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INTERREGIONAL ANALYSIS OF KOMÁROM-ESZTERGOM COUNTY (HUNGARY) AND NITRA COUNTY (SLOVAKIA) AUTOMOTIVE SECTOR VIA THE EXAMPLE OF THE JAGUAR LAND ROVER

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The Hungarian Komárom-Esztergom County (KEC) and the Slovak Nitra Region boarders with each other via natural boarder line in the Danube River. This neighbourhood means numerous inherit and mutually beneficial cross-border cooperation possibilities. In both counties, the automotive sector is one of the flagship of the regional economic development engine. In this context, it is crucial to gain a clear view about the main characteristics of the global automotive industry to get deeper understanding on KEC regional competitive advantages and the reasons beyond them. This paper is aiming to make interregional analysis and comparison between the Hungarian Komárom-Esztergom County and the Slovak Nitra Region automotive sector. In this context, Nitra Region and its automotive sector (Jaguar Land Rover-JLR) briefly summarized (main factors and the employment, education, innovation and the cross-border relations). At the same time, revealing the differences between the Hungarian-Slovak economical governance and regulation system, draw conclusions and adoptable recommendations for the domestic decision makers.

Keywords: interregional analysis, automotive sector, JLR

Introduction

Outside the capital regions, institutional, transportation and logistics infrastructural conditions, company density and business relations impact on the potentials to take part in different transnational value and supply chains. The agglomeration effects and the supplier networks developed around Original Equipment Manufacturers (OEM) have a major role given that Slovakia and Hungary have become part of a wider automotive production and growth zone in Central Europe. 76% of the plants of the major automotive suppliers in Hungary and 53% in Slovakia are operating within the border regions including: Komárom – Esztergom County (KEC) – Suzuki in Esztergom, Győr – Moson – Sopron County – Audi Hungaria in Győr, Volkswagen in Bratislava, PSA Peugeot Citroën (Stellantis) in Trnava, Jaguar Land Rover in Nitra. In western and northwestern Slovakia, the Bratislava – Žilina auto corridor including Bratislava, Nitra, Trencin, Trnava, and Žilina city regions as the Figure 1 indicates. Four of these five city-regions hosted foreign automobile assembly plants: the national capital city Bratislava is a home to VW; Trnava for PSA Peugeot Citroen (Stellantis); and the Village of Teplicka nad Vahom near Žilina hosts Kia, Nitra hosts Jaguar Land Rover (JLR). In addition, in the corridor, Nitra and Trencin, together host to more than 100 predominantly foreign owned automotive suppliers (Jacobs, 2018; SARIO, 2022).

In Dunajská Streda (Slovakia), you can find a logistics base operated by the Chinese-owned METRANS Group. For several years, the group has been one of Europe's leading companies in intermodal transport. It possess with own network of state-of-the-art container terminals, and its supplementary services, which are now available to a growing number of customers in ten European countries. Its strategic goal is to organize global container traffic through Central and European countries. From Xian, they are transported by boat to Rotterdam, from there by train to Dunajská Streda, from where trucks transport the necessary raw materials and components to the OEM factory of Magyar Suzuki Zrt. in Esztergom where the Just in Time production system operates. On the other hand, the companies of the Automotive Cluster in Vráble supply various automotive parts and sub-modules all over Europe (PonsDanubii EGTC, 2021).

KEC borders among the Danube River with Nitra Region in western Slovakia. This geographical proximity includes many cross-border, interregional and transnational cooperation opportunities for economic development, education, culture, infrastructure development and innovation, in the frame of institutional system provided by the European Commission through the European Grouping of Territorial Cooperation (EGTC). Regulation (EC) No 1082/2006 of the European Parliament and of the Council, allowed to establish independent legal entities operating on both sides of the border, may undertake tasks designed to strengthen the economic, social and territorial cohesion of the region in order to promote cross-border cooperation (CBC). In this context, in the area of KEC three different EGTC started its activity: PonsDanubii (Komárom), Rába-Duna-Vág (Tatabánya) and Ister-Granum (Esztergom). Their goal goes beyond the interests of their own settlement, they consider the development of the given border area to be the priority. They take into account national and international development policies as well as needs and opportunities of the border region.

In both regions the automotive industry is one of the most dominant sector – in KEC different automotive and industrial clusters: Esztergom, Tatabánya/Környe, Tata, Oroszlány, Komárom and in Nitra Region the Nitra Automotive Cluster, and in both regions automotive sector's stakeholders are facing complex and similar challenges. They definitely need to invest in new technologies, making quick, relevant alignment to the emerging changes which requires new skills and competencies, the suppliers also need to show a growing engagement in product development and innovation. According to the expert forecasts, the most important skills can be leadership, complex problem-solving, analytical thinking and system analysis and evaluation. The lack of necessary human labour workforce will be one of the biggest difficulties that should be overcome.

