

Do Incubators and Accelerators Matter? Regional Evidence from Slovakia

Katarína BELANOVÁ¹

¹ Assoc. prof., Bratislava University of Economics and Business, Slovakia, e-mail: katarina.belanova@euba.sk, ORCID: 0000-0003-2634-9238

Abstract: Startups represent an important driver of innovation and economic growth, particularly within regional entrepreneurial ecosystems. Their development, however, largely depends on the strength of the innovation ecosystem, which provides access to resources, knowledge, and support structures. This study examines the relationship between the number of startups and the availability of incubators and accelerators across Slovak regions. The analysis is based on cross-sectional data for eight regions in 2025. An Ordinary Least Squares (OLS) regression model was applied, complemented by heteroskedasticity-robust standard errors and bootstrap procedures to ensure the reliability of the results given the small sample size. The findings reveal a statistically significant positive association between the number of incubators and accelerators and startup activity. Regions with a higher concentration of support infrastructure, particularly Bratislava and Košice, exhibit a greater number of startups. However, the results should be interpreted with caution, as the cross-sectional design and potential endogeneity issues do not allow for causal inference. The study contributes to the literature by providing empirical evidence from a small open economy and offers policy implications for strengthening regional entrepreneurial support systems.

Key Words: incubators, accelerators, start - ups

1. INTRODUCTION

Start-ups play a significant role in shaping both the current and future entrepreneurial ecosystem within the economy of every country. They represent a segment of business that is inextricably linked to innovation, technological progress and economic growth.

In Slovakia, start-ups are legally defined by Act No. 290/2016 Coll. on the support of small and medium-sized enterprises and Act No. 71/2013 Coll. on the provision of grants within the remit of the Ministry of Economy of the Slovak Republic as *“commercial companies required to establish share capital, with their registered office in the Slovak Republic, which have been in existence for no more than 36 months and which are controlled by natural persons who are their founders, and which are innovative enterprises, micro-enterprises, small enterprises or medium-sized enterprises.”*

A key element of a successful start-up is sustainability. This means that a start-up must have the capacity to survive and thrive in the long term. Achieving sustainability involves several key factors that need to be considered and addressed.”

Factors influencing the creation and development of start-ups can be divided into internal and external factors. Internal factors, such as the quality of the business plan, the team’s experience and capabilities, and market adaptability, are undoubtedly key to a start-up’s success. However, these factors represent only a small part of the overall picture, as external factors – particularly the business environment, government support and the availability of funding – often have a decisive influence on whether a start-up will be able to survive and grow.

It is clear that support organisations play a significant role within the start-up ecosystem, providing start-ups with invaluable assistance in their growth and development. Among the most important support organisations are incubators and accelerators, which offer start-ups not only physical workspace but also expert advice, mentoring, access to funding and networking opportunities. Whilst incubators focus on supporting fledgling firms in their early stages, accelerators provide intensive support with the aim of accelerating growth and preparing firms for further investment.

The concept of the start-up ecosystem has become central to contemporary research on entrepreneurship and regional economic development. Isenberg (2010) introduced the idea that entrepreneurship flourishes within interconnected systems comprising institutions, investors, universities, culture and support organisations. Similarly, Stam (2015) conceptualised entrepreneurial ecosystems as a set of interdependent actors and factors coordinated in such a way as to enable productive entrepreneurship.

Ács, Autio, and Szerb (2014) emphasised that the quality of national and regional ecosystems significantly determines entrepreneurial performance and innovation capacity. According to Feld (2012), vibrant start-up

ecosystems are typically geographically concentrated and driven by dense networks of entrepreneurs, mentors, and investors. These findings are consistent with agglomeration theory (Porter, 1998), which suggests that geographical concentration enhances knowledge spillovers and innovation.

From a regional perspective, Audretsch and Belitski (2017) argue that local institutional frameworks and support mechanisms have a greater impact on entrepreneurial outcomes than national-level policies. This highlights the importance of examining entrepreneurship at the regional level rather than solely at the national level.

In this regard, business incubators and accelerators are widely recognised as key components of entrepreneurial ecosystems. Hackett and Dilts (2004) describe incubators as organisations designed to accelerate the growth and success of start-ups through the provision of resources, mentoring and access to networks. Bruneel et al. (2012) further differentiate between traditional incubators and more network-based models, emphasising the evolution towards value-added services.

Accelerators, as defined by Cohen and Hochberg (2014), provide time-limited, cohort-based programmes that include mentorship and educational components, often culminating in investor presentations. Empirical research suggests that accelerators improve start-up survival rates and fundraising success (Hallen, Bingham & Cohen, 2020).

