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Choosing Right from Wrong: Industrial Policy and (De)industrialization in Central and Eastern Europe

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Choosing Right from Wrong: Industrial Policy and (De)industrialization in Central and Eastern Europe

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Abstract
Over the past two and a half decades, the economic landscape of Central and Eastern European economies went through several waves of transformation. The demise of traditional industries and the rise of the service sector during the 1990s inclined economic structure towards deindustrialization. The events over the next years paved the way for the rise of new industries in many of these countries and embarked them on the route of reindustrialization. However, in some countries the rise of new industries was more modest and took place at a much slower pace. Such development can be attributed to the process of industrial restructuring as well as industrial policies. The recent rise of awareness about the importance of industrial development for the growth and well-being of nations makes it relevant to investigate the sources behind changes in the economic structure of Central and Eastern European countries. Our findings reveal two groups of CEECs, defined as reindustrializing and those going through deindustrialization. The research identifies loss of competitiveness as the principal driving force of such an outcome. No support was found for horizontal policies. The reindustrialization mainly takes place through productivity improvements in less knowledge and technology intensive activities. Such findings are in line with those on the position of CEECs in global value chains.

Keywords: CEEC, deindustrialization, reindustrialization, industrial policy
JEL classification: L16, D02, C36

Iz krivog u pravo: Industrijska politika i (de)industrijalizacija u središnjoj i istočnoj Europi

Sažetak
Tijekom protekla dva i pol desetljeća ekonomski krajobraz zemalja središnje i istočne Europe prošao je nekoliko valova transformacije. Propast tradicionalnih industrija i uspon uslužnog sektora tijekom 1990-ih usmjerili su ekonomsku strukturu prema procesu deindustrijalizacije. Događaji narednih godina u nekim zemljama regije otvorili su prostor za rađanje novih industrija dok je u drugim nastanak novih industrija bio slabijeg intenziteta. Ovakav razvoj događaja može se pripisati procesu industrijskog restrukturiranja i industrijskim politikama. Recentni porast svijesti o važnosti industrijskog razvoja za rast i blagostanje nacija zahtijeva razumijevanje uzroka promjena u ekonomskoj strukturi zemalja središnje i istočne Europe. Istraživanjem su identificirane dvije skupine zemalja označene kao reindustrijalizirajuće i deindustrijalizirajuće. Promjene konkurentnosti identificirane su kao ključni pokretač takvog ishoda. Rezultati istraživanja ne pružaju potporu horizontalnom pristupu ekonomske politike. Reindustrijalizacija je uglavnom pokretana poboljšanjem proizvodnosti izvoza u sektorima slabijeg intenziteta znanja i tehnologije u skladu s položajem analiziranih zemalja u globalnom lancu dodane vrijednosti.

Ključne riječi: CEEC, deindustrijalizacija, reindustrijalizacija, industrijska politika
JEL klasifikacija: L16, D02, C36

1 Introduction[1]

Recent years have witnessed a re-emergence of consensus among economists about the importance of industrial development for economic growth. Such insights are well-founded in the mainstream economic thinking of the 1950s and 1960s. Kuznets (1956), Chenery (1963) and more recently Kaldor (1978) highlighted the beneficial within- and between-sectoral spillover effects of manufacturing for the well-being of nations. After several decades, the transformation of European countries into service-led economies seems to be at halt. The messages conveyed by academics increasingly evoke traditional wisdom and speak about the necessity of reindustrialization for growth while the focus of policy makers shifts towards the creation of impulse for a new wave of industrial development. The consensus about the importance of reindustrialization comes along with a shift in the policy paradigm. The exposure of the weaknesses of new classical free market policies by the recent global economic downturn has paved the way for proactive industrial policies as a remedy for market failures. It is largely held that these policies can provide the initial impulse to drive the new industrial development of European economies.

Within the debate about the new industrial development in Europe, the question that frequently arises is which industries are needed for countries to be competitive in a globalized world. In one of its more recent strategic documents, the European Commission (2014) notes that the reindustrialization of European Union's member states should be based on knowledge and technology intensive industries characterized by high productivity and value added, with the ability to retain a competitive edge in a globalized world. Such reasoning, however, is not new to academics. Ever since the emergence of endogenous growth literature, the sophisticated, knowledge and technology intensive industries have been characterized by higher growth potential than the sophisticated price-competitive sectors due to their ability of differentiation on international markets, but also due to spillover effects on other related industries. Empirical evidence from the growth and trade literature (e.g. Hausmann et al., 2007; Jarreau and Poncet, 2012) supports such reasoning. From there, the necessity of industrial policy targeting strategically selected sectors arises as a prerequisite for the recovery of European economies.

The importance of reindustrialization in the EU does not arise solely from the need to compete with global rivals but also to diminish the development gaps that exist within the

[1] This work was fully supported by Croatian Science Foundation under the project IP-2016-06-3764.

association itself. The latter is particularly relevant in the context of Central and Eastern European countries (CEECs) hit by the three most recent waves of EU enlargement from 2004 onwards. For more than two and a half decades, CEECs have been subject to a reform package that has included building of market institutions, macroeconomic stability, enterprise restructuring, privatization and inflow of foreign direct investment. As the opening balance of transition in nearly all of these countries included a heritage of over-industrialized economic structure, the focus of economic policy was on the promotion of the service sector rather than industry. Moreover, the embeddedness of policy prescriptions in the new classical reasoning known as the Washington Consensus left little room for active industrial or sectoral policies in general across the region.

As a consequence of the above-mentioned, the deindustrialization of CEECs was far more pronounced than that in the rest of the EU, particularly during the 1990s. In the years that followed, the development paths of individual countries diverged. While in some countries new industries replaced traditional uncompetitive sectors, in others such as Croatia the deindustrialization and a decline in the competitiveness of existing industries continued. Bartlett (2014) points out that in some of the new EU member states industrial development takes the form of a "low path" characterized by standardized price competitive industries, while more advanced CEECs follow the "high path" that embodies more sophisticated industries with greater value added and higher growth potential. The shape of economic structure in individual CEECs was also related to the progress in their integration into regional, European and global economic and political associations. While most advanced countries soon reaped benefits from access to new markets, knowledge and technology, those lagging behind had to cope with destruction of established business networks and barriers in access to markets of EU member states and some candidate countries.

While integration into economic and political associations was important, perhaps the most profound influence on structural changes in individual CEECs came as a result of policy prescriptions governing their transition. Bartlett (2014) points to the detrimental effects of horizontal policies on the industrial potential of some of the new EU member states such as Croatia, Bulgaria or Romania. Similarly, Cerovic et al. (2014) point out that the absence of industrial policy was the key reason for absent or slow recovery in transition economies, while Damiani and Uvalic (2014) stress the necessity of a vertical approach for a new wave of reindustrialization in less advanced transition economies, including some CEECs. Such reasoning seems to be in line with current economic thinking on industrial policy. As Rodrik

(2009) notes, in the presence of market failures a proactive industrial policy is needed to provide impulse to otherwise stagnant sectors and to help them to build their competitiveness.

The existing research on the evolution of economic structure and its implication for growth in CEECs has pointed to a number of issues relevant for future policy makers. However, as Bartlett (2014) notes, the research is yet to assess the extent to which individual countries followed particular paths of industrial development as well as the effects of particular industrial policies. In this research, the attempt is to fill this gap but also to assess the effect of particular policies on the deindustrialization or reindustrialization of CEECs. Our starting premise is that during the period of absence of active industrial policy, CEECs experienced two dimensions of deindustrialization: one, more general, reflected in the share of manufacturing in an overall economy, and the other, within the manufacturing sector, reflected in the development of individual industries. Using the means of shift and share analysis, the sources of industrial development of particular sectors and their competitive profiles are assessed. Finally, the model is developed that assesses the role of individual policies in the industrial development.

The paper is structured as follows. The next section sets the theoretical framework of the research and analyzes the evolution of industrial policy in CEECs over the past two decades. The structural trends in CEECs followed by their decomposition using shift and share analysis are presented in section three. The competitive profile of industries within individual countries is contained in section four. Section five analyzes the role of individual policies in the industrial development of CEECs. Section six concludes.

2 The Evolution of Industrial Policy in Central and Eastern Europe

Under the neoclassical framework, government interference in market processes is limited to the correction of market failures such as coordination and information failures, negative externalities or provision of public goods (Mazzucato, 2015). Over past decades, such horizontal framework in which policy measures target all economic sectors equivalently has been applied to numerous countries under the concept of the Washington Consensus. It leaves little room for sectoral policies, as any intervention is perceived as interference with market forces. The alternative view on economic policy emphasizes the need for governments to create such measures that will provide the initial impulse for particular industries through the

creation of appropriate policies (Greenaway and Nam, 1998). This vertical approach has been embodied in the development paths of world economies such as South Korea or Singapore that followed an outward strategy of trade and capital liberalization and export-led growth as well as those such as Argentina or former Yugoslavia whose development paths were more inward-oriented on the development of a local industrial base, preservation of employment and import substitution.