Both regions should elaborate action for managing the digitisation and integration of value chains, tackling the obstacles linked to the global

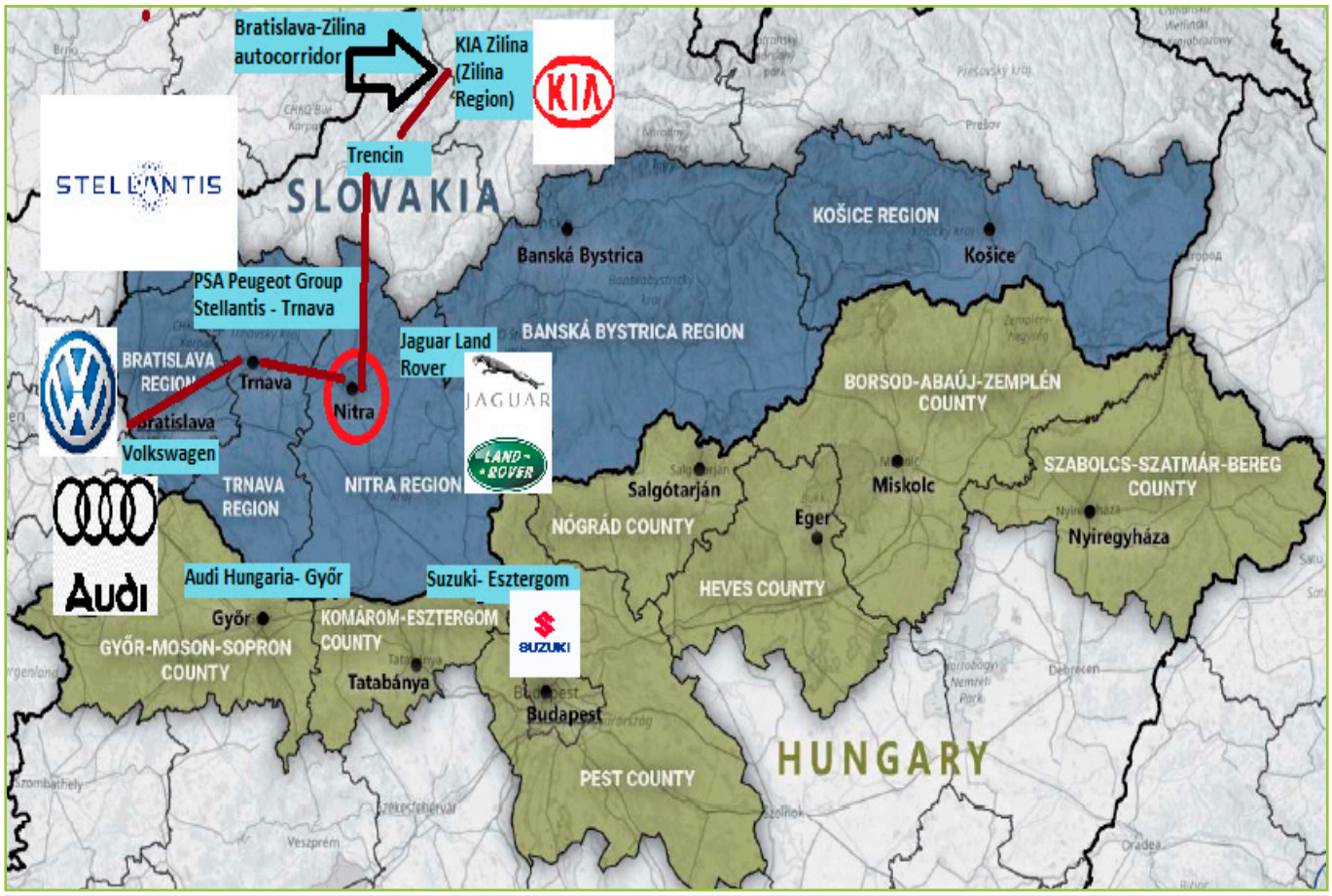


Figure 1 Bratislava, Nitra, Trencin, Trnava, and Žilina city-regions in Slovakia and Komárom-Esztergom County (KEC) in Hungary and their automotive OEM companies
Source: Author's own edition based on (Jacobs, 2018; CESCI, 2020; SARIO, 2022)

