

Hungarian firms' innovation performance in international comparison

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Üzleti Gazdaságtan Tanszék

179. sz. Műhelytanulmány
HU ISSN 1786-3031

2021. június

Budapesti Corvinus Egyetem
Vállalatgazdaságtan Intézet
Fővám tér 8.
H-1093 Budapest
Hungary

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Abstract

Innovation is key to Hungary's convergence. We analyzed the database of the latest 2018 Community Innovation Survey. The visualization toolkit help to demonstrate in the study that the innovation performance of Hungarian companies lags significantly behind the EU average. The weakest point is the process innovation. The analysis of the CIS database did not explain the reasons for the poor innovation performance, so this issue needs further investigation. The study could be a starting point for further research.

Keywords:

innovation performance, innovation performance indicator, CIS, Hungary, Visegradian countries

Magyar vállalatok innovációs teljesítménye nemzetközi összehasonlításban

Absztrakt

Az innováció kulcsfontosságú Magyarország felzárkózása szempontjából. A tanulmány a legutóbbi, 2018-as közösségi innovációs felvétel eredményeinek elemzése segítségével, a vizualizáció eszköztárát alkalmazva mutatja be, hogy a magyarországi vállalatok innovációs teljesítménye jelentős elmaradásban van az európai országokhoz képest. A folyamat innováció terén tapasztalható a legnagyobb mértékű elmaradás. A gyenge innovációs teljesítmény okaira a CIS adatbázis elemzése nem adott magyarázatot, ez a kérdéskör további vizsgálatot igényel. A tanulmány kiindulópontját jelentheti további kutatásoknak.

Kulcsszavak:

innovációs teljesítmény, innovációs teljesítményt jellemző mutatószámok, CIS, Magyarország, Visegrádi országok

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Introduction

The World Economic Forum in The Global Competitiveness Report 2018 highlighted that innovation, flexibility, and adaptation to change are becoming key factors for growth and competitiveness. (Schwab, 2018) The first edition of the Oslo Manual was published in 1992, which supported guidance for the national statistical offices and other innovation data producers. The first Community Innovation Survey (CIS) was conducted in 1993 in the EU. Since 1998, data were collected every two years. The primary basis of this study is an analysis of published data from the latest CIS survey in 2018. The study aims to analyze the innovation performance of Hungarian firms in an international comparison. Hámori-Szabó 2010 pointed the weak innovation performance of Hungarian companies. They concluded that one reason was that the companies' relationships with the state and their institutions greatly influence their market chances and that annuity-seeking behavior hinders innovation. The study aims to present the innovation activities of Hungarian companies in an international context, primarily with the help of graphs and visuals. Following the European comparison, the more detailed analysis will focus only on the V4 countries. The study could be a starting point for further research.

Measurement of innovation

Until the late 1970s, only statistics on research and development (R&D) were available. The importance of innovation has brought to the fore the issue of measuring innovation. OECD organized a conference on this topic in 1980. In 1986, a working committee was set up to define innovation metrics and make international comparisons. The NESTI (National Experts on Science and Technology Indicators) work team, in cooperation with the OECD Secretariat and representatives of countries, prepared the Oslo Manual, which can be considered a methodological basis for innovation surveys. The first edition of the Oslo Manual was published in 1992. It dealt only with the measurement of technological-, product- and process-innovation in companies operating in the manufacturing industry. (Szunyogh, 2010) There have been several revisions of the Oslo Manual. The 4th edition has been in force since 2018. To help the international comparability and to provide a platform for research and experimentation on innovation measurement, the Oslo Manual supported guidance for the national statistical offices and other innovation data producers. It articulates designing, collecting, and publishing measures.

The Oslo Manual defines the concept of innovation as follows: "An innovation is a new or improved product or process (or a combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users

(product) or brought into use by the unit (process).” (OECD/Eurostat, 2018 p. 20) This general definition was further developed and operationalised. „Innovation activities include all developmental, financial, and commercial activities undertaken by a firm that are intended to result in an innovation for the firm. Business innovation is a new or improved product or business process (or a combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm.” (OECD/Eurostat, 2018 p. 20) The third edition of the Oslo Manual defined four types of innovations (product, process, organizational, and marketing).

The first Community Innovation Survey (CIS) was conducted in 1993 in the EU. The survey was carried out with a harmonized questionnaire for the same period in each country. Since 1998, data were collected every two years. Commission Regulation (EC) No 1450/2004 mandated the frequency and methodology of the innovation survey for the EU Member States. The regulation stipulates the frequency of data collection every two years. A more detailed survey should be needed every four years, which contains the circumstances, causes, and effects of innovation. In the intermediate period, “light” surveys are conducted. As the need for information has increased significantly, Member States are encouraged to base all their innovation surveys on a more detailed questionnaire. The Commission Regulation determines the scope of the statistical survey. It covers enterprises with more than ten employees. Member States have the autonomy to decide about carry out full, partial, or a combination of data collection. The regulation determines, what indicators they need to produce. (Szunyogh, 2010)

The annual European Innovation Scoreboard (EIS) provides a comparative analysis of innovation performance in EU countries, it overviews the relative strengths and weaknesses of European countries' research and innovation systems. It examines trends and comparing European innovation performance with some Asian and American countries. The EIS measurement framework distinguishes between four main types of activities (framework conditions, investments, innovation activities, impacts) uses ten innovation dimensions (human resources, attractive research systems, innovation-friendly environment, finance and support, firm investments, innovators, linkages, intellectual assets, employment impacts, sales impacts), overall contains total 27 indicators. The Summary Innovation Index was calculated as the unweighted average of the 27 indicators. Member States fall into four different innovation performance groups based on the Summary Innovation Index. The group of countries with outstanding innovation performance is the “Innovation Leader”. These countries' performance was above 125% of the EU average. Denmark, Finland, Luxembourg, the Netherlands, and Sweden belong to this group. The second group is the „Strong Innovators” where the performance was between 95% and 125% of the EU average. Austria, Belgium, Estonia, France, Germany, Ireland, and Portugal are Strong Innovators. Most

Member States belonged to the group of „Moderate Innovators”, where performance was between 50% and 95% of the EU average. Croatia, Cyprus, Czechia, Greece, Hungary, Italy, Latvia, Lithuania, Malta, Poland, Slovakia, Slovenia, and Spain belong to this group. The fourth group of Modest Innovators included two countries (Bulgaria and Romania) where the performance level in this group was below 50% of the EU average. (European Commission, 2020)

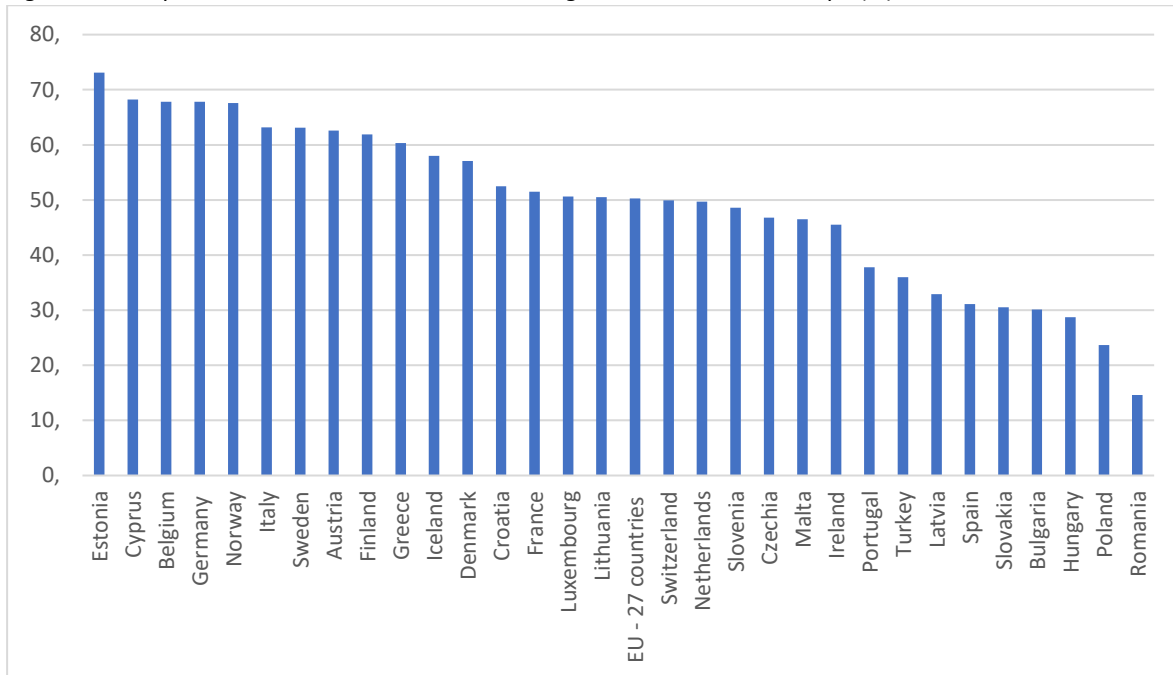
Innovative enterprises

According to Oslo Manual, one of the most important mandatory indicators is the rate of innovative firms. The Oslo Manual defines an innovative firm as a firm that reports one or more innovations within the observation period. The key to this definition is what we mean by innovation. “A business innovation is a new or improved product or business process (or a combination thereof) that differs significantly from the firm's previous products or business processes and that has been introduced on the market or brought into use by the firm.” (OECD/Eurostat, 2018 p. 20) We need to distinguish small change from significant innovation.

