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The impact of state aid on the firms´ innovation performance: an international comparative study

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The aim of this thesis is to analyze the approaches of national governments in a selected group of European countries that use various tools (economic and non-economic) to support the innovative performance of the firms.
The student will perform the characteristics of individual support systems in selected countries, then define the comparative indicators (input and output) and conduct an international comparative study using a benchmarking approach. In Conclusion section student will define the recommendations for improving the situation and for redefining public policies in this area.

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- Innovation performance of SMEs.
- Support systems and tools of innovation performance.
- Analysis.
- Results and Discussion.
- Conclusion.

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Leigh, H. & Juan J. (2021). Research Handbook on European State Aid Law. 2nd Edition. The Netherlands: Edward Elgar Publishing

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DECLARATION OF AUTHOR

I hereby declare:

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ABSTRACT

The research seeks to determine the impact of state aid on the innovation performance firms' within the "visegrad" (V4) member countries. This is due to the recent role firms' (SME) play in the development of every economy, thus influencing the need to determine how the government of the V4 member state support SME to attain their goals and objectives. The study first of all began with the literature review on innovation performance by reviewing the concept of innovation performance, determinants of innovation, corporation for innovation, policies that support innovation performance, brief meaning of state aid, financing of SME and funds available for financing as well as the effectiveness of the funds.

The second part of the study demonstrates literature on the concept of state aid, importance to firms, policies of state aid, state aid structure, and instrument of state aid. In the third part the methodology for the research was developed and hypothesis created and assessed.

In the fourth part analysis was conducted and it was noted that state financial aid has a significant influence on SME patent count and product innovation performance within the V4 member countries. Interestingly, the discussion it would be realized that other researcher in their study identified an insignificant relationship between state financial aid and SME innovation performance. However, the study concludes that state financial aid has a significant influence on SME innovation performance in the V4 member state.

KEY WORDS:

Innovation performance, Impact of state aid, Firms, International comparative study

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LIST OF THE ABBREVIATION

EEA European Economic Area

EC European Commission

EU European Union

EIB European Investment Bank

ESF European Social Fund

R&D Research and development

SME Small and Medium-Sized Enterprises

WTO World Trade Organization

TFEU Treaty on the Functioning of the European Union

OECD Organization for Economic Co-operation and Development

IT Information Technology

INNO Innovation

V4 Visegrad Countries

VC Venture Capita

INTRODUCTION

Business firms especially small and medium-sized businesses (SMEs) account for *"90 percent"* of all firms in the European Union. Making them very important as they employ more than half of the working categories employee in the EU regions, thereby contributes immensely to the general EU economy. The governments and European Union realizing the important role played by SMES decided to provide them with supports in the form of state financial aid, results to the need to determine the impact state aid has on innovation performance of firms.

Again, *"small and medium-sized enterprise (SME) classification is critical for obtaining financing and participating in EU support programs designed exclusively for these business enterprises"* (EC, 2020). In order to realize the aim of the study, the first chapter considered literatures such as the concept of innovation performance, how firms cooperate for innovation performance, policies of innovation and their impact on firms' innovation performance, financial support for firms innovations and the classification of funds for innovation performance as well as effective financing for firms innovation performance. The innovation performance of SMEs includes the measurement of all phases from research and development through patenting to new product introduction. Successful existence of market is as the result of innovative performance.

Secondly, the study would review literatures on the concept of state aid, importance to firms, policies of state aid, it structure, and state aid instrument. In the third part the methodology for the research would be developed and hypothesis created and tested.

In the fourth chapter analysis and discussion of results would be conducted and to determine the effect of state financial aid SME patent count and product innovation performance within the V4 member countries. Finally, the study would draw conclusion on its finding and suggest recommendation for future research and further action towards improving the impact state aid has on firms' innovation performance in the chosen countries.

1 THE CONCEPT OF INNOVATION PERFORMANCE

The concept of innovation has severally been explained in both economic and business literatures. From the meaning of the word, it is crystal clear that, it is a novelty, a new development in human thought and activity or in production (Mothe, 2010). The Oslo Manual defines innovation based on Schumpeter (1939) theory which states that *"the introduction of vastly improved product, new institutional business method, institutional workstation, new marketing strategy and external relationship''*. The manual again broadly classified innovation as *"technological"* innovation and *"non-technological"* innovation (Hyard, 2013). The definitions have all regarded innovation as something new (OECD, 2005).

The Oslo Handbook viewed types of innovation as a broad spectrum of changes in business activity (OECD, 2005), which are classified under two perspectives being *"Technological"* innovations and *"non-technological"* innovations.

- *"Product innovation.*
- *Process innovation.*
- *Marketing innovation.*
- *Organization innovation".*

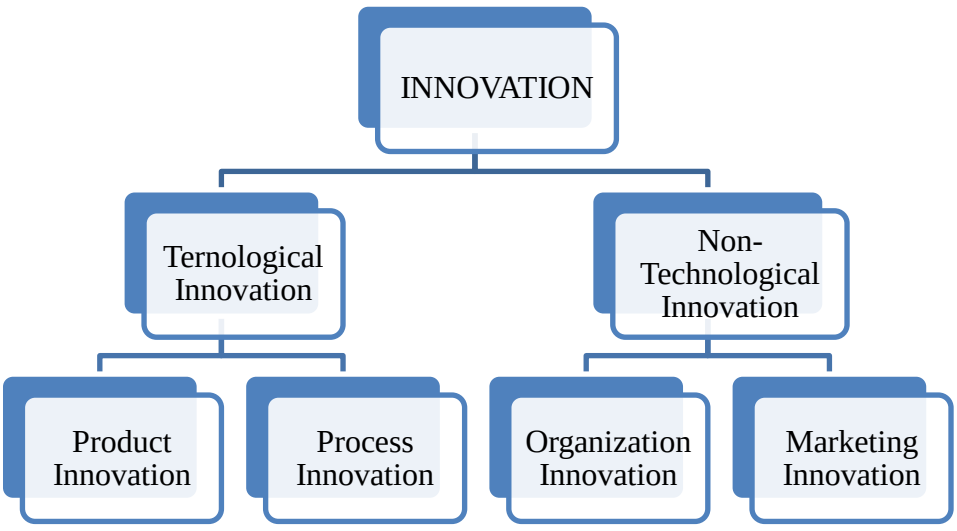

Figure 1: the classifications and types of innovation based on the Oslo Manual
Source: Prepared by Author base on the Oslo Manual (2005)

Reference to the above figure, the significant change in a product or service's capabilities are referred to as product innovations. Process innovation, on the other hand, entails considerable changes in manufacturing and delivery processes and these types of innovations are classified under the technological innovation (OECD, 2005).

The application of new organizational approaches is what organizational innovation is all about. Changes in company methods and workplace organization are examples of this. In addition, marketing innovation is a novel technique in marketing that leads to increased patronage of an enterprises goods and services. It is usually geared towards satisfying the needs and wants of customers and also broadens the market size of a business enterprise in order to increase sales; these two types are as well classified under non-technological innovations (OECD, 2005).

Other researchers looked into several crucial sorts of innovation in their studies. This includes, but not limited to the creation and deployment of new products and processes that result to a significant gain in operational efficiency, market interactions, and the fulfillment of new stakeholder needs. Managers can perceive, assimilate, and use logic and reason to develop new knowledge regarding the utilization of breakthrough technologies, according to the prevalent viewpoint (Stanikis & Katiliuté, 2019), referred to as radical innovation. However, incremental innovation implies a change in product and processes, such Changes are usually insignificant, minor, or insufficiently new to the business enterprise (Hartono & Kusumawardhani, 2019).

The measurement of communications against the rate of change or the adoption of new communication channel is referred to as communication innovation (Raja & Wei, 2015), these makes effective communication in innovation very key to the general acceptance of an enterprises innovation inputs and output.

According to Fiorentino (2010), very successful Small and Medium-Sized Enterprises achieve and retain success by continual innovation change in the industry in which they compete, which is achieved through systemic innovation. This refers to SMEs, who are able to respond to client demands and development trends more quickly due to their less organized organizational and administrative procedures (Zizlavsky, 2016). Their competitive advantage stems from their ability to 'run differently' by renewing themselves through inventiveness, thus business enterprises competitiveness and success stems from its innovative capabilities (Choi et al., 2012).

Furthermore, Hottenrott et al. (2017) state that, *"knowledge asymmetries in research initiatives have a considerable detrimental impact on early-stage investments, resulting in more binding financial limitations than in development projects".* The quality and outcome of research activities are frequently critical in the creation of products and processes. Through study, businesses may be able to learn ways to solve difficulties. Research is seen as a more sporadic process that may yield a meaningful result to an issue, whiles the continuous process that uses an existing set of ideas to find solutions to a problem is viewed as development (Svetina & Prodan, 2008). Therefore, the preference to invest in development either than research is triggered by the risk and uncertainty in business enterprises. It revealed that research investments are more reliant on the firm's own financial resources than on development projects, resulting in more binding constraints (Czarnitzki et al., 2011).

According to Zizlavsky (2013), innovation performance comprises of the product development stage which starts with research and development to launch of a product and its patenting. Again, innovation in a broader perspective emphasizes both the technical components of innovation and the introduction of new items to the market. Thus, *"the ability to derive an innovative output from an input, it transferability and strategies for market adoption; and that innovation market success is the result of innovation performance"* (Davila et al., 2013). Again, a cumulative self-reinforcing process links innovation performance to organizational performance, implying that non-innovative firms are usually outperformed by innovative firms, and those high-performing companies are more likely to innovate at every stage than low-performing companies (Cainelli et al., 2006).

However, the internal structure of the system to be tested and evaluated must match that system appropriately in determining performance. Therefore, from economic point of view performance related to a systematic approach to the measurement and evaluation of an internal business structure (Barbuová et al., 2020). In practice, the economy's performance as well as the company's financial performance, employee performance, the quality management system, organizational or business processes, and a variety of other economic categories influences the company's innovation abilities (Tuan, 2016). Again, companies that engage in innovation activities are those that: introduce new or significantly improved products to the market; introduce new or significantly improved processes within the company; introduce organizational or marketing innovations; or have incomplete or suspended innovations.

Furthermore, a firm's performance is triggered by very essential internal resources such as R&D, allocation of resources, production and overall teaching and learning (Sampson, 2007). The writer went on to explain terminologies such as.

- *"R&D competence is concerned with the integration of R&D strategies, its project implementation and management. The firm ability to detect, exploit and acquire new knowledge from its environment is known as the learning capability.*

- *The firm's resource allocation deals with how cash, talent and technologies are acquired and allocated.*

- *While manufacturing competence refers to turning of companies' research into finished goods, whiles publicizing and selling a companies' product depends on market demands and the level of competition.*

- *Organizing capability involves successfully harmonizing organizational resources as well as its effective management in other to attain set targets.*

- *The rate at which a company identifies its strengths, weaknesses, opportunities, and threats is termed as strategic planning competency."*

Except for learning capabilities, Sampson (2007)'s approach represents the main functional areas of the organization. That is, research and development, manufacturing, marketing, organizational structure, resource allocation, and strategic planning.

Dubey et al. (2012) posits that market power and industry structure are two important factors to examine when determining a firm's performance. They went on to say that performance can be defined as "the ability to assess organizational effectiveness, productivity, profitability, quality, continuous improvement, and social responsibility as important performance indicators." Furthermore, a cumulative self-reinforcing process links innovation performance to organizational performance, implying that innovative businesses outperform non-innovative firms, and those high-performing firms are more likely to innovate than low-performing firms (Cainelli, et al., 2006).

Finally, innovation performance is the whole institutional success as a result of the implementation effort, considering many areas of the firms' innovativeness such as processes, products, marketing, and organizational structure (Tuan, 2016). Again, performance is based on several indicators including new product launches, projects, procedures, patent as well as

organizational arrangements (Tuan et al., 2016). However, Choi et al. (2012) argued SMEs represents the innovative bedrock, technical advancement, as well as growth. Therefore, the government should be effective in encouraging SMEs to participate in innovation activities so that they can obtain better production and diversification results. In doing so they are several determinants that have the capability of enhancing the innovation performances of enterprises as elaborated below.

1.2 Determinants

They are several determinants that enable the innovation performance of business enterprises, notable among them are cooperation among firms in attaining innovative performances, innovation policies and their impacts, state aid, as well as firms R&D for the enhancement of an enterprises innovation performance. Again, size of market, it structure, and trade shares were also identified as conducive for further innovative activity of small and medium size enterprises and for high-tech firms as well. However, they will be a focus on only the most important determinants for these studies.

