The new EPPPL section 'International & Interdisciplinary' features high-level discussion papers from the EU and other jurisdictions on developments and practical implications for public procurement and PPP by scholars of different backgrounds, including law, economics, political and social silences, technology and science. Please send your feedback and submissions to the section's editor Désirée Klingler at <klingler@lexxion.eu>.

Policies to Stimulate Industrial Innovation by Small and Medium-Sized Enterprises:

Lessons Learned from the Public Procurement of Innovation during Emergencies

*Andrea S Patrucco, Ana-Maria Dimand and Désirée U Klingler**

Since the outbreak of COVID-19, Small and Medium-sized Enterprises (SMEs) have faced a heavy economic burden and uncertainty due to a contraction in resources and markets. As the world returns to normal conditions, we aim to synthesise key lessons from the pandemic and discuss which emergency actions should become routine to prevent or minimise the negative economic impact of future crises on SMEs and their innovation power. This paper reviews academic and non-academic literature on how governments can stimulate industrial innovation in SMEs based on experiences from public procurement of innovation during the pandemic. Our findings indicate that public procurement of innovation is a crucial tool to stimulate both the economy and new ideas. Against this backdrop, we propose the implementation of three related procurement policies: inter-agency and inter-governmental collaboration in the public procurement of innovation, cooperation partnerships between the government and firms, and the adoption of practices that encourage SME participation in the procurement of public innovation contracts.

Keywords: small and medium-sized enterprises; innovation; emergency management; procurement of innovation

I. Introduction

Environmental disasters and health emergencies severely test organisational resilience. During such circumstances, companies around the world must adopt and implement new solutions for an effective, immediate response and recovery.[1] Due to limited personnel and less agile organisational structures, Small and Medium-sized Enterprises (SMEs) are particularly affected by the contraction of resources and uncertainty during emergencies.[2]

To protect this vital sector from collapsing during the crisis, many governmental and non-governmental organisations have provided various forms of support to SMEs.[3] In addition to the typical direct (eg, emergency financial funding for the purchase of re-

DOI: 10.21552/epppl/2023/1/9

* Andrea S Patrucco, Assistant Professor at the Department of Marketing & Logistics, College of Business, Florida International University. He is the corresponding author: <apatrucc@fiu.edu>. Ana-Maria Dimand, Assistant Professor of Public Policy and Administration, Boise State University, School of Public Service, <anamariadimand@boisestate.edu>. Désirée U Klingler, Research Fellow at Yale Law School and PhD Candidate at the University of

sources) and indirect (eg, consultancy and support) measures, governments have also introduced policies to stimulate innovation by SMEs. These policies have yielded satisfactory results for both the government and businesses.[4]

Governments have used a mix of financial and non-financial policy tools to assist and encourage private sector innovation.[5] Many of these policies have involved collaborative innovation initiatives in which governments worked closely with each other, private companies and/or research organisations.[6] These relationships highlighted the 'power' of innovation in solving societal problems faster and more effectively.

With the return to business-as-usual, companies and governments alike are trying to extract key lessons from the COVID pandemic and understand which emergency actions should become 'routine' to mitigate the negative consequences of future emergencies and to stimulate innovation. By analysing academic and non-academic literature and by drawing upon insights gained from the public procurement of innovation during COVID-19, this paper examines how governments can better promote industrial innovation in SMEs.

Among the different levers available to governments, this study argues that the public procurement of innovation is key. The recent COVID-19 pandemic has shown that, by designing, adopting and implementing appropriate SME-friendly innovation procurement policies, governments can securely and effectively increase the level of innovation in the public sector while simultaneously stimulating innovation activities in SMEs, helping them to sustain themselves. We examine prominent procurement examples of SME-driven innovation during COVID-19 and propose a set of best procurement practices and policies that can help to stimulate SME-led innovation during both emergency and business-as-usual times.

II. Increased Public Sector Demand for Innovation During Emergencies

Innovation is 'an idea, practice, or object that is perceived as new by an individual or other unit of adoption'.[7] Innovation has become increasingly important in organisations across sectors. On the one hand, innovation can increase profit and offer a competitive advantage in the market for the private sector. On the other hand, it can improve public service delivery and offer solutions to public sector challenges. Innovation is not only an important concept to improve the public sector's effectiveness and efficiency, but also to enhance its legitimacy.[8]

According to Edquist (2001), innovation policy is a 'public action that influences technical change and other kinds of innovations', which includes 'elements of R&D policy, technology policy, infrastructure policy, regional policy and education policy'.[9] There are various instruments that public organisations can use to spur innovation, which can be oriented towards the supply or demand side.[10] Sup-

St. Gallen, funded by the Swiss National Science Foundation, <desiree.klingler@yale.edu>.

1 Kathy Gurchiek, 'Small Businesses Get Creative to Survive During the Pandemic' (SHRM, 2020) <https://www.shrm.org/hr-today/news/all-things-work/pages/small-businesses-get-creative-to-survive-during-the-pandemic.aspx> accessed 3 March 2023.

2 Jason Miklian and Kristian Hoelscher, 'SMEs and exogenous shocks: A Conceptual Literature Review and Forward Research Agenda' (2022) International Small Business Journal 178.

3 Shabir Ahmad et al, 'Family SMEs' Survival: The Role of Owner Family and Corporate Social Responsibility' (2020) Journal of Small Business and Enterprise Development 281; Hua Song et al, 'How Do Supply Chain Network and SMEs' Operational Capabilities Enhance Working Capital Financing? An Integrative Signaling View' (2020) 220(C) International Journal of Production Economics.

4 Santiago Omar Caballero-Morales, 'Innovation as Recovery Strategy for SMEs in Emerging Economies During the COVID-19 Pandemic' (2021) Research in International Business and Finance 1.

5 Caroline Paunov and Sandra Planes-Satorra, 'Science, Technology and Innovation in the Time of COVID-19' (2021) OECD Science, Technology and Industry Policy Papers.

