Public Procurement for Innovation in Vietnam: Rationales and Perspectives[†]

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Abstract

Public procurement for innovation (PPI) is a new approach in stimulating innovation, and currently attracts considerable attention from policymakers and academics. This paper discusses the rationales and perspectives of PPI in Vietnam. The rationales for public procurement for innovation policy in Vietnam compared to theoretical and international practice are discussed. From such a comparison, the paper concludes that R&D results-procurement policy in Vietnam shall be understood and implemented as regular PPI both theoretically and practically. However while designing the policy, policymakers must consider the characteristics of the STI system of the country in order to make the policy adaptable to context. The paper identifies that PPI in Vietnam can be implemented with a ready legal framework (intellectual property rights, R&D contracts, standardization, etc.), the prepared capabilities of R&D institutions, businesses, and public agencies in innovation processes, and the provision of a demand-supply network and other procurement incentives.

Keywords
innovation, public procurement for innovation, Vietnam

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1. INTRODUCTION

Public procurement of R&D results is a mechanism recently mentioned in Vietnam's science and technology (S&T) policy, specifically in the government's Resolution 46/NQ-CP on S&T, the Science and Technology Act of 2013, and Decree 95/ND-CP on investment and finance for S&T. Theoretically, government expenditure on R&D results can be a policy instrument for promoting innovation. However, certain questions need to be addressed: Why does the government have to procure R&D results when the public already funds many R&D activities? What kind of R&D results should the government procure for innovation? How can the government procure R&D results as a public procurement policy for innovation? The paper will start by identifying the theoretical justifications of the PPI instrument. It will then analyze European Union and Republic of Korea's practice in public procurement for innovation policy.

1.1. Review of the Literature on Public Procurement for Innovation Policy

1.1.1. Definition of Innovation

Innovation is a process that creates new effective processes, products and services. Innovation is divided into product innovation and process innovation. Some innovations save costs immediately for public authorities, while others may need additional time for long-term benefits. The innovation process includes research and development, preproduction, production, distribution, training, market preparation and new organizational or marketing methods. The outcomes of R&D might be adopted by the public sector in taking its functions and tasks.

1.1.2. Public Procurement for Innovation Policy: Innovation Policy Instrument

"The public organizations use innovation policy instruments as tools to influence innovation processes (Borrás & Edquist, 2013, p. 1513)." Researchers and policymakers accept the importance of considering how the instruments are chosen and implemented. This research looks at the first aspect, namely the choice of policy instruments.

Policy instruments are chosen through the consideration of various factors including the economic, environmental, social, health-related, and defense and security-related. Public procurement for innovation is one of these innovation policy instruments. Public procurement is the process whereby public authorities—including all levels of government and public agencies—buy goods and services or commission work.

Public procurement for innovation (PPI) is a demand-side policy instrument. PPI may happen when public organizations purchase goods, services, or systems they need to perform for their functions (Edquist, Hommen, & Tsipouri, 2000). Besides, public procurement also acts as a catalyst for innovation where new products and services are bought not for buyers but for other actors to stimulate innovation.

PPI is often classified into two types, namely public pre-commercial procurement and public procurement for innovative solutions. The former is defined as procurement of innovative solutions that require R&D, and the latter is the procurement of innovative solutions that do not require R&D.

1.2. Rationales for Applying Public Procurement as an Innovation Policy Tool

On the side of demand, rationales for PPI consist in either the need to improve the performance and/or delivery of public services, or the diffusion of underused innovation at the level of the public sector or external private-demand agents. Evolutionary and systemic approaches highlight the essential role of user-producer interaction in innovation processes, and identify public procurement as an instance thereof. In this regard, PPI instruments are thought to improve or create interaction between innovation producers and users of the products and services. Two categories of interaction are identified: those consisting in the sole signal of the nature and state of demand of the business sector, and proper users-suppliers interactive learning spaces. Each of them addresses specific rationales: A one-side information asymmetry, or failures in deep coordination and dynamic complementarities (weak networks). The third category of rationales for PPI instruments relates to the supply side. They correspond to inadequate firms' incentives to innovation or learning and capabilities failures (Chicot & Matt, 2015)

Other rationales for PPI include how public procurement reflects demand for innovation in the host country and thus influences localization decisions of multinational enterprises, and how public procurement is expected to effectively redress market and system failures "affecting the translation of needs into functioning markets for innovative products (Edler & Georgiou, 2007, p. 954)."

