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Determinants of Deindustrialisation in Developed European and Post-Communist Countries

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ABSTRACT

The main goal of this paper is to shed some light on the pro-cess of deindustrialisation defined as falling share of industry employment in total employment. Estimating the dynamic panel data models, the paper investigates differences in changes in the structure of the economy during the process of deindustrialisation in 26 European Union member states (15 developed and 10 post-communist economies) during the period between 1995 and 2012. The paper highlights the standard or "natural" and transition forms of deindustrialisation. In our analysis, we use a one-step system generalized method of moments estimator with robust standard errors, and in contrast to our expectations, the obtained result did not support the initial hypothesis that deindustrialisation in post-communist economies is characterized by factors crucially different from those in developed European countries.

INTRODUCTION

The shrinking of relative importance of industry in terms of employment or production is a phenomenon observed in most developed countries, but recently also in countries that are not considered to be developed. Numerous studies show that the development of the industry follows a specific path, i.e. the share of industry in gross domestic product (GDP) and total employment first increases to a certain point after which it gradually decreases. On the other hand, the share of services is constantly growing (see, e.g., Boulhol and Fontagné, 2006; Mickiewicz and Zalewska, 2002; Palma 2007; Rowthorn and Ramaswamy, 1999). However, most of the studies that examine this topic deal with developed countries, while today majority of developing countries are going through the same process. The difference is that this process in developing countries as well as post-communist starts at much lower levels of per capita income, which is why it is often said that these countries are experiencing premature deindustrialization. Moreover, even though the share

of the industry is decreasing, the absolute value of production in industry in developed countries still continues to grow. The difference is that its growth is slower than the growth of the service sector. But, in general, the industry still holds great importance in the economic growth of the country. Accordingly, the industry ceases to be an activity that employs most workers because new technologies replace human labour.

The decline in the share of industry in in total employment and / or GDP is followed with the reallocation of industrial facilities from developed to developing countries, but this is not considered to be the major cause of deindustrialisation. The productivity growth that lowers the price of the industrial products in relation to the services prices and the total income is usually quoted as the main cause. The only problem considered in developed countries occurs when, due to the downsizing of the industry, as a result of productivity growth, the service sector cannot absorb this surplus labour. But, Rodrik (2013) showed that there is unconditional convergence in labour productivity in manufacturing, meaning that countries with higher share of manufacturing exibit higer growth rates. Industry proved again as engine of growth.

Both data and historical facts show that the process of deindustrialisation in most post-communist countries did not occur at the same speed as in developed countries, therefore the question arises whether some other factors are responsible for their deindustrialisation. Thus, with the majority of authors who consider the deindustrialisation in developed countries as a natural consequence of development of an economy as well as its industry dynamics (see, e.g., Rowthorn and Wells, 1987; Rowthorn and Ramaswamy, 1997) there are authors who believe that the (often premature) deindustrialisation is a negative phenomenon that should be prevented or at least slowed down (Priewe, 1993; Dasgupta and Singh, 2006).

The impact of deindustrialisation on the economy has not yet been sufficiently explored, especially in developing countries. Hence, with the declining industrial production, weakened competitiveness, steadily falling in employment and the rising unemployment this issue becomes of particular importance. Although the papers that highlight the importance of deindustrialisation are numerous, empirical studies are rare and usually related solely to a specific country of which the most often are the OECD countries (Saeger, 1997; Rowthorn and Ramaswamy, 1997; Alderson, 1999; Iversen and Cusack, 2000; Rowthorn and Coutts, 2004; Boulhol and Fontagné, 2006; Nickell et al., 2008; Kollmeyer, 2009) and individually the United States of America (USA) (e.g., Lawrence, 1983) and United Kingdom (UK) (e.g., Rowthorn and Wells, 1987). On the other hand, econometric evidence on the determinants of deindustrialisation in other countries especially post-communist is rare mostly due to the lack of data or bad data quality.

