

An Econometric Study on the Role of Startups in Job Creation Using Panel Data Models: A Case Study of European Union Countries

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Received: 08-12-2025

Accepted: 12-28-2025

Published: 12-30 -2025

Abstract

This research paper aims to highlight the role of startups in absorbing unemployment and thus creating jobs in the European Union countries. By using panel data models, we have presented statistics related to the number of these companies and those related to the unemployment rates and job creation.

The main important result of this research paper is based on a disparity in the number of startups among European Union countries and that the Union pays great attention to supporting this type of company. The study also concluded that there is a positive and direct relationship between the number of startups and job creation, and that the contribution of these companies to job creation is also affected by the economic strength of the European Union countries.

Keywords: Startups, Unemployment, Job creation, European Union.

JEL classification: O49, O 52, C 33, E 24

Cite this article

M'hamel, A. A., Henni, M. D. (2025). *An Econometric Study on the Role of Startups in Job Creation Using Panel Data Models: A Case Study of European Union Countries*. Economic Researcher Review, 13(2),295–313.



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1. Introduction:

Unemployment rates are an indicator that causes great concern for major countries around the world as they represent alarming figures of citizens looking for work who have not found it. Among them, one can find people with the necessary skills that would enable them to add value to the institutions they work for. That is why all countries in the world strive to employ the largest possible number of workers each year, as they are wasted energies that must be exploited. This is done by filling vacant positions in public institutions and encouraging private institutions to do the same.

Startups are an integral part of private institutions, which are known for their rapid growth compared to other institutions. Employment within them increases as they grow and expand. This is why most countries in the world, including the countries of the European Union, whose impact on employment we will study as a sample, encourage and support these institutions so that they contribute to the absorption of unemployment and the creation of new jobs, and thus participate in the countries' policies aimed at reducing unemployment rates as much as possible. In light of the foregoing, the following problem can be raised: **what is the role of startups in creating job opportunities in the countries of the European Union? Sub-questions:**

- What is the concept of startups?
- What is the reality of unemployment in the countries of the European Union?
- What is the reality of employment in the countries of the European Union?
- What is the role of startups in absorbing unemployment and employment in some countries of the European Union?

Study Hypotheses : we based our research on the following hypothesis:

- There is a statistically significant relationship at the 0.05 level between startups and job creation.

The Objectives Of Study :

- Explain the concept of startups as pioneering institutions that must be supported and cared for;
- Establish a diagnosis of the reality of unemployment and employment in the countries of the European Union;
- Highlight the relationship between startups and job creation in the countries of the European Union, which support this type of institution.

Methodological Approach :

The study employs a descriptive approach for the theoretical section, analyzing unemployment and employment trends in the EU and globally using relevant statistics. For the empirical part, we used panel data models, combining cross-sectional data from 10 EU countries with time-series data from 2011 to 2022 to provide a more comprehensive analysis of startups' impact on job creation.

The limits of The study:

The temporal limits of the study were the period from 2011 to 2022 for the practical part and up to 2025 for the theoretical part, especially with regard to the updated statistics of some countries.

Previous Studies: In this research paper, we relied on the following two studies:

- Gus George Lazopoulos's doctoral dissertation, titled "Navigating Startup Financing Challenges: Impact on Economic Growth and Job Creation," Golden Gate University, San Francisco, USA, July 2025, addressed the financing challenges facing startups and their impact on their role in

economic growth and job creation in both Canada and the United States. The researcher used a multi-method sequential interpretive approach in his study, which contributed to highlighting the statistical relationship between funding sources and the performance of these companies, based on interviews with their owners. Among the most prominent findings of the researcher was the existence of a statistically significant correlation between the source of funding and the growth of startups, registering an expansion problem and consequently a decrease in employment at the level of these institutions whose owners relied heavily on self-financing, unlike those that relied on external financing, and the lack of effectiveness of current government policies for financing emerging institutions, especially those financed by the public sector, particularly for institutions outside the sectors with projects. This is especially true for businesses outside of high-growth sectors. The study also highlighted that 71.6% of the entrepreneurs surveyed had previously worked for other startups for only three years before establishing their own businesses, indicating that these earlier employers had faced funding challenges at the outset.