1.3. Role of PPI Policy in STI Policies

The role of PPI is explored in a number of studies. Mowery and Rosenber (1979), Rothwell and Zegveld (1981), Rothwell (1984) Geroski (1990) through their empirical studies on state demand for innovation conclude that procurement policy "is a far more efficient instrument to use in stimulating innovation than any wide range of frequently used R&D subsidies." Palmberg (2004) and Saarinen (2005) show that nearly half of the projects leading to successful innovation were triggered by public procurement or regulation.

PPI is regarded as a very powerful demand-side innovation policy instrument for triggering innovation (Dalpé, 1994; Edler & Georghiou, 2007; Geroski, 1990; Rothwell & Zegveld, 1981). Borrás and Edquist (2013) observe that most existing economic instruments largely influence the development and diffusion of innovations (products and processes) from the supply side rather than the demand side. Hence, it is essential to balance demand-side innovation policy instruments and supply-side instruments, and there is also a need for a new generation of innovation policy instruments, especially on the demand side, such as PPI.

PPI aims to close the gap between cutting-edge technology and processes and the public sector customers or users who benefit from them. Risk, costs, partnership and sharing gains are all important parts of PPI.

Beyond meeting the needs of individual public sector organizations, there is the potential for PPI to be catalytic—in other words, to trigger the procurement of innovative solutions on a larger scale. When procurers reach a critical mass, they can shift both public and private-sector demand towards new technologies and processes. "In certain sectors, the demand-pull from the public sector is the most important instrument to develop new markets for innovative products and services. Healthcare and civic infrastructure are two examples of this (Semple, n. d. p. 7)."

PPI policy is chosen in several regions worldwide, especially in Europe, as an instrument to stimulate innovation.

2. THE EUROPEAN UNION'S PRACTICE IN PUBLIC PROCUREMENT FOR INNOVATION POLICY

2.1. Policy Context

Supply-side innovation instruments are applied widely in the European Union to finance R&D and encourage industry investment in R&D activities. EU policymakers and scholars recognize that that a better balance between public demand and the R&D supply mechanism improves innovation absorption in the public market.

The EU actively builds up and implements PPI, illustrated by how "the total value of public procurement in the EU is estimated at €2 trillion per year—or about 19% of European GDP (European Commission, 2011, as cited in Semple, n. d. p. 5)." EU's PPI is designed to improve public service quality and address societal challenges through its links with the Europe 2020 sustainable growth strategy that targets 3% of the Union's GDP to be put into R&D for solutions towards employment, climate change and energy sustainability, education, and poverty and social exclusion.

The flagship Innovation Union initiative (2011) contains actions for stimulating partnerships through the strategic use of public procurement budgets. Guidance, financial support, public events and awards are available to help contracting authorities implement PPI in a non-discriminatory and open manner, pool demand, draw up common specifications, and promote access for small and medium-sized enterprises (SMEs).

2.2. Rationales for PPI in European Union

PPI in the EU features both pre-commercial procurement (PCP) and public procurement of innovative solutions. In PCP, public procurement steers the development of solutions towards sector needs

while comparing alternative approaches from various vendors. In PPI, public procurement acts as customers and early adopters of innovative commercial solutions newly arriving on the market. The objectives of these two forms are to make products better fit public sector needs, shorten time-to-market for suppliers, and widen commercialization of R&D results (Wert, 2012). In PPI, contracting authorities can act as a launch pad for innovative goods or services not yet available on a large-scale commercial basis (EC, 2015).

A strong and stable demand through government procurement can create demand long before a commercial market is established. This has several advantages:

- By acting as the first buyer or lead customer, a contracting authority can boost a particular, new market.
- The public benefits directly by being offered new and innovative public services provided in a more cost-efficient and effective manner.
- PPI and Pre-Commercial Procurement can lead to scientific and technological breakthroughs in areas such as health and well-being, food security, sustainable agriculture or clean and efficient energy.

Also notable is that in order to implement PPI in EU, the European Commission divides its actions into several phases and each phase has its own rationale.