In our analysis, we include 26 European Union countries during the period between 1995 and 2012 (due to limited data available in later years). However, in our modelling we will employ data for 15 developed European Union countries[1] and 10 new European Union member states that are former communist countries[2] (that joined EU during 2004-2013, except Estonia, Malta and Cyprus) in order to compare the process of deindustrialisation in developed and post-communist countries. Hence, this paper compares this process in these two groups of economies.

Moreover, as opposed to most of the research dealing with deindustrialisation in the post-communist economies that analyse the impact of structural changes (Thießen and Gregory, 2005; Raiser et al., 2003) and quality of reforms (Mickiewicz and Zalewska, 2001; 2002), we also include some variables in order to capture production capacity and investment. Next, the empirical analysis in this paper also differs from the aspect of the applied methodology. Namely, given the complexity of the research area and in order to obtain the findings and conclusions which are as reliable as possible, panel data analysis will be applied. More precisely, economic variables usually exhibit a correlation between the current value of a variable and its value in the previous period

[1] Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.
[2] Bulgaria, Croatia, Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia.

(first-order autoregressive process), and the econometric analysis will be conducted on the basis of dynamic panel models. In doing so, we use a one-step system generalized method of moments (system GMM) estimator with robust standard errors to model the dynamics of deindustrialisation. Namely, because of the good performance of the system GMM estimator relative to the difference GMM estimator in terms of finite sample bias and root mean squared error (rmse), it has become the estimator of choice in many applied panel data settings (Bun and Windmeijer, 2010). Furthermore, the specification of each set model will be ascertained based on diagnostic tests. The analysis of the adequacy of panel models will refer to the implementation of the Sargan test and a diagnostic test of autocorrelation in differences of residual deviations. The contribution of our paper stems from the above mentioned and from the empirical results.

Following a macroeconometric approach we found significant econometric evidence that economic development is the main cause of the process of deindustrialisation in both the developed European and post-communist countries. The main difference is that productivity growth showed to be the main determinant of deindustrialisation in post-communist countries while in developed countries it is insignificant. Moreover, it is found that gross fixed capital formation, trade balance to GDP and industrial production show positive and statistically significant relationship with employment in the industry in both sets of countries. All these findings are supported by a thorough panel data analysis.

The remainder of the paper is structured as follows: Section 2 defines the concepts of industrialisation and deindustrialisation with their specificity. In section 3 we provide a theoretical approach to the analysis of deindustrialisation and give an overview of empirical studies of the process of deindustrialisation in developed and post-communist countries. Section 4 is dedicated to describing the data used and the method applied, as well as the reasons behind the choice of a system GMM estimator. Section 5 contains the concrete results of the econometric analysis and their interpretation. Finally, section 6 concludes and presents some limitations and possible paths of future research..

1. ECONOMIC GLOBALIZATION, INDUSTRIALISATION AND DEINDUSTRIALISATION

In some countries industrialisation began with the development of light industry, while in the case of the former communist countries it began with the development of heavy industry. Also, the industrialisation of today's developed European countries began earlier and lasted longer than the industrialisation of today's European post-communist countries. In accordance with the differences in the industrialisation of countries at different stages of development, some authors define the concept of industrialisation. Szirmai (2009) defines industrialisation as a global process of structural change in which different countries follow different paths depending on their initial conditions and the time moment in which they entered the 'industrial race'. Generally, the industrialisation of the developed countries went the natural course and with the development of industry the production first moved from home workshops into manufacturing where the specialization led to an increase in productivity and labour intensity. Industrialisation soon became synonymous with wealth, economic development, political power and international dominance. In this sense, the concept of development was associated with industrialisation.

However, unlike developed countries, industrialisation of the post-communist countries had a slightly different course. Post-communist countries embarked through rapid industrialisation with the aim of achieving developed countries. Also, industrialisation in the European post-communist countries was state-controlled. However, this is not the exclusively characteristic of the post-communist countries, since, for example, industrialisation in Japan and the Asian tigers was strongly state-influenced. The main characteristic of the industrialisation of post-communist countries is the orientation on the heavy industry with a complete neglect of other industries.

