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Structural Changes – Theories and Tendencies

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Abstract

The structural transformation of the national economy has been a defining process in the development of the world economy since the Industrial Revolution. The relative proportions of economic sectors (agriculture, industry, services) reflect not only economic but also social, political and technological changes, and are considered a spectacular area of study. The aim of this study is to present the theoretical models of economic restructuring, and then, using the example of Hungary, to explain how the sectoral structure (GDP, Employment) of the national economy has changed over the past 120 years and how this aligns with international trends (comparing four selected countries). The main goal is to detect whether there is further labor force to fuel the growth. The study is based on a combination of quantitative and qualitative analysis methods, using GDP and employment rate correlation to define the hidden potentials of the sectors. I presented the data based on economic structural theories and relevant literature sources, with particular attention to the hidden productivity. A forecast was also part of the analysis for the upcoming 10 years using 3 scenarios as possible outcome for Hungary.

Keywords

Growth, Sectors, Transformation, Trends

JEL Classification: *F43, N10, J11, L16*

Introduction

One of the most striking accompanying phenomena of economic growth is the transformation of economic activities. The theories behind the transformation of the structure have examined sectoral shifts in many ways since the industrial revolution. The aim of theoretical models is to explain how and why the transition occurs between economic structures based on the dominance of the agricultural (primary), industrial (secondary), and then service (tertiary) sectors [1]. The literature of the turn of the millennium identifies two main directions (Kuznetz, 1966): observes the connections between the restructuring within the manufacturing industry and economic growth and observes the development of the relative weight of the sectors.

To understand the current sectorial changes first we need to understand the main structural changes related to models. This study firstly interprets the main directions, collecting the key original trends and listing some of the latest trends. On the next chapter the focus will be on Hungary, the history of the structural changes for 120 years was presented, pointing that the same trends to be followed as in case of other countries. Four other countries were selected to show the same patterns and highlight the differences compared to Hungary. As a deeper analysis triangle models were used to compare the sectorial changes in the last 20 years using GDP and Employment figures. The comparison includes countries whose directors can be followed as same (Poland and South Korea). The question to be: is there any hidden potential on the given sector labor force to fuel the growth further? Based on these opportunities' scenario analysis were made for the upcoming 10 years indicating the directions out Hungary can choose.

Theoretical Background

Regarding the models, the following literature summarizes some important basic models, plus the latest trends.

Clark–Fisher-Model
One of the earliest and best-known theories is the Clark–Fisher sectoral model, which states that during economic development, the proportion of labor and GDP gradually shifts from agriculture to industry and then to services. Colin Clark and Allan Fisher demonstrated in the mid-20th century, based on empirical data, that the transition between individual sectors is a necessary part of economic growth [2, 3]. The model assumed a universal development path driven by industrialization, urbanization, and technological progress. This current study also uses this approach.

Rostow's Growth Model
In his work "The Stages of Economic Growth", published in 1960, Walt W. Rostow proposed a five-stage development model in which the economy progresses from a "traditional society" to an "age of high consumption". Starting from the third phase – the "take-off" phase – industrial development accelerates, which later leads to the advancement of services [4]. Although the model is highly linear and Eurocentric, it has long defined development theory thinking.

Bell's Model - Emergence of New Sectors
Daniel Bell introduced the concept of post-industrial society in his works as early as 1973, where knowledge, information and services take the place of industrial production. After the tertiary sector, we now also talk about the quaternary (knowledge and information-based) and quintenary (decision-making, research, innovation) sectors, especially in developed countries. These also provide new directions for research opportunities [5].

The present study examines the shift between sectors from the above directions and the Clark-Fisher approach. This approach can quickly identify the hidden potential, which can be examined further using latest, more complex models.

Baumol's – Service Productivity Gap
Baumol's cost disease model back from 1966 explains why wages and prices in some labor-intensive service sectors (live music, education, health care, long-term care, personal services) rise relative to manufacturing: productivity growth in these sectors is inherently slower (harder to automate) than in manufacturing, but wages tend to equalize across sectors, so costs and prices in slow-productivity sectors increase. Recent work [6] revisits the model in the context of modern health care and long-term care, examines micro foundations (task limitations to automation), and measures implications for public finance and inequality.

