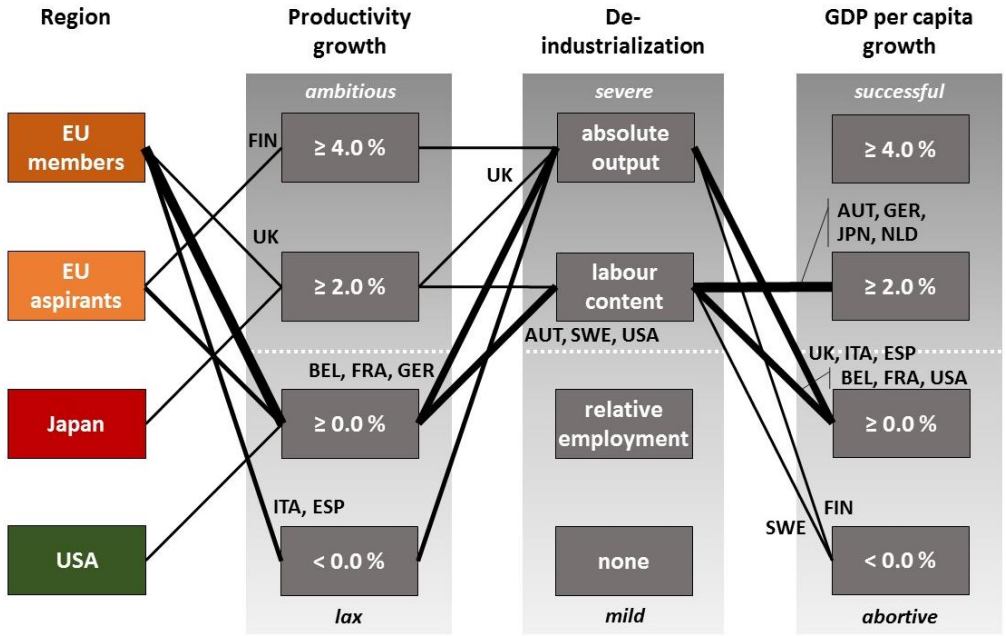
	Labour content	Employment	Output
absolute	**LAB CONT** CAGR < 0.0 %: all	**ME (abs.)** CAGR < 0.0 %: all w/o JPN, NLD	**MO (abs.)** CAGR < 0.0 %: all w/o AUT, JPN, NLD, USA
relative		**ME (rel.)**: CAGR < 0.0 %: all CAGR ≤ -1.0 %: all w/o JPN	**MO (rel.)**: CAGR < 0.0 %: all

Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data

The Eastern turbulences also inhibited Sweden and Finland, neighbouring countries which had relatively strong links to the former Soviet Union and were struggling to become free from these ties. For the five years under investigation here, both countries were even experiencing public welfare losses (Figure 10).

While all other states were going through the crisis without pushing their productivity too hard, Finland under its then neo-liberal government did just the opposite – with catastrophic results to its national economy, expressed by high unemployment, fast deindustrialization and reduced income per capita.

Figure 10. *Key Features of Deindustrialization (1988-1993)*



Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data

A World Economically United: 1993-2008

In the final long period investigated, the phase of true globalization due to open Eastern markets, there were new frame conditions for the rich Western economies, especially for the manufacturing sector. Low-cost countries became

more and more able to compete, at least on markets with low or medium levels of technology. Certain efforts were necessary to succeed in this environment, efforts that not all economies that were rather successful in previous decades were able to manage.

A comparative overview on the key indicators of deindustrialization is given by Table 11. All countries de-industrialized in a sociological sense. In half of the countries (Belgium, France, Netherlands, Spain, the United Kingdom, USA), relative employment decreased massively.