The dominance of the new classical paradigm in the 1990s and 2000s meant that rather than targeting specific sectors, the industrial measures were limited to the creation of a favorable business climate for market forces to spontaneously decide on the prosperity of particular industries or sectors (Bartlett, 2014). The focus of industrial policy within such a framework was on strengthening competition and promoting the internationalization of economic activities (Owen, 2012) through instruments and programs such as promotion of corporate governance, anti-corruption policies and flexible labor market. However, the emergence of the recent economic downturn has pointed, among other things, to the fact that without government intervention, the picking up and recovery of particular sectors, and consequently an economy, may always not be possible. As noted by Rodrik (2009), government intervention enables correction of market failures that otherwise would not be remedied. Together with contributions emerged within the framework of endogenous growth theory, this paved the way for the new form of industrial policy which picks those sectors with the highest potential of standing the test of international markets.

The scope for economic policy in CEECs during the past two and a half decades was determined with the initial conditions of transition, the overarching policy objective of joining the European Union and the economic reasoning of the time. Much of the measures undertaken in the period from the onset of transition have taken place in the framework of the strengthening regional, European and global economic and political integrations. In line with the economic thinking of that time, these measures were nested in the new classical framework of the Washington Consensus. As Estrin and Uvalić (2016) explained, the Washington Consensus held that the flow of capital, technology, knowledge and skills across national boundaries via FDI opens opportunities for all host economies, and that these might be greater for economies where the technology gap was larger so the gains from technological diffusion are greater.

In the above context, FDI had a twofold role. Firstly, FDI had a direct effect on economic growth through increase of investments and job creation. Secondly, the economy can also be stimulated indirectly via spillover effects on total factor productivity. These can take the form of learning about more productive methods, access to advanced technology, skills and training. Within such a framework, policies promoting privatization and FDI were soon recognized as one of the main channels for knowledge and technology transfer and structural change. Yet, the gains from FDI such as enterprise restructuring, export competitiveness or productivity growth for manufacturing were realized only in countries where the bulk of FDI went to this sector. In others, such as Croatia, the lesser intensity of FDI in manufacturing was followed by declining share of industry in employment and value added (EBRD, 2000).

The origins of deindustrialization in CEECs can be traced back to the 1990s and the differences in industrial policy of that time. In Hungary, faster inflow of FDI was accompanied by more rapid privatization than in other countries. In Croatia, the pace of industrial policy was set by a privatization scheme which favored management and employees of firms over foreign investors (Franicevic, 1999). Bohle and Greskowitz (2012) define the industrial policy in CEECs of that time as policy focused on control of damage which emerged through the systemic breakdown of former economic systems and confronted inherited and mostly inefficient industries with pressure of restructuring and adaptation. Industrial policy measures were focused on creating proper incentives for investors in existing enterprises while little incentive was provided for R&D investment. The consequences of such an approach remain visible to this day with the intensity of R&D remaining low in these countries (Radosevic and Stampi Caiova, 2015).

The results of the above-mentioned processes became visible as the differences in economic structure of CEECs in the second decade of transition. While advanced CEE countries shifted towards more technology and knowledge intensive sectors, the economic structure of countries such as Croatia or SEECs remained dominated by their traditional industries and revealed signs of eroding industrial competitiveness and deindustrialization. This process was further intensified in some countries such as Croatia with deskilling that brought substantial losses of sophisticated manufacturing output, employment and exports (Bhole and Greskovitz, 2012). Moreover, multinational enterprises (MNE), as a type of ownership, appeared to be more active among CEE countries as compared to Croatia (Aralica, Račić and Redžepagić, 2008). For CEE countries, favorable results could be found in terms of international trade in the same period. CEE countries except Poland in the period of 1995–2004 had higher trade

openness than Croatia, which implied (in that time of liberalization of international trade) a better competitive position of CEE countries as compared to Croatia. This is in line with Gligorov and Vidovic (2004) who confirmed the deterioration of Croatia's export position in this period compared to CEE countries.

After the year 2000, the economic policy was mainly centered around the goal of increasing the competitive environment. Yet, the concerns over competitiveness of CEECs devoted greater attention to the innovation activities of firms. Building on the concept of the Lisbon Agenda, this new approach in industrial policy emphasized the fostering of "regional competitiveness", and led to the creation of programs of regional development that embodied new formulations of horizontal industrial policy such as (i) support for small and medium sized enterprises at a local level through the creation of decentralized business networks and industrial clusters and (ii) an emphasis on "regional innovation systems", the "knowledge economy" and "knowledge transfer" from public research and higher education institutions to the business sector (Cooke, 2001). Thus, new programs were oriented towards development of new entities such as technology parks and technological clusters. Even more, this new approach in industrial policy influenced changes of universities, especially within developed countries such as EU-15 members[2]. These institutions started to play an important role in national and regional innovation systems and are increasingly perceived as instruments of development in these economies (Malerba et al., 2016).

The introduction of horizontal industrial policy also required strong commitment of EU member states to introduce innovation as a crucial part of industrial policy, but also to implement new forms of coordination between science and labor policies on the one hand, and industrial policy on the other. Such coordination is vital for the development of knowledge transfer from public to private sector as well as the better alignment between the structure of labor market and needs of industry. Moreover, it also required the introduction of appropriate science-technological infrastructure and national innovation systems.

Regarding empirical findings about industrial structure and industrial policy among Eastern European countries in the period from 2000 onwards, Bohle and Greskovitz (2012) argue that the processes of divergence between SEE and CEE countries were reinforced during the fast

[2] For universities, this type of engagement is named "third mission" (in addition to education and research), which generally relates to the social mission of engaging in external partnerships related to community needs and supporting economic development, coupled with new challenges determined by the emergence of the "learning economy".

growth period of 1999–2007. They established that in the period between 1999 and 2007 the share of complex-manufacturing industries in the Visegrád and Slovenian economies was double that of South Eastern European countries—whether output, employment or exports are considered. Data on employment in knowledge intensive services indicate similar variation. These facts reveal that CEE countries became more efficient in terms of development of new jobs in the service sector (these are knowledge intensive), as a result of the use of ICT.

Empirical evidence also reveals that horizontal industrial policy measures have become dominant within CEECs from 2005 onwards. Bartlett (2014) notes that in Croatia over this period several institutions were founded that can be considered a science technology infrastructure. These institutions had been founded around the main urban centers and owned by the state or local community (Bačić and Aralica, 2016). A similar increase in the number of these institutions could be found in CEE countries. But, the particularity of Croatia's research and innovation system was the dramatic downsize in government expenditure on research and development (GERD), which declined more than twenty percentage points in the period from 2001 to 2010 (Aralica and Redžepagić, 2012)[3]. In the case of CEE countries, Bohle and Greskovitz (2012) found that between 1999 and 2007 these countries designed packages of generous incentives and services to accelerate FDI inflow. Moreover, they argue that the foreign-owned banks showed more inclination towards the business sector including small and medium enterprises.

New elements important for the development of horizontal industrial policy based on innovation, such as knowledge intensive entrepreneurship as well as the science-industry link, had their own path of development, characteristic for CEE and SEE countries only. In terms of development of knowledge intensive entrepreneurship in new member states (NMS), Radosevic (2007) found that there was a limited domestic demand for knowledge based products and activities, including public sector demand. This was even more so for knowledge intensive services. Knowledge important for firms' growth is usually developed in-house so he concluded that networks connecting firms do not play an important role in terms of development of innovation. In terms of the science-industry link, among CEE and SEE countries it is a frequent appearance of the DUI (doing, using and interacting) mode of innovation. This mode of innovation is based on non-scientific drivers, namely learning-by-doing, learning-by-using and learning-by-interacting (Jensen et al., 2007). These findings

[3] This implied decrease of importance of R&D investments and innovation investments in policy agenda at that time in Croatia.

implied a non-scientific driver of innovation activities in these countries, which emphasizes the role of the demand side of innovation policy.

More recent industrial policy is grouped around the Smart Specialization (SS) concept. Smart Specialization could be considered the EU's version of new industrial policy (Radosevic et al., 2017). It has become a well-known policy approach, which applies to policy planning and policy implementation at the national and regional levels. Smart Specialization became an *ex-ante* conditionality for the EU regional and cohesion policy (Karo and Kattel, 2015). Similar to the horizontal approach of industrial policy, for Smart Specialization Strategy (S3) innovation is a crucial activity. Even more, the similarity between these two approaches lies in a strong emphasis on the regional (subnational) level of activities.

