

BUYING WITH INTENT: PUBLIC PROCUREMENT FOR INNOVATION BY PROVINCIAL AND MUNICIPAL GOVERNMENTS[†]

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SUMMARY

Innovation is a major driver of economic progress and a seemingly perpetual struggle for Canada. Supply-side innovation policies like research funding, tax credits and R&D subsidies have not delivered the expected results. Canadian governments should consider increasing their use of demand-side policies such as public procurement to support innovation.

Public procurement is the purchase of goods, services and works by government institutions and state-owned enterprises. For government, the focus in public procurement is often on cost minimization and risk avoidance. This approach comes with significant downsides. For example, insistence on low prices can squeeze small and medium-sized enterprises (SMEs) out of the bidding process. SMEs vastly outnumber larger firms in Canada and, given opportunities to innovate, they could provide a significant boost to employment and economic output.

Public procurement of innovation could stimulate local demand, further policy goals, turn society's needs into market demands, help manufacturers achieve critical mass for production and lower production costs and ultimately help innovative firms grow and spread their novel solutions to more users.

Risk aversion is one of the biggest barriers to innovation procurement. Public-sector buyers may be reluctant to buy novel solutions when the payoff takes too long or if they risk being blamed for careless spending. However, risks can be reduced through insurance, providing immunity to buyers for potential losses, third-party standards, or procurement intermediation.

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Another major barrier to procuring innovation is the increased cost. Buying new products is incompatible with short-term cost minimization. Governments and public institutions need to broaden their cost-benefit analyses to include lifetime costs and benefits and account for the extra benefits generated by innovation. To encourage public organization to assume the price premium associated with novel solutions, particularly from SMEs, governments should consider setting up grants or other special funds for innovation procurement. This financial support does not necessarily require additional government spending. Governments at all levels can start by identifying existing programs in support of innovation, investment, economic diversification, or SMEs that are underperforming and redeploy some of these funds toward innovation procurement.

Public procurement of innovation is a complex process that requires additional training for public servants so they can assess opportunities and accurately communicate buyers' needs and requirements. Corruption is a possible threat with open-ended specifications meant to encourage innovation. Free trade agreements may include provisions limiting public bodies' ability to offer preferential treatment to domestic suppliers.

The European Union adopted three new directives in 2014 to support innovation in public procurement. They allow life-cycle costing to be considered when contracts are awarded, encourage authorities to break up contracts into lots so SMEs can participate and encourage preliminary market consultations between buyers and sellers.

Canada has been slower to adopt similar changes. The Jenkins panel, convened in 2010 to review federal programs' effectiveness in supporting R&D, found that Canada is over-reliant on supply-side innovation instruments as opposed to demand-side ones. Successive federal governments have begun to re-consider the innovation policy mix with the Build in Canada Innovation Program, Innovative Solutions Canada and Canada's Innovation and Skills Plan.

However there is more potential to change the system at the subnational level. Provincial and municipal governments are responsible for the bulk of the country's public procurement, more than in any other OECD country. Provincial and local authorities are also in a better position to recognize concrete challenges in their constituencies, articulate them as needs and search for solutions. The province of British Columbia has been taking steps in this direction with a procurement strategy meant to support innovation. Some municipalities are also starting programs to support start-ups through challenge-based procurement.

As these initiatives are still in the early stages, it makes sense for Canada to start small. Innovation procurement should focus on SMEs as the risks involved are smaller. Public organizations should identify needs and challenges that existing goods and services cannot meet, and where possible seek solutions with many small contracts instead of fewer, larger contracts. They should be open about those needs with the public and potential suppliers and choose the most suitable procurement model.

Governments at every level should include innovation as a mandate in the procurement process and make the necessary reforms to embrace it. Ultimately, procurement reform to support innovation demands champions at the highest levels of policy-making circles and it also requires public belief that this is an effective approach to foster innovation and economic growth.

ACHAT AVEC INTENTION : LES MARCHÉS PUBLICS COMME INCUBATEURS D'INNOVATION PAR LES GOUVERNEMENTS PROVINCIAUX ET MUNICIPAUX[†]

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RÉSUMÉ

L'innovation est un des principaux moteurs du progrès économique, mais c'est aussi apparemment une lutte perpétuelle pour le Canada. Les politiques d'innovation du côté de l'offre, telles que le financement de la recherche, les crédits d'impôt et les subventions à la R.-D., n'ont pas donné lieu aux résultats escomptés. Au Canada, les gouvernements devraient envisager de pousser les politiques axées sur la demande, comme les marchés publics, pour soutenir l'innovation.

Par marchés publics on entend l'achat de biens, de services et de travaux publics par les institutions gouvernementales et les sociétés publiques. Pour le gouvernement, les marchés publics permettent la minimisation des coûts et la prévention du risque. Cette approche présente pourtant d'importants inconvénients. Par exemple, la recherche de prix plus bas peut écarter les petites et moyennes entreprises (PME) du processus d'appel d'offres. Les PME sont beaucoup plus nombreuses que les grandes entreprises au Canada et, si on leur donne la possibilité d'innover, elles peuvent stimuler considérablement l'emploi et la production économique.

Les marchés publics d'innovation permettent de stimuler la demande locale, de répondre aux objectifs politiques, de transformer les besoins de la société en demandes du marché, d'aider les fabricants à atteindre une masse de production critique à coût réduit et, en fin de compte, d'aider les entreprises innovantes à se développer et à diffuser leurs solutions.

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L'aversion pour le risque est l'un des plus grands obstacles à l'approvisionnement en innovation. Les acheteurs du secteur public peuvent se montrer réticents à acheter des solutions innovantes lorsque les bénéfices sont trop tardifs ou s'il y a risque d'être accusé de dépenses imprudentes. Cependant, les risques peuvent être réduits grâce aux assurances, ce qui offre une immunité pour les pertes potentielles, grâce aux normes de tiers ou encore grâce à l'intermédiation en matière de passation de marchés.

Un autre obstacle majeur à l'approvisionnement en innovation est les coûts accrus. L'achat de nouveaux produits est incompatible avec la minimisation des coûts à court terme. Les gouvernements et sociétés publiques doivent élargir leurs analyses coûts-avantages pour y inclure les coûts et avantages à vie. De plus, il doivent tenir compte des avantages supplémentaires générés par l'innovation. Afin d'encourager les sociétés publiques à assumer les coûts supplémentaires associés aux solutions innovantes – en particulier celles des PME –, les gouvernements devraient envisager la mise en place de subventions ou d'autres fonds spéciaux pour les marchés d'innovation. Ce soutien financier ne nécessite pas nécessairement des dépenses publiques supplémentaires. Les gouvernements à tous les niveaux pourraient commencer par identifier les programmes actuels de soutien à l'innovation, d'investissement, de diversification économique ou d'appui aux PME et redéployer certains de ces fonds vers les marchés d'innovation.

La question des marchés publics d'innovation est complexe. Les fonctionnaires doivent recevoir une formation supplémentaire pour évaluer les diverses possibilités et communiquer avec précision les besoins et exigences de l'acheteur. En outre, les spécifications ouvertes destinées à encourager l'innovation peuvent ouvrir la porte à la corruption. Par ailleurs, les accords de libre-échange prévoient parfois des dispositions limitant la capacité des organismes publics d'offrir un traitement préférentiel aux fournisseurs nationaux.

L'Union européenne a adopté trois directives en 2014 pour soutenir l'innovation dans les marchés publics. Ces directives permettent de tenir compte du coût du cycle de vie lors de l'attribution des marchés, encouragent les autorités à diviser les contrats en lots pour que les PME puissent participer et favorisent les consultations préliminaires entre acheteurs et vendeurs.

Le Canada tarde à adopter des mesures similaires. Le groupe du conseiller spécial Jenkins, convoqué en 2010 pour examiner l'efficacité des programmes fédéraux en matière de soutien à la R.-D., a constaté que le Canada dépend trop des instruments d'innovation du côté de l'offre par rapport à ceux de la demande. Les gouvernements fédéraux ont l'un après l'autre réexaminé les politiques d'innovation à la lumière de divers programmes, dont Construire au Canada, Solutions innovatrices Canada et le Plan canadien pour l'innovation et les compétences.

Cependant, un changement de système au niveau infranational offre plus de potentiel. Les gouvernements provinciaux et municipaux sont responsables de l'essentiel des marchés publics, plus ici que dans tout autre pays de l'OCDE. Les autorités provinciales et locales sont également mieux placées pour comprendre les défis concrets locaux, les transformer en besoins et rechercher des solutions. En ce sens, la Colombie-Britannique a mis au point une stratégie d'approvisionnement destinée à soutenir l'innovation.

Certaines municipalités ont adopté des programmes pour soutenir les entreprises en démarrage grâce à un approvisionnement axé sur les défis.

Ces initiatives n'en sont qu'à leurs débuts et il est logique pour le Canada de commencer à plus petite échelle. Les marchés d'innovation devraient se concentrer sur les PME car les risques encourus y sont moindres. Les sociétés publiques devraient identifier les besoins et défis auxquels les biens et services existants ne peuvent répondre. Elles devraient aussi, dans la mesure du possible, rechercher des solutions en concluant de nombreux petits contrats plutôt qu'un petit nombre de contrats plus importants. Les sociétés publiques doivent rester ouvertes aux besoins de la population et des fournisseurs et elles doivent choisir le modèle d'approvisionnement le plus approprié.

Les gouvernements à tous les niveaux devraient inclure l'innovation dans leurs processus de passation des marchés et ils devraient procéder aux réformes nécessaires pour y adhérer. En fin de compte, la réforme de la passation des marchés pour soutenir l'innovation exige des champions aux plus hauts niveaux des sphères décisionnelles. Il faut aussi que la population soit convaincue qu'il s'agit d'une approche efficace pour favoriser tant l'innovation que la croissance économique.

I. INTRODUCTION

Innovation is a key driver of economic progress and the subject of extensive scholarly research. It is also a subject of seemingly perpetual debate in Canada. Discussions around the disappointing level of innovation, its possible causes and potential solutions resurface periodically, both nationally and at the provincial level, under governments of all stripes. These discussions are inevitably followed by policy changes attempting to remediate this innovation deficit.

Traditionally, the support for innovation in Canada has rested predominantly on supply-side policies in the form of direct funding for research, tax credits and other R&D subsidies, with limited use of demand-side policies for innovation, including public procurement (Edler 2019). However, interest in using public procurement and other demand-side policies to boost innovation appears to be on the rise recently, in part due to the underwhelming effectiveness of supply-side innovation policies (OECD 2011).

In this study, I review the main government policies and recent trends in using public procurement for innovation purposes in OECD countries, including Canada. Based on these, I make some recommendations on how subnational Canadian governments and public institutions can better engage their procurement programs in supporting innovation.

Given the constitutional distribution of powers between levels of government in Canada, the bulk of public procurement is undertaken at the provincial and municipal levels, more so than in any other OECD country. Yet, the federal government owns the two most notable initiatives for using public procurement for innovation: the Build in Canada Innovation Program and Innovative Solutions Canada. There are some modest initiatives for the strategic use of procurement for innovation at the provincial level. A promising start is the British Columbia Procurement Strategy launched in 2018 which, for the first time, includes promoting innovation as an explicit objective. More attempts for innovation procurement have been made at the municipal level, but these initiatives appear for now sporadic and isolated.