Rationale of the first generation of public procurement networks (2009, €3M)

1. Forming European buyers' groups in lead market sectors
2. Developing guidance
3. Engaging with supply chain (SMEs & industries)
4. Community-building

Rationale of the second generation of public procurement networks (2012, €15M)

1. Forming European buyers' groups in all sectors
2. Developing guidance
3. Engaging with supply chains (SMEs & industries)
4. Encouraging innovative SMEs to take part in public tendering
5. Community-building
6. Realization of innovation procurement within the timeline of the project
7. Developing coordinated and joint procurement
8. Launching of a European Lead Public Customer Award
9. Preparing innovation procurement mainstreaming within Horizon 2020

Potential rationale of the third generation of public procurement networks (2013, €6.3M)

1. Forming European buyers' groups of public and private procurers of innovation
2. Developing guidance and public procurement roadmaps
3. Engaging with supply chains (SMEs & industries)
4. Encouraging innovative SMEs to take part within public tendering

5. Community-building of innovation procurers
6. Realization of innovation procurement within the timeline of a project
7. Developing coordinated and joint procurement
8. Preparing innovation procurement mainstreaming within Horizon 2020

From the rationales of each phase mentioned above, it is clear the EU made thought out its objectives as well as a systematic approach towards building up public procurement networks, the latter which includes a legislation corridor for PPI working as a driver encouraging public procurers to look for innovative solutions. Active involvement of the public sector in PCP projects also helps discover areas where existing regulation is not up-to-date anymore with technological advances. Such active involvement in the industrial R&D phase allows the public sector to update regulations while PCP development is still ongoing so regulations do not block newly developed innovations from entering the market quickly after PCP. The European Commission also prepares for implementing PPI by creating demand-supply groups, encouraging lead procurers. All of these steps aid PPI as a mixed-policy instrument that fosters innovation in a broader way.

2.3. The Role of PPI in Innovation Policy

The EU's success stories show that the commercialization rate of innovations developed through R&D procurement depends also on support from other demand-side policy instruments (such as regulation, product certification/labeling, standardization, deployment subsidies/tax incentives, and IPR) used during PCP to remove barriers of entry. The most successful case examples are those where PCP is executed not by a central R&D or innovation agency as an industry-support instrument, but by a public procurer that represents the real demand side, in other words the entity on the public-sector side that is aware of the real requirements that the innovative solutions should fulfill. This public procurer is also capable of mobilizing the aforementioned demand-side policy instruments in that specific sector that can speed up market introduction of solutions.

There is also a clear link between R&D procurement and standardization as a public demand tool. PCP can be used by the public sector to accomplish standardization in a fragmented sector. By setting requirements for interoperability at the start of the R&D, PCP (especially when executed by a critical mass of procurers in cooperation) enables procurers to drive industrial developments in the PCP to become the de facto standard in the sector.

Procurers can also align the PCP development process with the official standardization processes of standardization bodies, driving the creation of de jure standards out of PCP industrial development. The three-phase PCP process aligns with the three-phase standardization process of typical European standardization bodies such as ETSI. De jure standards are also created in three phases: First a requirement standard is created, afterwards an architecture standard, and last the detailed protocol/conformance testing the standards. Public procurers can therefore be alike private procurers (e.g. telecom operators), feed the outcomes of the PCP, phase by phase, into the European standardization process: after phase 1 of a PCP (design phase), procurers have confirmation about the

feasibility of their requirements, and a first version of requirements standards can be created; after phase 2 of a PCP (prototyping), procurers have confirmation about the system architecture and a first version of architecture standards can be created; after phase 3 of a PCP (development and testing of small quantity of first products), procurers have confirmation about conformity with detailed operational implementation issues and detailed protocol/conformance testing standards can be created. The EU-funded PCP project V-CON, for example, is planned for the creation of new de jure standards.

3. THE REPUBLIC OF KOREA'S PRACTICE IN PUBLIC PROCUREMENT FOR INNOVATION POLICY

3.1. Policy Context

Korea has been shifting from industrial policy towards innovation and competition since the 1980s. In this new policy thrust, the competitiveness of SMEs through PPI is a prioritized approach. The procurement market in Korea accounts for 13% of GDP in 2015 (OECD, 2015). PPI in the green industry particularly shows the manner in which industrial policy and innovation policy are interconnected. The first public procurement program was introduced in 1981 to promote demand for new technology products developed by SMEs (Chung, 2011).

Korea set up a dedicated legislative system for implementing PPI. The Korean procurement system is managed by the Public Procurement Service, which contracts activities for other central or local agencies. Korea's basic laws related to government procurement are (1) the Act on the Government Procurement Program (GPPA), (2) the Act on the Contracts in which the State is a Party, also called the Central Government Contracts Act (CGCA), and (3) the Act on the Contracts in which a Local Government is a Party, also known as the Local Government Contracts Act (LGCA). The PPI legal framework includes the Enforcement Decrees and Enforcement Rules of each of these acts.