supply chain (shutdowns due to COVID-19 pandemic, lack of microchip and other components, and other unpredictable, major events). Furthermore, the transition towards zero emission vehicles, and especially to battery-electric cars (BEV), has been accelerating during 2020–2021, with 74% of Slovakia's key export markets announcing bans on ICE vehicles sales by 2035. The Slovak car producers will have to adapt to the changing market situation eliminating the risks to be vulnerable to EV adoption trends, regardless of the local rate of the EV take-up, if they are to remain competitive. For the time being, Slovakia has no transformation plan and is not ready to meet the European targets in the sector (Globsec, 2022; Hudec, 2022). In the course of couple of last years, in KEC one of the global-market leader Li-ion battery manufacturer the SK Innovation Group established two branches in Komárom Industrial Park (SK Battery and SK Manufacturing). Besides that many suppliers of the SK Innovation Group decided the make FDI in KEC (Lotte Materials, Soulbrain in Tatabánya) as well and the Chinese electric bus manufacturer BYD also set up a branch in Komárom. It seems that KEC can be one of the winner of this global internal structural transition in the automotive sector (alternative power trains – electric and hybrid cars – came into forefront), because it started to implement support programmes for e-mobility and preparing reskilling policies for employees. Nevertheless, GDP expenditure on R & D is still at relatively low level. Developing, introducing and managing innovative technologies is a common challenge. In automotive industry and its related activities as well as in mechanics and electronics there are still huge unexploited potentials for stronger cooperation.

Taking into consideration above reasons, it is worth making comprehensive interregional analysis for this sector in both regions to gain up-to-date and clear landscape about the similarities and differences, draw some conclusions and set up recommendations for the Hungarian decision makers as well.

Materials and methods

This original paper is based on author's own research work combining secondary desk-research methods (studying and analysing domestic and international documents including statistics, databases, working papers and reports, previous publications, situation analyses and impact assessment studies as well). In addition to the primary data collection, interviewing some interested stakeholders was also introduced.

The conclusions drawn from the data and the recommendations reflect the subjective professional opinion of the authors.

Overview of Hungarian and Slovak automotive sector

Hungary

In the case of Hungarian automotive industry, 5 OEMs are operating in Hungary (Audi, BMW, Mercedes, Opel, Suzuki), and three additional OEMs (Ford, Nissan, Jaguar Land Rover – JLR). They all brought high added value engineering services to Hungary. 172,500 people worked at 700 supplier companies in 2018, this means 3.9% of the total number of employees,

Table 1 Comparison main indicators of the Hungarian and Slovak automotive sector (2020)

	Number of produced cars on 1,000 inhabitants (pieces)	Size of the industrial output (%)	Ratio from total GDP (%)	Ratio from total xport (%)	Number of employees working directly in automotive sector (person)
Slovakia	183	48	13	46	164,000
Hungary	42	18	10	34,8	170,000

Source: Own edition based on SARIO, 2022; Drahokoupil et al., 2019; HIPA, 2019; Gabrižová, 2020

12.9% of the total number of employees in the manufacturing industry. In terms of outputs, total Hungarian manufacturing exports accounted for 34.8% and total value added (GVA) for 4.9%, with 91% of the half a million cars produced being exported (HIPA, 2019; ACEA, 2020). This sector was the backbone of economic growth in the years before and after the 2008–2009 recession, but lost significant momentum between 2016 and 2018, and has already slowed and curbed industrial growth during this period. In 2019, however, the industry's output was 9.8% higher than a year earlier. The unique characteristic of the growth was that in the meantime the volume of vehicle production in the EU decreased by 4.3% (ACEA, 2021). The COVID-19 pandemic did not spare the countries of the Central and Eastern European region either. In 2018, the automotive industry accounted for an average of 4% of GDP in these countries, exports for 18% and research and development for the corporate sector for 14% of the total employment in the region. It represented 4%. The vehicle manufacturing companies in the region stopped their production for an average of 28 days, the output volume fell by 17–25% compared to the 2019 level (ACEA, 2020).

In the automotive industry, seamless coordination between interested subcontractors, logistics partners, and manufacturers is essential, since this sector is one of the most challenging area in terms of automated procurement processes. In addition to quality, on-time delivery and transparent logistics processes, a high degree of flexibility and short response times, are required to get parts to the production line in the due time. E-mobility, digitalisation, CO_2 emissions and a shortage of skilled labour pose new and complex challenges for the industry.

Companies have responded to the shortage of skilled, experienced and engaged labour workforce with the rise of robotics. Many companies have rethought their business model and operating processes in line with their regional strategy, choosing to be able to respond quickly to customer needs in the local market and reduce potential risks by reducing production time. According to data from the International Federation of Robotics (IFR) in 2019, there were 2.7 million industrial robots in the manufacturing and logistics units of various companies globally, of which 923,000 were in the automotive and automotive industries. (In addition to China, Japan, South Korea, the United States and Germany use industrial robots to the greatest extent, but Poland and the Czech Republic are also among the top 15 countries in the world in terms of robotics. In Hungary, between 2009 and 2019, a total of more than 8,900 industrial robots have been commissioned, about a third of which cover the automotive industry which employs nearly 170,000 people (IFR, 2020; Cséfalvay, 2020; Statista, 2021).