The Oslo Manual discusses changes in production or in the logistics that do not consider innovation. For example, minor aesthetic changes of the product, like changes in colour or minor changes in shape, do not meet the requirements of innovation. Routine changes or updates like maintenance, or software upgrades are not innovative changes. Some structural changes in the production, like outsourcing a business process or ceasing the outsourcing are not innovative either. Withdrawing a product from the market or widen the range of products (in case of retail, wholesale, transport companies) are not innovations themselves, only if the extension requires significant changes by the firm to its business processes or logistics.

Investigating the 2016-2018 period, we can see that the rate of the innovative firms is one of the lowest (28,7%) in Hungary comparing European countries. (See Figure 1)

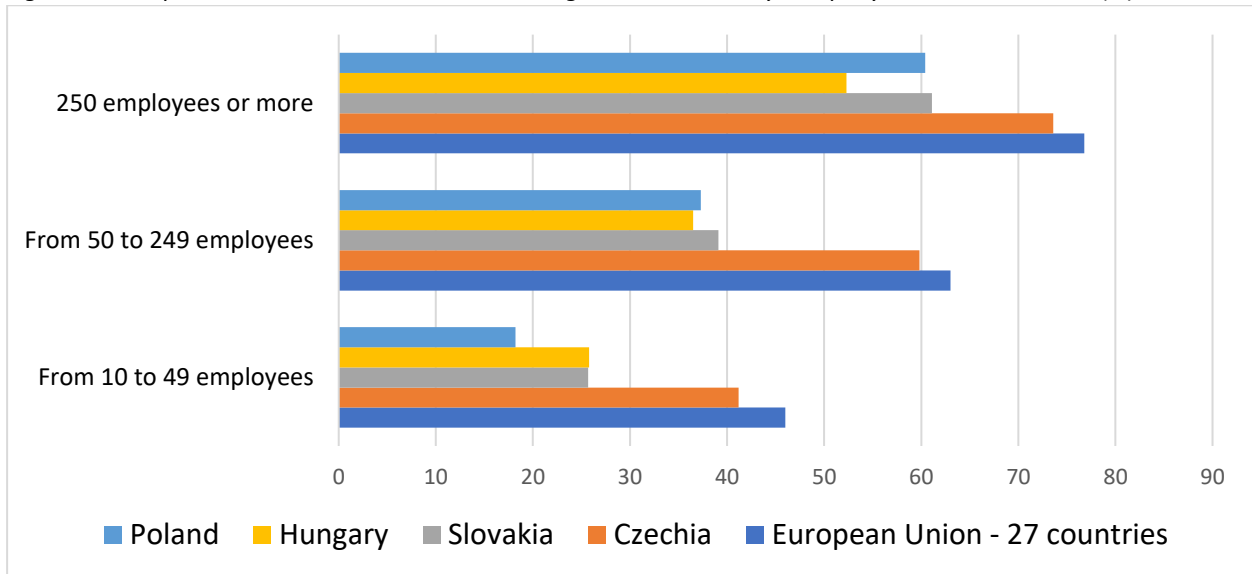
Figure 1. Enterprises with innovation activities during 2016 and 2018 in Europe (%)



Source: Own construction based on CIS database [Database - Science, technology and innovation - Eurostat \(europa.eu\)](#) Number of innovative enterprises in the EU: 366 758

There was a more detailed comparison among the V4 countries. The EU average was the benchmark. All the four Visegrad countries belong to “Moderate Innovators” according to European Innovation Scoreboard (EIS). The analysis by company size does not provide a better picture of the innovation performance of Hungarian companies either. In all company size categories, the proportion of innovative enterprises in Hungary is 30-40% lower than the average in the European Union. (See Figure 2)

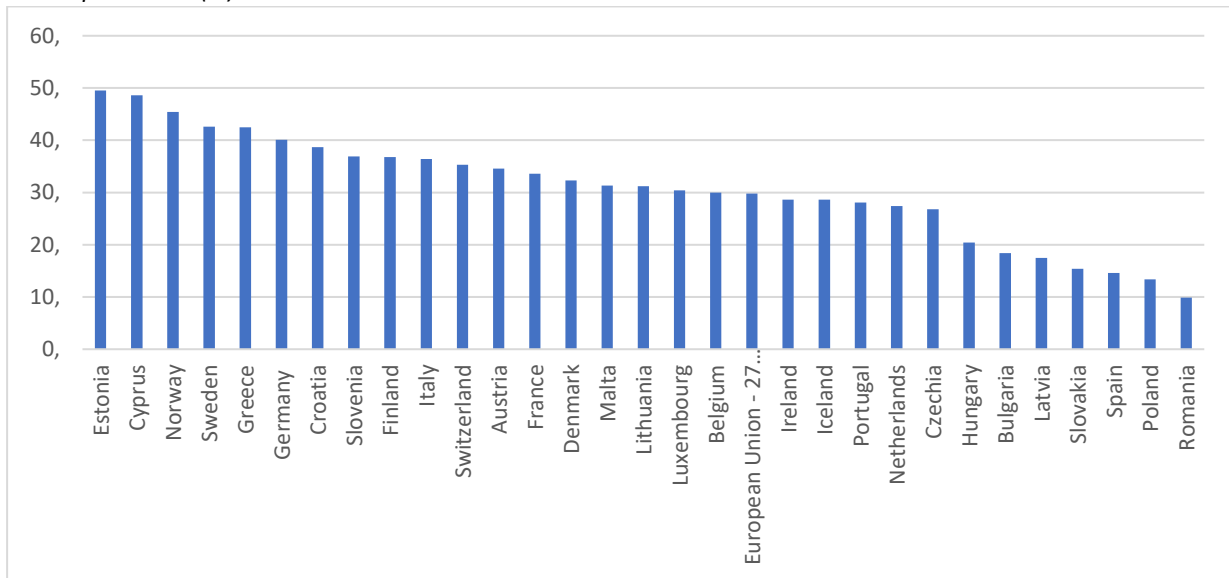
Figure 2. Enterprises with innovation activities during 2016 and 2018 by company size in V4 countries (%)



Source: Own construction based on CIS database [Database - Science, technology and innovation - Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1)

The fourth edition of the Oslo Manual defines two main types of innovation: product innovation and business process innovation. „A product innovation is a new or improved good or service that differs significantly from the firm’s previous goods or services, and that has been introduced on the market.” (OECD/Eurostat, 2018 p. 70) Although the rates of enterprises with product innovation and the enterprises with process innovation were about 20% in Hungary in 2018, we did not achieve as bad a ranking in the ranking of companies as concerning process innovation. Based on the previous findings, we even surpassed Slovakia. (See Figure 3.)

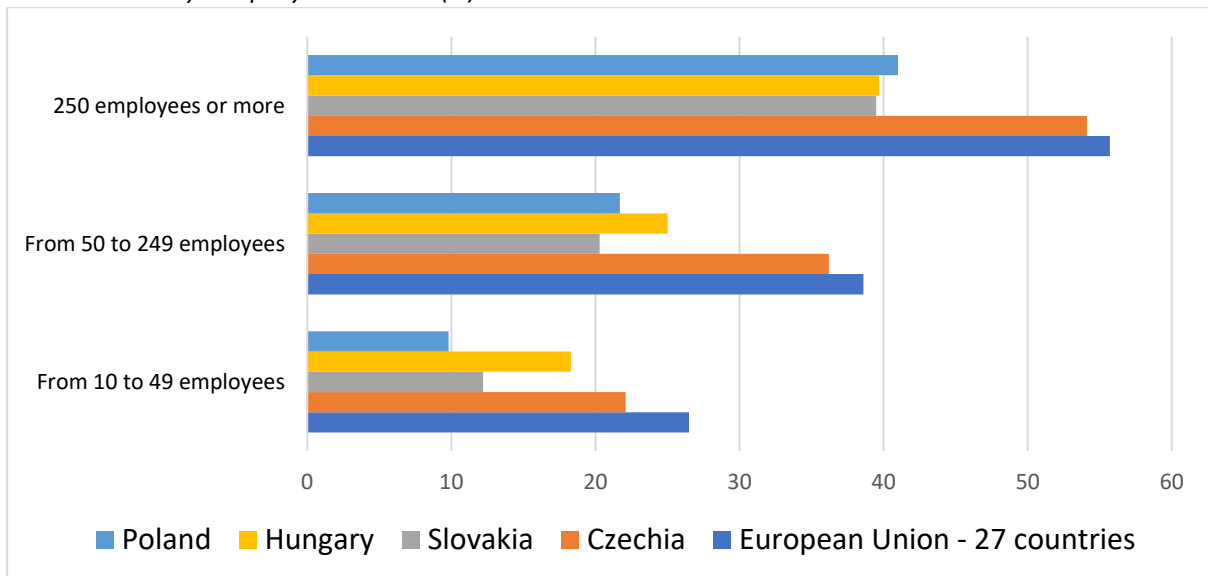
Figure 3. Product innovative enterprises that have introduced at least one new or significantly improved product in Europe in 2018 (%)



Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://www.eurostat.europa.eu)

Analysing company size, we found a smaller lag to the EU average in all categories than comparing to the innovative enterprises. (See Figure 4)

Figure 4. Product innovative enterprises that have introduced at least one new or significantly improved product in V4 countries by company size in 2018 (%)

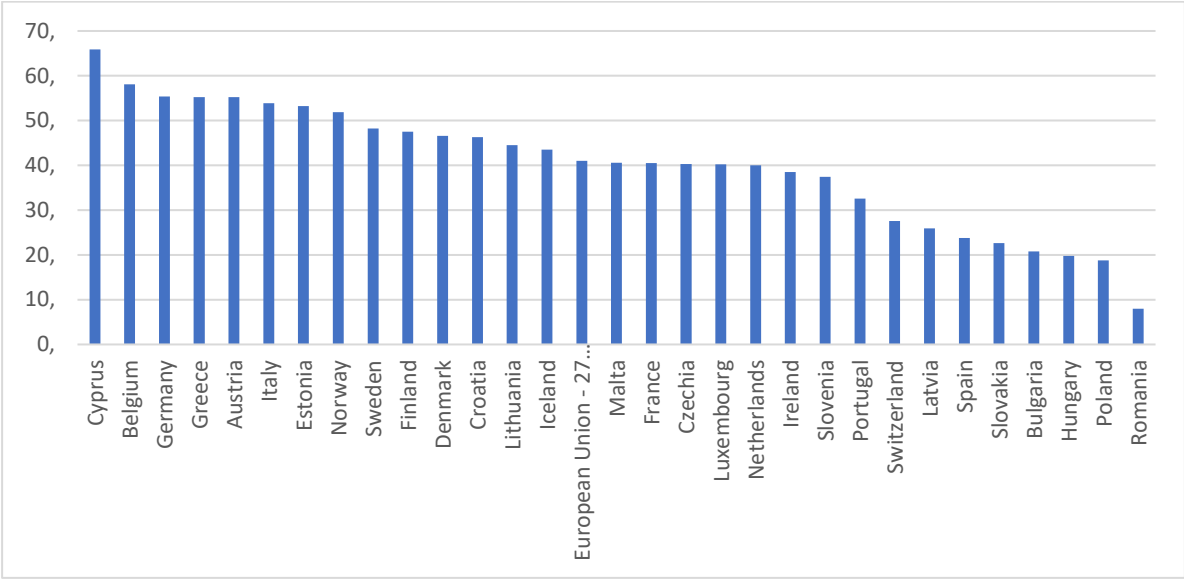


Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://www.eurostat.europa.eu)

„A business process innovation is a new or improved business process for one or more business functions that differs significantly from the firm’s previous business processes and that has been brought into use in the firm.” (OECD/Eurostat, 2018 p. 72) According to the international survey, one of the weak points of Hungarian companies is process innovation. We are the third

from the bottom in the European rankings. Poland and Romania perform only worse than us. (See Figure 5.)

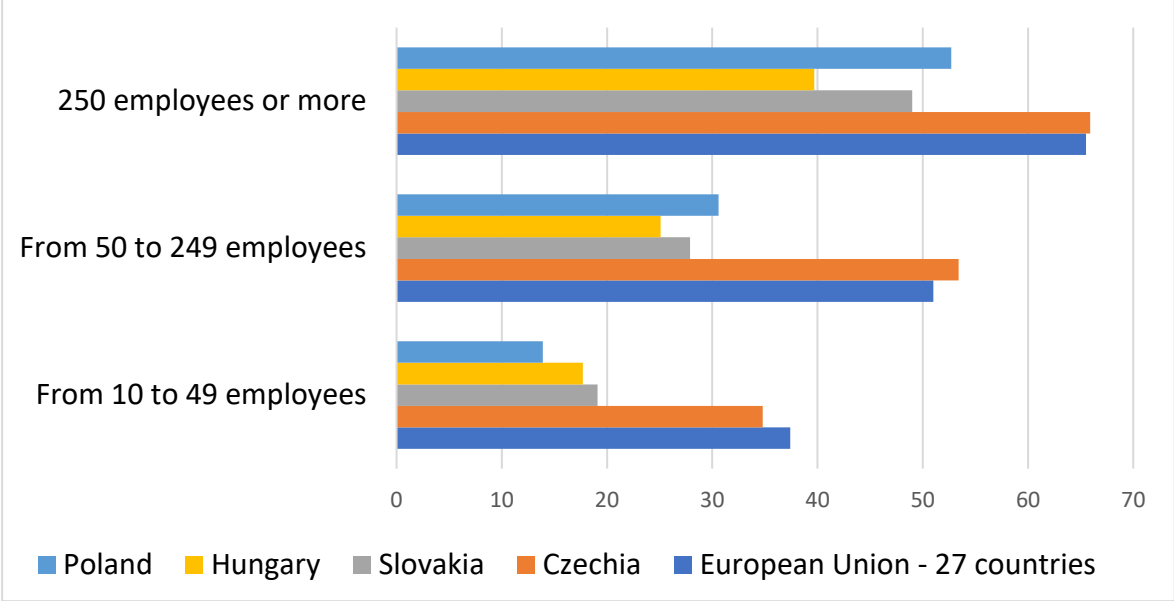
Figure 5. Enterprises that introduced new or improved processes in Europe in 2018 (%)



Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://statistics.eurostat.europa.eu)

In Hungary, the proportion of companies with more than 250 employees who have business process innovation did not reach 40%. In our case, only Romania performed worse. The rate of large companies with process innovation in the EU was 65.5%. In the case of small and medium-sized companies, the Hungarian ratio was less than half of the European average. In the case of enterprises with 10 to 49 employees, Poland's performance was even worse than ours. In the case of medium-sized companies, we were again only ahead of the weakest performing Romania. (See Figure 6)

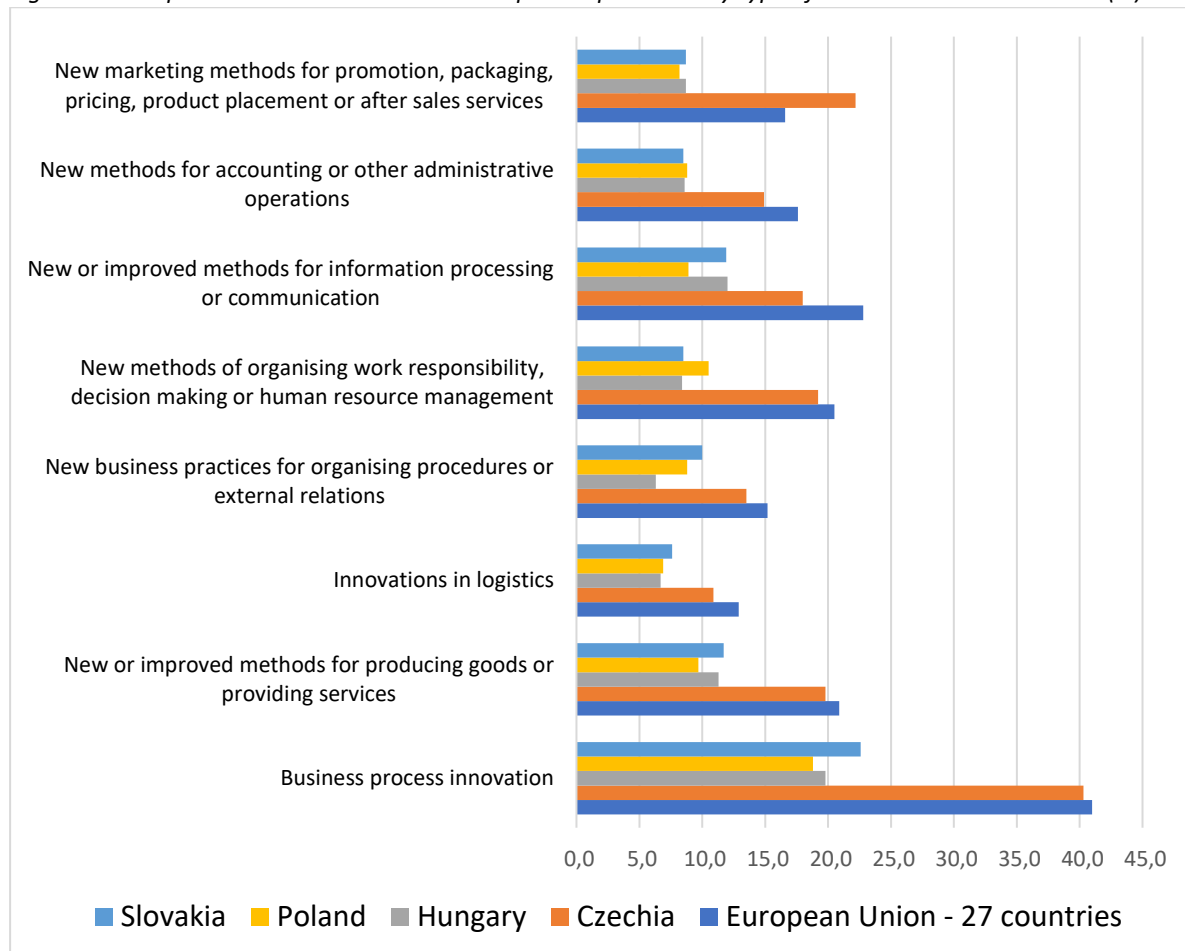
Figure 6. Enterprises that introduced new or improved processes by company size in V4 countries



Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://statistics.eurostat.eu)

The Community Innovation Survey (CIS) examined the different types besides the general questions of the innovation process. (See Figure 7.)

