

# Current Condition of Electrical Engineering Industry in Individual Self-Governing Regions in Slovakia

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*Abstract:* The Slovak economy is generally regarded as a functioning market economy. Slovak electrical engineering industry belongs to younger and the most dynamically developing sectors of Slovakia. Structural changes and foreign investments into the electrical engineering industry in 1989 led to its strong quantitative, qualitative and spatial changes. Consequently, growth and development of the electrical engineering industry varied among the individual self-governing regions of Slovakia. The article identifies, analyzes, compares and evaluates conditions of the electrical engineering industry at the self-governing level in Slovakia. Individual self-governing regions were allocated to the relevant category of development based on the typological analysis of selected geographical indicators.

*Key-words:* Electrical engineering industry. Regional disparities. Self-governing region.

## Introduction

Industry in Slovakia plays an important role among economic sectors and significantly impacts the development of the overall economy.

The umbrella definition of industry covers all activities related to the extraction of raw materials, agricultural products and their transformation to finished products [1].

In the world, but also in Slovakia, industry has undergone a long development. In transition period after 1989 it becomes to the decline of industry. The biggest decline was observed in mechanical engineering industry. Part of the labour force was absorbed in tertiary sector, other part was registered as unemployed [2].

Currently, automotive, metallurgical and electro technical industry belong to the most dominant industries in Slovakia. The electrical engineering industry (EEI) is one of the most dynamically performing industrial sectors in Slovakia. Today, EEI is one of the main pillars of national industrial growth. EEI was significantly growing mainly after the World War II. Foundations of high and low voltage electrical engineering associated with the production of components for power stations, power supplies, motors, wires, insulators, television, radio apparatus and lighting have been shaped in this period.

Because of loss the COMECON market, ineffective and lagging production, EEI led as a sector with no potential for further growth. Since then EEI absolved extensive structural, quantitative and qualitative changes. After 1989, EEI production was focused on production of cable harnesses [3].

The reduction of the number of staff and number of EEI companies was affected by economic crisis in 2008. Today, the production of electrical engineering products continually develops to the next production phase where implementation of new innovative technologies plays an inevitable role.

Production of electrical engineering equipment includes a wide range of simple as well as highly complex products. According to SK NACE Rev. 2 [4] EEI is defined as a summary of all divisions of industrial sectors.

26 – production of computer, electronic and optical products,

27 – production of electrical equipment.

Changes in EEI after 1989 were reflected also in the uneven spatial distribution of individual electrical engineering production sites in Slovakia. Uneven spatial distribution of electrical engineering industry remarkably affects the development and growth of regional disparities.

A growing number of scholars with diverse backgrounds investigate and analyze regional disparities. Consequently, the definition and interpretation of regional disparity is inconsistent and highly diversified.

An important source of theoretical knowledge on the classification of regional disparities provide following scientific papers:

According to Víturka [5] regional disparities are defined as inequalities, differences and heterogeneities.

Hančlová, Tvrdý [6] confirm that the term regional disparity is relatively intensively used term. Scholar literature and scientific practice define it differently.

Regional disparity is understood as the distance between regions in abstract metrical space that can describe one selected descriptor of region or the entire group of these descriptors, statically as well as dynamically.

Matlovič, Matlovičová [7] characterize that analysis of relevant development factors is a basis for a definition of regional disparities in Slovakia. This means the identification of key impacts on regional development such as definition of suitable spatial units, selection of suitable ratios as well as statistical instruments and scales that allow comparisons in time and spatial horizons.

Molle [8] explains that policies of European Union are closely connected to cohesion. The amount of disparities defines the ratio of cohesion shortage. Disparities' development is usually compared to the achieved level of living standard in members' countries, regions and social groups.

The OECD definition of regional disparities [9] has an important limitation. It is focused only on economical phenomena of regional disparities.

Vorauer [10] considers regional disparities as a problem or adverse events. On the contrary, regional disparities can be regarded also positively if the further development of the individual region is based on comparative advantage.