- The Impact of Startups on Economic Growth in Developing Countries, Volume 1, Issue 5, May 2025. This article discusses the role of startups in accelerating economic growth in developing countries, highlighting their contribution to innovation and technological advancement, which these types of companies rely on to create job opportunities, particularly for skilled and specialized personnel. This also contributes to increased competition in this field. This research paper highlights the role of startups in contributing to GDP, reducing unemployment, and stimulating private sector development, while also emphasizing the challenges and opportunities these startups face in some emerging countries such as India, Kenya, and Nigeria. One of the most significant findings of this study is the existence of the challenges facing these types of companies include funding problems, regulatory and bureaucratic hurdles in the countries under study, and a shortage of the skills and talent needed by startups in these countries. Therefore, governments must focus on creating and implementing specialized training programs for the human resources working at this level. These institutions periodically acquire the necessary skills that enable them to grow, expand, and participate in economic development, such as those in the technology sector, but also contribute to job creation indirect work in various sectors such as logistics, marketing and customer service.
- Miguel Santos Suen's study, (article titled: Role of Startups in Economic Growth of Emerging Nations, Volume 6, Issue 2, February 2025), highlights the role of startups in creating an innovative, technological, and economic institutional revolution by contributing to sustainable economic development and job creation, despite their relatively recent establishment in their early years, compared to traditional institutions. It also strengthens innovation systems, attracts foreign investment, and contributes to GDP. This study focused on Brazil, India, and Kenya. The number of startups is positively correlated with employment rates, with each successful startup creating between 15 and 20 direct and indirect jobs in its first five years. It also provides its human resources with many new skills while creating an entrepreneurial mindset to reduce brain drain.
- The Role of Start-Ups in Employment Generation: A Comparison Between Tech Start-Ups and Traditional Businesses, Volume 12, Issue 03, March 2023. This article compares startups and traditional businesses in job creation, drawing on various statistics around the world. The study highlights the significant role of startups in entrepreneurship, driving innovation, and utilizing skilled human resources with specific and diverse skills, particularly in technology, management, technical expertise, and marketing. Furthermore, in its innovative aspect, emerging companies rely on identifying gaps in the market and then attempting to create and develop products that fill these gaps, thus contributing to the creation of new job roles, such as those found in e-commerce and artificial intelligence. Startups contribute to sustainable economic growth, which drives them to ensure their continuity, expansion, and the creation of new job opportunities. This, in turn, helps to alleviate isolation and develop impoverished and marginalized areas by establishing

branches there. Undoubtedly, these startups face numerous challenges, including financial difficulties, organizational problems, and intense competition, the shortage of talent, especially in developing countries, infrastructure and technology, gaining consumer trust, especially in its early years, as well as the risks of cyber-attacks.

- ❖ Our study differs from previous studies in that it focused on European Union countries and used the "panel data" to highlight the strong relationship between startups and job creation. This distinguishes it from other studies that focused on North America and some developing countries. We also focused on the relationship between startups and job creation only, contrary to what other previous studies have shown, which highlighted the role of startups in economic development and achieving sustainable development, of which job creation is a part, and this is what all previous studies have conclude.

Nowdays, countries around the world have shown increasing interest in startups and their ability to adapt, compete, and survive in a volatile business environment (Eslamloo, Brown, Amro allahi Biyouki, 2025, p. 01), where these companies are constantly faced with the need to adapt and innovate in their field of activity, in order to ensure their sustainability and excellence on the one hand, and to meet their customers' demands on the other (Filippelli, Troise, Bigliardi, Corvello, 2025, p. 04)

1.1. Definition of startups: There are several definitions of startups, including:

Startups are defined in the English dictionary as small businesses that have just been launched. The term "start-up" is divided into two parts: "start," which means "start," and "up," which means "strong growth" (Kallouche, Hakem, 2021, p. 92).

These companies are defined as "small businesses in the startup phase that seek innovation in their products and aspire to grow with limited human and material resources" (Nosella, Forza, Workalemahu, 2025, p. 180).

They can also be defined as "small businesses in the startup and modern phase that develop innovative ideas and demonstrate flexibility, and that aspire to significant and rapid growth with limited resources, due to their newness and small size." (Kanemoto, Sugihara, Tsujimoto, 2025, p. 01).

Therefore, it can be said that startups are small, recent, and startup-phase businesses that rely on innovation in their activities, are characterized by their flexibility, and aspire to rapid growth. They are also distinguished by their limited human and material resources compared to medium and large companies. These are companies that start with an idea and end up experiencing rapid growth.

The advantage of these companies lies in their small size, their innovative and creative nature, their potential for growth and prosperity, and the fact that they do not require significant funding (Merabet, 2024, p. 317).