Decades later, the process of deindustrialisation replicated the process of industrialisation. While in developed countries it is considered a normal and plausible course of development, in the post-communist countries deindustrialisation usually took place rapidly and was premature (see more in Penava, 2014). Palma (2007) emphasizes that although the changes in employment structure are common during the long-term economic development, the relative changes in employment on the scale and at the speed occurring in recent years constitute a phenomenon without precedent. It is necessary to build large manufacturing sector in order to become developed country (Felipe et al., 2014) which means that premature deindustrialization can be impediment to growth. Rodrik (2015) concludes that "premature deindustrialization has potentially significant economic and political ramifications, including lower economic growth and democratic failure".

2. REVIEW OF RECENT EMPIRICAL LITERATURE OF THE PROCESS OF DEINDUSTRIALISATION

2.1 A review of studies referring to developed countries

The term deindustrialisation was first used by Kaldor (1966) and later the same term was used by Cripps and Tarling (1973) and Cohen and Zysmana (1987). Nevertheless, there is no universally accepted definition of the term deindustrialisation in the literature. However, term deindustrialisation usually involves reduction in the importance of industry in the national economy as measured by its share in the GDP and / or in the total employment. We take the most common definition of deindustrialization: a shrinkage of industrial employment as a percent share of total employment.

Although debut study on deindustrialisation was conducted by Clark in 1957, Blackaby (1978) was the first to systematize all the research on this topic. 11 years later Rowthorn and Wells (1987) construct a model which is considered a fundamental empirical model of deindustrialisation. In their paper they conclude that long-term structural changes are triggered by different productivity growth rates by different sectors (productivity is higher in industry and lower in the services, see e.g. Lavopa and Szirmai, 2015) and differences in income elasticity of demand. Also, they believe that these two internal factors are sufficient to explain the long-term dynamic structural development which first results in a phase of industrialisation (growth of the share of industry and services at the expense of the share of agriculture in total employment), and then in a phase of deindustrialisation (where the share of employment in services grows at the expense of the share in industry). Thereby the main driving force of structural change is specifically the rate of change in productivity - its growth leads to growth in per capita income which in turn affects the structure of demand, which leads to the development of new sectors, or more specifically, the services sector (Penava and Družić, 2015).

Rowthorn and Ramaswamy (1997) even more vehement advocate the thesis that the deindustrialisation is caused by internal factors[3] (productivity growth is, on the average, responsible for more than 60% of the decline in the share of employment in the industry in the industrialized countries), and that trade between developed and developing countries (in the literature often referred to as a North-South trade) has no great significance in this[4]. Therefore, they advocate the idea that deindustrialization is primarily characteristic of successful economic development. Nevertheless, they do not dismiss the possibility that the effects of deindustrialisation, if followed by the shock of

[3] They find that deindustrialisation is primarily the result of productivity growth, while the share of spending on industrial goods was stable in the last few decades of the twentieth century.
[4] However, the pattern of movement of trade and specialization explains at least part of the difference in the structure of employment between these countries, and the authors agree with that.

some kind, can be negative[5]. Their estimate is updated and expanded by Rowthorn and Coutts (2004) who conclude that internal factors are the most important factors of deindustrialisation (e.g. productivity growth), but external factors (e.g. trade with low-income countries) are also a significant factor.

Along with studies that ponder internal causes, there are studies that support the view that the main causes of deindustrialisation are external factors. Lawrence (1983) and Sachs and Shatz (1994) prove that international trade is responsible for deindustrialisation in the US. Analysing the relationship between employment in industry and imports from developing countries, Wood (1995) shows that the expansion of trade with developing countries is the main cause of the deteriorating situation of unskilled workers in developed (OECD) countries. The reason behind this reduction in the rate of industrial employment in these countries is the fact that imported industrial products from countries on lower level of development are mostly labour intensive. Accordingly, as income grows the demand for services grow which leads to the increase in the rate of employment in services sector. A similar study was carried out by Saeger (1997). He explores the reasons for the appearance of deindustrialisation and its causes in the developed countries (OECD). With the known effects of differences in labour productivity, his results suggest that the North-South trade is statistically significant predictor of employment in industry (and real income) while the trade among OECD countries is not the cause of deindustrialisation.