1.2.1 Cooperation

Cooperation for innovation improves the firm's strategic position in a competitive market by allowing them to share costs and risks through leveraging resources from their collaborators. These resources provide a buffer for businesses in the event of downturns or other setbacks, as well as a more consistent and predictable resource flow (Xia et al., 2012). Cooperation also gives financial resources that allow other businesses to share costs and risks. It also helps companies access the necessary skill-based resources in a timely manner, that influences the attainment of hard to gain knowledge and experiences (Grant, 2008).

Stejskal et al. (2016) posits that a business capability is determined by knowledge generated internally or acquired externally, and also stated that research and development cooperation is a crucial to the division of inventive labor. As a result, it was discovered that effective business collaborators mostly attain success in the market (Stejskal & Hájek, 2012). Therefore, entrepreneurial cooperation is a critical to economic growth, creation of wealth, and the long-term viability, profitability, and growth of businesses (Kim et al., 2012).

For innovation performance, organizations tend to develop and disseminate knowledge internally; nevertheless, businesses require internal capacities and knowledge from outside sources (Gyamfi & Stejskal, 2020). Furthermore, when internal knowledge is insufficient for

an enterprise's innovation activity, the enterprise can gain knowledge through collaboration networks with other businesses, customers, as well as suppliers (Prokop et al., 2019), which can take the form of formal or informal relationships. Again, the strategic alliance among public and private organizations inside the commercial enterprise's location, such as universities and research institutions, these businesses may develop relationships with entities beneficial to their innovative activities and even so with other businesses abroad (Svetina & Prodan, 2008).

External knowledge, according to Gyamfi & Stejskal (2019), may not be effective in ensuring innovation until internal absorbency is increased and developed. As a result, territorial innovation patterns with external knowledge connections are necessary. More recently, innovation theories and studies have identified company collaboration as a frequent method for many organizations to obtain external knowledge for innovation (Kotkova & Prokop, 2020). In this regard, the following holds true: as long as innovation activities entail collaboration between manufacturers and customers, engagement is unavoidable and largely informal.

The cooperation with commercial firms, according to Mukherjee et al. (2019), is a collaborative activity that connects business partners and competitors. Commercial businesses, on the other hand, have established formal mechanisms for disseminating critical information on significant market developments and modern trends (Kim et al., 2012). This entails both horizontal and vertical inter-business cooperative partnerships that offer the firm with significant external expertise and information to help it perform better in terms of its innovation. Evidence from the *"Central and Eastern European"* countries suggests business companies' innovative knowledge is primarily derived from in-house research and development activities (Radosevic et al., 2008). Furthermore, SMEs' open innovation deals with unstructured external networks that promote the acquisition of new knowledge (Bigliardi & Galati, 2016). Suppliers, clients, and partners inside the enterprise group, as well as competitors outside the domain of business enterprises, form vertical and horizontal partnerships with SMEs (Braga et al., 2016). The goal is to create a pool of resources for doing research and development into the use of novel technology ideas to improve a company's innovation activities and performance (Radicic et al., 2020).

According to De Faria et al. (2010), the character of working partners can influence innovation success as well as enhances business performances. Furthermore, though collaboration with customers and public sector organizations happens to be linked with

product innovation success, collaboration with suppliers as well as universities has a greater effect on process innovation success (Freeland, 2006). Again, the role of innovation activities on firms overall performance varies depending on partner type: collaboration with suppliers and competitors has a significant effect on labor productivity growth, whereas collaboration with universities, research facilities, as well as competitors increases firm turnover of new products and services (Belderbos et al., 2004).

Several studies have attempted to determine the variables behind the decision to cooperate in various areas of R&D with the goal of improving performance of business enterprises (De Faria et al., 2010). They can be summed up in three points:

- *"Concerning the different types of partners.*
- *Concerning the features of enterprises (particularly their ability to control and capitalize on spillovers).*
- *Concerning the many forms of inventive activity."*

Several sources of information and knowledge on the performance of business enterprises, as well as collaborations as a significant channel SMEs used to acquire external knowledge and this would help improve the innovation ecosystem in times of economic recession (Urbancova, 2013). According to Lee et al. (2009), SMEs place a greater emphasis on personal means of information transfer and learning through action or contact. In addition, a companies' ability to develop new goods and manufacturing methods will improve if these challenges are addressed. While the advantages of creative partnerships aid in the development of new products and processes, a company's internal capabilities moderates the interplay between innovative collaboration, product, and process.

However, internal strategy, organizational, and technology skills are found to be lacking in many small businesses (Michael et al., 2020). Therefore, collaborating with outside parties in the area of innovation is a good approach for businesses. Again, it provides efficient knowledge transmission; resource sharing and organizational learning opportunities, as well as synergies and cross-fertilization effects is created through the utilization of complementary assets and resources. Finally, joint innovation is also popular among businesses since it allows them to leverage external resources for their own aims in a systematic and direct way (Mendi et al., 2020).

In addition to the foregoing, collaboration for innovation in well-organized networks promotes the collaborating partners' innovation activities, increasing their chances of developing innovative products and services (Dachs et al., 2008).

Furthermore, according to Tether & Tajar (2008), joint innovation initiatives are utilized to supplement resources internally, hence improving the innovativeness of corporate firms. Because they lack all of the essential internal resources to improve innovation performance; businesses develop innovative collaboration agreements with partners such as consumers, suppliers, competitors, as well as universities. Again, the resources that business companies get through cooperation allow them to develop a differentiated product technology, which balances the disadvantages of joining a cooperative arrangement. Knowledge spillovers to competitor businesses are deemed involuntary in the absence of collaboration since they raise competing businesses' knowledge stock and weaken the enterprise's relative technological advantage (Lee et al., 2009).

Strategic concerns such as shared learning and trust, according to Tomlinson (2010), are important variables that influence a company's decision to collaborate with a supplier. As a result, frequent collaboration was linked with the tendency to focus on core businesses through outsourcing, while collaborating with suppliers in ensuring quality improvements, to innovation inputs, aimed at further reduction of cost in the firms' attainment of innovation performance (Belderbos et al., 2004). In addition, business companies will be able to attain a comprehensive grasp of each other's strengths and shortcomings in their numerous innovative operations by cooperating with competitors. They'll be able to spot areas where their skills complement each other, allowing them to create a new set of innovative methods, goods, or services (Tether & Tajar, 2008).

Again, a companies' strength is demonstrated as its competitive advantage, collaborating rather than trying to copy the other's strengths makes a lot of sense, when in competition. Furthermore, customer collaboration offers businesses with supplementary expertise and technological know-how (Bartelsman et al., 2014). It also provides a better understanding of user behavior, which is useful for improving the firms' innovation. These partnerships are critical for decreasing the risks associated with bringing new products to market. Collaboration is seen as necessary when ensuring that products remain relevant when they are novel and complicated and hence require client modifications (Stejskal et al., 2016).

Furthermore, universities and government research institutions play a major role in the supply of new scientific and technological knowledge, making them valuable collaborators for businesses. As a result, collaboration with colleges and research institutions is typically focused on discoveries that have the potential to create entirely new markets or market segments (Tether & Tajar, 2008).

However, according to Lee et al. (2009), government innovation funding cannot directly boost the innovation performance of private organizations. As a result, government assistance has no direct effect on a company's innovation outputs. According to the input-output model of business innovation, governmental support to firms is usually mediated by inputs into the business. Thus, the higher the input, the more likely the firm is to access governmental support. Therefore, innovative inputs such as business enterprise collaboration operate as intermediary in determining governmental support and a firm's innovation. The ability of businesses to translate innovation inputs into innovation outputs is harmed by this deficit.

Finally, according to Abramovsky et al. (2009), successful maximization of collaborative result brings the need organizations to have well-rounded competency in the relevant organizational functions. They also mentioned that, in addition to technological capacity, very successful technology innovation relies on competencies internal to the business such as manufacturing, marketing, organization, strategic planning, learning, and resource allocation. Given the inherent technological limits that many SMEs have, those who can develop strong capabilities in these areas are more likely to be able to fully utilize the full potential of their resources to develop innovative products and production processes (Sampson, 2007).

1.2.2 Innovation Policies

In both regional and industrial policy, innovation related policy's has risen to the top of the political agenda. The linear innovation policy, probed into R&D, infrastructure, financial innovation support for enterprises, and technology transfer until the 1990s, was in effect. These methods concentrated on providing *"innovation inputs and financial mechanisms, frequently missing the absorption capacity of businesses and the unique demand for innovation funding in underserved areas"* (Isaksen et al., 2018). Additionally, the behavioral characteristics, management, and organizational deficiencies of SMEs were not adequately considered. Thus, the instruments were largely directed to specific enterprises and employed in an ad-hoc fashion (Becker, 2019). Some research, focused on the analysis of high-performing regions, asking why certain industries are concentrated in specific areas, what

types of links and networks exist, and to what degree knowledge spillovers may be found. Tödtling et al. (2009) propose a new policy model for innovation and regional strategy that highlights the following elements:

- Emphasis on high-technology.
- knowledge-based.
- Excellence in research.
- Attracting global enterprises and
- Encouragement of business spin-off.

However, no single established innovation strategy can be employed in every site (Tödtling et al., 2009). As a result, political judgments based on success stories are only of limited use to disadvantaged places, because innovation potential varies greatly. Policy lessons from the most dynamic regions, on the other hand, can be learned and implemented in a variety of ways in a different location. Tödtling et al. (2009) highlighted the following new themes in innovation policy:

- *"A new method of thinking about policy priorities has emerged. Because inter-organizational arrangements have an impact on innovation processes and enable global competition, a shift from a typical firm-oriented strategy to a more system-centered approach to innovation policy is required.*
- *When it comes to designing political efforts that support learning processes, a wide view of the innovation process is viewed as crucial. This means that concentrating solely on R&D and technology components of innovation is frequently insufficient.*
- *Institutional, financial, educational, and commercial components of innovation should all be considered by policymakers. Similarly, they pointed out that innovation policy should not just focus on supplying physical capital, but also on improving human and social capital. Academics are increasingly optimistic that public policy measures can improve social capital, a vital component of a well-functioning RIS".* However, it was claimed that it is critical to reconsider the nature of political intervention and the role of political actors.

Therefore, traditional top-down political techniques are considered as inferior to interactive forms of state action and associative forms of governance (Criscuolo et al., 2019). Thus, policy formation and implementation are the result of extensive communication, tight collaboration, and consensus building across all regional actors involved in policy networks. In these networks, political decision-makers are just one of many actors. As a result, the major

function of governments in supporting learning and innovation shifts from direct action to stimulation, mediation, regional conversation, and the formation of social capital (Hottenrott et al., 2017). Furthermore, a trend toward competitive tendering is noticed in selecting programs and places to be supported by governmental measures. In general, this indicates that the winning approach has been chosen, and the actors and locations with the most competitive and innovative potential have been bolstered (Becker, 2019). The importance of good cooperation within the political system is emphasized once more. On the one hand, it is critical to connect various policy arenas (Foray, 2016).

On the other hand, there is a need for regional, national, and European policy hierarchies to coordinate and collaborate effectively (Boschma, 2017). In a comparative investigation of numerous European regions, it was discovered that in practice, innovation policy frequently falls short of these criteria. Many regional policymakers were discovered to have little experience in developing effective innovation strategies (Asheim et al. 2017). This research found that in many locations, political mechanisms and techniques do not meet the needs of businesses. A firm-centered approach and a heavy focus on the technological components of innovation alone were found to be still present in innovation policy. Tödtling & Trippl (2018) also found a lack of a defined vision and innovation strategy, as well hurdles to good cooperation between regional and national public agencies.

Furthermore, the desire to expand capacity in specific industries, technologies, or regions is commonly invoked to explain political support. Supporting industry research and development as well as innovation is increasingly valued by governments. Recent studies in a number of countries have proved the effectiveness of governmental research and development as well as innovation policies in boosting private investment in research and development. The most common sorts of direct governmental engagement include subsidies, research grants, and tax credits. The findings show that government R&D investment, innovation, and company performance are all linked in a positive way (Becker, 2019).

Finally, Becker (2019) identified four mechanisms via which public policy support can result in enhanced private-sector R&D and improved economic performance. These are some of them:

- Fiscal support boosts liquidity and financial leeway of a business, lowering the R&D financial risk (Zona, 2012). A lack of resources, on the other hand, can foster

sluggishness or laxness in risk-taking, implying an inverse U-curve effect (Grg & Strobl, 2007).

- Cost-sharing through public subsidies lowers the required investment and lowers the risk of these investments in terms of technology and economic performance (Roper et al., 2008).
- Public support according to Mazzucato (2016) plays the role of a market economy role in tackling specific economic concerns, such as new technology or larger social benefits (Zehavi & Breznitz, 2017).
- Politics also helps businesses gain acquire competitive knowledge that has the tendency of differentiating them among competitors; innovation vouchers are one such tool (OECD, 2010).

