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ANALYSIS OF THE INNOVATION SYSTEM IN SERBIA FROM A PUBLIC POLICY PERSPECTIVE

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Abstract

The capacity to generate innovation is considered paramount for long-term sustainability of economic development. Given that the nature of innovation creation is collective and dependent on multiple actors and their interaction, the concept of national innovation system (NIS) is a modern approach to public policy that is based on the transformational character of innovation. Innovation policy is particularly significant in emerging and developing economies that lack the necessary market capacity to generate adequate innovation incentives automatically. This paper is focused on the assessment of the key dimensions of the innovation system in Serbia through analysis of the main innovation policy activities. Based on comprehensive data on the activities of the Innovation Fund of Serbia, we conduct an elaborate analysis of the main dimensions and facets of the innovation policy activities in Serbia. Based on this analysis, prominent trends and structural characteristics of the Serbian innovation ecosystem are outlined and interpreted. Finally, we offer several proposals in the area of innovation policy which may address the present weaknesses identified by our analysis..

Key words: *innovation, public policy, innovation policy, Innovation Fund of Serbia.*

1. Introduction

Innovations and innovation-generating research is considered paramount to achieving sustainable economic growth (Romer, 1990). Given that innovation output and novel ideas and knowledge underlying it possess the elements of a typical positive externality, the so-called 'spillover' effects often appear concerning innovation, i.e. the original proprietor of the idea is rarely able to fully capture the complete benefits generated by it, while at the same time innovation surplus is freely captured by the third persons without any reimbursement for the original inventor. Positive externalities ultimately lead to appropriability problems (Nelson,

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1959; Arrow, 1962), which in turn hamper investment in research due to reduced private incentives, thus creating a market failure in the domain of private investment in research and innovative technologies. Prominent public good characteristics, primarily non-excludability (Samuelson, 1954) and the 'free-rider' problem that arise in connection with innovations lead to market failure in terms of financing these activities by economic agents. The stance about the necessity of public intervention in the domain of innovation policy is based on the arguments of market failure in connection with inadequate private incentives to finance innovative activities (Arrow, 1962). Public intervention is deemed as necessary due to positive externalities and spillover effects which cause appropriability problems for original innovators with regards to the innovation surplus, and consequently lead to a suboptimal level of private investment in innovative activities. The role of public policies has long been confined to amelioration of market failures and raising the level of investment in innovation to a socially efficient level in the absence of market incentives. At first, the market failure argument was the dominant rationale for government intervention in the field of innovation by shaping an active research-oriented innovation policy to alleviate market shortcomings (Lewandowska et al., 2022). Predominant model of innovation policy was broadly based on 2 pillars: government spending on research and science due to shortage of private investment; and amplifying incentives for the private sector to engage in R&D investment, directly (by way of providing subsidies) and by strengthening the (intellectual) property rights regime (Ivanovic, 2023). By and large, innovation policy was seen in narrow interventionist terms as merely a means of addressing the gap between insufficient private investment and the socially optimal/desired level of funding dedicated to research and innovation. Following the widespread stagflation in 1970s and subsequent economic crises that lasted into the next decade and led to the breakdown of the until-then prevailing development paradigm, a new concept of competitiveness of national economies centred around innovation and collective learning emerged at the end of 1980s. The construct of national innovation system (NIS) denotes the interaction and interdependence between technological and institutional development, and includes all parts and facets of the economic structure and the relevant institutional environment which influences learning processes and innovation performance (Johnson & Lundvall, 2013). The notion of NIS first appeared in the works of Freeman, whereby he considered NIS as 'the network of institutions in the public and private sectors whose activities and interactions initiate, import and diffuse new technologies' (Freeman, 1987, from Edquist & Chaminade, 2006). From this follows that innovations do not emerge in isolation but rather through a process of continuous interaction between the innovator and the environment, thus implying that production structures and institutional background are equally important dimensions whose interaction defines the national innovation system (Lundvall, 1992). On the other hand, a more narrow approach to NIS can be found in Nelson (1993), who stresses the importance of a nation's R&D capacities and organisations which are crucial in the process of creation and diffusion of innovation. However, a more comprehensive notion of NIS puts emphasis on the fact that these organisations are embedded within a broader

network of socio-economic structures in which the direction and intensity of innovation is influenced by a host of external (political, cultural, social) forces and public policies (Freeman, 2002).