Roddick – Premature Deindustrialization
Premature deindustrialization describes a stylized fact: many low- and middle-income countries today see manufacturing shares (employment or output) peak at much lower income levels than historical early industrializers [7]. The model links this to globalization, automation, weaker absorptive capacity, and trade patterns that limit the traditional manufacturing growth path. Recent empirical work [8] refines measurement and highlights globalization, automation, and policy aspects.

It should be noted that the global economic integration, international value chains and technology transfers that have taken place in the past decade have resulted in new structural constraints. The economic structure of countries is increasingly dependent on international specialization and competitiveness [10]. The outsourcing of industrial production, the digitalization of services and the rise of the knowledge-based economy have presented new challenges to traditional models – which also suggests the possibility of new directions of analysis in the literature.

New – Digital Economy Models
Technological change means that tasks can be done by machines, displacing some jobs. As a result, the employment numbers affected hence the need of new models. The distributional and structural effects depend on which tasks are automated, how fast, and how new tasks are created. Early task decomposition ideas brought the task approach method into spotlight, while frameworks on automation and displacement vs reinstatement noted how automation formalizes and reduces labor demand and create new tasks [10]. Automation accelerates movement out of manufacturing (and routine occupations) into services, personal or high-skill tasks so influence a structural change driven by technology.

Another wing relates to multi-sector macro models which provide a multi-sector extension of growth models (agriculture, manufacturing, services) where structural change emerges from differential demand and productivity growth across sectors (income effects, Engel curves) and input-output linkages [11]. They unify many mechanisms (relative prices, consumption patterns, productivity differences). Further recent models also concentrate on emerging directors such as environmental and green transformation, or service platforms, using cross disciplinary methods.

Changes in the Economics Structure in Hungary
At the beginning of the 20th century, the economy of Hungary was dominated by agriculture, with two-thirds of the population working in this sector. Industrialization started slowly, but by the 1930s the industrial employment rate had already risen to over 23%. During the world wars, mainly military industry developments took place, then during the socialist period (1945–1989) the planned economy aimed at the rapid development of heavy industry, with centralized control. The share of agriculture gradually decreased, while that of the industrial sector increased to over 40%. The importance of services only began to increase in the 1970s and 1980s, but it still lagged the Western level [12]. After the change of regime (1990–2000), the transition to a market economy brought about a radical transformation: agriculture and traditional heavy industry were pushed back, while services and manufacturing, especially with the involvement of foreign capital, developed spectacularly [13]. The share of the service sector increased to over 50%, while that of industry decreased to around 30%. Modern post-industrial sectors appeared, especially in Budapest. However, the transformation also resulted in regional and social inequalities [14].

Globalization, digitalization and the dominance of the service sector (2000–present) The first two decades of the 21st century opened a new era in the economic structure of Hungary: the tertiary sector became dominant, while the economy became increasingly closely integrated into the global and European economic space. (Eurostat, 2024) EU accession (2004) gave new impetus to the transformation, especially the development of

service sectors and export-oriented industrial clusters. The share of the service sector in the gross domestic product exceeded 65% by 2020, and more than 70% of employees in employment worked in this sector [15]. Its main components are financial and business services, information and communication technologies (ICT), transport, logistics, tourism and hospitality, public services (education, healthcare). High-value-added services – such as shared service centers (SSCs), IT and development centers – are concentrated in metropolitan regions, especially in Budapest. The structure of Hungarian industry is increasingly dominated by high-tech manufacturing, primarily the automotive industry, electronics manufacturing, and the pharmaceutical industry. In parallel, key players in the digital economy have emerged: start-ups, fintech companies, software developers, which strengthen the knowledge-intensive, export-capable sector. The contribution of the ICT sector to GDP is constantly increasing, although its weight is still moderate compared to the EU average [16].

In summary, Hungary's economic structure has been strongly approaching the patterns of post-industrial countries in the past two decades. The challenge is to move forward: towards an economic structure with a higher knowledge and innovation content, in a sustainable manner. Let's see what opportunities the country has – with a little international comparison.