However, according to the empirical evidence on the relationship between public policy and private R&D as innovation input, they are positive influences on performance (Becker, 2015). Innovation inputs include *"R&D spending, encompassing industry and government-funded shares, the population of R&D scientists and engineers, and cost of importing intellectual properties from abroad"* (Rasiah, 2018). The compelling evidence that additional policy is disproportionately high for small enterprises R&D is likely to be financially limited. Small businesses have less collateral in terms of existing assets that may be utilized to take out loans, and they are more likely to be made up of new companies. There's also proof of a beneficial incentive effect, especially for small and medium size businesses (Zona, 2012). Again, large corporations frequently replace incremental public cash for internal funds, despite the fact that they would have conducted R&D even without government assistance.

Dimos & Pugh (2017), on the other hand, employed meta-regression analysis in assessing the impact of subsidies on both company innovation input and output. The study revealed evidence that also stresses the need of control for company heterogeneity and omits variable biases in assessing the effects of outputs rather than inputs less attention but are generally also confirmed as positive. According to Rasiah (2018), innovation output includes *"the percentage of high-technology exports of products, patents, scientific publications, intellectual property receipts, as well as trade balance"*. The newest findings from the United States illustrate how pooling uncommitted resources might increase corporate enterprise innovation performance (Marlin & Geiger 2015).

Positive R&D employment benefits were observed by Czarnitzki & Lopes-Bento (2014), they claimed that *"one major issue that remains under-researched is the influence played by the*

precise financing source of the innovation policy assistance in the success of the support". In their studies, multiple sources were usually compared, for instance national against EU support (Huergo & Moreno 2017); regional versus other support (Czarnitzki & Lopes-Bento, 2013); as well as national support versus other support (Czarnitzki & Lopes-Bento, 2013). Furthermore, Szczygielski et al. (2017) the level of support received in the form of national, regional and the EU support determines the domestic innovation policy to be applied. The support for domestic innovation policy is found to encourage enterprises' innovation in a number of countries (Huergo et al., 2016). Becker et al. (2017) assessed the impact of regional, national, and EU funding sources in a comparative panel data analysis between UK and Spain.

The findings imply that national innovation financing is linked to a higher chance of product or service innovations and a higher degree of uniqueness. Regionalized support has the greatest impact on the possibility of process and organizational innovation. The comparison of the UK and Spain is particularly interesting because of the public sector's very different involvement in the two countries' innovation systems, the greater regionalization of innovation support in Spain, and other aspects of the two countries' business environments, such as regulation (Mate-Sanchez-Val & Harris, 2014).

1.2.3 State Aid

State aid, according to Radukić & Vučetić (2019), is *"a type of selective government intervention aimed at specific economic units, sectors, or regions"*. They claimed that state aid always has an effect on a person or business enterprises. The primary function of state aid as part of a state intervention system is *"to neutralize serious market failures rather than cyclical oscillation or serve as the foundation for economic development"* (Heim et al. 2016). Furthermore, if this state intervention tool is used in an ineffective manner, it can significantly reduce competition between market players by creating unequal market conditions for individual companies.

However, the situation in developing countries is complicated, especially when the government decides to sell companies owned by the state to the private enterprises without an acceptable level of transparency and with high sales risks, resulting in a loss for the state on the one hand and a significant advantage for the businesses that buy them cheaply (Dimos & Pugh, 2016). The danger posed by the political dimension of state aid should not be overlooked. Despite the fact that state aid had a variety of political effects and is frequently

decisive practically, state aid is made-of an objective basis in systemic market failure, which identifies legitimate objectives of an intervention based on systemic rather than day-to-day political criteria (Berkhout et al., 2011). However, in other to identify State aid measures that have a higher positive impact on the Community as a whole, law to protect competition and govern state aid must be established (European Commission, 2012).

Regulations and rules have a complicated impact on innovation, (Patanakul & Pinto, 2014), and relies on the type of innovation. The dynamic character of innovation is frequently considered in the ways that rules and laws are established and enforced (Leitner & Güldenberg, 2010). Because willingness to change, ability to change, and the potential of change are all key factors in promoting technological progress, government policy should support these factors. The EEA Agreement's on state aid regulations are remarkably similar to the EU's. Again, a state aid is money made accessible for commercial purposes, and it can come in a variety of forms, such as grants, loans, and tax incentives. In other to avoid market distortions and harmful consequences on trade, state aid is strictly prohibited except in exceptional cases as noted in previous studies. However, exceptions are usually made in situation where public interventions are necessary for the well-functioning and ensuring equity in an economy. This Aid could be regarded compatible with the functioning of the internal market in such circumstances (European commission, 2012).

Furthermore, according to Biondi et al. (2021), a subsidy is a *"financial gift made with public funds that provides benefit to the receiver"*. These benefits could be in the form of a cash payout, a low-interest loan, or a guarantee. All levels of government are responsible for administering subsidies. Direct payments, tax incentives, or tax breaks that indirectly lower the prices of input into the production of goods and services, such as through cutting social security bills, show the variety of goals for a giving financing and the incentive impact of economic actors (Alvedalen & Boschma, 2017). Other forms of assistance can be provided by allocating state resources through state-controlled assets or through interlocutors such as state-controlled companies and associations, such as preferential loans or loan guarantees from state-owned or controlled banks or covert funding of R&D costs through state-funded contracts (Dimos & Pugh, 2016).

However, the contractual or other agreements between public and private players may also be used to provide funding. The EU's and WTO's definitions of subsidy and aid do not preclude such help from being admissible (Biondi et al., 2021). The question of whether subsidies and aids are allowed is decided in light of the control system's goals. At the World Trade

Organization level, the goal of banning certain sorts of subsidies is defined rather strictly as ensuring that one country's economic policy measures do not harm the interests of actors in another country. To put it another way, *"it is primarily focused on mitigating negative externalities"* (Berkhout et al., 2011).

Table 1: Summary of literature on SME's Innovation

Research area	**AIMS**	**FINDINGS/SME's INNO. & STATE AID**	**REFERENCE**
Entrepreneurial research ecosystem.	Determined entrepreneurial ecosystem skills and abilities	Direct payments, tax incentives, and tax breaks that reduce the cost of inputs into the production of products and services indicate the variety of reasons for providing finance and the incentive influence of economic participants capable of strengthening the entrepreneurial environment.	Alvedalen & Boschma (2017)
The control of subsidy in an economy	Analysis of public consultation in designing a new subsidy control	Stakeholder consultation is key in designing a new approach to subsidy control among enterprises	Biondi et al. (2021)
The effectiveness of subsidies on research and development.	Analysis subsidies effect on R&D	Subsidies are very crucial in ensuring the effective R&D	Dimos & Pugh (2016)
EU State Aid and aid	Establishing the need	It was established that	European

Modernisation from EU institutional point	for effective communication among the European Union's Institutions	they should be the existence of an effective and efficient communication channel among the institutions in order to facilitate institutional efficiency	commission (2012)
Government innovation policy	The roles government policy and programs play on innovation performances	Regulations and rules have a multifaceted impact on innovation, depending on the type of innovation.	Patanakul & Pinto (2014)
state aid and competitiveness of countries	Establishing the effectiveness of state-aid among countries	Improved state assistance structure, as the proportion of horizontal to sectorial state help in total state aid growth, resulting in higher Global Competitiveness.	Radukić & Vučetić (2019)
SMEs performance strategies	Determining the how generic strategies enhances performance of SME's	When it comes to establishing and enforcing norms and laws, the dynamic nature of innovation is taken into consideration to ensure that SME's perform.	Leitner & Güldenberg (2010).
State aid on the survival and financial viability of aided firms	Determining the significance of state-aid on aided firms	State aid's principal duty in a state intervention system is to neutralize major	Heim et al. (2016)

		market failures rather than cyclical oscillations.	

Source: prepared by the author

1.3 Financing

For many businesses, accessing funds for innovation is a major concern. This is because businesses are facing financial setbacks, resulting in lower investments in innovation, which stagnate long-term economic progress. Therefore, policymakers must be aware of the many sources of capital available to businesses in order to ensure innovativeness, as well as the interventions that should be developed to offer funding to innovative businesses (Bravo-Biosca et al., 2012).

Again, companies that receive government support might send a positive signal to market-oriented investors (Takalo & Tanayama, 2010). As a result, they may be able to attract more external investment than those that do not obtain such assistance. In addition, government backing can lead to additional sources of finance, allowing enterprises with limited resources to access greater resources. Rent-seeking factors, on the other hand, suggest that government subsidies are not always allocated effectively because they are not granted based on a prospective firm or a societal benefit. Subsidies based on social networks or political connections, as a result, are not favorable to commercial success. Such biases in government assistance tend to reinforce biases in the effective allocation of resources between enterprises, resulting in delayed profit growth or lower returns on assets and financial services (Zhang et al., 2014). Furthermore, private enterprises can overcome institutional and other impediments to unequal conditions with the help of appropriate government support. As a result of the government's backing (Wu, 2017), corporations will boost their R&D spending and so improve their performance.

Finally, the bulk of prior studies (Zhang et al., 2014) used Ordinary Least Squares (OLS) for regression of pool or panel data to examine the relationship between government support and company financial performance. However, some empirical issues, such as the endogeneity of explanatory variables, are not addressed by such approaches. In addition, according to Becker (2015), government assistance helps businesses enhance their performance and survivability. Furthermore, different sorts of government assistance might have varying consequences on a company's financial success. This study will go beyond previous research by looking at the

influence of various types of government support on corporate financial performance. Innovations can come from a variety of groups, both for profit and non-profit, in the private and governmental sectors. To that purpose, the Fund provides grants, loans (including convertible bonds), and equity investments, among other options (Dimos & Pugh 2017).

1.3.1 Categories of Funds

There are numerous types of funds meant to help companies enhance and boost their innovation performance around the world. When the government, a private organization, or both, deems it suitable, these monies will be utilized in relative terms. Bravo-Biosca et al. (2012) alluded to this fact by identifying four important funding types that support firm innovation: These are the following:

- ✓ Debt: The financier lends money to a firm for a set length of time, with the corporation agreeing to return the loan plus interest on a set timetable. Most SMB owners favor leverage because it allows them to keep complete control of their firm. Debt financing, on the other hand, comes with more unpredictable returns on equity and a larger danger of bankruptcy, which can result in a full loss of control, the destruction of all equity, and the company's liquidation.
- ✓ Equity financing gives the investor a share in the company profits or losses at a breakeven stage. The sale of new shares dilutes the entrepreneur's authority over the company and can cause conflict if shareholders disagree, but it also improves risk-sharing and provides the entrepreneur with access to investor networks and knowledge.
- ✓ Innovation dedicated finance: Companies are able to acquire funding without the need to pay it back, no cost of capital, and no ownership dilution. Direct government support in the form of grants is the most obvious example, but other private sources, such as gift-based crowd-funding platforms, may also offer funding with few constraints. Many types of government support, such as public loans and public venture capital programs, do, however, require some payback of government contributions.
- ✓ The money of invention is known as venture capital. With a concentration on technological firms, this type of financing appears to be a natural fit for fostering innovation and growth. Although these investments are high-risk and prone to severe regulatory issues, thorough due diligence, well-designed VC contracts, and staggered fund injections all help to limit these risks (Zhang et al., 2014). Only a small

percentage of firms are eligible for VC funding in the United States. Only around a sixth of one percent of new businesses receives venture capital funding, according to estimates. VC, on the other hand, has a significantly higher economic impact than this modest fraction suggests. Indeed, VC-backed companies accounted for roughly 60% of all public companies in the United States in the last 20 years. IT, which includes hardware and software, internet-related services, cloud computing, mobile applications, and e-commerce, has traditionally absorbed the majority of VC funding. While a considerable number of bio sciences businesses have gotten VC funding, it is more challenging to invest in this field. In general, venture capital is distributed through Limited Partnership Funds that last 10 to 12 years, which is typically insufficient for biotech because the journey from basic scientific discovery to completely licensed medications can take 15 to 20 years. Given that the VC model may not be ideal for long-term science-based firms, and hence cannot solve R&D funding challenges in biotechnology and related sciences, it has been advocated to create "project-focused organizations" to carry out a specific R&D project. However, such organizations have significant obstacles since they do not address the agency issues that are inherent in high-risk venture investing. Finally, corporations can employ CVC as a tool to foster the development of technologies that rely on the parent company's platform (Taboroi, 2011).