The main act, the GPPA, regulates the structure and role of Public Procurement Service (PPS). E-Procurement was managed based on this Act. The methods and procedure for procurement contracts are mostly regulated by the CGCA and LGCA. Budget control, crucial in public procurement, was traditionally dealt with through public finance law, and government contracts through the Government Budget and Accounting Act and the Local Government Finance Act. However, government contracts are currently provided in individual statues, separate from these Acts. The Act on Contracts in which the State is a Party (CGCA) was enabled in 1995 and the Act on Contracts in which Local Government is a Party" (LGCA) was enacted in 2005 (Kim, 2006, pp. 79-80).

Korea PPI policy can be classified into two categories: (1) SME-specific PPI policy and (2) PPI policy whose application is not limited to SMEs (Kim, 2014, p. 209). Between these two, SME-specific policy is on the rise in recent years.

A range of policy tools are proposed for implementing PPI policy. One approach to the mitigation of risk is the provision of insurance for buyers, or the New Technology Purchasing Assurance Scheme. The scheme works to protect buyers from losses incurred from the procurement of products. SMEs can get their products certified and benefit from the government providing price and purchasing assurance (OECD, 2011, p.154).

3.2. Challenges for PPI in Korea

PPI policy in Korea has problems and challenges (Jang, 2015), which are identified as the following: PPI policy prioritizes SME protection and existing demands, focusing on price competition and stable supply; it does not create new demands, and only deals with finished goods. PPI also limits R&D and innovation as it does not reflect private sector demand comprehensively and tends to be limited to the construction and defense sectors. Recent studies suggest that PPI must be re-oriented to promote technological innovation and the technology appraisal system and indicators need to be reformed accordingly. Heavy dependence on technology accreditation and quality certification should also be addressed along with fragmented governance in planning public services.

3.3. Lessons from the Korean Experience

The Korean experience of SME-focused PPI is applicable to Vietnam as the latter's economy is more than 90% composed of SMEs. Similarly to the EU, Korea has legislation for PPI policy implementation. Vietnam should similarly define its PPI objectives clearly and make its subsequent PPI policy better suited for these objectives.

4. ANALYSIS OF RATIONALES FOR PUBLIC PROCUREMENT OF INNOVATION POLICY IN VIETNAM

4.1. Policy Context and Rationale

In terms of policy, the potential for PPI in Vietnam was not highlighted until recently. A bidding law was issued in 2013 regulating procurement using public funds for supplying public products and services, and a public investment law was issued in 2014 regulating public support for investment in social economics development. The term, public procurement was mostly used for government expenditure for public purposes. While data for public procurement in Vietnam are currently unavailable, total state budget expenditure accounts for 25.39% of GDP in 2015, in which expenditure on investment, development spending, and social and economic services account for 23% of GDP. These numbers indicate that public procurement is both a key source of demand for firms (sectors like construction, healthcare, the environment, security and transport) and other areas in which the government strives to improve effectiveness.

Because the term "innovation" has been popular in Vietnam since fifteen years ago, innovation is

usually referred to as "technological innovation" in order to put it in an S&T context and to avoid confusion with the term "doi moi" (revolution). Innovation has been increasingly emphasized in the past five to ten years, especially by MoST projects and agencies. Innovation in Vietnam relates mostly to the private sector, but the limited innovative capability of enterprises (which are mostly SMEs) need strong support from government expenditure for innovation.

In Vietnam, PPI is never mentioned in legislation, even in science and technology regulations. Some research mentions PPI as a demand-side policy instrument for innovation that supports supply-side policy instruments, and of PPI's popularity in developing countries. However, PPI is not formally a part of the national agenda.

Further reasons for singling out PPI in the agenda setting are:

- PPI in Vietnam can complement existing funding mechanisms for R&D and is independent from other governmental STI investment policies.
- PPI can meet multiple objectives by supporting sellers (owners of R&D results) and buyers (government, innovative enterprises, and farmers), and linking the demand and supply on R&D.
- PPI encourages innovation, creates domestic markets, and promotes the spread of innovation.

4.2. Overview of Government Investment for S&T in Vietnam

4.2.1. Investment for S&T in Vietnam

According to the Vietnam S&T Development Strategy (2010–2020), the Vietnamese government expects to invest 1.5% GDP for S&T in 2015 and more than 2% in 2020. In particular, investment from the state budget for S&T is no less than 2% of total annual state budget expenditure. In recent years, investment in S&T maintained 2% of total state budget expenditure (equivalent to 0.5–0.6% GDP) and increased with the development demand of S&T—this comprises the crucial content of the Law on S&T 2013. The state investment in S&T is three times larger than the non-state budget for S&T, increasing five times in 2009. Table 1 illustrates state budget expenditure for S&T from 2006–2014.