Public procurement is often focused on cost minimization and risk avoidance, while the development of innovative solutions typically comes with the additional costs and risks inherent to early stage product development. That means harnessing the potential of public procurement for boosting innovation can only be achieved if these two key challenges — increased costs and risks — are carefully considered and addressed. In addition, procurement specialists must be supported to acquire the set of skills necessary to assess these additional risks and costs and balance them against the potential benefits of the innovative products. Ultimately, the use of public procurement to stimulate innovation requires openness to new ideas, the identification and communication of challenges that are currently not being met by existing market solutions, and the political will to include innovation as an explicit objective of the procurement process and to provide adequate financial support for it.

II. PUBLIC PROCUREMENT AND INNOVATION

Public procurement is the acquisition of goods, services and works by government institutions and publicly owned enterprises. The primary role of public procurement is to provide the tools that public institutions need to perform their functions. However, there is a growing recognition in both academia and among policy makers that besides enabling government organizations to fulfil their roles more effectively, purchasing innovative products can also influence the level of innovation in the private sector (OECD 2011; Uyarra et al. 2014).

The link between public procurement and innovation can be established on two levels. For goods and services that are needed and already exist on the market, public procurement can be made more open to innovation, perhaps by including innovation-related criteria in the tender documents, or at the very least making sure that innovative solutions are not disqualified due to outdated specifications or rigid contract terms. The other possibility is public technology procurement for a product or solution that does not exist but could be developed by private firms based on some functional requirements (OECD 2011, 35-36)

The history of using public procurement to achieve social outcomes can be traced back to at least 1840 (McCrudden 2004). Since then, using government contracting as a policy tool has gradually extended from promoting fair labour conditions and fair wages to providing employment opportunities for disabled workers, addressing unemployment, enforcing anti-discrimination laws or stimulating economic activity by disadvantaged groups. Today, strategic or mission-oriented procurement¹ is engaged in three main directions: social procurement (concerned with generating community benefits from government purchases), green procurement (employed to achieve certain environmental goals or to purchase goods and services with a reduced environmental impact) and innovation procurement (purchasing novel solutions or adapting existing solutions to new uses).

Innovation procurement is perhaps the most prominent tool governments are using in their recent efforts to shift away from supply-side innovation policies toward more interventionist demand-side policies. Given the increasing prominence of innovation procurement, it is important to review the mechanisms through which public procurement programs can enhance innovation, along with the main advantages of this policy and the costs and risks associated with it.

At first glance, public procurement and innovation may appear to have different, and perhaps even contradictory, objectives. Through public procurement, governments and public institutions acquire the goods and services they need from the private sector. Price is one of the most important aspects in these transactions and contracts are often awarded to the lowest cost bidder. That typically means buying off-the-shelf products and solutions that have already been tried and tested and where economies of scale

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Mariana Mazzucato has coined the term “mission-oriented” to describe innovation and innovation policy that aim to solve some societal challenges. Here, the term “mission-oriented” is borrowed to describe public procurement used for a scope that exceeds simply buying the goods and services that government bodies need.

can be achieved through large-scale production. On the other hand, innovation entails bringing new products or processes to the market. The novelty element implies that the new product is likely not being produced in large enough quantities to minimize unit costs of production; that, plus the inherent risk associated with a new solution, implies that a higher price is to be expected. However, this innovation premium is justified given the policy mission of the innovation (Edler and Georghiou 2007, 957).

The focus on lowest price in procurement contracts can be a potential deterrent for small and medium-sized enterprises (SMEs) pursuing innovation, as their reduced scale is typically associated with higher production costs. This is the reason why evaluations based on a larger set of criteria like MEAT — the most economically advantageous tender, advocated by the European Union — are sometimes viewed as a way to give more advantage to innovative SMEs in winning public contracts. However, upon scrutiny, it appears that bid evaluation in terms of MEAT may not help SMEs compete, and, in fact, it increases large firms' bids and success rates. This suggests that this type of policy may be counteractive to its intended purpose of increasing SMEs' participation in public procurement contracts (Stake 2017).

The debate on the capacity for innovation of small versus large firms, and the need for policy intervention to support their innovation, is ongoing. There is a view that large firms are more productive, create more jobs, are more innovative and have the capacity to create impactful innovation (Atkinson and Lind 2018; Mazzucato 2015). However the evidence appears more nuanced and sector-specific. Rothwell (1984, 312) finds great variation in the innovatory role of small firms across U.K. sectors when analyzing 2,200 innovations in the U.K.'s economy between 1945 and 1980. Generally, small firms' share of innovation was larger in sectors with relatively low entry and R&D costs (like scientific instruments or machine building), and much smaller in high capital/R&D costs (like chemicals, pharmaceuticals or aluminum production).

An extension of the idea that innovation is driven mostly by large firms — and the evidence from the EU's MEAT evaluation framework — is the hypothesis that public procurement can only successfully stimulate innovation if the contracts are large, in order to drive costs down. This implies that buyers must be large as well. Along this line, Pickernell et al. (2011) (cited in Stake 2017) argue, based on data for public procurement in the U.K., that procurement at the subnational level cannot successfully stimulate innovation because of the small scale of government spending. What may be true for the U.K. may be quite different in Canada, however, given that Canadian governments spend significantly more at the provincial and municipal level than do other OECD countries, as will be discussed in a section below.

Even if the argument stands that small firms are less likely to innovate, it can be interpreted as an argument in favour of more support for small businesses, not less since large firms are more likely to succeed on their own. This is particularly relevant in Canada, as small businesses exceed large businesses by far, not only in terms of sheer number, but also in terms of employment and economic output (Business Development

Bank of Canada n.d.).² Empirical estimates by Aschhoff and Sofka (2009) of the impact of public procurement on firms' share of sales from novel products suggest that public procurement is particularly beneficial for small firms in economically depressed areas, in their case eastern Germany.

A significant body of academic literature explores the link between public procurement and innovation from a theoretical standpoint. For Edler and Georghiou (2007) public procurement is an under-utilized instrument for driving innovation, whose use is justified on several rationales: to stimulate local demand (government acting as lead user, the creation of lead markets); to overcome market and system failures (risk and uncertainty, lack of trust, transaction, learning, entry and switching costs, etc.); to support normative policy goals (examples include sustainability or energy efficiency); to help translate societal needs into market demand.

Dolfsma and Seo (2013) compare public procurement with other innovation instruments to develop a framework for deciding which type of policy is more effective depending on the context. They conclude that public procurement is the appropriate tool for stimulating innovation in situations where the technology develops in a cumulative manner, and network effects are low or absent.

Dale and Bryson (2012, 11) summarize this literature and identify three main directions in which public procurement can be used to address the market failures typically associated with innovation:

1. By providing firms with a demonstrator to support diffusion of the innovation to other users (public-sector organizations and/or private);
2. By helping firms to achieve the critical mass for production that enables a notable decrease in production costs. Having a large customer contracted also reduces significantly the market risk of developing a new product (Aschhoff and Sofka 2009, 1236);
3. By supporting the creation of new standards which facilitate knowledge spillovers and increase the incentives for firms to invest in R&D.

However, using public procurement for innovation also comes with the risk that the new product may only serve a specific government need, with limited market applicability (Aschhoff and Sofka 2009). This risk seems particularly relevant for areas that are governments' exclusive domain, like military procurement. On the other hand, defence research in the U.S. has been the starting point for some of the most significant inventions of the 20th century, such as semiconductors, cellular technology, the internet, GPS, etc. (Mazzucato 2015; Rothwell 1984).

Edquist and Zabala-Iturriagagoitia (2012) point out that the main goal of the public procurement of innovation is not the development of new products, but the fulfilment

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According to the Business Development Bank of Canada, more than 98 per cent of businesses in Canada are small (fewer than 100 employees) and 55 per cent have fewer than four employees. Small businesses employ almost 70 per cent of private-sector workers. See <https://www.bdc.ca/en/articles-tools/business-strategy-planning/manage-business/pages/10-things-didnt-know-canadian-sme.aspx>

of some functions of public organizations through that new product. In other words, the creation of a new product is not the target, but a consequence of the fact that existing products fail to assist these organizations in fulfilling their roles properly. The diffusion of the new product may or may not be one of the objectives of the procurement process. Not all procurement is equally conducive to innovation. Pre-commercial procurement is focused on acquiring research results, without a commitment to procuring the resulting product. Developmental public procurement of innovation involves completely new products or solutions and can result in radical innovation. Adaptive public procurement of innovation involves adapting an existing product to specific national/local conditions.

Besides the extensive theoretical literature on the potential for using public procurement for innovation, significant attention has been paid to studying the efficacy of supply-side innovation-oriented policies (particularly R&D tax credits). Yet there is significantly less empirical evidence when it comes to the impact of demand-side policies on innovation, including public procurement programs. In part, this stems from the difficulty of defining and measuring these variables. Firm-level data on involvement in public procurement are not readily available. At the same time, the measurement of innovation in itself is not without issues — there is no unique way of measuring what constitutes innovation and the degree of innovation (Cohn and Good 2013; OECD 2010).

Thus, with few notable exceptions, the empirical evidence is typically reduced to case studies documenting specific success stories in using public procurement programs for innovation in a particular country. Rothwell and Zegveld (1981)³ review some of the empirical evidence to date to conclude that, over the long run, state procurement resulted in more innovation in U.K. regions than did R&D subsidies.

Aschhoff and Sofka (2009) investigate the effectiveness of public procurement and three other policy instruments⁴ on innovation based on survey data on the innovation activities of more than 1,100 German firms from 2003. Their measurement of innovation is given by a firm's share of sales from novel products. Their findings suggest that, while public procurement was the least prevalent of the four policies, firms that engaged in it achieved a higher share of sales from new products (more innovation), compared to firms that received public funding. Their results also suggest that public procurement is particularly beneficial for smaller firms located in economically challenged regions (eastern Germany). This conclusion is in line with Rothwell's (1984) proposition that public procurement can be a powerful tool for regional policy by stimulating innovation by small new firms, which are better able to adapt to changes than large, mature firms.

More recently, Guerzoni and Raiteri (2015) analyzed 2009 Innobarometer survey data on over 5,000 firms from 14 EU countries that were treated to various innovation policy instruments. They investigated the impact on innovation of both supply-side instruments (R&D tax credits and subsidies) and public procurement, as well as the interaction between them. Their findings suggest that innovative public procurement is more effective than R&D grants in stimulating private expenditure on innovation inputs.

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As cited by Hanson (1982) and Cohen and Amorós (2014).

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Laws and regulation, university research as a catalyst for innovation and access to public funding.

Case studies are more abundant in the literature, including OECD, EU⁵ and government reports on public procurement highlighting successful or cautionary stories. One academic study, Rolfstam (2013), presents eight successful instances of procurement of innovative products or services to infer the success factors behind them. The cases included are diverse, from the British National Health Service's purchase of a silver-coated catheter to reduce the risk of hospital-acquired infection, to a digital maritime radio system facilitating communication between ships and land-based entities in Norway, and building eight-storey wooden houses using passive energy by a municipality in Sweden. Some success factors inferred from these examples (or some of the necessary conditions to ensure the procurement of the innovative products) include: expertise on the public procurement procedures and relevant law; technical competence for functional specification; co-ordination and co-operation among procurers and other stakeholders (like future operators); managerial control and risk management; adequate resources and political support.

III. CHALLENGES IN USING PUBLIC PROCUREMENT TO STIMULATE INNOVATION

Risk is one of the most challenging aspects of using public procurement for innovation. From the buyer's perspective, innovative solutions are risky to adopt.⁶ Moreover, public-sector buyers tend to be more risk averse than private-sector buyers because the benefits of the innovative solution may take longer to materialize than the typical political cycle (Georghiou et al. 2014). In addition, audit bodies tend to criticize excessive risk-taking more than insufficient risk-taking. On the other hand, the most significant risk suppliers face is that their offer of an innovative solution will not be accepted.

