The Structural Change of Manufacturing in Hungary, 2008–2014

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*After the financial crisis of 2008, there was an increased focus on industrial restructuring and reindustrialization in many countries including Hungary. In our study, with the adaptation of Tregenna's method, we analyze the transformation of the structure of Hungarian manufacturing based on employment and gross value added, considering the 13 manufacturing sub-sections from 2008 to 2014. We classify the sub-sections into growing, stagnating and weakening groups. Following the analysis of the sub-section groups, we also describe the changes of particular background factors, such as investments, export, foreign direct investment and the composition of employment.**

Journal of Economic Literature (JEL) code: E22, E23, E24, J21, L60.

Introduction

After the crisis originating from the financial sector in 2008, the economic policy of several countries focused on promoting the real sector, manufacturing in particular. Various resolutions were taken in the European Union on boosting manufacturing activities, on "reindustrialization" (EC, 2010; 2014). The current 16% share of manufacturing activities is proposed to be increased to 20% by 2020, the

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explanation emphasizing that 80% of the EU's export is provided by industry and that industry can stimulate a wide range of related services (*Győrffy*, 2015). This shift can be observed in the majority of developed countries, the former deindustrialization was replaced by reindustrialization in economic policies, encouraging high value added knowledge-intensive activities, rather than traditional manufacturing ones (*Westkamper*, 2014).

Reindustrialization as a governmental concept emerged in Hungary as well: industry's 26.7% share of the country's GVA in 2014 (out of which manufacturing represents 23.5%) is intended to be increased to 30%; to this end the Irinyi Plan was introduced in the spring 2016. The professional opinions on reindustrialization concepts are mixed, there are skeptical and opposing opinions besides supporting ones (*Botos*, 2010; *Bod,* 2013; *Lux*, 2012; *Uliha–Vincze*, 2014; *Valentinyi*, 2014).

In our paper, we examine the changes in the structure of Hungarian manufacturing based on the methodology applied by *Tregenna* [2009; 2013]. In her research on de- and reindustrialization she relied on data on employment and GVA analyzing labor productivity and labor intensity, and the changes of these indicators. *Tregenna* studied the structural change of different countries and the role of manufacturing in this process; we adapt her method on the sub-sections in manufacturing in Hungary. In the analysis, we consider 2009 as the base-year. Due to the switch to the TEÁOR'08 (NACE 2008) classification, comparable data at sub-section level are consistently available from 2008, but as a result of the downturn caused by the crisis, in 2008–2009 there is a so-called "structural break" in the data, thus the processes of the previous period changed fundamentally. First we describe the situation of manufacturing and its sub-sections in Hungary, then we present our calculations related to the structural transformation of the sub-sections, as well as our typifying of the sub-sections and their specificities. The end of the study reviews some important background factors of the presented structural change of manufacturing such as investments, export, foreign direct investment and the composition of employment.

Hungarian manufacturing and its sub-sections

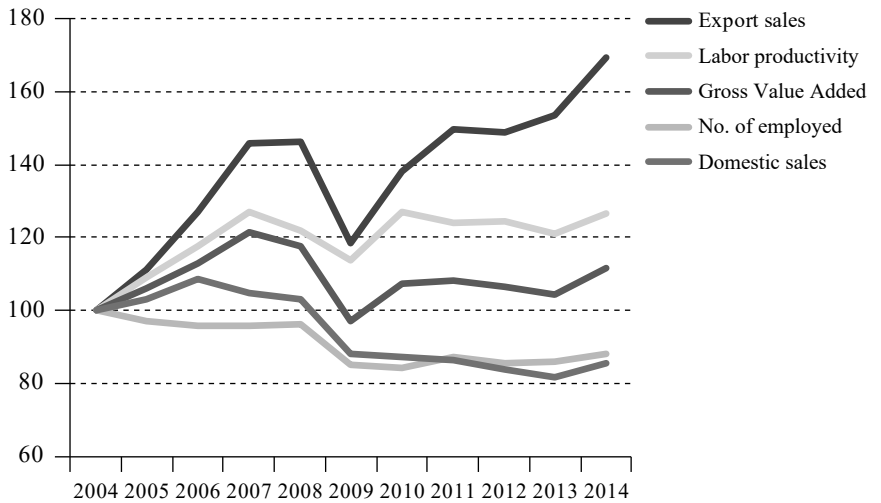
In the analysis of the structural change of manufacturing, as well as de- and reindustrialization, usually two basic indicators are taken into consideration: number of employees and GVA (*Barta et al.*, 2008; *Cristopherson et al.*, 2014; *Szirmai*,

2012; *Tregenna*, 2014; *Weiss*, 2002). In the detailed analysis, we also analyze labor productivity calculated from these two indicators, and will also use further indicators, e.g., the change of sales and export in particular.

Figure 1

Change of the main indicators of manufacturing

(2004 = 100%)



Note: The data of manufacturing export, labor productivity, domestic sales and GVA are volume indices.

Source: Authors' calculation based on the HCSO STADAT 2.1.30; 3.1.4; 3.1.5; 4.2.8; 4.2.10 tables (downloaded: 03/21/2016).

The evolution of domestic manufacturing can be divided into three different stages, if we consider a longer period, from the accession to the European Union in 2004 (see: *Figure 1*). Between 2004 and 2007, GVA, labor productivity and export sales increased dynamically, while employment gradually decreased. Manufacturing was halted in 2008, and substantially dropped in 2009; there is an evident "break" in the case of each indicator. The third stage takes place from 2010, export became dynamic again, while the other indicators essentially stagnated, it was only in 2014 that GVA increased and labor productivity improved. In our opinion, however, the tendency indicated by the data is not reindustrialization; the boost in export refers primarily to a transformation within manufacturing, to a structural change.

Apparently, structural change is continuously ongoing in industry, but a substantial transformation usually takes place over a longer period, only particular signs are present in the shorter period we analyze.

In our study, we examine the *structural change in manufacturing* for 13 sub-sections based on the TEÁOR'08 (NACE 2008). We considered the employment number as the number of staff, our database includes full-time and part-time manual and non-manual workers employed by organizations with more than 4 employees from the dissemination database of the Hungarian Central Statistical Office. GVA is real value added on a 2008 base, which we calculated using price indices calculated from values added at current prices and at the price of the previous year for each year, taken also from the dissemination database of the Hungarian Central Statistical Office.

Employment number decreased substantially (by 3.7%) in the total national economy in 2009 (see: *Table 1*). Following slight fluctuations, nationwide employment exceeded the level of 2008 by about 60 thousand people in 2014. *Employment number in manufacturing* was below the value of 2008 in both 2013 and 2014, however, it outperformed the value of 2009 in both years, by 28 thousand people (by 3.6%) in 2014. The share of manufacturing in employment amounted to 24.8% in 2008, while only 22.7% in 2014, thus manufacturing declined in the national economy (although its proportion slightly increased in 2014 compared to the previous years).