1.2. The role of Startups in job creation:

According to startup statistics for the year 2025, there are approximately 150 million companies worldwide, including 1,361 startups with the title of "unicorn." This title is given to startups whose value exceeds one billion dollars. The following table shows the ranking of the main countries in the world based on the number of startups:

*Table 01 : Ranking of the main countries in terms of the number of
Startup companies in 2025*

N°	countries	Number of startups
01	Usa	82.038
02	India	17.838
03	Uk	7500
04	Canada	4055
05	Australia	3008
06	Indonesia	2653
07	Germany	2523
08	France	1724
09	Spain	1544
10	Brazil	1224

Source : (Demandsage, 2025)

The table above shows that the ranking of countries by the number of emerging companies covers "almost" all continents, with the exception of Africa. This shows the continent's delay and its desire to catch up with the leading countries in this field. Furthermore, this ranking is logical insofar as the countries mentioned above have the largest global economies, which confirms that the high number of startups in a given country is linked to the strength of its economy. It is also clear that the countries mentioned above have adopted rigorous plans to support this type of company.

Funding is considered one of the biggest concerns for startups, which can embody the creative and innovative idea of their owners (Diaf, Hammana, 2016, p. 169) in 2021, startup funding increased by 32% to reach \$671 billion. In the same year, the world saw a 53% increase in requests to create this type of company compared to 2019, with a total number estimated at 5.4 million startups worldwide (My Codeless Website). Startups have contributed to job creation worldwide as follows:

- According to 2023 statistics, the contribution of startups to employment in **America** was estimated at approximately 3.7 million jobs (Statista, 2023);
- According to 2025 statistics, the contribution of startups to employment in **India** was estimated at approximately 1,769,000 jobs (Ministry of Commerce & Industry, 2025);
- According to 2024 statistics, startups also contributed to the employment of 250,000 people in **Canada** (Kale , 2024);
- Regarding **Australia**, we only have precise information for the state of Victoria, where startups created more than 5,900 local jobs in 2020 (Launvhvic, 2021, p. 06);
- In **Germany**, startups contributed to the creation of 415,000 jobs according to 2025 statistics (German Startup Association, 2025);
- In **France**, startups contributed to the creation of 1.1 million direct and indirect jobs according to 2025 statistics (La mission French Tech, 2025);
- **Spanish** startups also contributed to the creation of 19,422 jobs according to statistics for July 2024 (Invistin Spain, 2024);

We have collected statistics on the contribution of startups to job creation in the largest countries in the world, which have the largest number of them according to the available official statistics, with the exception of certain countries such as "the United Kingdom, Indonesia, and Brazil," for which we were unable to obtain statistics related to our research topic despite our many attempts.

In light of the above, it can be stated that, despite the differences between some of the available statistics, particularly regarding the year and the overall country statistics or partial statistics from a particular state, as in the case of Australia, which is explained by the difficulty of obtaining these statistics, it is clear that startups play an important role in creating jobs in different economic sectors, particularly in the technology sector. I would like to emphasize here that the role of these companies in job creation varies from one company to another. We find that startups, at the beginning of their creation, employ a small number of people compared to older companies. The same is true for startups with the title of "unicorn," whose market value exceeds, as we mentioned earlier, one billion dollars. They inevitably contribute more significantly to the reduction of unemployment and therefore to the creation of new jobs that can reach thousands due to their size, weight, and market value.

2. Number of startups and policies implemented to encourage them in the European Union:

We will discuss below certain statistics related to startups in European Union countries, then we will deal with the latest policies adopted for the development of startups in the Union.

2.1. A few figures on the situation of startups in European Union countries:

We will present below a few figures relating to the situation of startups in certain countries of the European Union.

In 2014, the European Union launched an initiative, then called Startup europe (SE), after becoming aware of the economic importance of this type of company. This initiative aimed to improve and expand the European entrepreneurial ecosystem by improving business infrastructures as well as the systemic conditions related to social capital and the human talent associated with it (Shawinska, I.Zalewski, 2020, p. 02). In 2016, the European Commission adopted another program aimed at improving the economic situation of startups, and 46 proposals were submitted to improve European policies supporting startups active in the Union's space (Shawinska, I.Zalewski, 2020, p. 02).

According to statistics from May 2025, the European Union has 38,400 startups. These companies have helped raise 70 billion euros in venture capital (which is an injection of funds by investors in startups in exchange for stakes) and have created an institutional value of 500 billion euros (European, 2025, p. 01).