As will be discussed in more detail below, the procurement of innovation can include the purchase of new products, as well as the purchase of the research and development of new solutions for a particular need before they become commercially available (pre-commercial procurement). In the second case, the government buys the research and development of the innovative solution without necessarily committing to purchase the product that may result from it. In addition, procurers may purchase R&D from multiple competing providers in order to identify the best solution to their challenge. The risk associated with this type of procurement is naturally smaller and comparable to the risk of undertaking in-house research for developing a solution.

However, even in the case of procuring innovative products, some solutions to mitigate the risks exist and have already been tested. One obvious way to reduce suppliers' risk is to include clear requirements for innovation in the tender documents (Georghiou et al. 2014). From a procurer's perspective, solutions include providing financial incentives like price premiums to reduce the risk of procuring from SMEs, using third-party standards

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The Innovation Procurement Platform features a variety of case studies and other resources intended to facilitate the exchange of information on the public procurement of innovation. See <https://innovation-procurement.org/resources/>

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This risk may be higher in the case of procuring from small firms, as their capacity to fix problems that might arise is limited. A large firm will be more likely to do so to protect its reputation.

and certificates like quality labels to reduce the uncertainty associated with new products and the provision of insurance guarantees/immunity to buyers for potential losses incurred due to the procurement of innovative products.

The evolution of Korea's New Technological Purchasing Assurance (NTPA) program (Box 1) offers an example of how product certification and buyer immunity clauses can reduce procurers' risk and stimulate the public procurement of new technological products.

The risk associated with procurement of new solutions is real, but also perceived. An internal review by the Australian government found that risk aversion can lead staff to adopt processes even more stringent than the internal regulations in place. They also found that some of the procurement staff believed that some innovation-friendly procurement practices were against regulations even though, in fact, they were not. These findings reinforce the idea that public-sector employees tend to interpret internal regulations conservatively, rather than risk breaking the law (OECD 2015a, 59).

A second obvious challenge associated with the procurement of innovative solutions is the increased cost. Buying new products or solutions is virtually incompatible with cost minimization in the short term. The latter entails firms identifying and producing at their efficient scale of production, where all possible cost-reduction measures have been employed. This is highly unlikely for a new-to-the-market product.

Governments and public institutions need therefore to weigh the short-term benefits of cost minimization against the long-term benefits of innovation and make the appropriate choice. In that sense, the typical cost-benefit analysis must be amended in two directions: to include lifetime costs and benefits⁷ as opposed to immediate short-term ones, and to account for the additional external benefits or the spillovers generated by innovation. An innovative product that may fail the cost-benefit test based on immediate benefits and costs may still be preferable to the status quo when lifetime benefits that accrue directly to the buyer, plus the additional spillover effects from which society at large benefits, exceed lifetime costs. The important question remains: Who should pay for the additional cost or the innovation premium — the buyer itself or the government at large?

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This may be difficult to achieve in specific environments. For example, in the health-care context, the use of a new product or service may change the care process. Savings may be found in one area while costs may increase in another. Budgetary rigidity may prevent the transfer of savings from one part of the organization to another part that may experience higher costs. Or vice versa: adopting a solution in one part of the organization may cost more, but reduce the end-to-end cost of treatment, although no budgetary mechanism exists to transfer the reduced costs to the department experiencing higher costs at the point of adoption.

Box 1. The New Technological Purchasing Assurance (NTPA) Program in Korea

Discussion based on Lee (2013) and OECD (2011).

NTPA was launched in 1996. In its initial form, the program required public institutions to give priority in their purchasing decisions to SMEs' technological products that the government had approved for performance. However, no enforcement mechanism existed to ensure the procurement of these products would actually happen. A series of studies revealed that public organizations remained reluctant to purchase SMEs' technology products for reasons that included lack of confidence in the quality of performance, lack of product performance verification and auditing concerns.

The program was subsequently revised in 2005-2006 to include a performance certification system for SMEs' technological products, as well as select the products that would qualify for preferred procurement. At the same time, a system was introduced that conferred performance insurance on the certified products. In addition, a clause was introduced that granted immunity to procurement managers in relation to potential losses resulting from the procurement of performance-insured products.

With these revisions, public institutions were required to dedicate at least five per cent (in 2006), increasing to 10 per cent in 2010, of their procurement to this program. It was estimated that as a result of these revisions, the share of new technology products in the public procurement of all SME products rose from 2.2 per cent in 2001 to 9.3 per cent in 2009. A new regulation also mandated that new technology-certified products must represent at least 20 per cent of an item's total procurement amount.

The Korean NTPA program offers an example of successfully mitigating the risk inherent in procuring new solutions. A study by the Science and Technology Policy Institute based on survey data collected prior to the program's 2005 revision revealed the program had a high recognition rate of more than 40 per cent among surveyed firms, although the utilization rate was less than 10 per cent. The econometric analysis also revealed that the program had a significantly smaller impact on the firms' innovation activities than tax incentives. However, from 2005 to 2012 the number of public organizations involved in using the NTPA increased from 18 to 36, and the number of supported firms from 87 to 254.

The additional costs are particularly critical for small buyers, which potentially leads to increased risk aversion of municipal governments and institutions. Procurement co-operatives may offer a solution to this. Typically, this type of agreement is used to help small buyers aggregate their demand in order to negotiate better prices from their suppliers. In the case of procuring innovative products, a single collective contract may serve not necessarily to diminish suppliers' market power, as much as to help them achieve the lower costs associated with the larger scale of a larger contract.⁸

A third challenge, related to the risk procurers face when buying new products, is the difficulty in measuring innovation, as noted above. The OECD's *Oslo Manual* provides as close as practically feasible to a universally accepted definition of innovation. According to page 20 of the manual's newly revised 2018 edition:

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From conversations with procurement specialists, it appears that partnering with similar buyers in order to reduce the acquisition price is better suited to consumable products. When it comes to the procurement of services that require customization, there is less advantage in bulk-buying.

An innovation is a new or improved product or process (or combination thereof) that differs significantly from the unit's previous products or processes and that has been made available to potential users (product) or brought into use by the unit (process).

Yet even this widely accepted definition is quite vague in terms of assessing the degree of innovation. The task of assessing how much a product is improved and how it “differs significantly” from similar existing products is not trivial. It is even more difficult to assess how much this improvement is worth for society and therefore how much premium we are willing to pay for it, which is an essential piece of information for the cost-benefit analysis mentioned above.

A fourth major hurdle in using public procurement for innovation, closely related to the challenges mentioned above, is its complexity. Assessing the risk and potential rewards of procuring innovation products is not a trivial task. For a long time, procurement specialists have been expected to minimize costs and risks. Innovation procurement requires a significant change in mindset, as well as additional skills and training. For this reason, beyond political will and public discourse, building capacity is perhaps the most critical pre-condition for success in using public procurement to stimulate innovation. Building capacity takes time and political will and translates into additional costs for the authorities in charge.

In some situations the complexity can be mitigated through the use of procurement intermediation (Edler and Yeow 2016), where a knowledgeable third party, perhaps a government agency, brokers the link between the buyer and seller of the innovative solution. Innovative Solutions Canada, for example, publishes challenges issued by federal departments and agencies, and invites companies to submit novel solutions to these challenges, which they further help grow through direct funding (Innovative Solutions Canada n.d.).

Adding another layer of complexity is a fifth challenge in the public procurement of innovation — the identification and communication of buyers' needs and requirements in the tender process. For public procurement to allow and encourage innovative solutions, buyers' requirements should take the form of functional specifications, which identify the needs without prescribing solutions (Georghiou et al. 2014). This difficult task comes with the risk of escalating costs. It is up to the buyers and their expertise to find the optimal set of restrictions. The fewer restrictions and parameters there are, the more room for innovation. But this comes with a higher risk of escalating prices and increased difficulty to evaluate the degree to which the final product serves the procuring body's needs.

A sixth challenge in using public procurement for innovation is the potential for corruption.⁹ This is a major concern for public procurement in general but even more so in innovation procurement. If, as noted before, public tenders are designed with fostering innovation in mind, they will lack clear specifications of what the final product should look like. While this openness is precisely what makes innovation possible, it also raises

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An issue related to the potential for corruption is the perception of corruption. Procurers may be skeptical to seek/accept innovative solutions to avoid the suspicion of corruption.

the question of whether innovation-centred public procurement is more susceptible to corruption. This concern is reinforced by the previous point that the lack of clarity in specification may lead to higher costs, which makes corruption both more likely and harder to detect.

Finally, a major limitation in using public procurement for innovation is the legislative framework, including the free trade agreements that a country has signed. Since the purpose of free trade agreements is to encourage free(er) movements of goods and services, they often include restrictions that limit the extent to which public bodies can offer preferential treatment to nationals. These restrictions often take the form of a maximum threshold for contracts that can be awarded to preferred suppliers.¹⁰ A direct consequence of these restrictions is that, in practical terms, it will be easier to use public procurement to trigger innovation in SMEs, or at least for small contracts that fall below the procurement thresholds.

IV. INNOVATION AND PUBLIC PROCUREMENT: INTERNATIONAL EXPERIENCE

1. UNITED STATES

One of the earliest attempts to use public procurement to stimulate innovation is the U.S. National Bureau of Standards' Experimental Technology Incentives Program (ETIP) from the 1970s.¹¹ The program identified three ways in which government procurement could stimulate technological innovations and their diffusion:

1. By applying its buying power, the government can create a market for new products;
2. Government procurement creates a demand pull for new technologies if it expresses its needs in functional or performance terms, leaving it to the industry to find new ways to respond to these needs;
3. Government as the first and largest buyer provides the opportunity to test innovative products.

¹⁰

For example, under the New West Partnership Agreement between the Governments of British Columbia, Alberta, Saskatchewan and Manitoba, there is a threshold of \$75,000 for institutions in the MASH sector (municipalities, academic institutions, school boards, and health regions/providers) where preference can be given to local firms for the procurement of goods and services. For contracts above this threshold, the MASH institutions must provide open and non-discriminatory access to businesses from the other provinces. The Canadian Free Trade Agreement, which includes all Canadian provinces and territories, has a higher threshold of \$105,700 for goods and services procured by the MASH sector for 2020 and 2021. The threshold is higher still at SDR 200,000 (approximately \$375,000) for goods and SDR 300,000 (approximately \$561,000) for services under the Canada-European Union Comprehensive and Economic Trade Agreement (CETA). Other trade agreements are less restrictive. The new U.S.-Canada-Mexico trade agreement (USMCA) has eliminated some of the procurement provision included in NAFTA (Grier 2019). A list of the trade agreements of which Canada is a member can be found at <https://buyandsell.gc.ca/policy-and-guidelines/policy-and-legal-framework/trade-agreements#10>.

¹¹

The ETIP discussion is based on Rothwell (1984).

In order to seize these opportunities, the public procurement process was revised to include several novel approaches, among which are:

- Life-cycle costing — the use of the total cost normally incurred over the lifetime of a product in its evaluation;
- Value incentives clauses — the possibility for the manufacturer to share with the government some of the cost savings resulting from improved/innovative design of its products;
- Performance specifications — stipulation of performance standards that the products must meet;
- Sliding scale rating — the cost bid is reduced on a sliding scale for products offering a superior performance;
- Two-step procurement — manufacturers submit technical proposals prior to their cost proposal, to help determine the feasibility of innovation;
- Prototype purchasing — the producer sells a limited quantity of the innovative product which may lead to a larger government market upon successful testing.