Economic Structural Change in International Comparison in the 21st Century

The transformation of Hungary's economic structure did not occur in isolation, but was linked to the globalization, technological and social processes of the world economy. However, historical, political and development differences resulted in different paths for each country. In this chapter, I present the main trends through the examples of four selected countries: Germany (advanced industrial country, EU engine, significant link to Hungarian economy), Poland (regional comparison, same kind of possibilities), South Korea (rapidly modernizing, developed economy), and the United States (global role model). Data was taken from the OECD and World Bank to interpret the structural factors of the selected countries, also adding other key quantitative indications of these countries using Trade economics databases.

Poland – Similar History, Different Structural Dynamics

Poland has implemented one of the most successful transformations in the Central and Eastern European region after the regime change [19].

- share of services has increased to around 63–65% by 2020,
- industry is also significant (nearly 30%),
- agriculture still represents a higher share than in Hungary.

Other key indicators: recent GDP growth is 3.5%, while 10 years trend is above 5, labor productivity 131 points and keep increasing, trends with average 115 reflecting the significant potential [17].

Although it has a similar historical heritage, Poland is characterized by a larger internal market and more dynamic IT, logistics and e-commerce development. The economy is more diversified, especially in the field of services. However, regional differences also pose a serious challenge here.

Germany – Strong Industry, High Technology Content

Germany's economy has been industrially oriented since the mid-20th century, but has been strongly modernizing its industrial structure since the 2000s [19]:

- industry (especially mechanical engineering, automotive, chemical) remains dominant (25% of GDP),
- the dominance of the service sector is strong, reaching a ratio of over 70% in 2020,
- the share of agriculture is negligible (below 1%).

Other key indicators: GDP growth more recently close to zero but 10 years trends are around 4%, labor productivity point is currently drop to 95 but trend is around 98 – reason of slowness [17]. Like Hungary, Germany is a center of global supply chains, but it produces higher value-added products and is at the forefront of the application of Industry 4.0 technologies. The change in the production structure has not occurred at the expense of services, but in close symbiosis with them.

South Korea – A Model of Industrial Leap

South Korea was still a poor, agricultural country in the 1960s, but today it is one of the world's technological superpowers [18].

- share of agriculture has decreased to below 2%,
- industry (especially electronics, shipbuilding, automotive) remains strong (35%),
- the share of services is above 60%.

Other key indicators: recent GDP growth is close to 1%, while 10 years trend is around 3, showing a same kind of pattern with +1% than Germany [17]. However, labor productivity waved more than other countries with slight increase trend still, around 100 points, also just ahead of Germany.

The secret of success is a conscious state industrial policy, massive investment in education and R&D. The country is one of the most spectacular examples of the transition to a knowledge-based economy. Although the share of industry is like Hungary, it has a much higher added value and is research-intensive. It is worth monitoring this as a potential and drawing conclusions about the future direction of the country – due to its size, it can serve as a closer example compared to the USA or even Poland, which has a more common past.

Hungary's Position in the International Space

After joining the EU, Hungary's economic structure has become closer to European models, but in several respects, it shows a hybrid nature [19]:

- dominance of services has developed, but with less high added value,
- industry is strong, but mostly assembly-type, not innovation-driven,
- weight of agriculture is low, but still decisive in certain regions.

Other key indicators: recent GDP growth is close to 1%, while 10 years trend is nearly 3, showing a same kind of pattern with -2% than Poland [17]. However, labor productivity increasing trend from 99 to 120 points presenting even better labor potential than US but behind Poland.

Compared to the countries examined, Hungary can be described as a "catching-up peripheral" model, which tries to offset the limitations of the service sector with an industrial orientation. The key question of the next decade will be whether it will succeed in moving towards structures with higher knowledge and innovation content.

United States – The Benchmark of the Post-Industrial Model
The USA already switched to the dominance of the service sector in the second half of the 20th century. Note that these key indicators can be a target to reach within the analysis [18].

- share of agriculture is barely 1%,
- industry stagnates between 18–20%,
- share of services exceeds 77%.