6 Henry Chesbrough, 'To Recover Faster from Covid-19, Open Up: Managerial Implications from an Open Innovation perspective' (2020) Industrial Marketing Management 410; Andrea S Patrucco et al, 'The Impact of Covid-19 on Innovation Policies Promoting Open Innovation' (2021) R&D Management 273.

7 Everett M Rogers, *Diffusion of Innovations* (5th edn, Free Press 2003) 12.

8 Hanna De Vries et al, 'Innovation in the Public Sector: A Systematic Review and Future Research Agenda' (2016) Public Administration 146.

9 Charles Edquist, 'The Systems of Innovation Approach and Innovation Policy: An Account of the State of the Art' (DRUID Conference, Aalborg, 12 – 15 June 2001) 18.

10 Jakob Edler and Luke Georghiou, 'Public Procurement and Innovation—Resurrecting the Demand Side' (2007) Research Policy 949.

ply-side innovation tools include financial support and services offered to businesses. Financial support includes equity support, fiscal measures, support for public sector research, training and mobility and grants for industrial research and development (R&D), while services to businesses include information and brokerage support, as well as networking measures. Demand-side innovations are known as 'systemic policies', and include regulation, public procurement and support of public demand.[11]

Public sector organisations around the world have embraced innovation as an important aspect of public policies to serve the needs of their constituents. Despite operating under tight fiscal constraints, governments are expected to deliver high-quality and sustainable outcomes at reasonable costs.[12] To date, the top policy instruments used to stimulate innovation are financial support for business R&D and innovation activities in the private sector, which include loans and credits, corporate tax relief and project grants for public research.[13] However, public innovations are still considered episodic, and government cutbacks through prolonged periods of austerity mean that public organisations rarely have the capacity to continue to innovate.[14]

Innovation becomes particularly important during economic and health crises. In these situations, governments must increase the effectiveness and magnitude of their traditional policies to stimulate the economy and industrial innovation. New technologies, products and services need to be developed quickly to address the emergency and help mitigate its negative health and/or financial impacts. For example, new medical treatments or communication technologies can save lives and reduce the spread of the disease. By investing in industrial innovation during emergencies, governments can help build corporate resilience and prepare firms for future crises. Investing into technologies to improve disaster recovery can help communities recover faster. Finally, stimulating industrial innovation during emergencies can create new economic opportunities. New technologies and products developed during an emergency often have commercial applications, creating new jobs and industries during normal times.

The recent COVID-19 pandemic serves as a prime example for this. Especially during the first months of the emergency, governments around the world engaged with research and innovation communities to initiate different innovation-related policies aimed at responding to the short and long-term impacts of the crisis. These initiatives included:

- Government-funded research and development: governments in several countries (eg, Ireland, the US, Canada, Brazil, Italy) provided funding for research and development of new technologies, products and services that helped to address the consequences of the pandemic.[15]
- Economic incentives for private-sector innovation: governments used economic incentives to encourage corporate investment in the development of new technologies, products and services to address the negative consequences of COVID-19. These incentives included tax credits, grants and procurement contracts for R&D activities. For example, in April 2020, Moderna received a grant of USD 483 million (approximately €447.9 million) from the US Biomedical Advanced Research and Development Authority (BARDA) to support the development of its COVID-19 vaccine. The grant allowed Moderna to accelerate its R&D, conduct clinical trials and scale up manufacturing of its vaccine.[16]
- Emergency response teams: governments established emergency response teams that could quickly respond to a health crisis, providing support and expertise to find innovative solutions to maintain

11 Ibid.

12 Jiuchang Wei and Yang Liu, 'Government Support and Firm Innovation Performance' (2015) Chinese Management Studies 38; Anthony Arundel et al, 'Advancing Innovation in the Public Sector: Aligning Innovation Measurement with Policy Goals' (2019) Research Policy 789.

13 European Commission and OECD, 'STIP Compass: International Database on Science, Technology and Innovation Policy (STIP)' (STIP Compass, 2020) <https://stip.oecd.org> accessed 3 March 2023; Patrucco et al (n 6) 273.

14 Jason Potts and Tim Kastelle, 'Public Sector Innovation Research: What's next?' (2010) Innovation 122; Adão Carvalho, 'Wishful Thinking about R&D Policy Targets: What Governments Promise and What They Actually Deliver' (2018) Science and Public Policy 373.

15 Patrucco et al (n 6) 273.

16 Moderna, 'Moderna Announces Award from U.S. Government Agency BARDA for up to $483 million to Accelerate Development of MRNA Vaccine (MRNA-1273) Against Novel Coronavirus' (Press release, 18 April 2020) <https://bit.ly/3KTOEeE> accessed 14 March 2023.

operations' continuity in areas like logistics, communications and medical care. For example, the US Federal Centers for Disease Control and Prevention (CDC) created a COVID-19 Response Team, comprised of experts like epidemiologists and public health advisors. These authorities would then help states and local jurisdictions develop strategies for testing, contact tracing and vaccination.[17]

- Safety regulations and standards for technological innovation: governments issued new regulations and standards that helped ensure that technologies, products and services developed during an emergency or disaster were safe and effective.[18]

Hence, the COVID-19 pandemic has shown that governments can not only stimulate the economy through fiscal measures,[19] but can also address health-related effects through public sector innovation policies.

These initiatives are particularly important for SMEs, as they are often more strongly affected by emergencies due to their often-slower response time in such conditions.[20] For example, SMEs have less personnel and tend to have less agile organisational structures, making it more difficult to quickly introduce new technologies and/or process innovations to adapt to a suddenly- changed environment. This unequal preparedness, combined with the contraction of market demand and new customer needs (eg, an increase in demand for online products, rather than 'in-store' purchases) has widened the gap even more between large companies and SMEs, which have been left behind in innovation processes.[21] To counter this tendency, government and public policy support is crucial, as it can aid SMEs' efforts in responding to the emergency and increase their chance of survival. Government initiatives during emergencies usually comprise a mix of policy instruments used to assist or encourage SMEs,[22] both monetary (eg, grants or tax credits) and non-monetary (eg, training, assistance programmes or cluster/consortia organisations). During COVID-19, these efforts led to an increase in the successful engagement of SMEs in public innovation demand, which was helpful in boosting their internal innovation and organisational resilience, helping them survive the crisis.[23] Among these efforts, we argue that there is an under-utilised government tool to promote innovation: public procurement.