Figure 7. Enterprises that introduced new or improved processes by type of innovation in V4 countries (%)

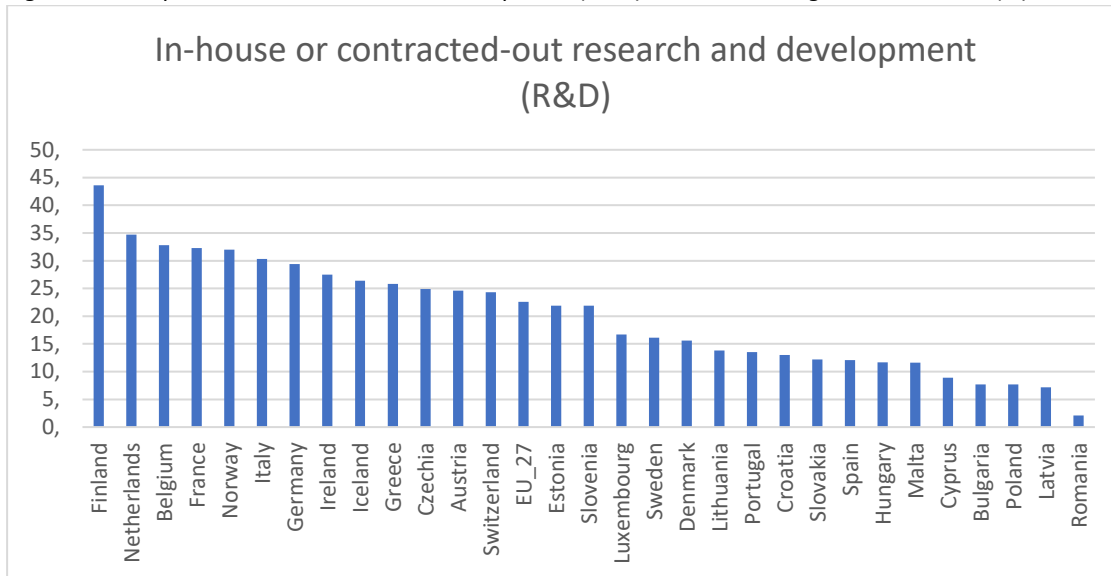


Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1)

Enterprises with research and development (R&D) activities

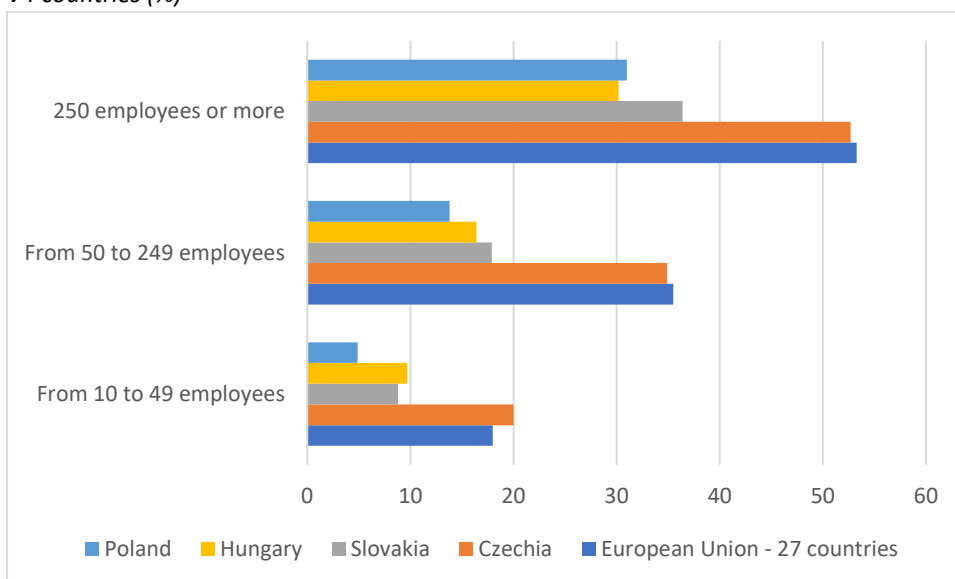
The Community Innovation Survey (CIS) collects data about enterprises' research and development (R&D) activities. Although Hungary (11.1%) lags behind the EU average (22.6%) regarding the rate of enterprises with in-house and contracted-out research and development, Hungary did not perform as far back in the ranking of countries as in the case of innovative enterprises. In case of European countries, correlation analysis indicated significant and strong relationship (66.3%, correlation is significant at the 0.01 level) between rate of innovative enterprises and rate of enterprises with R&D. However, there was no similar significant correlation between the two variables when we performed the analysis only in the group of "Moderate Innovators". We can't conclude that the weak innovation performance of Hungarian companies is mainly, or not only, due to weak R&D activity.

Figure 8. Enterprises with research and development (R&D) activities during 2016 and 2018 (%)



Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://statistics.eurostat.europa.eu)

Figure 9. Enterprises with research and development (R&D) activities during 2016 and 2018 by company size in V4 countries (%)



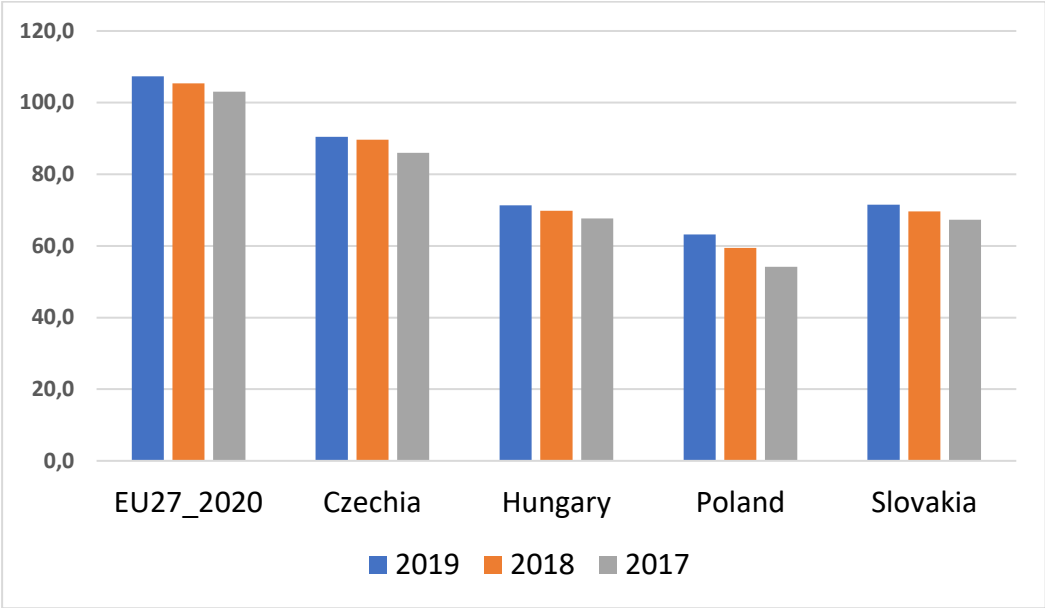
Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://statistics.eurostat.europa.eu)

European Innovation Scoreboard (EIS)

NKFI 2018 report found that Hungary made little progress in the EIS ranking compared to previous years. It showed more or less growth in more than half of the indicators. At the same time, Hungary's position in the innovation performance of SMEs between 2010 and 2017 compared to the EU changed unfavorably. The European Innovation Scoreboard 2020 report

also found that Hungary's performance has increased relative to the EU average in 2012, particularly since 2017. Figure 10. shows this improving trend.