TABLE 1. Investment in S&T from State Budget (Excluding Environmental, Security and Defense Expenditure)

Year	Total state budget expenditure (billion dong)	Total expenditure for S&T from state budget (billion dong)	Percentage of S&T expenditure comparing with state budget (%)	Growth rate of expenditure for S&T (%)
2006	292,700	5,429	1.85	
2007	348,000	6,310	1.81	16.22
2008	390,000	6,585	1.69	4.36
2009	486,000	7,867	1.62	19.46
2010	575,000	9,178	1.60	16.66

2011	725,600	11,499	1.58	25.28
2012	903,100	13,168	1.46	14.51
2013	978,000	13,869	1.44	7.41
2014	1,006,700	13,666	1.36	-1.46

Source: MoST (2013)

The non-state budget for S&T normally comes from the private sector. However, most Vietnam enterprises are SMEs; capital size is not large enough to mobilize funding for investment in S&T and innovation. Small enterprises have low pre-tax profit, so deductions for developing S&T are not enough for them to innovate technologies. Meanwhile, no regulations exist for local governments to deduct pre-tax profit into provincial S&T development funds or to maintain or develop such funds. Many big enterprises with strong potential (such as Viettel, VNPT, or Petro Vietnam) have their own S&T development funds amounting to more than a hundred billion dong. Due to lack of consensus between enterprises and financial regulators in identifying investment targets and in setting up the complex process of expenses and payment, however, the effect of using these funds is not significant and does not meet the private sector's S&T demands.

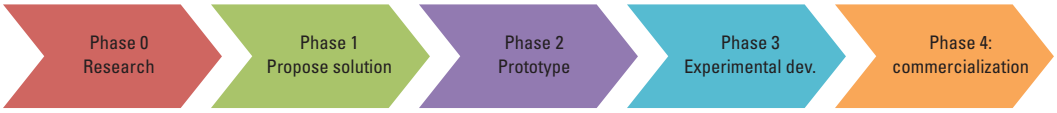
TABLE 2. Expenses for R&D in 2013 According to Type of Activity (Not Including the Private Sector)

Type of activity	Total		Implementation sector				
	Billion dong	%	Institutes	University	Administrative organization	Non-private sector	Non-public sector
Basic research	1,194	30.50	807	309	43	27	8
Applied research	2,068	52.82	1,167	376	253	244	28
Experimental development	458	11.70	235	49	69	82	24
Pilot production	195	4.98	104	24	28	30	8
Total	3,915	100	2,313	758	393	383	68

Source: MoST (2013)

According to S&T investment data, R&D expenditure in Vietnam is largely taken up by basic and applied research, with spending on experimental development activities and production testing extremely limited (accounting for less than 17% of total R&D expenditure in 2013). As discussed in a previous section, research results require continuous investment in order to reach commercialization—from the research stage to proposal solution, pilot production, and production testing. The private sector is yet uninterested in investing in early-stage research, with early R&D mainly carried out through public funds. Increased private sector involvement in early-stage research is highly recommended.

FIGURE 1. From Research to Commercialization



4.2.2. Investment and Financial Policies for R&D in Vietnam

As described in the previous section, government intervenes on S&T through investment and financing. The following section summarizes the financial investment policies in Vietnam used for R&D activities.

As in other countries, a research period is set through funding for public S&T organizations by the investment into development and scientific tasks to maintain the apparatus and expenditure for S&T tasks (programs, schemes and projects implemented by S&T organizations, individuals, or businesses). The Law on Science and Technology also supports the implementation of research results through financial assistance, loans, or loan guarantees from science and technology funds.

There are many national policies for promoting research activities (through the operation of public organizations performing research activities) and for encouraging and mobilizing the participation of non-state (private sector) organizations.

Concerning the phases of solution proposal–specimen production–production testing, the government issued a series of financial preference policies for domestic technology transfer. In addition to financial support from the state budget for the implementation of R&D as defined in the Law on S&T 2013, private application of R&D results for new products or improvement of the productivity, quality, and competitiveness can be supported up to 50% of total investment while enterprises operating in key sectors receive a number of privileges through economic programs. These programs provide direct assistance to enterprises operating in a number of specific areas, and support government services including consultancy, technology transfer, or training.

The National Technology Innovation Fund was founded according to Decision No. 1342/QD-TTg dated 05/08/2013 with a charter capital of VND1 trillion from the state budget. This is a non-profit financial fund that provides preferential loans with subsidized interest rates, loan guarantees, and capital for supporting firms in technology innovation and transfer (CIEM, 2013).