Slovakia

In the last two decades, the automotive industry has been the flagship of the Slovak economy, accounting for 54% of total industrial production (33% in Hungary and 31% in the Czech Republic), 33% of total exports and 13% of GDP. According to 2020 data, the four car manufacturers present in Slovakia (Volkswagen, KIA, PSA and JLR) with 5.5 million employees employed a total of 177,000 people, while the total number of employees in the sector was 275,000 (10% of the total number of employees). , most of the cars were produced here in the V4 countries (1.2 million units). It has significant capacities in the production of electric-powered models (4 BEV and 11 PHEV models). The V4 region has the highest number of cars produced per thousand inhabitants (229), the same value is 126 in the Czech Republic, 44 in Hungary and 12 in Poland (SARIO, 2022).

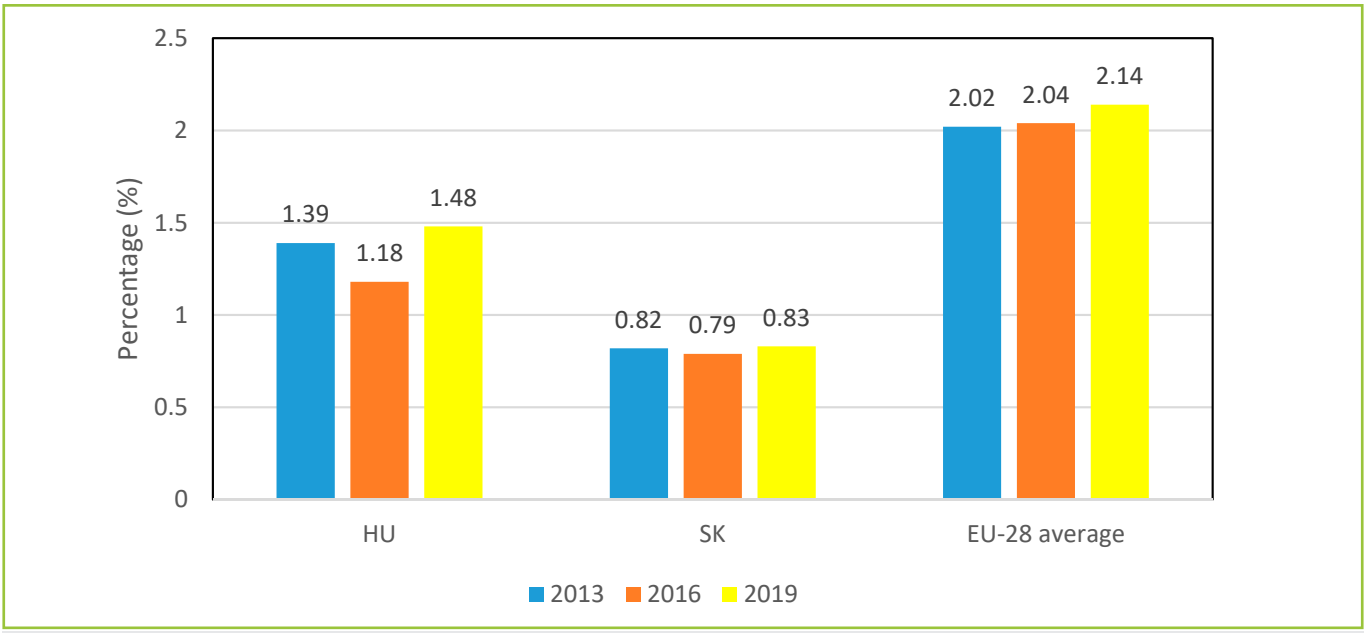


Figure 2 Gross Domestic Expenditure on R & D as percentage on GDP Hungary, Slovakia and the EU-28
Source: Author's own edition based on Globsec, 2021

These facts reflect one-sided Slovak economic structure mainly dominated by the automotive industry perhaps the strongest among the V4 countries as you can see on the below Table 1. Slovakia can be regarded in certain sense as "Detroit 2" in the CEE region with the strongest "Anglo-Saxon orientation" among the V4 countries.

The local manufacturing and assembly plants of the automotive companies (4 OEMs as well as the TIER-1 companies) were essentially "manual" based only in Slovakia. Differing from Hungary, R & D bases located next to automotive clusters are not typical in Slovakia.

As a consequence of Slovakia's low prioritization of R & D compared to Hungary or the EU-28 average in 2013–2019 timeperiod, which clearly indicated on the above Figure 2, the low quality of the R & D system and the inability to attract students and researchers, reinforcing the brain-drain trend that continues to define Slovakia.