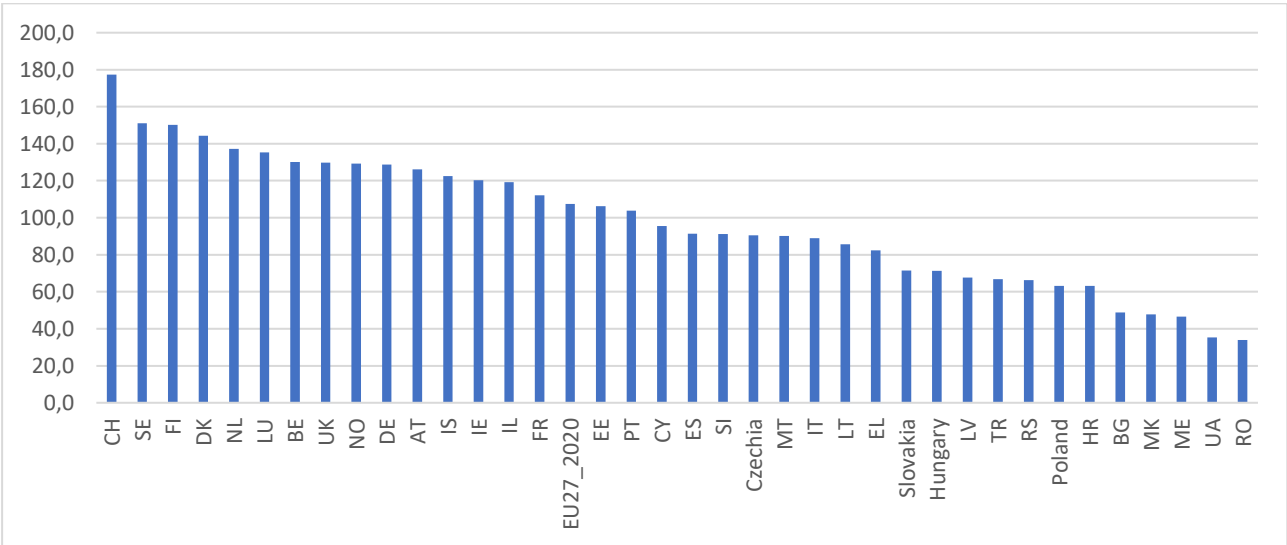
Figure 10. Summary Innovation Index relative to EU average in 2012 between 2017-2019



Source: Own construction based on European Innovation Scoreboard 2020 – Database [DocsRoom - European Commission \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1)

Despite a small improvement, Hungary is still lagging in international comparison. Figure 11 shows that the Visegrad countries lag behind the EU average. That is the reason for being in the “Moderate Innovators” group.

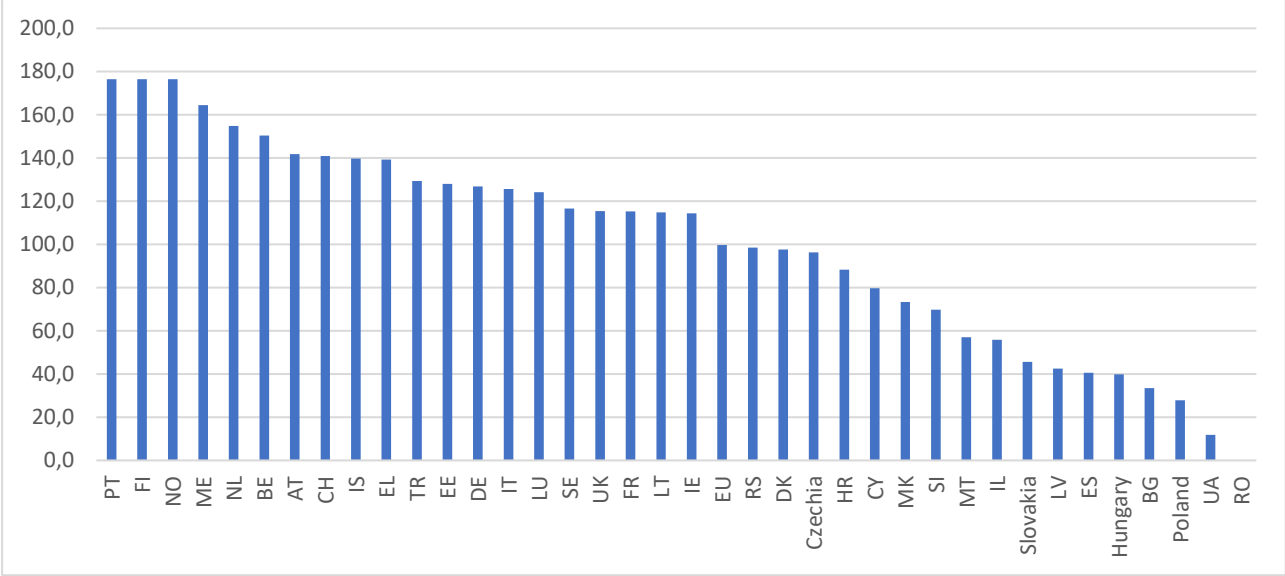
Figure 11. Summary Innovation Index in 2019 relative to EU average in 2012



Source: Own construction based on European Innovation Scoreboard 2020 – Database [DocsRoom - European Commission \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1)

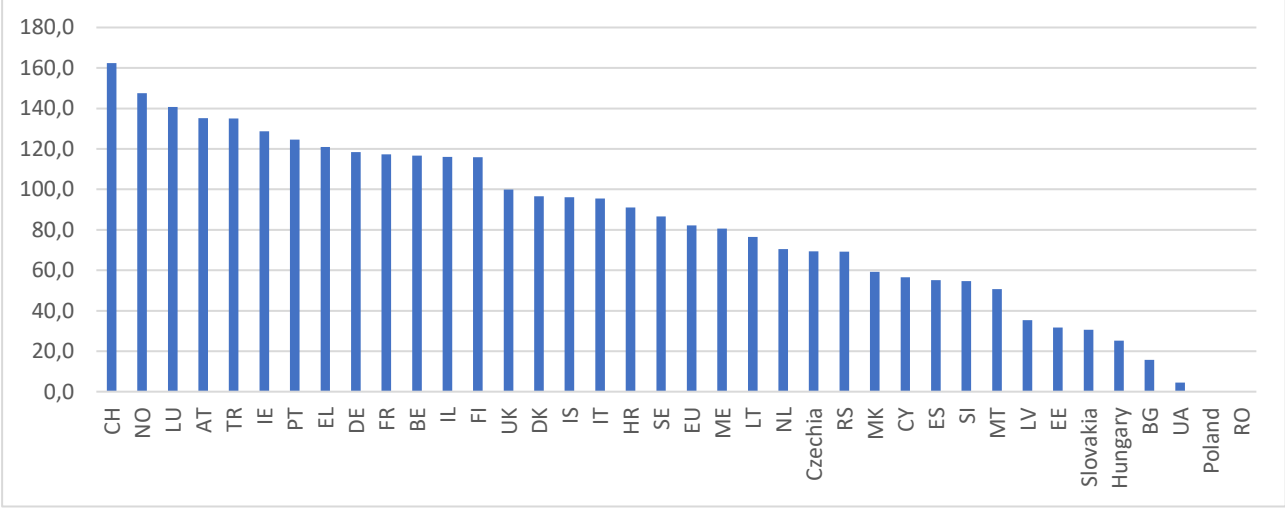
The European Innovation Scoreboard 2020 also points out that the two weakest points of Hungary’s innovation performance are: SMEs marketing/organizational innovations and SMEs innovating in-house. The Scoreboard consists of 27 indicators. This paper presents only three indicators of SMEs innovation performance. Figures 12-14 show that Hungary's innovation performance is weak in the examined factors.

Figure 12. SMEs with product or process innovations in 2019 relative to EU average in 2012



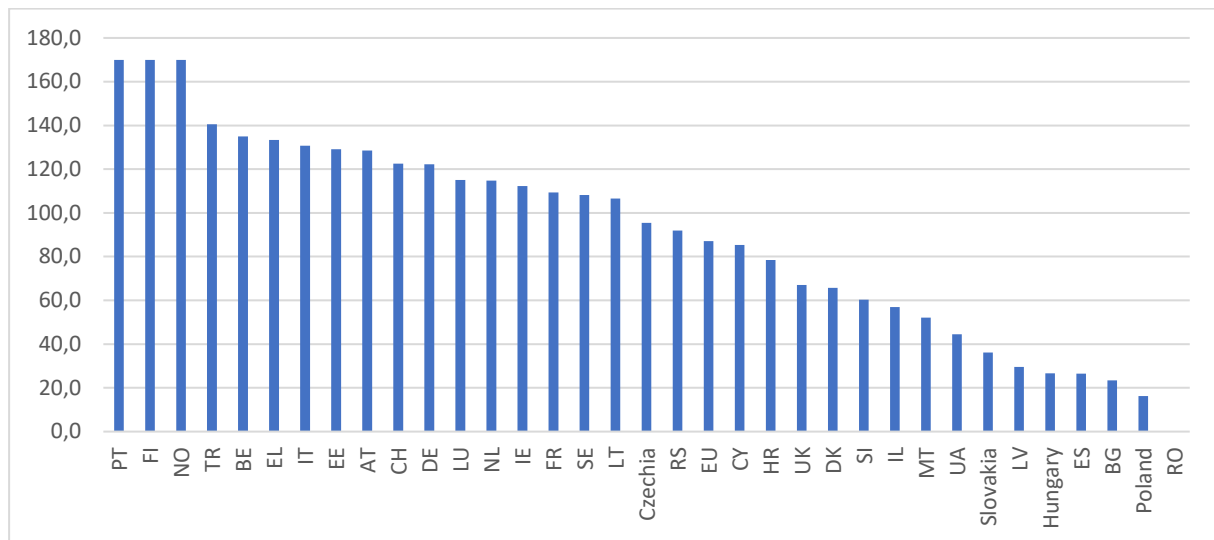
Source: Own construction based on European Innovation Scoreboard 2020 – Database DocsRoom - European Commission (europa.eu)