By manufacturing sub-sections, *employment number* changed to a minimal degree between 2009 and 2014 (see: *Table 1*). There are four sub-sections [Manufacture of machinery and equipment (CK), Manufacture of transport equipment (CL), Manufacture of chemicals and chemical products (CE) and Manufacture of pharmaceuticals, medicinal chemical and botanical products (CF)] where the figure of 2014 exceeds that of both 2008 and 2009, i.e., in these sub-sections the number of employees grew, while in others it stagnated or substantially decreased [Manufacture of textiles, apparel, leather and related products (CB), Manufacture of wood and paper products, and printing (CC), Manufacture of coke and refined petroleum products (CD), Manufacture of computer, electronic and optical products (CI) and Manufacture of electrical equipment (CJ)].

Table 1

Employment number in manufacturing sub-sections

(Person)

Sub-section	Code	Number of employees, ’000							Change, %	
		2008	2009	2010	2011	2012	2013	2014	2014/ 2008	2014/ 2009
Manufacture of food products, beverages and tobacco products	CA	101.6	96.4	97.4	95.7	94.2	94.0	97.0	95.5	100.6
Manufacture of textiles, apparel, leather and related products	CB	54.5	46.0	43.2	43.2	43.1	42.0	41.9	76.9	91.0
Manufacture of wood and paper products, and printing	CC	43.5	39.0	39.8	38.6	36.4	36.3	38.4	88.2	98.4
Manufacture of coke, and refined petroleum products	CD	6.5	6.4	6.3	6.4	6.4	6.1	5.9	90.6	92.8
Manufacture of chemicals and chemical products	CE	13.5	13.0	12.5	13.8	12.6	12.7	13.5	100.1	103.5
Manufacture of pharmaceuticals, medicinal chemical and botanical products	CF	16.1	15.7	15.9	16.6	16.7	17.1	17.6	109.4	111.8
Manufacture of rubber and plastics products, and other non-metallic mineral products	CG	74.9	63.4	60.7	62.5	60.3	60.4	63.7	85.1	100.5
Manufacture of basic metals and fabricated metal products, except machinery and equipment	CH	85.9	71.0	67.2	73.0	73.0	74.9	79.1	92.0	111.4
Manufacture of computer, electronic and optical products	CI	60.3	51.6	57.6	57.5	51.7	48.2	41.5	68.9	80.4
Manufacture of electrical equipment	CJ	54.2	45.7	37.2	37.0	36.2	37.1	38.9	71.8	85.1
Manufacture of machinery and equipment n.e.c.	CK	45.2	43.1	48.0	57.9	57.3	56.1	56.8	125.8	131.7
Manufacture of transport equipment	CL	86.0	66.9	67.9	70.0	72.4	78.8	86.6	100.8	129.5
Other manufacturing, and repair and installation of machinery and equipment	CM	43.5	48.0	46.7	49.4	49.1	48.9	47.3	108.7	98.4
Manufacturing	C	685.4	606.3	600.3	621.5	609.4	612.6	628.2	91.6	103.6
Total	A-S	2761.9	2660.7	2701.9	2691.5	2674.1	2700.2	2823.1	102.2	106.1

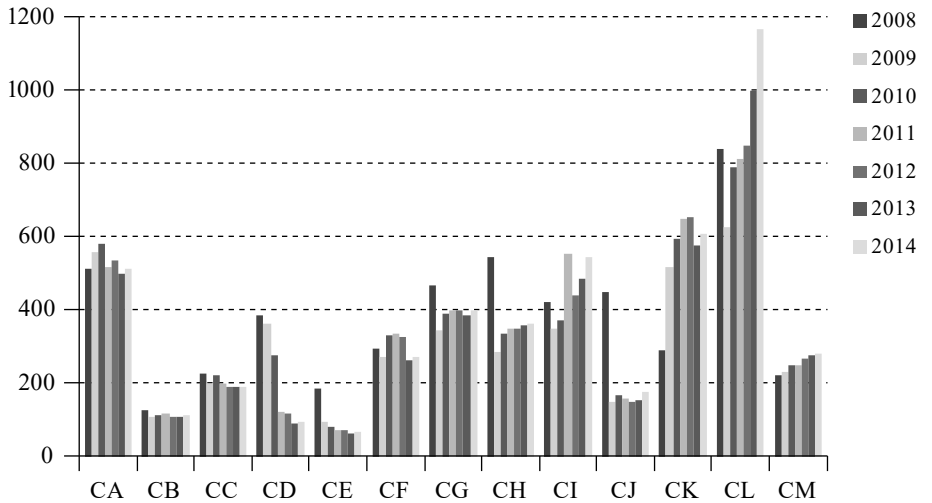
Source: Authors’ collation from the dissemination database of the HCSO (downloaded: 09/04/2015).

In the case of the data on employment number, two influencing factors need to be mentioned: public employment and people working abroad. As our study is limited to manufacturing, we consider that the influencing effect of these factors is not significant in this context.[1]

Figure 2

GVA in manufacturing sub-sections, at prices of 2008

(Billion HUF)



Note: CA = Manufacture of food products, beverages and tobacco products, CB = Manufacture of textiles, apparel, leather and related products, CC = Manufacture of wood and paper products, and printing, CD = Manufacture of coke and refined petroleum products, CE = Manufacture of chemicals and chemical products, CF = Manufacture of pharmaceuticals, medicinal chemical and botanical products, CG = Manufacture of rubber and plastics products, and other non-metallic mineral products, CH = Manufacture of basic metals and fabricated metal products, except machinery and equipment, CI = Manufacture of computer, electronic and optical products, CJ = Manufacture of electrical equipment, CK = Manufacture of machinery and equipment, CL = Manufacture of transport equipment, CM = Other manufacturing, and repair and installation of machinery and equipment.

Source: Authors' collation from the dissemination database of the HCSO (downloaded: 12/15/2015).

Only a few sub-sections were able to increase their *GVA* from 2010 (see: *Figure 2*). The manufacture of transport equipment (CL), the manufacture of computer,

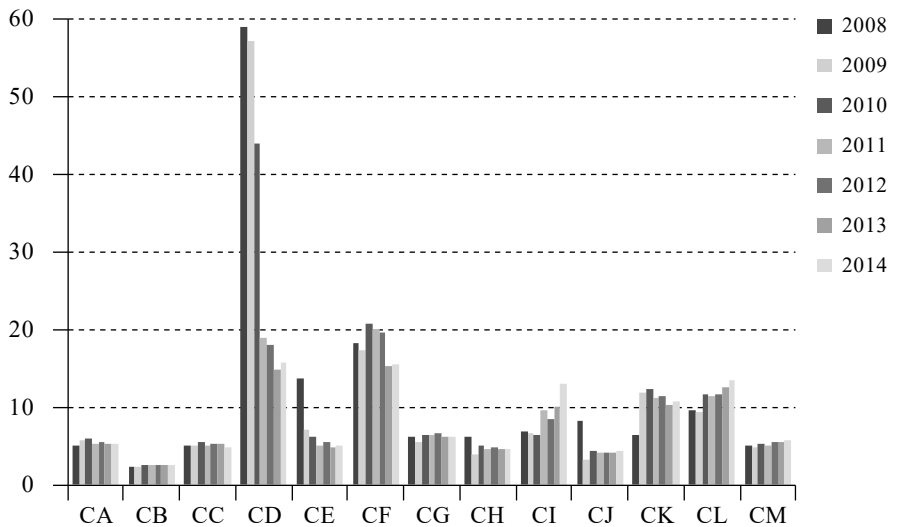
[1] For more details about the methodological issues related to taking account of the Hungarians working abroad and the foreign nationals working in Hungary, see *Lakatos* [2015].