III. The Role of Public Procurement In Government Innovation

Government spending makes up a large proportion of national GDP, eg, 61.14 % in France, 57% in Finland, 58.8% in Belgium and 50.8% in Denmark.[24] In countries where government spending on goods and services makes up a significant percentage of the overall annual spend, public organisations can command more influence over private sector supply chains than any other customer, connecting the needs of public departments with supply sources and procuring everything from hospitals and bridges to information technology and cleaning services. Historically, government and public procurement were considered simple clerical activities aimed at cost saving and efficiency.[25] However, recent research recognises the role of public procurement in support-

17 US CDC, 'COVID-19 Rapid Response Team Guidance' (CDC, updated 1 March 2021) <https://www.cdc.gov/coronavirus/2019-ncov/global-covid-19/rtt-management-introduction.html> accessed 14 March 2023.

18 OECD, 'Regulatory Quality and COVID-19: The Use of Regulatory Management Tools in a Time of Crisis' (30 September 2020) <https://bit.ly/3UCXl07> accessed 14 March 2023.

19 Désirée U Klingler, 'Government Purchasing During COVID-19 and Recessions: How Expansionary Legal Policies Can Stimulate the Economy' (2020) Public Contract Law Journal 1.

20 Helena Forsman, 'Innovation Capacity and Innovation Development in Small Enterprises. A Comparison Between the Manufacturing and Service Sectors' (2011) Research Policy 739.

21 Jill Juergensen et al, 'European SMEs Amidst the COVID-19 Crisis: Assessing Impact and Policy Responses' (2020) Journal of Industrial and Business Economics 499.

22 Nawal Abdalla Adam and Ghadah Alarifi, 'Innovation Practices for Survival of Small and Medium Enterprises (SMEs) in the COVID-19 Times: the Role of External Support' (2021) Journal of Innovation and Entrepreneurship 1.

23 Stephen Roper and Joanne Turner, 'R&D and Innovation after COVID-19: What Can We Expect? A Review of Prior Research and Data Trends After the Great Financial Crisis' (2020) International Small Business Journal 504; Alain Verbeke, 'Will the COVID-19 Pandemic Really Change the Governance of Global Value Chains?' (2020) British Journal of Management 444.

24 OECD, 'General government: General government spending (indicator)' (2023) <https://www.oecd-ilibrary.org/governance/general-government-spending/indicator/english_a31cbf4d-en> accessed 8 March 2023.

25 Evelyn Rodriguez-Plesa et al, 'A Review of Public Administration Research: Where Does Public Procurement Fit In?' (2020) International Journal of Public Administration 655.

ing strategic government and procurement objectives.[26]

Governments are increasingly recognising the vital role procurement can play,[27] highlighting it as an effective tool to achieve innovation policy goals in the public sector,[28] and its ability to provide even greater support to innovation than R&D subsidies.[29] Public procurement can be a mechanism for delivering better social outcomes,[30] address sustainability issues,[31] and can play a role in encouraging social responsibility in private sector organisations.[32] Public procurement can also be leveraged to impact businesses, the economy and society to support, and even lead, broader government policy implementation,[33] including stimulating innovation[34] and encouraging entrepreneurship in SMEs.[35]

Various countries have established programmes to encourage SMEs' innovation through public procurement.[36] In the United Kingdom, the government's 'Innovate UK' organisation offers funding and support to SMEs for the development and commercialisation of new products and services.[37] They also introduced a procurement programme that helps SMEs sell their innovations to government agencies. In the United States, the Small Business Innovation Research (SBIR) programme provides funding to SMEs for the research and development of new technologies.[38] The programme has set aside a certain percentage of federal R&D contracts for SMEs. In South Korea, the Small and Medium Business Administration provides funding to SMEs to develop new products and services. They established a public procurement programme helping SMEs sell their innovations to the government and large organisations.[39] In India, the government has set up a scheme for the promotion of innovation, incubation and entrepreneurship called 'Atal Innovation Mission', which aims to create a culture of innovation and entrepreneurship in India by providing funding and support to SMEs.[40]

Despite these initiatives, the proportion of government spending utilised towards this end remains largely insignificant[41] and the two policy objectives of innovation through public procurement and SME engagement are seldom accomplished simultaneously. Even though governments are investing in increasing the participation of SMEs in public procurement markets for traditional goods and services, this engagement is less common when it comes to public demand of innovation for two reasons: first, governments don't frequently make use of innovation initiatives, and second, SMEs often lack the capability

26 Klingler, 'Government Purchasing' (n 19) 1.

27 Oishee Kundu et al, 'Public Procurement and Innovation: A Systematic Literature Review' (2020) Science and Public Policy 490; Charles Edquist and Jon Mikel Zabala-Iturriagagoitia, 'Functional Procurement for Innovation, Welfare, and the Environment' (2020) Science and Public Policy 595.

28 Luke Georghiou et al, 'Policy Instruments for Public Procurement of Innovation: Choice, Design and Assessment' (2014) Technological Forecasting and Social Change 1.

29 Edler and Georghiou (n 10) 949.

30 Jolien Grandia and Joanne Meehan, 'Public Procurement as a Policy Tool: Using Procurement to Reach Desired Outcomes in Society' (2017) International Journal of Public Sector Management 302; Klingler, 'Fair Pay and Safe Workplaces: Reassessing the Costs and Benefits in Government Contracting' (2021) 39 Yale Journal on Regulation Bulletin 69.

31 Sönnich Dahl Sönnichsen and Jesper Clement, 'Review of Green and Sustainable Public Procurement: Towards Circular Public procurement' (2020) Journal of Cleaner Production; Ana Maria Dimand, 'Determinants of local government innovation: the Case of Green Public Procurement in the United States' (2022) International Journal of Public Sector Management 584; Klingler and Steven L Schooner, 'Promoting Sustainable Public Procurement through Economic Policy Tools: From Moral Suasion to Nudging' (2022) European Journal of Public Procurement Markets, 4.