The strategic role of public policies is especially important for developing economies which are in the process of building innovation capacity and stimulating private investment in innovation (largely in absence of adequate market incentives), in order to overcome the development gap by expanding the technological and production possibilities frontier. In addition, specific challenges in the process of development of the innovation system and building of innovation capacity in small countries lies in numerous limitations that are posed by various factors: institutional deficiencies and uncertainty of 'rules of the game', specific level of development of the economic structure that influences needs, strategies and priorities in the development of the innovation system, international circumstances and the global position of the economy (which determines the degree of dependence on advanced systems and globally available resources for innovation development), available domestic potential for commercialisation of knowledge and new ideas, and regulatory framework (Ivanovic & Simic, 2024). According to North (1990), a precisely defined and consistently enforced regime of property rights is the single most important factor for encouraging investment, innovation and efficient resource allocation. Secure property rights are the connection between investment and the resulting benefits that investment generates, in terms that property rights provide the basis for proprietors to claim ownership of the yields stemming from the initially undertaken investment. If property rights are protected and free from political interference then investors face reduced risk and uncertainty over their ability to fully capture the results of their investment, and in that way secure property rights directly contribute to rectifying the appropriability problem related to innovation. Another important consideration that inhibits investment and infringes upon intellectual property rights is corruption. Widespread corruption (both in its petty and political forms) inhibits innovation through undermining enforcement of IP laws and regulations, erodes public confidence in institutions and rule of law and creates artificial barriers for innovators in the domain of registration and enforcement of IP laws through lack of transparency and legal uncertainty, thus making it difficult for businesses to navigate such unpredictable environment (Huang & Yuan, 2021). Both property rights uncertainty and corruption therefore substantially hinder innovation and amplify inherent uncertainty and risk contained in innovation that reduce innovators' incentives.

Taking into account the path dependence of the innovation system and its reliance upon the existing institutional infrastructure, as well as the failure of the market to automatically generate necessary incentives for the development of an efficient innovation system, for countries like Serbia that lag behind developed economies in terms of innovation performance, effective public policies are of paramount importance for the establishment and development of innovation capacity and supporting infrastructure. This imperative stands out particularly in the domain of defining and implementing appropriate public policies to support the construction and development of the innovation system, owing to the fact that

multiple critical elements of the innovation system generated by the market do not necessarily have adequate conditions to automatically emerge in developing economies. Therefore, developing countries as a rule necessarily require public support in the form of effective policies aimed at fostering development of an efficient innovation system.

This paper provides a comprehensive overview of innovation policy in Serbia by conducting a detailed analysis of the activities of the Innovation Fund. We aim to capture the principal dimensions, dominant structural trends and key characteristics of the innovation landscape in Serbia, thus providing a unique perspective on how public policy navigates the challenge of shaping an efficient system for fostering innovation, while addressing the obstacles in the form of resource availability, inherited (and increasingly anachronistic) institutional structures and the imperative to catch up, development-wise, and remain competitive in a complex and increasingly globalised environment.

Institutional foundations of innovation policy in Serbia

The adoption of the Smart Specialisation Strategy in Serbia (4S) in 2020 established a comprehensive platform for innovation policy which 'involves the efforts of policy-makers, business sector, academia, research community and other stakeholders with the aim of increasing the competitiveness of the economy, economic growth and progress of the society through connecting research, industrial and innovation forces with a limited number of priority economic areas' (Smart Specialisation Strategy of Serbia, 2020). By concentrating efforts and allocating resources to only those sectors deemed a priority, i.e. most competitive and with the highest potential for successful innovation development, 4S contributes to streamlining the resource allocation and improving overall efficiency and productivity of scarce domestic resources, while simultaneously increasing resilience and diversification of the Serbian economy. The 4S defines four priority areas to which policy measures and resources allocation should be targeted: food for the future, ICT, future machines and manufacturing processes and creative industries (Smart Specialisation Strategy of Serbia, 2020). The choice of innovation priorities resulted from entrepreneurial discovery process in which a thorough analysis of available resources and domestic capacities, as well as the future prospects for growth and development based on knowledge and innovation was carried out in the form of a widespread social dialogue involving key stakeholders within the national innovation system (businesses, science and research sector, academia, policy-makers and civil society experts). As such, the final Strategy can be interpreted as not merely another administrative and regulatory framework imposed unilaterally by policy-makers but rather as a more organic and evolutionary bottom-up approach to policy-making that engages various stakeholders and joins their respective expertise and interests in the process of informing and formulating national innovation policy (Estensoro & Larrea, 2023). Taking into account the fragmented structure of Serbian businesses and distinctive lack of cooperation between relevant sectors, implementation of the

entrepreneurial discovery process in itself is an important step forward in the direction of increasing cooperation and synergy within the national innovation system. Another significant potential benefit is the fact that increased stakeholder involvement in policy formulation reduces the risk of policy failures as it boosts transparency and mitigates the available room for rent seeking and regulatory capture by interest groups. However, the implementation of 4S in Serbia diminishes some of the benefits of the entrepreneurial discovery process, given that the strategy was operationalised only on a national level, as opposed to the regional (NUTS 2) approach (Radonjic, 2022).