Regarding the differences when compared to previous horizontal approaches in industrial policy, as a policy process, S3 requires partnership between policy makers and various types of actors with entrepreneurial capabilities, examining of the opportunities and potentials of the region, and development of policies that will facilitate entrepreneurial activities in these areas (McCann and Ortega-Argilés, 2015). Citing McCann and Ortega-Argilés (2015), Radosevic et al. (2017) argue that the novelty of S3 lies in an explicit prioritization and selectivity as well as in a departure (at least nominally) from the focus on high-tech sectors in EU innovation policy. The differences could appear in terms of the role of previously mentioned institutions like universities in creating links between science and industry. The fact that the EU started placing emphasis on innovation strategies for regional innovation systems provides universities with the opportunity to participate in tackling regional development issues. For the universities, the main challenges in terms of S3 should be: a) rationalization of the course portfolio and research capabilities of universities to match with industry demands and regional priorities; b) search for their place in the European/national innovation ecosystem – to provide the expertise at a given stage of innovation where they have strength and capability (EUA, 2014).

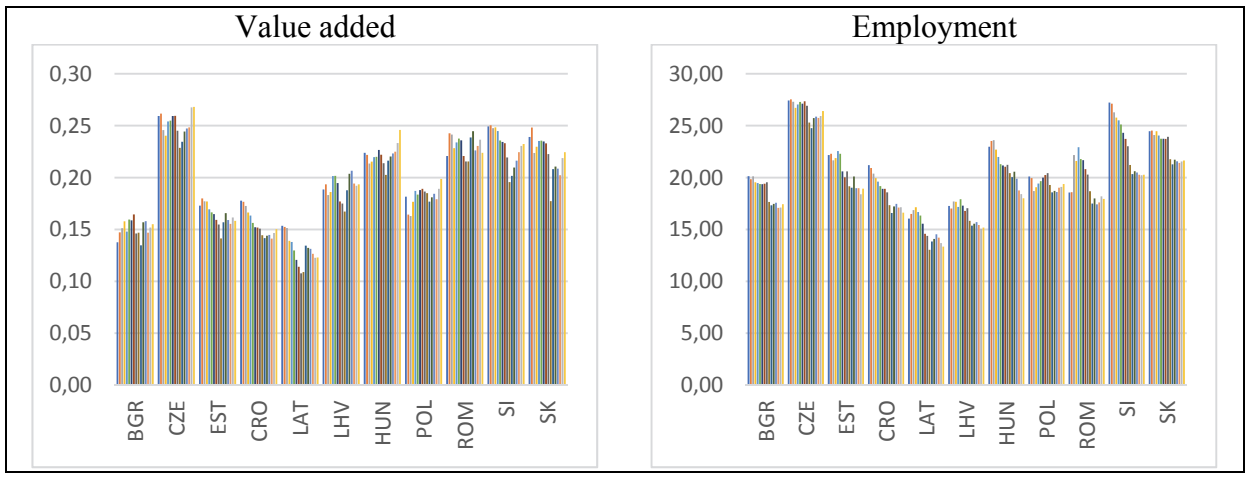
Research and innovation strategy as an implementation activity of Smart Specialization differs from previous approaches in terms of positioning regions/regional clusters within global value chains and local production systems. In this context, regions trying to implement Smart Specialization Strategy should have appropriate government capacity in terms of including policies for entrepreneurial discovery, promoting technology platforms and networks, diagnostic and indicator based tools and infrastructure, strategic governance for

RIS3[4] as well as openness to other regions (OECD, 2013). Finally, there are recommendations to regions to develop institutional capacities in terms of identification of technology based development patterns, sharing the principles of the construction of regional advantages (CRA) approach (Boschma, 2014).

3 (De)industrialization in Central and Eastern Europe

According to Havlik (2014), before 1990 the value added generated within the manufacturing sector accounted for between 20 percent of gross domestic product in Hungary and 40 percent in countries such as Bulgaria and Poland. At the same time, the service sector in all CEECs was largely underdeveloped. The exceptions were countries emerging from the dissolution of former Yugoslavia, such as Croatia and Slovenia. The somewhat more liberal economic environment of a semi-market economy that came in place during the 1960s and the great degree of openness towards Western countries had formed an economic structure which bore more resemblance to market economies than any other CEEC. The initial wave of transition reforms paved the way for narrowing of these structural differences and by the end of the last century the economic structure of most CEECs showed much resemblance to mature market economies.

Figure 1 **Share of Manufacturing in Value Added and Employment, 2000–2015**



Source: Authors' calculations based on Eurostat data.

The opening of a new millennium was marked with similar trends (Figure 1). Broadly speaking, one can distinguish three patterns of changes in the share of manufacturing value added in the economy between 2000 and 2015. The share of manufacturing in value added

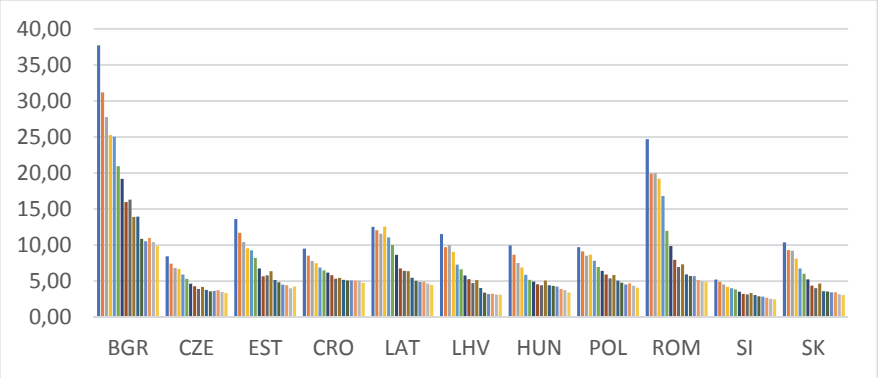
[4] Research and innovation strategies for Smart Specialization.

increased in Hungary, Poland and Bulgaria, remained constant in the Czech Republic, Lithuania and Romania, and decreased in Estonia, Slovenia, Slovakia and particularly Croatia and Latvia. Across the region, the manufacturing sector employed on average 19 percent of the workforce in 2000. In the years that followed, this share was continuously decreasing, the fall being particularly pronounced in Slovenia, Croatia and Hungary. In Slovenia, the employment in manufacturing dropped by 25 percentage points, while the fall in the latter two countries amounted to 22 percentage points.

Observing changes in the manufacturing value added and employment together, conclusions can be made about two patterns of industrial development. Countries such as the Czech Republic, Hungary, Poland, Bulgaria, Lithuania and Romania have gone through contraction of manufacturing workforce while keeping the share of manufacturing value added constant or increasing. It can thus be concluded that in these countries restructuring of the manufacturing sector in terms of labor intensity and increasing productivity has taken place. On the other hand, Slovakia, Estonia, Latvia and particularly Croatia and Slovenia have been marked with contraction of both manufacturing value added and employment shares in the economy. Such trends suggest that a decline in competitiveness of manufacturing and deindustrialization could be in place in these countries.

Further evidence in favor of the above reasoning can be found in Figure 2. There it can be seen that across the entire region the labor intensity of the entire manufacturing sector has been continuously decreasing, a continuation of the trend that started in the first decade of transition. Already in 2000, labor intensity of manufacturing was below 15 percent in all countries except Bulgaria and Romania. By 2015, Bulgaria was the only country with labor intensity above 5 percent, while in all other countries the production structure of manufacturing seems to have changed. It is worth noting, though, that a decline of labor intensity in all countries took place mostly in the first half of the 2000s. During the crisis and in the post-crisis period, this productive pattern remained stagnant.

Figure 2 **Labor Intensity of Manufacturing, 2000–2015**



Source: Authors' calculations based on Eurostat data.

The sources of the above-mentioned changes can be found in the policy mix within individual countries as mentioned in the previous section. While some CEECs recognized the necessity of implementing sectoral policies, in others the policy framework continued to be dominated by horizontal policy measures intended to ensure macroeconomic stability and functioning of the market mechanism. In a parallel development, trade liberalization together with a rise in the living standard increased the inflow of imports in practically all countries. While in some countries improving export competitiveness and restructuring of the domestic manufacturing sector managed to offset the pressure of imports, in others the manufacturing sector continuously declined. The low intensity of FDI or its flow into sectors other than manufacturing, together with the absence of active sectoral policies and the continuous pressure of imports on the domestic market, have eroded the industrial base in these countries.