Pauwels et al. (2016) identify distinct accelerator models and highlight their role in reducing information asymmetries between start-ups and investors. Furthermore, Gonzalez-Urbe and Leatherbee (2018) demonstrate that participation in accelerators can enhance innovation output and strategic orientation.

At the regional level, Fehder and Hochberg (2014) find that the establishment of accelerators has a positive impact on regional entrepreneurial activity and venture capital investment. These findings suggest that incubators and accelerators may act as catalysts for local start-up development.

Start-up formation is influenced by multiple factors, including access to finance, human capital, institutional quality, and market conditions (Acs et al., 2014; Stam, 2015). Regional characteristics such as population density, GDP per capita, and knowledge infrastructure significantly shape entrepreneurial outcomes (Audretsch & Belitski, 2017).

Research also highlights the importance of knowledge spillovers from universities and research institutions (Audretsch & Lehmann, 2005). The availability of venture capital and innovation capacity are frequently identified as strong predictors of start-up intensity (Porter, 1998; Feld, 2012).

However, whilst numerous studies analyse entrepreneurial ecosystems at national level, fewer focus on intra-country regional disparities, particularly in smaller Central and Eastern European economies.

Although the literature discusses entrepreneurial ecosystems and the role of incubators and accelerators at length, several gaps remain:

1. **Geographical gap** – Whilst extensive research has examined start-up ecosystems in developed economies such as the United States (Feld, 2012; Fehder & Hochberg, 2014) and Western Europe (Audretsch & Belitski, 2017), empirical evidence from Central and Eastern Europe remains limited. In Slovakia, existing analyses are predominantly descriptive (SBA, Sapie) and lack regional econometric analysis.
2. **Regional-level analysis gap** – Although several studies examine entrepreneurial ecosystems at the national level (Acs et al., 2014; Szerb et al., 2019), fewer studies empirically test ecosystem infrastructure at the subnational level, particularly in smaller economies such as Slovakia.
3. **Quantitative relationship gap** – Previous research has predominantly assessed the effectiveness of incubators and accelerators at the firm level (Hackett & Dilts, 2004; Hallen et al., 2020). However, limited attention has been paid to the aggregate regional relationship between the number of support institutions and start-up intensity.
4. **Policy relevance gap** – Despite the growing policy emphasis on strengthening entrepreneurial infrastructure, empirical evidence from small open economies remains insufficient to guide regional investment decisions regarding the expansion of incubators.

Therefore, this study contributes to the literature by empirically examining the relationship between the number of incubators and accelerators and startup activity across Slovak regions. By focusing on a small open

economy with significant regional disparities, it provides context-specific evidence that may inform regional innovation and entrepreneurship policy.

Building on this research gap, the aim of this article is to examine whether the regional availability of incubators and accelerators is associated with startup activity in Slovakia. Accordingly, the following research question was formulated: Does the regional availability of incubators and accelerators significantly influence startup activity in Slovakia?

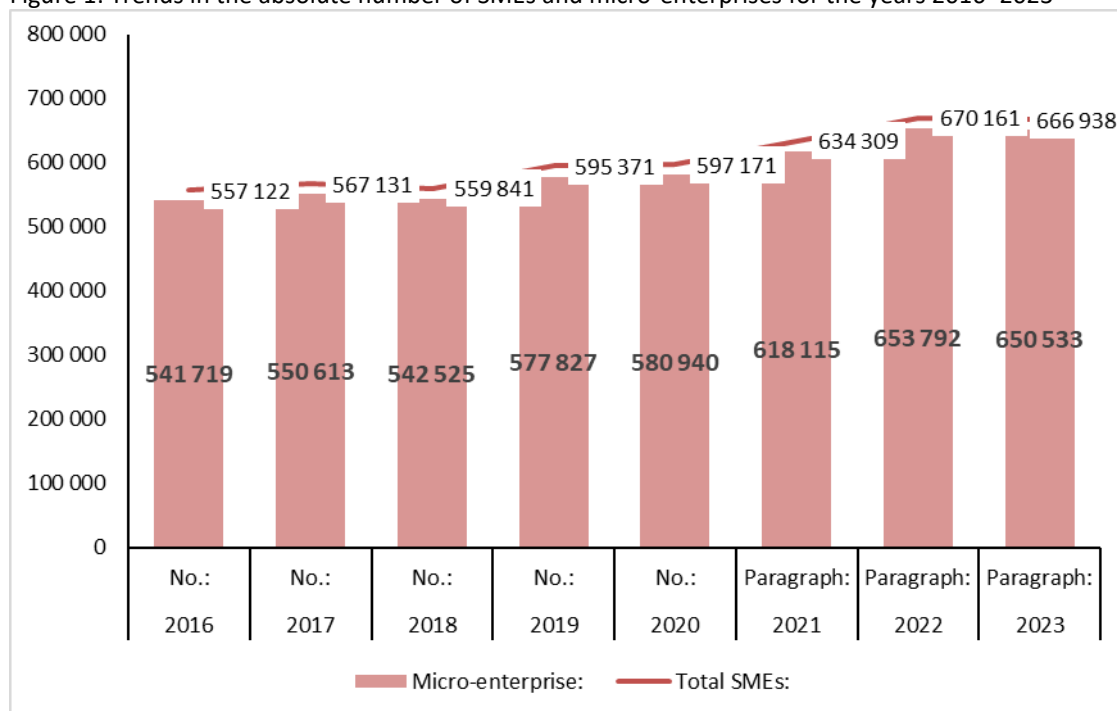
The empirical analysis indicates a statistically significant positive relationship between the availability of incubators and accelerators and the number of startups. In particular, regions with the highest concentration of support organizations, such as Bratislava and Košice, also exhibit the highest levels of startup activity.