In addition, companies established and operating in Vietnam can deduct up to 10% of taxable income to fund S&T development (Article 17, Law on Corporate Income Tax) for spending on technology innovation activities of enterprises. Besides tax incentives, import and export taxes, and corporate income tax under the Investment Law, the Corporate Income Tax Law 2013 allows businesses to use their own capital to invest in S&T, which can lead to a 10% reduction in income tax and accelerated depreciation for equipment formed from technology investments.

In general, the issuance of policies supporting enterprises shows the urgency of accelerating the transfer and application of technology in Vietnam. Table 3 summarizes the tax incentives for enterprises for implementing technology transfer.

TABLE 3. Tax Incentives for Enterprises for Implementing Technology Transfer

Taxes	Content of incentives	Legal documents
VAT tax	Special-use machines, equipment and means of transport that cannot be produced at home and yet are not liable to value-added tax if they are used for the performance of technology transfer contracts.	Section 3, Article 44, Law on Technology Transfer
Law on corporate tax	Enterprises use their own capital to invest in a number of areas that can be reduced to 10% income tax for investments in S&T.	
Import-Export tax	Import tax shall be exempted for goods imported for direct use in the research, development or renewal of technologies.	Section 2, Article 44, Law on Technology Transfer
Corporate income tax	Income of operations technology transfer projects is exempted from income tax.	Article 33, Law on Investment in 2005
	Income tax exemption shall be given to organizations and individuals that contribute capital in the form of patent or technology.	Section 1, Article 44, Law on Technology Transfer
	Production and business establishments that invest in the building of twenty-three new production chains, expansion of the production scale, renewal of technologies, improvement of the ecological environment, or raising of the production capacity are entitled to enterprise income tax exemption for increased incomes for four years and a 50% reduction of payable tax amounts for seven subsequent years.	Section 4, Article 44, Law on Technology Transfer
	Enterprises that invest in technological renewal and receive technologies on the list of those encouraged for transfer are entitled to enterprise income tax exemption for four years with the total exempted tax amount not exceeding 50% of the total fund invested in technological renewal.	Section 5, Article 44, Law on Technology Transfer

Source: CIEM (2013)

The government also supports pilot production projects and provides tax incentives and credits for businesses performing R&D activities. Thus from the solution proposal to prototype and pilot production, the state encourages the participation of the private sector. This is consistent with the analysis in the previous chapter on the role of the government in the financial phase of the research cycle. On the other hand, the issuance of policies for supporting enterprises expresses the urgency of accelerating the transfer and application of technology in production and business activities in Vietnam.

As reported by MoST (2011), there are no specific incentive mechanisms for manufacturing enterprises to apply domestic R&D results, nor is there support for domestic technology, equipment, materials, or goods in manufacturing, limiting the commercialization of R&D results.

The government has issued a series of policies to promote scientific research and technological development, and to apply R&D results in production. However, the challenge is in the mechanism

for S&T projects for scientists. This mechanism has many gaps, and state funding for the application and implementation of R&D results is very limited. We suggest more policy tools to mobilize non-state fund investing in S&T projects and to provide businesses access to feasible R&D results for application in manufacturing and trade.

4.3. Public Procurement for Innovation in Vietnam

4.3.1. Policy on Pre-commercial Procurement in Vietnam

In the 46/NQ-CP resolution, a new mechanism launched where the government must actively procure R&D results and support enterprises in procuring technology from domestic institutes and universities. Article 52 of the Law on S&T 2013 provides for "the government procurement of R&D results agreed with organizations and individuals." Decree 95/ND-CP on investment mechanisms and financing for S&T also issues conditions for the procurement of R&D results.

This procurement of R&D results by the state partly addresses the issue of underutilized R&D results by mobilizing funds from non-state budget resources for research activities and providing additional funding from the state for R&D projects. Does the use of this mechanism on procurement properly address the following case?

> There are many long-term R&D projects that have been running for years, nearly complete or even considered complete, before they were put forth for state funding. They are subsequently lauded for their rapid implementation. Few people know that the researcher had to pour energy into them long ago. (Vu, 2015)

As such, new regulation only pays attention to the procurement of R&D results for the purpose of state consumption (internal consumption or public purposes) but not to the purpose of using R&D results for third-party beneficiaries of government procurement in R&D results.

It is necessary to investigate the practical need for PPI in order to design a mechanism for R&D results procurement that promotes innovation that is in line with current practical needs.