A deeper insight into the factors behind industrial development patterns in all analyzed countries requires observing all or some of them together. A recent method proposed by Tregenna (2011) and implemented by Stojcic and Aralica (2016) establishes the link between changes in the sectoral share of employment, changes in the labor intensity of the sector, changes in its competitiveness (and thus value added) and overall national competitiveness[5]. Through such decomposition one can extract three components, where the first component measures the contribution of changes in the labor intensity of the sector, the second one establishes a link between changes in the value added and employment of the sector, and the third is related to the contribution of improvements (or deterioration) of the overall national productivity.

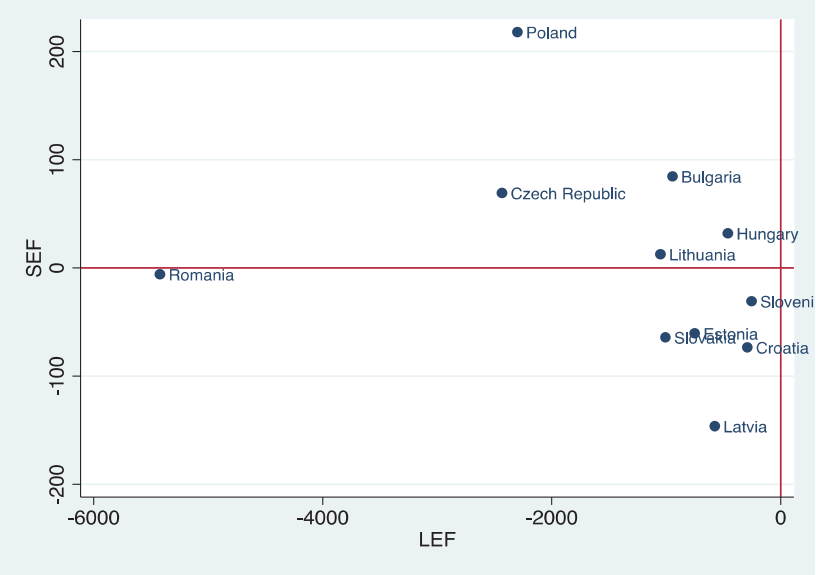
[5] For a detailed explanation, see the Appendix.

Through the above-described analysis one can understand the causes of deindustrialization (or industrialization) in individual CEECs. The changes in the share of manufacturing employment due to the changing labor intensity of manufacturing can be a signal of sectoral restructuring and a shift in production structure. The change in sectoral employment due to changes in the value added of manufacturing signals the changes of sectoral competitiveness. Finally, the third component reveals to what extent improvements in the overall productivity of the country drive employment changes within the manufacturing sector. The results of decomposition for the 2000–2015 period are graphically presented in Figure 3[6]. For expositional convenience, Figure 3 contains only results for labor intensity and competitiveness effects. The reasons for such a presentation lie in the fact that in all analyzed countries the aggregate productivity effect was positive. Hence, the extraction of the contribution to the changes in the manufacturing employment share by overall economic performance of the country enables the search for sources of (de)industrialization to focus on changes in labor intensity and competitiveness.

The horizontal axis of the scatterplot in Figure 3 measures the changes in labor intensity (LEF), while the contribution of changes in sectoral competitiveness (SEF) is portrayed on the vertical axis. The first finding is that in all analyzed countries the contribution of the labor intensity effect to the pattern of industrial development is negative. Such a finding, consistent with the explanations offered for the findings in Figures 1 and 2, further confirms that restructuring of manufacturing was underway across CEECs in the observed period. This process, which started already in the 1990s, took place along two dimensions. On the one hand, across all CEECs a movement from labor intensive sectors towards medium high and high technology intensive industries took place. On the other hand, within more sophisticated sectors, some CEECs specialized in labor intensive production activities while others succeeded in integrating into segments of global value chains with greater value added and based on knowledge and technology activities.

[6] For detailed results, see Table A1 in the Appendix.

Figure 3 **Labor Intensity and Sectoral Share Effects of Changes in the Share of Manufacturing Employment, 2000–2015**



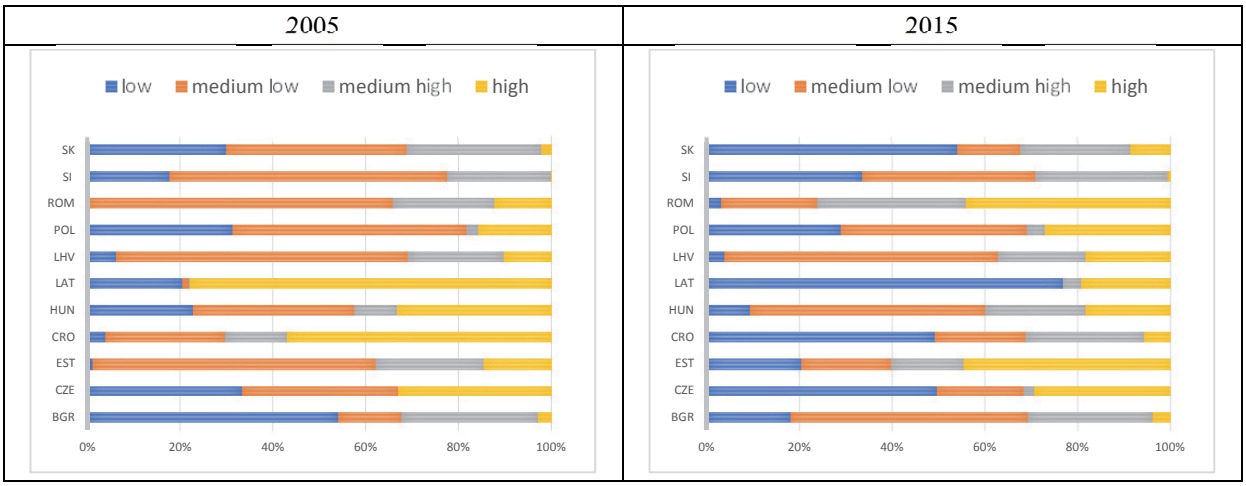
Source: Authors' calculations.

The conclusion from the above is that the sources of industrial development patterns within individual CEECs can be found in changes of manufacturing competitiveness. Here, the findings confirm our earlier conclusions. It is evident that in countries characterized by a reduction in manufacturing employment and stagnation or improvement of the value added generated within the sector, this change was driven by a decline in labor intensity, improvement in sectoral competitiveness and greater productivity of the entire sector. Such a finding holds for all five countries identified previously as ones where reindustrialization has taken place. In all the other countries, changes in the manufacturing employment share have been driven by a decline in labor intensity and in the competitiveness of the manufacturing sector. It is, therefore, likely that one of two potential scenarios has taken place in these countries. The first one refers to the fact that traditional, mainly labor intensive industries have lost their competitiveness over the second decade of transition, while new industries have not replaced them. An alternative explanation is, however, that the substitution of traditional industries with new sectors was not accompanied by success in building competitiveness.

4 Structural Trends within the Manufacturing Sector in Central and Eastern Europe

The transformation of the manufacturing sector in more advanced CEECs was already underway from the second half of the 1990s. These early attempts at integration into global value chains took place mostly through a shift from low-tech towards high technology intensive industries. However, within the latter group of industries, producers from CEECs mainly participated in standardized labor intensive production activities in line with their comparative advantages of the time (Stojcic and Hashi, 2011). In the years that followed, producers from some of the CEECs managed to penetrate more sophisticated segments of global value chains, while in others the manufacturing sector remained locked within old production patterns.

Figure 4 **Structure of Manufacturing Sector by Technological Intensity in 2005 and 2015**



Source: Authors' calculations.

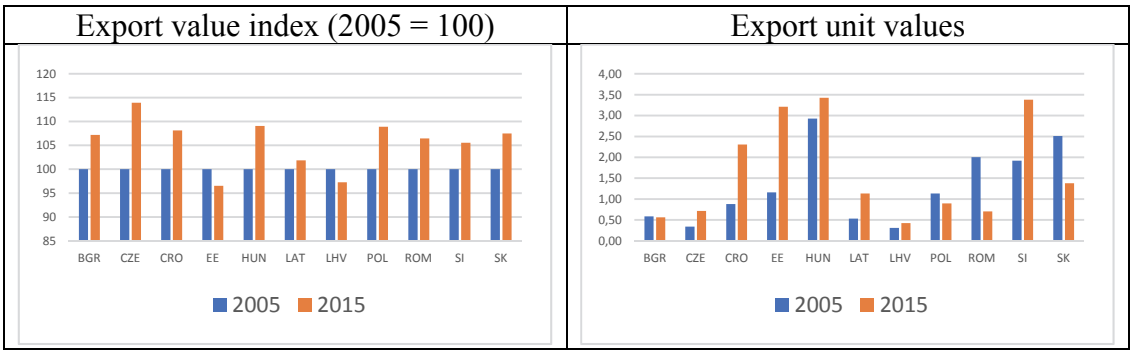
Figure 4 presents the share of individual sectors within manufacturing, grouped by their technological intensity, following Eurostat taxonomy and calculated using data from the Prodcomm database. It can be seen that across CEECs a structural change took place within the manufacturing sector. Out of five countries identified previously as revealing signs of reindustrialization (the Czech Republic, Poland, Bulgaria, Hungary and Lithuania), in four the shares of medium high and high technology intensive industries within manufacturing have increased. The exception from this is the Czech Republic where an increase is recorded only in the share of medium high technology intensive industries.