The Slovak automotive industry has an extensive, nationwide and high-quality supplier network, 27 of the 350 suppliers have higher added value compared to car factories, use more local inputs and have a higher share of fixed assets. However, like the other V4 countries, they are exclusively subsidiaries of large foreign-owned companies. TIER2 has some large Slovak-owned companies and a number of domestically owned small and medium-sized enterprises, but their added value is lower than that of foreign-owned companies (Horbulák, 2019; Globsec 2021).

The Hungarian Komárom-Esztergom County and the Slovak Nitra Region in brief

Komárom-Esztergom County (KEC)

KEC area (2,265 km^2) covers 2.4% of Hungary's territory and its residential population size means 3% of the total Hungarian population, provides 3.2% of employment, and 2.4% of domestic registered enterprises. The share of the value of investments within the country (5%) is significantly higher than the share of the population, the same is strongly true for industrial production (8.3%). The production of county-based industrial enterprises increased by a total of 11%, including that of automotive companies by 17%. Construction output grew by 6.3%, with companies entering into new contracts for construction work 20% higher than last year in 2018. Although the number of enterprises with foreign direct investment decreased nationally and in the county between 2010 and 2018, the amount of foreign capital in the county doubled during this time (HUF 595 billion in 2010; HUF 1,209 billion in 2018). KEM is the fourth in Hungary in terms of gross domestic product (HUF) per capita. The order for 2018 is:

1. Budapest (8,070 thousand HUF/person),
2. Győr-Moson-Sopron 5,044 thousand HUF/person),
3. Fejér (4,019 thousand HUF/person),
4. Komárom- Esztergom (3,880 thousand HUF/person).

The county's result is close to the national average (HUF 3,919 thousand/person), 99.0% of it (KEC, 2014; KEC, 2021).

The number of employees increased from 127 thousand to 141 thousand between 2010 and 2019. The increase is almost entirely due to job creation in the competitive sector, while the number of people employed in public employment has declined. The number of unemployed fell from 11,000 to 26,000 between 2010 and 2019. The unemployment rate fell from 8.6 percent to 1.6 percent. The KEC's labour reserve, including that of public employees, was about 6,000 (Central Statistical Office, 2019). In the third quarter, the number of both employed and unemployed persons decreased compared to the same period of the previous year (Employment expanded nationwide.) The employment rate was slightly below the national average, but the unemployment rate was the lowest among the counties (1.1% in Q4 2019 and 1.6% in 2019). The favorable process was hampered by the epidemic and a temporary jump in the unemployment rate due to the local economic recession, especially in the local service sector (Unemployment increased from 2,600 in 2019 to 5,934 in 2020, slightly more than doubling from the previous level, but in 2021 a return to the previous situation began).

Nitra Region

Nitra Region, with an area of 6,344 km^2 and the number of inhabitants of 671,508 in 2020 corresponds to 12.3 % of the total population of Slovakia. There are 7 districts in the county (Nitra, Zlaté Moravce, Topoľčany, Levice, Nové Zámky, Šaľa, Komárno), 354 municipalities, of which 16 are urban. The economically active population is 342 thousand people. The climate of Nitra County has a dry climate with high quality arable land that provides the best conditions for agriculture (mainly cereals and corn) and food processing, viticulture. In addition, it is a popular destination for domestic and foreign tourism (wine region near Múzsla, excellent cycle path network). The centre of the chemical industry is Šaľa, the automotive industry is concentrated in Nitra, the paper industry in Štúrovo and the mechanical engineering industry in Tlmače. The county is also home to the Mochovce nuclear power plant, which has become known for its operational uncertainties, shipbuilding in Komárno and furniture manufacturing in Topoľčany (Statistical Office of the Slovak Republic, 2021).

Nitra Region is a "neglected", lagging behind area in terms of infrastructure (public transportation roads, railways). The northern part is more developed than the southern part: the "break" on the Surány-Érsekújvár line, the districts of Komárom and Leva, lagging areas of among Ipoly, among Garam. There are no Industrial Park or Logistics Park developments throughout the county (Bratislava – Vág Tatra is the main axis of developments, all resources are concentrated here). In 2020, the share of the economically active population was 49.8 % in Nitra Region. The economic activity rate reached 57.8 %. Since 2010 to 2019 the employment rate in age 20–64 years had been rising. In 2020 it dropped by 1 p. p. at the value 72.8%. Contrary, the unemployment rate has been falling between years 2010–2019, but in 2020 it increased by 0.6 at the value 5.2 %. The average monthly earnings were by 10.7 % lower than the national average and reached the level of EUR 1 191 (Statistical Office of the Slovak Republic, 2021).

There is no engineering higher education in Nitra Region, neither at János Selye University in Komárno nor at the Slovak University of Agriculture or at the University of Constantine the Philosopher in Nitra. For those students who want to enrol engineering higher education, they have to go to Bratislava, Žilina or Košice, although talented young people prefer to go either to Prague University of Technology (CZ), Budapest University of Technology (HU) or German, British HEI's making advanced engineering studies (Oral information by interview, 2022).