32 Yanlin Ma et al, 'Does Green Public Procurement Encourage Firm's Environmental Certification Practice? The Mediation Role of Top Management Support' (2021) Corporate Social Responsibility and Environmental Management 1002.

33 Christine Harland et al, 'Implementing Government Policy in Supply Chains: An International Coproduction Study of Public Procurement' (2019) Journal of Supply Chain Management 6.

34 Joeri H Wesseling and Charles Edquist, 'Public Procurement for Innovation to Help Meet Societal Challenges: A Review and Case Study' (2018) Science and Public Policy 493.

35 Kim Loader, 'Is public procurement a successful small business support policy? A review of the evidence' (2013) Environment and Planning C: Government and Policy 39.

36 OECD, 'Public Procurement Forum for SMEs Small, Medium, Scalable' <https://www.oecd.org/gov/public-procurement/smes-public-procurement-highlights.pdf> accessed 10 March 2023.

37 UK Research and Innovation, 'Innovate UK' <https://www.ukri.org/councils/innovate-uk/?_ga=2.124690888.338045784.1678329975-809925427.1678329975> accessed 8 March 2023.

38 SBIR, 'About: The SBIT and STTR Programs' <https://www.sbir.gov/about> accessed 13 March 2023.

39 Ministry of SMEs and Startups, 'Affiliated Organization' <https://www.mss.go.kr/site/eng/01/2010400000000020191106 51.jsp> accessed 13 March 2023.

40 Startup Talk, 'List of Government Schemes to Support Startups in India' (4 July 2022) <https://startuptalky.com/list-of-government-initiatives-for-startups/> accessed 14 March 2023.

41 Edquist and Zabala-Iturriagagoitia (n 27) 595; Elvira Uyarra et al, 'Public Procurement, Innovation and Industrial Policy: Rationales, Roles, Capabilities and Implementation' (2020) Research Policy.

to successfully compete for procurement contracts in innovation.

Emergency situations can aggravate or alleviate these issues. On the one hand, government demand for innovation often surges during emergencies. According to data published by the OECD Observatory of Public Sector Innovation,[42] during the first 19 months of the COVID-19 pandemic, governments around the world were able to introduce hundreds of innovations focused on the rapid acceleration of digital tools, particularly in healthcare systems. Most of these solutions were 'bottom-up', as they were built thanks to insights coming from citizens, residents and businesses. On the other hand, as part of their support initiatives, governments saw unprecedented participation by SMEs in public procurement contracts. For example, a quick look at the COVID-19 spending report published by SAM.gov reveals that the US federal government awarded a significant number of contracts to local and small business suppliers,[43] confirming the ability of these organisations to compete for public contracts. Similar trends are also present in European countries.[44]

In addition to those more general innovation-related policies, governments around the world have adjusted their procurement policies and laws to allow for more SME innovation in public contracting. Even though many of those measures are not specifically geared towards SMEs, they have (a) relaxed the rules of procurement and (b) increased government spending in a way that has allowed SMEs to bid for government contracts and provide innovative solutions more easily.[45]

In the United States, the Guidance on Federal Contract Performance during COVID-19 of May 2020, issued by the Office of Management and Budget (OMB), allowed federal contractors to maximise telework, extend performance deadlines, retool contracts 'that possess capabilities for impending requirements such as security, logistics, or other function'. The OMB Guidance also enabled federal contractors to coordinate outreach activities with the offices of small and disadvantaged business utilisation and acquisition innovation advocates.[46] Additionally, it introduced 'procurement flexibilities' that increased the micro-purchase threshold, the simplified acquisition threshold and the threshold for commercial items drastically – up to USD 13 million (approximately €12.04 million).[47] Finally, the Guidance allowed preferences and set-asides for local firms.[48]

Similarly, several countries in Europe have issued guidelines on procurement flexibilities during COVID-19, stressing the importance of alleviating SMEs.[49] Measures have included more rapid payment of contractors, use of digital and electronic procedures and communication, suspension of financial penalties, extra funding to cover costs from delays, extension of offer submission deadlines and use of expedited and simplified procedures to procure emergency goods, such as vaccines, masks and COVID tracking applications.[50]

In summary, emergency situations provide valuable insights into how governments can maintain innovation as a central part of their policy agendas while also supporting, engaging and sustaining SMEs in the long term. Specifically, the combination of the revitalised demand for public innovation following COVID-19, the underutilisation of public procurement as a tool to foster innovation and the newly developed/matured capabilities of SMEs to create and participate in public innovation should make the public procurement of innovation a priority on government policy agendas, as it represents the intersection of government innovation and SME support strategies.

---

42 OECD-OPSI, 'Embracing Innovation in Government: Innovative Responses to the COVID-19 Crisis' (Report, July 2020) <https://trends.oecd-opsi.org/wp-content/uploads/2020/11/OECD-Innovative-Responses-to-Covid-19.pdf> accessed 14 March 2023.

43 SAM.gov, 'Static Reports' <https://sam.gov/reports/awards/static> accessed 3 March 2023.

44 Matus Kubak et al, 'On the Competition and Transparency in Public Procurement During COVID-19 Pandemic in European Union' (2021) <https://ssrn.com/abstract=3812924> accessed 24 March 2023.

45 Klingler, 'Government Purchasing' (n 19) 1.

46 US Office of Management and Budget, 'Memorandum: Managing Federal Contract Performance Issues Associated with the Novel Coronavirus (COVID-19)' (20 March 2020) <https://www.whitehouse.gov/wp-content/uploads/2020/03/M-20-18.pdf> accessed 3 March 2023; Klingler, 'Government Purchasing' (n 19) 9.

47 US Office of Management and Budget, ibid.

48 Ibid.

49 See eg, Swiss Beschaffungskonferen des Bundes, 'Guidance on Measures to alleviate the economic consequences of COVID-19 by Means of Public Procurement' (27 March 2020) <https://www.bkb.admin.ch/bkb/de/home/themen/coronavirus.html> accessed 8 March 2023.