Among the countries revealing traits of deindustrialization, the changes in the shares of individual groups of industries within the manufacturing sector do not provide a clear picture.

All these countries have exhibited an increase in the share of either medium high or high technology intensive industries. It is therefore likely that the deindustrialization of these countries is driven by the loss of competitiveness in traditional and emerging industries.

The above reasoning requires a closer analysis of the changes in the international competitiveness of the manufacturing sector as a whole and its subsectors in particular (Figure 5). Overall, it can be said that the value of exports increased in all analyzed countries. When it comes to unit values of exports, the majority of countries have experienced an increase in this respect which can be a signal either of declining price competitiveness or improvements in the quality of products. As we have established, in several countries deindustrialization was accompanied by declining competitiveness and an increase in the share of low technology intensive industries where price competitiveness is the primary mode of competition. Figure 5 reveals that highest export unit values are observed within these deindustrializing countries. Together, these findings signal a decline in the price competitiveness of manufacturing in selected CEECs.

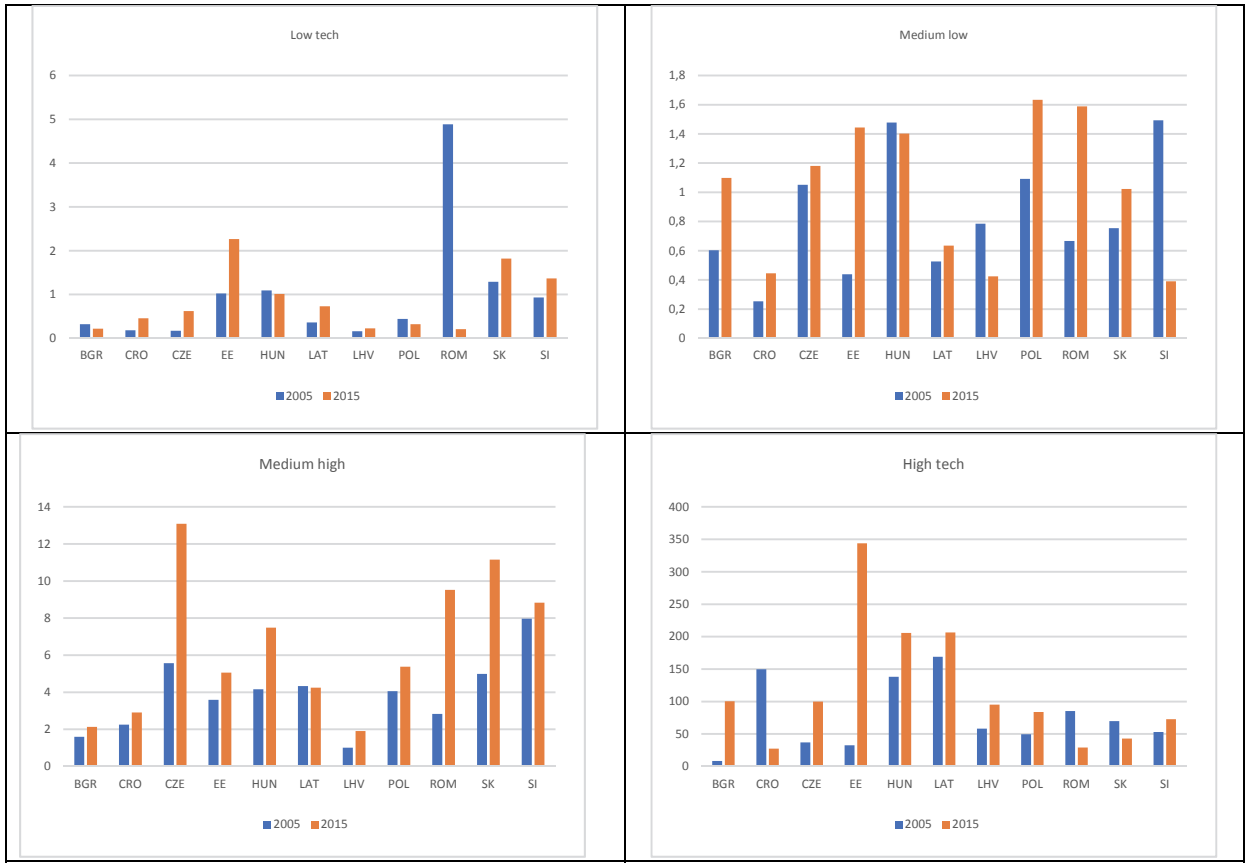
Figure 5 **Export Value Index and Export Unit Values of Manufacturing in CEECs, 2005–2015**



Source: Authors' calculations.

The analysis of changes in export unit values across groups of industries supports our reasoning about the loss of competitiveness as the primary source of deindustrialization in some of the CEECs (Figure 6). Among reindustrializing CEECs, the highest increase in the export unit values took place in sectors with higher technological intensity. On the other hand, in countries exhibiting traits of deindustrialization, an increase in export unit values is observed across all four groups of industries. It is therefore likely that the observed decline of manufacturing in terms of both value added and employment as well as evidence on declining competitiveness of the sector signal the inability of producers from these countries to position themselves on international markets and to build their competitiveness within the sectors in which they operate.

Figure 6 **Export Unit Values and Technological Intensity of Sectors, 2005–2015**



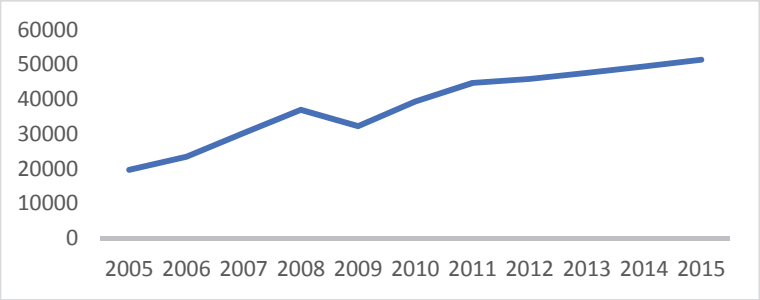
Source: Authors' calculations.

The final insight into the changes within the manufacturing sectors of CEECs concerns changes in productivity, embodied in the production and sophistication of goods exported by producers from this sector. Integration into higher segments of global value chains entails products of higher value added and greater sophistication. For a considerable period of time, CEECs were known as producers of low value added standardized goods. Even countries that moved, in the second decade of transition, to the more technology intensive segments of the market have been involved in activities such as assembly or similar price competitive activities. The assessment of changes in productivity and export sophistication of manufacturing goods in CEECs can be undertaken using the means of productivity and export indices originally proposed by Hausmann, Hwang and Rodrik (2007). After modification to focus solely on the manufacturing sector, the productivity index for individual good *i* produced by *n* countries can be defined as:

$$PRODY_i = \sum_{j=1}^{n} \frac{\frac{x_{ij}}{X_j}}{\sum_{j=1}^{n} \frac{x_{ij}}{X_j}} * PROD_j, \quad (1)$$

where productivity of manufacturing sector $PROD_j$, defined as value added per employee, is weighted with the comparative advantage of a given country in sector *i*. From there, the index of productivity embodied in the production of a given sector or good is obtained through aggregation of weighted productivity of manufacturing across all countries. Figure 7 provides the evolution of productivity defined this way across all CEECs. As can be seen, with the exception of a short period during the economic crisis, productivity of the manufacturing sector was following the trend of aggregate productivity growth observed in the region during the period.

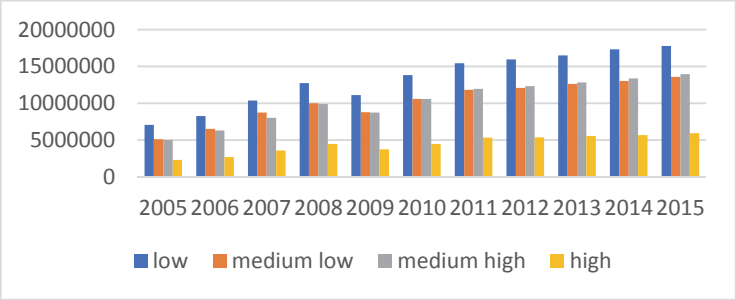
Figure 7 **Average Productivity of Manufacturing Industries in CEECs, 2005–2015**



Source: Authors' calculations.