- ✓ Angel Investing: Angel financing in entrepreneurial firms has become more important as venture capitalists have concentrated more on growth potential and later stages. Angel investors, also known as business angels, often invest in start-ups when they are still in the early phases of development, with most of their contributions totaling less than $1 million per company. Angel investors are increasingly banding together in semi-formal networks to make larger investments as a group and diversify their portfolios. Angel investors, like venture capitalists, are often entrepreneurs or ex-entrepreneurs (Kaplan & Lerner, 2017). Angel investors and their networks, like VC firms, invest in early-stage businesses after conducting extensive due research. As is the case with venture capitalists, they usually provide particular advice to the entrepreneur. Angel investors frequently take a hands-on approach to the deals in which they invest, providing industry-specific views based on their own expertise and knowledge, and establishing new business contacts that help firms expand. The number of seed funding rounds in which angel groups have allegedly participated shows that they are becoming more common in emerging markets.

- ✓ Equity crowd funding: Finally, equity crowd funding platforms, which have arisen in tandem with other crowd funding mechanisms, may be used by enterprising start-ups in their early stage to raise funds. Equity crowd funding, like its debt-related cousin, is an Internet-based tool for reducing search friction and improving matchmaking between start-ups and possible investors. Start-ups seeking funding can post important information about themselves on the platforms and interested investors can review their investment offers. Funders receive compensation in the form of equity-based revenue- or profit-share arrangements from the fundraiser in the equity-based variation of crowd fundraising (Bravo-Biosca et al. 2012). Importantly, internet platforms are not financial intermediaries and are thus unaffected by investment decisions. Rather, individual crowd investors, like business angels, make the final decision to back a company. The democratization of entrepreneurial capital has been labeled as equity crowd investment. Previously, venture capitalists and well-connected angel investors were the only ones who could invest in start-ups, but these online platforms now allow anyone with a small amount of money to access startup investment opportunities. Surprisingly, equity crowd fundraising is frequently used as a screening method by VC funds and business angels to uncover promising investment prospects. While equity crowd funding has been hailed as a business model that has the ability to change the VC industry and early-stage investment in general, it comes with significant risks for both entrepreneurs and investors. Entrepreneurs must realize that no investor will fund a startup without first evaluating its future worth. When seeking investment from venture capitalists and angel investors, the entrepreneur typically shares specific information about the business idea in exchange for a legally binding nondisclosure agreement (NDA). Individual NDAs, on the other hand, are not included in the basic concept of crowd investing, which forces entrepreneurs to openly disclose their business ideas and strategies. This early disclosure could disadvantage start-ups that have a unique business plan that is easy to copy. As a result, equity crowd funding is expected to be more industry-diverse than venture capital, which has primarily focused on digital start-ups.

1.3.2 Effective funds

Cornelius (2020) have linked overall financial development to metrics like the introduction of new business enterprise into a country. Bases on data from a variety of countries, it is clear that a *"country's financial development level, for instance, private lending and market*

capitalization has a significant impact on small business entry and post-entry growth, while having little impact on large business growth". Again, Kerr & Nanda (2015) took a very different approach to addressing the impact of cash flow on entrepreneurial businesses. Using tax data on U.S. entrepreneurs (sole proprietorships) who received inheritances, they found that receiving inheritance money increased the survival of entrepreneurs and surviving firms grow faster, implying the financial viability of those businesses.

In addition, Small firms, particularly in research and development as well as creative small businesses, face more financial restraints than larger businesses (Hartono & Kusumawardhani, 2019). However, Goel & Saunoris (2021) discovered that finances are especially crucial for smaller innovative businesses. Stiebale and Reize (2011) looked at the funding of emerging innovative enterprises on Germany's Neuer Market and discovered the association between bank debt and venture capital investment to be negative. They posit that, companies supported by venture capitalists expand at a considerably faster rate. Thereby, highlights the importance of risk-taking financiers to the successes of emerging creative businesses, particularly in countries like Germany, where bank funding dominates.

However, Hall (2010) stressed the relevance of the cataloged and investigated market failure as a result of the independence business owner from managers. Therefore, he claimed that the main public policy case for funding creative enterprises may change because it is based on the societal benefit that can be generated from businesses freely sharing their expertise. That is, the issue of the inadequacy of the returns on knowledge investment. The following are Hall's arguments:

- First, debt is an undesirable funding source for R&D expenditure.
- Second, with their dense and well-developed stock markets and relatively transparent ownership structures, Anglo-Saxon nations' R&D is typically more sensitive and responsive to cash flow than continental economies.
- Third, greater responsiveness could be attributable to their financial constraints, in the sense that they see external funding sources as much more expensive to internal ones, requiring a far higher return rate on investment margin.

Again, Stiebale & Reize (2011) posits that market response arises as a result of corporations' and increased sensitivity to financial market demand signals; further research is needed to determine the exact origin of the hypersensitivity reaction. Finally, there is now strong data to imply that young and/or small enterprises are more prone than large incumbents to encounter financial restrictions, a conclusion that is unsurprising if the cause of the problem is a lemon

premium. Such companies are more likely to have a shaky track record to base their investor valuations on. The findings they discussed in their paper, however, revealed a number of policy ramifications. Governments have designed policies in order to reduce innovation expenditures for their states (Isaksen et al., 2018). The most common strategy is the use of basic tax credit that targets small enterprises in some circumstances. Various project-based or pre-commercial research and development projects are among the others (Lo & Pisano, 2016).

According to Hall (2010), Several European governments have attempted to act as venture capitalists for their own start-ups and small innovative businesses. More than 800 federal and state-funded company start-up programs have lately been introduced in Germany (OECD, 2015). The Swedish government launched the succession of investment corporations in 1980, following in the footsteps of the United States (Kerr et al., 2014).The UK has recently introduced a set of government programs administered through the Enterprise Fund that distribute funding to small and medium-sized businesses in high-tech and specialized locations, as well as grant some small-business loans to enterprises (Morris, 2018).

Finally, Cornelius (2020) asserted that government R&D subsidies based on firm and project screening can sends important signals to private equity and venture capital markets about the quality of the beneficiaries. According, Bonini & Capizzi (2019) when compared to a matched sample of firms that did not receive SBIR money in the US, having an SBIR award enabled firms to obtain more resources elsewhere, and these firms developed faster subsequently.

The European Investment Fund (EIF) is also affiliated with the European Investment Bank Group. Its fundamental aim is to assist Europe's micro, small, and medium-sized firms (SMEs) in obtaining financing. EIF creates venture financing, growth capital, guarantees, and microfinance solutions that are tailored to this market niche. In this capacity, the EIF promotes EU goals in support of innovation, R&D, entrepreneurship, growth, and employment (OECD, 2020). The Baltic Innovation Fund set aside one hundred and thirty million euros as a funding intervention created by the EIF in collaboration with the Baltic national promotional institutions in order to encourage equity investments in Baltic SMEs with strong growth potential. It is a non-profit organization that was founded in 2012 and is entirely devoted. BIF resources sponsored funds with EUR 522 million in financing as of 30 June 2020. Nearly EUR 260 million has already been invested in 54 firms (OECD, 2020).

This indicates the importance of funding to firms, as well as the fact that, based on the developmental stage, size, and firms' operational purpose, appropriate funding mechanisms are identified and chosen, and then effectively applied to the specific firm (small-medium-sized enterprises or large firms) in order to enable it to achieve its innovation performance goals (Bonini & Capizzi, 2019).

2 STATE AID

This chapter consists of description of the concept of state aid, its importance and criteria for determination, state aid policies as well as exceptions and exclusion, structure of state aid, state aid instruments and factors that motivates a government to issue out aid at various EU levels.

2.1 Concept of State Aid

As stated by the European Commission (2018) "*any benefit that is bestowed in selective basis to business enterprises by the government or national authority constitutes state aid"*. Therefore, it is a form of government support provided to business enterprises by public authorities on a selective basis and in whatever form. It mostly has the potential to stifle competition in markets where businesses compete. However, granted subsidies directed towards individuals or business enterprises, in general, do not constitute state aid (EC, 2018).

There to, state aid instrument has been classified into two main groups, that is financial and non-financial aid instruments. The non-financial are in the form of regulations in support of SME's operation, enhanced environment for SME's, and the cooperation activity between the SME's and the government (Rahman et al., 2016; Jaroslav, 2017). However, the financial instruments include subsidies, grants, tax breaks, guarantees and soft loans.

A measure that is classified as a state aid must contain the following characteristics (EC, 2021):

- They have been a state intervention or use of state resources, which could come from various sources such as grant, interest and tax relief, guarantee, government holding of all or part of a company, or preferential provision of essentials.
- The intervention provides the recipient with a selective advantage, for example, to specific business enterprises or business enterprises concentrated in specific geographic regions.
- Competition may or may not be distorted as a result of the intervention, competition may or may not.

According to Raduki & Vueti (2019) state aid is a kind of government intervention aimed at certain economic units, sectors, or regions. They asserted government assistance as never being neutral and that it always results to a benefit or a detriment to a particular business enterprise, unit, or sector. The principal duty for state aid in a state intervention system is to

neutralize major market failures rather than making provision to cyclical oscillations in an economy (Heim et al. 2016).

In the study of Sciskalová & Münster (2014) five criteria was identified in order for a government intervention to be called a state aid, these are:

- aid is given by a member state or through the resources of a state.
- aid provides a financial advantage to the beneficiary that would not have been available under normal market conditions.
- it favors specific commercial activities or the manufacture of specific goods;
- it distorts or has the capacity to distort competition.
- the activity is transportable between Member States, and the aid has the potential to affect trade.

However, if one or more of the aforementioned conditions is or are not met, the assistance provided is not deemed state aid (Sciskalová & Münster, 2014), thus all the conditions must be holistically met in order to qualify as an aid from the state.

Again, depending on the GDP per capita of the relevant outermost zone, maximum aid intensities for major firms as well as member states range from 40% to 70% in the EU (Godke Veiga & McCahery, 2019). For original investments with qualifying expenditures up to €50 million, maximum aid intensities in all of the EU areas can be enhanced by 10% points for medium-sized firms and by 20% points for small enterprises (EC, 2018). According to the European Commission (2020), member States spent EUR 134.6 billion, on State aid at European Union level in 2019, according to national spending reports, excluding aid to agriculture, fisheries, and railroads. This is a nominal rise of around 3.6 percent over 2018 expenditure (EUR +4.7 billion) and a notional increase of about 0.001 percent. In terms of GDP in relative terms, there is a large spending dispersion across Member States when looking at the distribution of State aid expenditure as a proportion of national GDP (Gormsen, 2019). The Member States such as Malta, Lithuania, and Hungary spend more which is roughly about 1.6 - to -1.8 percent of their national GDP, whereas the Member States that spend the least spend around 0.2-0.3 percent of GDP in the case of Ireland, Luxembourg, and Spain. Since 2014, state aid spending has risen in nominal terms (Podsiado, 2018). Overall expenditure of state aid as a percentage of EU GDP is reported to have been steady over the

last two years (Pisapia, 2015). In absolute terms, Germany is the member state that spent the most in 2019, with EUR 53 billion, accounting for 39% of overall EU state aid spending.

Furthermore, article 107 paragraph 1 (TFEU) states that state aid is any benefit offered to a specific business enterprises or producers while excluding others in promoting economic growth through the support provided. Therefore, State aid cannot be considered if the given measure does not benefit the addressed entity (Jansen, 2016). However, supporting either a specific economic activity or EU member state may distort market competition by making state-supported enterprises more competitive than non-state-supported enterprises (Davies, 2013).

Furthermore, with the EU member states being significant trading partners, the need for convergence of their economies to the EU economy is paramount. This is usually a slow process, especially in light of the global crisis (Krstevska, 2018). In addition, Hottenrot et al. (2017) has it that, the analysis of state aid as a measure of state intervention is important from the standpoint of compliance with permissible state aid in the European Union.

However, according to Jaki & Jaki (2018), state aid should not be limited to a single economic entity; rather, it should contribute to the national economy's overall prosperity by increasing efficiency and effectiveness, competitiveness, and, finally, by positively impacting the population and living standard. Their report posits that "*Consolidated democracy and efficient markets are depending on the fundamental factor of growth, notably inclusive institutions that ensure better satisfaction of populations' basic needs"*. With such a broad description of the objectives that must be satisfied, the effects of state aid programs must be assessed from a variety of angles. The impacts of state aid on market competitiveness, a company's market behavior and market strength, social welfare, efficiency, and other factors are the most important.

Finally, state aid is effective if it boosts an economy's competitiveness (Bénassy-Quéré et al., 2020). The relationship in existence between the competitiveness of business enterprises and corresponding aid provided them, clearly showed the effects of state aid, and as well solves the question of whether state aid, in terms of structure and volume, is satisfactory in European regions or whether it needs to change and improve to achieve a higher level of competitiveness in the relevant economies (Raduki & Vueti, 2019).

2.1.2 Importance of Aid

In addition to the above, the following are also some of the possible economic reasons for given state aid is very important to member states and gains much attention from the European Commission.