50 OECD, 'Stocktaking Report on Immediate Public Procurement and Infrastructure Responses to COVID-19' (updated 24 June 2020) <https://read.oecd-ilibrary.org/view/?ref=132_132982-9i47fud8xb&title=Stocktaking-Report-on-Immediate-Public-Procurement-and-Infrastructure-Responses-to-COVID-19> accessed 3 March 2023.

IV. A Case Study of Government-Procured Innovations from SMEs During COVID-19

Analysing both academic and non-academic literature,[51] this paper explores the potential of public procurement of innovation as a means of supporting SMEs during emergency situations.

The COVID-19 pandemic serves as a prime case study for innovation policies applied in public procurement. Governments worldwide have acquired a diverse array of innovative products and services to address the crisis with the support of SMEs. This has been achieved through various funding initiatives such as government contracts and grants.[52] Examples of SME-driven *innovations* acquired by governments during COVID-19 include:

- Personal protective equipment (PPE) such as face masks, gowns and gloves to protect healthcare workers and other essential workers from infection. SMEs around the world repurposed their production to support national demand for PPE, or they were established just for that purpose. For example, the small non-profit organisation MaskOn was created in March 2020 to address the shortage of PPE at hospitals in Boston and across America during the pandemic. With the help and expertise of Boston's medical, academic and tech communities, MaskOn repurposed full-face snorkel masks for high-risk clinicians in direct contract with COVID-19 patients.[53]
- Solutions to disinfect large spaces and public buildings, such as ultraviolet (UV) light disinfection systems. For example, R-Zero, a small start-up in California, developed a lower-cost, portable UV-C light disinfection device that can be used to disinfect surfaces and PPE quickly, effectively and safely.[54] This device was procured by various government agencies, hospitals and private companies to aid in the fight against COVID-19.
- Rapid diagnostic tests to help diagnose and treat patients with COVID-19. For example, NG Biotech, a small family-owned biotech company located in Brittany, France, developed serological tests for the rapid detection of antibodies produced in persons contaminated by the COVID-19 virus. It supplied its tests (offering results in 15 minutes) to public institutional partners around the world.[55]
- Technological solutions, such as telemedicine, digital platforms to distribute the vaccine[56] and contract tracing to track and control the spread of the virus. Such solutions have also included digital platforms, apps and software to help manage the distribution and administration of vaccines. For example, the Swiss Federal Office of Public Health (FOPH) has procured an innovative mobile application from a small Swiss software development firm (Ubique) to track the spread of COVID infec-

51 Christine Mary Harland et al, 'Practitioners' Learning about Healthcare Supply Chain Management in the COVID-19 Pandemic: a Public Procurement Perspective' (2021) International Journal of Operations & Production Management 178; Robert Handfield et al, 'Assessing State PPE Procurement During COVID-19: A Research Report' (National Association of State Procurement Officials, 2021) <https://www.naspo.org/wp-content/uploads/2021/03/2021_COVIDReportC.pdf> accessed 3 March 2023; Tea Paulović, 'Case Studies on the Impact of COVID-19 on public procurement practices in Europe: focus on social, environmental, and economic impacts' (Urban Agenda for the EU Partnership on Public Procurement, 2021) <https://futurium.ec.europa.eu/sites/default/files/2021-07/Case%20studies%20on%20the%20impact%20of%20COVID-19%20on%20public%20procurement%20practices.pdf> accessed 14 March 2023; The World Bank Group, 'Opportunities and Challenges for Public Procurement in the First Months of the COVID-19 Pandemic: Results From an Experts Survey' (EFI Insight-Governance, 2021) <https://documents1.worldbank.org/curated/en/565021618898683492/pdf/Opportunities-and-Challenges-for-Public-Procurement-in-the-First-Months-of-the-COVID-19-Pandemic-Results-From-an-Experts-Survey.pdf> accessed 14 March 2023; OECD, 'Stocktaking Report on Immediate Public Procurement and Infrastructure Responses to COVID' (OECD, 2020) <https://bit.ly/42ZMAsA> accessed 14 March 2023; Evelyn Rodriguez-Plesa et al, 'Getting the Job Done in Public Procurement During COVID-19: A National Panel Study' (The Institute for Public Procurement) <https://www.nigp.org/resource/research-papers/NIGP%202021%20COVID-19%20Research%20Report.pdf> accessed 3 March 2023.

52 Steven A Melnyk et al, 'The Pandemic and SME Supply Chains: Learning from Early Experiences of SME Suppliers in the US Defense Industry' Journal of Purchasing and Supply Management 1.

53 Darren Garnick, 'Snorkels Become Critical COVID-19 Protection' (SME) <https://www.sme.org/smemedia/humans-of-manufacturing/maskson-and-ptc/> accessed 3 March 2023.

54 Amy Feldman, 'This Startup Wants To Bring Disinfecting UV Light Into "Every Physical Space,"' *Forbes* (19 August, 2022) <https://www.forbes.com/sites/amyfeldman/2022/08/19/this-startup-wants-to-bring-disinfecting-uv-light-into-every-physical-space/?sh=7c1ae21b5556> accessed 14 March 2023.

55 BignonLebray, 'Bignon Lebray advises NG Biotech, a young SME from Brittany that has perfected rapid detection tests for COVID-19 antibodies' (Press release, 15 June 2020) <https://www.bignonlebray.com/en/bignon-lebray-advises-ng-biotech-a-young-sme-from-brittany-that-has-perfected-rapid-detection-tests-for-covid-19-antibodies/> accessed 3 March 2023.

56 Carsten C Guderian et al, 'Innovation management in crisis: patent analytics as a response to the COVID-19 pandemic' (2021) R&D Management 223.

tions,[57] which formed the basis for calculating the insulation requirement during the pandemic. The FOPH developed the app in cooperation with the Federal Institutes of Technology Zurich (ETH) and Lausanne (EPFL), and it was launched just three months after the outbreak of COVID-19 in June 2020.[58]

V. Measures to Promote SME Participation in the Procurement of Innovation

The biggest barriers for procurement innovation are the high managerial efforts and necessary technical skills that are not available in all public organisations. The COVID-19 response and recovery demonstrate that the public sector can overcome these barriers and improve innovation outcomes through collaboration between agencies and governments.[59] As pointed out by recent research,[60] openness and collaboration are common factors across countries and their policy efforts to promote innovation during emergencies.