Table 11. *Overview on Manufacturing Indicators (1993-2008)*

Indicator		AUT	BEL	FIN	FRA	GER	ITA	NLD	ESP	SWE	UK	JPN	USA
Empl. (%)	1993	18.7	18.4	18.2	16.3	23.0	22.5	14.5	17.4	18.0	12.5	21.9	14.4
	2008	15.3	13.2	16.8	11.8	18.2	19.3	10.2	12.2	15.4	7.9	16.9	9.5
GVA p/c k USD)	1993	38.4	51.4	46.7	45.3	41.2	36.3	49.8	36.5	38.7	31.3	19.0	35.6
	2008	61.4	68.0	69.3	54.3	62.3	40.2	65.2	42.4	55.5	41.1	52.6	51.9
CAGR (%)	Empl. (rel.)	-1.3	-2.2	-0.5	-2.1	-1.5	-1.0	-2.3	-2.3	-1.0	-3.0	-1.7	-2.8
	Empl. (abs.)	-0.4	-1.2	1.0	-1.2	-1.1	-0.2	-0.8	0.6	-0.3	-2.4	-1.9	-1.6
	Output	2.6	0.6	3.6	-0.4	1.4	0.3	0.9	1.2	2.7	-0.8	0.0	1.0
	Output p/c	3.0	1.8	2.6	0.8	2.5	0.5	1.7	0.6	3.0	1.6	1.9	2.6
	Productivity	3.2	1.9	2.7	1.2	2.8	0.7	1.8	1.0	2.6	1.8	2.0	2.5
	Workload	-0.2	-0.1	-0.0	-0.5	-0.3	-0.2	-0.1	-0.4	0.5	-0.2	-0.1	0.1
	Labour	-0.6	-1.3	0.9	-1.6	-1.4	-0.4	-0.9	0.2	0.1	-2.6	-2.0	-1.5

Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data (in 2010 USD)

On the other hand, all countries except of France and the UK managed to increase their output. The reductions in labour content were mostly the result of medium to strong increases in productivity.

- Austria, Finland, Germany, Sweden were the four countries most determined in raising productivity. Accordingly, they were most successful in increasing their output. All are export countries and pursued a strategy striving for international competitiveness.
- In comparison to the previous decades, the USA followed a pretty determined strategy towards a better competitive position also at an international stage.
- Belgium and the Netherlands manoeuvred in the midfield, with a strategy somewhat stuck in the middle – not really increasing the competitive position, but not risking too many jobs as well.
- Spain and Italy kept pursuing their traditional precautious strategies of limited productivity rises, aiming at little job losses. Spain fared comparatively well, given its limited industrial capabilities.
- Japan's industry had the main new low-cost competition just next door. Despite of significant productivity rises, it could barely stabilize its output.

- France did not really meet with the competition but rather aimed at avoiding job losses by significantly reducing workload (reduction to 35 working hours per week). This resulted in limited productivity gains and a loss of its market position.
- The United Kingdom's manufacturing industry kept losing out against its competitors, despite of some more productivity increases.