1. The commission uses state aid as an intervention to offer benefits on selective basis to deserving recipients (Duguet, 2012). The intervention provides a selected advantage to recipients', such as to specific business enterprises or industry sectors (Schito, 2021), or to companies in specific regions, which aids in the improvement of their overall operations.

2. The Commission uses state aid in addressing market failures that exist in markets of the Member States (Cremieux et al., 2017). For example, while several member states offered aid to banks and the financial industry during the 2008-2009 financial crisis, that distortion was likely preferable to the alternative of a shattered financial system. Similarly, state aid may be acceptable in businesses and activities that generate huge positive externalities (Davies, 2013).

3. The EU Commission uses state aid to foster competition in the sense that, it can be used to compensate for inherent disadvantages while also encouraging competition (Gormsen, 2019; EC, 2020). Similarly, even if the concentrated sectors are overseas and the new competitors are domestic, assisting the establishment of new competitors in highly concentrated industries may be welfare-enhancing (Brůžková, 2015).

4. It uses state aid also assists in the correction of existing distortions that negatively influence economic activity in the EU (EC, 2018). Thus, it helps the commission to supply less distortionary and better-tailored tax rates that may be competition promoting (Cremieux et al., 2017). In the sense that, subsidized taxes enhance the rate at which the benefitting business enterprise approach competition in the market and has the tenacity to adversely affect the other enterprises that never got a tax subsidy during their operational activities.

In addition to the above, several motivations for issuing state aid was identified and highlighted in relations to the interplay between both *"political and economic motivations",* which guide states and their sub-structure. The first is *"to achieve political preferences of governments; a second and often related reason is that state aid remains one of the few*

economic tools that member states can use to enhance innovation performance of business enterprises" (Jansen, 2016).

First, states grant help to achieve policy goals in the broadest sense. Such objectives reflected that a broader public interest governs the state; such interest includes guiding national economic development and preserving interregional employment (Dewatripont & Seabright, 2006). The ability to govern or influence behavior by encouraging individual behavior makes subsidies and state aids appealing as a policy tool. States come up with ingenious strategies to entice players to act in ways they might not have done if not for the subsidy (Jansen, 2016).

Governments of member states seek to achieve policy goals by the use of state aid. It is noted that state aid helps in regional development, employment of specific underrepresented elements of the workforce, and developments of entire sectors of the economy (Popov & Roosenboom, 2012). Again, the policy aims of the member state are sought by awarding aid include encouraging activities that, in the view of a government, are supposed to benefit society as a whole, any individual profit earned by this activity, such as investments in renewable energies or R&D investments. Individual incentives can help achieve these goals without relying on the government to deliver services directly (EC, 2020).

According to Hölscher et al (2017), state aid is used to postpone bankruptcy and preserve job possibilities within SMEs of the EU. The governments, particularly in modern "regulatory states", use public resources to achieve national policy goals through the SMEs, and it is considered as a key steering tool in achieving policies of general interest in this regard. Such a mindset may explain why states are more likely to offer or not give subsidies in the end. For example, even before the wave of privatization that began in many countries in the late 1970s, EU Member States continued to subsidize enterprises in many sectors to avoid catastrophes like bankruptcy and job losses (Ginevičius et al., 2008). Significant national enterprises may otherwise become insolvent if competitive market forces were allowed a full run; it was and is believed; if such firms collapsed, unemployment would have risen.

The economic needs for aid were implicit in case certain sectors of the economy are underperforming, market failure would be justified in order to provide support to certain economic operators or activities in this sector that would have otherwise ceased in the absence of aid, saving jobs, and having an impact on goods and services available to citizens (Jansen, 2016). Beginning in the 1970s, the European Commission grew increasingly proactive in enforcing the Treaties' State assistance provisions to regulate the awarding of State aid. The

economic rationale was that creating a single market necessitated not only lowering customs and regulatory barriers to entry, but also ensuring that governments could not unilaterally re-create unequal conditions by supporting local businesses (Pastor-Merchante, 2017). Furthermore, granting state aid entails the use of public funds, and because that, the government should play a limited role in the economy since aid provided to SME's puts them in an advantageous position to contribute to the general development of the state (Ginevičius et al., 2008). Thus, increases desire to help, in the form of financial injection, loan, shared purchases, and state guarantee by the governments.

Finally, governments in the EU may be persuaded to employ financially effective incentives as a tool for regulatory policies, particularly in areas where the EU has regulatory authority. Few policy sectors have not been *"Europeanized",* in the sense that they remain totally under national authority despite the fact that many regulatory rules are created at the EU level, such as telecommunications (López, 2015), rail and air transport, and energy supply. In this situation, public authorities may consider other strategies of public intervention initiatives such as grants, subsidies, loans rather than ownership direction (Botta, 2013).

However, the positive justifications for state aid muddle the waters considerably. This is why, in each case of state aid, the Commission must examine the grounds for the aid scheme, its potential implications, and as to whether it has the potential to distort and undermine competition among enterprises or EU member (cremieux et al., 2017).

Having reviewed relevant literature that provided insights on the concept of state aid as well as why state aid is very crucial, thus given very much attention by the EU Commission. It is paramount to probe into available literatures' to find policies that affect state aid within the EU.

2.2 State Aid Policy

State assistance policy, as part of competition policy, is one of the areas where the EU's supranational authority is particularly powerful. The EU's competition policy has been called the *"most supranational*" and *"most Europeanized"* policy (Blauberger, 2012). It falls under the EU's exclusive competences and adopt binding actions on member states (Lindstrom, 2021).

The goal of state aid policy teaches member states to behave the way neoliberal government do when designing new policies (Nyberg, 2017). The policy spells to member states questions they should examine themselves with such as.

1. Does the measure provide a competitive advantage to one set of market competitors over another?
2. Is it followed by an economic business?
3. Is it designed to address market imperfections?
4. Which of the following types of government action had the least impact on competition?

Furthermore, *"any sort of state aid that could distort competition and trade among national governments is prohibited"* (Murschetz, 2014). Again, insofar as it has the ability to influence commerce among member nations (Sciskalová & Münster, 2014), when delivered using public funds or given in any form whatsoever by a member state; it has the capability to distort competition among firms.

According to the European Commission (2016), a measure must meet four conditions in order to qualify as state aid:

1. The existence of economic gain: according to the council, "*any economic advantage that an undertaking cannot obtain under normal market conditions of Article 107(1) of the Treaty*" *qualifies* (Miceli, 2022). In order to establish if an enterprise received the desired benefit envisaged by the support, it is required to assess its economic state before and after government engagement (Sciskalová & Münster 2014). State help refers to both the supply of positive economic advantages and the relief from economic duties (Roth et al., 2011).

2. It must be funded by state funds or grants from the state: *"Only advantages provided directly or indirectly through State resources can constitute state aid,"* as was argued (Roth et al., 2011). This is mostly called the *"imputability criteria"*, thus for a support to qualify as aid its benefit must be *"imputable"* to a member country or by a state's own resources (Miceli, 2022). The criteria for *"imputability"* throws a limit on this concept because numerous government measures are said to have helped some business enterprises more than others, and so perceived as offering an advantage. This criterion restricts the application of policies related to state aid to activities involving the transfer of public cash (Sciskalová & Münster, 2014).

3. Thirdly, a state aid "*must distort or threaten to distort competition" in a way that "affects trade between the member states or competing business enterprises."* These two distinct requirements are regarded *"inextricably related,"* therefore they are usually treated together (EC, 2016). This is because of the assumption that business enterprises in the EU operate on a single market, thus any state intervention that affects competition in one member state will influence competition throughout the Union (EC, 2020).

4. The cross-border business activity among EU member states has to be present in other to constitute a state aid. This is because state aid given to one member state will enhance the receiving states production of goods and services over and above its competing counterparts not receiving state support. This had possibility to distort competition and pose a negative effect on the member states or organization's not privileged to have received such governmental support at a particular period of time (López, 2015).

However, exclusions are provided in Article 107(3) TFEU that are deemed coherent with the single market (Gormsen, 2019);

- *"assistance to support the national economy of places where the living standard is particularly low.*
- *assistance in enhancing some specific developmental efforts in which trade conditions are unaffected.*
- *support for history and cultural preservation.*
- *enable easier diversity conservation.*
- *such nominalizations of aid as the Council may determine in response to a recommendation from the Commission.*
- *any other groups of aid as the Council might specify in response to a recommendation from the Commission."*

Three forms of aid are defined in Article 107(2) TFEU as being consistent with the domestic markets and hence exempt from state aid laws.

- aid to individual consumers without regard to the country they belong.
- aid directed towards correcting a damage caused by natural disasters, for instance the covid-19 aid given to member countries.

- aid to an economic segment, insofar as it is required to compensate for the financial constraints cause.

Again, the policy allows for social activities and aid in response to "*damage caused by disasters" (Bénassy-Quére et al., 2020),* such as the present Covid-19 pandemic. The European Commission's control of state aid stems from a desire to avoid potential distortions generated by the assistance they provide in such circumstances. As a result, the Commission recognizes that state aid may provide benefits to the supported businesses (Bénassy-Quére et al., 2020).

In addition, on April 19, 2021, the Commission adopted a new policy guideline that went into effect on January 1, 2022, allowing member states to help the EU's least developed regions catch up and reduce disparities in economic well-being, revenue, and unemployment, as well as the Union's core cohesion objectives. They also give member states more options to support regions that are going through transitions or structural changes, such as depopulation, so that they can fully participate in green and digital transformations. The greatest amount of state assistance that can be awarded per recipient, represented as a percentage of eligible investment expenditures, is referred to as aid intensity (EC, 2020).

The European Commission recently announced the launch of a *"State Aid Modernisation program",* which allows member states to implement aid measures that promote investment, economic growth, and job creation while allowing the commission to concentrate its state aid oversight on other cases that are likely to distort competition (Buts et al., 2013).

The Commission, on the other hand, is in charge of deciding which aids to allow and which to prohibit on a daily basis. It is also worth emphasizing that in the field of competition policy, the European Parliament only has advising powers. As a result, it has a smaller impact on state aid policy than in most other policy areas where the co-decision approach is applied (Nyberg, 2017).

2.3 State Aid Structure

Horizontal aid, sectoral aid, and regional aid are the three types of EU aid. It should be emphasized that the volume of all three categories of aid has decreased over time, in accordance with EU standards. From 2015 to 2016, horizontal aid comprises the largest share, followed by regional aid, and finally sectoral aid (Raduki & Vueti, 2019).

Horizontal aid accounts for the majority of overall EU aid because it is not sectoral or regionally targeted; rather, it is directed to all other economic entities. Because of its impact on total social welfare and economic development, it has a broad impact on market competitiveness of SME's (Stojanovic & Radukic, 2017).

Typically, sectoral aid aims at companies such as SMEs in specific economic sectors. The transportation and mining industries receive the majority of the company's stock. As seen during evaluations, the commission’s choice of help direction oscillates a lot (Schito, 2021).

Regional aid is directed towards specific SME’s divisional area affected in an economy, in as much as such aid is essential to compensate for the divisions in economic disadvantages faced by SME’s within the EU. As a result, this aid is intended to assist underserved EU areas while also contributing to the achievement of the EU 2020 agenda and long-term growth (Raduki & Vueti, 2019).

The received aids are in the form of either of the state aid instrument such as subsidies, grants, guarantee, interest on tax equity, capital venture to mention but just a few. However, OECD (2018) stated that each member state has received one or more aid from both the EU level, regional level, and sectorial level of aid support. Thus, we will look at the various state aid instruments in brief in other to enhance further understanding.

2.4 Instrument of State Aid

The instruments that deals with SME's financing makes use of related enterprises budget in executing its mandate. The financial instruments include subsidies, grants, tax breaks, guarantees and soft loans. According to EIB (2019) state aid granted from 2014-2020 amounted to EUR 17.1bn of aid was received by SME’s to finance various projects. Thereby, making SME’s the most supported policy area by financial instrument in other to make them able to compete in the global market. Its noted that SME’s are the highest employers of the states in the EU as such much attention is given to them in order to facilitate their operations (Jaroslav, 2017). Some of these important instruments are.

Grants: is a mechanism for dispensing funding. It is a widely used tool that comes in many different shapes and sizes and is used for many different purposes (EC, 2020). It is an extremely flexible instrument can be used to fund R&D and innovation as well as several other types of activities (Bravo-Biosca, 2014). This mechanism has several features such as;

It is made from within a particular program or initiative that has been established with a particular policy aim.

It is intended to help the recipient (SME's) achieve a particular purpose that aligns with the particular policy aim of the dispensing program.

The receiving SME is required to act in accordance with particular terms or conditions regarding how the grants are used.