At the procurement level, this openness can be achieved through 'collaborative public procurement', a term used to describe how agencies can collaborate horizontally and across borders to procure goods and services more efficiently and effectively. Collaboration is a strategic tool used for sharing resources and information towards the success of specific goals,[61] and extant literature reveals the positive impact collaboration has on performance.[62] While public procurement has been discussed as a contributor to public innovation policy, to our knowledge, the role of inter-governmental collaborative public procurement of innovation has yet to be investigated. Some EU member states have Central Purchasing Bodies (CPB) that are responsible for tendering and awarding public contracts and framework agreements for other contracting authorities.[63] However, CPBs usually operate within national borders and are designed for normal times, rather than emergencies. A collaborative public procurement approach across agencies and governments can lead to information sharing, pooling of resources, efficiency gains and increased purchasing power to stimulate market behaviour towards innovation – aspects that are of particular importance during times of crisis.

Collaborative public procurement has proven to be effective during COVID-19 when governments realized that cooperating – rather than competing – for scarce resources was the optimal strategy.[64] In Europe, the European Commission and several European countries collaborated to purchase rapid COVID-19 tests through the Emergency Support Instrument (ESI).[65] In the United States, several states collaborated to purchase UV-C light disinfection devices through the National Association of State Procurement Officials (NASPO).[66] In South America, several countries collaborated to purchase UV-C light disinfection devices through the Union of South American Nations (UNASUR).[67]

These examples show how collaboration between governments can help support the procurement of innovative solutions during a health pandemic. This paper submits that collaborative public procurement can also be used as an innovative governance model in a post-pandemic world to overcome the barriers of high managerial effort and lacking technical skills, while simultaneously promoting the public sector

57 Swiss Federal Office of Public Health (FOPH), 'Coronavirus: SwissCovid app' <https://www.bag.admin.ch/bag/en/home/krankheiten/ausbrueche-epidemien-pandemien/aktuelle-ausbrueche-epidemien/novel-cov/swisscovid-app-und-contact-tracing.html> accessed 8 March 2023.

58 Ibid.

59 J Ignacio Criado and Ariana Guevara-Gómez, 'Public Sector, Open Innovation, and Collaborative Governance in Lockdown Times. Research of Spanish Cases During the COVID-19 Crisis' (2021) Transforming Government: People, Process and Policy.

60 Chesbrough (n 6) 410; Patrucco et al (n 6) 273; Sawsan Abutabenjeh et al, 'Supplying the Pandemic Response: The Importance of Public Procurement' (2021) Journal of Emergency Management 189.

61 Abutabenjeh et al, 'Determinants of the Success of Cooperative Public Procurement' (2022) Public Performance & Management Review 1.

62 Noella Edelmann et al, 'Collaboration for Open Innovation Processes in Public Administrations' in Yannis Charalabidis and Sotirios Koussouris (eds) *Empowering Open and Collaborative Governance: Technologies and Methods for Online Citizen Engagement in Public Policy Making* (Springer 2012) 21.

63 OECD, 'Central Purchasing Bodies' (2011) <https://www.oecd-ilibrary.org/governance/central-purchasing-bodies_5js4vmnnw15d-en> accessed 8 March 2023.

64 Handfield et al (n 51).

65 European Commission, 'Emergency Support Instrument' COM <https://commission.europa.eu/strategy-and-policy/coronavirus-response/emergency-support-instrument_en> accessed 13 March 2023.

66 Handfield et al (n 51).

67 Maria Belen Herrero and Beatriz Nascimento Lins de Oliveira, 'COVID-19 in Latin America and the Caribbean: the visible face of a regional health cooperation in crisis' (2022) Revista Brasileira de Política Internacional 65.

goal of spurring industrial innovation and improving public service delivery.

Proposed Strategic Action 1: Increase Collaboration among Agencies and Governments to Procure Innovation.

During the COVID-19 pandemic, governments have formed partnerships with businesses, including small businesses, to develop and commercialise innovative solutions. These included the provision of funding to develop new technologies, and connected businesses with government agencies.

In Singapore, the government partnered with local universities, research institutes and small businesses to develop and commercialise new technologies to address the negative consequences of the pandemic. The partnership has supplied funding and support for R&D and helped to connect small businesses with government agencies and large organisations to encourage collaboration. Additionally, the government launched a 'COVID-19 Innovation Challenge' to encourage small businesses to develop new products and services.

The Australian government established a COVID-19 'Innovation Connects' programme that linked small businesses with government agencies and large organisations to develop and commercialise new products and services.[68] In South Africa, the Technology Innovation Agency (TIA) launched the collaborative programme 'Innovating Tomorrow Together' to jointly develop new products, such as rapid diagnostic tests, to mitigate the consequences of the pandemic.[69]

In the United Kingdom, the Build Back Better Business Council (BBBBC), established in January 2021, has brought together government and business leaders to drive economic recovery from the pandemic across the UK.[70] In order to address the economic consequences of COVID-19 and spur collaborations, on 3 September 2020, the French government set out its 'France Relance' recovery plan.[71] In Spain, the government encouraged collaboration with small businesses through the 'Retos Colaboración' programme to develop new technologies and products, such as contact tracing apps.[72] The Italian government allocated funding to small businesses through the 'Piano Nazionale Impresa 4.0' programme to jointly develop new products, such as UV-C light disinfection devices.[73]

As these practice examples show, governments around the world have collaborated with small businesses to support innovation and develop new technologies, products and services to help address the negative consequences of the COVID-19 pandemic. Buyer-supplier collaboration and engagement have been proven to increase supplier innovation in product development.[74] To have a greater impact on innovation, a collaborative approach to both bundling demand (on the buyer side) and building relationships with suppliers can lead to increased innovation in product and service development.