Other key indicators: recent GDP growth is close to 4%, while 10 years average is above 5, with several waves. Labor productivity keeps increasing, 10 years trend from 100 to 115 points [17].

The US economy stands out with the weight of innovative, knowledge-based services (e.g. financial sector, tech companies, creative industries). It is the global center of the digital economy and, as such, can be a model to follow for those who want to shift the industrial structure in a knowledge-based direction. Hence this country to be eliminated from further analysis and only its numbers to be measured as status to reach.

Analysis
In one of my previous studies, I analyzed the Employment rates and GPD growth of the sectors until 21st Century [20]. The aim of refreshing and extending this research was to have a deeper understanding of the recent two decade's changes. Using correlation coefficients between the two data sets and tracking the trends is a good starting point to see how much labor the given sector still needs. If we find hidden potential, we can target them as areas for automation. The analyses reviewed so far have shown that there are still opportunities in our country in terms of added value. So, the goals of the analysis: (1) can we measure whether there is any hidden potential and (2) can we forecast the structural changes.

Figures are: Agriculture, Industry, Service sector Employment rates (%) and GDP growth shares (%)

Source of the data: OECD and World bank. Highlight below in **Table 1:** only the first and last data of the observed period for better understanding.

Method: Correlation calculation of the database for the period of 2000-2024 between the two series of data trends. Correlation coefficients support the observations using excel program (Pearson correlation). So, if there is strong positive correlation it means that the increased GPD growth share is strongly linked to the Employment rate increase of that sector, hence the productivity is fueled by the labor force. That means that automation has room for further development. If the correlation is getting weaker the trend has already started, if even turned to negative labor can be replaced, but the productivity index should remain at a growing level.

Table 1: GDP and Employment rates. Summary. OECD, World Bank 2024.

Sector GPD growth relevance	2000	2024	Employment rate	2000	2024
HU agriculture.	4.1%	4.7%	HU agriculture	6.5%	4.4%
HU industry	33.8%	26.8%	HU industry	35.0%	31.4%
HU service	62.1%	68.5%	HU service	58.5%	64.3%
PL agriculture	4.0%	3.4%	PL agriculture	19.0%	8.0%
PL industry	31.0%	33.6%	PL industry	31.0%	30.0%
PL service	65.0%	63.0%	PL service	50.0%	62.0%
DE agriculture	1.0%	0.7%	DE agriculture	2.6%	1.2%
DE industry	30.0%	29.1%	DE industry	30.0%	27.0%
DE service	69.0%	70.0%	DE service	67.4%	71.8%
KO agriculture	3.2%	1.6%	KO agriculture	15.0%	5.4%
KO industry	34.6%	32.9%	KO industry	31.0%	24.5%
KO service	62.2%	65.5%	KO service	54.0%	70.1%

Correlations
Industrial sector: After examining the data series, it can be noted that in the case of South Korea, the industrial Pearson correlation analysis revealed a weak (r=-0.2) relationship between the two data, which indicates that automation and labor replacement were done in the given sector and they are close to maximum potential on the replacement. It should be noted that within the observed period the changes were drastic before 2010. The relationship is also negative, but much stronger in the case of Poland, where the major change was spectacular in the last decade (r=-0.72). This means that the replacement is still in progress and fueled by the human labor replacement. This was also visible on the productivity points, which are significantly growing. The transformation of the sector is in progress; I was not able identify any slowness (linear trends). In contrast, in the case of Hungary, the very strong positive relationship (r=0.95) indicates that the loss of space in the sector (from 34% to 27%) took place at a steady pace with the loss of labor in the sector in the nearly 25 years examined (from 35% to 31%). All this supports the fact that the presence of labor-intensive, assembly-construction companies in the sector remains high. Our country has increased its capacities in this area, but after these firm stabilize their productivity, we will experience changes in the Employment trends. (See Fig. 1.) As for the productivity points behind Poland it

means that further growth can be reached if the level of automation to be increased further and some labor to be replaced. However, in case of Germany, both indicators have almost stagnated in the last two decades, indicating that the change is continuous and follows technical development and hardly any impact on productivity. Due to lack of real trends Germany were also eliminated from the radar review see below.