Figure 13. SMEs with marketing or organisational innovations in 2019 relative to EU average in 2012



Source: Own construction based on European Innovation Scoreboard 2020 – Database DocsRoom - European Commission (europa.eu)

Figure 14. SMEs innovating in-house in 2019 relative to EU average in 2012



Source: Own construction based on European Innovation Scoreboard 2020 – Database [DocsRoom - European Commission \(europa.eu\)](https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&plugin=1)

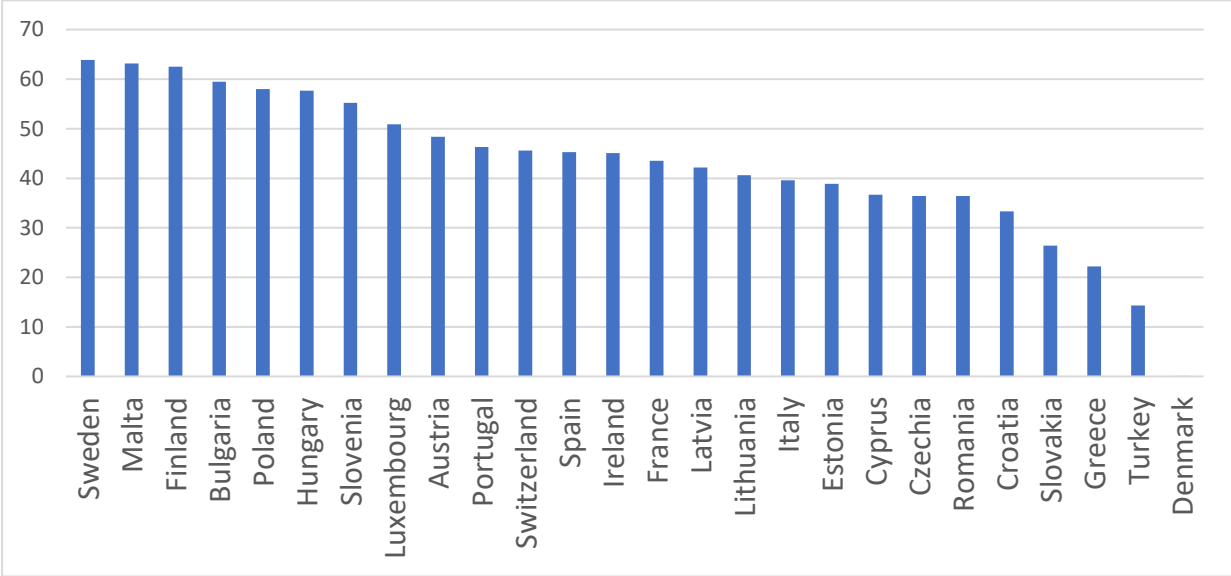
Overall, the European Innovation Scoreboard also pointed out that one of the weakest points of Hungary's innovation performance is the innovation activities of small and medium-sized enterprises. In this respect, Hungary lags far behind in European comparison.

Innovation barriers according CIS

European statistics have shown that Hungary lags far behind in international comparison in terms of innovation. The question arises, what might be the reason for this. The CIS survey also addresses barriers to innovation. Respondents were asked to rate 9 factors based on how much they pull back innovation. Possible answers are: high, medium, low, none.

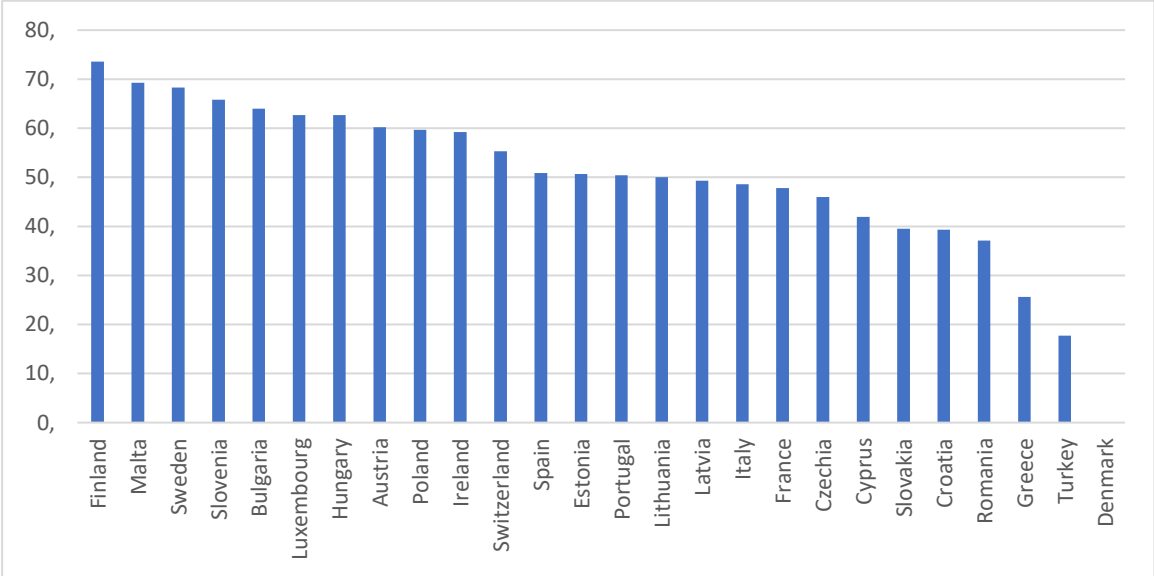
Figures 15-24 show the percentage of the surveyed firms who claimed that the investigated factor was not a barrier to their innovation. Our hypothesis that, due to the low rate of innovative enterprises in Hungary, Hungarian managers consider the barriers to innovation to be high, we couldn't verify. In more than half of the surveyed companies, the following factors did not hamper the innovation: lack of internal finance, lack of external finance (credit or private equity), lack of collaboration partners, difficulties in obtaining public grants or subsidies, uncertain market demand, high competition, lack of access to external knowledge. The two most significant barriers: a high cost and a lack of qualified employees within the enterprise. Correlation analysis did not show a significant relationship between the examined barriers and the proportion of innovative enterprises, so this question needs further investigation.

Figure 15. Rate of enterprises for which “Lack of internal finance” in not an innovation barrier



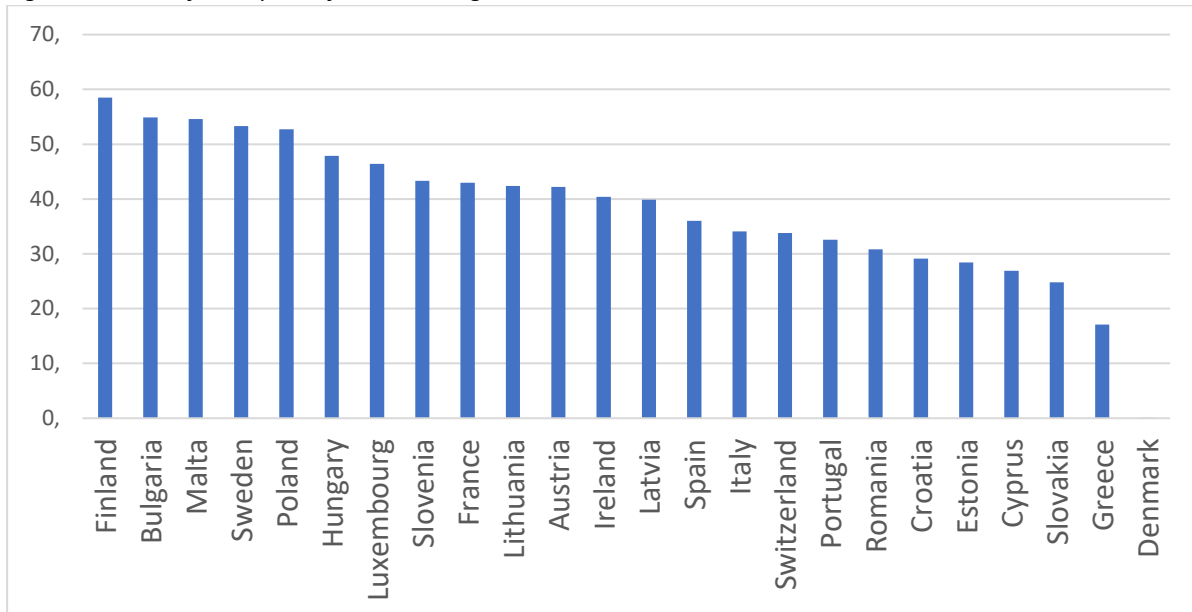
Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://statistics.eurostat.eu)

Figure 16. Rate of enterprises for which “Lack of external finance” in not an innovation barrier