electronic and optical products (CI) and other manufacturing, and repair and installation of machinery and equipment (CM) expanded with slight fluctuations but dynamically. The output of several sub-sections essentially stagnated (CA, CB, CE, CF CG, CH, CJ and CK), while the manufacture of wood and paper products, and printing (CC) and the manufacture of coke, and refined petroleum products (CD) dropped. The change in employment number and the development of GVA both imply that there is a structural change in progress in manufacturing; in particular, the manufacture of transport equipment strengthened its positions considerably.

Figure 3

GVA per employee in manufacturing sub-sections, at prices of 2008

(Million HUF)



Note: CA = Manufacture of food products, beverages and tobacco products, CB = Manufacture of textiles, apparel, leather and related products, CC = Manufacture of wood and paper products, and printing, CD = Manufacture of coke and refined petroleum products, CE = Manufacture of chemicals and chemical products, CF = Manufacture of pharmaceuticals, medicinal chemical and botanical products, CG = Manufacture of rubber and plastics products, and other non-metallic mineral products, CH = Manufacture of basic metals and fabricated metal products, except machinery and equipment, CI = Manufacture of computer, electronic and optical products, CJ = Manufacture of electrical equipment, CK = Manufacture of machinery and equipment, CL = Manufacture of transport equipment, CM = Other manufacturing, and repair and installation of machinery and equipment.

Source: Authors' calculations based on the dissemination database of the HCSO.

GVA per employee, i.e., *labor productivity,* developed in different ways in different manufacturing sub-sections (see: *Figure 3*). It increased significantly only in two sub-sections: in the manufacture of transport equipment (CL), where employment returned to the level of 2008, and in the manufacture of computer, electronic and optical products (CI) sub-section, where, on the other hand, employment significantly dropped. In the majority of the sub-sections, labor productivity stagnated, while it decreased in the sub-sections of the manufacture of coke, and refined petroleum products (CD), the manufacture of chemicals and chemical products (CE), and the manufacture of pharmaceuticals, medicinal chemical and botanical products (CF).

The review of the key indicators of manufacturing and its sub-sections shows that a structural change has started, but the various sub-sections are developing in different ways. This transformation can be grasped by examining the change in employment number and GVA.

The methodology of the analysis of the structural change in manufacturing

Tregenna [2009, 2013] studied de- and reindustrialization as the change of the employment number in manufacturing in various countries, decomposing it into two components. During a process of deindustrialization, employment in manufacturing in a country can decrease, on the one hand, because manufacturing produces less value added (i.e., the sector shrinks as a whole): she calls this the *sector-growth effect*. On the other hand, the number of employees in the sector can decrease because the productivity of workers has increased and the sector has become less labor-intensive: this is what she calls the *labor-intensity effect*. She argues that the situation in a country is more favorable if a decrease in the manufacturing employment number takes place so that the entire sector shrinks but labor productivity grows, rather than for example, if the opposites of these two happen.

We reinterpreted *Tregenna's* decomposition within Hungary and applied it to the change of employment number in each manufacturing sub-section. The previous chapter indicates that there was an increase in employment number in some of the sub-sections, while there was a decrease in others, and value added also changed in different ways for the different sub-sections.

The two effects mentioned above playing a role in the change of employment can be quantified as follows. Let L_{it}, be the number of employees in any sub-section over a period, and L_{it+1} in the next period (hereafter we apply the term "sector" to national

manufacturing). The value added generated by a sub-section is Q_{it} and Q_{it+1} in the two periods (in real terms). Based on these indicators we can determine the labor intensity in the two periods as $\Phi = L/Q$ (which indicator is the reciprocal of labor productivity[2]). Thus, for both periods $L = \Phi \cdot Q$ holds by definition.

The change of employment number in a sub-section can be resolved as follows:

$$\Delta L_i = \Phi_{it+1} \cdot Q_{it+1} - \Phi_{it} \cdot Q_{it} = (\Phi_{it+1} - \Phi_{it}) \cdot \left(\frac{Q_{it+1} + Q_{it}}{2} \right) + (Q_{it+1} - Q_{it}) \cdot \left(\frac{\Phi_{it+1} + \Phi_{it}}{2} \right) \quad (1)$$

The first term is the labor-intensity effect, and the second term is the sector-growth effect. From this the *labor intensity-effect* as a percentage change in employment for a given sub-section is:

$$(\Phi_{it+1} - \Phi_{it}) \cdot \left(\frac{Q_{it+1} + Q_{it}}{2} \right) \cdot \frac{100}{L_{it}} \quad (2)$$

The labor-intensity effect shows by what percentage the number of employees in the sub-section should have changed solely as a result of the change in labor productivity in that sub-sector over the given period. If production becomes more efficient at the end of the period than it was at the beginning, then at the end of the period fewer workers are required to generate the same value added. In this case the labor-intensity effect will be negative, pointing toward a decrease in employment.

Similarly, the *industry-growth effect* as a percentage change in employment for a given sub-section is:

$$(Q_{it+1} - Q_{it}) \cdot \left(\frac{\Phi_{it+1} + \Phi_{it}}{2} \right) \cdot \frac{100}{L_{it}} \quad (3)$$

The industry-growth effect shows by what percentage the employment number should have changed over the given period in the sub-section solely based on the sub-section generating more (or less) value added in the subsequent period compared to the earlier one, with all other factors remaining unchanged. If the value added generated increased, then assuming constant labor productivity more employees are required to generate this higher value added. In this case the sector-growth effect

[2] We adopted the concept of labor intensity in our paper in *Tregenna's* interpretation for comparability, even though the Hungarian literature uses this term in a different sense. For the same reasons, in order for our line of thinking to harmonize with the internationally renowned author's, instead of the intuitively more obvious labor productivity, we use labor intensity introduced as its "reverse indicator" in our analysis.

will be positive, pointing toward an increase in employment. The sum of the two effects gives the percentage change of the employment number in the industry. In our study, first we describe the decomposition of national economy and manufacturing, and then we address the sub-sections.

The structural change of manufacturing

In the period of 2009–2014 in the whole national economy, employment increased to an appreciable extent (by 6.1%) as we presented in *Table 1*. This increase was combined with a slight improvement in labor productivity, which was greater than the employment decreasing effect of productivity growth (see: *Table 2*).