2. MATERIAL AND METHODS

As mentioned in the Introduction to this article, start-ups in the Slovak Republic belong to the SME category.

SMEs form a very important part of our economy. Each year, they account for approximately 99.9 per cent of the total number of businesses, whilst large enterprises represent only 0.1 per cent. The importance of the small and medium-sized enterprise sector in Slovakia is greater than in other countries. According to available data from 2023, we can confirm that the number of SMEs per capita in Slovakia is one of the highest in the European Union. According to European Commission estimates from 2023, there were 99 SMEs per 1,000 inhabitants in Slovakia, which was the second-highest figure in the EU, with only the Czech Republic recording a higher number – 102 (SBA, 2023).

Figure 1: Trends in the absolute number of SMEs and micro-enterprises for the years 2016–2023



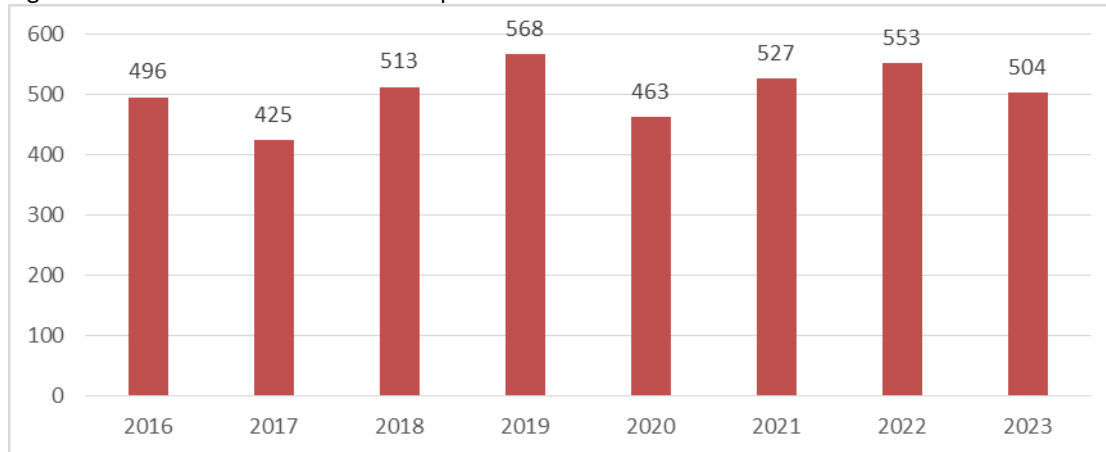
Source: Own analysis

Figure 1 illustrates the trend in the absolute number of SMEs and micro-enterprises. Micro-enterprises constitute the largest share of the sector in every year, with their number reaching 653,792 in 2022. This high proportion of micro-enterprises may be due to several factors that influence entrepreneurs' decisions. Key factors include lower risk and lower start-up costs. Micro-enterprises often operate on the basis of sole traders or small teams, which allows them flexibility and makes it easier to adapt to changing market conditions. However, although micro-enterprises make up the majority of SMEs, their growth and expansion are constrained by legislative requirements and high social security contributions. These factors can lead to a reluctance on the part of entrepreneurs to employ more people, as increasing the number of staff brings not only higher wage costs but also more complex administrative obligations.

Micro-enterprises, as the largest group within small and medium-sized enterprises, provide a significant breeding ground for the emergence of start-ups. Start-ups often share similar characteristics with micro-enterprises, particularly in terms of innovation and low start-up costs. In the early stages of their business, they have a similar level of flexibility to micro-enterprises; however, thanks to their innovative potential and ambitions, they can achieve significant growth.