The level of EEI development in individual self-governing regions in Slovakia was defined by the typological analysis of selected geographic indicators: number of production plants, average evidence number of employees (AENE), turnover for own products and services (turnover), AENE per 1 production plant (PP), AENE for 1 km<sup>2</sup>, AENE per regions' inhabitants, AENE per employed in industry in the region.

### Material and Methods

The regional allocation to the relevant category was achieved as follows. Firstly, data values were grouped to five levels of development.

Secondly, the districts were allocated to five levels of EEI development based on the final indicator's value. Subsequently level of the indicators was counted by arithmetical average of regions. Level 1 was assigned to regions with the smallest classifications level of development, level 5 was assigned to regions with the highest classification level.

Evaluation of selected indicators is available in Table 1 and displayed in Fig. 4.

Type 1 with the least developed EEI

Type 2 with below average developed EEI

Type 3 with average developed EEI

Type 4 with above average developed EEI

Type 5 with the most developed EEI

### Importance of electrical engineering industry in Slovak regions

The regional disparities in allocation, structure and performance of EEI are highlighted based on the comparison of selected geographic indicators presented in individual self-governing regions. Spatial definition of the region was carried out according to the current classification of statistical territorial units at eight self-governing regions of Slovakia.

Fig. 1 describes the spatial allocation of achieved level in **number of electrical engineering plants** in 2012. Statistical Office of Slovak Republic was the source of relevant information [11a], [11b]. Trnavsky self-governing region (TSR) had with 28 production plants the most dominant position of the division production of electrical equipment in 2012. The lowest number of production plants in the analyzed division was localized in Trenčiansky self-governing region (TNSR) with 8 production plants.

The greatest level of representation of the division production of computer, electronic and optical products was in TSR with 15 production sites. 8 production factories were located in the Nitriansky self-governing region.

The lowest level of representation of the analyzed division was in Banskobystrický self-governing region (BBSR) with only 2 factories.

The growing importance of electrical engineering industry is definitely proved in the analysis of the ratio of the number of EEI production plants to the overall number of industrial production plants in Slovak Republic. The ratio was growing from 7% in 2008 to 8% in 2010 and to 8.6% in 2012.

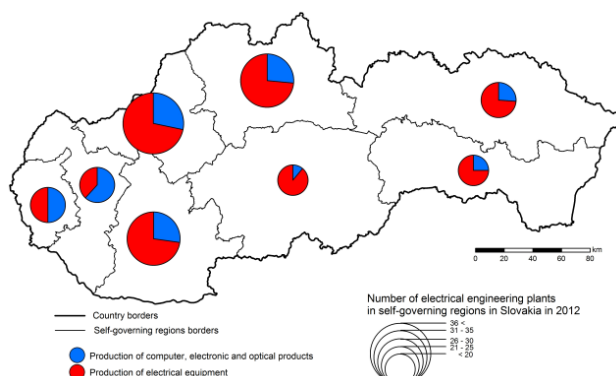
The highest observed increase in the number of production plants between 2008 and 2012 was recorded in the division production of electrical

equipment. Here the number of plants grew from 118 in 2008 to 139 plants in 2012.

The number of production plants in the division production of computer, electronic and optical products for the same period of time was stagnating on the level of 65 factories.

The comparison of different levels in increase in the number of plants between the individual self-governing regions showed that the highest increase was documented in regions in West Slovakia, such as TNSR, Zilinsky self-governing region (ZSR) and NSR. The lowest increase in the number of production plants was evidenced in BBSR and Kosicky self-governing region (KSR).

Fig. 1 Number of production plants in electrical engineering industry by self-governing regions in Slovakia in 2012



**The average evidence number of employees** depends on number of electrical engineering plants. Although the number of EEI production plants in Slovakia is continuously growing, the ratio of employed people in EEI to the total industrial employment has been constantly falling since 2008. Statistical data was taken from Statistical Office of Slovak Republic [13a], [13b]. In 2008, 49,908 employees were working for one of the EEI production plants, resulting in 11.67% of total industrial employees. In 2012 the number of people employed in EEI decreased by 11,577 employees. The number of employees in EEI in 2012 was 38,331, resulting in 10.33% of total industrial employees. The economic crisis in 2008 is considered as one of the main reason for the fall in number of employees in EEI. Moreover, changes in statistical methods in 2009 influence the results as the production of electrical cables was transferred to the category of production of cars and accessories. As a result, EEI recorded a fall of 27,000 employees. Furthermore, the significantly growing importance of new innovations and technological progress that leads to substitution of labour force by machines influence the decrease in the number of employees in EEI.