Within the manufacturing sector, productivity improvements have been recorded in all sectors. However, cross-sectoral intensity of the embodied productivity differs across sectors with respect to their technological intensity. The strongest levels of productivity in CEECs have been recorded in low technology intensive industries. At the opposite end of the spectrum are high technology sophisticated sectors. Such a finding is in line with arguments about specialization of CEEC producers in low value added sectors and their position in the lower end of global value chains within more sophisticated manufacturing industries.

Figure 8 **Average Productivity of Manufacturing Industries in CEECs, 2005–2015 (by Technological Intensity)**



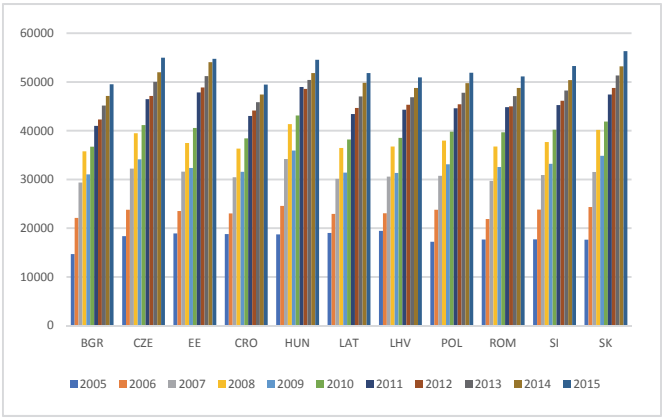
Source: Authors' calculations.

The productivity embodied within sectors does not provide insights into the competitive profiles of the industries. To obtain such findings one needs to observe the sophistication of their exports. Departing from the previously used PRODY index, the level of sophistication embodied in the exports of product *i* can be derived as:

$$EXPY_j = \sum_{i=1}^{n} \frac{x_{ij}}{X_j} PRODY_i, \quad (2)$$

where the level of productivity embodied in each product is weighted with its share in the total export basket of manufacturing goods within the country. To this end, it is possible to obtain insights into the level of sophistication embodied in the overall manufacturing exports of each CEEC and in the exports of their industries of different technological intensity.

Figure 9: **Export Sophistication of the Manufacturing Sector in CEECs, 2005–2015**

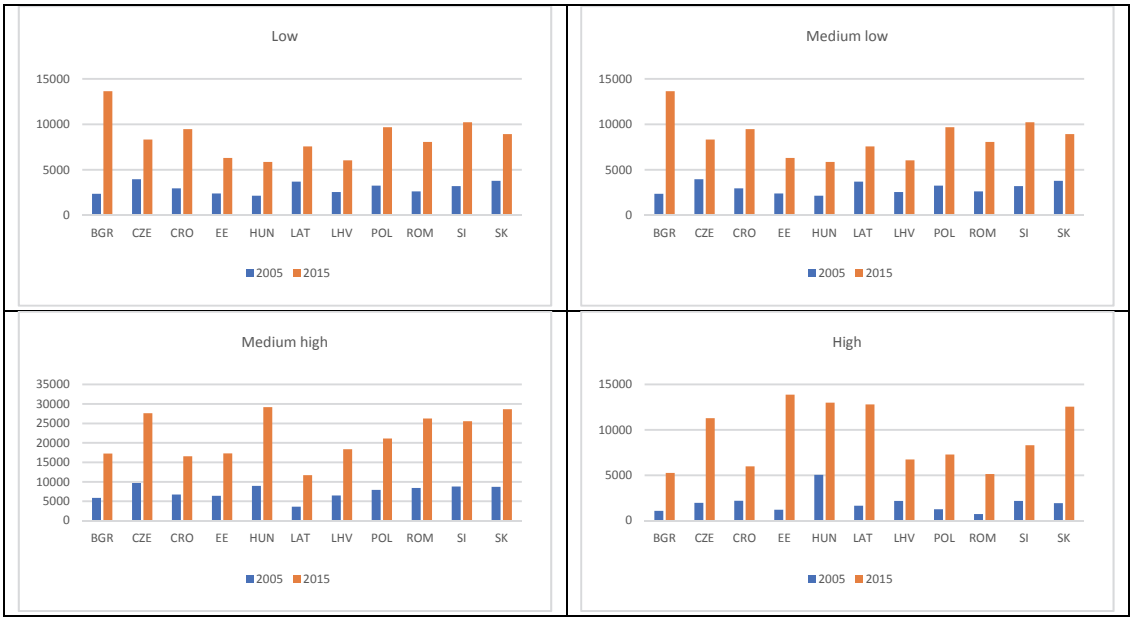


Source: Authors' calculations.

The trends of export sophistication in individual CEECs reveal continuous upgrading in the embodied level of productivity. This trend is present in all countries although the magnitude of increase reveals cross-country variation. The strongest improvement in the level of export sophistication has taken place within manufacturing in Bulgaria, Slovakia, the Czech

Republic, Estonia and Slovenia. Within the manufacturing sector, in the production of standardized price competitive goods within low technology intensive industries the highest levels of export sophistication were found in the three Baltic states and Croatia. The same countries were among the leaders in terms of sophistication in this sector already in 2005, suggesting that patterns of competitiveness inherited from the early period of transition were governing the manufacturing sector in these countries. Moving up the technological intensity ladder, lower levels of export sophistication can be observed. Within medium low technology intensive industries, the highest index values are found in Bulgaria, Croatia, Poland, Slovenia and Slovakia. However, the findings for this sector in 2015 are somewhat different from those in 2005 when the Czech Republic, Latvia and Slovakia were the leaders of the sector.

Figure 10: **Export Sophistication of the Manufacturing Sector in CEECs, 2005–2015 (by Technological Intensity)**



Source: Authors' calculations.

In the upper technological segment of manufacturing, countries identified as reindustrializing lead in terms of export sophistication. Interestingly, relatively high levels of export sophistication are found in countries revealing signs of deindustrialization such as Slovakia and Slovenia. There is a similar finding in the segment of high technology intensive industries where Czech, Hungarian, Estonian and Latvian manufacturers exhibit the highest levels of export sophistication.

With respect to everything said in this section, it can be concluded that the manufacturing sector within CEECs experienced substantial restructuring in the more advanced stage of transition. While in some countries this resulted in an increase in the share of manufacturing within the economy, in others the changes took the direction of deindustrialization. Our findings suggest that across all countries an increase in the share of high technology intensive activities and improvements in productivity and export sophistication have taken place. For this reason, the deindustrialization of these countries can be attributed to their loss of competitiveness, as indicated in the previous section.

5 Determinants of Industrial Development in CEECs

As a final step of investigation, the research explores the determinants of the changes in the manufacturing share of value added in Central and Eastern European countries. Having established in previous sections the patterns of industrial development within individual CEECs, the question that arises is which forces and policies have contributed to the observed outcome. To this end, an empirical model is developed that takes into account a number of country and industry specific characteristics together with indicators reflecting the progress of individual countries in pursuit of reforming policies. A model developed for such purpose in general form can be expressed as:

$$lnshare_{it} = lnexpy_{it} + lnberd_{it} + lngerd_{it} + lnlabcost_{it} + lnepo_{it} + lnictskills_{it} + lnconsumption_{it} + lnfdi_{it} + lnpropertyrights_{it} + lntaxburden_{it} + lntradefreedom_{it} + lninvestmentfreedom_{it} + lnbusinessfreedom_{it} + u_i + v_{it}. \quad (3)$$

The dependent variable used by the model in equation (3) is the share of manufacturing in value added for country *i*, member of CEEC group, in period *t*. Such a defined dependent variable is specified as a function of several variables defined as follows. Export sophistication index (*expy)* controls for the improvements in the productivity of exports. As established in previous sections, across CEECs, an improvement in the productivity of the manufacturing sector has taken place over the past decade, having an upward impact on the sophistication of manufacturing goods exported from these countries, particularly goods in low and medium low technology intensive industries. Such an improvement can present a source of higher competitiveness over international rivals, for which reason a positive sign is expected on the variable.