Secondary technical education is at the Komárno Vocational High School, the Újvár Vocational Secondary School, and the János Selye High School which is the best high school in the entire Nitra Region (in Slovakia the primary schools are state-owned, the industrial vocational secondary schools and high schools are operated by municipalities).

Due to the inadequate legal basis, there have been negative experiences with the introduction of dual secondary education in Slovakia so far. A proportionate share of the student per capita quota of internships with corporate partners has been deducted from schools ("the company will absorb the workforce"). As there was no interest at all in this form, an amendment to the law in 2016 allowed the missing resources of schools to be replaced by corporate partners, so now there is some shift in this matter.

The dual training model would be implemented in Slovakia through bilateral agreements between the given vocational high school company, there is no practice-oriented Dual Training Centre model similar to the Hungarian one (KEC): Sector Vocational Training Centre (SVTC). SVTC is operated by a Non-profit Ltd., established jointly by the founding members, which provides several services to the companies concerned in a "membership system":

- Providing training infrastructure and trainers.
- Support in administrative background.
- Organizing dual trainings in the areas indicated by the companies based on their stated preliminary needs.
- Services complementary to dual training – career guidance and pre-employment surveys.
- Other adult trainings (company trainings, training of trainers, HR development, digital module, project management module, process development – Lean, SixSigma modules).

The purpose of investment incentives in the narrower sense is to reduce the risk and costs of investments and to improve their return. Its assets include tax benefits, tax exemptions, financial subsidies and other subsidies (infrastructure development, technical assistance, providing services during the implementation of the investment). In Slovakia and Nitra County, there are no local economic development and industrial park operators similar to Hungary for example the existing Regional Economic Development Organisation Non-profit Ltd. in Tatabánya, Real-estate Development Corp. in Oroszlány, Industrial Park Ltd. in Komárom. FDI would have been involved in the Danube SK with the prior creation of local intellectual, institutional and transport infrastructure (there was no reception on the part of the SK management at the time). Instead, SARIO is trying to perform these tasks centrally throughout Slovakia. Similar to KEC, Nitra Region is also not characterized by the integration of global-scale automotive companies into the local economy. JLR in Nitra has no role in the development of either the municipality or the local community (no corporate social responsibility).

In Slovakia, with one or two exceptions, local SMEs have not been able to integrate to some extent into these globalized supply chains as suppliers, either directly or indirectly (exceptions: Tatra in Archbishop, Matador Automotive Group TIER1 in Nitra – structural steel and aluminum components, for VW, Audi, Porsche and JLR, Jászplasztik Group in Galanta – electronic components for Samsung Electronics as a logistics centre) (oral information in the interview 2022).

Slovak taxation system

The International Tax Competitiveness Index (ITCI) of the Organization for Economic Co-operation and Development (OECD). This indicator measures the extent to which a country's national tax system (the structure of which reflects a country's economic performance) respects two important aspects of tax policy: competitiveness and neutrality. According to ITCI 2021, the Slovak tax system is the 11th most competitive tax system in the world (Hungary is 13th, the Czech Republic is 7th and Poland is 36th on this list (Bunn and Asen, 2021).

According to OECD research (OECD, 2008), economic growth may be most negatively affected by excessive corporate tax rates and less by personal income tax and consumption tax rates. Property taxes have the least impact on growth (the ITCI takes these scale and weight into account when examining each country's tax systems). Currently, most OECD countries generate significant amounts of revenue from broad-based taxes such as payroll tax and value added tax (VAT). The main principles of the Slovak taxation system are the followings (https://taxfoundation.org/country/slovak-republic):

- Tax reform in 2004 – reduction of the number of tax types (0% business tax, vehicle registration tax, real estate transfer tax, property acquisition tax, gift tax). When the tax reform was introduced, all income was taxed uniformly (the same tax rate was applied to wages, business, rental income, winnings, bank interest, capital investment and other one-time income). VAT, Personal Income Tax (PIT) and corporate tax rates were initially uniform at 19% (this resulted in an annual GDP growth of 10% between 2006 and 2010 + the euro was introduced in 2009). Companies could deduct property tax when calculating their taxable income (property tax is payable to local governments). This unified taxation size changed in the last several years (https://taxfoundation.org/country/slovak-republic; Bunn and Asen, 2021):
  - 20% VAT in 2022, in some rare cases (certain foodstuffs, medical devices, pharmaceuticals, books and accommodation) the reduced VAT rate is 10% (VAT rate in other V4 countries: Hungary: 27%, Poland: 23%, Czech Republic: 21%);
  - the corporate tax (profit tax) according to the current rules of Slovak corporate taxation is 21% (in some cases 15%, up to a turnover of € 49,790/year). The advantage of the Slovak regulation is that the local business owner can deduct the profit taxed in this way in the form of a one-time dividend tax of 7%, without having to pay TB or other contributions. This rate is less than half of the Hungarian dividend tax (a Hungarian resident is taxed on dividends in Slovakia in his own country, but only has to pay the difference between the Slovak and Hungarian dividend taxes);
  - the size of the Slovak income tax in 2022: Slovak minimum wage – € 646 in 2022 – € 381.61 after tax; 19% – up to an annual income of € 38,553; 25% – over an annual income of € 38,553.