The decrease in the number of employees can be seen also in the individual divisions of EEI. In 2012 in the division production of electrical equipment were employed 23,702, which was 5,072 employees less than in 2008. Division production of computer, electronic and optical products with 14,629 employees in 2012 recorded a decrease in 6,505 employees compared to 2008.

The spatial allocation of the number of employees in EEI shown in the Fig. 2 describes that the highest level of number of employees in EEI in 2012 was achieved in TNSR with 11,354 employees. It results in 3% ratio on overall industrial production in Slovakia. NSR a TTSR employed approximately the same amount of employees on the level of 6,200 employees. In addition, the named regions had also similar 1.6% ratios of EEI employment on the overall employment in Slovakia. In 2012, NSR recorded a downturn in the number of employees of 1,969 compared to 2010. At the same period of time, TTSR reported a decline of 894 EEI employees. The lowest levels of number of employees in EEI plants were evidenced in BBSR and Bratislavsky self-governing region (BSR) where the level of 2,000 employees was not reached.

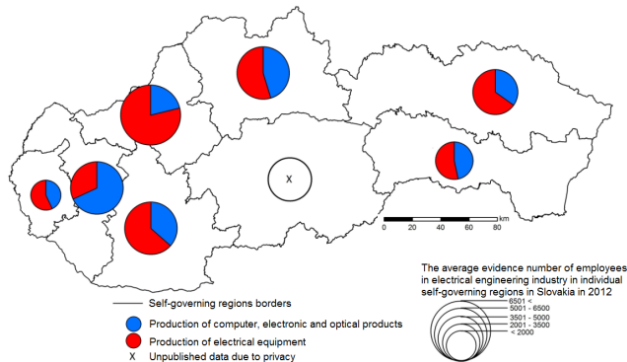
In 2012, TTSR documented 4,224 employed in the division 26. TNSR, ZSK and NSR recorded approximately 2,400 employees. Lower level of number of employees in the division production of computer, electric and optical products was noted in KSR, BSR and Presovsky self-governing region (PSK). The dominant role in the division production of electrical equipment had TNSR with 8,948 employees. In NSR 3,942 employees were employed. In 2012 ZSR recorded a decline of 178 employees compared to 2011. Lower levels of number of employees in the division production of electrical equipment were found in PSR with 2,302 employees and with 1,698 employees in KSR. TTSR recorded 1,988 employees which was 795 employees more compared to 2010.

Industry growth is determined by turnover for own products and services in the electrical engineering industry.

The indicator turnover for own products and services in the electrical engineering industry shows the overall growth of the sector. EEI plays an important and irreplaceable role in Slovak industry. EEI sales in 2012 compared to other economic activities in industrial production achieved in the division 26 with the volume of 5,751,253 thousands € the third place and in the division 27 with the volume of 2,325,108 thousands € the tenth place. The EEI market share increased from 13% in 2008 to 15.4% in 2009. Due

to the impacts of global economic crisis, the turnover share declined to 11.5% in 2012.