However, in the EU some special funds are set aside to enhance business operation of SME's due to their importance and contribution to the general economic growth of member countries and also the provision of jobs (Jaroslav, 2017). These special individual funds partly dedicated to the support of SME's are.

European regional development fund is set aside for the improvement of economic growth and the enhancement of social cohesion. The goal is to correct inequities in the European Union's development levels (Torkkeli, 2016). An amount of *"EUR 199billion was allocated to ERDF from 2014-2020"* (OECD, 2012).

The focus areas for the programme are:

- Innovation and research.
- Support for SME's.

The level of required concentration differs in accordance with the region receiving the support. Allocation is made in the percentages and in accordance with the regional development level such as (Godke-Veiga & McCahery, 2019).

- In developed regions, 80% of the ERDF fund is allocated to at least two areas of priorities as indicated above with the remaining 20% directed towards achieving a low-carbon economy.
- In transition regions, 60% is allocated to at least two areas of priorities with 15% geared towards a low-carbon economy.
- In low developed regions, 50% is allocated to at least two areas of priorities with at least 12% set side to ensure a low-carbon economy.

Smart growth and the green economy are the focus from the budget of EUR200.36billion for the years 2021-2027. Which was further divided in components and percentage such as (Godke-Veiga & McCahery, 2019).

- Less developed region gets a share of 85% from the total allocation.
- Transition region gets a share of 60% from the total allocation.

- More developed regions get a share of 40% from the total allocation for projects.

The European social fund (ESF): Places emphasis on employment, social inclusion, education, and human capital investment (OECD, 2020).
The fund is centered on four cohesion policy theme objectives:

- *"Employment and labor mobility.*
- *Social inclusion and poverty.*
- *Education, skills, and lifelong learning.*
- *Institutional capacity and efficient public administration."*

Innovation fund focuses on "innovative technology and processes in energy-intensive industries, such as carbon-efficient products and novel renewable energy generation". It is a large funding program for the demonstration of breakthrough low-carbon technology anywhere on the planet (EC, 2018). The money comes from "Emission Trading Scheme credits" (ETS). About EUR, 10 billion will be available for investment in the European Union's climate-neutral future between 2020 and 2030 (OECD, 2015).

EUREKA: is aimed at enhancing competitiveness in operations between public-private enterprises by encouraging small and large businesses, institutions of research, and universities to collaborate on innovative ideas (Marek, 2012; EC, 2020).

The EUREKA program consists of:

- Clusters are long-term efforts that create technologies that are critical to European competitiveness. They are initiated by European industries. They are the engine for industrial innovation and progress, serving the demands of both huge corporations and small businesses.

- A multinational consortium designs and manages network projects, which are market-driven innovative R&D projects.

- The project participants frequently receive money and support from the EUREKA network's national innovation agencies and public authorities.

Guarantees and loans are geared towards assisting business enterprises with immediate working capital and investment needs by guaranteeing up to 90% of the risk on their loans

(EC, 2020). By lowering the damage, a bank faces if a business enterprise defaults, these programs help business enterprises with higher risk profiles have access to capital (Ramlogan & Rigby, 2012; EC, 2020).

Subsidies are used for municipal and regional tasks (EC, 2020). The European programs offer financial support and also stimulate cooperation of business enterprises within Europe. This often results in interesting partnerships and knowledge sharing (Marek, 2012). More so, direct public loans allow for greater control than credit guarantee schemes. Insufficient expertise, soft budget constraints, political objectives, and lobbying can, however, lead to poor credit cultures with insufficient discipline, resulting in a misallocation of credit and poor use of taxpayers' money, in addition to the substantial administrative costs these schemes entails to the SME's (Bravo-Biosca, 2014).

Considering all the elaborated significance of state aid, it enormous importance to the member states, why the EU commission gives it much attention and some of challenges that it is faced with as stated by several researchers above. It is concluded that state aid instrument are key to the economic development of member state and the EU in general. However, it was noted that, the instruments are differently applied in different situation as each of them has its own aim of coming into force and must be applied appropriately to attain it intended purpose. It will be eminent now to develop a methodology that will test the available theories and determine if the current findings will match previous ones or will turn out different and unique.

3 DATA AND METHODOLOGY

In this chapter, the study would consider the design of research, sources and kind of data, sample population, data collection method, data analysis techniques, variable description, and the study limitation.

3.1 Research Aim and Objective

The main aim is to examine how national governments in the V4 nations use a variety of state aids (both financial and non-financial) to boost SME innovation performance.

To achieve this aim, the following objectives must be attained.

1. To identify financial state aid instruments, use in boosting SME innovation.
2. To determine non-financial state aid instruments, use in enhancing SME innovation.
3. To determine the effects of the financial and non-financial instruments on SME innovation performance.
4. To recommend methods of improving SME innovation performance.

3.2 Research Hypothesis

Given the preposition from the theoretical review, the following hypotheses are formulated in other to facilitate achieving the research aim and objectives thereby giving understanding of the research work.

Proposition 1: the state financial aid effect on patent count innovation performance of SME in the V4 member states.

H_{1a}: Direct grant has significant influence on patent count innovation performance of SMEs.

H_{1b}: Government guarantee has significant influence on patent count innovation performance of SMEs.

H_{1c}: Soft loan has significant influence on patent count innovation performance of SMEs.

Preposition 2: the effect of state financial aid on product innovation performance of SMEs in the V4 member states.

H_{2a}: Direct grant has significantly influence product innovation performance of SMEs.

H_{2b}: Government guarantee has significant influence on product innovation performance of SMEs.

H_{2c}: Government soft loan has a significant effect on product innovation performance of SMEs.

3.3 Research Design

The comparative study analysis will be used in this work; this is because it has three primary designs, which are the single-country studies, often known as case studies, comparative case of a few countries, and comparative case of numerous nations. The situation of various countries would be considered in this study (Lor, 2017; Gariba, 2019). This study will in a comparative way analyze the impact state aid makes on the innovative performance of SME's in the EU. The research strategy that will be used to conduct this research is the quantitative research approach. This is because in quantitative research the description and analysis involves the collection of numerical data and presents a meaningful view of the relationship between theory and research as a deductive and objectivist manner (Babbie, 2010). It would consider SME's within EU member countries in other to establish the various aid instrument that are in operation within the EU. More so, whether some member countries derive more benefits from it than other member states or all are at par to the receipt of state aid and establish whether state aid has facilitated the innovative performance of SME's within the selected EU countries.

3.4 Sample Population

For this study, SME's within the *V4* group mostly referred to as the V4 countries (Poland, Czech Republic, Republic Slovakia, and Hungary) would be studied. This is because SME's within the V4 countries is the major employer to the nation and contribute immensely to the economic development of members (Ayyagari et al., 2007; Jaroslav et al., 2017). Again, SME's are generally the bedrock of the EU economies and as such gets much level of attention and support from the Union, regional governments of members and other European national authorities. The V4 group is chosen because of the economic similarity and size as well as historical connection having been part of the close economy and now transitioning to the open market economy. Furthermore, the sample was chosen because of the effectiveness in cooperative activities geared towards economic development and growth among the V4 member countries. This cooperation among them places them at an advantages position cooperatively execute projects that offers them numerous benefits and makes them more proactive in the utilization of state financial aid as well as maximizing its intended benefit.

This makes them much better off than other western EU member countries that are otherwise not cooperating with any other countries in providing support to businesses.

3.5 Variables Description

This study will consider variables that are "dependent and independent" in conducting this research as well as control variable that would facilitate the success of this study (Babbie, 2010). The *"independent variables"* are those variables such as the state aid instruments that when deliberately manipulated it will give a desired result on the variables (Yazidu & Ashenafi, 2021). In addition, Zhang (2012) stated that "*dependent variables*" are those that are observed to change in response to change in another variable.

Table 2: Variables and their Description

Independent Variable	Description of Variables	Sources
State Aid Instruments: Direct Grants	Direct grants are usually issued to businesses in the form of cash payment from EU governments without any need for a payback to the government. Again, the Government provides tax breaks; direct contribution to SME's so as to offset operational cost and its usually referred to as a subsidy.	OECD (2022) EC (2020) Eurostat (2021) Banai et al., (2020) Bronzini & Piselli (2016) Podsiadło (2018) Yenni (2021) Polishchuk et al., (2020) Stokstad (2020) Mormann (2021)
Government guarantees	Mostly in the form of public guarantee to SME's as an intervention to unlock finance for them.	OECD (2022) EC (2020) Eurostat (2021) Yenni (2021)
Soft Loan	Issued to business enterprises with 0-249 employees and a total income of 59313308.03 EUR. This is usually issued	OECD (2022) EC (2020) Eurostat (2021) Bronzini & Piselli (2016)

	with no interest or very little interest rate to the receiving SME and always has an extended grace period that offers more leniency than the traditional loan scheme. Provides funds to SME's for enhancing their investment activity.	Johnstone (2006)
Output/dependent variables	Description	Sources
Innovation Performance: Product & service	SME's able to develop new product and services in order to meet the need of customers.	OECD (2022) EC (2020) Eurostat (2021) Podsiadło (2018) Bronzini & Piselli, (2016)
Patent	This has to do with SME's that are able to develop an intellectual property that is free from being copied by other businesses. It has to also do with the SME's ability to introduce new technological method that helps it to compete competitively and effectively meet the demands of customers.	OECD (2022) EC (2020) Eurostat (2021) Podsiadło (2018) Bronzini & Piselli (2016) Yenni (2021)
Control variables	Description of variables	Sources

Number of Researchers	This has to do with how research activities influence state aid and it is also about the cooperation of SME's in R&D towards the attainment of innovation performances.	Eurostat (2021) EC (2021) OECD (2022) Čučković & Vučković (2018)
Absorptive capacity	This has to do with the employees of the SME's intellectual abilities that help to make effective use of state aid toward the attainment of innovativeness.	Eurostat (2021) EC (2021) OECD (2021)
Size of SME	This has to do with the size of an SME and how it influences the SME's ability to acquire state aid towards innovation performance. This also deals with how much a business makes in a particular period as well as employees turnover within the SMEs.	Eurostat (2021) EC (2021) OECD (2021)

Source: Authors own creation

3.6 Data collection

In this study, secondary data would be collected from renowned websites such as the European Statistics (Eurostat), Organization of Economic Cooperation and Development (OECD), World Bank and the European Commission (EC). These international websites assist to build better policies for better life. Timeline for this research is the 2021/2022 academic year, the year range for the data collected is between 2007 and 2019 is due to available data series on the subject matter of the state aid instrument geared towards SME's

innovative performance enhancement. This does not suggest that data length should not extend between the two extremes but could be in between them (Babbie, 2010).

Furthermore, due to the unavailability of classified data based on the issuers of state aid such as regional aid which is offered in the regional level by a regional government, sectoral aid and aid from the EU member states. This study will only focus on aid provided by European Union to its member states in support of SME's innovativeness among member states.

3.7 Data Analysis

Data analysis would involve analyzing the gathered data for the purpose of drawing a logical conclusion and make beneficial impact to knowledge in a particular study area. For the purpose of this study, the gathered data would be analyzed using the quantitative analysis.

The regression method of analysis would be used to make predictions and draw conclusions on the way SME's innovation performance is enhanced in response to the level of state aid they receive at a particular point in time (Kump et al., 2019; Podsiado, 2018). Similarly, Zhang (2012) regression analysis should be use when conducting a study involving more than two variables. The regression method would enable the graphical representation of data for further analysis and conclusion to be done. The relationship between the dependent and independent variables would be described using descriptive statistics (Morgan, 2014). Its goal is to compile a list of observations about the data using tables, frequency distributions, percentages, mean, mode, as variance would be established using the SPSS data analysis tool (Mwangi, 2011). The study will use inferential statistics to describe individual variable reactions in order to arrive at final decision about the state aid impact on SME'S innovation performance. In addition, descriptive statistics would be used to quantitatively characterize the set of data understudy. This will be utilized to describe the features of selected variables in this study.

The formulae for the Regression Analysis that would be used during analysis (Arnas et al., 2021):

$$Y = \alpha + \beta X1 + \beta X2 + \beta X3 + \epsilon \quad (1)$$

Definition of the formulae:

Y : Innovation Performance

α : Constant

X_1, X_2, X_3: Instrument of aid (Independent variable)

β: Regression Coefficient

ϵ: Error

The figure below shows the conceptual framework developed from the research work.