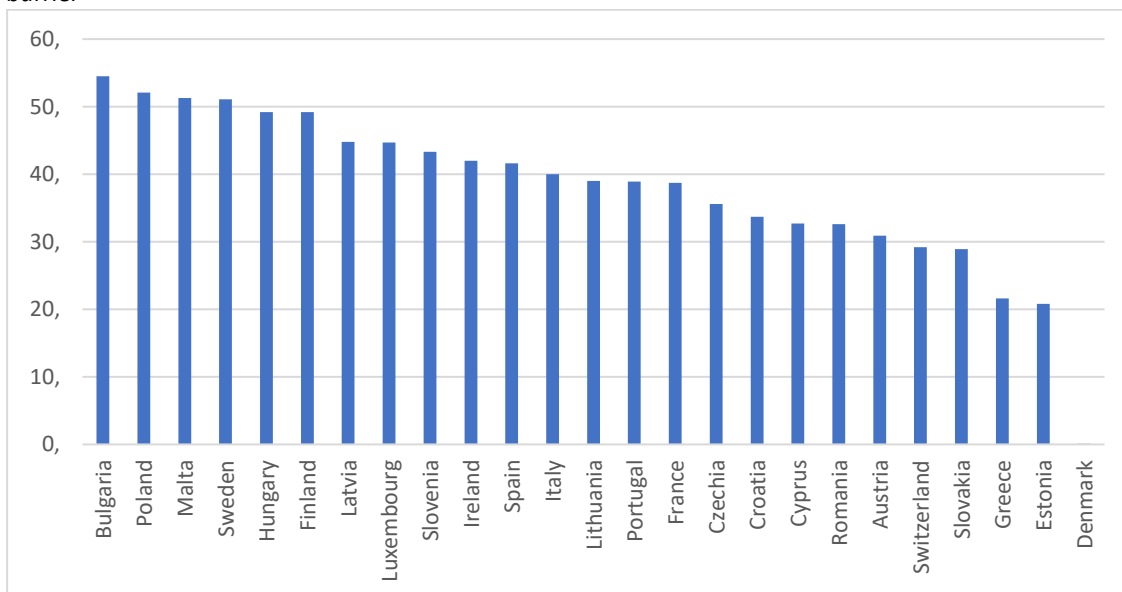
Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://statistics.eurostat.eu)

Figure 17. Rate of enterprises for which “High costs” in not an innovation barrier



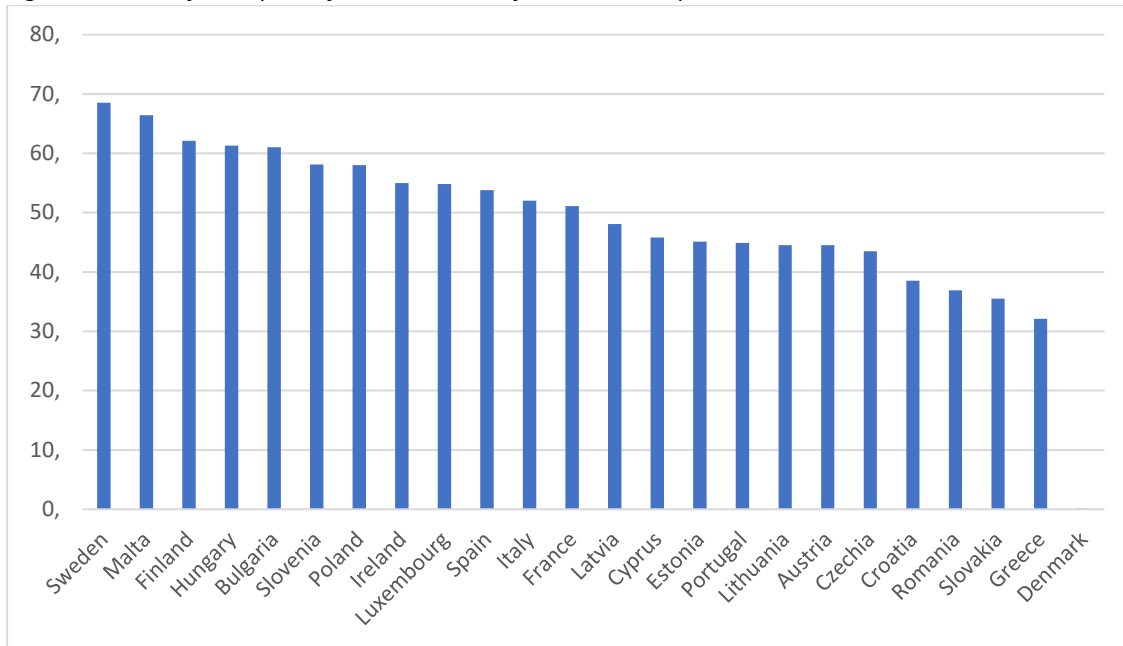
Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://statistics.eurostat.europa.eu)

Figure 18. Rate of enterprises for which “Lack of qualified employees within enterprise” in not an innovation barrier



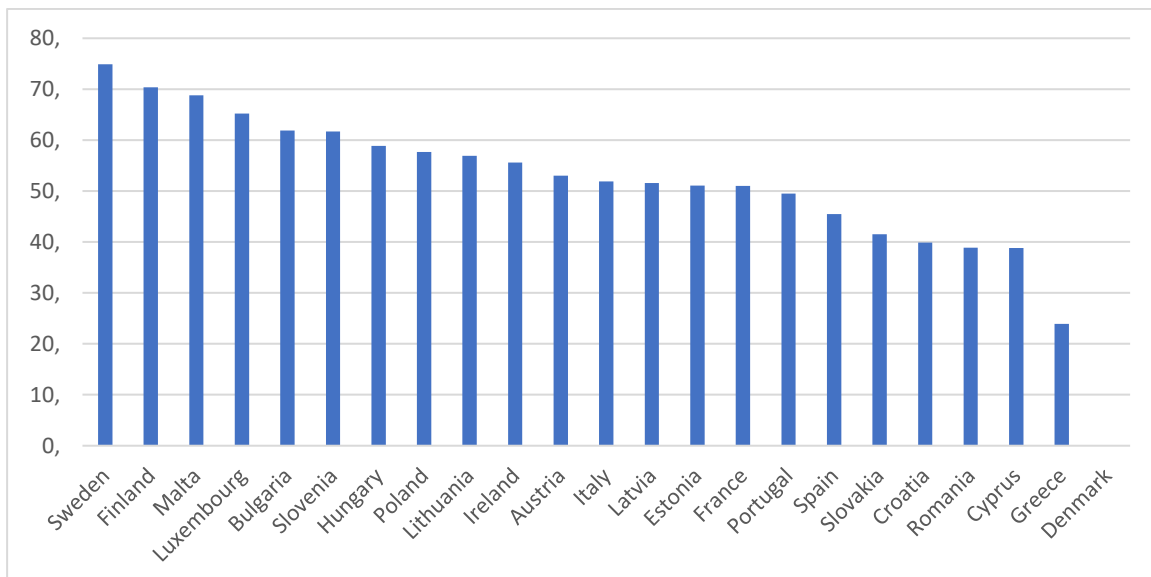
Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://statistics.eurostat.europa.eu)

Figure 19. Rate of enterprises for which “Lack of collaboration partners” in not an innovation barrier



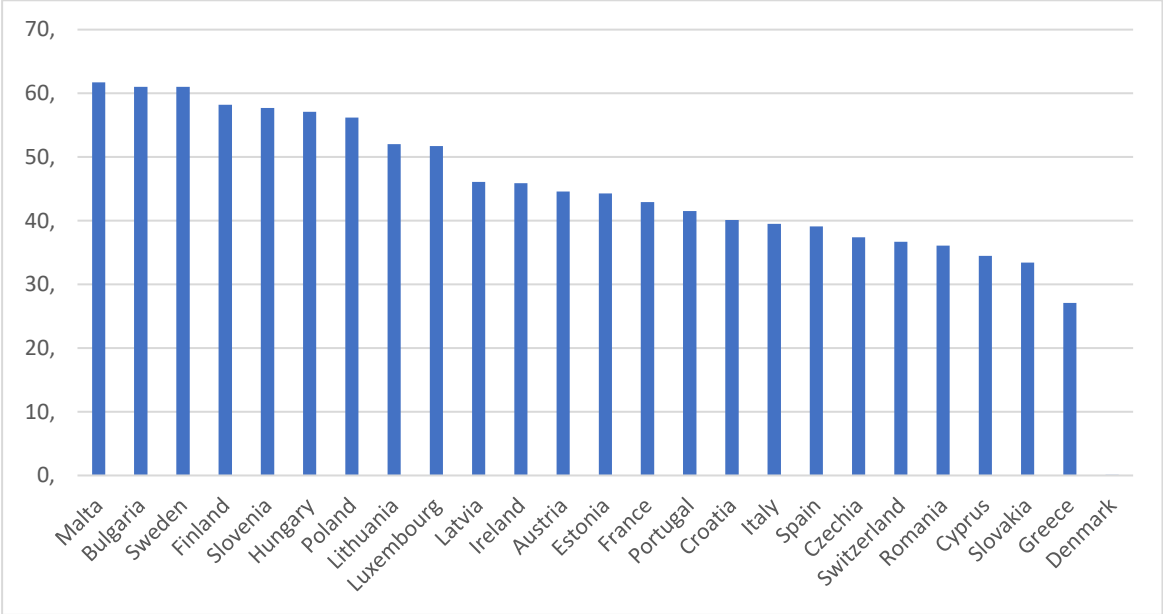
Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat)

Figure 20. Rate of enterprises for which “Difficulties in obtaining public grants or subsidies” in not an innovation barrier