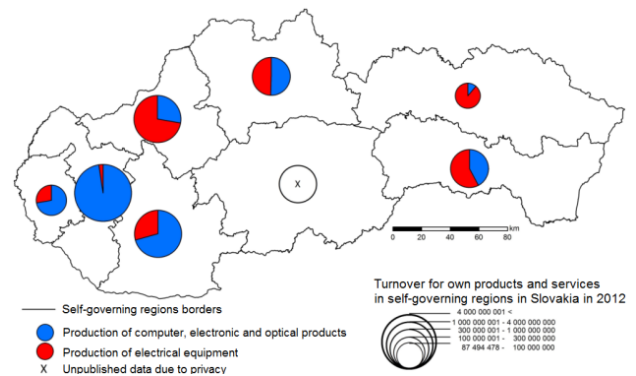
Fig. 2 The average evidence number of employees in electrical engineering industry in individual self-governing regions in Slovakia in 2012



The highest levels of turnover achieved the EEI in TTSR with 4, 115, 902 thousands €, followed by TNSR with 1, 453, 825 thousands € and NSR with 1, 100, 602 thousands €. The lowest levels of turnover were recorded in PSR with 87, 494 thousands €. The level of achieved turnover in PSR suggests that the EEI factories in the region make use of less technologically demanding production processes with low added value and higher demand for non-qualified labour force. Turnover decrease in 2012 compared to previous periods of time recorded NSR, KSR, PSR, BSR a BBSR.

In 2012, TTSR was dominated by turnover in the division 26 with 4, 019, 071 thousands €. Relatively high levels of turnover with 778, 386 thousands € were achieved in NSR. In BSR were prevailing turnover levels in division 26 with 182, 536 thousands €. The lowest amount of turnover in division 26 was evidenced in PSR with the level of 39, 667 thousands €. The lowest amount of turnover in division 27 was achieved in BBSR with 3, 113 thousands € in 2010. TTSR in 2012 reached the highest turnover level with 1, 052, 189 thousands € in the less technologically demanding division 27. Relatively high levels of turnover recorded NSR and PSR in 2012 when the turnover amounted to more than 300, 000 thousands €. The lowest turnover levels of division 27 were noticed in BSR and TTSR with amounts lower than 100 000 thousands €. BBSR's turnover for the division 27 in 2010 registered 93, 228 thousands € [13a, 13b]. Spatial description of the achieved level in turnover for own products and services in EEI are shown in Fig. 3.

Fig. 3 Turnover for own products and services in electrical engineering industry by individual regions in Slovakia in 2012



## Results and Discussion

### Evaluation of the electrical engineering industry in self-governing regions in Slovakia

The highest EEI development level (type 5) was recorded in TNSR that currently belongs to the most developed industrial regions in Slovakia. EEI also belongs to prosperous segments of the region. EEI achieved in all evaluated indicators except from turnover the best evaluation. Good positioning of TNSR influence production of electrical equipment with a focus on the production of modules for the automotive industry and the production of electric motors. The important status of TNSR is underpinned by the EEI share on the number of industrial production plants in the region that increased from 9.3% in 2010 to 9.7% in 2012. The EEI share on the employees in industrial production was stagnating around the level of 17.0%.

The most important electrical engineering companies in TNSR are: Emerson, a.s., Nové Mesto nad Váhom with 1, 396 employees. Other important companies are Hella Slovakia Signal-Lighting, s.r.o.; Leoni Slovakia, s.r.o.; Delta Electronics, s.r.o.; YURA Corporation Slovakia, s. r. o.; Askoll Slovakia s. r. o.; Elster s. r. o.; Power - One s.r.o.; VACUUMSCHMELZE, s.r.o.; AU Optronics s.r.o.. To the regions with above average developed EEI (type 4) belong NSR and TTSR. The EEI production did not play such an important role in these regions as it does today. The EEI importance increased due to the market entry of foreign investors from Japan and South Korea. From the economic structure point of view, TTSR followed by BSK belong to the most industrially developed regions in Slovakia.

The EEI share on the number of production plants in TTSR increased from 7.3% in 2010 to 8.3% in 2012. The increase of the number of production plants correlated with the market entry of subsuppliers for Samsung. Also production plants producing electrical equipment for automotive industry were growing in number. The

EEI share on employees in industrial production in TTSR decreased between 2010 and 2012 from 14.9% to 13.3%. However, the EEI share on salaries in industrial production increased in TTSR from 91.3% to 96.3%. Salary increase can be the result of downsizing of low-salary employees and employment of better paid employees in the production of computer, electric and optical products. TTSR achieved high development level in all indicators except from the number of production plants whereas the indicator average evidence

number of employees per 1 production plant recorded level 5. This disparity is caused by Samsung that in 2 production plants employs a significant amount of employees. The most important electrical engineering company in TTSR is SAMSUNG with the production in Galanta and Voderady. Other important companies are Elektronika Slovensko, a.s. Trnava; OMS, s.r.o., Dojč.