In their influential paper, Jensen et al. (2007) point to two main channels for productivity improvements within firms and industries, defined as the science, technology and innovation (STI) and doing, using and interacting (DUI) modes of innovation. The former refers to the absorption and management of knowledge defined outside of firms, most commonly in the science sector or through interactions with customers and suppliers. The latter, however, encompasses the processes that take place within firms through new structures and relationships which facilitate learning by doing, using and interacting. Both channels have implications for improvements in sophistication and embodied productivity of exported goods. However, while the DUI concept is difficult to measure (Jensen et al., 2007), the extraction of effects related to STI is far more easier. To this end, the model includes two variables defined as the share of the business sector expenditure (*berd*) and government expenditure (*gerd*) on R&D within overall R&D expenditure in country *i* in period *t*.

Through the inclusion of variables measuring the share of R&D expenditure, one can also distinguish between two forms of policy towards innovation funding. Within the horizontal policy approach, the role of government is limited to the creation of an environment that facilitates innovation activities, and funding of such activities should come from the private sector. However, proponents of an active government role in innovation policy note that the impulse for innovations should come from public investment in R&D. The inclusion of both variables should therefore highlight an additional dimension of policy making in CEECs. Finally, the model includes the number of patents per capita (*epo*). It is expected that greater innovation output facilitates the competitiveness of knowledge and technology intensive industries.

While innovations are a relevant generator of competitiveness for the knowledge and technology driven industries, the costs of labor have a decisive role in labor intensive and price competitive sectors. To control for this source of competitiveness, the model also includes an index of labor costs (*labcosts*) for each country-year pair, where 2010 is taken as the reference period. It is expected that lower costs of labor have a beneficial effect on the rise of price competitive manufacturing, while the opposite would hold for knowledge and technology driven sectors. The model also includes the proportion of workers with ICT skills (*ictskills*), which are an important driver of competitiveness for more sophisticated industries. The share of foreign direct investment (*fdi*) in manufacturing is included to control for spillover channels recognized in earlier transition literature as a source of enterprise restructuring, productivity improvements and higher export competitiveness. However, the

effect of this variable depends on the motives of FDI. Rent-seeking FDI and that not establishing horizontal and vertical links with domestic business entities should have an adverse effect on the domestic manufacturing sector. For this reason, there is no *a priori* expectation about the sign of this variable.

The share of domestic household consumption (*consumption*) is recognized in existing literature as an important driver of industrial development. The profile of domestic demand and its requirements determines the behavior of domestic producers and in turn determines their competitiveness and prospects of the manufacturing sector. Producers in those countries where domestic buyers exhibit preferences for sophisticated knowledge and technology intensive goods will be under pressure to continuously come up with innovative products that can stand the test of foreign rivals. The inability to do so, however, would have an adverse effect on their performance and overall domestic production. For this reason, the expectation about the sign of this variable cannot be made. There are also five variables measuring the progress of individual CEECs in pursuit of reforms essential for the creation and functioning of a free market environment. These include the quality of protection of property rights (*property rights*), the level of tax burden (*tax burden*), the freedom of trade (*trade freedom*), the freedom of investment (*investment freedom*) and the freedom of doing business (*business freedom*). For all of these variables, a positive sign is expected.

The data for estimation of the previously defined model are taken from Eurostat and from the Heritage Foundation in the case of the five institutional variables. All variables enter the model in logarithmic form. The estimation is undertaken using the means of fixed effects instrumental variables panel estimator which enables estimation of panel models with potentially endogenous variables and unobserved time-invariant heterogeneity. The former is present in the model through correlation between the export sophistication index and some of the other regressors, while the latter refers to unobservable factors such as the quality of institutional framework not controlled for within the model or the quality of management etc. The potentially endogenous variable is instrumented with its own lagged values and for this reason the analysis covers the 2009–2015 period, the years through and after the global economic downturn. Moreover, to allow for effects of institutional changes, variables measuring these effects have been lagged for two periods.

Table 1 **Results of Estimation**

Variable	**Coefficient**
Export sophistication (*lnexpy*)	0.29***
Business sector expenditure on research and development (*lnberd*)	-0.08**
Government expenditure on research and development (*lngerd*)	-0.09**
Labor costs index (*lnlabcosts*)	-0.16**
EPO patents per capita (*lnepo*)	-0.02**
% of employment with ICT skills (*lnictskills*)	0.01
Domestic consumption as % of GDP (*lnconsumption*)	-0.96***
FDI share of manufacturing (*lnfdi*)	-0.001***
Property rights protection (*lnpropertyrights*)	0.03
Tax burden (*lntaxburden*)	-0.05
Trade freedom (*lntradefreedom*)	-0.64***
Investment freedom (*lninvestmentfreedom*)	-0.18***
Freedom of doing business (*lnbusinessfreedom*)	0.14
Model diagnostics	
Underidentification test	59.48***
Weak identification test	155.1
Sargan overidentification test	0.872
Number of observations (groups)	77 (11)

Note: ***,** and * denote statistical significance at 1%, 5% and 10% level, respectively.

Source: Authors' calculations.

The results of estimation of the above-described model are presented in Table 1. All relevant diagnostics provide support to the chosen model specification meaning that the underidentification test is rejected, the value of weak identification test is above critical values and there is no sufficient evidence to reject the Sargan test for overidentification of instruments. Overall, these diagnostics provide support to our specification and enable an interpretation of the results.

Starting with the export sophistication index, it is evident that higher sophistication of exports, reflecting greater embodied productivity of exported goods and services, has a beneficial effect on the share of the manufacturing sector within CEECs. An increase in export sophistication for 1 percentage point contributes to an increase in the share of manufacturing within the economy of 0.49 percentage points. The improvements in productivity do not seem, however, to arise from innovation activities. Both variables measuring public and business sector investment in research and expenditure as well as the variable measuring the patenting activity are significant with a negative sign. Several conclusions can be made from this finding. First and most important is that innovation activities have an adverse effect on the size of the manufacturing sector. Another important finding is that neither private nor public policies promoting innovation have a beneficial effect on the manufacturing sector. Finally, from the above findings it can be concluded that

the STI principle of innovation does not seem to be a relevant channel for realization of innovation effects.

The effects of foreign direct investment as well as domestic consumption of households do not facilitate development of the domestic manufacturing sector since both variables emerge as significant with a negative sign. The observed effect of foreign direct investment can be interpreted with the structure and motives of FDI. In some CEECs such as Croatia the entrance of FDI was mainly driven by rent-seeking motives and directed at sectors outside of manufacturing. Even though in some CEECs FDI facilitated the development of manufacturing, it is likely that the structure of the sample is such that it drives findings towards the above conclusion. The negative effect of domestic consumption can signal that domestic producers are unable to meet the requirements of households in their countries, which in turn paves the way for imports and erodes domestic manufacturing. Another likely explanation is that the structure of domestic demand in CEECs is not such that it provides sufficient impulse for improvement in the competitiveness of domestic producers.

As a final group of variables, we observe the findings on the controls for the quality of the institutional framework. Out of five included regressors, a significant coefficient with a negative sign is obtained on measures for the freedom of trade and that of investment. These findings are in line with everything said earlier. They signal that removal of trade and investment barriers paves the way for an inflow of imports which destroys domestic producers and leads to shrinking of the domestic manufacturing sector. Moreover, such findings question new classical policy prescriptions that dominated CEECs through much of their transition. According to these, creation of an environment in which market forces can act freely without government intervention is a sufficient condition for the development of domestic industries. However, it is more likely that the creation of such an environment without building the competitiveness of domestic industries has an adverse effect on them and eventually can lead to the disappearance of domestic manufacturing.

Overall, the findings obtained in this section suggest that deindustrialization in CEECs was driven by two sets of factors, the first being horizontal policies that leave domestic producers exposed on international markets and the second being policy measures intended to promote integration of CEECs into segments of global value chains for which they lack the resources needed to successfully compete. The former is in line with the findings of Bartlett (2014) who identifies horizontal policies as the primary reason for erosion of the industrial base in South

Eastern and some Central Eastern European countries. At the opposite end, the principal driver of reindustrialization appears to be export competitiveness based on the improvements in sophistication and embodied productivity. Such a finding may signal establishment of product space networks through which knowledge spillovers transfer among producers within and between CEECs in related industries, as outlined by Hausmann and Hidalgo (2008). Moreover, together with other reported findings it is likely that these spillovers emerge through the DUI rather than the STI mode of innovation.

6 Conclusion

Over the past two and a half decades, Central and Eastern European countries have gone through several policy experiments intended to transform these countries into competitive market economies, trigger growth and increase the well-being of their citizens. Recently, the focus of both policy makers and academics interested in the above objectives has been shifting towards reindustrialization. Traditional arguments about the beneficial effects of manufacturing, both in itself and for other sectors of economy, are again being evoked and the arising question for not only CEECs but the entire EU is how to initiate a new wave of industrial development. Policy packages implemented in CEECs through their transition have approached this issue from various perspectives. In the early stages of transition, it was largely held that the creation of market institutions was a sufficient condition to shape an optimal market structure. The years that followed have pointed to the necessity of additional activities that would govern economic performance and restructuring of these economies. This second set of policies has been mostly concerned with building knowledge societies whose industries are knowledge and technology intensive and successfully integrated into higher segments of global value chains.