The radar review can help us to understand the period changes and complete these three countries: Hungary, who is still in the increasing industrial capacity fueled by labor force with good productivity numbers. Poland, who is already in the phase of replacing Employees and in parallel reaching the highest productivity. While South Korea with moderate productivity and seems to be at the end of the Industrial reorganization process.

Figure 1: Radar view on Hungary, Poland and South-Korea industrial sector changes. Own design.

As for the service sector, in the case of Hungary, the correlation coefficient is strong (r=0.91) for the entire period, but after the 2020s the employment rate showed a slight downward trend, in contrast to the still increasing % of GDP (in favor of industry). All this may indicate that development, the shift towards an economic structure with a higher knowledge and innovation content favor to services sector. In case of Poland, the change in the sector did not show such a spectacular value in the examined period, but employment increased more strongly, indicating that the sector may be strongly linked to the development of industry. (See Fig. 2.) These trends also reflect the increasing productivity points. As for South Korea the employee volume changes not significant but still showing that the automation pushes further employees towards service sector.

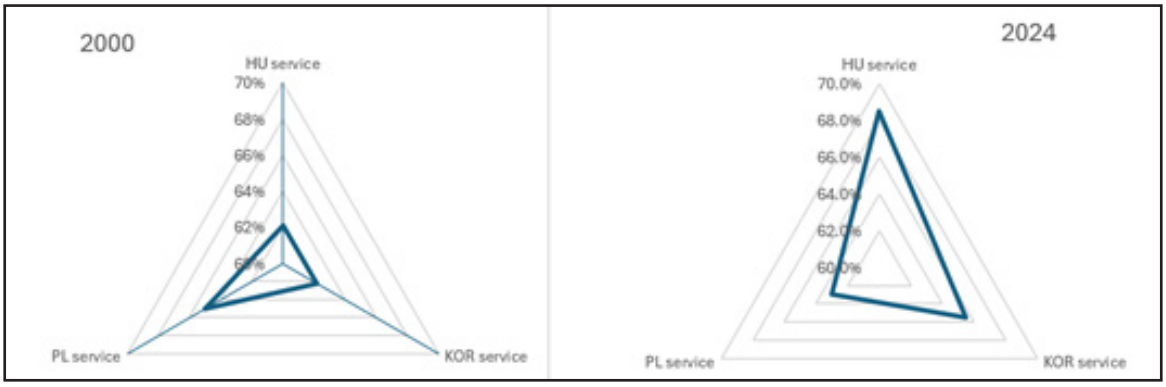

Figure 2: Radar view on Hungary, Poland and South-Korea service sector changes. Own design.

So how Hungary can increase the productivity and can be benefit from the service sector increase further? Hungary is deeply integrated into global value chains, especially through the supply chain system linked to German industry. So, if Germany is showing stagnate productivity, that will influence Hungary changes as well. It should be noted that it represents vulnerability but also an opportunity. Fluctuations in external demand and global logistical disruptions (e.g. COVID–19, wars) affect export-oriented sectors sensitively. The modernization of the economic structure is taking place in a highly differentiated manner by region. Hungary's so called semi-peripheral industrial character is well-known as one of the problems. The climate protection and digitalization turn, the labor shortage, the challenges of education and vocational training, and demographic processes (aging, emigration) are all structural factors that influence the economic structure of the future. This all means that these can be used as productivity potential for further development, which to be fueled by industry labor shifting.

Forecast

After the status observed it is worth doing some forecast scenarios. If we declare US numbers as benchmark, the goal of this research to be: (1) estimate the timeframe how and when it can be reached. Based on the existing data of OECD and World Bank and reviewing the constraints as well as opportunities, I have prepared a forecast for the coming period (2025–2035) for Hungary for the sectors (also for GDP and Employment rates). As for the economy is very exposed to global changes and macroeconomic environment, I have outlined three more extreme scenarios as possible outcomes. The key difference is the directions Hungary can choose among.

Figures are: Three sectors (Agriculture, Industry, Service) Employment rates (%) and GDP shares (%)

Source of the data: OECD and World bank. Same base data as for the previous analysis as base.