ETIP was more than an experiment in using innovative procurement practices. It also addressed the adverse effect of existing securities regulations on the ability of start-up technology companies to access venture capital. While many deemed it a successful policy experiment, ETIP was cancelled in 1982 after 10 years. Two reasons for the cancellation are believed to be the program's failure to produce an overall strategy integrating the individual policy experiments, and the difficulty in retaining the "multidisciplinary, analytical, highly motivated, and entrepreneurial staff" necessary to manage such an innovative program. However, the program was successful in getting government agencies to change some of their internal policies and experiment with new policy mechanisms (Tassey 2014).

Currently, in the U.S., the main program in support of innovation for small businesses is the Small Business Innovation Research (SBIR n.d.) program. This is a highly competitive program that encourages domestic small businesses to engage in federal research/ research and development (R/R&D) with the potential for commercialization. The program is funded through mandatory contributions; agencies with an extramural research budget greater than \$100 million per year are required to contribute 3.2 per cent of this budget to the program. The program includes three phases. In phase I, up to \$150,000 for six months can be awarded for businesses to investigate the feasibility, technical merit and commercial potential of an idea and for concept development. In phase II, up to \$1 million can be awarded over two years for continuation of R/R&D efforts from phase I and for prototype development. Phase III is the commercialization phase, for which there is no SBIR funding, but award winners from phases I and II may be considered for sole-source contracts by government agencies (SBIR 2014).

Several other OECD countries (Ireland, the Netherlands and the United Kingdom) have national programs for innovation similar to the SBIR (OECD 2017a).

2. THE ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT (OECD)

The OECD Council on Public Procurement developed a series of recommendations to ensure “the strategic and holistic use of public procurement” (OECD 2015b). The starting point of this document is the growing interest in using public procurement to achieve public sector efficiency but also help fulfill other strategic objectives (innovation, job creation, support for small businesses, environmental protections). While efficient and effective public procurement is essential for the purpose of the government, it is also viewed as vulnerable to mismanagement, fraud and corruption.

One of the key recommendations of this document for its adherents is to balance the use of their procurement system to pursue secondary objectives against its primary objective. The secondary objectives should be set in accordance to clear priorities and their benefits should be balanced against the need to achieve value for money. Adherents should develop strategies and action plans to integrate the secondary objectives into the procurement system and to monitor the effectiveness of the procurement system in achieving them. In particular, adherents should consider the capacity of the procurement body to support these secondary policy objectives and the additional workload associated with them.

In 2015, the OECD conducted the Survey on Strategic Innovation Procurement in order to inventory the current state of using procurement strategically to promote innovation within its member countries and outside. The survey covered 35 countries and found that 80 per cent supported using procurement for innovation, and 50 per cent had developed an action plan for it (either stand-alone, or as part of their general innovation or procurement strategy). Countries submitted their definitions of procurement for innovation and details of their procurement for innovation programs, as well as good examples. The findings of this survey were summarized in a report on public procurement and innovation (OECD 2017a).

The report concluded that the main challenges in implementing procurement for innovation practices were risk aversion, management, personnel and skills, capacity and political support. It further suggested several necessary directions for government action to achieve success in the strategic use of procurement for innovation:

- Demonstrate political leadership and commitment for the procurement of innovation;
- Cultivate a culture that is more open to embracing risk and new ways of doing things;
- Build up the capacity required to implement this strategy (both quantity and quality of skilled staff);
- Encourage horizontal and vertical co-operation between different branches of the public procurement process, as well as different levels of government;
- Communicate about the positive outcomes of innovation.

Based on the survey's findings, the OECD elaborated upon a general framework intended to assist countries in expanding their own programs for the strategic use of procurement of innovation (Box 2).

OECD identifies public procurement as one of the areas of government activity most susceptible to corruption and has a set of recommendations on preventing corruption in public procurement (OECD 2016). Some of the issues around corruption in public procurement identified in this document are particularly relevant for innovation procurement. Corruption risks increase with the complexity of the procurement process and the existence of close interaction between government officials and businesses. Integrity risks exist at every stage of the procurement process, from the lack of adequate need assessment before the tendering phase to deficient supervision by public officials of the way suppliers perform their contract. Procurement at subnational level may be more or less susceptible to corruption as local officials tend to be more accountable to their constituencies but also closer to local businesses. SMEs are more susceptible to corruption than larger companies as they lack the time and resources to comply with complex regulations, tend to be less concerned with reputation and more focused on short-term outcomes.

The OECD recommendations to prevent corruption are formulated around a set of general principles. Particularly relevant to innovation procurement are the need for transparency (ensuring open access to information, levelling the playing field for all businesses), integrity (setting specific standards for procurement officials and rules and procedures to manage conflict of interest), oversight and control (developing oversight mechanisms to support accountability throughout the public procurement cycle) and the implementation of e-procurement (to increase transparency and competition, reduce contact between officials and companies, and help detect irregularities).

Box 2. Nine Areas of Action for the Development and Implementation of Strategic Procurement of Innovation (OECD 2017a)

1. Policies and targets: Public procurement for innovation must be used in co-ordination with other policy areas and policy strategies with defined targets must be included within any national, subnational and regional innovation policy.
2. Legal framework: To make the procurement of innovation possible, a clear legal framework must be established, including definitions, guidelines and templates.
3. Effective management: Procurement of innovation is complex and requires multidisciplinary teams and effective leadership to manage this increased complexity. Innovation agencies can also broker the link between buyers and suppliers.
4. Capacity: Adequate capacity and skills are critical for the success of innovation procurement. These can be built through specific training and the creation of multidisciplinary teams, as well as competence centres focused on public procurement for innovation.
5. Financial support: Given its increased cost, it is imperative to provide the financial support for the procurement of innovation in the form of sufficient budgets, funds and other financial incentives (grants, awards, etc.).
6. Risk management and impact assessment: Understand the potential risks and rewards associated with the procurement of innovative products, and take steps to reduce loss and damage.
7. Awareness and stakeholder engagement: Given its relative novelty, procurement of innovation must be advertised through many channels, including the publication of good practices and success stories, organization of workshops and seminars to share these experiences, creation of a dedicated knowledge-sharing platform, etc. Early stakeholder engagement is also critical.
8. Standardization: Define test standards, methods and quality certificates which can incentivize innovation (example: energy efficiency).
9. E-procurement: Use appropriate e-procurement and information technology (IT) tools to standardize the procurement process, promote transparency and discourage fraud/corruption.

3. THE EUROPEAN UNION¹²

In 2010 the European Commission developed Europe 2020, its new strategy for smart, sustainable and inclusive growth (European Commission 2010) built around seven themes. Under the “Innovation Union” initiative, public procurement is identified as one of the demand side policies (in addition to smart regulations) to help re-focus EU’s innovation policy to challenges facing its society. Procurement is also included in the set of industrial policy instruments to support innovation activities, particularly by SMEs.

In 2011, the EU defined its new framework programme for research and innovation, Horizon 2020 which currently provides funding for two types of innovation procurement: Public Procurement of Innovative solutions (PPI) and Pre-Commercial Procurement (PCP) (European Commission n.d.)

¹²

The European Union has a wealth of resources on the procurement of innovation that can be difficult to navigate. The following discussion is non-exhaustive and covers some of the key points in the evolution of innovation procurement in EU.

In 2014 the EU modernised its public procurement framework with three new directives reflecting new economic and technological trends, including a framework for the procurement of innovation. To better support member states in advancing their own procurement of innovation, in 2018 the European Commission released a Guidance on Innovation Procurement which clarifies the innovation procurement concept, outlines the policy framework for it, and provides practical advice on its implementation. (European Commission 2018).

The new directives and the Guidance reinforce the value-for-money focus, however full life-cycle costing can and should be considered when awarding contracts. The Most Economically Advantageous Tender (MEAT) criteria combines considerations on price and cost. The cost component should be calculated based on an objective life-cycle costing methodology that reflects the monetary value of the production, acquisition, use, consumption, maintenance, interconnecting, recycling and/or disposal of the good contracted. This could encourage the adoption of more innovative solutions, even if initially more expensive, if they can be shown to lead to savings/improved performance over the longer term. In order to attract investors and to stimulate SME participation, contracting authorities are encouraged to break the contracts into lots and to design SME-friendly payment schemes.

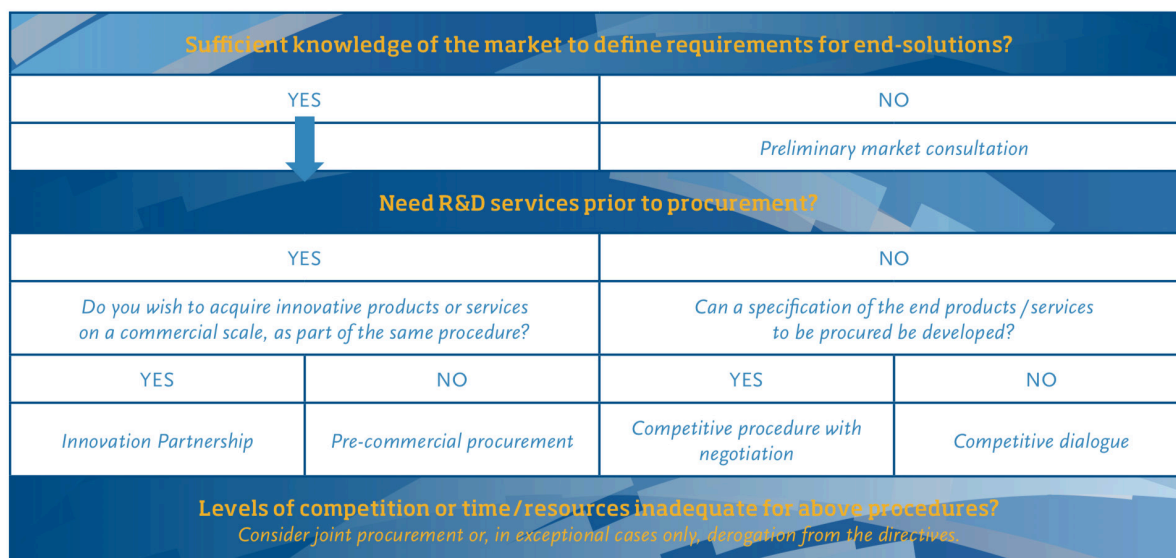
In 2018, the Procurement of Innovation Platform¹³ published its own guide for public authorities on public procurement of innovation (Semple 2018). This document outlines practical steps for procuring innovation under the new EU directives. Selecting the most suitable innovation procurement procedure is not always straightforward. The choice depends on several factors, including the degree of knowledge about the solution being procured and the possibility of developing technical specifications for it. To assist public authorities in identifying the best procedures for their needs, the guide includes a useful scheme illustrated in Figure 1 below.

The procurement guide also outlines the main issues to be considered when creating a public procurement for innovation (PPI) strategy: needs assessment; creating the project team and steering group; making a business case for PPI, including the calculation of future costs and savings; considering the possibility of joint procurement; deciding when/how to engage suppliers; legal aspects; life-cycle costing; risks and financial support.

