

# QUANTITATIVE STUDY AND MATHEMATICAL MODELS ON THE SYNERGY BETWEEN EUROPEAN GRANT FUNDED START-UPS AND RESEARCH INFRASTRUCTURES

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**ABSTRACT:** The study focuses on the efficiency of the current financial management applicable to start-ups financed by European funds, in the context of policies at the European level, which aims to transition from the traditional economic model (linear economy) to a circular economy. This transition requires, first of all, the establishment of stable and long-lasting links between young entrepreneurs and research institutes. The obtained results provided us with a fairly broad framework from which we were able to build a mathematical model that realizes the synergy between the business environment financed by non-reimbursable funds and the research infrastructures that can offer entrepreneurs innovative solutions through which the transition to a circular economy. The result of the research, and implicitly the proposed mathematical model, can represent the starting point for the institutions that finance start-ups in terms of sustainable economic development both at the entrepreneurial level and especially at the national and international economic level.

**KEYWORDS:** Entrepreneur, European Funds, Research Infrastructure, Financial Management, Start-up

## 1. INTRODUCTION

Analyzing the evolution of a sample consisting of 350 start-ups financed through non-refundable funds, as shown in Figure 1, related to the Start-up Plus and Start-up Diaspora project calls, over a period of 2 years it can be seen that the compound turnover (the sum of 350 CA) evolved in 2020 by +209% (from approx. 13.4 million Ron to 41.42 million Ron) thus having an expected evolution given the fact that the financing contracts were carried out during 2019, so the activity of the respective companies started in the 3rd and 4th quarter of 2019).

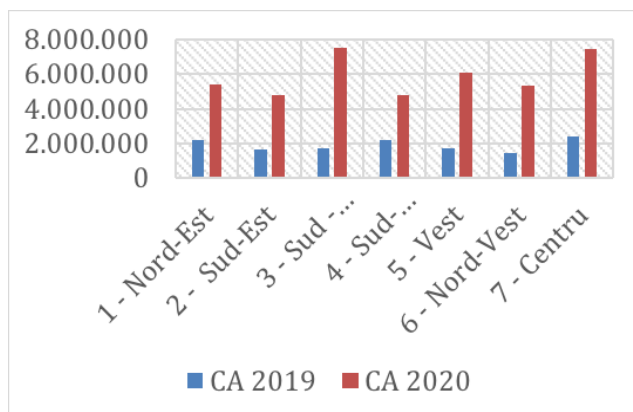


Figure 1. The evolution of the turnover of companies

Analyzing the percentage, as shown in Figure 2, evolution at the level of each region, we obtain the following data, the South Muntenia region growing by over 340%:

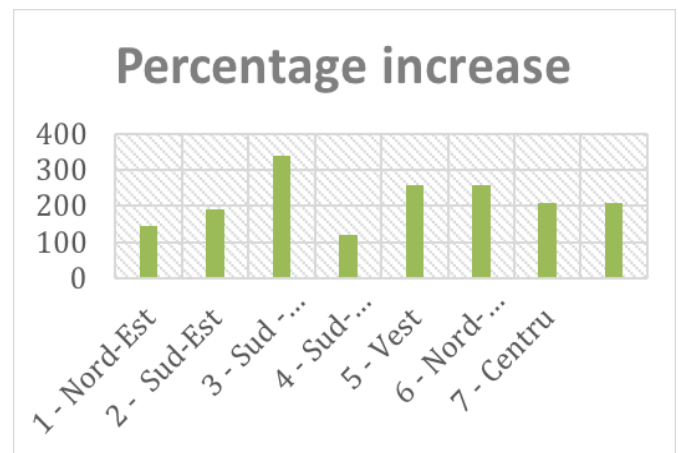


Figure 2. The percentage of the evolution of the business figure of the companies

## 2. ADVANTAGE

Analyzing the evolution of the sample over the 2 years, it can be seen that the compound profit (the sum of the 350 profits) evolved in 2020 by +94% (from approx. 3.4 million Ron to 6.6 million Ron) thus having an expected evolution given being the fact that the financing contracts were made during 2019, so the activity of the respective companies

started in the 3rd and 4th quarters of 2019), as shown in Figure 3.