Germany, France and Spain are among the top countries in the world in terms of the number of startups, as we mentioned previously in table n° (01). Below is an overview of a few statistics relating to the number of startups in certain countries of the Union:

- Germany is 7th in the world with 2,523 startups;
- France is 8th in the world with 1,724 startups;
- Spain is 9th in the world with 1,544 startups;
- Italy has 53,869 startups (About startup landscape in Italy, 2025);
- Belgium has 21,306 startups (Startup Landscape in Belgium, 2025);
- Denmark has 19,200 startups (Unicorn startups in Denmark, 2025);
- Finland has 13,437 startups (Startup Landscape in Finland, 2025);
- In 2025, 6,340 startups were created in Ireland (Think Business, 2025);
- Malta has 271,000 startups (Startup Blink, 2025);
- The Netherlands has nearly 8,000 technology companies, 97% of which are startups (Constantijn, 2025);
- Sweden had 4,719 startups (2024 statistics) (Reports & Startup & Entrepreneurial Ecosystem, 2024);
- Sweden has 26,853 startups (Startup Landscape in Sweden, 2025);

According to the latest statistics for 2025, 157,000 startups have been created within universities in all European Union countries (European, 2025, p. 10).

The above highlights the huge volume of startups in most European Union countries, as well as the disparity in numbers between these countries, which is mainly due to the difference in economic power from one country to another.

2.2. The policies adopted to encourage startups in European Union countries:

We will present below the different policies adopted by the European Union to encourage startups.

Based on the detailed report published on May 28, 2025, the European Union has adopted and will adopt the following policies to encourage startups in the Union countries:

- The European Innovation Council (EIC Fund) has one of the largest venture capital funds in the field of deep technologies in the European Union, with the objective of raising 20 billion euros by 2027 (European, 2025, p. 03).
- The InvestEU European Investment Fund, which is an investment mechanism aimed at promoting sustainable investment, innovation and the financing of investment projects in several areas, such as digital transformation and innovation. It also aims to raise at least 372 billion euros in investments (InvestEU, 2024).
- Adapt existing regulatory frameworks to align with startup innovation and make them more flexible.
- Seek to grant new tax facilities to startups (European, 2025, p. 05)
- Support and create "regulatory sandboxes" which have helped 50% of startups to attract funding (European, 2025, p. 05). These sandboxes are virtual spaces whose objective is to allow startups to safely test various modern applications and software before putting them on the market.
- Propose a unified legal system at the level of all Union countries, aiming to smooth out the obstacles to the growth and expansion of startups digitally.
- Seek to create the European business Wallet, which aims to simplify things for startup managers by creating a digital identity allowing startup owners to share accredited data and documents between the different companies active in the Union countries.
- Launch a study by 2026 allowing the European Commission to identify the obstacles that startups could face, based on the laws and procedures in force in the Union's space.
- The European Innovation Council (EIC) supported deep tech companies to the tune of 30 million euros (European, 2025, p. 06).
- Strive to launch by 2026 a European initiative fund called "European Tech Champions 2.0" (ETCI 2.0), which is an ambitious fund seeking to raise capital from private and public investors to support startups active in the field of technologies, with the support of the European Investment Fund (European, 2025, p. 08).
- Implement a support plan for startups active in the field of European security and defense (European, 2025, p. 10).
- The European Institute of Innovation and Technology (EIT) has directly supported 9,900 startups, which has led to the emergence of "unicorn" companies and other innovative companies with a total value of 71.2 billion euros (European, 2025, p. 11).
- The European Commission will help startups access global markets thanks to the trade agreements concluded between the Union's space and various other countries and entities.
- Launch the "Lab to Unicorn" initiative by 2026 to accelerate research results, by supporting the main European research centers, in particular university centers, by developing a licensing and revenue and share-sharing program with academic institutions,

by providing the necessary legal and executive guidance under which universities and public research organizations can grant intellectual property rights (European, 2025, p. 12).

- Seek to attract skills and young talent from outside the Union countries, which strengthens and supports human capital within startups active in the Union's space.
- Encourage entrepreneurship education for secondary and higher education students in the Union countries, which helps to create young people capable of innovation and leadership (European, 2025, p. 15).
- Create a common European high-performance computing project including 13 new artificial intelligence factories. This project provides considerable computing power and support to startups (European, 2025, p. 17).

The above highlights the paramount importance that the European Union attaches to supporting this new business model, largely based on innovation and the use of modern technologies, especially since we are in the era of digital transformation. This also explains why three of its countries rank among the first in the world in this area, and the reason for the success and progress of the Union countries in general in the field of startups.