Given that the regional level is institutionally seldom developed, smart specialisation can be seen as a 'leapfrogging' strategy, i.e. it could provide the necessary catalyst for establishing the missing institutional structures and regional capacities. That way, the region-specific specialisation would initiate bigger inter-regional cooperation and develop regional innovation potentials in a bottom-up manner that would engage local stakeholders with vested interests and the best knowledge of each region's specific needs, priorities and opportunities for development. As it stands, however, the choice of centralised smart specialisation, rather than regional, reflects prioritisation of more immediate concerns (catching up with developed economies) and benefits of a top-down approach for resource mobilisation and targeted allocation over the comparatively more distant and less immediately tangible benefits of establishing a regional perspective in the context of building domestic innovation capacity. Additional possible interpretation involves treating smart specialisation strategy as purely an administrative framework and a formality necessary to facilitate access to the EU funding schemes, thus implying the failure of national government and political elites to fundamentally understand the essence of what 4S is and its role in the national innovation system (National Convention on the EU, 2023). A bureaucratic approach to smart specialisation is not specific to Serbia, given that certain regions of the EU opted for a similarly technocratic perspective (Laranja et al. 2020), which can be attributed to the quality of the intermediary institutions and the ability of policy-makers to engage wider community and sustain stakeholder engagement in the process of development and implementation of the strategy (Cvijanovic et al., 2020; Muur, 2022). Moreover, the observed heterogeneity of experiences of certain EU regions with respect to smart specialisation suggests that there is no universal approach to smart specialisation that is guaranteed to succeed. According to Aranguren et al. (2019) regional structures and mechanisms exhibit strong impacts of path dependence which condition the way in which smart specialisation is implemented. Similarly, smart specialisation impacts are shown to build upon and reinforce existing regional agglomeration and cluster effects (Foray et al., 2021) and therefore tend to perform better in regions with pre-existing networks of innovation resources and infrastructure in place. On the other hand, there are countries that have managed to facilitate a sustainable concept of fostering regional cooperation and innovation synergy through smart specialisation (Kangas & Ryyanen, 2022) , and in some cases (like Romania) did so despite lack of appropriate institutional support on a regional level (Perianez Forte et al., 2016). There are also countries

(like Estonia and fellow Baltic states) that have, due to their size, implemented the national model akin to one used in Serbia and managed to perform successfully in terms of building innovation-based competitive advantages and to achieve certain degree of convergence (in terms of innovation performance) with more successful countries (Muur, 2022).

According to Radonjic (2022), the process of formulating 4S in Serbia involved both regional and national-level approaches, particularly in regards to identifying the 4 priority areas which relied on entrepreneurial discovery and engaged relevant stakeholders in the process of identifying and assessing economic, creative and innovation capabilities of specific regions. Present regional inequalities in terms of economic strength and capacity for development based on knowledge and innovation posed a major hurdle to region-specific implementation of the Strategy, which ultimately resulted in the decision to develop regional competencies and innovation capacities through an integrated centralised approach. In absence of relevant institutional capacity on a regional scale and with considerable inequalities in economic power and resource capacity between different regions of Serbia, advantages of a national approach to smart specialisation ultimately prevailed over regional aspects and distributional concerns. In a centralised structure of NIS the bulk of innovation policy activities are organised through one central institution - The Innovation Fund of Serbia (IF). Its primary purpose is to provide specialised support and manage public funds and other financial resources for promoting innovative projects and adjacent activities. After coming under the umbrella of the new policy paradigm defined by 4S which entails holistic approach to innovation from a systematic perspective, the Innovation Fund's programs were reconfigured to address the imperative defined by 4S and encourage development of the chosen strategic areas. Presently, the IF comprises the following programs: Mini Grants, Matching Grants, Collaborative Grant Scheme, Katapult, Smart Start, Technology Transfer, Innovation Vouchers, Serbia Ventures, Serbia Ventures - Biotech, GovTech and Regional Start-up Centre Capacity Building, and Proof of Concept (which has since transferred to the Science Fund) and a special one-off COVID-19 program (Innovation Fund of Serbia, 2024).