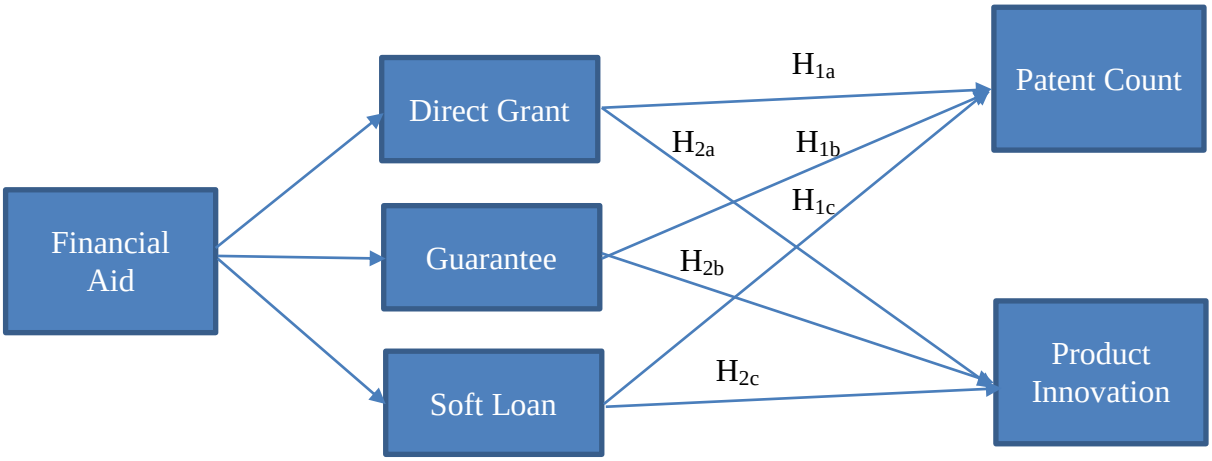

Figure 2: Conceptual Framework
Source: own creation

3.8 Limitation of the study

As every research is bond to face limitation towards it successful execution, this research is definitely not an exception. Therefore, it is necessary to mention the shortcomings' of the study. The research was faced with limited availability of data point for the selected countries which made it impossible for a comparative analysis to be conducted. Secondly, the non-availability of sufficient data for non-financial state aid limited the possibility of determining the effects of non-financial state aid of SMEs within the V4 member countries. Finally, the research could have covered all the EU member state but due to time constrain, the research only considered the V4 member countries and such results is only peculiar to these selected countries as well as selected variables.

4 DATA ANALYSIS AND DISCUSSION

The chapter demonstrates the practical aspect of the impact of state aid on firm's innovation performance within the "*visegrad"* countries (Czech Republic, Republic of Slovak, Hungary, and Poland). Here, the research questions regarding what the financial state aid instrument are? will be theoretically answered. Secondly, solutions would be provided to the research question on how financial state instrument affect the innovation performance of SMEs? among the "visegrad" states would be demonstrated by the use of regression analysis of chosen variables and practically establish their effects on patent and product innovation performance of SMEs.

The study also presents how significant the selected financial state aid instrument relates to SME's patent and product innovation performance among the V4 countries.

However, the study result was based on financial state aid instrument and its impact on patent count and product innovation performance of SMEs. This is due to the limited availability of data on non-financial state aid as well as limited time constraint.

The data collected for the variables was extracted from Eurostat, OECD and other relevant studies as would be seen in subsequent paragraphs. The range of data points is from the year 2000 to 2019 this range was considered because of the unavailability of more data on the other years. The regression analysis was done using MS Excel analysis tool in order to determine the effects of financial state aid instrument on patent count and product innovation performance of SMEs. This is done by the use of both regression and correlation analysis of the gathered data.

Table 3: Correlation Analysis among variables

	GDP	GUAR.	DRE.G	PATENT	PRO.	R AND D	RESE	SOFT L.	SIZE
GDP_	1	-0.1796790	0.07662218	-0.0306884	-0.0892565	-0.2426037	0.13122207	-0.3595919	-0.3535891
GUAR.	-0.1796790	1	-0.0963091	-0.3790423	-0.3153857	-0.0047741	-0.1567633	0.08062515	0.06702824
DRE. G.	0.07662218	-0.0963091	1	-0.3172889	-0.3395941	-0.2102511	0.11933493	0.16665373	-0.2104031
PATENT	-0.0306884	-0.3790423	-0.3172889	1	0.96459562	0.17364574	0.07429119	-0.0743987	-0.0160919
PRO.	-0.0892565	-0.3153857	-0.3395941	0.96459562	1	0.17720154	0.05131498	-0.0545810	-0.0501457
RANDD	-0.2426037	-0.0047741	-0.2102511	0.17364574	0.17720154	1	0.09013754	0.34700883	0.60977722
RESE.	0.13122207	-0.1567633	0.11933493	0.07429119	0.05131498	0.09013754	1	0.32169399	0.17334826
SOFT L.	-0.3595919	0.08062515	0.16665373	-0.0743987	-0.0545810	0.34700883	0.32169399	1	0.38713311
SIZE	-0.3535891	0.06702824	-0.2104031	-0.0160919	-0.0501457	0.60977722	0.17334826	0.38713311	1

Authors own calculation

From table 3: The correlation for selected variable demonstrates figures lower than 0.8 among all explanatory variables. This is an indication that the variables are free from multi-collinearity (Wooldridge, 1994; Daoud, 2017).

Table 4: Financial State Aid and Patent count Innovation

	coefficient	Std. error	t-statistics	Prob.
LOG Direct Grant	0.303157	0.180621	1.678418	0.1030*
LOG Guarantee	-0.083075	0.032616	-2.547099	0.0159**
LOG Soft Loan	-0.044873	0.037603	-1.193312	0.2415
Size	0.043022	0.062371	0.689778	0.4953
LOG GDP	-1.054213	0.267687	-3.938227	0.0004***
LOGRESEARCH	0.284740	0.154517	1.842776	0.0746*
Intercept	15.77791	3.333526	4.733099	0.0000***
R-squared	0.556295		Mean dep. Var.	8.056022
Adjusted R-squared	0.473100		S.D. dep Var.	0.499401
F-statistic	6.686667		Durbin-Watson Stat	1.713379
Prob(F-statistic)	0.000117			

Authors own calculation

Note on Legend: ** significant at p < 0.05, ** Significant at p < 0.10, *** significant at p < 0.001*

The results of the analysis as presented on Table 4 shows a significant F-statistic which is an indication that the regression model is significant at (6.686667). Thus, this result indicates that there is a significant relationship between the financial state aid instruments chosen and patent count innovation performance. The R-squared value indicates that 56% of the variation in patent count is explained by the regression model. The log of direct grant is positive and significant at (10%), which leads to the acceptance of **hypothesis H_{1a}** whilst log of guarantee is significant at (5%) but inversely related to patent count innovation performance supporting **hypothesis H_{1b}**. However, soft loans are not significantly related to patent count, which rejects **hypothesis H_{1c}**. The results also show that control variables such as log of GDP and the log of the number of researchers are significantly related to patent count innovation. However, size of firms does not explain variation in patent count innovation performance.

Table 5: Financial State Aid and Product Innovation

Authors Own calculation

Variable	coefficient	Std. error	t-statistics	Prob.
LOG Direct Grant	3645.947	1317.431	2.767467	0.0093***
LOG Guarantee	-449.2222	233.2636	-1.925814	0.0631*
LOG Soft Loan	-461.0281	271.9815	-1.695071	0.0998*
Size	-2243.232	446.3745	-5.025448	0.0000***
LOG GDP	-1.058590	0.099383	-10.65157	0.0000***
LOGRESEARCH	0.320780	0.032427	9.892424	0.0000***
Intercept	45306.45	3703.547	12.23326	0.0000***
R-squared	0.919257		Mean dep. Var.	10613.83
Adjusted R-squared	0.904118		S.D. dep Var.	8410.719
F-statistic	60.71988		Durbin-Watson Stat	1.020970
Prob(F-statistic)	0.000000			

Note on Legend: ** significant at p < 0.05, *** significant at p < 0.000*

From Table 5 the results of the data analysis present the relationship between financial state aid product innovation performances of SMEs. The finding of the study shows that the F-statistic is significant at (1%). This is an indication that the regression model is significant, and the explanatory variable jointly explains the variations in product innovation performance. The R-squared value indicates that (92%) of the variation in product innovation is explained by the regression model. Thus, the result of the study supports the assertion that, state financial aid affects product innovation performance of SMEs. Specifically, the log of direct grant is positive and significantly related to SME product innovation at (1%) significant level which leads to the acceptance of **hypothesis H_{2a}** whereas the log of guarantee is significant at (10%) but inversely related to product innovation of SMEs supporting

hypothesis H_{2b}. Log of Soft loans is significantly related to product innovation at (10%), which leads to the acceptance of **hypothesis H_{2c}** but has an **unexpected negative sign**. Control variables such as log of GDP and log of number of researchers are significant at (1%). However, whereas the log of GDP is unexpectedly negative the number of researchers is positive. The intercept of the model is also positive and significant at (1%), an indication that when all explanatory variables are equated to zero, the value of SME product innovation performance will be at (45306.45).

The regression results are summarized by the analytical framework as showed in the below figure.

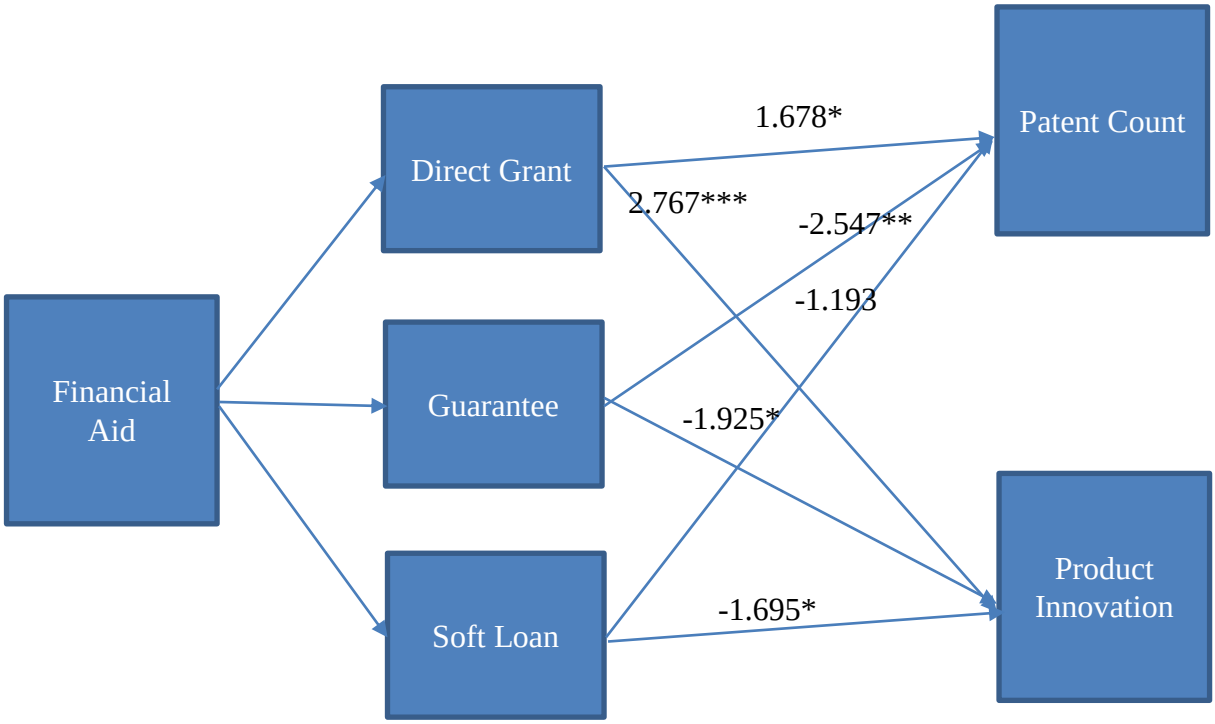

Figure 3: Analytical framework
Source: own creation

Table 6: Decision Matrix table

This table shows the decision matrix of the entire hypothesis tested in this research.

Hypothesis	**Decision**
H_{1a}: Direct grant has significant influence on patent count innovation performance of SMEs.	Supported
H_{1b}: Government guarantee has significant influence on patent count innovation performance of SMEs.	Supported
H_{1c}: Soft loan has a significant effect patent count innovation performance of SMEs.	Rejected
H_{2a}: Direct grant has a significant influence on product innovation performance of SMEs.	Supported
H_{2b}: Government guarantee has a significant influence on product innovation performance of SMEs.	Supported
H_{2c}: Government soft loan has a significant influence on product innovation performance of SMEs.	Supported

Source: Own creation

4.1 Discussions of results on financial state aid instruments

Base on the objectives outlines in the previous chapters, the following research hypothesis as outline also in the previous chapter would be tested.

1. What is the financial state aid methods use in boosting SME innovation performance?
2. How does the financial state aid method used affect innovation performance of SMEs'?