Figure 2 shows the trend in the number of start-ups between 2016 and 2023.¹

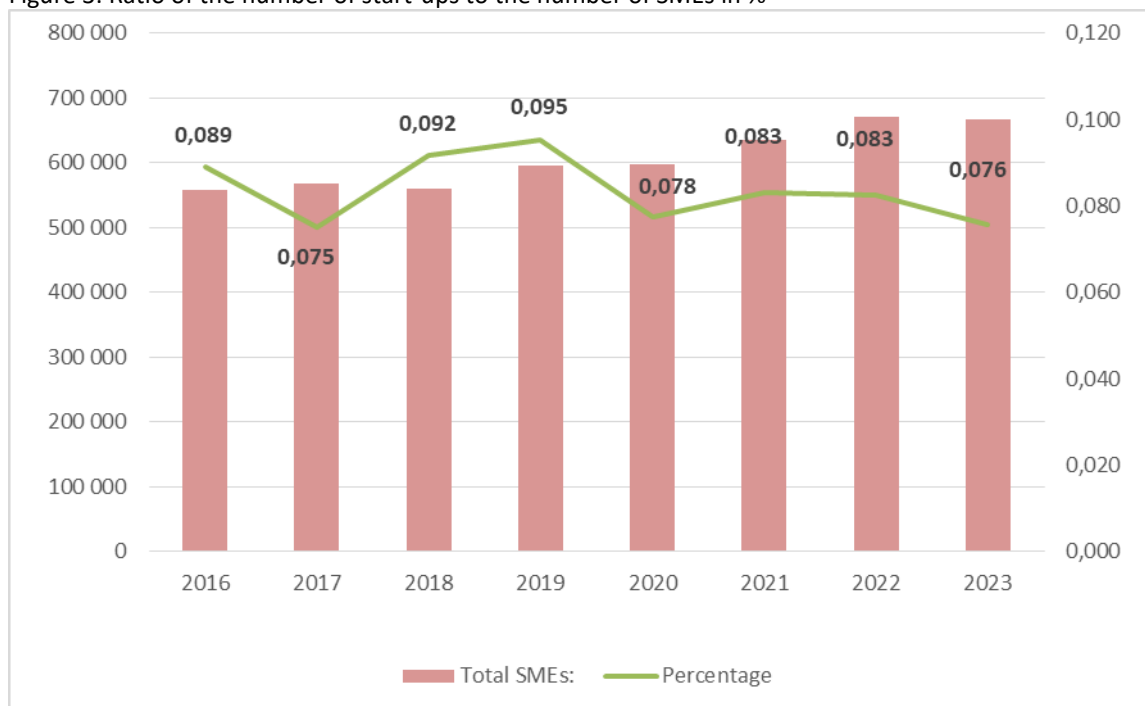
Figure 2: Trend in the number of start-ups 2016–2023



Source: Own compilation

As can be seen from Figure 2, the trend in the number of start-ups is highly volatile. The highest number was recorded in 2019, when it reached 568 start-ups, whilst the lowest number was in 2017, followed in recent years by 2020, when there were only 463 start-ups. This decline can be attributed primarily to the onset of COVID-19 and its negative impact on the business environment. Such volatility is typical for start-ups, as they are high-risk ventures. They are dependent on external sources of funding, and if they fail to secure sufficient funding, they are forced to cease operations in the early stages of their business. For this reason, start-ups do not grow at the same rate as, for example, micro-enterprises.