2. Assessment of key dimensions in Serbian innovation system - analysis of Innovation Fund activities

The distribution of approved projects across available IF programs indicates that the largest share of all supported projects is taken by the Innovation Vouchers program, followed by Mini Grants in a distant second place and Proof of Concept in third position. The dominant position of the Innovation Vouchers is not surprising given the short time frame of realisation (6 months), relatively low amount of funding provided by the program and the degree of flexibility that is afforded to recipient firms with regards to the use of funds. Additionally, the popularity of the voucher scheme signals the need (and willingness to seek) on behalf of innovative firms for expert advice and scientific support from academia in the process of developing and implementing commercial innovation, suggesting the existence of

significant benefits and potentials for further collaboration between the two innovation pillars. Moreover, the non-predetermined nature of the voucher system with regard to concrete services to be obtained from research institutions goes a long way toward ensuring the widespread scope of availability and access to the program for as many beneficiaries as possible, irrespective of their prior capacity to assess their own specific needs and particular modes of service befitting their project. The 'catch-all' blanket concept does not condition the support on the ability of applicants to accurately specify beforehand the exact knowledge or service they seek to employ, and instead relies on the market mechanisms to determine the best fit for each individual project. Put differently, vouchers provide the necessary funding, but the choice of the exact service and its provider is left to the recipient, thus rendering them more flexible in terms of exploring and choosing between the available options. On the other hand, the Mini Grants program provides financial support for establishing innovative start-ups and supplying novel solutions on the market, and its position in the distribution of IF projects demonstrates the importance and general lack of financial resources available to start-up entrepreneurs. This fact is underlined by the number of applications submitted in this program, which is substantially higher than any other program under the IF umbrella, suggesting the overwhelming need for public funding in the start-up community. Financial assistance is essential during the critical phase of initial funding that is necessarily expense-heavy and therefore requires the financial capacity to operate at a loss on the expectation of future returns once the innovation takes off and begins accruing revenue, something that very few start-ups can afford on their own or through traditional investment channels.

Proof of Concept is the most commonly used program out of the research and scientific-oriented cluster of projects. Its purpose is to provide the necessary funding to researchers in order to conduct the assessment of practical applications and commercial viability of their scientific research. The number of approved applications through this IF scheme points to the extent of existing potential for practical innovation that originates from scientific research. Put differently, it implies the availability of research resources within Serbian academic institutions that can be feasibly transformed into novel practical solutions that are commercially successful, and that there are sufficient innovation capacities to enable that process. Furthermore, the widespread use of the program funds suggests that the consciousness of the fact that innovative potential and scientific capacity of Serbian research institutions can be commercially exploited is recognised as a significant driver of economic innovation. Such recognition on behalf of policy-makers is essential, particularly in the context of the fact that bulk of the SMEs in Serbia perceive public institutions governing the innovation policy as the most important actor within the innovation ecosystem (Djuricin & Beraha, 2021).

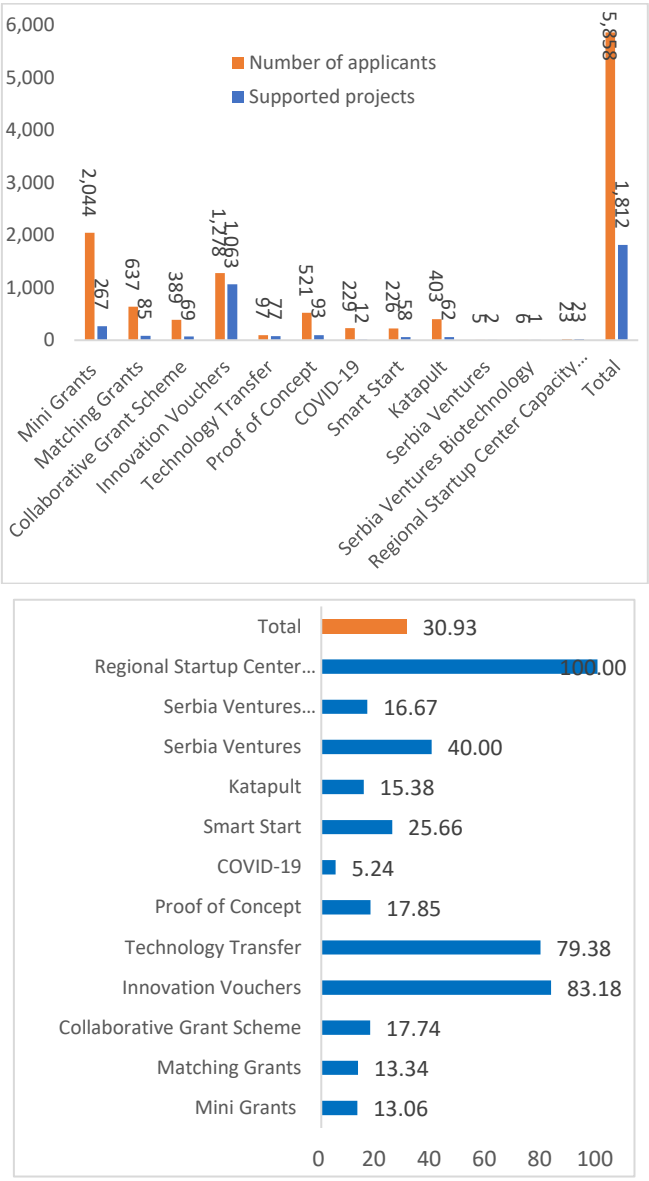

Figure 1. Number of submitted and approved projects across IF programs and Project approval rate (%) per IF program, until 2024