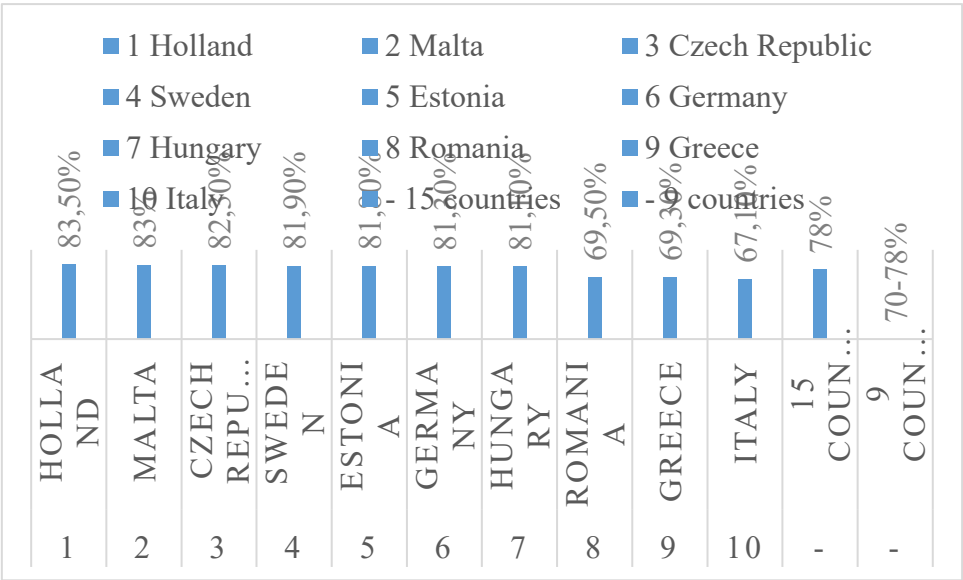
2.3.The employment situation in some European Union countries:

According to European Union estimates, the unemployment rate stood at 5.9%, which is equivalent to 13 million and 52 people registered as unemployed in the Union space in May 2025. Despite this, the Union considered that these rates had decreased by 23,000 unemployed people compared to May 2024.

Youth unemployment in the Union countries was registered at 14.8%, or 2 million and 864 young people (under 25 years old), in May 2025. The highest rate was registered in Spain with 25.4%, while the lowest unemployment rate was registered in Malta with 5.9% (Eurostat, 2025).

According to 2024 statistics, the number of people employed in various sectors amounted to 197.566 million people in all European Union countries, among people aged 20 to 64. The following figure illustrates the employment rates in the European Union countries:

Figure 1: Illustrative chart of employment rates in some European Union countries.



Source : Prepared by the researchers based on (Statistics Explained, 2024)

Based on the above and according to 2024 statistics, we can say that there is a notable disparity in employment among member states. Some have recorded rates above 80%, such as the Netherlands with 83.5%, followed by Malta with 83.5%, then the Czech Republic with 82.3%, Sweden with 81.9%, Estonia with 81.8%, Germany with 81.3%, and finally Hungary with 81.1%. Other member states recorded rates below 70%, such as Romania with 69.5%, followed by Greece with 69.3%, with Italy ranking last with a rate of 67.1%. Fifteen countries reported employment rates exceeding the 78% threshold, while nine other countries reported employment rates between 70% and 78%.

It should be noted that Italy ranks last in terms of employment, although it is the 8th world power and the 3rd power in the euro zone in terms of GDP. This is explained by a lack of need for labor, as is the case in countries that have recorded the lowest rates. We also found that some countries in Eastern and Southern Europe, such as Malta, the Czech Republic, Estonia, and Hungary, whose economies are promising compared to the countries of Western Europe in the Union, have a higher employment potential than several other countries.

2.4. The role of start-ups in job creation in numbers in European Union countries:

According to 2022 statistics, startups in European Union countries recorded an average annual employment growth rate of 12%. These companies contributed to employment in Finland, Germany, Denmark, Luxembourg, Austria, Sweden, and the Netherlands at a rate of 2%, but exceeded 5% in Greece, Estonia, and Portugal (EU, 2025).

Startups play an important role in job creation and thus in absorbing unemployment, even at low percentages. Given that these companies rely primarily on innovation and the use of modern technologies, they hire more young people than other categories, as this category has the necessary skills to master modern technological applications and tools. The employment rate of young "university graduates" aged 20 to 34 in European Union countries reached 83.5%, with disparities between different countries. Italy recorded the lowest rate with 67.5%, while Malta recorded the highest rate with 95.8%. The employment rate of young "vocational training center graduates" in the Union countries reached 81% (eurostat, 2023).

The above allows us to say that the European Union's approach to employment is good because it focuses on graduates of universities and vocational training centers, who are characterized by their young age (a huge potential of young people) and their lack of field experience. Thanks to this policy, the Union helps provide them with the necessary experience to engage in development and innovation efforts.