Figure 3: Ratio of the number of start-ups to the number of SMEs in %

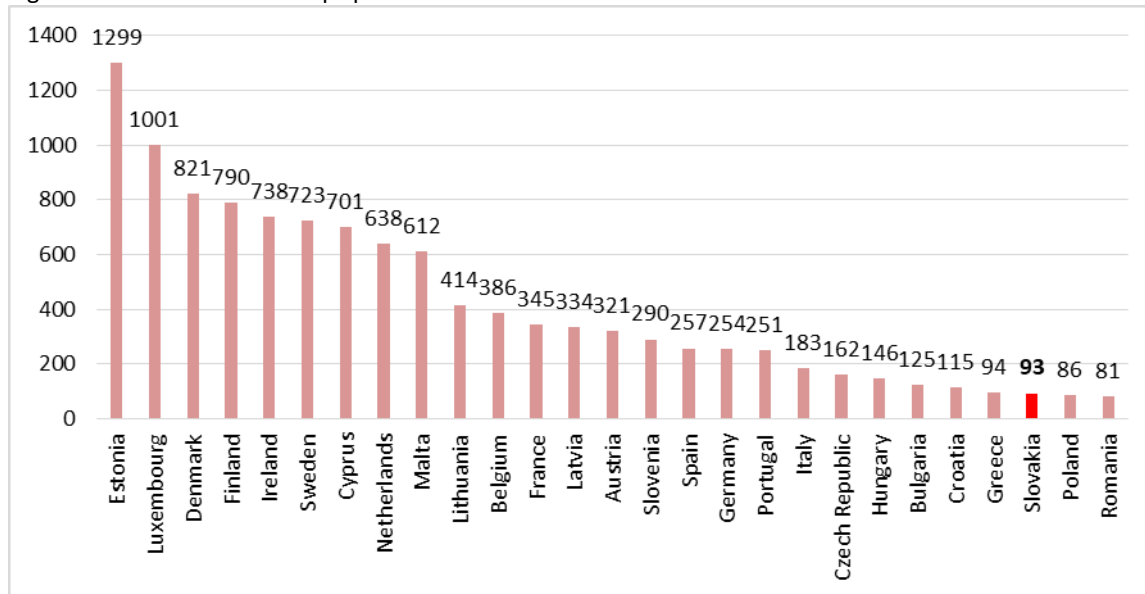


Source: own analysis

Similarly, the trend in the proportion of start-ups out of the total number of SMEs shows slight fluctuations (Figure 3). The highest proportion was recorded in 2019 at 0.095 per cent, suggesting that more start-ups were established or remained in operation during this period relative to the total number of SMEs. Conversely, the share was low in 2020, at 0.078 per cent, which may be linked to the lingering effects of the pandemic, reduced availability of venture capital, or a higher rate of start-up failure.

Generally speaking, the proportion of start-ups among SMEs hovers around 0.07–0.09 per cent, although there has been a slight downward trend in recent years. This decline may be due to various factors, such as economic conditions, legislative changes or a reduced attractiveness of the business environment for the creation of new start-ups.

Figure 4: Number of start – ups per 1 million inhabitants for 2023



Source: Own compilation based on: Prosperity and Financial Health Index. *Business Environment 2023*. [electronic resource]. [2023], online. [accessed 16 March 2025]. Available at: <https://www.indexprosperity.cz/2024/prostredi-pro-podnikatele-2/>

Compared with other EU countries, Slovakia ranks near the bottom of the table. In 2023, there were only 93 start-ups per million inhabitants in Slovakia, placing us in third-worst position within the EU. Only Poland and Romania are behind us. In contrast, Estonia achieved the best results with 1,299 start-ups, which represents almost 14 times the number per capita compared with Slovakia (Figure 4).

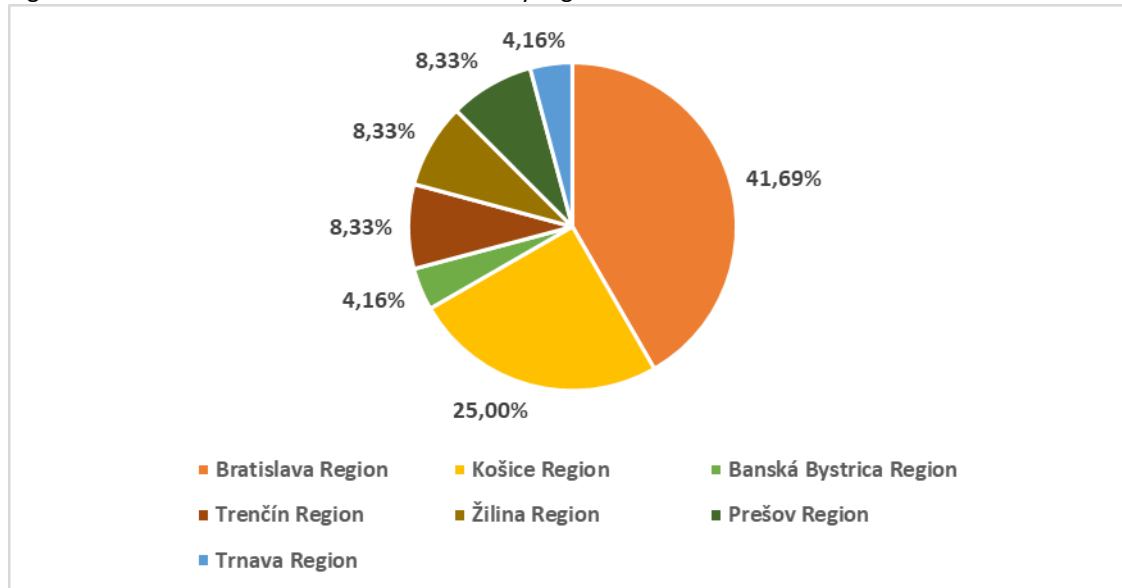
It is undeniable that a supportive business environment is essential for the creation and further development of SMEs, and therefore also of start-ups.