¹³

While funded from an EU Horizon 2020 research grant, the Innovation Procurement Platform is an organization independent of EU, providing resource on current developments and best practices in innovation procurement. <https://innovation-procurement.org/>

FIGURE 1. PROCEDURES FOR PROCURING INNOVATION



Source: Semple (2018)

V. PUBLIC PROCUREMENT FOR INNOVATION IN CANADA

FEDERAL LEVEL

The disappointing state of innovation in Canada, particularly as measured by the level of R&D spending, has been a constant concern for policy-makers over the last few decades.¹⁴ In 2010, the federal government appointed an expert panel (the Jenkins panel) to undertake a review of the federal programs' effectiveness in supporting business and commercially oriented R&D and the final report (Canada. Industry Canada 2011a, henceforth referred to as "the Jenkins report") was released in October 2011. The panel identified the need to support the growth of small innovative firms into larger enterprises as a key element in addressing Canada's innovation challenges. It also identified the insufficiency of demand-side policies for innovation as a weakness of the Canadian system.

The panel's six main recommendations included, on the demand side, making business innovation one of the core objectives of public procurement. On the supply side, the panel recommended both a shift in focus from indirect support in the form of R&D tax credits to more direct support initiatives to benefit small and medium-sized

¹⁴

Canada's R&D intensity or the share of GDP spent on R&D peaked at 2.02 per cent in 2001, when it was also the closest to the OECD average of 2.16 per cent. Since then, the OECD average increased steadily to 2.37 per cent in 2017, while Canada slipped to 1.59 per cent in 2017, and even further to 1.55 per cent in 2018. Data from <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>.

enterprises, as well as redefining the base of the R&D tax credit for SMEs as labour-related costs, for simplification.¹⁵

Regarding the strategic use of public procurement to stimulate innovation, the Jenkins panel report outlined the potential for the acquisition of innovative products to both boost productivity and lower costs in the public sector, as well as to contribute to the viability and growth of innovative firms, particularly SMEs. The mechanisms through which public procurement could help such firms include facilitating their debt and equity financing through the prospect of sales, showcasing/marketing their products and stimulating the output toward the critical mass required for economies of scale. At the same time, the panel emphasized that the use of these policies must be justified based on cost-benefit principles and balanced against Canada's trade obligations, the risk of cultivating supplier dependency and the risk of hampering competition.

The report noted the modest use of public procurement for innovation in Canada, compared to other developed countries, and proposed a series of changes to accelerate this practice. These included:

- Making innovation an explicit objective in procurement policies;
- Formulating procurement requests for proposals in terms of needs/problems to be addressed rather than detailed technical specifications;
- Setting targets for external R&D contracting (including a sub-target for SMEs, similar to the U.S.'s Small Business Innovation Research program);
- Increasing the scope of the Canadian Innovation and Commercialization Program (CCIP);
- Increasing collaboration among the federal, provincial and municipal governments in terms of sharing best practices and developing joint strategies for the effective use of public procurement to advance innovation.

Given the central role that smart procurement could potentially play in stimulating innovation, the expert panel further issued a special report on procurement (Canada. Industry Canada 2011b). The report summarized some of the opportunities and challenges of using government procurement to support business innovation, with emphasis on defence and security-related procurement, one of the main areas of jurisdiction for federal procurement.

Two possible reasons for Canada's lack of success in fostering innovation advanced in the literature, including in the Jenkins report, are (1) the over-reliance on indirect support/tax subsidies as opposed to direct funding on the supply side, and more generally (2) the over-reliance on supply-side instruments as opposed to demand-side ones.

¹⁵

Since 2014, capital expenditures have been excluded from the definition of qualified SR&ED expenditures for investment tax credits. Currently, SR&ED qualified expenditures include mainly expenditures of a current nature (wages, materials), plus 80 per cent of contract R&D expenditures. While generally SR&ED expenditures are dominated by labour-related costs, the actual extent depends on the sector. Both the Jenkins panel recommendation and the federal exclusion of capital expenditures from allowable SR&ED expenditures tend to discourage capital-intensive R&D.

Indeed, fiscal instruments to stimulate the amount of R&D in the form of deductions for current and capital spending, R&D tax credits, super deductions, super allowances, etc., have been used in Canada for more than seven decades at the federal level¹⁶ and more than 35 years at the provincial level.¹⁷ Despite recent reductions in the scope of the federal Scientific Research and Experimental Development (SR&ED) Program,¹⁸ Canada continues to rely disproportionately more on tax support for R&D and less on direct government funding compared to other OECD countries, and to offer significantly larger R&D subsidies for SMEs compared to large firms (Appelt, Galindo-Rueda, and Cabral 2019, 20-21).

The federal government has taken steps to change the innovation landscape in some of the directions suggested by the Jenkins report, particularly with the new Innovation Agenda launched in Budget 2016 (Canada. Department of Finance 2016, 109).¹⁹ In Budget 2017, the federal government launched Canada's Innovation and Skills Plan, "an ambitious effort to make Canada a world-leading centre for innovation" (Canada. Department of Finance 2017, 44). One of its targets is to increase Canadian business expenditures in research and development as a share of GDP to the OECD average by 2025, which would require a 70 per cent increase of these expenditures from the \$17.6 billion (in 2017) to \$30 billion by 2025 (Government of Canada n.d.)

Regarding the support for innovation through public procurement, in 2010, the federal government launched a program for the procurement of innovative pre-commercial goods and services. The program became permanent in 2012, as the Build in Canada Innovation Program (BCIP). The program used a continuous intake process, in which applications could be submitted any time. Proposals were then evaluated by the National Research Council of Canada Innovation Assistance Program (NRC-IRAP), and successful proposals were then referred to potential clients in the federal government. BCIP had four standard²⁰ priority areas: environment, health, enabling technologies, and safety and security, with a funding limit of \$500,000 per innovation. To be eligible, innovations were required to have a technology readiness level (TRL) of at least seven, meaning a prototype existed already and was ready for demonstration in an operational (not simulated) environment (OSME and PSPC n.d.). From 2010 to 2019, the BCIP awarded 398 contracts with a value of more than \$170 million and helped over 80 per cent of participating businesses to commercialize their innovation within 12 months of contract completion. (Canada. Public Services and Procurement Canada 2019, 12-13).

¹⁶ For a timeline of the main fiscal instruments for stimulating R&D at the federal level, see <https://www.canada.ca/en/revenue-agency/services/scientific-research-experimental-development-tax-incentive-program/evolution-program-a-historical-perspective.html>.

¹⁷ For an extensive discussion of R&D support in Canada at the federal and provincial levels and their interaction, see Crisan and McKenzie (2017).

¹⁸ In 2013, the eligibility of contract payments for SR&ED purposes was reduced to 80 per cent of the contract's value. In 2014, the definition of eligible expenditures for SR&ED purposes was narrowed by removing capital expenditures. In addition, the general SR&ED investment tax credit was reduced from 20 per cent to 15 per cent effective Jan. 1, 2014, and lease costs can no longer be claimed for SR&ED purposes.

¹⁹ Sulzenko (2016) reviews extensively the federal initiatives in support of R&D and innovation in general, five years after the Jenkins report, and how they match the Jenkins panel's recommendations.

²⁰ BCIP also had six military priority areas (cyber security, command and support, in-service support, protecting the soldier, arctic and maritime security, and training systems) with a funding limit of \$1,000,000 per innovation.

For proposals not yet at the prototype level, Budget 2017 announced a new procurement program as part of the Innovation and Skills Plan — Innovative Solutions Canada (ISC). The purpose of the program was to replicate the successful U.S. SBIR program, with federal departments and agencies allocating a portion of their funding towards early-stage research and development, late-stage prototypes and other goods and services from Canadian innovators and entrepreneurs. (Canada. Department of Finance 2017, 86). In 2018 the purpose of ISC became more clear: ISC would post challenges issued by 20 federal department or agencies, and invite small businesses to develop new products or applications in response to those challenges (Canada. Innovation, Science and Economic Development Canada 2019, 18-19).

ISC is a multi-stage program, looking for solutions to these challenges “at the earliest level of technological development”. In phase I, solutions with a TRL of one to four are proposed and may receive up to \$150,000 in funding over six months to develop and deliver a proof of concept. Eligible²¹ small businesses that successfully complete phase I can move to phase II, where a maximum of \$1 million over two years can be awarded for developing and delivering a prototype. In phase III, a federal department may choose to fund additional research and/or procure the novel technology or service from Canadian small business through a separate procurement process. (Innovative Solutions Canada 2019).

Budget 2018 streamlined²² the federal government’s suite of innovation program, including the consolidation of BCIP, previously administered Public Services and Procurement Canada, into ISC, under the administration of Innovation, Science and Economic Development Canada (Canada. Department of Finance. 2018, 109). The consolidated ISC program has two streams: a challenge stream (the original ISC) and a testing stream (the former BCIP) with a budget of \$100 million. The program continues to be geared toward small businesses and encourages submissions from businesses owned by women, Indigenous peoples, youth and visible minorities, thus including elements of both innovation and social procurement. (Canada. Innovation, Science and Economic Development Canada 2020, 22)

When considering the opportunity of using public procurement as a means of boosting business innovation, it may seem natural to start with the central government as innovation promoter. However, in many federal states, and particularly in Canada, the potential to stimulate innovation through public procurement may be even greater at the subnational level. The reason for this is that Canada is one of the most decentralized OECD countries by several dimensions. Canada had the largest share of total public expenditure at subnational level in OECD (76.2 per cent compared to the OECD average of 40.4 per cent) and the second largest share of subnational expenditure in GDP in

²¹ Two of the eligibility conditions for the ISC program is that businesses must have no more than 499 employees and 50 per cent of wages, salaries and fees should be paid to employees or contractors that spend the majority of their time working in Canada.

²² Part of the streamlining process is the new Innovation Canada interface launched in January 2018 with the purpose of providing a single point of contact for Canadian entrepreneurs looking to grow their business, connecting them to all government programs and services that suit their profile, including those at provincial and territorial level.

OECD (31.6 per cent compared to the OECD average of 16.2 per cent) in 2016 (OECD 2018 Fig. 5.1 p. 115). Canada also had the second largest share of public investment at subnational level in OECD in 2016 (87.6 per cent versus the OECD average of 61.1 per cent) and the largest share of subnational investment in GDP (3.4 per cent versus OECD average of 1.9 per cent) (OECD 2018, 125).

Looking closer at each level of government, in Canada the federal government undertook only 24.5 per cent of general government expenditures in 2015, the provincial government was responsible for 47.5 per cent (the largest share in OECD),²³ the local government for 21.1 per cent and social security for an additional seven per cent. By contrast, the average for OECD was 41.0 per cent of general government expenditures contracted by the central government, 23.3 per cent by state, 15.6 per cent by local government, and 20.1 per cent social security (OECD 2017b, 81).

Compared to other OECD countries, Canada also displays a larger share of public procurement²⁴ in government expenditure (32.7 per cent in Canada versus an OECD average of 29.1 per cent in 2015) and a larger share of public procurement in GDP (13.4 per cent in Canada, 11.9 per cent OECD average in 2015). The largest contributors to procurement spending in OECD, on average, are health (29.8 per cent), economic affairs (17.0 per cent), education (11.9 per cent), defence (10.1 per cent), and social protection (9.8 per cent), however with large variations from country to country.²⁵ (OECD 2017b, 173).