The deindustrialization models eventually expanded so as to identify additional (external) determinants of deindustrialisation, mostly to include globalization. Alderson (1999) conducted first study deliberating the relationship between globalization (FDI and North-South trade) and deindustrialisation in developed industrial countries (18 OECD countries). The results of the comprehensive empirical analysis showed that: (1) FDI displaces those employed in the industry; (2) FDI may increase the required marginal rate of return on domestic investments, shift investments from industry to the services and reorient investment away from real investment toward purely financial investments; and (3) FDI may, in the long run, move an economy into a 'wealth trap'. Alderson also concludes that the North-South trade in industrial goods affected the reduction of employees in the industry in the North. This confirms the hypothesis that imports from developing countries played a significant role in the process of deindustrialisation of the developed countries and that the movement pattern of international trade is an important determinant of deindustrialisation (Alderson, 1999).

Papers mentioned above try to assess which factors are the main cause of deindustrialisation and at the same time most of these studies have assumed that the internal and external factors affect deindustrialisation independently. In reality, there is a possibility that external factors, such as trade or FDI, directly affect the internal factors (Kang and Lee, 2011). However, general conclusion is that the internal factors play the greater role. Also, up to now Rowthorn's model represents a general consensus and a starting model in the studies dealing with the deindustrialisation. But, the most studies are based on data for developed countries so the question about developing countries (as well as the post-communist countries) that started the process of deindustrialisation at much lower income levels arises. Some authors already tried to give the answer to this question and this is the topic of this paper too.

2.2 A review of studies referring to post-communist countries

It is obvious that most of the research on the process of deindustrialisation and its causes and effects has been carried out for developed countries. However, the post-communist countries, alt-

[5] This may lead to the situation that the service sector can not absorb a large increase in the labour supply that is released by industry sector, and that can lead to unemployment and / or to the falling in living standard. The authors state that in the U.S. the negative consequences are stagnating wages and increasing income gap, while the EU has experienced a rise in unemployment.

hough medium-income countries, also went through this process but the research on it are scarce.

Additionally, studies show (see, e.g., Dohrn and Heilemann, 1996; Raiser et al., 2003) that the deviations in the structure of planned and market economies are large-scaled. The planned economies have a higher proportion of heavy industry, a lower share of the service sector, a greater proportion of food consumption, and are characterized by underutilization of the benefits of international trade. Therefore, along with the transition, the economy transforms away from the above structures and converges to the structures of the modern market economies. Commonly used measure of 'success' of the transition is the difference in the structures at the beginning of the transition and success in eliminating these differences, along with the speed at which the differences are removed. To determine the size and the speed at which the structure of the economy of post-communist countries converge to other groups of countries ranked by income level, Thießen and Gregory (2005) conducted a panel analysis of Eastern European countries that are now members of the European Union. After the analysis and simulations of sectoral employment, they conclude that it will take more than 10 years for the countries of Eastern Europe to become structurally similar to Western European countries. But, after the economic crisis in 2008 one might say that the time of convergence is significantly prolonged. This entails often disputed fact that the transition is not yet complete, and that the inherited structural differences in post-communist economies remain an obstacle to the faster growth.

Most notable authors dealing with deindustrialisation in the post-communist economies are Mickiewicz and Zalewska. According to them: (1) both the shrinkage in the industry share and the drop in GDP would be lower in countries with more efficient reforms; (2) the speed and quality of reforms affect more the evolution of the economy structure than the GDP levels (in other words, the 'quality' of reforms, rather than the initial level of GDP (at the beginning of the reform) determine the 'path' of development (transition) of an economy (i.e., the path by which the structure of employment in the economy is changing)); (3) fast deindustrialisation is not an optimal path of transition (Mickiewicz and Zalewska, 2001). Moreover, Mickiewicz and Zalewska (2002) reveal a negative relationship between market reforms and the size of deindustrialisation. Also, the agricultural reforms play a significant role in the placement of post-communist countries on a development path that guarantees the convergence to EU employment structures.