Collaborative Grant Scheme and Matching Grants are 2 of the most widely used programs which promote closer collaboration and interaction between research centres and business innovators, apart from the Innovation Vouchers. Unlike the voucher-based scheme, these 2 IF programs directly provide financial support and assistance to businesses and scientific research organisations in the

process of developing joint venture projects aimed at creating commercially feasible innovative products and services, and co-fund commercialisation of business R&D initiatives and activities (Innovation Fund of Serbia, 2024). Therefore, they support a more direct, all-encompassing and long-standing type of collaboration between the science sector and businesses in the process of conceiving and developing commercial innovation. Relative lagging behind the Innovation Voucher program in terms of the number of approved applications indicates that the dominant form of cooperation between the academia and industry is mainly based on the more consultative approach and application of scientific expertise in the process of commercialisation of pre-conceived innovative solutions, rather than integrating the knowledge capacities in the process of collaborative research and development of innovation. Similarly, Technology Transfer is a science and research-oriented program that trails the related Proof of Concept scheme of financing research projects. Given that both programs cater to the same target group and aim to increase researchers' capacity and efficiency in the field of commercial development and application of scientific knowledge and results, the observed discrepancy between the number of approved projects may be evocative of two possible reasons. For one, it can indicate that willingness of research institutions to fully engage in commercialisation of their inventions is limited. However, based on the fact that there is a demand for commercial assessment of research through the Proof of Concept program, another explanation is that there is insufficient capacity or missing entrepreneurial drive in the research community to make the transition from theoretical concept into tangible innovation ready for commercial deployment, which further emphasises the importance of stimulating cooperation between the scientific and commercial sectors in order to facilitate integrated development of innovation.

Besides the absolute numbers of funded projects and their program-wise distribution, another important marker of the dynamics in the Serbian innovation system that can be assessed from IF's activities is the level of competition and efficiency of individual innovative initiatives. These aspects can be explored through analysis of acceptance rate per specific IF programs, which demonstrates the intensity of competition for particular programs' support, and the extent to which individual submissions manage to succeed in meeting the selection criteria necessary to obtain the funding through IF. Overall, IF has so far supported 1.812 projects out of 5.858 applications across all program platforms, amounting to a total approval rate of 31 %. The success rate indicates that nearly a third of submitted project applications managed to obtain funding from IF, while over two thirds of applications were rejected. The interpretation of the performance rate can be twofold. First, the fact that only one third of submissions were evaluated positively and were granted funding suggests that innovation capacities of applicants are limited and therefore unable to meet the performance standards outlined in program requirements. Additionally, the level of interest in financial support provided by IF testifies to the comparative shortage of available funds elsewhere which consequently leads to over-reliance on public resources, thus indicating the under-development of financial markets geared towards innovation and reinforcing

the critical role of public policy in that context. However, the suboptimal rate of positive outcomes may also indicate that the Innovation Fund applies a rigorous and diligent evaluation process that only selects those projects that unequivocally fulfil the required criteria for funding, which minimises resource waste and ensures that the IF's funds are allocated to according to their most effective uses. On the other hand, the 31 % approval rate can be seen as a positive indicator of the vibrancy that exists within the innovation ecosystem. From that standpoint, tough competition for IF funds demonstrates the existence of widespread interest in innovative activities in firms and entrepreneurs, awareness of their innovation potentials and the critical role of innovation in their survival and development. Furthermore, it can be argued that, irrespective of the actual outcome, the act of participation in IF's programs in itself has merits in terms of improving participants' innovation capacity. The rationale behind this argument is the fact that exposure to fierce competition during the application process forces the participating parties on its own to assume a learning trajectory and acquire additional knowledge and resources, improve their skills and aptitude for generating knowledge and innovation. That way, even if the funding is not obtained, the participants still receive intangible benefits from the process which ultimately increases their overall internal capacity for innovation, and can be considered as a form of behavioural additionality (positive change in innovation skills and behaviour of firms) as a result.