Table 2

Decomposition of the performance of national economy and manufacturing

	Labor-intensity effect (%)		Sector-growth effect (%)		% change of employment number	
	National economy	Manufacturing	National economy	Manufacturing	National economy	Manufacturing
2009	3.04	6.54	–6.70	–18.08	–3.67	–11.54
2010	0.75	–11.00	0.80	10.00	1.55	–1.00
2011	–2.29	2.66	1.91	0.88	–0.38	3.53
2012	1.15	–0.45	–1.80	–1.49	–0.65	–1.94
2013	–1.53	2.68	2.50	–2.15	0.98	0.53
2014	0.75	–4.35	3.80	6.88	4.55	2.54
2008–2014	1.92	–3.43	0.29	–4.93	2.22	–8.36
2009–2014	–1.23	–10.72	7.33	14.32	6.10	3.60

Source: Authors' collation from the dissemination database of the HCSO (downloaded: 12/15/2015).

The periods of 2008–2009 and 2011–2012 show different type of decrease in employment number. While in the former case, the decrease in employment number took place with declining labor productivity, in the latter case value added increased,

but it was outweighed by the decrease in employment number due to improved labor productivity.

The lowest point of the crisis was the year 2009; the sector-growth effect shows a substantial decline in this year in both total economy and manufacturing. 2010 and 2011 are clearly favorable in terms of the sector-growth effect. If we select 2009 as the base year, and we study the change of employment number in the period of 2009–2014, we can see an expansion in both national economy and manufacturing.

Table 3

A possible categorization/typology of sub-sections

Type number	Marking		Labor-intensity effect	Sector-growth effect	% change of employment number
1		(…)	–	+	+
2	*	(…)	+	+	+
3		(…)	+	–	+
4	*	(…)	–	+	–
5		(…)	–	–	–
6	*	(…)	+	–	–

Note: We will use the system in the "marking" column in *Table 4.* A sub-section falling into the first category will be written on a white background with no asterisk. A sub-section falling into the second category will be written on white background, but marked with an asterisk, etc.

Source: Own construction.

The decline in employment in 2008–2009 was so substantial in manufacturing, that even by 2014 it could not recover to its 2008 level, whereas the total national economy could. It is interesting to observe that while the increase in employment number took place together with labor productivity growth and a simultaneous value added expansion in terms of both total economy and manufacturing, both effects were stronger in manufacturing, but the percentage increase in employment number generated as their resultant is still lower. Due to the significant decline in both national economy and manufacturing from 2008 to 2009, we consider that we can

get a more accurate picture of the processes after the crisis if we take 2009 as the base year.

The labor-intensity effect, the sector (sub-section) growth effect and the percentage change of employment number can take positive or negative values. Overall, there are 6 mathematically possible combinations. If the key indicator of reindustrialization is that the number of employees is increasing, the following order seems most probable (1 – best case, 6 – worst case) (see: *Table 3*).

The most favorable case (1) is when employment number increases in a way that the value added of the given sub-section also increases, and at the same time it becomes more productive. The most unfavorable case (6) is when employment number decreases in the given sub-section in a way that, in addition to the shrinkage of the whole sub-section, even labor productivity decreases. In *Table 2* we found that while 2009 falls into the worst (6^{th}) category in the case of both national economy and manufacturing, the year 2010 can already be positioned into a better (the 4^{th}) category for manufacturing even though the outcome is still a decrease in employment (as is the case in the year 2011 for the whole national economy).

Performing the decomposition and categorizing each manufacturing sub-section based on *Table 3,* a differentiated picture emerges by sub-sections (see: *Table 4*). The marking (coloring with or without asterisk as in *Table 3*) of the cells indicates the industry growth and labor intensity effects explaining the percentage change in employment reported in the cells. The first column of the *table* shows that during 2009, employment number decreased not only in national economy and manufacturing, but also in almost every manufacturing sub-section (except for CM: other manufacturing, and repair and installation of machinery and equipment), moreover, this mostly happened in a way that the shrinkage of the sub-section was accompanied by a decline in labor productivity. In subsequent years, (in particular in 2011 and 2014) the employment figure of many manufacturing sub-sections was rising, but as the second-to-last total column shows, the decline of 2009 generally could not be regained. The situation is better if we start out from 2009 as the base year: thus in the period of 2009–2014, 7 out of 13 sub-sections could achieve a lesser or greater increase in employment number.

The percentage changes of employment in each manufacturing sub-section, which are given in *Table 4,* are received as the resultant of the industry-growth effect and the labor-intensity effect. *Figure 4* now only presents the direction and percentage of the change of employment for the entire period of 2009–2014 explained by the sector growth-effect (on the vertical axis) and the labor-intensity effect (on the horizontal

axis) separately for each sub-section. Let us take the sub-section Manufacture of transport equipment (CL) as an example. The decomposition reveals that labor productivity improved in this sub-section, because of which employment should have decreased by 44.12% ceteris paribus. The real GVA produced by the sub-section, however, increased, which by itself should have increased the employment number by 73.64%. The first is the labor-intensity effect, the second is the sector-growth effect. These two numbers as coordinates will locate sub-section CL in *Figure 4,* and the sum of these two numbers gives the 29.53% employment increase reported in *Table 4* for this sub-sector CL, and will put this into category one in *Table 3.*

Employment increases in the case of the points above the line drawn from the upper left corner to the lower right corner of the figure and it decreases in the sub-sections represented by points below the line. The portion of the second quadrant above this diagonal is the most favorable combination of a negative labor-intensity effect (increasing labor productivity) and the over-compensating industry-growth effect: sub-sections represented here are of the first category in *Table 3* (like sub-section CL we used above as an example). In a clockwise direction from here we can find sub-sections of the second category in the first quadrant, then of the third category in the shaded part of the fourth quadrant. The white area below the diagonal in the second quadrant contains sub-sections of the fourth category, the third quadrant those of the fifth and finally sub-sections of the sixth category will be found in the white area below the diagonal in the fourth quadrant (like, for example, Manufacture of wood and paper products, and printing (CC), where the number of employed decreased by 1.59% as a sum of a labor-intensity effect of 1.98 and a sector-growth effect of –3.57).

We consider strengthening sub-sections (at least in terms of employment expansion) in the period of 2009–2014:

- CK (Manufacture of machinery and equipment n.e.c.),
- CL (Manufacture of transport equipment),
- CF (Manufacture of pharmaceuticals, medicinal chemical and botanical products) and
- CH (Manufacture of basic metals and fabricated metal products, except machinery and equipment) sub-sections.

Out of the sub-sections we identified as strengthening, only CH and CL belong to the 1st category, the best in *Table 3,* and CK sub-section is included in category 2. We classified CF sub-section from the 3rd category as a strengthening one because the increase in its employment number is close to the other sub-sections listed here.