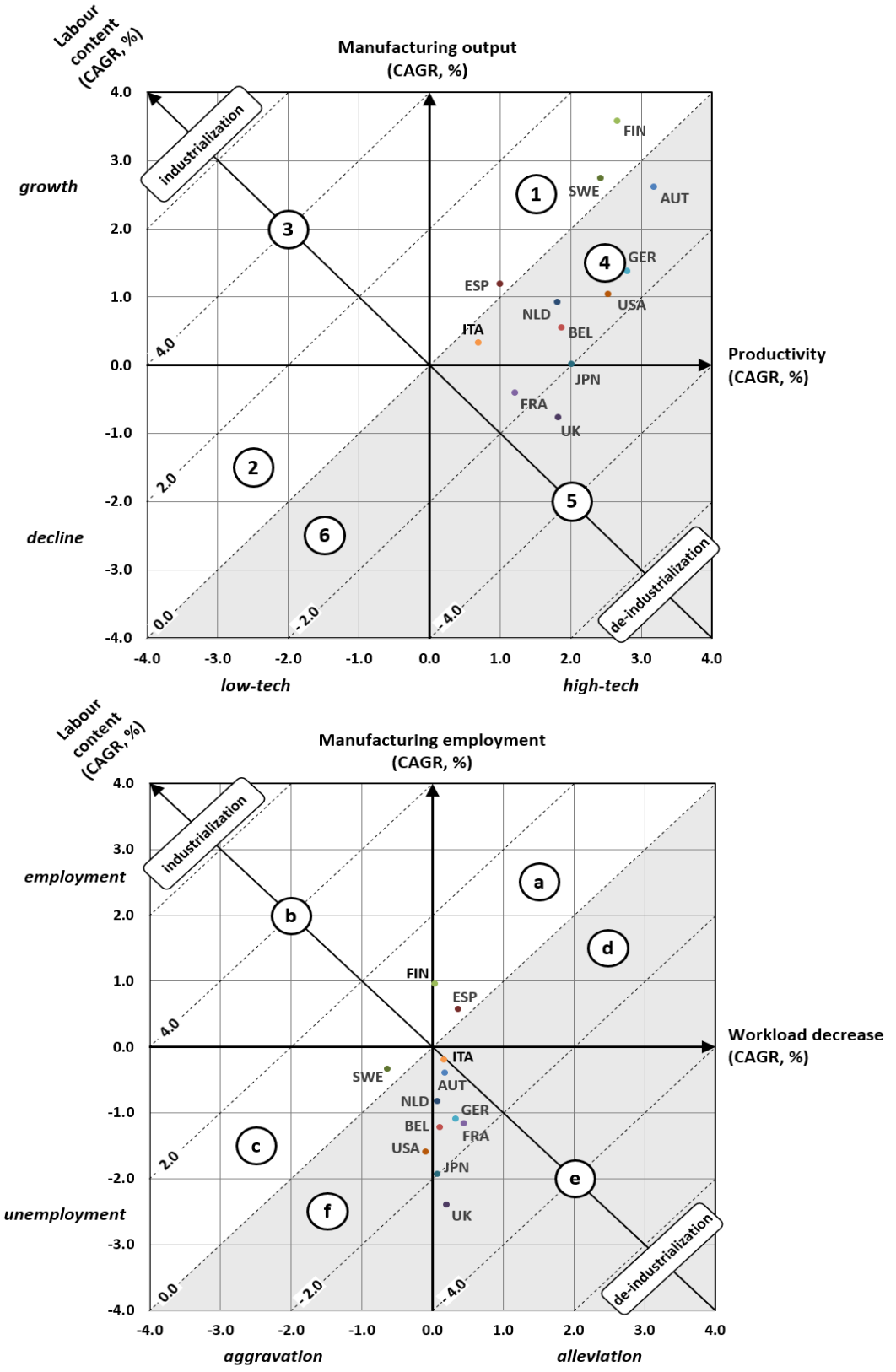
The pressure of globalization resulted in disperse scenarios. The standard 4e type was only followed by the Austria, Germany, the Netherlands, Belgium, Italy and Japan. Workload rises put the USA into a 4f scenario.

Finland played an extraordinary role. It managed to industrialize by raising productivity, output and labour content in parallel. Finland could also lower the average workload. Spain did the same, though at less impressive numbers – but nevertheless deindustrialized by relative employment. This is due to a significant growth in the total available workforce (societal change by higher female participation), leading to a relative decline of manufacturing employment despite of growth in absolute terms. Sweden also industrialized since its output, productivity and also the labour content grew. But since Sweden increased the individual workload significantly, it accounted a decline of absolute manufacturing employment. The scenario is one of the 1c type (pseudo-deindustrialization).

Two countries ran into or remained in trouble: France and the United Kingdom (5e type scenarios). Both produced less output, and both were the only countries where high-tech manufacturing did not grow faster than the industrial average. Since due to globalization, there is more market pressure especially in standard goods, this is an unfavourable development. In terms of success in manufacturing, the UK and France were the losers of the globalized period from 1993-2008.