Table 1 Evaluation of selected indicators in 2012

Self-governing region	Number of production plants	AENE	Turnover	AENE per 1 PP	AENE per 1 km <sup>2</sup>	AENE per regions' inhabitants	AENE per employed in industry in the region	Overall level
Bratislavsky	2	1	2	1	3	1	1	<b>2</b>
Trnavsky	2	4	5	5	4	4	4	<b>4</b>
Trenciansky	5	5	4	5	5	5	5	<b>5</b>
Nitriansky	4	4	4	3	3	4	4	<b>4</b>
Zilinsky	4	3	3	3	2	3	3	<b>3</b>
Banskobystricky	1	1	3	2	1	2	1	<b>2</b>
Presovsky	3	2	1	3	1	2	2	<b>2</b>
Kosicky	1	2	3	4	2	2	2	<b>2</b>

Abbreviations: AENE - average evidence number of employees; Turnover - turnover for own products and services; PP- production plant

NSR is characterized from the economical point of view as industrial-agricultural region. Electrical engineering industry in NSR has never recorded such a high development level as it does today that is mainly influenced by the market entry of foreign direct investments. EEI share on the number of production plants in NSR was stagnating at 10.6% during the observed period of time which is derived from the new entry of subsuppliers in the production of electrical equipment. It is possible that the mother company finished cooperation with some subsuppliers in the division 26 and implemented their processes in-house. NSR achieved in all observed indicators an average and above average level. The most important EEI Company in NSR is Foxconn Slovakia, s.r.o. To other important companies belong ICS Industrial Cables Slovakia, s.r.o., Nitra; Osram, a.s., Nové Zámky; SE Bordnetze – Slovakia, s.r.o., Nitra; KROMBERG & Schubert s.r.o.; SEWS Slovakia, s.r.o.; Danfoss Compressors, spol. s.r.o.; Hefra Vráble s.r.o.; GLOBO EASTERN EUROPE, s.r.o.; Ryoka Global Europe s.r.o.; Daidong Slovakia s.r.o.; Farquell Nitra, s.r.o..

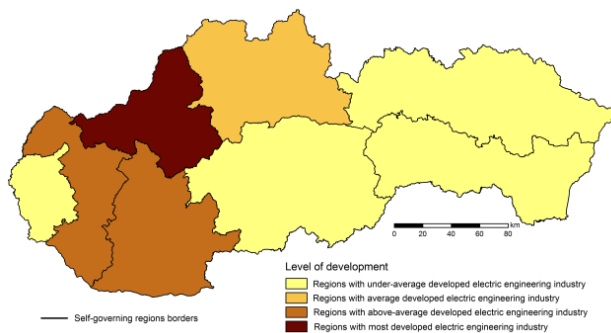
The average EEI development level (type 3) was achieved by ZSR. EEI has a relatively important role

in ZSR and its importance is still growing. EEI in ZSR recorded an average level in the majority of evaluated indicators. The above average level was documented by the indicator number of production plants and below average level by the turnover indicator. The most important electrical engineering companies in ZSR are: Avex electronics, s.r.o., Dolný Kubín; Elteco, a.s., Žilina; Eltek, s.r.o.. Liptovský Hrádok; Klauke Slovakia, s.r.o.. Dolný Kubín; Panasonic Industrial Devices Slovakia, s.r.o., Trstená.