Table 4

Decomposition of the performance of manufacturing sub-sections

	2009	2010	2011	2012	2013	2014	**2008–2014**	**2009–2014**
Total	* –3.66	* 1.55	* –0.38	* –0.65	0.98	* 4.55	* **2.22**	**6.10**
C	* –11.54	* –1.00	* 3.53	–1.94	0.53	2.53	**–8.36**	**3.60**
CA	* –5.07	0.98	* –1.73	* –1.55	* –0.20	* 3.18	**–4.50**	**0.61**
CB	* –15.47	* –6.18	* –0.02	* –0.28	–2.52	* –0.17	**–23.05**	* **–8.97**
CC	* –10.36	1.96	* –3.01	–5.77	* –0.09	* 5.7	* **–11.79**	* **-1.59**
CD	* –2.36	* –1.05	1.60	* –0.06	* –4.88	* –2.92	* **–9.41**	* **–7.22**
CE	* –3.24	* –4.26	10.68	–8.42	0.77	5.81	**0.12**	**3.48**
CF	* –2.23	1.03	* 4.92	0.46	2.46	2.5	**9.35**	**11.85**
CG	* –15.29	* –4.26	* 2.88	* –3.43	0.09	* 5.55	* **–14.88**	**0.50**
CH	* –17.39	* –5.35	* 8.67	* 0.00	* 2.56	* 5.62	* **–7.60**	**11.42**
CI	* –14.38	* 11.68	* –0.30	* –10.10	* –6.64	* –13.94	* **–31.14**	* **–19.58**
CJ	* –15.57	* –18.72	* –0.54	* –2.09	2.63	4.75	* **–28.17**	* **–14.92**
CK	* –4.51	11.25	* 20.69	* –0.97	* –2.21	1.32	**25.80**	* **31.74**
CL	* –22.21	1.59	* 2.99	3.51	8.80	9.93	**0.77**	**29.53**
CM	* 10.47	* –2.81	* 5.83	* –0.62	* –0.45	* –3.32	**8.69**	* **–1.62**

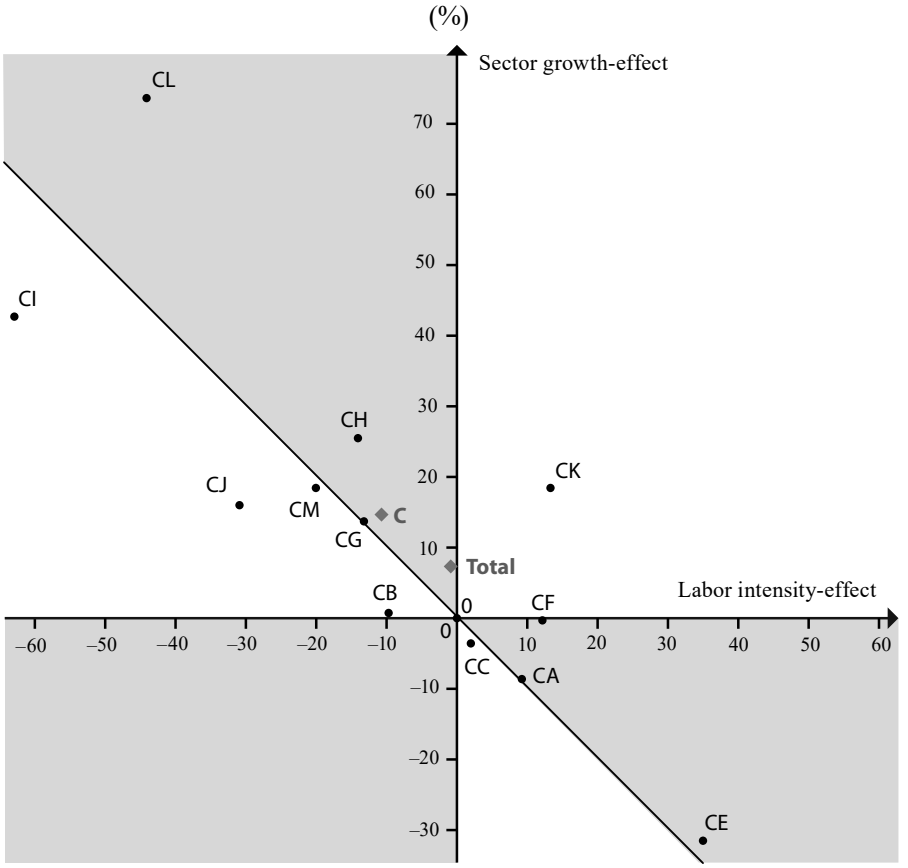
Note: The color and asterisk marking of cells indicate how the sub-section changed based on the marking system of *Table 3.*

CA = Manufacture of food products, beverages and tobacco products, CB = Manufacture of textiles, apparel, leather and related products, CC = Manufacture of wood and paper products, and printing, CD = Manufacture of coke and refined petroleum products, CE = Manufacture of chemicals and chemical products, CF = Manufacture of pharmaceuticals, medicinal chemical and botanical products, CG = Manufacture of rubber and plastics products, and other non-metallic mineral products, CH = Manufacture of basic metals and fabricated metal products, except machinery and equipment, CI = Manufacture of computer, electronic and optical products, CJ = Manufacture of electrical equipment, CK = Manufacture of machinery and equipment, CL = Manufacture of transport equipment, CM = Other manufacturing, and repair and installation of machinery and equipment.

Source: Own calculations based on the dissemination database of the HCSO.

Figure 4

Change of employment explained by sector-growth effect and labor-intensity in each sub-section in the period of 2009–2014



Note: Sub-section CD is not included in the figure due to its outlier values (its labor-intensity effect is 165.5 and its sector-growth effect is –172.7).

CA = Manufacture of food products, beverages and tobacco products, CB = Manufacture of textiles, apparel, leather and related products, CC = Manufacture of wood and paper products, and printing, CD = Manufacture of coke and refined petroleum products, CE = Manufacture of chemicals and chemical products, CF = Manufacture of pharmaceuticals, medicinal chemical and botanical products, CG = Manufacture of rubber and plastics products, and other non-metallic mineral products, CH = Manufacture of basic metals and fabricated metal products, except machinery and equipment, CI = Manufacture of computer, electronic and optical products, CJ = Manufacture of electrical equipment, CK = Manufacture of machinery and equipment, CL = Manufacture of transport equipment, CM = Other manufacturing, and repair and installation of machinery and equipment.

Source: Own calculations based on the dissemination database of the HCSO.

These four sub-sections in total accounted for 32.4% of manufacturing employment and 42.9% of manufacturing value added in 2009 (in nominal terms), and these shares increased to 38.2% and 48.1% by 2014. In these strengthening sub-sections, labor productivity increased from 128.0% to 133.8% of average labor productivity in manufacturing.

In contrast with the growing ones, we termed *weakening sub-sections* the following:

– CI (Manufacture of computer, electronic and optical products),
– CJ (Manufacture of electrical equipment),
– CD (Manufacture of coke, and refined petroleum products) and
– CB (Manufacture of textiles, apparel, leather and related products).

Each sub-section in this group has a common feature of decreasing employment. Out of these sub-sections, however, only one (CD) belongs to the worst (6th) category of *Table 3,* characterized by a negative sector-growth and a positive labor-intensity effect, the other three are included in the 4th category, where a negative labor-intensity effect prevails, over-compensating a positive sector-growth effect.