Proposed Strategic Action 2: Increase Buyer-Supplier Collaboration to Procure Innovation.

During the COVID-19 pandemic, governments worldwide have used a variety of procurement strategies that support small businesses and encourage innovation. These can be summarised in the following strategies:

- *Increased transparency*. Governments have increased transparency in procurement processes, making it easier for small businesses – who have been less experienced in bidding for government contracts in the past – to understand the requirements and stay informed about the progress of their application.
- *Specialised procurement programmes*. As outlined above, governments have created specialized procurement programmes for small busi-

68 Australian Government, 'Innovation Connects' (19 January 2023) <https://business.gov.au/grants-and-programs/innovation-connections> accessed 13 March 2023.

69 Technology Innovation Agency South Africa, 'Innovating Tomorrow Together' <https://www.tia.org.za/blog/category/covid19-updates/> accessed 13 March 2023.

70 Build Back Better Business Council, 'Summary Report' (2021), <https://bit.ly/3MD3SG5> accessed 5 April 2023.

71 Ministère de l'Europe et des Affaires Étrangères, 'France Relance Recovery Plan: Building the France of 2030' (3 September 2020) <https://bit.ly/40irp2x> accessed 14 March 2023.

72 For the latest release see: Subvenciones Publicas, 'Retos Colaboracion' (12 February 2023) <https://subvencionespublicas.com/retos-colaboracion-2023/> accessed 14 March 2023.

73 MISE Italy, 'National Plan Impresa 4.0' <https://www.mise.gov.it/images/stories/documenti/investimenti_impresa_40_eng.pdf> accessed 14 March 2023.

74 Aydin Inemek and Paul Matthyssens, 'The Impact of Buyer–Supplier Relationships on Supplier Innovativeness: An Empirical Study in Cross-Border Supply Networks' (2013) Industrial Marketing Management 580.

nesses and the procurement of innovation during the pandemic. These include the creation of procurement programmes that provide funding to and connect small businesses with large organisations and government agencies to encourage collaboration.

- *Use of electronic procurement*. During the pandemic, governments have increased the use of e-procurement instruments, which reduces the costs and simplifies the participation in procurement procedures, making it easier for small businesses to bid for government contracts. E-procurement tools include online portals to submit applications, the publication of electronic procurement notices, and online tools for suppliers to track the status of their applications.
- *Flexible payment terms*. To ease the financial pressure on firms, governments have provided flexible and accelerated payment terms to help businesses better manage their cash flows. These measures include providing faster payments not awaiting the usual payment period, advance payments to contractors and milestone payments instead of end-of-project payments.
- *Streamlined evaluation process*. During the pandemic, governments have streamlined the evaluation process to make it faster and more efficient. The streamlining measures included fewer evaluation criteria, and fewer rounds of evaluation, making it easier for SMEs to participate in government contracting.

In addition to introducing those more general measures, governments have implemented specific procurement tools and practices that are geared toward SMEs participation and target the procurement of innovative solutions. These practices can be categorised into four main areas:

(1) *Solution-oriented procurement*. Governments have used solution-oriented procurement (also known as functional procurement) to encourage business innovations that solve a specific problem or challenge related to the pandemic. Functional procurement is predominantly applied in design contests and competitive negotiations.

(2) *Simplified procurement process*. During the pandemic, governments have simplified procurement processes, making it easier for small businesses to participate in government procurement by reducing bureaucratic requirements (red tape), streamlining the application process and providing clear, simple application guidelines.

(3) *Pre-commercial procurement*. Governments have used pre-commercial procurement to support the development and commercialisation of new technologies and products that have not yet been fully developed or tested. Pre-commercial procurement practices have involved the use of open innovation[75] to encourage collaboration between businesses – including small businesses – and government agencies to jointly develop and commercialise new technologies and products to overcome the pandemic.

(4) *Procurement of prototypes*. During the pandemic, governments have procured prototypes of innovative solutions, often provided by SMEs, to test and validate new technologies and products as quickly as possible. Such measures included providing funding and support for the development of prototypes, as well as incubation and acceleration programmes to support the development of new technologies, products and services by small businesses.

Proposed Strategic Action 3: Use SME-friendly Procurement Processes and Practices to Promote Innovation

VI. Conclusion: A Policy Framework to Stimulate Innovation

In this article, we have concentrated on the type of policy actions governments should undertake to promote industrial innovation and support SMEs. We have identified public procurement of innovation as a crucial tool and suggest that interventions should be implemented in three policy areas: inter-agency and inter-governmental procurement collaboration, innovation partnerships between the government and SMEs and SME-friendly processes for the procurement of innovation contracts (as depicted in Figure 1).

75 Open innovation represents a management model defined as 'distributed innovation process involving purposive knowledge flows across organizational boundaries for monetary or non-monetary reasons'. See Chesbrough (n 6) 410, 411; Chesbrough et al, *New Frontiers in Open Innovation* (Oxford University Press 2014) 3.