Below is a presentation of statistics on the contribution of startups to job creation and thus to the reduction of unemployment in some European Union countries:

- Startups in **Germany** contributed to the creation of 415,000 jobs. The employment rate in these companies, founded in Germany in 2005, increased by 55% between 2018 and 2020, and is expected to reach 4 million jobs in 2030 (Jochen , 2021).
- Startups in **France** contributed to the creation of 1.1 million jobs in various sectors (La Mission French Tech, 2025).
- Startups in the **Netherlands** contributed to the creation of 109,000 jobs, with a growing growth rate of 8%, making it the leading sector for job creation (Dutch startups, 2020).
- Startups in **Malta** contributed to the creation of 20,000 jobs in various sectors (Malta, 2025).
- Startups in the **Czech Republic** contributed to the creation of 160,000 jobs in various sectors (idea of the year, 2025).

- Startups in **Sweden** contributed to the creation of 76,000 jobs, while only 5 of them created 3,200 jobs ([dealroom, 2024, p. 12](#)).
- Startups in **Estonia** also contributed to the creation of 19,654 jobs in various sectors ([Estonia, 2024](#)).
- Startups in **Romania** also contributed to the creation of 3,300 new jobs in 2023 alone ([Romania, 2025](#)).
- Startups in **Italy** hired 15,300 people and created 2,940 new jobs in 2022 alone ([Emil, 2024](#)).
- Startups in **Finland** contributed to the employment of 36,000 people ([Finnish, 2024](#)).

The above shows how much startups contribute to job creation despite their youth, small size, lack of funding, and the risks related to their survival due to the ferocity of the market in which they operate. This also shows the extent of the disparity in job creation by these companies in the countries mentioned above, which is mainly explained by their number in these countries and their age. For example, startups that are more than five years old are not the same as those that have been recently created, and are not the same as those that are 15 years old. The more a company grows, the less the risk of survival in the market decreases and the more its need for employees increases.

3. The econometric study using panel data models:

The first step in building an empirical study is to define its temporal and spatial dimensions. The temporal dimension of our study covers the period from 2011 to 2022. The spatial dimension covers a group of European Union countries, considered leaders in the adoption, support, and creation of startups. They are ranked as follows: Germany, France, Spain, Italy, Belgium, Denmark, Finland, Ireland, Malta, and, finally, the Netherlands.

In addition, the estimation method for the empirical study model will be that of panel data models, which are models based on both temporal and cross-sectional series. Applied to the study, the temporal series will be between 2011 and 2022, and the cross-sections will represent 10 European Union countries. We will thus have series composed of 120 observations. These models are distinguished from others by a greater degree of freedom, a reduction or absence of the multicollinearity problem, and an attenuation of the heteroscedasticity problem from which other models suffer.

From a theoretical point of view, we can define the variables of the study model as follows:

- **Number of jobs:** This is the dependent variable, which represents the number of jobs created each year by the creation of new startups, for each country. We use "N_Jobs" as a notation.
- **Number of startups:** This is the explanatory variable, which represents the number of startups created in each country and for each year. We use "N_Startups" as a notation.

We can also mathematically link the functional relationship between the two previous variables as follows:

$$N_Jobs=f(N_Startups)$$

From the previous mathematical relationship, we formulate the empirical relationship of the study as follows:

$$N_Jobs_{it} = \beta N_Startups_{it} + \theta_{it} + \rho_{it} + \mu_{it}$$

Knowing that:

- μ_{it} , is the effect or the difference in the cross-sectional observations, representing the differences between the observations of the European countries "Cross section effects".
- λ_t , is the effect or the difference in the temporal observations, representing the differences between the observations in the time periods "Cross time effects".
- ϵ_{it} , is the error term that represents all the errors that the model undergoes and all the variables that have not been taken into account and included in the model. It follows a normal distribution.

To strengthen the robustness of the model in terms of stability, we apply the logarithm to the observations of the model's variable series, so that the previous relationship becomes the following:

$$L_N_Jobs_{it} = \beta L_N_Startups_{it} + \theta_{it} + \rho_{it} + \mu_{it}$$

The previous effects, both cross-sectional and temporal, allow us to determine the model that is suitable for the relationship between the two previous variables, which means:

- If these effects are fixed, we use the fixed effects model.
- If the effects are random, we use the random effects model.