Type 2 with below average EEI development includes BSR, BBSR, KSR and PSR. The EEI development in BSR with the industrial orientation on services has almost no influence on the economic indicators of the region. The most important EEI companies in BSR are: BEZ Transformátory, a.s., Bratislava; Hella Innenleuchten-Systeme Bratislava, s.r.o., Bratislava; PPA Controll, a.s., Bratislava; Siemens, s.r.o.; Universal Media Corporation /Slovakia/, Bratislava; WHIRLPOOL SLOVAKIA spol. s.r.o.. The bad position of EEI in BBSR is derived from the evaluated indicators that were on the lowest level of scale except from the indicators, the average evidence number of employees per

1 production plant and per region's inhabitants which were on the below average levels

Fig. 4 Development level of self-governing regions in Slovakia in 2012



BBSR is a direct contrast to TNSR based on the EEI development. The most important EEI companies in BBSR are: H.E.S., s.r.o.; ZVT - PRINT, a.s.; Elba, a.s.; Brother Industries, Ltd.; Yura Eltec Corporation Slovakia s.r.o. Rimavská Sobota. KSR belongs to regions with the most developed industrial production. EEI does not play a significant role in KSR confirmed by the evaluated data. The most important EEI companies in KSR are: BSH Drives and Pumps s. r.o.; Molex Slovakia a.s.; Yazaki Wiring Technologies Slovakia, s.r.o.; Panasonic AVC Networks Slovakia, s.r.o.. PSR region is located outside of the main transportation and industrial ways. Therefore, it is a marginal region with shortage on financial resources for development. Final evaluation of electrical engineering industry supports the above mentioned facts. Relatively high evaluation was recorded in PSR only in the EEI share on the average evidence number of employees. Turnover documented the lowest value. As a result, the EEI in PSR has relatively low added value. The most important factory in PSR is Whirlpool Slovakia, s.r.o., which is established in Bratislava. The important electrical engineering companies in PSR are: TESLA STROPKOV, a.s.; Elcom, s.r.o.; TATRAMAT - ohrievače vody, s.r.o.; Křížik GBI, a.s.; Hengstler, s.r.o.. Kežmarok; Regada, s.r.o., Prešov; Embraco Slovakia s.r.o. Kompresory Spišská Nová Ves.

Type 1 regions with the least developed EEI do not include any of Slovak regions.

## Conclusion

Due to structural changes after 1989, electric engineering industry was regarded as a sector without perspective, technologies, knowledge and financial resources. Attracting foreign investors with their financial capital and technologies caused turnaround in EEI development. As a result, sector

without foreign investments does not achieve such a significant development.

One of the first employers in the field of EEI were investors focusing on the production of wiring harnesses. Production of wiring harnesses and insertion of circuit boards are found in many cities. In recent years, due to required low wages and high operational performance, many foreign companies have left Slovak Republic. Today, this type of production is located only in areas with high level of unemployment rate.

The correlation between electric engineering industry and automotive industry is another factor of distribution of electric engineering industry in Slovakia.

The growth of EEI production for automotive industry leads to an increased number of international companies in Slovakia. Additionally, new companies specialized in massive production of LCD and LED panels, televisions, monitors, media players and satellite receivers set up their subsidiaries in Slovakia. These production facilities decreased dependence of EEI on automotive industry. Small companies producing electric motor systems, transformers, lamps, light sources and memory components have significant presence on market. The business crisis forced EEI companies in Slovakia to optimize their production processes and invest in more efficient machines, technologies and innovations.

EEI is unevenly distributed in Slovakia. The majority of companies are located in Western Slovakia close to cities Trnava and Nitra. Other locality with significant impact of EEI is Middle Váh valley with two significant concentrations of EEI companies. The first group is created by companies operating in Trenčín, Nová Dubnica and Dubnica nad Váhom. Second group is created by companies in Nové Mesto nad Váhom, Piešťany and Stará Turá. Rest of Slovakia is not that important for EEI. Further development of EEI in Slovakia requires building up and modernising infrastructure of research and development departments, innovation and human resources and thus creating the conditions for a development of knowledge-based economy. It is necessary to increase the use of local and regional resources provided by EU. Irreplaceable position of EEI development in Slovakia has foreign direct investment and its importance for modern technologies, innovations and new knowledge.

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