A summary of the findings with regard to a decline of the manufacturing sector is given in Table 12. No matter what mode of deindustrialization, there is no simple interrelation with national income (Figure 12). Half of the more successful countries in GDP per capita had a medium-high productivity growth, half of them had a medium-low growth; the same holds for countries with a medium-low productivity growth. For mature economies, the manufacturing sector is not the only key driver of national wealth, as especially the British example demonstrates.

Figure 11. *Scenarios (1993-2008): Demand Side (up), Supply Side (down)*



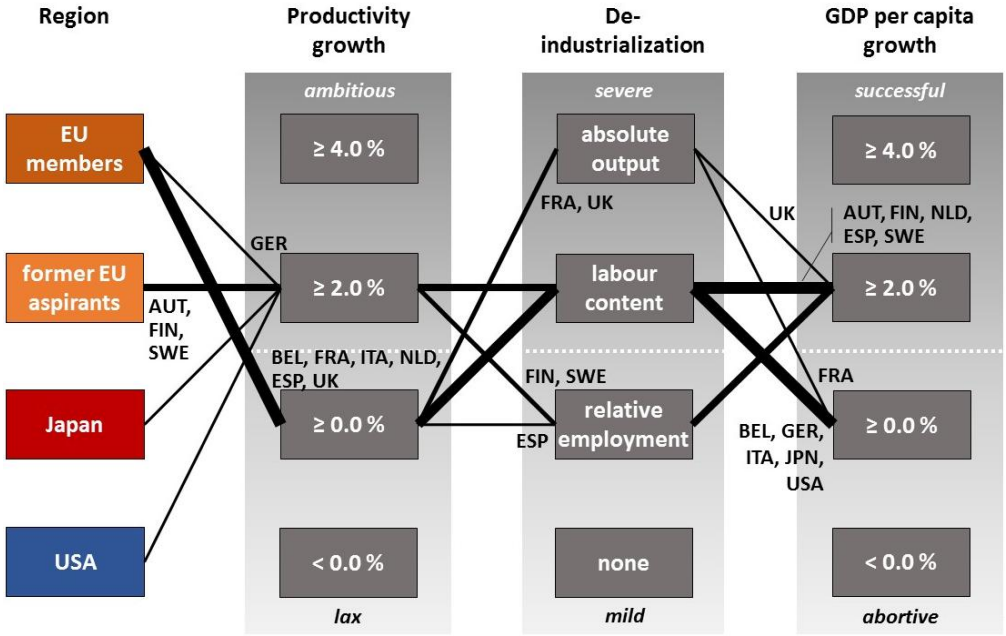
Source: Own graph, based on Groningen Growth and Development Centre (2012) data

Table 12. *Fulfilment of Deindustrialization Definitions (1993-2008)*

	Labour content	Employment	Output
absolute	**LAB CONT** CAGR < 0.0 %: all w/o FIN, ESP, SWE	**ME (abs.)** CAGR < 0.0 %: all w/o FIN, ESP	**MO (abs.)** CAGR < 0.0 %: FRA, UK
relative		**ME (rel.)**: CAGR < 0.0 %: all CAGR ≤ -1.0 %: all w/o FIN	**MO (rel.)**: CAGR < 0.0 %: all

Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data

Figure 12. *Key Features of Deindustrialization (1993-2008)*



Source: Calculations based on World Bank (2014a) and Groningen Growth and Development Centre (2012) data

There are four economies that have had a clear focus on technology, aiming at high productivity and international high-technology markets: Austria and Germany, Finland and Sweden. All of these had tremendous economic success; in Germany, the light picture was blurred by the burdens of its reunification. Its transfer payments to the former communist East amounted to an annual average of more than 100 billion Euro (Endres, 2010). Taking these payments into account, Germany was probably the economically most successful country between 1993 and 2008.

Ambitious industrial policies assured economic success at least in Europe. Only the Netherlands, Spain and the UK could achieve similar success, but on an individually different basis (see analysis in Przywara, 2016). Briefly summarized, these national courses were:

- Netherlands: trade, oil and gas;

- UK: knowledge-intensive services, especially finance;
- Spain: construction sector which blossomed with support of the EU for building infrastructure, especially means of transport (motorways, high-speed trains).