Before choosing the appropriate model, we must check the stationarity of the model's variable series. To do this, we used a set of stationarity tests, the results of which are as follows:

Table 02: Results of the stationarity tests for the model's varia

Variable	Test type	At the (P) level	At the first differences (P)
<i>L_N_Jobs</i>	<i>LLC</i>	0.2326	0.0000
	<i>ADF-Fischer</i>	0.0908	0.0136
	<i>PP-Fischer</i>	0.8951	0.0000
<i>L_N_Startups</i>	<i>LLC</i>	0.0573	0.0023
	<i>ADF-Fischer</i>	0.5083	0.0351
	<i>PP-Fischer</i>	0.0897	0.0000

Source: Prepared by the researchers based on the "Eviews 13" program.

Based on the table above, we can see that:

- The series of the study model's variables are not stationary at the level, which means that the original series of the variables contain a unit root, as the corresponding probability for the various previous stationarity tests is greater than 0.05.
- All the series became stationary at the first difference, which means they are integrated of the first degree. The corresponding probability for all the previous tests is less than 0.05. There is therefore a strong probability of co-integration.

Having discovered that the series of the study model's variables are stationary at the first difference, which indicates a possible co-integration, we performed the **Pedroni test**. The results are presented in the following table:

Table 03: Results of the Pedroni co-integration test

Pedroni Residual Cointegration Test				
Series: L_N_JOBS L_N_STARTUPS				
Date: 08/09/25 Time: 06:09				
Sample: 2011 2022				
Included observations: 120				
Cross-sections included: 10				
Null Hypothesis: No cointegration				
Trend assumption: No deterministic trend				
User-specified lag length: 1				
Newey-West automatic bandwidth selection and Bartlett kernel				
Alternative hypothesis: common AR coefs. (within-dimension)				
	<u>Statistic</u>	<u>Prob.</u>	<u>Weighted Statistic</u>	<u>Prob.</u>
Panel v-Statistic	1.124536	0.1304	0.519005	0.3019
Panel rho-Statistic	-0.093984	0.4626	-0.250654	0.4010
Panel PP-Statistic	-0.410532	0.3407	-1.052859	0.1462
Panel ADF-Statistic	-2.949656	0.0016	-3.237867	0.0006
Alternative hypothesis: individual AR coefs. (between-dimension)				
	<u>Statistic</u>	<u>Prob.</u>		
Group rho-Statistic	1.256429	0.8955		
Group PP-Statistic	0.148425	0.5590		
Group ADF-Statistic	-1.911222	0.0280		

Source: Prepared by the researchers based on the "Eviews 13" program

Based on the table above, we can conclude that the series of the model's variables do not suffer from a co-integration problem. Indeed, all the corresponding probabilities are greater than 0.05, which leads us to accept the null hypothesis, meaning there is no co-integration.

The next phase is to determine the appropriate study model by estimating the three panel data models. We have summarized the estimation results in the following table:

Table 04: Results of the estimation of the three panel data models.

Variables	The Pooled Model (P)	Fixed effects model (P)	Random effects model (P)
C	(0.0000) 12.27827	11.51122 (0.0044)	12.18810 (0.0000)
L_N_Startups	(0.0016) 2.230175	1.602025 (0.0226)	2.156331 (0.0388)
Degrees of freedom	120	120	120

Source: Prepared by the researchers based on the "Eviews 13" program

After estimating the three models, we performed the "Likelihood Ratio" test to compare them. The results are presented in the following table:

Table 05: Results of the "Likelihood Ratio" test for fixed effects.

Redundant Fixed Effects Tests			
Equation: Untitled			
Test cross-section fixed effects			
Effects Test	Statistic	d.f.	Prob.
Cross-section F	4.114763 35.09805	(9,109)	0.0001
Cross-section Chi-square	8	9	0.0001

Source: Prepared by the researchers based on the "Eviews 13" program

Based on the table above, we can conclude that the fixed effects model is the appropriate model for the study, because the probabilities corresponding to the Fisher and Chi-square statistics are less than 0.05. To distinguish between the fixed effects model and the random effects model, we used the Hausman test.

Table 06: Results of the Hausman test

Correlated Random Effects - Hausman Test			
Equation: Untitled			
Test cross-section random effects			
Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.906924	1	0.0044

Source: Prepared by the researchers based on the "Eviews 13" program

Based on the table above, we can conclude that the most appropriate model is the **fixed effects model**, rejecting the null hypothesis that the random effects model is more suitable, due to the probability corresponding to the Hausman test.

Through the estimation of the fixed effects model, we observe that the relationship between the dependent variable (number of jobs) and the independent variable (number of startups) is positive and direct. This explains the increase in the number of jobs with the increase in the number of startups in the European Union, which reflects the reality.

To know the ranking of the effects of each of the ten countries included in the model on job creation in the European Union, we must present the coefficients of each country separately, as summarized in the following table:

Table 07: Ranking of the effects of each country according to the number of startups in the European Union.