Support organisations, such as incubators and accelerators, play a vital role in the start-up ecosystem. These organisations provide start-ups not only with funding, but also with mentoring support, access to investor networks and other invaluable resources that facilitate their development. In mature start-up ecosystems, incubators and accelerators are an integral part of the entrepreneurial infrastructure, as they provide start-ups with access to the necessary tools and expertise that are essential for their success in the market.

The empirical section of this article examines the relationship between the number of start-ups and the number of incubators and accelerators in individual regions of the Slovak Republic.

Administratively, the Slovak Republic is divided into 8 regions.

Figure 5: Ratio of incubators and accelerators by region



Source: Author's own compilation

Figure 5 shows the proportion of incubators and accelerators by the region in which they were established. The graph clearly shows that the largest number of these organisations is concentrated in the Bratislava Region, where they account for 41.69 per cent. In second place is the Košice Region with a share of 25 per cent. In third place, with an equal share of 8.33 per cent, are organisations in the Žilina, Prešov and Trenčín regions. In last place, with a share of 4.16 per cent, are incubators and accelerators in the Banská Bystrica and Trnava regions. Identifying these shares is significant not only in terms of the geographical distribution of organisations, but also in relation to the need for further support in regions where their concentration is lower.

2.1 Data and methodology

Based on the theoretical framework and previous empirical evidence, it is expected that regions with a greater availability of incubators and accelerators will exhibit higher levels of startup activity. Accordingly, the following hypotheses were formulated:

H0: There is no statistically significant relationship between the availability of incubators and accelerators and startup activity.

H1: There is a statistically significant positive relationship between the availability of incubators and accelerators and startup activity.

The hypotheses were tested using an Ordinary Least Squares (OLS) regression model. Given the small sample size (eight regions) and the potential presence of heteroskedasticity, heteroskedasticity-robust standard errors (Huber–White estimator) were employed. In addition, a bootstrap procedure with 1,000 replications was conducted to obtain more reliable confidence intervals and p-values. Bootstrap estimation is particularly suitable for small samples because it does not rely on the assumption of normally distributed residuals.

The regression model is specified as:

$$\text{Startups}_{s_i} = \beta_0 + \beta_1 \text{Incubators}_{s_i} + \varepsilon_i \quad (1)$$

Where:

Startups s_i – the number of startups in region i ,

Incubators s_i – the number of incubators in region i ,

B_0 – the intercept,

B_0 – captures the association between support infrastructure and startup activity,

E_i – the error term-

The empirical analysis is based on cross-sectional data for the eight Slovak regions in 2025. The dataset includes the number of startups and the number of incubators and accelerators operating in each region. These data were compiled from publicly available sources and are summarized in Table 1.