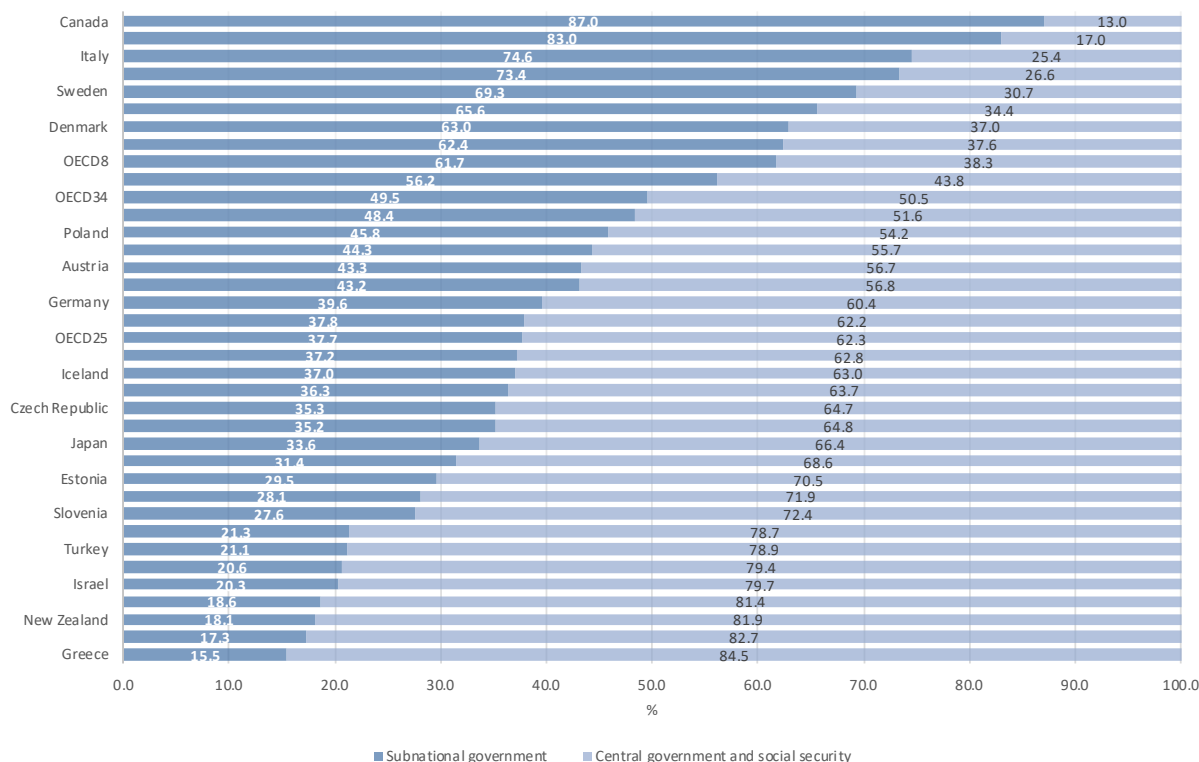
Canada not only has a larger than average share of public procurement in government expenditure and GDP, but also the largest share of procurement at the subnational level of all OECD countries, almost seven-fold the federal government's share.

²³ The U.S. has a combined share of 48.5 per cent of expenditures contracted at state and local level, but it is unlikely that the state share alone exceeds the provincial share of 47.5 per cent in Canada.

²⁴ The OECD defines general government procurement as "the sum of intermediate consumption (goods and services purchased by governments for their own use, such as accounting or information technology services), gross fixed capital formation (acquisition of capital excluding sales of fixed assets, such as building new roads) and social transfers in kind via market producers (purchases by general government of goods and services produced by market producers and supplied to households)."

²⁵ Israel and the U.S. spend significantly more than the OECD average on defence procurement (28.4 per cent and 21.3 per cent, respectively), while Belgium spends disproportionally more on health procurement (47.0 per cent) and disproportionally less on defence (only 1.4 per cent).

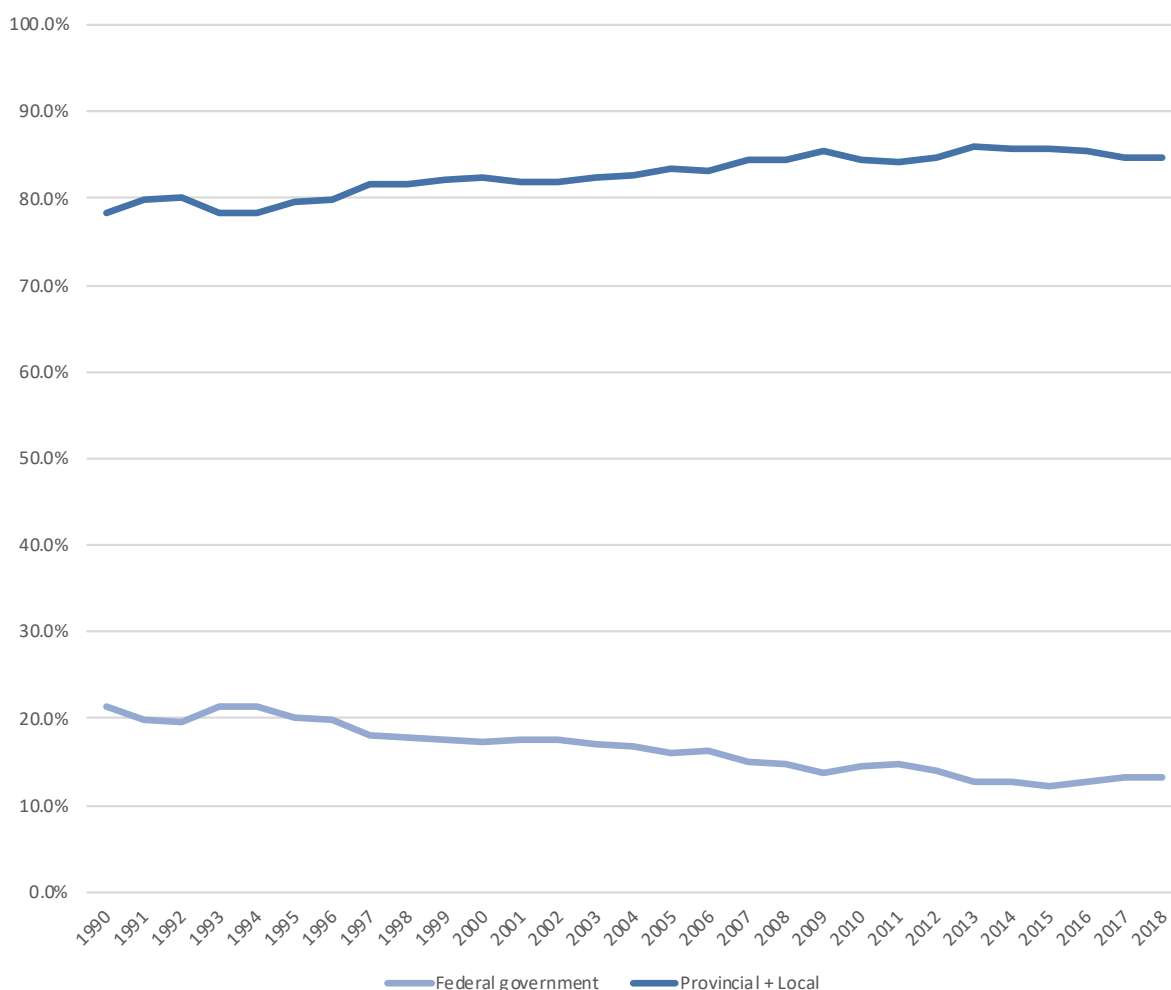
FIGURE 2. SUBNATIONAL GOVERNMENT PROCUREMENT AS A SHARE OF TOTAL PUBLIC PROCUREMENT, 2016 (%)



Source: OECD Regions and Cities at a Glance 2018 - © OECD 2018. Figure 5.6: Subnational Government Procurement as a Share of Total Public Procurement in 2016 (%).

This ranking is not surprising, given the roles and responsibilities of each level of government in Canada. Health care, education and social welfare, some of the largest areas in public procurement, are predominantly the responsibilities of provincial and municipal governments. As the spending needs in these sectors have increased steadily over the past decades, so has the share of procurement under the responsibility of provincial and municipal governments, as evidenced in Figure 3 below.

FIGURE 3. USE OF GOODS AND SERVICES BY LEVEL OF GOVERNMENT



Source: Statistics Canada. Table 10-10-0015-01 Statement of Government Operations and Balance Sheet, Government Finance Statistics (x 1,000,000)
<https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1010001501>.

PROVINCES

Despite their predominant share in public procurement, there are no programs yet in place for using procurement for innovation at the provincial level, similar to the federal one. Provinces are even better positioned in Canada to support innovation through procurement, given their constitutional responsibilities and the scale of their procurement programs. Perhaps such programs will be developed in the future, independent of or in conjunction with the federal programs, similar to the provincial support for R&D in the form of tax incentives that supplement the federal program.

Some provinces are taking steps in this direction. The new British Columbia Procurement Strategy (B.C. Ministry of Citizens' Services 2018) aims, among other things, to promote innovation, and to improve "social, Indigenous and environmental outcomes". While concrete policies are still being developed, this is a first example of a provincial program with emphasis on the procurement of innovation, as well as green and social procurement. A first step in the direction of driving innovation through procurement

was the creation of a new “‘procurement concierge’ program, to act as a matchmaker between government buyers and suppliers of innovative products”, which sounds similar in mandate to the federal BCIP.

British Columbia is also one of the first jurisdictions in Canada to launch a Start-up in Residence program, modelled after a similar San Francisco initiative started in 2014. The idea is to bring together start-up tech companies and government institutions to co-develop technology solutions that respond to specific challenges these institutions face in delivering their services (similar to what the ISC intends to achieve at the federal level). At the end of the residency period, companies receive, among other things, \$10,000 for their participation, full rights to commercialize their solution and the ability to reference the B.C. government as a customer (Government of British Columbia, n.d.).

The Alberta government’s support for innovation has waxed and waned. For a long time, Alberta was the only province, besides Prince Edward Island, without a provincial tax credit for R&D. In 2009, a provincial SR&ED tax credit of 10 per cent was introduced. This credit was cancelled in the October 2019 budget, together with four other business tax credits, including the Alberta Investor Tax Credit introduced in 2017, which provided 30 per cent tax credits (up to \$60,000 per year) for investments in targeted growth areas like clean technology and digital animation.²⁶ The rationale behind the elimination of these tax credits was a return to a broad-based, low-rate tax system, through elimination of targeted tax credits and an across-the-board corporate tax rate reduction from 12 per cent to eight per cent by 2022. However, only two months later, the government expressed exploring the idea of allowing technology companies to issue flow-through shares to help them attract capital investment (Stephenson 2019). In June 2020 the Government of Alberta announced the Alberta’s Recovery Plan (Government of Alberta 2020) to help its economy recover from the crisis due to the COVID-19 pandemic, global recession and oil price collapse. The plan includes advancing the reduction in the corporate income tax rate to eight per cent to Jul 1, 2020 and the introduction of the Innovation Employment Grant for companies that invest in research and development to incentivize job creation in high growth new industries. The recovery plan also announced the commitment to release a technology and innovation strategy in fall 2020.

Alberta does not have any notable initiatives in public procurement of innovation yet. However, there are increasing calls to reform and modernize the procurement process. In 2019, an expert panel on Alberta finances recommended the creation of a procurement council to examine, in collaboration with businesses and industry, innovation and efficiency in the government’s procurement methods. One purpose would be to increase access to procurement opportunities for small and medium-sized enterprises. The panel also recommended refreshing the provincial procurement policy to achieve best value for money through innovative partnerships and other innovative procurement solutions (Blue Ribbon Panel on Alberta’s Finances 2019, 57).