Nitra Region and the Jaguar Land Rover (JLR)

At the time of the arrival of the Jaguar Land Rover car factory in Nitra, the unemployment rate in the county was 12%. At the turn of the millennium, Nitra Region was in second place – behind Košice Region – in the ranking of the counties hardest hit by unemployment. At the end of February 2019, the share of the registered unemployed decreased to 3.14%. This ratio rose again to 5.94% in 2021 due to COVID-19 (which is still more favourable than the national average), but it shows a strong variance within counties. Poor 3%; New Castle 4%; Komárno 6%; Leva 8%; Sturovo is 9%, but without Magyar Suzuki Zrt. (OEM) in the Esztergom IP and Kirchhoff Hungaria Ltd. (TIER-1) this ratio would be 20%. The workers offered by the companies of the Győr and Komárom Industrial Parks help the workers of the Párkány area, but the workers also go to Rétsági Industrial Park (Nógrád County) to work (https://ec.europa.eu/eures/public/living-and-working/labour-market-information/labour-market-information-slovakia_de).

Jaguar Land Rover (JLR) is the UK's largest carmaker, employing nearly 40,000 people and has invested £ 12 bn in new product development and capacity expansion over the past five years in Castle Bromwich, Halewood and Solihull in the UK, with newer models such as Jaguar XE, Jaguar F-PACE, Range Rover Evoque Convertible and Land Rover Discovery). In 2018, JLR spent £ 4 billion on research and development. JLR's expansion into V4 countries was in line with the company's global strategy (opening its Chinese joint venture in 2014 and its Brazilian plant in 2016, supported by contract manufacturing in India). The creation of new international manufacturing facilities will allow JLR to expand its model range, increase its global competitiveness.

Slovakia, Hungary and the Czech Republic competed each other for the JLR investment, but Slovakia promised the biggest discounts and bonuses, as the country definitely wanted to be on the map of Europe. With the same approach, Slovakia has been able to involve VW, KIA and PCA/Peugeot (Stellantis). JLR was a greenfield investment in the field, there was no infrastructure and utility network in the area before it was built, and railway lines were even relocated due to JLR. During the € 1.4 billion (£ 1 billion) investment, 45% of the total costs were borne by the Slovak state, while JLR paid only 55%. On behalf of the Slovak state, the construction was carried out by MH Invest, the back office of the Ministerstvo hospodárstva SR (Slovakian Ministry of Economy) (Oral information by interview, 2022).

JLR's 300,000 m^2 automated and robotic (KUKA robot systems) production plant in Nitra was opened in October 2018 with a capacity of 150,000 cars per year. JLR's plant in Nitra started with 1,500 employees, and another 850 people were hired in the following months. When recruiting, the existing SK and HU OEM companies were promised 50% of the wages (recruitment from competition because they did not find the right number and quality of labour locally. All new entrants must attend a 12-week JLR Academy course during their training. JLR spent 7.5 million euros on the establishment and operation of the academy, with the most sought-after professionals: varnish, welder, car electrician, car mechanic, maintenance technician, robot operator, tool technician, quality controller, team leader. Land Rover Discovery, Land Rover, Defender 90, Land Rover Defender 110, Land Rover Defender 130 (https://www.jaguarlandrover.com/news/2018/10/jaguar-land-rover-opens-manufacturing-plant-slovakia; https://www.automotivemanufacturingsolutions.com/jlr/transforming-a-field-into-a-factory-jaguar-land-rover-in-slovakia/40901.article).

Jaguar Land Rover stopped production of Land Rovers at its assembly plant in Nitra, Slovakia, in June 2021 due to the lack of automotive parts containing semiconductors. The unit that makes the Defender and Discovery SUVs is no longer the first plant in Jaguar Land Rover to be disrupted by a global chip shortage. As early as April 2021, the factories in Castle Bromwich and Halewood, England, were to be shut down. The Slovak plant has also been overtaken by a shortage of chips preventing the production of about half a million vehicles worldwide. Thierry Bolloré, CEO of JLR, told investors in 2020 that ordering electronic components directly from their manufacturers protected the company from the worst of the chip shortage. It is not known whether this procurement model is still used. In the business year just ended, JLR sold 439,588 vehicles due to the coronavirus, down 13.6 percent from the previous period. The good news, however, is that sales have increased in China, and the new Defender has proven to be very marketable, selling 45,255 units. The full-year figures were improved by the results of the first three months of this year. In January-March, the number of vehicles sold was 123,483, an annual increase of 12.4 percent. In addition, the result before extraordinary items was EUR 619 million (Page, 2021).