4.2 What is the financial state aid methods used in boosting SME innovation performance?

The study established that, instruments such as direct grants, government guarantees, and soft loans are financial state aid methods used among government of the V4 countries in order to achieve SMEs innovation performance. This study results demonstrates that financial state

aid instruments are presented to SMEs in support of their day-to-day operations towards innovation performance among the *V4* states.

The study result on first research question of *"identifying the financial state aid instrument"* have been found to include direct grant which supports the results from Price & Nicholson, (2019) and Priemus & Gruis, (2011). Thus, direct grant is a financial state aid instrument that is issued out by the government in order to enhance product and patent count innovation performance of SMEs in the *V4* countries. Again, direct grant in the V4 countries is in several form including individual funds that are directed towards specific needs of SME, regional grants as well as grants from the V4 member states. However, in the study result of other researcher's direct grant is demonstrated as an unsuitable form of financial state aid offered to businesses (example, Nicolaides, 2013 and Raitanen et al., 2013). The reason for their accession is that direct grant is distortive to competitions' among firms and mostly is directed towards inefficient enterprises resulting to a negative and an insignificant effect on firms' competitiveness.

The second financial state aid instrument is government guarantee which collaborate the research results of Primorac & Župančić, (2016) and Heald & Hodges, (2018). They asserted that government guarantee is a form of state aid because it enables the government to assist efficient SMEs in an event of production bottleneck. This demonstrates that guarantees are financial state aid instrument that supports SMEs innovation performance in the V4 member state. However, the study result of Gropp & Tonzer (2016) posits that government guarantee is not a suitable financial state aid instrument that should be used in enhancing the patent and product innovation performance of SMEs.

Lastly, the study also identified government soft loan as a financial state aid instrument affirming the findings of Mir-Artigues & Del Río, (2014). However, the study result of Nicolaides (2013) demonstrated that soft loan is an unsuitable financial state aid instrument. Finally, the results from this study on the first research question demonstrates that direct grant, government guarantee and soft loans are financial state aid instrument issued by governments that influences the patent and product innovation performance of SMEs (support the results from Martín-Domingo & Martín, 2022).

4.3 What are the effects of the financial state aid instruments on SME innovation performance?

The discussion on the effects of financial state aid instrument would be done in two-fold. Based on the findings as presented in the above tables, the discussion will focus on the effect of financial state aid instrument on patent count innovation and product innovation performance of SMEs within the V4 countries. Therefore, discussion of the results on table 1 will be done first and followed secondly with discussions on table 2 respectively. This is done in that order to facilitate simplicity in the discussion and make analysis clearer to future researchers.

- Financial state aid and patent count innovation performance.

The effect of direct grant on patent count innovation performance of SME aid is positive and significant supporting the results of Lawson, (2013), Kaplan & Vakili, (2015), and Ellis et al., (2020). This result demonstrates that direct grant has a very positive and significant influence on the patent count innovation performance of SME in the V4 countries. Interestingly, results from other study demonstrated a negative and insignificant relation between direct grant and patent count innovation performance of SMEs (example from the result of Lahr & Mina, 2016; Guellec & Van Pottelsberghe De La Potterie, 2003; Plank & Doblinger, 2018). They posited that, negative relation among direct grant and patent count usually arise when subsidies exceed 20% of R&D expenditure incurred for the purposes of enhancing firm innovation performance. The result of their study was as well influenced by the sample large sample size understudied. However, the result in this study demonstrates that direct grant has a positive and significant relation to patent count due to the sample size and also the influence direct grant has on patent count innovation of SMEs.

The effect of government guarantee on patent count innovation performance of SMEs is significant but inversely related to patent count. This results support the findings of Leng et al., (2022), Dechezleprêtre & Glachant, (2014), and Belenzon & Cioaca, (2021). The result of the study demonstrates that, government guarantee significantly influence SME's patent count innovation performance in the V4 member countries. However, it has been posited in the results of other study that there is an insignificant relation between patent count and government guarantee (example from the results of Li & Lin, 2016; Nelson et al., 2022; Xiao & Zhao, 2012). This demonstrates that, their finding is in contrast to the findings in this study and implies that while government guarantee has a positive effect on patent count innovation

of SME, it comes with negativity if not well controlled by the issuing agency and or mismanaged by the SME. Therefore, in order to effectively utilize guarantee, governments must ensure that efficient SME are their focus and monitored towards the desired outcomes.

However, the effects of soft loan on patent count innovation performance of SMEs are not significantly related. This finding is in consonant with that of Howell, (2017), Gu et al., (2017), and Xin et al., (2017). This implies that, a government soft loan directed at SMEs with the intention of enhancing their patent count innovation performance has a negligible effect on patent count innovation performance. However, the result of some other studies posits a positive and significant relation between patent count and soft loans (example from the study of Atanassov et al., 2007; Shahzad et al., 2021). Thus, making the number of patent pending positively related to the probability of obtaining funding. This demonstrates that the increased financial market has enhanced the SME application for patent in the recent years.

The results also show that control variables such as GDP and the number of researchers are significantly related to patent count innovation performance (this supports the results from the research of Elia et al., 2019; Li, 2009; Ascani & Gagliardi, 2015). Thereto, the size of firms does not explain variation in patent count (the study results as indicated supports the results from Noailly & Smeets, 2015; Hu & Jefferson, 2009). The result demonstrates that the size of firm does not explain the fluctuation rate in patent count innovation performance of SMEs.

Therefore, the result from this study as presented in table 1 above and subsequently explained indicates that there is a significant relationship between financial state aid and patent count (the results support the findings from the study of Czarnitzki, 2006). However, Dang & Motohashi (2015) indicated that there is a lag effect in the relationship between financial state aid and SMEs patent count innovation performance.

- Financial state aid and product innovation performance

The result of the study asserts the effect of state aid instrument on product innovation performance of SMEs. The analysis demonstrated that direct grant is positive and significantly related to SME product innovation performance at a very significant level which supports result from (Bourreau et al., 2020; De Jong & Vermeulen, 2006; Yenni, 2021; Polishchuk et al., 2020). This means that direct grant provided to SMEs helps in boosting their product innovation performance. Thus, the result of this analysis on direct grant is attained to be positive and significantly related to product innovation performance of SMEs. However, other study's noted a negative and an insignificant relation between direct grant and

product innovation performance of SMEs (for example the results from Bérubé & Mohnen, 2009; Petrin, 2018; Hou et al., 2019). Most of these previous studies employed methods such as simple linear regression analysis and correlation analysis in arriving at the finding that, direct grant is distortive to competitions' due to its keen alignment to inefficient enterprises whiles neglecting more efficient firms. These result to a negative and an insignificant effect on competition among enterprises. However, this study asserts that, direct grant is positive and significant to product innovation performance of firms in the V4 member countries because the governments have realized the importance of supporting SMEs by providing them adequate funds in order to enhance their operations.

The effect of government guarantee as a financial state aid on product innovation performance of SME is realized to be significant and inversely relates to product innovation of SMEs. The significance of government guarantee as established in table 2 supports the results of Bonner & McGuinness (2007), whereas the inverse relationship of government guarantee to SMEs product innovation performance supports the results from Brancati (2015). However, the findings from other research noted an insignificant and negative relation between government guarantee and product innovation performance of SMEs (example from the results of Mercan & Goktas, 2011; Asongu et al., 2018).

The effect of government soft loan on product innovation performance of SMEs is found to be significant though with an unexpectedly negative sign (supports the results from Moro et al., 2013; Cotugno et al., 2013; Brancati, 2015). It is evident from their research as supported by this latest finding that government soft loan though significant but has an unexpected negative sign. However, the result from the study of Imoughele, (2014) posits an insignificant but a positive relation between soft loan and product innovation performance of SMEs.

The Control variables such as GDP and number of researchers are significant (supports the result from Hasan & Tucci, 2010). Therefore, demonstrate that the percentage of the country's GDP and also number of researchers involved in doing research will determine product innovation performance of SMEs. However, other research opined that, GDP is negative and insignificant in determining the product innovation performance (example from the study results of Headey & Hodge, 2009; Kisman, 2017). Again, the number of researchers demonstrates a positive relation to product innovation performance of SMEs (example from the research results of López-Mielgo et al., 2009; Drechsler et al., 2013).

Interestingly, study results from other research demonstrate that state financial aid does not have any significant influence on product innovation performance of SMEs (example from the research results of Ambroziak, 2016; Racolța & Dragos, 2019). The result of their study demonstrates a negative relationship among state financial aid instruments and product innovation performance of SMEs due to the rules governing state financial aid as well as several restrictions it comes with. These according to them pose a negative relation between state aid and product innovation performance of SMEs. However, the study result from this study contradicts their finding because state financial aid is well controlled in its disbursement to SME within the V4 member state which is evident in their general efficiency and effectiveness in operation.

Finally, the result from the analysis demonstrates positive and significant relation among financial state aid and product innovation performance of SMEs (supports the results from von Wendland, 2015; Kubera, 2016; Tudor, 2010). This is an indication that when all financial state aid instruments are applied at the right time, and to the right course of action and quantum, the product innovation performance of SMEs among the V4 countries would be significantly influenced.

5 CONCLUSIONS AND RECOMMENDATION

These chapters briefly summarizes the results of the research work, important findings from the review of literature and recommend a more effective course of action that can be taking by the government, policy maker and SMEs in order to ensure innovation performance within the V4 member state.

5.1 Conclusion

The study results demonstrated that government of the V4 countries provides financial aid to SMEs in order to enhance their innovation performance within the various regions and in the international market. This financial aid is mostly provided to SMEs in order to ensure efficiency and effectiveness while ensuring equity among SMEs within the V4 member countries.

Secondly, the study concludes that, financial state aid instrument such as direct grant, government guarantee and soft loans are all suitable financial aid in actively existing and operationalized within the V4 member countries. This is evident in the results as presented in the previous chapter.

Furthermore, the study concludes that, financial state aid instruments such as direct grant, government guarantee and soft loans has a positive effect and are significantly related to product and patent count innovation performance of SMEs in the V4 member countries. However, the study examined demonstrated a negative effect of soft loan to patent count innovation performance of SMEs within the V4 member countries.

Again, the research realized that financial state support has the tendency to inflict negative effect on the innovation performance of SMEs, especially if the SMEs receiving the support among the V4 member countries are a less efficient one while neglecting the very efficient firms. The ripple effect of this situation balls down to the customers and the states at large.

Finally, the study also concludes that state aid objective on policy control is to reduce and eliminate the adverse effects wrongful application of state aid may pose to the performance of SMEs within the V4 member countries. However, the insufficient availability of data for the V4 member countries made it impossible for a comparative analysis to be conducted.

5.2 Recommendation

With reference to the main aim of this research being to examine how national governments in the V4 member countries use a variety of state financial aid (both financial and non-financial) to boost SME innovation performance. The objectives such as identifying state financial aid instruments use in boosting SME innovation, determining the effects of the financial and non-financial instruments on SME innovation performance, and recommending methods of improving SME innovation performance were formulated.

Base on the objectives formulated, the following research questions such as what is the state financial aid methods use in boosting SME innovation performance, how does the financial and non-financial method used affect innovation performance of SMEs'? And how can innovations performance of SMEs be improved were tested?

Here the study makes recommendation on how the innovation performance of SME can be improved. This is made based on the results of the study, thus below are the suggested recommendation that can be used in improving SME innovation performance in the V4 member countries.

- Policymakers should ensure that state aid control policies are put in active operation in order to ensure that SMEs within the V4 member state are effective in attaining innovation performance. Thus, the V4 member state should be guided by effective policies of financial and non-financial state aid in order to achieve a more efficient design and implementation of financial and non-financial state aid schemes among SMEs of the V4 member countries.

- The governments of the V4 member state must ensure the formation of an effective monitoring and evaluation team. This team should be tasked with the responsibility of ensuring that financial state aid is effectively disbursed to the right beneficiaries and in the right among. And also ensure that, state provided aids are used only for their intended purposes so as to achieve the desired results.

- The amount of financial state aid should be increased in order to make proactive provisions for unforeseen situation such as the advent of OCVID-19 and its effects on SMEs. Again, state aid funds must be directed more towards efficient SMEs instead of inefficient ones so as to facilitate their effectiveness in the attainment of innovation performance among the V4 member countries.

- SMEs must be educated to ensure the effective utilization of state financial aid and the consequences' of diverting the funds for different purposes than what it was originally intended for.

- Finally, SMEs should ensure that received state aid must be used for its intended purpose so that the desired results would be achieved. Thus, aid received by an SME either in cash or kind should not be diverted and must be used only for the purpose it was intended for, failure to do so should be liable to an offence of either paying back the received aid or facing a sanction equivalent to the offence as maybe deemed appropriate by the committee.

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