²⁶

The other three credits cancelled were the Alberta Capital Investment Tax Credit, the Community Economic Development Corporation Tax Credit and the Interactive Digital Media Tax Credit. Cancelling these five tax credits was estimated to save \$400 million by 2022-2023.

While the focus of this paper is increasing the role of public procurement in stimulating innovation, anecdotal evidence suggests that the private sector in Canada is not particularly open to innovation either, that Canada is great at producing new ideas but not necessarily at commercializing them, and that Canadian entrepreneurs are often advised to commercialize their new products elsewhere, notably in the U.S., before being able to sell them to Canadian companies. One reason for this seeming resistance to change appears to be a high degree of risk aversion in both the public and private sectors in Canada. Private companies, like the government sector, appear unwilling to take the risk of embracing new solutions if existing ones work reasonably well. It may therefore be the case that governments can encourage innovation, particularly from small firms, not only by opening their procurement to them, but also helping them sell their ideas to the private sector.

The Alberta Small Business Innovation and Research Initiative (ASBIRI) was designed to do just that. Run by Alberta Innovates in collaboration with other Alberta ministries and agencies, this multi-phase pilot program looked to match specific challenges identified by industry partners or the public sector with SMEs able to provide solutions to those challenges. Currently, the program is fully subscribed and will not issue new challenges (Alberta Innovates n.d.-a) likely as a result of a shift in priorities by the new government following the 2019 election.

Some of the success stories credited to the ASBIRI include a new real-time pipeline monitoring and leak detection technology developed by Alberta-based Hifi Engineering in response to a challenge posted by TC Energy (formerly TransCanada Corporation) and Enbridge Inc. (Hifi Engineering n.d.), a new technology for earlier detection of prostate cancer developed by DynaLIFE (Alberta Innovates 2018) and a non-invasive blood test for breast cancer developed by Synatra (Alberta Innovates 2019). Also underway through the ASBIRI is the Municipal Community Generation Challenge (Alberta Innovates n.d.-b), funded by the Municipal Climate Change Action Centre and Alberta Innovates, which looks to municipalities to provide sustainable solutions toward low-carbon, community-scale electricity generation, whose data and knowledge can later be transferred to other municipalities in Alberta.

MUNICIPALITIES

Some early initiatives are also starting to happen at the municipal level. An example is the City of Guelph's Civic Accelerator initiative from 2016. This was a pilot project developed by the Guelph Lab in which the municipality invited submissions of innovative solutions to complex municipal problems, like detecting leaks and reducing water use, maximizing the value of parking space downtown and making it easier for the public to provide feedback on planning. The following year, Guelph published a case study report based on this experience, and officials are looking at expanding the Civic Accelerator project in partnership with Barrie and London (Huynh 2019).

Inspired by Guelph's initiative, the City of Toronto is looking at challenge-based procurement as a potential solution to tackling some of its problems (Coop 2019). Municipalities across Ontario have also hosted a series of reverse trade shows for the last few years, as a way for local businesses to learn about local procurement opportunities.²⁷

Edmonton has also been a pioneer in Canada (Kornik 2018) in terms of launching its own Start-up in Residence program (now known as City Innovate). In October 2018, Edmonton launched three challenges to be solved over a 16-week period: a vandalism detection and prevention system, a chatbot to reduce the number of 311 routine calls and a mobile app to deliver information to users about the optimal blend of transportation options (Startup Edmonton 2018). Currently, Innovate Edmonton is in the early stages of preparing the next Start-up in Residence challenge.

There are also some examples of green and social procurement initiatives at the subnational level in Canada. Green procurement certainly overlaps with the procurement of innovation, in the sense that many of the green solutions of tomorrow are likely not in use today, and maybe not even invented. However, innovation in general has a much larger scope than green innovation. Stating that procurement of innovation is an explicit government objective would be a very important step in the direction of more and better demand-side government support for innovation.

Public procurement initiatives and particularly green procurement can also overlap with regulation, the other significant demand-pull instrument, to stimulate innovation. In 2004, Vancouver became the first North American city to require that all municipal buildings over 500 square metres achieve the LEED (Leadership in Energy and Environmental Design) Gold Green building credentials. This was followed by a similar request for the private-sector brownfield redevelopment of Southeast False Creek for the 2010 Olympics. Next came a series of incentives to encourage the private sector to adopt greener building standards. These strategies have resulted in the largest number of LEED-certified buildings in North America, a significant growth in the green building sector in Vancouver (green products, services, consultancies), and also the creation of a "Vancouver brand" that now sells its products and services across North America (Cohen and Amorós 2014).

VI. RECOMMENDATIONS FOR INCREASING THE USE OF PUBLIC PROCUREMENT TO STIMULATE INNOVATION AT THE PROVINCIAL AND MUNICIPAL LEVELS

The procurement of innovative goods and services by the public sector may be an answer to Canada's innovation problem but, as seen above, it comes with a significant set of challenges. A good place to start would be to focus on the procurement of novel solutions mostly from small and medium-sized enterprises. Starting small makes particular sense in Canada, where mission-oriented procurement is still in its early stages.

²⁷

For some examples, see <https://www.opba.ca/insidepages/content/index.cfm?newsid=4661A5D5-5056-8960-3E48-3B60B501C630>; <https://www.sootoday.com/local-news/supply-ontario-reverse-trade-show-183735>; <https://www.bramptonguardian.com/news-story/9330287-more-than-200-vendors-signed-up-for-brampton-reverse-vendor-trade-show-on-may-2/>.

A focus on small firms is not just the second-best, easier thing to do. There are both theoretical and empirical arguments to suggest that public procurement can be particularly helpful to stimulate growth and innovation in small firms. The U.S.'s SBIR program, similar SBIR-type programs existing or proposed in other OECD countries and Canada's own ICS, focus on small businesses. Increasing the opportunity for SMEs' participation in public procurement is viewed as an important step for fostering innovation and growth in Ontario²⁸ and in Australia.²⁹

Some of the advantages of starting small are:

- Compliance with the existing legislative framework, including trade agreements

Since the existing legislation puts a cap on the size of contracts that can be awarded by giving preference to local firms, it may be prudent to start with contracts that do not require legislative changes. While such a restriction may limit the usefulness of procurement as an innovation policy tool, it can be potentially circumvented, where technically feasible, by breaking bigger challenges into smaller components, each with its own procured solution. In fact, contracts that are too large can act as a barrier to innovation, as they exclude smaller and potentially more agile firms from competing. Splitting large projects and contracts into several components can level the playing field, increase SME participation, and potentially reduce the contracted price due to the increased competition (Brown 2011, Knutsson and Thomasson 2014)

- Reduced risk and complexity

Not all areas are equally suited for innovation procurement, either due to the maturity of the area or the need for safety, reliability and reasonable costs for large-scale projects. In major infrastructure projects, the risk of trying a new technical solution cannot be assumed without extensive and expensive testing. Small contracts are unlikely to involve solutions to very complex problems, and therefore the risks associated with these contracts (for example, the risk that the contracted solution will not perform as expected) are easier to manage. In addition, an alternative solution may be easier and faster to contract than if the contracts were large and/or technically complex.

- Reduced corruption potential

Small-sized contracts and the potential for more firms to bid for them make corruption both less likely to occur and less severe when/if it occurs.

²⁸

A report by the Ontario Chamber of Commerce and the Canadian Manufacturers & Exporters outlines six steps for smarter spending and leveraging the strategic role of public procurement by provincial governments, including "improved access to procurement opportunities for small and medium enterprises" (Deyanska, Hjartarson and Holmes 2014).

²⁹

Australia and Canada share many similarities, including their size, economic structure, prominent extractive sectors and ambitious plans to improve their lacklustre innovation performance. In 2017, the Innovation and Science Australia board released "Australia 2030: "Prosperity through Innovation", a report outlining Australia's plan to "become a top-tier innovator by 2030". The plan identifies procurement, particularly from SMEs, as a "strategic lever" for innovation. Recommendation 14 sets a procurement target of 33 per cent of contracts (by dollar value) to be awarded to Australian SMEs by 2022 (Innovation and Science Australia 2017).

-Diversification

The procurement of a larger and more varied set of innovative solutions via small contracts is akin to portfolio diversification and more likely to result in identifying winners than a narrow focus on fewer solutions via larger contracts.

The Ministry of Government and Consumer Services Ontario and Supply Chain Ontario (n.d.) have released *The BPS Primer on Innovation Procurement*, an extensive document intended to help broader public-sector (BPS) organizations in Ontario design and conduct their procurement of innovation. The *BPS Primer* starts with the definition of innovation procurement and the circumstances in which it may be preferred to traditional procurement practices, followed by a list of key factors for the success of innovation procurement, the early market strategies to support it and a description of various models organizations may choose from based on their specific needs.

The following steps draw from the *BPS Primer* and other literature discussed above to outline a roadmap that public institutions can follow to increase their use of innovation procurement, and thus indirectly to increase the role of public procurement as an innovation policy tool.

The first step is for public organizations to identify their needs that existing goods and services cannot meet or cannot meet satisfactorily. When purchasing innovative solutions, it is essential to keep in mind that the final purpose is to provide an answer to an existing problem or need. The identification and communication of needs is indispensable for launching the procurement process, but it's also critical for gaining public acceptance for using public money for things that have not been proven yet.

Some countries, such as Austria, Sweden and Germany, have successfully articulated and included societal needs in their innovation policy agenda. The Canadian government has set an ambitious innovation agenda, but has yet to define specific societal challenges that it looks to resolve through innovation (Edler 2019).

Starting small may again be the sensible answer to this. Rather than waiting for the federal government to identify the big societal challenges to be solved through innovation, provincial and local governments and institutions can take the lead in this process. Starting at the grassroots level makes it easier to identify concrete challenges that are relevant to the local population, possible to articulate and therefore to solve.

It is important to note that procurement departments do not initiate this process. Other government departments, institutions, etc. must identify these needs, beginning with the challenges they face in meeting their mandates. These departments must work closely with procurement departments to see these challenges properly articulated and fulfilled through the procurement of novel solutions. The success of this process requires a smooth collaboration between these departments, and may require consulting with, and including procurement departments in, early decision-making processes at higher levels than typically expected.

Once the needs/challenges to be met are identified, the next step is the translation of needs into functional specifications. This step is again significantly challenging. The

specifications must be general enough to allow for a variety of technical solutions, but concrete enough to delineate what is expected from the innovative product. Once again, the procurement departments are not responsible for this step, and good communication between them and the beneficiary department is essential for the success of this step. It may be helpful for provincial/municipal governments to have a specific department or unit with knowledge and experience in identifying and evaluating new technologies and technological trends to intermediate this step in the case of more complex challenges, or when the need for innovative solutions appears often and for challenges that are diverse.

Next comes communicating needs to the public and potential suppliers. To avoid the perception of unfair advantage toward some vendors, this information should be openly accessible to anyone interested. This step may require some institutional changes and more transparency and openness than public organizations are typically used to.

An effective and cheap way to engage with a large number of potential suppliers, to hear about emerging technologies and to uncover potential solutions is to organize reverse trade shows, where several public institutions or departments showcase challenges they are looking to solve and invite vendors to discuss them. Reverse trade shows allow buyers to gauge to what extent existing market solutions can answer their challenges, helping them prioritize those challenges based on the probability of being met. At the same time, and especially if organized with some degree of regularity, reverse trade shows give potential vendors a better idea of the public sector's most pressing needs and allow them to allocate their resources and R&D efforts accordingly.