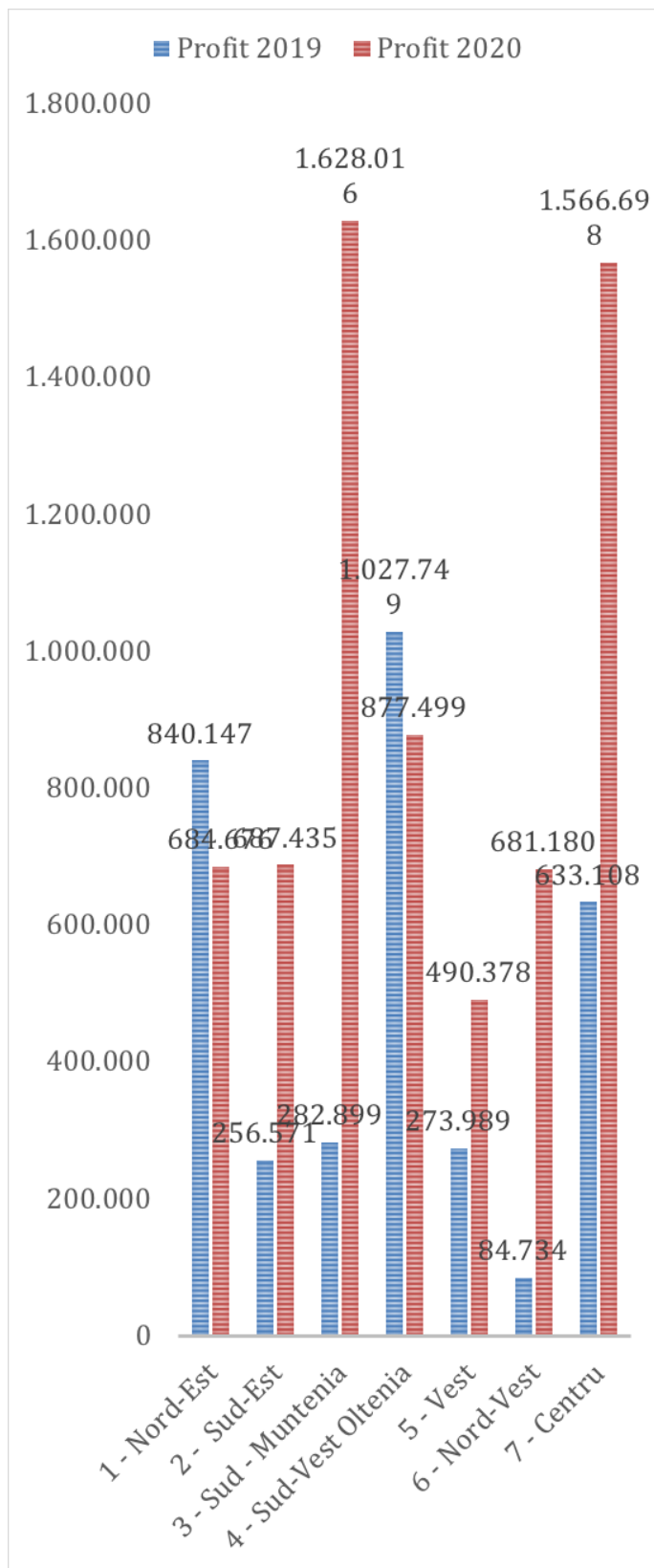


Figure 3. Analysis of profit evolution

Analyzing the percentage evolution at the level of each region, as shown in Figure 4, we obtain the following data: North West region growing by over 704% and the North East and South West regions recorded decreases in profits recorded in 2020 compared to 2019.