Since the key findings of previous studies did not answer our question if the deindustrialisation in developed countries differs from that in post-communist countries we will try to shed some light on this issue in the next section.

3. ECONOMETRIC ANALYSIS

Based on a review of previous empirical studies we can conclude that there is no single generally accepted model of the determinants of deindustrialisation. Our paper builds on the work by Rowthorn & Wells (1987). However, the model will be tailored to the specific analysis to be carried out in this study.

In this section we will explain the way of obtaining the variables included in the econometric analysis in great detail, and it will also highlight the specific characteristics of individual time series. Further, we will also investigate the impact of potential determinants – GDP per capita, differences in productivity growth in industry and services, gross fixed capital formation, industrial production and inflation on the employment in industry, based on panel analysis.

In our modelling we will employ data for 15 developed European Union countries and 10 new European Union members that are former communist countries. The analysis covers the 1995–2012 period, in order to compare the process of deindustrialisation in developed and post-communist countries.

3.1 Data description and sources

Aggregated annual data from 1995 to 2012 are used to evaluate the econometric model of the process of deindustrialisation. Due to the missing data for certain explanatory variables for some countries, to estimate the appropriate model we apply an unbalanced panel model. All variables that are not expressed in shares are logarithmically transformed (GDP per capita, investment and production in industry). Selection of variables in the model is made on the basis of previous research and the specific needs of this research. Dummy variable representing post-communist economies take the value 1 for that countries and value 0 for all others (EU 15 countries). The lagged value of a dependent one-period-lagged variable will be used as an instrumental variable. Table 1 provides a description of the variables and their expected signs that are in line with economic theory and previous research.

Table 1. Data description and sources

Code	*Variable*	*Source*	*Expected sign*
EMPIS	Employment in industry, including energy (ISICRev. 3.1 C-E), percent share total employment	UNECE	Positive
GDPPC	GDP per capita	UNECE; WEO	Negative
NLP	Unbalanced productivity growth (the difference between productivity growth in industry and services)	UNECE	Negative
GFCF	Gross Fixed Capital Formation per capita, US$, at prices and PPPs of 2005	UNECE	Positive
TBGDP	Trade balance to GDP, %	UNECE	Positive
IND_PRO	Production in industry - annual data (2010 = 100)	Eurostat	Positive
INF	Inflation, GDP deflator (annual %)	UNECE	Positive

Note: United Nations Economic Commission for Europe (UNECE), World Economic Outlook (WEO)

The dependent variable measures employment in industry as a share in total employment. Along with the GDP growth, the share of employment in industry is first rising and then falling after a certain level. The declining values for dependent variable indicate the process of deindustrialisation. As countries that are analysed already crossed the threshold in the years analysed, the regression equation is not quadratic and the sign of GDP per capita is negative. The second explanatory variable (unbalanced productivity growth – NLP) measures the difference between yearly increase in value added per worker in industry and services. Since productivity growth is considered one of the most important causes of deindustrialisation the expected sign is negative. The next explanatory variable is gross fixed capital formation per capita, and since larger investments (which are usually specific to the industry sector; machinery, buildings, etc.) lead to higher demand for industrial products, thereby increasing the relative importance of the industry the expected sign

is positive. As for the variable trade balance (exports – imports as a % of GDP), its purpose is to pick up the effects of total trade on the employment structures in the economy. The expected sign is positive since countries with large surpluses tend to have a larger share of employment in industry. Another explanatory variable is production in industry. Namely, since higher industrial production means less deindustrialisation, the expected sign is positive. The control variable is inflation, recorded as GDP deflator, and has a positive expected sign.