Method: Forecast options using extended historical trends (excel program forecast linear) for the period of 2025-2035. Scenarios are: conservative, innovative and slow-down. Pro-dimension: productivity. Influenced by the global economy changes as obstacle. Linear forecasts excel was used as a base, putting to the existing historical data. As for the scenarios, it is defined to be different on the speed of the recent digitalization and automation I used different time scale for them (10, 15 and 5 years). Conservative: linear trend for historical data for 10 years as the changes to happen at the same time. Innovative: as for the speed of the changes dramatically increase, I used historical data but estimate that the predicted linear changes for 15 years can happen much quicker, in 10 years. Slow-down: due to outside impact the world will slow down so the 10 years change to happen like we extend the linear scale with 5 years.

Baseline Scenario: Conservative Trend Continuation

In this case, it is assumed that digitalization will continue to progress continuously, but the significant industrial presence will remain (especially the automotive industry). At the same time, a slight decrease in the GDP ratio is expected in agriculture, but employment will decrease more slowly (shift towards higher labor-intensive sectors). The role of services will gradually increase, especially in the field of business and digital services. This trend can be realized if the following directions occur in the economy: Strong rural digitalization, precision farming; education and retraining in service areas (e.g. IT, healthcare, finance); Support for green industry (battery, recycling) in order to stabilize the industrial share. We can reach these numbers if we put linear forecast to the historical database and extend it for ten years.

Innovation-Driven Scenario

This assumption is worth examining because it could potentially be realized with stronger capital inflows, although in my opinion it is less likely than previous scenario – this direction is more likely in a 15+ year time frame. In this scenario, the flow of foreign investments into high-tech industries (e.g. semiconductors, green technology) will increase sharply. Agriculture will be partially/fully automated (e.g. robotics, sensors), and there will be strong productivity growth. At the same time, services will also be strongly digitized (e.g. AI, fintech, e-health). Its realization may be the result of the following changes in direction: R&D incentives, startup incubators in rural areas; integration of AI and machine learning into industry and services; development and export support for Agritech businesses. As a result of all this, the weight of the agricultural sector may approach 2.5%. (see table 2)

Table 2: Scenarios. Summary. Own design.

2035 future split	conservative		innovative		slow down	
	GDP %	Employment %	GDP %	Employment %	GDP %	Employment %
Agriculture	4.7%	3.2%	4.9%	2.8%	4.6%	3.6%
Industry	22.7%	28.8%	21.5%	28.0%	24.0%	29.6%
Service	72.6%	68.0%	73.6%	69.2%	71.4%	66.8%

Slowdown Scenario (Unmanaged Macroeconomic Scenario)

This possibility must be considered, because the uncertainty of the current geopolitical situation (wars, sanctions) remains high. At this time, industry will decline due to the decline in global demand and supply problems; agriculture will not be able to innovate and stagnation or even decline may follow (+series of drought years); although the service sector will grow, it will mainly be in low value-added activities (e.g. logistics, tourism).

This unmanaged option can be avoided/mitigated if the following directions are implemented: Modernization of existing industrial capacities; Quality development of tourism (e.g. health tourism); Strengthening of mid-level vocational training so that not only low-productivity jobs are created. The % related to the estimates are included in Table 1, and the ratios can be seen in Radar Figure 3.