Accordingly, the forms of deindustrialization were very diverse. While the UK could compensate its losses in manufacturing output by other sectors, in France, the losses went along with an economic crisis.

Summary and Outlook

Deindustrialization in terms of a decline of the share of workers in manufacturing is a natural outflow of technical development towards automation and innovation. Only in the case of the UK and recently France, this also meant a reduction of sectoral output. For some mature nations, being at the cutting edge of manufacturing technology is one way to prosper in a globalised economy, as the examples of Austria, Finland, Germany and Sweden have demonstrated.

The course of deindustrialization is country-specific and is influenced by the respective country's position in the international division of labour. Economic welfare may also be achieved by competitive advantages in other sectors (e.g. KIBS, oil and gas production). Any sectoral weakness needs to be compensated by imports. Sectoral specialisation may be the source of wealth (e.g. oil and gas exports) but often weakens other sectors (e.g. manufacturing). Both as an exporter (e.g. of oil and gas) and as an importer (e.g. in manufacturing), the unbalanced economy is put at an extra risk of being very susceptible to blackmail from their respective customers or suppliers. Close international cooperation is the only way to limit these risks.

Deindustrialisation as a reduced share of sectoral employment is an opportunity in the Schumpeterian sense but may become a threat if taken too far without careful compensation.

References

Blackaby F (ed.) (1979) *De-industrialisation.* London: Heinemann.

Bryson J, Taylor M (2008) *Enterprise by 'Industrial' Design: Creativity and Competitiveness in the Birmingham (UK) Jewellery Quarter*. Available at http://www.dime-eu.org/files/active/0/WP47-IPR.pdf

Chakrabortty A (2013) *Thatcherism, R.I.P.* Available at: http://www.businessweek.com/articles/2013-04-11/thatcherism-r-dot-i-dot-p-dot-britains-economy-needs-new-ideas

Clark C (1940) *The conditions of economic progress.* London: Macmillan.

Cowell M (2014) *Dealing with Deindustrialization: Adaptive Resilience in American Midwestern Regions.* London: Routledge.

Dasgupta S, Singh A (2006). *Manufacturing, Services and Premature De-Industrialisation in Developing Countries: A Kaldorian Empirical Analysis.* Centre for Business Research, Faculty of Economics, Cambridge: University of Cambridge.

Endres A (2010) *Aufbau Ost - "Ein demokratisches Gemeinwesen lebt von Chancengleichheit".* Available at: http://www.zeit.de/wirtschaft/2010-03/Aufbau-ost-interview

European Commission (ed.) (2014) *Eurostat Database.* Available at: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database

European Union (ed.) (2015) *EU member countries.* Available at: http://europa.eu/about-eu/countries/member-countries/

Fisher A (1935) *The clash of progress and security.* London: Macmillan.

Fourastié J (1949) *Le Grand Espoir du XXe siècle. Progrès technique, progrès économique, progrès social.* Paris: Presses Universitaires de France.

Fourastié J (1954) *Die große Hoffnung des 20. Jahrhunderts.* Köln: Bund-Verlag.

Groningen Growth and Development Centre (ed.) (2012) *Growth and Productivity Accounts: Data in the ISIC Rev. 4 industry classification, rolling updates.* Available at: http://www.euklems.net/

Healey N (1994) *UK: De-industrialisation - Made in Britain.* Available at: http://www.managementtoday.co.uk/uk-de-industrialisation-made-britain/article/410136

Henning F-W (1995) *Die Industrialisierung in Deutschland 1800 bis 1914* (9th ed.). Paderborn: Schöningh.

Hospers G-J, Steenge AE (2002) Structural and Institutional Change in Europe: An Analysis inspired by Fourastié and Perroux. In Prinz A, Steenge A, and Vogel A (eds.) *Agglomeration, Population und Koordination in Europa.* Münster: LIT Verlag, 1-34.