3.2 Dynamic linear panel data model

Observing the extensive research methodologies used in the empirical studies, we assess the impact of deindustrialisation determinants by using the dynamic panel models (in which there are lagged dependent variable). Namely, panel datasets have enriched the set of possible identification arrangements and forced economists to think more carefully about the nature and sources of identification of parameters of potential interest (Arellano and Honore, 2000). On the other hand, even when the coefficients of lagged dependent variables are not of direct interest, allowing for dynamics in the underlying process may be crucial for recovering consistent estimates of other parameters (Bond, 2002). Further, panel data, by blending the inter-individual differences and intra-individual dynamics have several advantages over cross-sectional or time-series data (see Hsiao, 2006). Therefore, for the purposes of empirical testing, three dynamic panel data models are estimated. Furthermore, the number of observations differs among panel members, so an unbalanced panel model will be used to evaluate the specified equations. The dynamic panel specification that we estimate is as follows:

$$y_{it} = \mu + \delta y_{i,t-1} + \beta_i x_{itK} + v_i + u_{it}, \; i = 1,\ldots, N, \; t = 1,\ldots, \; T_i \quad , \tag{1}$$

where N is the number of units of observation, T is the number of periods, y_{it} stands for the value of the dependent variable (in this case, the share of employment in industry) *i* in the period *t*, the parameter μ is the constant, δ is the scalar, $y_{i,t-1}$ is the one-period-lagged (one year) dependent variable (for the same country), $x_{it1},\ldots,x_{itK}$ are the K of independent variables (i) for the member state *i* during the period *t* (i.e. $x_{it}^{'} \text{ is 1 x K and } \beta \text{ is K x 1}$), v_i is the fixed element or random error for the unit of observation, and u_{it} the error term in the model. It is assumed that all variables x_{it} are strictly exogenous and uncorrelated with any u_{it}. However, with the inclusion of lagged dependent variable $y_{i,t-1}$ in model, it becomes correlated with v_i.

Arellano and Bond (1991) constructed a difference GMM estimator, which is broadly utilized in economic applications in recent years. However, Blundell and Bond (1998) showed that weak instruments could cause large finite-sample biases and imprecision when using the first-diferenced GMM procedure to estimate autoregressive models for moderately persistent series from moderately short panels. The authors (1998) also demonstrated that these biases could be dramatically reduced by incorporating more informative moment conditions that are valid under quite reasonable stationarity restrictions on the initial conditions process. Hence, Arellano and Bover (1995) and Blundell and Bond (1998) proposed a system GMM estimator which is an enhanced and more efficient estimation version of Arellano and Bond (1991). Namely, whereas Arellano and Bond (1991) uses moment conditions based on the differenced errors, system GMM uses moment conditions based on both the differenced errors and their levels (StataCorp, 2015). The system GMM estimator can both greatly improve the precision and greatly reduce the finite sample bias when additional moment conditions are valid, so the use of this estimator offers a simple and powerful alternative that can overcome many of the disappointing features of the standard first-differenced GMM estimator (Blundel, Bond and Windmeijer, 2000).

Further, we use the one-step estimator, with robust standard errors in all specifications. The validity of instruments is tested using the Sargan test of overidentifying restrictions. Consistency of estimates requires that error terms are not second-order serially correlated, so we report p-values of Arellano-Bond AR(2) tests.

4. RESULTS

To investigate the impact of selected determinants on deindustrialisation, the set of regression analysis that use panel estimation models and that were discussed in the previous section were undertaken over the sample of 15 developed European Union member states and the remaining 10 new European Union member states during the 1995–2012 period, in order to compare the process of deindustrialisation in developed and post-communist countries.

Table 2 contains the results of the impact assessment of the selected macroeconomic variables on the employment in industry (per cent share) in the 15 developed EU member states (Column 1). The effects of gross domestic product per capita, (unbalanced) productivity growth, gross fixed capital formation, trade balance to GDP, industrial production and inflation were examined. Analysis of the results of the evaluated panel model led us to conclusion that selected explanatory variables to a large extent explain changes in employment in industry for 15 developed EU countries. Hence, the signs of the estimated coefficients are in line with economic theory. This empirical evidence is consistent with the previous findings of Rowthorn and Wells (1987), Rowthorn and Ramaswamy (1997), Rowthorn and Coutts (2004), and Kollmeyer (2009).