The weakening sub-sections in total generated 22.5% of manufacturing value added by employing 24.7% of manufacturing employees in 2009, and these shares decreased to 20.4% and 18.7% by 2014. In these sub-sections productivity fluctuated around 95.8% of average manufacturing productivity throughout the period.

The remaining 5 sub-sections we considered *stagnating*; these are characterized by an employment number that did not change substantially. The stagnating category includes a sub-section (CG, Manufacture of rubber and plastics products, and other non-metallic mineral products) where employment number increased and labor productivity improved, i.e., it can be categorized in the best (1st) category based on these two effects, but this growth is very small. At the same time, this group also contains CC (Manufacture of wood and paper products, and printing) sub-section from the worst (6th) category, where along a negative sector-growth effect and declining labor productivity employment number decreased but again only to a small extent.

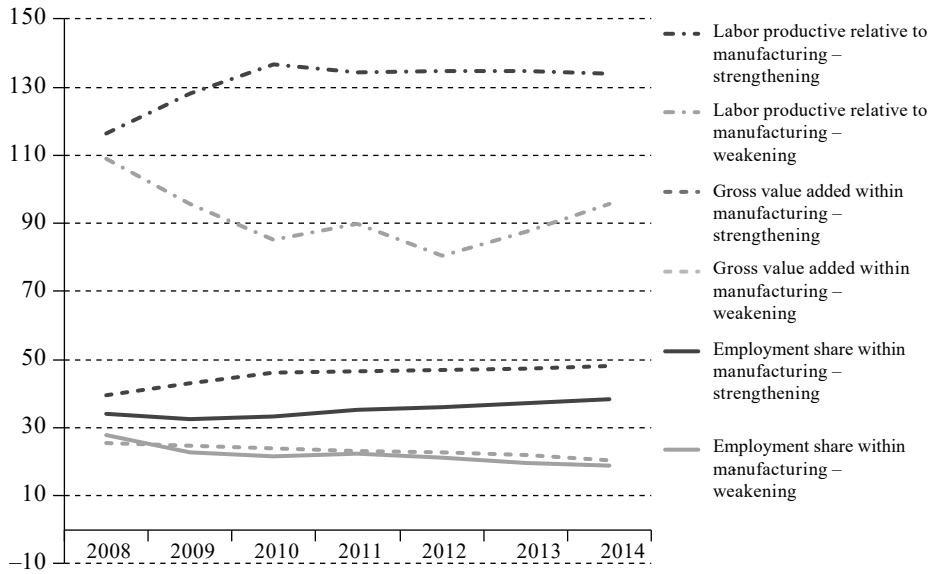
In the case of the four strengthening sub-sections, there is a strong positive linear correlation between value added and the share in manufacturing gross value added (Pearson's r coefficient values: 0.87–0.94). In the weakening group, only one subsection (CB) is characterized by a negative, but only moderate correlation (–0.59). Based on this, it does appear that by the internal structural transformation

of manufacturing, the weight of sub-sections generating (in real terms) higher value added is increasing.

Figure 5

Comparing growing and weakening sub-sections

(%)



Note: The solid lines on the figure represent the share of employed in the given group of sub-sections within manufacturing, the dashed line represents the share of GVA produced by them and the dot-dash line is to show average productivity.

Source: Own construction based on the dissemination database of the HCSO.

We can also observe the changes in the four strengthening and the four weakening sub-sections by each year in terms of their share in manufacturing and the average productivity (see: *Figure 5*). Looking at the sub-sections with the highest increase in employment we find that their share in GVA grows faster than their share in employment, so average labor productivity in these sub-sections exceeds the average of manufacturing. In *Figure 5,* the two dotted lines refer to the tendency of the average labor productivity compared to the manufacturing average, which is above 100% throughout the studied period, although a clear trend is not visible.

The solid lines compare the strengthening and weakening sub-sections in terms of employment number, while the dashed lines show their shares in GVA.

In our opinion, the increasing employment in manufacturing is more of a recovery to a former stage after a short-term halt, rather than reindustrialization. The value added of the national economy increased by 8% on average per year in the period of 2004–2008 at current prices, and only by 4.8% on average per year after the crisis, in the period of 2009–2014. Regarding the volume indices, we can also observe that the annual average increase of 3.3% in the pre-crisis years dropped by half in the years after the crisis. On the other hand, in manufacturing value added at current prices increased by 8.6% on average per year in the period of 2004–2008, and by only a slightly lower 8% after the crisis. The annual average increase of the volume index dropped by half in the post-crisis years from 6.4% of the period before the crisis, similarly to the tendency experienced in the total national economy. Consequently, value added in manufacturing increased faster than the value added of the total national economy in both the period before and after the crisis. The strengthening and weakening sub-sections are one of the signs of transformation and structural change in manufacturing.

Some background factors of the structural change of manufacturing

In manufacturing, we distinguished the strengthening and weakening sub-sections, essentially based on one of the indicators of reindustrialization, the change in employment. We compare the two groups in terms of their export, investments, foreign direct investments and the change in the composition of employment. For the sake of completeness, we add the indicators of the remaining, so-called stagnating sub-sections, as well as their changes.

If we study how *export-oriented* the growth of each sub-section group is, we find that in both the strengthening and the weakening sub-section groups the share of export sales within total sales increased. This share is higher for the strengthening group and the difference also increases (see: *Table 5*). While in the worst performing CH sub-section (Manufacture of basic metals and fabricated metal products, except machinery and equipment) of the strengthening group, the share of export sales within total sales is around 60% throughout, in the weakening group this share is below 34% for CD sub-section (Manufacture of coke and refined petroleum

products). It reveals even more if we look at the share of the two types of groups in total manufacturing export revenue: here the share of the first group constantly rises (from 40.4% to 53.8%), while that of the second group falls rapidly (from 40.9% to 24.2%). The two sub-section groups start from nearly the same value in 2009, but the share of the better performing sub-sections increased to more than double the share of the less well performing ones by 2014. The best performing CL (Manufacture of transport equipment) sub-section of the strengthening group has the greatest share in manufacturing export in total and its share constantly increases from 2009, while the best performing sub-section of the weakening group, CI (Manufacture of computer, electronic and optical products), which otherwise provides the second highest share of manufacturing export in total, keeps losing share. It becomes evident that the sub-sections termed strengthening are export-oriented. In the case of the third sub-section group, the stagnating one, the share of export is low but growing (changed from 40.7% to 52.1%), i.e., the share of domestic sales is still quite high.

Table 5

Export performance indicators of the different sub-section groups

	Share of export in total sales (%)				Share of export in manufacturing export (%)		
	Manufacturing	Strengthening	Stagnating	Weakening	Strengthening	Stagnating	Weakening
2008	66.7	79.5	39.3	76.0	43.5	17.1	39.4
2009	67.7	80.5	40.7	79.1	40.4	18.6	40.9
2010	70.2	84.0	43.8	78.2	42.2	18.2	39.6
2011	70.7	84.4	46.9	75.9	45.5	19.3	35.1
2012	70.8	85.3	48.9	74.1	48.0	21.3	30.7
2013	72.3	86.5	50.9	74.5	51.3	22.1	26.7
2014	73.4	86.5	52.1	75.7	53.8	21.8	24.4

Source: Own calculations based on the dissemination database of the HCSO.