International Labour Organization (ed.) (2014) *ILO main statistics (annual).* Available at LABORSTA Internet: http://laborsta.ilo.org/STP/guest

Investopedia (ed.) (2014) *Compound Annual Growth Rate - CAGR.* Available at: http://www.investopedia.com/terms/c/cagr.asp

Jaililian H, Weiss J (2000) De-industrialisation of Sub-Saharan Africa: Myth or Crisis? *Journal of African Economies* 9(1): 24-43.

Kaldor N (1966) *Causes of the Slow Rate of growth in the United Kingdom.* Cambridge: Cambridge University Press.

Klenner W, Watanabe H (2009) *Neupositionierung regionaler Führungskräfte: Japan und Deutschland.* Bern: Peter Lang.

Klodt H (2014a) *Deindustrialisierung.* Available at: http://wirtschaftslexikon.gabler.de/Archiv/71504/deindustrialisierung-v6.html

Klodt H (2014b) *Drei-Sektoren-Hypothese.*Available at: http://wirtschaftslexikon.gabler.de/Archiv/58475/drei-sektoren-hypothese-v6.html

Klodt H (2014c) *Sektoraler Strukturwandel.*Available at: http://wirtschaftslexikon.gabler.de/Archiv/71503/sektoraler-strukturwandel-v6.html

Kollmeyer C (2009) Explaining Deindustrialization: How Affluence, Productivity Growth, and Globalization Diminish Manufacturing Employment. *American Journal of Sociology* 114(6), 1644-1674.

Kuznets S (1966) *Modern Economic Growth: Rate, Structure and Spread.* New Haven: Yale University Press.

Lever W (1991) Deindustrialisation and the Reality of the Post-industrial City. *Urban Studies* 28(6), 983-999.

Maddison A (1995) *Monitoring the World Economy.* Paris: OECD Development Centre.

Murata Y (2008). Engel's law, Petty's law, and agglomeration. *Journal of Development Economics* 87(1), 161-177.

OECD (ed.) (2015) *Average annual hours actually worked per worker.* Available at: http://stats.oecd.org/Index.aspx?DataSetCode=ANHRS

Petty W (1690) *Political Arithmetick.* London.

Pieper U (1999) *Deindustrialization and the Social and Economic Sustainability Nexus in Developing Countries: Cross-Country Evidence on Productivity and Employment.* Available at http://www.economicpolicyresearch.org/scepa/publica tions/working papers/1998/cepa0110.pdf

Pohl H-J (1970) Kritik der Drei-Sektoren-Theorie. *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung* 3(4), 313-325.

Przywara R (2016). Versions of Deindustrialization - A model-based analysis 1973-2008. PhD Thesis, Cheltenham: University of Gloucestershire.

Rostow WW (1960) *The Stages of Economic Growth.* Cambridge: Cambridge University Press.

Rowthorn R, Wells JR (1987) *De-industrialization and Foreign Trade.* Cambridge: Cambridge University Press.

Scheuer M, Zimmermann G. (2006) Deindustrialisierung: Eine neue "britische Krankheit"? *Wirtschaftsdienst* 2006(4), 245-251.

United Nations (ed.) (2002) *International Standard Classification of All Economic Activities - Revision 3.1.* New York: United Nations.

United Nations (ed.) (2008) *International Standard Classification of All Economic Activities - Revision 4.* New York: United Nations.

van Suntum U (2006) *Rechnen mit Wachstumsraten.* Available at: https://www.wiwi.uni-muenster.de/insiwo/studieren/vorl/10_kub/3.RechnenmitWachstumsraten.pdf

White H (1996) Adjustment in Africa. *Development and Change* 27, 785-815.

World Bank (ed.) (2014a) *Data/Indicators.* Available at: http://data.worldbank.org/indicator/all

World Bank (ed.) (2014b) *How does the World Bank classify countries?* Available at: https://datahelpdesk.worldbank.org/knowledgebase/articles/378834-how-does-the-world-bank-classify-countries