Based on the model results it can be concluded that, on average, with the GDP per capita growth the share of employment in industry decreases, ceteris paribus. The coefficient for productivity growth showed to be statistically insignificant. Considering the observed time period this result is not as surprising. Data shows that productivity growth in EU 15 has slowed down, especially after 1995. So this variable may not be the driving force of deindustrialisation any more. Also, Kollemeyer (2009) showed that neither rising levels of per capita income nor productivity growth alone could completely deindustrialize a country.

Further, according to our results, investments have the second largest impact on relative industrial sector. However, this variable cause employment in the industry to growth or respectively, it causes slow-down of deindustrialisation. The coefficient for trade balance to GDP is positive and statistically significant, implicating that the higher trade surplus the slower deindustrialisation. The coefficients for industrial production and inflation also have expected signs.

The second model in Column 2 also tests the role of GDP per capita, (unbalanced) productivity growth, gross fixed capital formation, trade balance to GDP, industrial production and inflation in determining deindustrialisation in the 10 selected post-communist economies. The results indicate a significant impact of all variables except inflation. Specifically, the results show the largest effect of GDP per capita on the process of deindustrialisation. Higher labour productivity growth in industry than in services proved as one of the determinants of deindustrialisation, with high, negative and statistically significant coefficient. On the other hand, industrial production is the main force slowing down the process of deindustrialisation. Investments and trade balance also cause employment in the industry to growth. In sum, the results from model in Column 2 support the contention that analysed macroeconomic variables are important determinants of deindustrialisation in the post-communist countries.

Although we would possibly expect somewhat different results, they show that deindustrialisation in post-communist countries is not crucially different from one in 15 developed EU countries. The main difference in the estimated models is in the coefficient for productivity growth, but taking into consideration the slow-down in its growth in developed countries we can infer that the pattern is the same. Second, post-communist countries have been known by high shares of industry in

GDP which collapsed during the transition. As these economies are going through recovery, the data show that in most countries the industrial production suddenly increased, therefore the coefficient is higher for these countries. Third, investments and trade balance coefficients are slightly higher showing that deindustrialisation in these countries is less influenced by them than in developed EU countries. Finally, the control variable, inflation, is insignificant which may be the result of hyperinflation that is characteristic of these countries in some analysed periods.

The extended model in Column 3 with the dummy variable representing post-communist economies as an explanatory variable is estimated as well. The obtained results of the estimated model are in line with expected outcomes and point out to the statistically significant effects of GDP per capita and productivity growth as well as of the dummy variable[6]. Moreover, the industrial production is also statistically significant. On the other hand, the gross fixed capital formation, trade balance to GDP and inflation are not statistically significant in the third model. Based on this result we can conclude that, although these countries share some common characteristics they are quite heterogeneous for instance with respect to different levels of economic development.

All three models show no autocorrelation between the residuals of the second order. Furthermore, based on the Sargan test, the hypothesis that there is no correlation between the residuals and the instruments was accepted. The dependent lagged variable was statistically significant and had a positive algebraic sign.

Table 2. The Results of the Dynamic Linear Panel Model – Dependent variable: employment in industry (per cent share)

	(1) EU countries	(2) P-K countries	(3) ALL countries
Lagged dependent variable EMPIS	0.988*** (0.000)	0.985*** (0.000)	1.015*** (0.000)
GDP_PC	-2.907*** (0.000)	-5.422*** (0.004)	-4.269** (0.040)
NLP	-0.051 (0.917)	-3.216** (0.0031)	-1.563* (0.070)
GFCF	1.062*** (0.001)	1.346** (0.018)	0.545 (0.178)
TB_GDP	0.045*** (0.000)	0.074*** (0.000)	0.030 (0.162)
IND_PRO	0.869*** (0.000)	3.146*** (0.005)	3.468*** (0.000)
INF	0.027** (0.039)	0.027 (0.266)	0.006 (0.772)
dummy			1.031* (0.074)
Constant term	16.381*** (0.006)	-0.458 (0.934)	-2.160 (0.754)
Sargan test of overidentifying restrictions (p-value)	0.9994	1.000	0.9593

[6] The result indicate that employment share in industry (in total employment) is on the average higher in post-communist economies than in EU 15 for 1.031 percentage point.