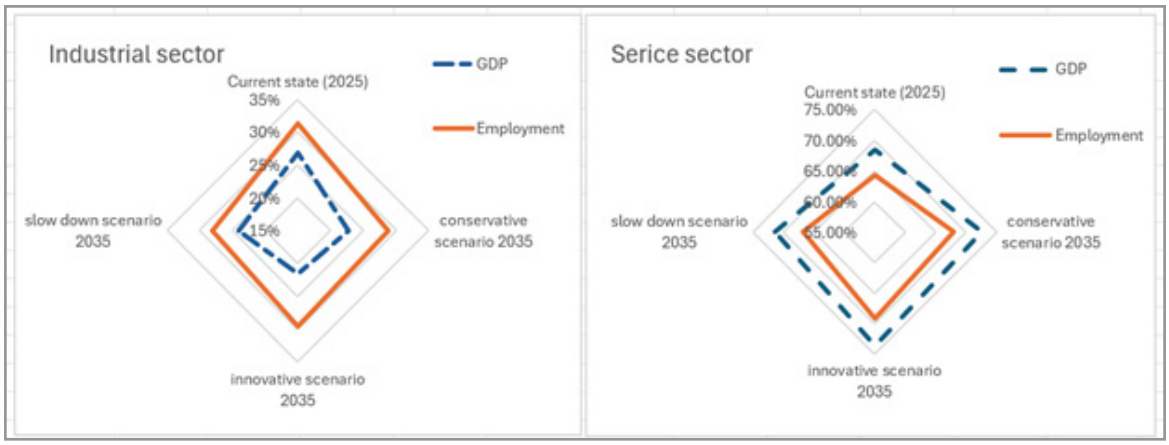

Figure 3: Radar view on Sectorial changes scenarios. Own design.

According to the most likely scenario, the realization of Conservative scenario is likely to take place over a 10-year period, with Innovative faster option expected to be achieved over a longer time scale. If geopolitical conditions take an unfavorable turn, Slow down option will come first, and then we could move to Conservative and then Innovative, of course, immediately calculating with a longer time horizon (postponing implementation by a few years). What is good news is that whichever scenario is implemented soon, the elements of current and expected market demand and supply are expected to sort out the lines. Only a smaller amount is expected to be available in the nominal value of GDP, which is clearly a function of the higher added value. So sooner or later the US benchmark is reachable for Hungary as well. But it should be noted that these are just figures, if Hungary reach the same numbers as US currently has it does not mean reaching ideal structure. In terms of ratios, it cannot be stated that a service sector ratio of over 70% indicates an appropriate and developed economy, since economic and natural conditions influence and create the ratios related to the given level of development and market. Optimizing these and adapting to the conditions is the key to achieving a higher growth potential and level of development [21-23].

Conclusion

The transformation of the structure of the national economy is not just a statistical process, but one of the most important reflections of social and technological development. In the thesis, I reviewed the main theories of economic restructuring, from the basic models to the latest complex calculation methods. But to achieve my research goal I still used one of the original concepts: GDP growth and Employment rate splits of the three main sectors. This concept still ensured, identifying the answer to the questions I was seeking: can we identify whether there is a hidden growth potential of the sectors and forecast the timing of these changes? And both answers were yes.

The examples of the countries studied (Germany, Poland, South Korea, USA) show that the expansion of the service sector is a universal trend but does not exclude the modernization of industry. At the same time, successful restructuring is not only an economic issue. The shift to higher value-added sectors is essential for sustainable growth. The analysis pointed that the GDP growth and employment rates are correlated showing the potential of hidden improvement slots. In South Korea and Poland, the negative correlation reflects that the automation and standardization shift the labor from the industrial sector towards the third sector, South-Korea is already in a matured level, while Poland is in a good progress. However, in Hungary the strong positive correlation noted that the increasing productivity is still fueled by labor-based activities. Although our country faces many challenges, such as deepening regional differences, low innovation performance, labor shortage and emigration, export dependence and supplier vulnerability, it should pay attention to these as opportunities. The development of the digital economy, the rise of green and sustainable technologies, the expansion of knowledge-based services benefits of the Eastern opening, and the increase in cooperation opportunities with the US can contribute to achieving a higher growth potential sooner if we use them well. Economic restructuring is not a closed story, but a continuous process of adaptation, shaped by technology, global trends and domestic political and economic decisions. The most important question for Hungary in the future is how well the economic structure, and the labor market within it, can adapt to the rapidly changing environment and whether it will be able to achieve higher levels of value creation – all within the framework of a more inclusive, sustainable economic model. The prepared three forecast scenarios reflect that the difference is on the timeframe, so it is essential to reach the next level of development earlier, to be as close as possible to the maximum GPD growth potential. And within this journey automation and digitalization will be the key.

This current paper managed to identify the hidden potential and did some forecast scenarios, using the original sectorial factors. But to be able to dig deeper into the above listed opportunities the new digital economy models should be used to create more complex analysis and scenarios.

Conflict of Interest

"The author declares no conflict of interest."

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