The value of *investments* in the total national economy at current prices changed from 4,950 billion HUF in 2008 to 5,200 billion HUF in 2014 (we used sub-section level investment data requested directly from HCSO). In the same period, investments in manufacturing started from about 1,140 billion HUF in 2008 and it constantly increased following the decrease in 2009, and it reached 1,530 billion HUF by 2014. The share of manufacturing within national economy investments increased from 19.9% to 29.9% between 2009 and 2014.

Investment in the strengthening sub-sections shows an increase in nominal terms, while it more or less stagnates in the weakening ones. Accordingly, while the strengthening sub-sections concentrated only 37.2% of manufacturing investments in 2008, this share was already 53.6% by 2013 and 46.5% in 2014 (see: *Table 6*). Meanwhile, the share of the weakening sub-sections within total manufacturing investments decreased from 16.9% in 2008 to 12.3%. We can say that the strengthening sub-sections noticeably take an increasing part of total manufacturing investments; presumably this also contributes to their development and growth. The stagnating sub-sections group also made significant investments, particularly in later years (its share within manufacturing is 41.2% in 2014).

Table 6

Investments in manufacturing and its sub-section groups, at current prices

	Investments (bn HUF)				Share in manufacturing (%)		
	Manufacturing	Strengthening	Stagnating	Weakening	Strengthening	Stagnating	Weakening
2008	1135.8	422.4	521.3	192.0	37.2	45.9	16.9
2009	929.1	399.9	368.3	160.9	43.1	39.6	17.3
2010	995.0	440.8	377.6	176.6	44.3	37.9	17.8
2011	1286.8	678.5	427.2	181.2	52.7	33.2	14.1
2012	1369.4	817.8	379.7	171.9	59.7	27.7	12.5
2013	1366.4	731.8	476.8	157.7	53.6	34.9	11.5
2014	1530.1	712.1	630.6	187.4	46.5	41.2	12.3

Source: Own calculations based on HCSO data provision.

Table 7

FDI of foreign controlled enterprises in manufacturing and its sub-section groups

	FDI of foreign controlled enterprises (bn HUF)				Share within manufacturing (%)		
	Manufacturing	Strengthening	Stagnating	Weakening	Strengthening	Stagnating	Weakening
2008	5284.0	2847.2	1284.7	1152.1	53.9	24.3	21.8
2009	5718.4	3030.9	1380.3	1307.2	53.0	24.1	22.9
2010	6136.5	3103.8	1480.1	1552.6	50.6	24.1	25.3
2011	4327.4	1776.2	1521.3	1030.0	41.0	35.2	23.8
2012	4362.0	1670.5	1604.1	1087.4	38.3	36.8	24.9
2013	5051.5	2089.6	1840.6	1121.3	41.4	36.4	22.2

Note: BPM6 reporting groups together the sub-sections of CD (Manufacture of coke and refined petroleum products), CE (Manufacture of chemicals and chemical products) and CF (Manufacture of pharmaceuticals, medicinal chemical and botanical products), which belong to 3 different groups in our classification. We took the weights of the available BPM5 reporting as the basis for estimating each sub-section. We estimated the data of 2013, which is not included in BPM5, by assuming unchanged weights of 2012.

Source: HCSO STADAT 3.1.27.2 table.

The most current data on the evolution of the foreign direct investment of foreign controlled enterprises, composed based on BPM6 classification, are available for the period of 2008–2013 based on the tables of HCSO STADAT. Over this period, the FDI of foreign controlled enterprises constantly increased in the total national economy. In manufacturing, however, there is a decline from 2010, with a recovery only in 2013, but even then it reached only 82% of the value in 2010. There is a large fluctuation in nominal terms in the strengthening sub-sections, while the weakening sub-sections exhibit a much greater stability. The proportion of the latter group in manufacturing FDI broadly stagnates, but that of the former group decreases, for the benefit of the stagnating sub-sections positioned between the two groups. In terms of shares, the 2.5-times advantage of the strengthening sub-sections at the beginning of the period was reduced to 1.9-times by the end of the period (see: *Table 7*). FDI per

employee is similar in all the three sub-section groups, between 7.4 and 91.1 million HUF/capita.

One of the stagnating sub-sections, CG (Manufacture of rubber and plastics products, and other non-metallic mineral products) stands out, as it has a substantial share in both the investments and the FDI of foreign controlled enterprises within manufacturing over the whole period. This sub-section accounted for 17.8% of total manufacturing investments in 2008, and 13.3% in 2014, while in this sub-section the FDI of foreign controlled enterprises accounted for 9.6% within manufacturing in 2008, and 16.2% in 2013. As we have previously demonstrated (see: *Tables 1* and *4*), this sub-section shows a decline in employment, with an increase in demand unable to overcompensate the falling labor demand of the sub-section resulting from improving labor productivity. This capital-intensive sub-section generates 9.4% of GVA in manufacturing (this proportion is broadly unchanged in the studied period) with the help of 8.3% of manufacturing employment.

Table 8

The number and proportion of non-manual employment in manufacturing and its sub-section groups

	Number of non-manual employment (thousand people)				Proportion of non-manual employment in total employment (%)			
	Manufacturing	Strengthening	Stagnating	Weakening	Manufacturing	Strengthening	Stagnating	Weakening
2008	152.4	53.4	61.6	37.4	22.2	22.9	22.3	21.3
2009	145.8	50.4	61.0	34.4	24.0	25.6	23.5	23.0
2010	143.0	50.9	58.9	33.2	23.8	25.6	22.9	23.0
2011	155.3	56.9	61.3	37.0	25.0	26.2	23.6	25.7
2012	154.4	58.3	60.1	36.0	25.3	26.5	23.8	26.2
2013	156.0	61.6	60.0	34.3	25.5	27.2	23.8	25.7
2014	159.3	64.7	61.8	32.7	25.4	27.0	23.8	25.6

Note: Non-manual and manual employment both include full-time and part-time employment.

Source: Authors' compilation from the dissemination database of the HCSO (downloaded: 09/04/2015).

The transformation of manufacturing is also indicated by how the number of manual and non-manual employment and their proportion change in total manufacturing and in its sub-sections and sub-section groups (see: *Table 8*). Both in total manufacturing and in all the three subsection groups we identified, the proportion of non-manual employment increased between 2008 and 2014, but increased in different ways. In total manufacturing, the number of non-manual employment increased exceeding the expansion of manual employment, and the same applies to the strengthening sub-sections, only at a slightly higher level. In the stagnating sub-sections, non-manual employment number increased, while manual decreased in the studied period, and in the weakening sub-sections both non-manual and manual employment numbers decreased, but the latter did so to a greater extent.