Further insights can be gained by examining approval rates per individual program. In that respect, two programs in particular stand out from the rest of the IF portfolio by the above-average margin of success - Innovation Vouchers and Technology Transfer (besides the Regional Start-up Centre program, which is by definition 100%, as it is an intra-institutional program that builds government capacities) . The success rate of Innovation Vouchers is especially remarkable given the popularity of the scheme and the number of applicants that exceeds all other IF programs combined (except the Mini Grants). High demand for vouchers indicates that there are significant benefits in cooperation between businesses and academia as well as the necessary incentives for enterprises to seek support from IF, while the degree of successful applications implies that there are sufficient capacities to capitalise on the aforementioned advantages. Success of the voucher scheme points to the fact that entrepreneurs recognise the value of scientific research and expertise in the process of conversion of innovative ideas into tangible products, thus demonstrating the raising awareness of integration into dense innovation networks as means of supplementing own resource or capacity shortages. Even more significant, however, is the extraordinarily high percentage of approved projects in the Technology Transfer program. Taking into account that this program is targeted at the scientific community and supports commercialisation of research conceived in academic institutions, the 80 % success rate can be attributed to the high quality of submitted research projects and their prospects for commercial success, thus indicating the existence of a high-performing academic research sector with significant own capacity for innovation. Moreover, a strong rise in submissions corresponding to the discontinuation of the Proof of Concept program may demonstrate the ability of the scientific sector to seamlessly transition from the

testing phase into a fully integrated process of innovation development from research to commercialisation. This further suggests that there is an important resource base within the scientific sector in Serbia that is adequately equipped with sufficient internal capacity for generating knowledge and fully developing innovative solutions.

On the other hand, despite outperforming in terms of the strong rate of success, there is still a comparatively low number of applications relative to other IF platforms, which translates to lower level of overall interest in this particular program. Given the apparently high degree of internal capacity for innovation in the scientific sector, lower interest for IF programs can be attributed to the existence of alternative sources of funding available to and used by innovative researchers which implies that this particular part of the innovation ecosystem in Serbia is less dependent on public support in the process of innovation development, especially in comparison with start-up entrepreneurs and SMEs. Furthermore, it may signal the imbalance of innovation capacities between the business and research sectors in favour of the scientific community (an assumption that is corroborated by the fact that 2 of the most popular IF platforms cater to both business and academia and support their interaction), which further underlines the importance of facilitating collaboration between the two parts of the innovation system in order to improve overall innovation performance. Additionally, this may point to the fact that there is a substantial part of the scientific community that is innovation-active and self-sufficient to the extent of being largely independent in their innovative endeavours, and thus out of reach of the innovation policy, which reduces the potential for knowledge sharing through collaboration with other actors within the system that would otherwise be possible.

Another valuable aspect of the analysis is regional (NUTS 2) distribution of projects funded by IF, which gives an approximate estimate of the degree of concentration of innovation resources and regional capacity for developing innovative projects. Put differently, the regional analysis offers useful insights in terms of which regions are drivers of innovation performance on a national level. According to IF's data, the overwhelming majority (over 50 %) of projects approved for funding per each program are located in the Belgrade region. The biggest regional asymmetry in favour of Belgrade is recorded in the Proof of Concept and Technology Transfer programs, indicating that potential for commercial innovation supported by the IF is best recognised by the research entities based in the Belgrade region compared to the rest of the country. This fact further suggests that research activities and capacity for commercial development of innovation in academic institutions are disproportionately concentrated in the capital city. Additionally, the Belgrade- centric distribution of IF's funds aimed at supporting commercial development of scientific innovation is evocative of the awareness of the innovative potential in research organisations located in the capital, and of their integration in innovation networks, which makes the Belgrade based research hub the most active scientific part of the national innovation ecosystem. Given that every macro region in Serbia have their own university centres, the dominant position of Belgrade serves as an indication of the lack or insufficient degree of recognition for benefits

of commercial innovation and corresponding potential for their development in the academic sector outside of the capital city. Similar discrepancy in performance between Belgrade and the rest of the regions in Serbia is apparent from other IF programs as well, although to a lesser extent than in the case of the science-oriented platforms. For instance, in the Smart Start and Mini Grants programs there is also an imbalance in favour of start-ups from the Belgrade region, which account for almost three quarters of successful applicants. This implies that, analogous to resource disparity in the scientific sector, potentials for emergence of novel ideas and capacities for their development and market commercialisation through establishing of start-up companies are substantially clustered within the region of Belgrade. Additionally, significant lag in the number of supported start-up businesses registered in regions other than Belgrade may also be indicative of the comparatively low capacity for establishing start-ups and weak(er) entrepreneurial culture in general.