The emergence of the recent economic downturn has exposed the weaknesses of such an approach that does not target specific sectors but rather consists of measures applicable to an entire economy. Evidence gathered over more than a decade reveals that not only have CEECs failed to integrate into high value added segments of global value chains, but in some of them the processes of deindustrialization have continued. Such scenarios require revisiting policies at whose core is active industrial policy focused on sectors with the greatest potential for gradual integration into global value chains. Hence, rather than focusing on a specific

group of industries and building their competitiveness, this new policy framework suggests identification of industries with the greatest potential and building of their international competitiveness through continuously climbing up the ladders of global value chains.

The appropriateness and mutual exclusivity and complementarity of these policy frameworks have been the subject of much debate in recent years. Neither academics nor policy makers agree on the optimality of any of these approaches. Moreover, some researchers point to the lack of relevant data about more recent trends within the manufacturing sectors of CEECs. Bearing the above said in mind, the objective of this paper was twofold. Its first task was to assess the evolution of economic policy towards manufacturing and trends that have taken place in this sector over the past decade and a half, while its second task was to evaluate the effects of individual policy measures on the development of manufacturing in CEECs.

The results of the investigation reveal two groups of CEECs, following the paths of reindustrialization and deindustrialization, respectively. The sources of such divergent paths seem to lie in the differences in their competitiveness. While in more advanced CEECs increases in aggregate productivity and reductions of labor intensity have been accompanied by improvements in the value added of the manufacturing sector and its competitiveness, in others domestic producers have not been able to follow such a path. It appears, though, that manufacturing in CEECs is still very much based on less knowledge and technology intensive industries and that any improvements in productivity or position in global value chains are related to processes taking place within these two segments of manufacturing.

Our analysis of the determinants behind the more recent industrial development in CEECs reveals interesting findings. Little support was found for the old approach of creation of free market institutions. In fact, it appears that trade and investment liberalization have an adverse effect on domestic manufacturing, most likely reflecting the inability of domestic producers to compete with the inflow of imports and to exploit the opportunities of the joint EU market. A similar effect is yielded by policies promoting inflow of foreign direct investment and investment in research and development. In light of our findings, the question arises whether incentives provided to foreign investors are warranted. Moreover, policies intended to promote investment in research and development as the leading source of innovation are also challenged by our findings, regardless of their source. Rather than initiating reindustrialization, these measures can be associated with deindustrializing processes which questions both their effectiveness and the absorption capacity of domestic firms.

Our findings, however, suggest that improvements in export competitiveness are a principal driver of reindustrialization. In this context, the strongest improvements in export sophistication and its embodied productivity have been observed in standardized sectors. It is likely that in these sectors quality upgrading is taking place as well as integration into higher segments of global value chains. Some recent theories associate improvements in export sophistication with product space clustering within and between countries through spillovers between related industries. Given the findings from our analysis about similar patterns of productivity and export upgrading in all CEECs, it is likely that such a mechanism is in place here as well. A more detailed analysis based on supply-use and input-output data would provide more insight in that direction.

The question that arises from our investigation is what kind of policy should be implemented by those CEECs revealing signs of deindustrialization to trigger a new wave of industrial development and increase their growth prospects. Based on our findings, such policies should not stem from the package of traditional policy frameworks at whose core is the assumption about the ability of markets to independently lead to optimal allocation and economic structure. Rather, future policies in such CEECs should identify within existing sectors those with the greatest potential of market success that can serve as wheels of future development. Identification of barriers to quality upgrading and climbing up ladders of global value chains in these sectors will be the key prerequisite of future growth and reversal of trends of deindustrialization.

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Appendix

The starting point of such an analysis is the assumption that the share of a particular sector (e.g. industry) in the total employment of a given country and year can be decomposed in the three components measuring the contribution to the change of sectoral share of employment shifts in the labor intensity of the sector, its share in overall value added and economy-wide changes in labor productivity. Such a relationship can be defined with an identity:

$$\sigma_{ijt} \equiv \frac{L_{ijt}}{L_{jt}} \equiv \phi_{ijt}\delta_{ijt}\theta_{jt} \quad \text{(A1)}$$

where σ_{ijt} is the share of employment from sector *i* from country *j* in the year *t* (L_{ijt}) in total employment of a given country and year (L_{jt}). To construct an identity decomposing the share of industry employment in total country employment, the $L_{ijt} = \varphi_{ijt}Q_{ijt}$ identity can be established where Q_{ijt} is sector *i*'s value added and φ_{ijt} is labor intensity of that sector, measured as L_{ijt}/Q_{ijt}. In addition, let term $\theta_{jt} = Q_{jt}/L_{jt}$ be labor productivity of country *j* in period *t* and δ_{ijt} is the share of sector *i* in total value added in country *j* in the period *t* defined as Q_{ijt}/Q_{jt}. After all necessary calculations, the equation can be expressed as:

$$\Delta\sigma_{ijt} = \frac{1}{6}\left(\phi_{ijt} - \phi_{ijt-n}\right)\left\{\left(\delta_{ijt-n}\theta_{jt-n} + \delta_{ijt}\theta_{jt}\right) + \left(\theta_{jt-n} + \theta_{jt}\right)\left(\delta_{ijt-n} + \delta_{ijt}\right)\right\} + \frac{1}{6}\left(\delta_{ijt} - \delta_{ijt-n}\right)\left\{\left(\phi_{ijt-n}\theta_{jt-n} + \phi_{ijt}\theta_{jt}\right) + \left(\theta_{jt-n} + \theta_{jt}\right)\left(\phi_{ijt-n} + \phi_{ijt}\right)\right\} + \frac{1}{6}\left(\theta_{ijt} - \theta_{ijt-n}\right)\left\{\left(\phi_{ijt-n}\delta_{jt-n} + \phi_{ijt}\delta_{jt}\right) + \left(\delta_{jt-n} + \delta_{jt}\right)\left(\phi_{ijt-n} + \phi_{ijt}\right)\right\}. \quad \text{(A2)}$$

In equation (A2), the component $\frac{1}{6}\left(\phi_{ijt} - \phi_{ijt-n}\right)\left\{\left(\delta_{ijt-n}\theta_{jt-n} + \delta_{ijt}\theta_{jt}\right) + \left(\theta_{jt-n} + \theta_{jt}\right)\left(\delta_{ijt-n} + \delta_{ijt}\right)\right\}$ measures the labor intensity effect of changes in the sector employment. $\frac{1}{6}\left(\delta_{ijt} - \delta_{ijt-n}\right)\left\{\left(\phi_{ijt-n}\theta_{jt-n} + \phi_{ijt}\theta_{jt}\right) + \left(\theta_{jt-n} + \theta_{jt}\right)\left(\phi_{ijt-n} + \phi_{ijt}\right)\right\}$ measures the contribution of changes in the share of the sector in total value added of the region to changes in the share of the sector in total employment. Finally, the aggregate labor productivity effect $\frac{1}{6}\left(\theta_{ijt} - \theta_{ijt-n}\right)\left\{\left(\phi_{ijt-n}\delta_{jt-n} + \phi_{ijt}\delta_{jt}\right) + \left(\delta_{jt-n} + \delta_{jt}\right)\left(\phi_{ijt-n} + \phi_{ijt}\right)\right\}$ is a residual in the equation that will measure the contribution of changes in aggregate labor productivity to changes in the share of the sector in total regional employment.

Table A1 **Results of Decomposition of Changes in the Share of Manufacturing Employment, 2000–2015**

Country	Change in the share of manufacturing employment (p.p.)	Labor intensity effect (1)	Sectoral share effect (2)	Aggregate productivity effect (3)	Control (1 + 2 + 3 = 100)
BGR	-0.18	-946	85	761	-100
CZE	-0.07	-2434	69	2265	-100
EST	-0.22	-752	-61	713	-100
CRO	-0.30	-292	-74	266	-100
LAT	-0.18	-577	-146	623	-100
LHV	-0.14	-1051	13	939	-100
HUN	-0.33	-463	32	331	-100
POL	-0.05	-2301	218	1983	-100
ROM	-0.04	-5421	-6	5327	-100
SVK	-0.19	-1008	-64	972	-100
SVN	-0.46	-255	-31	186	-100

Source: Authors' calculations.

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