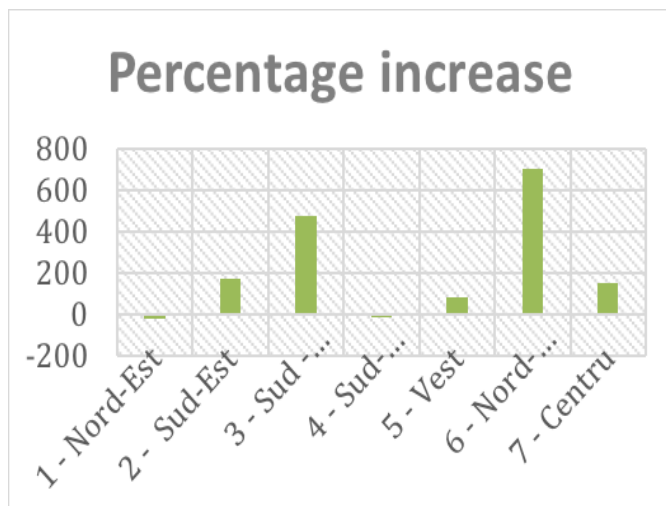


Figure 4. The percentage of profit evolution

### 3. STAFF

Analyzing the evolution of the sample over the 2 years, it can be seen that the total number of employees (the sum of the 350 data samples on the number of employees), as shown in Figure 5, evolved in 2020 by +45% (from 572 to 831), thus having an expected evolution given the fact that the contracts of the financing were carried out during 2019, so the activity of the respective companies started in the 3rd and 4th quarter of 2019.

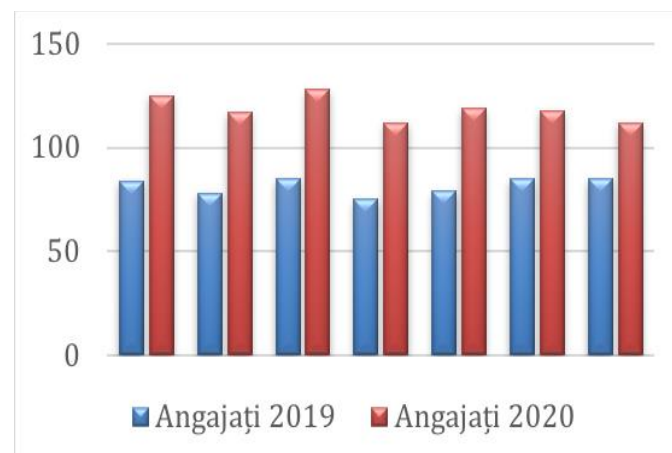
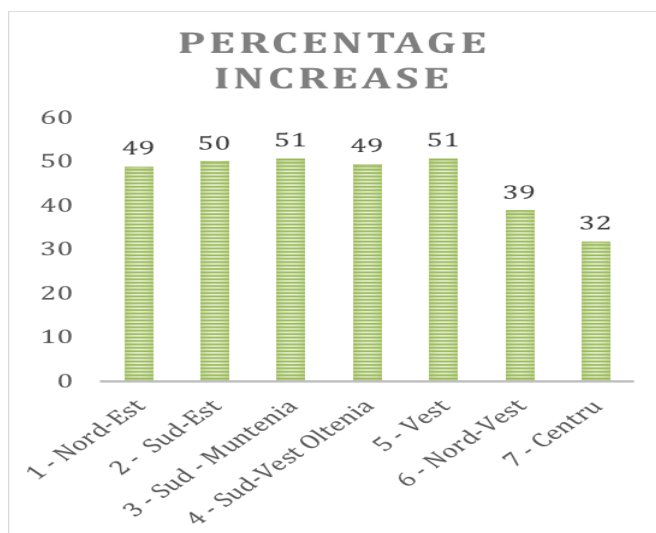


Figure 5. The evolution of the number of employees

Analyzing the percentage evolution at the level of each region, as shown in Figure 6, we obtain the following data for the year 2020 compared to the year 2019 in terms of the number of employees.

We find that such non-reimbursable financing provides a series of solutions regarding the increase in employability. This solution can also represent an inefficient condition, given that there are certain types of businesses that do not require employees. The granting of additional points for those who hire staff is also an artificial condition that should be eliminated.