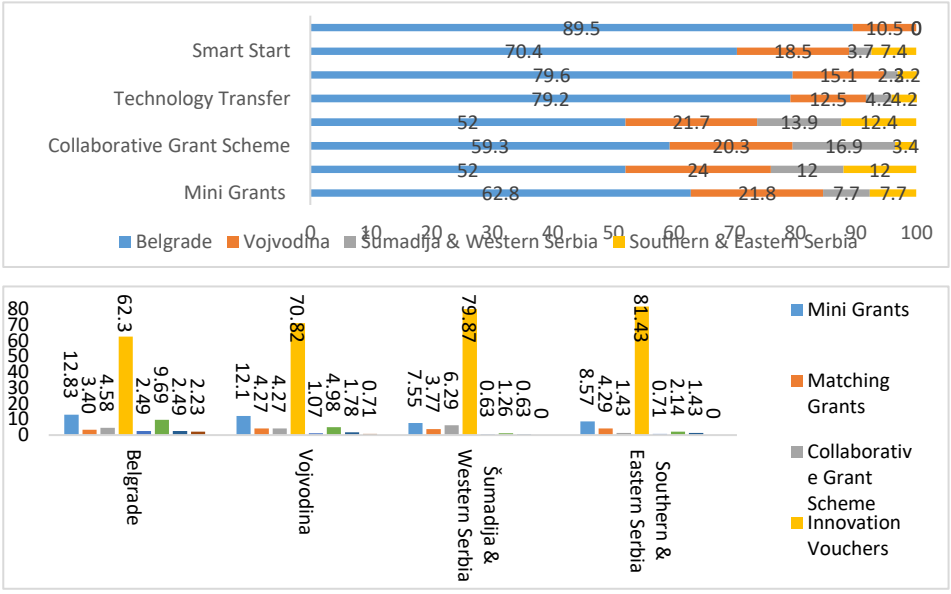

Figure 2. Regional distribution (%) of approved projects per SF program and Share (%) of programs in the structure of approved projects across regions, until 2021

Another example of unequal distribution of innovation resources and capacities can be seen in the dominance of Belgrade enterprises in the structure of funded projects through the Matching Grants scheme, which demonstrates that innovation capacities in the private sector are equally concentrated as is the case in the research organisations. Furthermore, owing to the fact that this program supports innovative businesses in the process of commercialisation of their own research projects, it can be argued that private companies located in the capital possess substantially greater capacity to develop their own innovation in a self-

sufficient manner and relying upon internal resources than it is the case for firms in other regions.

Representation of certain programs in the structure of approved projects in different NUTS-2 level regions is important for mapping regional trajectories and dominant mechanisms of development of the innovation ecosystem, and to assess the degree to which the IF support for innovative projects coincides with regional-specific competitive advantages and development levels of regional innovation capacities. In that regard, it is evident that the Innovation Vouchers program is the most frequently utilised IF platform in all 4 macro regions of Serbia. However, the extent of the program's prominence varies across the regions, with the biggest share of the Vouchers being recorded in the Šumadija and Western Serbia and Southern and Eastern Serbia regions respectively, which illustrates that these 2 regions disproportionately rely on the short term programs compared to other available IF venues. Conversely, in the Belgrade and Vojvodina regions the voucher system is comparatively less represented in the overall structure of IF funded projects and the Mini Grants program is more prominent compared to other 2 regions. These trends suggest that the least economically advanced regions - Šumadija and Western Serbia and particularly Southern and Eastern Serbia - overwhelmingly favour the more immediate and applied models of support for the development of their respective innovation systems. Private businesses located in these regions disproportionately rely upon engagement of the short-term academic services in the process of commercial development of existing solutions as the dominant mode of improving their innovation performance, as opposed to establishing a long term strategic collaboration with the research organisations and/or investing in their own research capacity and ability to independently conceive and develop creative innovation. By contrast, in Belgrade and, to a slightly lesser extent, Vojvodina there is a broader appeal of the support measures tailored to the needs of new-founded firms and start-up projects through the Mini Grants program, suggesting an elevated level of business sophistication and propensity for sustainable effort towards establishing and improving own innovation capacities in these regions. One more remarkable aspect is that the Proof of Concept program features prominently in the Belgrade region, thus reinforcing the notion that the research cluster based in Belgrade is the most active and influential sector of academia in the country in terms of commercially feasible and market oriented innovation activity.

However, one somewhat unusual finding is the fact that IF programs such as the Collaborative Grant Scheme that support integration of business innovation with scientific research feature more or at least equally prominently in the project structure of economically and innovative underdeveloped regions. This apparent inconsistency may point to the increased need of innovative enterprises from these areas for supplementing their own lacking research capacity and resources with the external infrastructure and expertise found in the academic field, which ultimately implies that businesses and researchers elsewhere (in Belgrade and Vojvodina) possess a higher degree of own knowledge capacities for developing novel solutions and therefore need to rely less on external resources. Additional argument in favour of the sophisticated and highly developed innovation activity in the Belgrade

region's research sector stems from the fact that in the region of Šumadija and Western Serbia, which is most dependent on the collaborative business/academia schemes of the IF, business seeking academic expertise and partnership in the innovation process disproportionately cooperate with scientific institutions outside of their own region, mainly from Belgrade (Radonjic, 2022). In addition to reinforcing Belgrade's strong position in terms of innovative research capacity in the academic sphere, this fact further suggests that academic capacity for innovation is not sufficiently developed and/or the potential for and value of commercial implementation of knowledge through research and development is not yet adequately valued by the scientific community in the Šumadija and Western Serbia region.