Arellano-Bond test for AR(2) in differences (p-value)	0.6817	0.1705	0.1648
Wald (chi2) statistics	7148.90 (0.000)	3352.12 (0.000)	1657.43 (0.000)
Number of observations	205	125	330
Number of groups	15	10	25

Source: Authors' calculations

Note: ***, **, * indicate statistical significance at 1%, 5% i 10%; p-values in parenthesis. One-step system GMM estimator with robust standard errors is applied.

CONCLUSION

One of today's unanswered questions in economic literature is whether the deindustrialisation is positive or negative phenomenon, how it affects economic growth and whether there is a need for the reindustrialisation of the country. Some of these questions we assay in this paper.

Referring to post-communist countries most authors agree that regardless of the dramatic changes that have occurred in recent decades, they still represent a group of countries which differs from developed countries. Therefore, the basic empirical analysis of the transformation of the economy in the form of deindustrialisation is an important area of economic analysis especially for post-communist countries. In this sense, we assumed that the comparative analysis of the panel results would show the difference between the causes of deindustrialisation in post-communist and developed EU countries.

Detailed theoretical framework as well as empirical research on deindustrialisation is mainly given for developed countries. Although the issue of deindustrialisation is significant for the post-communist countries, the papers dealing with it are rare or, and in case of some countries, nonexisted.

With this in mind, this paper sought to determine the main determinants of deindustrialisation in 15 developed European Union member states and 10 post-communist countries (also EU member states) during the period 1995–2012. Our estimation strategy relies on a dynamic panel specification using GMM methodology. Therefore, three models are estimated using one-step system GMM estimator with robust standard errors.

The empirical results imply that GDP per capita growth and higher capital formation to a large extent explain changes in employment in the industry in 15 EU countries with both variables causing employment in the industry to decrease. The coefficients for the trade balance to GDP, industrial production and inflation are positive and statistically significant, implicating that higher trade surplus and boosting production are slowing down the process of deindustrialisation. Hence, the estimated coefficients have signs in line with economic theory.

In the second model for 10 post-communist countries the results also show the largest effect of GDP per capita on the process of deindustrialisation. However, unlike previous model, in this model higher labour productivity growth in industry than in services proved as one of the determinants of deindustrialisation, with high, negative and statistically significant coefficient. Hence, larger productivity in the industry translates into a reduction in share of the employment in industry. On the other hand, industrial production is the main force slowing down the process of deindustrialisation. Likewise, investments and trade balance also cause employment in the industry to grow. The

analysis therefore shows that determinants of deindustrialisation are not crucially different in post-communist countries comparing to 15 developed EU countries.

The results of the extended model with the dummy variable representing post-communist economies as an explanatory variable point out to the statistically significant effects of GDP per capita and unbalanced productivity growth as well as of the dummy variable. The main causes of deindustrialisation are therefore the same, but some coefficients are insignificant due to heterogeneity with respect to different levels of economic development and integration with the European Union.

In all three models there was no autocorrelation between the residuals of the second order. Furthermore, based on the Sargan test, the hypothesis that there is no correlation between the residuals and the instruments was accepted.

Summing up, the models presented are very good in describing the determinants of deindustrialisation and the sources of differentiation between developed European and post-communist countries. Hence, they should be treated as a valuable supplement and extension of an existing literature. Furthermore, bearing in mind the limitations of the analysis, a number of extensions could be envisaged. First, extending the framework of the empirical analysis to other dynamic panel estimators could enhance the robustness of our empirical findings. Finally, we could also apply these techniques to estimate the model for each country individually.

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