CROSSID	Effect	countries	Rank
1	2.161406	Germany	01
2	1.572973	France	02
3	0.156853	Spain	09
4	0.234619	Italy	08
5	1.056544	Belgium	04
6	1.229005	Denmark	03
7	0.874898	Finland	05
8	0.337356	Ireland	07
9	0.069959	Malta	10
10	0.492083	Netherlands	06

Source: Prepared by the researchers based on the "Eviews 13" program

Based on the table above, where the ranking of countries is based on the impact of the number of startups on job creation, Germany comes first with a coefficient of 2.16, followed by France with 1.57, then Denmark with 1.22, Belgium with 1.05, Finland with 0.87, the Netherlands with 0.49, Ireland with 0.33, Italy with 0.23, Spain with 0.15, and finally Malta, which ranks tenth with a coefficient of 0.06.

It appears from this ranking that it differs somewhat from the ranking mentioned in the theoretical part, which concerned the number of startups in the countries of the European Union. This difference is mainly explained by the non-homogeneous economic size of the countries.

4. RESULTS AND DISCUSSION:

This study concluded the following:

- Startups are modern, rapidly growing companies, and as their size increases, so does their contribution to supporting the economy. So, with the increase in the size of institutions, the demand for human resources increases, especially for competencies, given that many emerging institutions are innovative institutions.
- Unemployment represents significant rates in various EU countries and around the world, which is considered a major dilemma that all countries of the world seek to reduce as much as possible by urging all institutions, including emerging institutions, to employ the largest possible number of workers.
- EU countries are striving to reduce unemployment rates and create jobs through various policies, including supporting different economic sectors and institutions of all sizes and types, including startups.
- The EU, through its bodies, works to enact various laws and regulations that would remove obstacles for startups and support them. In the same way, the European Council's Innovation Fund was established, along with the creation of a European Investment Fund. Efforts are underway to facilitate regulatory frameworks, grant tax incentives, and create regulatory sandboxes to help these startups test their ideas before launching them on the market. The EU is also working to establish the European Commercial Portfolio, identify and remove all obstacles facing these institutions, and launch "European Tech Champions 2.0" to raise new capital for these firms. A new "Lab to Unicorn" initiative is being launched to accelerate research outcomes. Additionally, there are efforts to attract skilled talent to work in these startups, encourage entrepreneurial education for high school and university students to push them to get involved and open new

businesses, and establish a joint European high-performance computing project that includes 13 new artificial intelligence factories.

- There is a large disparity in startups among EU countries, which also makes their contribution to job creation unequal.
- The contribution of startups to job creation is affected by the economic power of the countries. This explains the disparity among EU countries, in other words, the stronger a country's economy, the greater its financial support, the more suitable the climate it provides for these businesses, and the more tax incentives and other forms of support it offers them.
- There is a statistically significant relationship at the 0.05 level between the number of startups and job creation. This implies that an increase in the number of startups leads to more job creation, which proves the validity of the second hypothesis.
- The addition of our research paper and in relation to the research papers we relied on as previous studies is highlighted by the fact that our study focused on the role of startups in job creation using the "panel data", which contributed to accurately defining this impact and the relationship between the two variables, in the European Union countries which are considered leaders in the field of startups, and through this paper, we were able to provide a diagnosis of these institutions at the level of the EU countries. This contrasts with most of the other research papers that addressed our topic and highlighted the relationship between the two variables secondarily, especially regarding developing countries, with the exception of only one study that shed light on North American countries.

5. Conclusion:

Through our research on the role of startups in creating jobs in European Union countries, it became clear to us that these businesses face difficulties in their first years, especially regarding financing. Consequently, and due to their small size, these businesses hire a relatively smaller number of employees compared to other institutions. It was found that the larger their size becomes, the more they hire. Given the European Union's countries' certainty about the importance of this type of business not only in employment and job creation but also in providing large and effective contributions in the field of innovation, the European Union space, through its member states, has supported this type of business with various effective policies that would develop them and ensure their continuity, which benefits both them and all European Union countries. Additionally, we came to the conclusion that the stronger the economy of any country, the more positively it will reflect on the support and development of these businesses.

6. Study Recommendations:

- EU countries should provide a better climate for the growth of startups.
- The EU countries should encourage people with innovative ideas that could be embodied in a startup project.
- EU countries should offer incentives to new startups by providing tax exemptions and facilitating bank loans to ensure their growth.
- EU countries should establish a fund to support struggling startups.
- EU countries should help startups open branches outside the EU space to support them and ensure their continuity and sustainability.

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