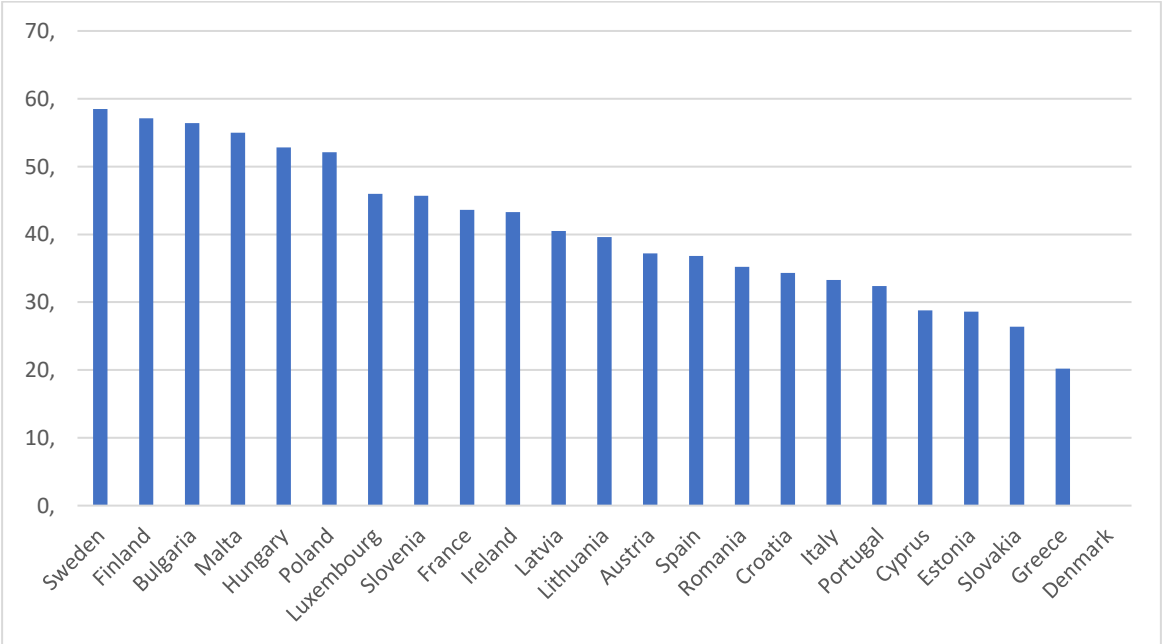
Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat)

Figure 21. Rate of enterprises for which “Uncertain market demand” in not an innovation barrier



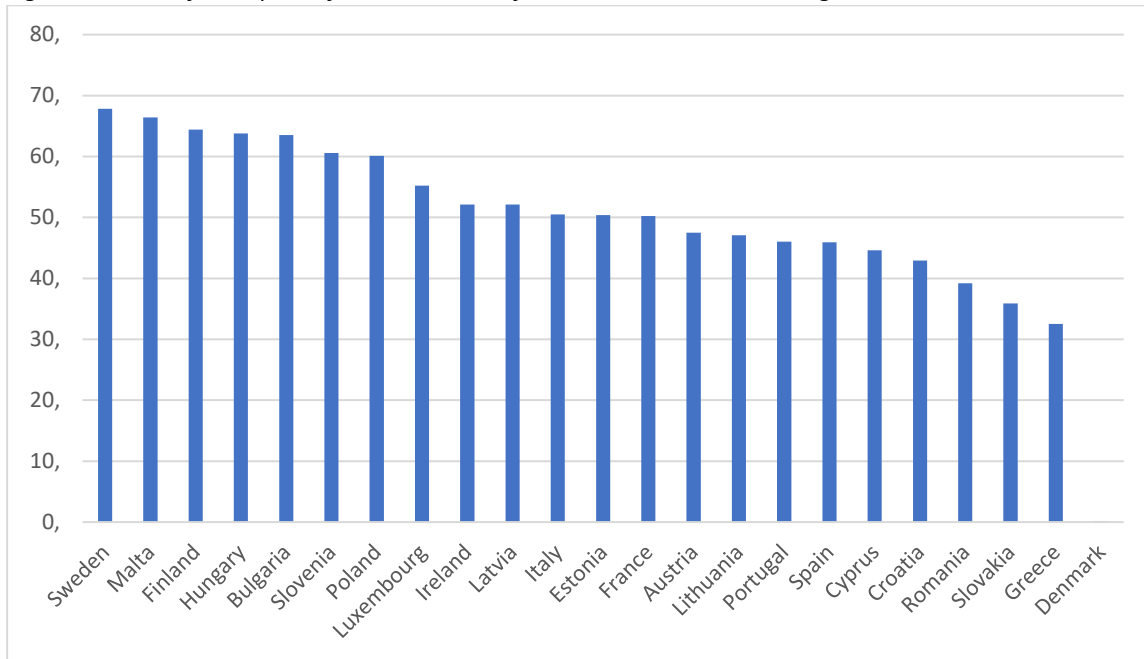
Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat)

Figure 22. Rate of enterprises for which “High competition” in not an innovation barrier



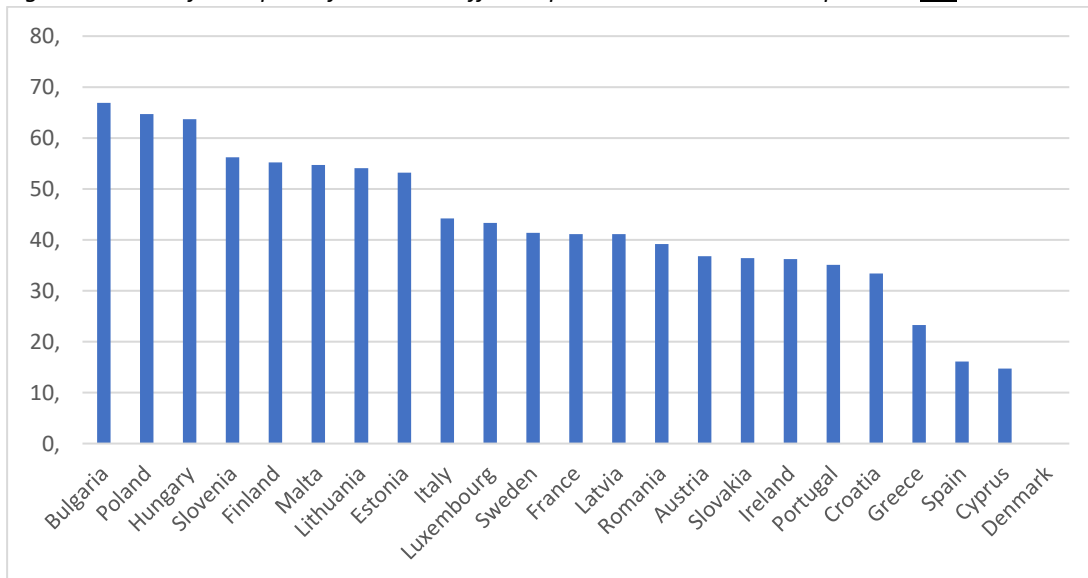
Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat)

Figure 23. Rate of enterprises for which “Lack of access to external knowledge” in not an innovation barrier



Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat)

Figure 24. Rate of enterprises for which “Different priorities within the enterprise” in not an innovation barrier



Source: Own construction based on CIS database [Statistics | Eurostat \(europa.eu\)](https://ec.europa.eu/eurostat)

Conclusion

Although NKFI 2018 and the European Innovation Scoreboard (EIS) 2020 pointed a small improvement in Hungarian innovation activity relative to the EU average, Hungary is still lagging in international comparison. Hungary and V4 countries belong to the „Moderate Innovators”, where performance was between 50% and 95% of the EU average. According to EIS 2020, SMEs innovation performance was one of the weakest points in Hungary.

We investigated Hungarian enterprises' innovation performance based on Community Innovation Survey (CIS). The rate of innovative firms is one of the lowest (28,7%) in Hungary comparing European countries. The rates of enterprises with product innovation and the enterprises with process innovation were about 20%. In international comparison, the process innovation is where Hungary lags mostly behind. The rate of companies with more than 250 employees who have business process innovation did not reach 40%. The EU average was 65.5%. In the case of small and medium-sized companies, the Hungarian ratio was less than half of the European average.

The analysis of the CIS database did not explain the low proportion of innovative companies in Hungary. Although the rate of companies with R&D is low in Hungary (11.1%), there was no significant correlation between the rate of innovative enterprises and the rate of enterprises with R&D within the group of “Moderate Innovators”. We couldn't conclude that the weak innovation performance of Hungarian companies is mainly, or not only, due to weak R&D activity. The analysis of innovation barriers in the CIS database did not help to understand the roots of the problem. In more than half of the surveyed Hungarian firms, the following factors did not hamper the innovation: lack of internal finance, lack of external finance (credit or private equity), lack of collaboration partners, difficulties in obtaining public grants or subsidies, uncertain market demand, high competition, lack of access to external knowledge. The two most significant barriers: a high cost and a lack of qualified employees within the enterprise. Correlation analysis did not show a significant relationship between the examined barriers and the proportion of innovative enterprises, so this question needs further investigation.

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