Table 1: Number of incubators/accelerators and start-ups by region in 2025

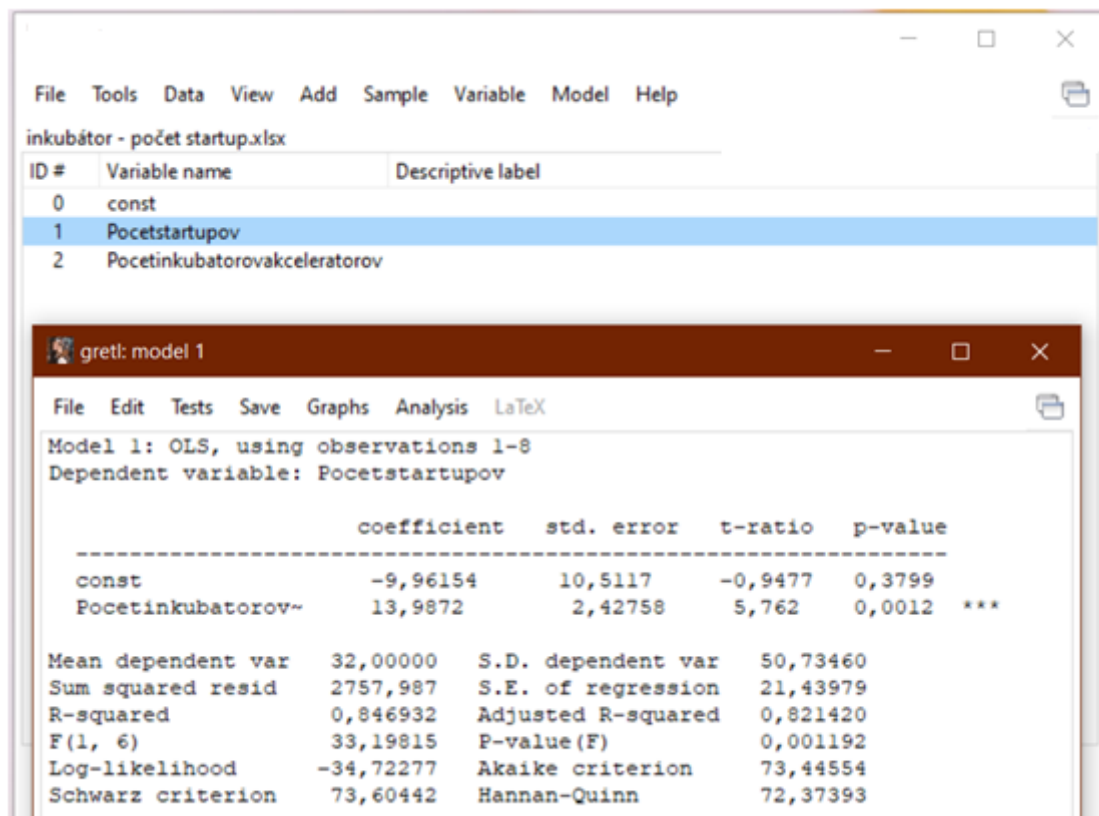
Region:	Number of start-ups:	Number of incubators/accelerators:
Banská Bystrica	5	1
Bratislava	154	10
Košice	40	6
Prešov	7	2
Nitra	8	0
Trenčín	6	2
Trnava	24	1
Žilina	12	2

Source: Own compilation

3. RESULTS AND DISCUSSION

Figure 6 represents the outcomes of the model in Gretl.

Figure 6: Outcomes from the Gretl



Source: Own compilation

The estimated intercept ($\beta_0 = -9.96$) is statistically insignificant and has no meaningful economic interpretation, as a negative number of start-ups is not feasible in practice. Therefore, the focus of the interpretation is on the slope coefficient.

The estimated slope coefficient ($\beta_1 = 13.99$) is positive and statistically significant at the 5% significance level. This indicates that, on average, an additional incubator or accelerator within a region is associated with an increase of approximately 14 start-ups.

However, this result should be interpreted as a statistical association rather than evidence of causality.

The F-statistic ($F = 33.19$) indicates that the model as a whole is statistically significant. The associated p-value confirms that the independent variable contributes significantly to explaining regional variation in start-up activity.

The coefficient of determination ($R^2 = 0.847$) suggests that approximately 84.7 per cent of the variation in the number of start-ups across regions is explained by the variation in the number of incubators and accelerators. Nevertheless, given the small sample size and the simple bivariate structure of the model, this value should be interpreted with caution.

The positive relationship remains statistically significant after applying heteroscedasticity-robust standard errors, confirming the robustness of the estimated association.

4. CONCLUSIONS

Start-ups represent a key component of modern economies due to their innovation potential and capacity to drive economic growth. In advanced economies such as the United States, Israel and Estonia, well-developed start-up ecosystems supported by institutional infrastructure contribute significantly to entrepreneurial activity. In contrast, the development of the start-up environment in Slovakia still faces several structural challenges.

The formation and growth of start-ups are influenced by both internal and external factors. Whilst internal factors such as entrepreneurial skills, business ideas and adaptability are important, external conditions – particularly the quality of the business environment, the availability of financing and institutional support – play a decisive role in determining start-up success. In this context, incubators and accelerators represent an essential part of the entrepreneurial ecosystem, providing start-ups with access to knowledge, networks and financial resources.

The aim of this study was to examine the relationship between the number of start-ups and the number of incubators and accelerators across Slovak regions. The empirical analysis revealed a statistically significant positive association between these variables. Regions with a higher concentration of incubators and accelerators, such as Bratislava and Košice, also exhibit a higher number of start-ups. The estimated coefficient remains statistically significant even after applying heteroscedasticity-robust standard errors and bootstrap procedures, confirming the robustness of the results.

However, these findings should be interpreted with caution. Due to the cross-sectional nature of the data and the potential presence of endogeneity, particularly reverse causality, the results indicate correlation rather than causation. Furthermore, the relatively small sample size and the omission of additional explanatory variables limit the generalisability of the findings and may introduce bias into the estimated relationship.