The strengthening sub-sections include CF (Manufacture of pharmaceuticals, medicinal chemical and botanical products) sub-section, which differs from the other 3 sub-sections: the proportion of non-manual employment is high and increasing, 61.2% of the total employment of 18 thousand in 2014, which is the highest proportion within domestic sub-sections. Only 22.2% of the 222 thousand employees in the other three growing sub-sections is non-manual, which proportion is below even the average in manufacturing. This means that a growing tendency is present in the sub-sections employing mainly manual workers on a massive scale.

In terms of the proportion of non-manual employment, only one, CE (Manufacture of chemicals and chemical products) sub-section, stands out of the stagnating sub-sections, where the small increase of non-manual employment number in the studied period is accompanied by a decline in the number of manual employment. Out of the total of 13.5 thousand employees, the proportion of non-manual employment increased from 39.8% in 2008 to 41.8% in 2014.

Conclusions

In our paper we analyzed the change of domestic manufacturing and its sub-sections between 2008 and 2014 based on *Tregenna's* method. The study revealed that a significant structural change took place within manufacturing and based on the characteristics of change three sub-section groups can be distinguished. We identified a group of sub-sections in which employment number increased and labor productivity improved in total and called them *strengthening sub-sections* [these are: Manufacture of machinery and equipment n.e.c. (CK), Manufacture of

transport equipment (CL), Manufacture of pharmaceuticals, medicinal chemical and botanical products (CF), and Manufacture of basic metals and fabricated metal products, except machinery and equipment (CH)]. These sub-sections employ one third of manufacturing employees, 86% of their sales is export and 41% of the FDI of manufacturing foreign controlled enterprises is found here. Of the 4 sub-sections, the manufacture of pharmaceuticals, medicinal chemical and botanical products has an outstandingly high proportion of non-manual employment (it increased from 52% to 61% in the studied period).

In the second group of sub-sections both employment number and GVA decreased, and productivity also lags behind the average in manufacturing. We called these sub-sections *weakening* [these are: Manufacture of computer, electronic and optical products (CI), Manufacture of electrical equipment (CJ), Manufacture of coke, and refined petroleum products (CD) and Manufacture of textiles, apparel, leather and related products (CB)]. This sub-section group is also export-oriented, 75% of their sales is directed abroad. However, investments decrease and the amount of FDI stagnates. Nevertheless, it is interesting to see that the proportion of non-manuals within employment equals the average in manufacturing, with the values of CD highly above average (about 51%) and the values of CB highly below average (about 11%). The remaining sub-sections go to a group we called *stagnating* [there are 5 of them, namely: Manufacture of food products, beverages and tobacco products (CA), Manufacture of wood and paper products, and printing (CC), Manufacture of chemicals and chemical products (CE), Manufacture of rubber and plastics products, and other non-metallic mineral products (CG) and Other manufacturing, and repair and installation of machinery and equipment (CM)]. These are less export-oriented, half of their sales is directed at the domestic market, investments are moderate, while they took off only in 2014 with the increase in FDI.

Our analysis reveals that following the crisis of 2008 and the lowest point in 2009, there was no substantial reindustrialization until 2014. What is evident is a dynamic transformation within manufacturing, a significant structural change among the sub-sections. In this structural change, the export-oriented sub-sections have come into focus, besides the manufacture of pharmaceuticals which employs only relatively few people, the largest two out of the four machinery sub-sections, which employ manual workers predominantly and the role of FDI is of key importance.

References

Barta, Györgyi – Czirfusz, Márton – Kukely, György [2008]: Újraiparosodás a nagyvilágban és Magyarországon (Reindustrialization in the world and in Hungary). *Tér és Társadalom,* No. 4, pp. 1–20.

Bod, Péter Ákos [2013]: Iparosítás, újraiparosítás – de mi az ipar ma? (Industrialization, reindustrialization – but what is industry today anyway?) *Magyar Szemle,* No, 7–8, pp. 183–188.

Botos, Balázs [2010]: Munkahelyteremtés és újraiparosítás (Workplace creation and reindustrialization). *Polgári Szemle, No.* 2, pp. 1–12.

Cristopherson, S. – Martin, R. – Sunley, P. – Tyler, P. [2014]: Reindustrialising regions: rebuilding the manufacturing economy. *Cambridge Journal of Regions, Economy and Society,* No. 7, pp. 351–358.

EC [2010]: An Integrated Industrial Policy for the Globalisation Era. European Commission, Luxembourg, COM (2010) 614 final.

EC [2014]: For a European Industrial Renaissance. European Commission, Luxembourg, COM (2014) 14 final.

Győrffy, Dóra [2015]: Újraiparosítás az Európai Unióban és Magyarországon (Reindustrialization in the European Union and in Hungary). *Külgazdaság,* No. 1–2, pp. 17–21.

Lakatos, Judit [2015]: Külföldön dolgozó magyarok, Magyarországon dolgozó külföldiek (Hungarian nationals working abroad, foreign nationals working in Hungary). *Statisztikai Szemle,* No. 2, pp. 93–112.

Lux, Gábor [2012]: Reindusztrializáció Közép-Európában (Reindustrialization in Central Europe). In: *Baranyi, Béla – Fodor, István* (Eds.): Környezetipar, újraiparosítás és regionalitás Magyarországon. MTA KRTK Regionális Kutatások Intézete, Pécs–Debrecen, pp. 21–34.

Szirmai, Ádám [2012]: Industrialisation as an engine of growth in developing countries, 1950–2005. *Structural Change and Economic Dynamics,* No. 4, pp. 406–420.

Tregenna, F. [2009]: Characterising deindustrialisation: An analysis of changes in manufacturing employment and output internationally. *Cambridge Journal of Economics,* No. 3, pp. 433–466.

Tregenna, F. [2013]: Deindustrialization and Reindustrialization. In: *Szirmai, A. – Naudé, W. – Alcorta, L.* (Eds.): Pathways to Industrialization in the Twenty-First Century. Oxford University Press, pp.76–101

Tregenna, F. [2014]: A new theoretical analysis of deindustrialisation. *Cambridge Journal of Economics*, Vol. 38, No. 6, pp. 1373–1390.

Uliha, Gábor – Vincze, János [2014]: Az újraiparosodás lehetősége és hatásai – Hosszú távú szerkezetváltási folyamatok vizsgálata egy többszektoros makrogazdasági modellel (Possibility and effects of reindustrialization – analyzing the long term processes of structural change with a multi-sector macroeconomic model). *Külgazdaság,* No. 7–8, pp. 86–113.

Valentinyi, Ákos [2014]: Újraiparosítás: út a semmibe! (Reindustrialization: a road to the void!) Defacto, Retrieved from: http://index.hu/gazdasag/defacto/2014/09/15/iparositas_ut_a_semmibe/

Weiss, J. [2002]: Industrialisation and Globalisation. Theory and evidence from developing countries. Routledge, London and New York.

Westkamper, E. [2014]: Towards the Re-Industrialization of Europe: A Concept for Manufacturing for 2030. Springer, Heidelberg.