4.4. Demand of Applying R&D Results in Vietnam's Enterprises

4.4.1. Demand and Practice of Applying R&D Results

As stipulated in the Law on S&T 2013, governmental encouragement of the application of R&D results take the form of tax breaks, credit provision, and other incentives. However, the application of R&D results for businesses is still very limited. As indicated by Nguyen (2003) and Nguyen (2013), the percentage of research results commercialization is only 10%. Nguyen (2013) outlines the following reasons behind this situation: (1) lack of funding for pilot projects and completing technology; (2) lack of public policies for promoting the commercialization of R&D results; (3) lack of venture capital and; (4) low demand for applying technology from businesses. To solve this problem, the author suggests that "the state should introduce policies to promote enterprises in

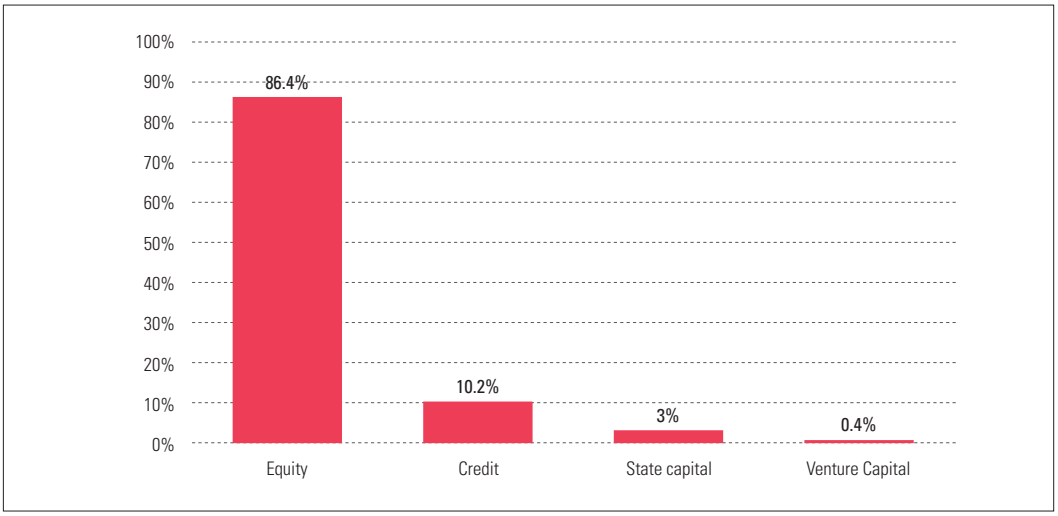
applying domestically generated R&D results" and "improving business attitudes toward domestically generated R&D results (p. 53-72)."

The MoST (2011) reports on key limitations surrounding domestic R&D results, particularly on capabilities for commercialization as well as difficulties in mobilizing funding for application. It seems that the responsibility for applying R&D results is on scientists while participation from businesses at the research stage is not emphasized in publically funded R&D projects.

Emerging Issues:
Placing sole responsibility on the scientists for commercializing R&D results is extremely problematic. Discussions with scientists indicated that the most optimal solution in the present time would be for the government to act as a catalyst for bringing research results to market.

Many policies exist to support corporate implementation of R&D activities and technology investment, but their beneficiaries are mostly large enterprises, accounting for 86% of investment, while more than 90% of Vietnamese enterprises are SMEs (CIEM, 2013). This situation causes difficulty in accessing public funds and the mobilization of at least 30% of funds for particular R&D innovation projects. A survey on competition and technology at the enterprise level shows that among 500 enterprises, R&D costs mostly come from their equity (86%), and only 3% of costs come from state funding. Therefore, the provision of seed capital from the state budget is an urgent issue.

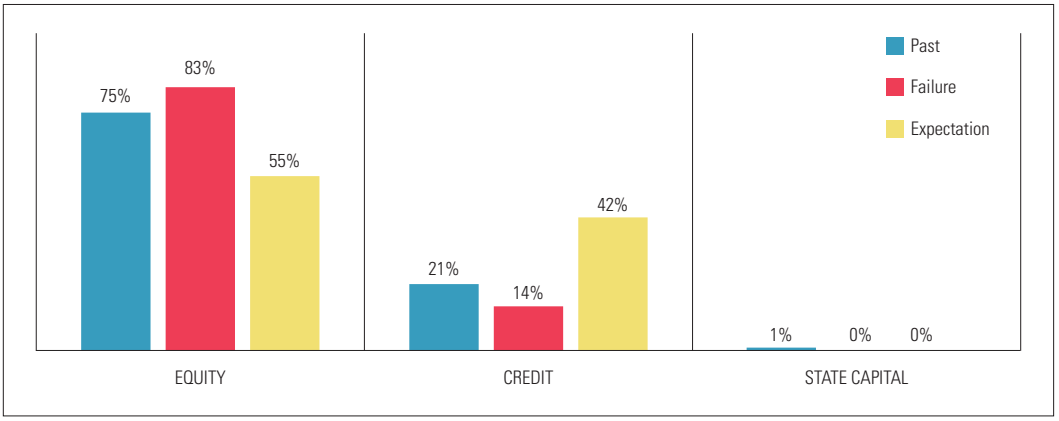
FIGURE 2. Mobilizing of Funds for Business R&D