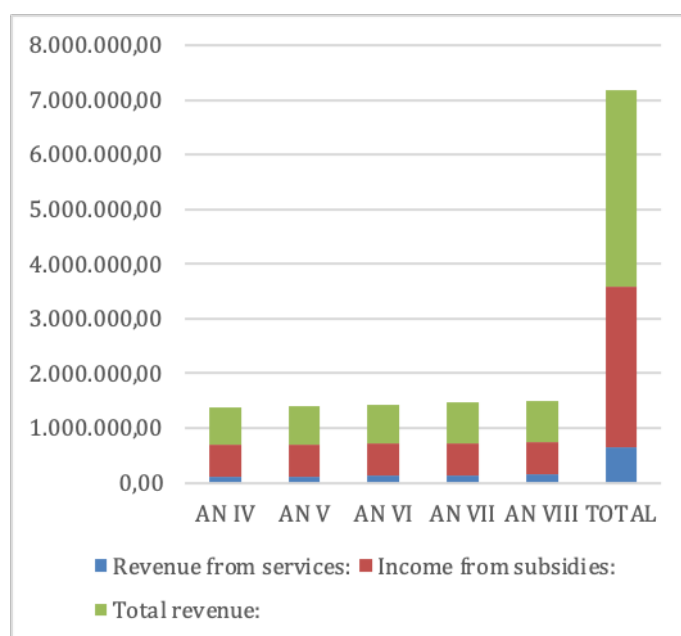
**Figure 6.** Percentage of evolution of the number of employees

#### 4. RESEARCH INFRASTRUCTURE (RONAVEC) [1]

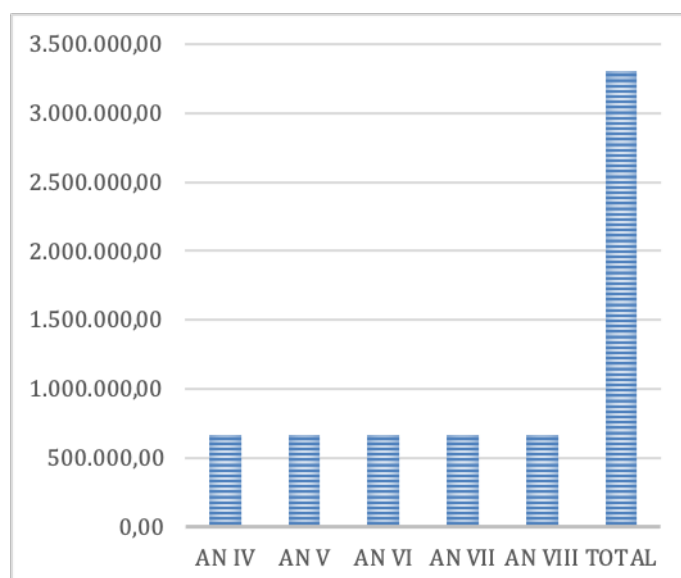
The purpose of RONAVEC is to ensure high-performance facilities and installations, equipment, and tangible/intangible endowments based on advanced technology, highly qualified human resources, together with knowledge resources and/or structured scientific information (relating to plant genetic resources), as well as providing related services to be used by the scientific community in the research activity regarding the exploration, inventory, collection, conservation and valorization of phylogenetic resources.

The purpose of RONAVEC is fully subsumed by the object of activity of the co-donor institution (Vegetable Genetic Resources Bank - for Vegetables, Floriculture, Aromatic and Medicinal Plants Buzău), and the research activities proposed at the level of the new infrastructure will essentially contribute to the fulfillment of its attributions. Taking the years 2015 - 2020 as the reference period, in the figure below we find the graphic representation of the weight that research projects have in the total sums allocated through the PNDR to private sector beneficiaries for the establishment and/or expansion of agricultural activities. In practice, it can be observed that in the period 2015 - 2020, although more than 1.4 billion euros were allocated to private beneficiaries for the establishment and/or expansion of agricultural activities and only a percentage of 0.56% was allocated for the creation of partnerships between beneficiaries and research institutions in order to generate added value in this field. At the national level, a list of priority research infrastructures for national support was created, based on policy documents of the field (National R&D Strategy