4. Conclusion

Based upon the above analysis of dominant policy mechanisms for fostering innovation, certain key out-takes arise from these considerations about the general features, prevailing conditions and developmental patterns in the Serbian innovation landscape. Firstly, the demand for funding and other benefits offered by the Innovation Fund continuously exceeds resources at the disposal of these institutions and therefore the degree of competition involved in the Fund's support programs is significant. This fact indicates that there is a vibrant and dynamic population of innovation actors in all targeted sectors (start-up entrepreneurs, businesses, science and research institutions) that recognises the value of knowledge and creative innovation and possesses the potential and capacity for commercial deployment of knowledge and development of innovative solutions. However, the initial innovation capacity, and therefore dominant mechanisms of innovation development (and corresponding use of support mechanisms) vary substantially between specific innovation actors according to their type, size, industrial area and region of origin.

In that regard, the second salient feature that defines Serbian innovation ecosystem is one of strong and enduring centralisation and asymmetry, primarily of territorial variety that subsequently influences and reflects itself in other dimensions that determine innovation performance. The overwhelming bulk of innovation resources, capacity and activity in Serbia is concentrated in the capital city of Belgrade and its adjacent area, followed quite distantly by the Vojvodina province and leaving the remaining 2 regions of Šumadija and Western Serbia and Southern and Eastern Serbia trailing very far behind. The vast majority of innovators in the two least developed regions (both economically and in terms of innovation) rely more heavily on policy support in their innovation efforts and tend to approach the innovation process (and collaboration with external partners) in a short term fashion that favours adaptation and application of existing solutions rather than development of their own capacity for creative innovation based on research. Contrary to this practice, in Vojvodina and especially in Belgrade there is a more pronounced focus on the more sustainable and advanced approach to innovation through building and improving start-up entrepreneurial capacity for generating

knowledge and its transformation into novel commercial uses, and the policy support mix focuses more prominently on sophisticated research and development of own innovation capacities, as well as on cohesive commercial deployment of creative ideas and scientific outputs. The overall dispersion of projects approved for funding by the Innovation Fund reflects (and indeed often amplifies) the aforementioned asymmetrical tendencies, given that the critical portion of resources is allocated to projects and entities with the largest and most efficient innovation capacity, and those are predominantly based in the Belgrade region. Taking into account that delayed effects and intangible implications of policy support extend beyond the immediate scope of funded projects, and given the critical importance of public funding for emerging innovators with few independent innovation resources, the practice of allocation of the Fund's resources that disproportionately prioritises actors with established and more advanced capacity directly contributes to exacerbating the gap in innovation performance between emerging and sophisticated innovators. In the Serbian context of all-encompassing regional disparities in economic power and innovation ability a policy approach that favours efficiency and performance ultimately reinforces existing discrepancies.

While such policy approach is justified in terms of the imperative of boosting overall innovation performance in the country, and is endorsed by the Smart Specialisation Strategy and its stated objectives, there needs to be awareness of the inherent trade-off that targeted support guided by excellence entails, which in the long run, through compounding present contradictions, may affect the stability and sustainable development of the innovation system itself. The singular focus on benefits of establishing a high-performing innovation system through policy support might result in the creation of sophisticated knowledge-based and innovation-intensive clusters that are embedded in wider European and global innovation networks but have few links with local economy and negligible impact on welfare of the local population, the phenomenon known as the 'desert cathedral' (Hassnik & Shin, 2005; Morgan, 2007). Given that the Innovation Fund has no explicit mandate to consider distributional implications of their activities, in order to alleviate potential risks of further divergence resulting from innovation performance, it is of great importance to devise a carefully coordinated policy response to these challenges. In that regard it is necessary to consider the need for integrating and coordinating innovation policy with other relevant stakeholders, particularly those concerning regional development, industrial policy, gender and socio-economic inequality. Therefore, the overarching conclusion that can be derived from the analysis of the current activities of innovation policy in Serbia is the need to ensure the higher degree of policy coordination, given that innovations are far from an isolated phenomenon both in terms of the manner in which they emerge and their far-reaching and long-standing implications which go beyond the boundaries of the innovation system. In much the same vein as the objective to incite collaboration between different actors in the innovation ecosystem, the challenges posed by the current innovation policy activities also need to be resolved by establishing and maintaining the similar level of coordination and consistency on a policy-making level in order to ensure effectiveness and long-term sustainability of innovation policy.

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