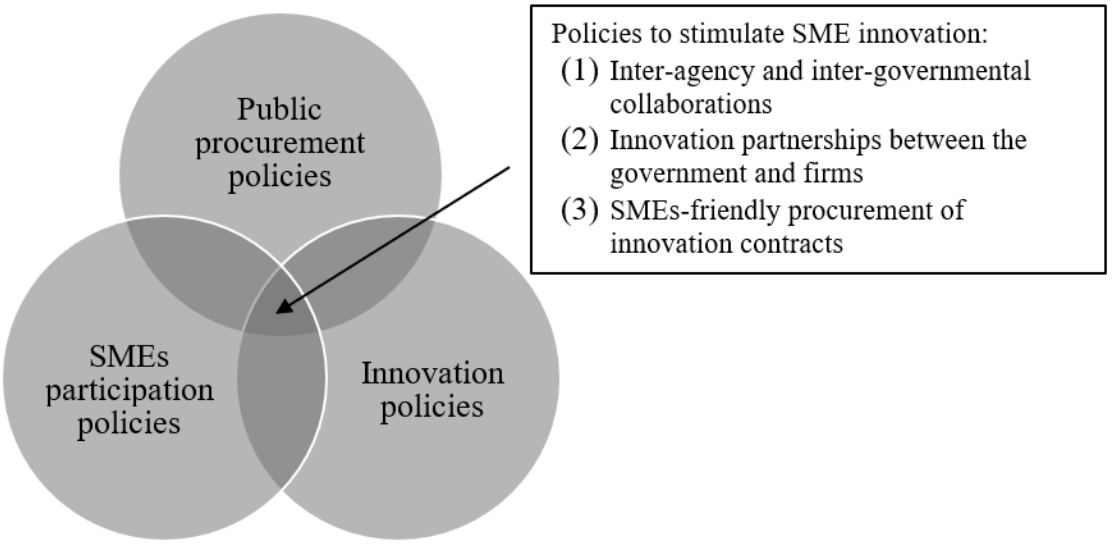

***Figure 1**. Area of policy interventions to stimulate innovation from SMEs*

***Table 1**. Tools to promote SME participation in the public procurement of innovation*

Tools	**Relevance to promote SME participation in procurement**
Functional procurement	Moving the focus from product procurement – ie, telling suppliers what to produce – to functional procurement – ie, telling suppliers what outcome is expected. This is key for attracting SME participation, as SMEs usually rely on less structured, less formalised organisational processes.
Pre-commercial procurement	The early engagement of potential suppliers creates an innovation-friendly environment, from which SME suppliers can particularly profit. On the one hand, the risks perceived by the suppliers decrease, as agencies express their willingness to procure a novel or significantly improved product/service before the formal procedure is in place. On the other hand, early supplier engagement helps government agencies collect preliminary information about the status and competencies of the supply market to satisfy their demand, which can be useful for more targeted expressions of needs or definition of product characteristics.
Simplified procurement	Bidding on big volumes reduces the possibility of SME participation and favours larger companies. SME participation can be increased by dividing contracts into smaller lots, using more flexible procurement procedures such as competitive negotiations, and making use of electronic means.
Competitive dialogue	Competitive dialogue is a procedure through which agencies can directly conduct dialogues with bidders to develop the best solution to satisfy their needs. This allows government agencies and SMEs to establish a direct relationship, helping the agency and the firm to better understand and formulate a given product's characteristics to meet the government's needs.
Feedback to unsuccessful bidders	Providing feedback about why the winning bid was selected could be useful for unsuccessful SMEs to understand why they were not selected and what they should improve in the future.

To provide guidance to governments on how to promote innovative procurement by SMEs, Table 1 outlines specific tools that can be used in these policy areas. They include functional procurement, early buyer-supplier interaction (ie, pre-commercial procurement), simplified procurement to increase access

for SMEs, the increased use of competitive dialogue, and providing feedback to unsuccessful bidders.

While most of the suggested procurement instruments already exist in procurement practice – for example, pre-commercial procurement in the US or competitive dialogue in the EU – countries can learn from each other's experiences, and agencies can make more frequent use of those practices to increase the participation of SMEs. For example, while many procurement regulations – such as those in the EU and US – allow for functional procurement, it can only be applied as a secondary option if the product-focused procurement is not feasible. We argue that making functional procurement the norm, rather than the exception, for innovative procurement would allow for more innovation and increased participation of SMEs during both emergency and normal times.

While the pre-commercial exchange of information is common practice in US federal procurement, EU procurement law prohibits pre-award communication to avoid discrimination and favouritism. It is argued here that more flexible procurement procedures that allow for more and earlier communication between the government and businesses, such as pre-commercial procurement and the competitive dialogue, would be particularly helpful to SMEs, which often lack the experience that large companies, who often engage in government contracting, have.

Dividing large contracts into lots is a tool that has been suggested by the EU and European countries, such as Switzerland, to promote the participation of SMEs in government contracting. Yet agencies' use of this tool is rather temperate. Expanding the practice – especially during health emergencies, as suggested by the Swiss COVID Guidance[76] – would likely increase SME participation in public innovation contracts. Even though the idea of providing feedback to unsuccessful bidders is not new, it often depends on the agency's discretion whether feedback is provided and to which degree. While some agencies give feedback when requested, others are more reluctant to do so – mostly to avoid bid challenges by competitors. However, it is argued that providing feedback is particularly helpful for SMEs to learn from previous mistakes and increase their successful participation in the future.

While this article investigated policies and procurement procedures to promote SME innovation during the COVID-19 pandemic, the authors submit that the suggested instruments to promote SME participation and innovation are not limited to emergency times. Rather, they can also be applied during normal times, with some limitations.

The first limitation concerns increased government spending for innovation during emergencies. During normal times, procurement agencies underlie a budget constraint, and can only spend the budget that has been appropriated by the legislator.

The second limitation concerns the introduction of more flexible procurement procedures and increased communication during the procurement process. In the past, open bidding has been favoured over more flexible procedures due to increased process transparency. As long as transparency continues to outweigh the procurement of innovative solutions, and as long as the use of more flexible procedures forms an exception in procurement regulations, the increased use of such procedures is inhibited. Over the last years, however, governments around the world have recognised that more flexible procurement procedures, such as the EU competitive dialogue and innovation partnership, are necessary to promote innovation in public procurement.

The third limitation originates from one of the core principles in public procurement: the equal treatment of suppliers. This principle has inhibited more SME-friendly policies and practices, especially in the EU. Unless the promotion of SMEs is declared a policy goal of public procurement – such as in US federal procurement in the form of small business set-asides (contracts that are reserved for SMEs)[77] – procurement instruments can only be applied if they do not favour SMEs over large companies. The measures suggested here, especially the idea of dividing large contracts into lots and the use of flexible procurement procedures that allow for more communication between the government and the suppliers, do not unduly favour one group over the other. Hence, these concepts can and should be applied more broadly to increase public innovation through SMEs, also during normal economic times.

76 BKB (n 49).

77 US Federal Acquisition Regulation, 48 CFR Ch 1, Subpart 19.5 – Small Business Total Set-Asides, Partial Set-Asides, and Reserves.