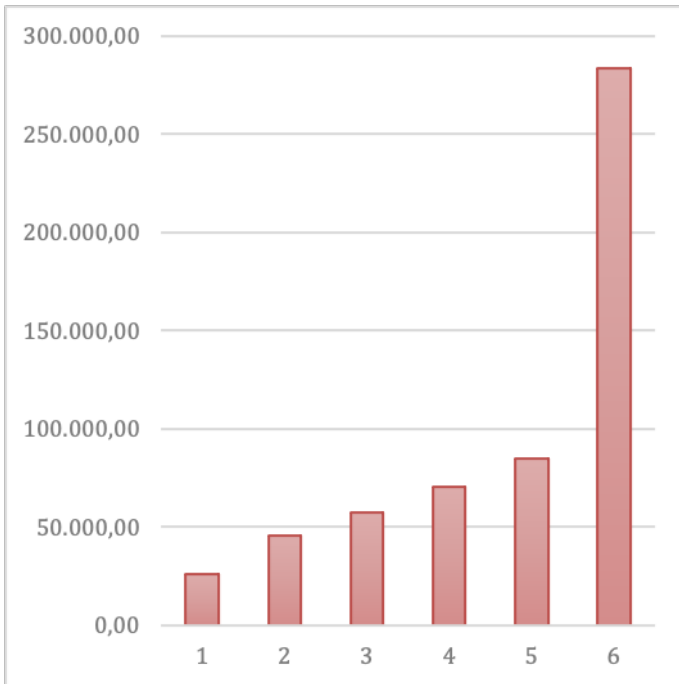
2014-2020), on European and international commitments of Romania (participation in pan-European research infrastructures included in ESFRI Roadmap, etc.) on a prospective substantiation of needs and on a process of identifying areas of specialization and future development with potential economic and regional impact, embodied in the national Radmap (road map) regarding research infrastructures from Romania related to the period 2017-2025. Thus, at the national level, a total number of 60 research infrastructures, in different stages of maturity, was highlighted, respectively: emerging -20, active - 30, and landmark - 10. Enrollment in the National Roadmap was a condition for the possibility of accessing non-reimbursable structural funds necessary for the development or establishment of these infrastructures.



**Figure 7.** Total average income euro/ year for RONAVEC



**Figure 8.** Total expenses euro/ year for RONAVEC



**Figure 9.** Total income/expediture balance euro/ year for RONAVEC

From the Figure 7, Figure 8 and Figure 9, presented above, it resides the massive dependence in the operating phase on public budget revenues, as shown in Figure 10 and Figure 11, which in the current conditions with the possibility of massive budget reductions in the public sector puts the very sustainability of the investment from structural funds at risk.

**Figure 10.** Operating expenses for RONAVEC

**Figure 11.** Annual income

## 5. RESULT

Taking "RONAVEC" [1 - 2] as an example, but also the other 350 analyzed companies, the research infrastructure for SMEs active in the agricultural field, and the National Rural Development Program (PNDR) in the period 2015 - 2020, we defined the following elements that lead us to obtain the necessary calculation formula:

- The non-refundable financing granted to the beneficiaries in the period 2015 – 2020,
- The number of beneficiaries financed in the period 2015 – 2020,
- The operating costs of the research infrastructure over a period of 5 years.

The potential impact of the operating costs of research infrastructure on the total payments made to beneficiaries in the period 2015 - 2020.

The average amount of funding received by each beneficiary in the period 2015 - 2020.

$$\blacksquare \quad \boxed{ICOP = \frac{CIC}{FA} \%}, [1]$$

where:

- **ICOP** represents the potential impact of the operating costs of research infrastructure in the total payments made to the beneficiaries;
- **CIC** represents the operating costs of the research infrastructure;
- **FA** represents the non-refundable financing granted to the beneficiaries;

**BAIC** represents the average budget allocated to the research infrastructure by each beneficiary. [1]

## 6. CONCLUSIONS

The South Muntenia region and the Center region had the largest increases in absolute numbers of affected figures in 2020 compared to 2019.

The statistical data obtained from the analysis of the year 2019 must be looked at carefully, however, given that the moment of signing the financing contracts during 2019 is not known (there were at least 3 distinct moments on the molds of companies). At the same time, the 2020 data may be flawed given

The evolution by region was very similar, a fact explained by the obligation to employ at least 2 people during the implementation period. Total average and indicative cost that each SME should allocate at the level of Business Plans/Funding Requests in order to access the research infrastructure for a period of 5 years, so that the research infrastructure ensures operational costs necessary to function in optimal conditions. In this way, the negative impact generated by the granting by the government of the subsidies necessary for the operation of a research infrastructure is eliminated the medical context of 2020, when certain CAEN codes were positively and artificially influenced while others were simply curbed (compared to an economic context not influenced by the medical context).

As can be seen, the South Muntenia region is the best-performing region in terms of the evolution of profit in absolute figures in 2020 compared to 2019, followed by the Center region.

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