Despite these limitations, the results highlight the importance of entrepreneurial support infrastructure in shaping regional start-up activity. From a policy perspective, strengthening the network of incubators and accelerators, particularly in less developed regions, may contribute to a more balanced development of the start-up ecosystem in Slovakia. At the same time, enhancing cooperation between the public sector, the private sector and academia appears to be crucial for fostering innovation and long-term economic competitiveness.

Future research should focus on addressing the identified limitations by incorporating panel data, additional explanatory variables and more advanced econometric techniques in order to better capture causal relationships and the dynamic nature of entrepreneurial ecosystems.

Acknowledgment

This work was supported by the Slovak Scientific Grant Agency under the contract VEGA No. 1/0723/24. The opportunities and risks arising from the growing role of non - bank financial institutions and the acceleration of the dynamics of innovation in the financial system.

ENDNOTES

¹ The exact number of start-ups in Slovakia is not available in a single, consolidated database. Their number was identified on the basis of available data from various sources, such as analyses by the SBA, Sapie, Dealroom, Slovenská sporiteľňa's Seedstarter, and other articles on start-ups. Determining their number was complicated

by the fact that not all start-ups are officially registered as companies; some exist solely within incubators and may not be formally recorded in business databases. As start-ups are included in the statistics alongside SMEs, accurately determining their number in individual years is challenging for this reason too (the total number of SMEs includes not only limited companies but also sole traders, self-employed professionals and independent farmers). Furthermore, some enterprises may only be classified as start-ups some time after their establishment, which further complicates the accurate recording of such data. The number of start-ups cited in the analysis may therefore differ from the actual figure, as accurate data on them is difficult to obtain.

REFERENCES

- Act No. 290/2016 Coll. on the support of small and medium-sized enterprises and Act No. 71/2013 Coll. on the provision of grants within the remit of the Ministry of Economy of the Slovak Republic.
- Ács, Z. J., Autio, E., & Szerb, L. (2014). National systems of entrepreneurship. *Research Policy*, 43(3), 476–494. DOI: 10.1016/j.respol.2013.08.016
- Audretsch, D. B., & Belitski, M. (2017). Entrepreneurial ecosystems in cities. *Journal of Technology Transfer*, 42, 1030–1051. DOI: 10.1007/s10961-016-9473-8
- Audretsch, D. B., & Lehmann, E. E. (2005). Does the knowledge spillover theory apply to regions? *Research Policy*, 34(8), 1191–1202. DOI:10.1016/j.respol.2005.03.012
- Bruneel, J., Ratinho, T., Clarysse, B., & Groen, A. (2012). The evolution of business incubators. *Technovation*, 32(2), 110–121. DOI:10.1016/j.technovation.2011.11.003
- Cohen, S., & Hochberg, Y. (2014). Accelerating start-ups: The seed accelerator phenomenon. SSRN Working Paper. DOI:10.2139/ssrn.2418000
- Fehder, D. C., & Hochberg, Y. V. (2014). Accelerators and the regional supply of venture capital. SSRN Working Paper. DOI:10.2139/ssrn.2518668
- Feld, B. (2012). *Startup Communities*. Wiley.
- Gonzalez-Urbe, J., & Leatherbee, M. (2018). The effects of business accelerators. *Review of Financial Studies*, 31(4), 1566–1603. DOI:10.1093/rfs/hhx103
- Hackett, S. M., & Dilts, D. M. (2004). A systematic review of business incubation research. *Journal of Technology Transfer*, 29(1), 55–82. DOI:10.1023/B:JOTT.0000011181.11952.0f
- Hallen, B. L., Bingham, C. B., & Cohen, S. (2020). Do accelerators accelerate? *Organisation Science*, 31(2), 378–414. DOI:10.1287/orsc.2019.1304
- Isenberg, D. (2010). The big idea: How to start an entrepreneurial revolution. *Harvard Business Review*.
- Ministry of Economy of the Slovak Republic (2021) Report on the state of the business environment in Slovakia.
- Pauwels, C., Clarysse, B., Wright, M., & Van Hove, J. (2016). Understanding accelerator models. *Technovation*, 50–51, 13–24. DOI: 10.1016/j.technovation.2015.09.003
- Porter, M. E. (1998). Clusters and competition. *Harvard Business Review*.
- Slovak Business Agency. State of SMEs 2023. [electronic resource]. [2023], online. [accessed 15 March 2025]. Available at: https://www.sbagency.sk/sites/default/files/sprava_o_stave_msp_2023_final.pdf
- Stam, E. (2015). Entrepreneurial ecosystems and regional policy. *European Planning Studies*, 23(9), 1759–1769. DOI:10.1080/09654313.2015.1061484