Once the buying institutions are able to narrow down the set of challenges and potential solutions, they can better formulate the best procurement model that fits their needs. The *BPS Primer* draws on international experience in innovation procurement to outline six models the procuring organizations can start with in designing their own procurement processes. Each of these models involves specific steps which are not discussed here.

- R&D procurement — for the purpose of purchasing new, radically different solutions in the form of prototypes or first-test products, without a commitment to purchasing the end product on a commercial scale;
- Innovation partnership — establishing a long-term collaborative relationship with specific suppliers to develop a new solution from exploration, design and prototyping to production. It may also involve adapting existing solutions to new problems;
- Design contest — participants submit design proposals or prototypes to compete for an award; the procuring organization may decide to enter into a contract with the contest winner to develop a prototype of the winning design and purchase the resulting solution, or may conduct the procurement separately;
- Competitive dialogue — a process through which the procuring organization engages in discussions with potential suppliers about different aspects of procurement prior to formulating their exact requirements and inviting suppliers to submit their proposals. This type of procurement is typically used for large and complex projects where it is difficult to formulate precise technical specifications prior to industry consultations;

- Competitive procedure with negotiation — a procurement process to be used when innovative solutions exist but there is some flexibility in the requirements that must be met, which allows the procuring organization and potential sellers to negotiate some aspects of the contract for their mutual benefit;
- Innovation-friendly competitive process — refers to the procurement of solutions in such a way that innovative solutions are not treated unfairly in the evaluation process. It is based on setting up evaluation criteria that are flexible and outcome-focused, allowing the organization to identify the best value solution and not necessarily the lowest price.

Following the preferred procurement process, an innovation solution (design idea, prototype or final product) is procured and the contract is awarded. The final step is managing the contract, making sure that the outcomes the vendor has committed to (in terms of quantity, quality, features, value, etc.) are delivered according to the contract. This also includes, where applicable, taking the necessary steps to ensure that the purchasing organization successfully adopts the innovative solution.

The presentation of these steps is sketchy and simplistic because innovation procurement is not easy. It is more complex than traditional procurement due to the novelty element that inherently involves taking risks and spending more. It is arguably easier to procure innovative solutions when there are no proven solutions to a particular problem, because there will be less resistance to change within the departments involved. When existing solutions work reasonably well, it will likely be considerably harder to convince these departments of the necessity to adopt better solutions for the sake of the collective good represented by the innovation spillovers that everyone else will enjoy.

For this reason, increasing the scope of using public procurement for innovation first requires innovation champions at the highest level, the decision-makers in charge of looking at the bigger picture who can ensure the collaboration of the different branches of government. They also must be able to weigh the potential increase in costs from procuring innovative solutions in some areas against potential savings in other areas.

A single government department, whether provincial or municipal, may not have the skill, the budget capacity or the willingness to undertake the procurement of a new, innovative and potentially more costly solution without support at the highest level of government and without collaboration with other departments. Likewise, procurement departments cannot be expected to be the champions of taking risks through innovative but likely more costly solutions, given their responsibility to spending wisely.

For the procurement of innovation to happen and for government officials at the highest level to champion the use of public procurement as a tool of innovation policy, the public must be convinced that this is a good use of its funds. One useful step is to widely publicize success stories. Some provinces are doing a better job than others in showcasing their successes. Some co-ordination among provinces and municipalities in sharing each other's stories, or perhaps a national directory listing all these stories, could help increase their visibility and the public's acceptance for spending more for the sake of newer, better solutions and benefits from these innovations.

Focusing on the procurement of innovative solutions from small and medium-sized enterprises can help achieve a higher level of public support, both because the public relates better to SMEs, and also because the perceived risk of trying something new is smaller. Adding some green and social objectives can further increase public support for innovation procurement.

Such support may also be easier to achieve if the additional cost of procuring novel solutions is not too high, or, better yet, is financed through a redeployment of existing government spending. As noted above, Canada already spends more than other OECD countries on indirect R&D support in the form of R&D tax credits, both at the federal and provincial levels. There is a host of other innovation policies and initiatives at federal, provincial and even municipal levels, not always with clear objectives and/or proven results. In addition, increasing the support for small and medium-sized enterprises is a priority at all levels of government.

A critical review of some of these programs and a redeployment of funds from the least successful programs to the procurement of innovation could mean that authorities can stimulate innovation through procurement without any additional spending.

The federal government could incentivize provincial and municipal governments and organizations to procure innovative solutions by setting up a matching grant. The federal government would cover a given share of the cost of procurement, say 30 per cent, if it fulfils certain criteria, for example, if it involves purchasing a product from a SME that has not been sold commercially before.

The provincial governments could set up similar grants for municipalities. In addition, they may consider establishing a department to help provincial and municipal institutions and organizations identify and articulate some of their unmet challenges and to intermediate the purchasing of solutions, similar to what Innovate Solutions does at the federal level.

All large cities in Canada are looking for ways to attract investment and become innovation hubs. The City of Calgary, with a downtown office space vacancy rate of more than 24 per cent (DaSilva 2019), is perhaps more interested than most in attracting investment and embracing innovation to diversify its economy away from the struggling energy sector. Calgary's difficult financial position may make it challenging to convince the public of the need to spend more to purchase solutions to boost innovation. However, through Calgary Economic Development, the city has a plan to spend \$100 million "to attract and support transformative investments in the city" via the Opportunity Calgary Investment Fund (OCIF). The targets for OCIF funding are "innovative and catalytic projects" in Calgary that create jobs and economic benefits in the city. To date, approximately \$23.5 million has been awarded for nine projects (Calgary Economic Development n.d.). The city appears to have in mind large, impactful investment projects (only three of the nine projects to date have been awarded less than \$1 million). At the moment, the intake of applications has been paused due to the high level of uncertainty created by the COVID-19 pandemic and the low oil price environment.

One significant difficulty in attracting large, impactful investors and projects is that many other jurisdictions compete for them, often by offering facilities they can hardly afford. An extreme example of this race to the bottom is the recent bid to attract the Amazon second headquarters (HQ2), for which 238 cities submitted proposals, including more than 10 cities in Canada, with Calgary among them (CBC 2017). Some US states offered billions of dollars in incentives to support their bid. In the end, Virginia won the race due in part to its workforce advantages (Cohn 2019).

A different approach to stimulate innovation and create local jobs would be to redeploy a share of these funds toward purchasing innovative solutions from local innovative SMEs. If, for example, 10 per cent of OCIF would be set aside specifically for SMEs, and awarded a maximum of \$75,000 per contract,³⁰ Calgary could potentially buy innovative solutions from more than 130 local SMEs. Moreover, these innovative solutions could be procured in response to specific challenges identified by the city, making this program even more relevant for the locals.

For challenges that require tech solutions, Calgary could launch its own iteration of the Start-up in Residence program, already explored in Edmonton, in British Columbia and in many other North American cities. With an award of only \$10,000, the city could seek solutions to a variety of challenges at a relatively small cost, while helping small and medium-sized local businesses to innovate, test their ideas and gain valuable experience.

Perhaps through creative and innovative procurement, Calgary could find innovative and scalable solutions for challenges such as the stockpile of plastic clamshells that the city accumulated for almost two years in the absence of a recycling solution (CBC 2019),³¹ or to some of the many concerns raised by residents in the thousands of 311 service requests placed monthly on issues related to waste management, roads and parks maintenance, and many others (City of Calgary 2020).

At the provincial level, resurrecting the ASBIRI program and its scope to encourage not just the private sector, but also the provincial government to procure innovative solutions for some of its challenges could be an important step in boosting innovation and economic diversification in Alberta. This could also help the government achieve better value for the money in the form of tailored solutions to some specific problems, in line with the Blue Ribbon Panel on Alberta's Finances' recommendations.

While these proposals sound Alberta-specific, they are equally applicable to other Canadian provinces and municipalities, each facing unique challenges, but all of whom are seeking ways to improve their innovation performance, foster economic growth, and get more bang for their buck. Public procurement is a powerful tool in the innovation toolkit that Canadian provincial and local governments, for the most part, have not used

³⁰ This is the maximum amount for which local firms can be given preference under the New West Partnership Agreement, the Canadian Free Trade Agreement and the Canada- European Union Comprehensive and Economic Trade Agreement.

³¹ The City of Calgary has spent more than \$300,000 over the past two years to store 2,000 tonnes of plastic clamshells, after China stopped importing them in September 2017. Absent a solution to recycle the clamshells collected prior to April 2019, it appears that the city will have to spend \$130,000 to bury them in the landfill.

to its full potential. As the earlier literature survey suggests, public procurement can be particularly helpful to boost innovation for small, new firms. Local governments may be in the best positions to drive innovation through procurement, given their close proximity to citizen concerns and their more streamlined processes, which should be easier to reform (Brown 2014).

VII. CONCLUSION

Public procurement is potentially the most powerful, yet currently underutilized, tool for stimulating innovation from the demand side. It also represents a significant departure from the Canadian tradition of using mostly supply-side instruments like R&D tax credits to encourage innovation by reducing its costs, mostly with underwhelming results.

Almost 90 per cent of public procurement in Canada is undertaken by provincial and municipal governments. Therefore, the largest potential for using public procurement for innovation in Canada is at the subnational level, in the areas under the control of provincial and municipal governments: education, health care, social services and municipal affairs.

Despite its promise, provincial and municipal governments show little evidence of using their procurement powers specifically for innovation. This is partly due to the traditional view of public procurement's role as purchasing the lowest cost, safest solutions that answer the public sector's needs.

To take advantage of the potentially large role that procurement could play in solving Canada's innovation problem, innovation should be included as a specific mandate of the procurement process. In addition, procurement departments and processes would have to embrace the additional risks and increased costs that come with procuring innovative solutions.

Not all domains of responsibility for the provincial and municipal government are equally suitable for innovation. The focus must be placed on the areas which would benefit most from innovation — where either there are no existing products for specific needs, or where their performance is unsatisfactory, and/or the risks of adopting novel solutions are not too high.

A good place to start is by creating more opportunities for SMEs to participate in public tenders. Focusing on smaller challenges reduces the risks, increases the probability of identifying successful innovations from a larger pool of candidates and makes it easier to comply with procurement thresholds set up in the trade agreements that Canada and individual provinces have signed.

Provincial and municipal governments, Crown corporations and organizations in the MASH sector should start by identifying the challenges they are looking to address, communicating these challenges clearly and openly and setting up their procurement processes so as to allow for the acquisition of innovative solutions to these challenges.

To incentivize the procurement of innovative products, the federal, provincial and municipal governments should consider setting up matching grant programs or specific funds dedicated to the procurement of new-to-the-market goods and services. Having access to additional funds will make it easier for public-sector buyers to seek and embrace new, innovative, but potentially more expensive solutions that better respond to their needs. This financial support does not necessarily require additional government spending. Governments at all levels can start by identifying existing programs in support of innovation, investment, economic diversification, SMEs, etc. that are underperforming, and reallocate some of those funds toward supporting the procurement of innovative products from SMEs.

Using public procurement strategically as an innovation tool is ultimately possible only if the importance of innovation as an outcome of the procurement process is recognized at the highest level of decision-making. Various government departments must collaborate to ensure the success of innovation procurement. The additional costs and potential savings may occur in different areas. Decision-makers must co-ordinate these aspects with the larger picture in mind — that buying innovative goods and services serves more than the particular government unit they are intended for. Used wisely, public procurement may be an answer to Canada's perpetually disappointing innovation performance.

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