JLR STA Center in Hungary (Budapest)

In 2019, JLR opened the Supplier Technical Assistance (STA) Centre in Budapest, the task of which is to control the quality of products arriving in the Eastern European supply chain. It inspects parts from regional suppliers based on quality and compliance criteria, and follow up if there is a problem. The significance of the investment is also shown by the fact that Jaguar has a headquarters similar to that in Budapest only in Great Britain, Ireland, North America and China.

The basis of JLR's decision is that Hungary has the lowest corporate tax in Europe, a high standard of Hungarian higher technical education and a knowledge base of automotive engineering based on decades of tradition. Budapest was chosen as the location for the new office because it allows for close cooperation with suppliers in Central and Eastern Europe. This investment is in line with the changing dimension of the Hungarian economy which puts high technology and high added value at the forefront. Although the JLR STA Centre does not deal with developments related to the creation and introduction of new models, it also performs high value-added "non-assembly plant" tasks. The type of work done in the design and development departments and the STA departments is connected to the production process at a completely different point: the whole thing starts with the development, but the role of the STA departments only comes at the end, just before the cars are on the production line (https://europe.autonews.com/article/20181102/ANE/181109936/jaguar-land-rover-will-open-engineering-office-in-hungary; https://hipa.hu/jaguar-land-rover-announces-technical-engineering-office-in-budapest).

Conclusions

Due to emerging urgent request of taking into practice digitalisation and other Industry 4.0. linked technological solutions, adoption of the green deal, COVID-19 supply chain disruptions, global shortage of microchips, the automotive sector has to face the biggest transformation ever in Hungary and in Slovakia. All of this combined has the potential to change the transformation into disruption. This makes the need to stay on top of the developments for Slovakia all the more pressing. Support for innovation, start-ups and industry clusters and for the transfer of know-how are key. Slovakia only ranks 21st in European Innovation Scoreboard. Slovakia still lacks behind its European partners in private R & D expenditure.

Making comparison between the KEC (HU) and Nitra Region (SK) automotive industry, you can draw some important lessons learnt from this research work:

- SK (and Nitra County) operates according to a highly centralized model of economic governance and economic development, which is less efficient in everyday life. In contrast to HU (and KEC), there are no local economic development and IP operating organizations (decentralized model), which has made KEC an unavoidable factor for FDI decisions.
- Nitra County is an area lagging behind in terms of infrastructure without engineering higher education.
- SK automotive clusters are not characterized by R & D, so they are only assembly plants. This is due to inadequate funding in the field of R & D, the directions and topics of applied research at universities and research institutes do not cover the needs of industry factors, and the ability to cooperate between factors in the R & D sector and the corporate sector is low. That is why the JLR Supply Chain Technical Support Centre (STA Centre) came to Budapest in 2019 (HU R & D infrastructure, intensity and professional standards are much stronger than in Slovakia).
- The dual training model has not worked in Slovakia so far, there is none similar to the Hungarian Dual Education Centre (ÁKK in Hungarian) model, only there are Corporate Training Centres based on bilateral agreements. Dual training collaborations have started mainly at the level of vocational secondary schools and companies in the last 2–3 years, this does not really work between Slovak universities and companies.
- Partnerships between local public institutions and branches of multinational companies in Nitra Region are weak, the bottom-up cooperation and initiatives between local actors to promote networking have not really developed.

- Slovakia tries to take advantage of the tax system different from the Hungarian (the corporate tax rate is higher, but there is no business tax and the taxed profit can be withdrawn from the company in the form of a 7% dividend tax, no other contribution has to be paid. This rate is less than half of the Hungarian dividend tax).
- From 1 January 2022, the revised legislation in Hungary will allow large companies to invest in the capacity expansion in an existing facility, in addition to their new site investment. The rate of regional investment aid intensity that can be granted to KEM companies is 30%.
- Investment incentives in the narrower sense show that job creation is the most important goal and vehicle production is a priority, but that there is a serious shortage of skilled labour due to problems in the education and training system and emigration. Rising wages due to labour shortages are leading to a decline in the wage advantage in the V4 countries. This has a shift from work-intensive to knowledge-intensive production.

In order for investors to settle in disadvantaged regions, higher aid intensities, subsidies for infrastructure and job creation are not enough, but a suitably qualified workforce has to be also provided.

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