Source: CIEM, 2013

The CIEM report shows that Vietnamese enterprises should focus on improving available technology rather than on R&D activities, and public policies should be designed for the enterprises that apply R&D results. In implementing R&D, the lack of financing for R&D results application and technology innovation makes it difficult for companies as they rely on their equity or credit, with state funding and venture capital almost at zero while equity and credit sources consequently take up about 55% and 42%.

FIGURE 3. Mobilizing Funds for Technology Adaptation



Source: CIEM (2013)

Emerging issue:
Vietnamese enterprises should focus on both doing R&D and applying R&D results for technological innovation. However, success depends on the scale and funding for R&D and technological innovation. Can public procurement of R&D results become a suitable innovation mechanism for enterprises?

The technology sources for enterprises come mostly from other domestic enterprises, accounting for about 66% (CIEM, 2013), in which domestic and customer enterprises are 10.2% (7,174 reservations) and 11.9% (2,760 reservations).

Emerging issue:
Technology issues will likely be resolved easily if enterprises associate to create larger scale. Can public procurement of R&D results be a feasible policy for connecting companies together through the government provision of technology either free-of-charge or at lower prices for groups of enterprises or enterprise clusters?

4.4.2. Scientists and S&T Managers at Local Perspectives

1) Local Initiatives

Demand for procurement R&D research is currently present. In late 2012, the idea of buying R&D results was frequently cited by the media, as in 2013 Ho Chi Minh City planned to adopt a new financial mechanism for scientific research funding by procurement of R&D results. Expectations were high for incentivizing of breakthroughs in scientific research; scientists would have more time for research instead of being mired in administration. Ho Chi Minh City tested this model at their Institute for Computational Science. This helped researchers focus on scientific research, using their final results for articles or product application. The Department of Science and Technology of Ho Chi Minh City People's Committee set the terms for the procurement of R&D results, treating R&D results as a commodity, and the R&D results procurement policy were expected to help scientists be more active and reduce risk in public R&D funding projects. However, as of early 2015, none of the public-procured research findings has been implemented in Ho Chi Minh City.

In this vein, Dr. Pham Van Sang (Director of the Dong Nai S&T Department) stated that two years ago, their department wished to procure R&D results to apply in practice without funding S&T projects in order to reduce risk during the project implementation and to mobilize funds for R&D activities. The R&D results are:

- A solution to fix a leaking provincial irrigation lake that would otherwise lead to water shortages in agricultural production during the dry season
- Cucumber varieties suitable for local needs that could be widely planted in the province

However, Dong Nai DoST still has not found the demanded R&D results, and the research capacities of organizations and individuals inside and outside the province do not meet requirements. Supply and demand in R&D results procurement could not be matched up, and the question arises as to whether R&D results can be procured if such results could not be found.

This indicates there is a need for procuring R&D results for government expenditure or for public purposes. Such procurement can eliminate difficulties in financing for scientists, as it has in Hachiman City. R&D results procurement policy should be designed with the concerns about the procurer, results, and method of procuring in mind.

2) Scientist and S&T Managers on S&T Results Procurement

The actors express their understanding of the R&D results procurement framework as scientist/S&T organizations being the sellers, S&T managers the buyers, users the mediators, and enterprises the end-users. The following questions were answered by these actors:

- Should government procure R&D results or should R&D be led by the market without government intervention?
- What R&D results can be procured by the government through the market?
- What are the solutions or supporting mechanisms that support government in procuring R&D results?

Views proliferated on government intervention in the market through R&D results procurement; the majority of scientists agreed with the policy and expected it to facilitate research for scientists. They pointed out that government procurement of R&D results harmonizes the interests of both scientists and S&T managers, enhances the socialization of R&D activities, and incentivizes scientists to invest their own funds for R&D projects that are of interest to the government. Many scientists remarked that the spillover effects of R&D results would be higher when applying those used by the public sector than the private sector.

As sellers, when comparing public and private buyers, some scientists were reluctant to sell their R&D results to the government due to intellectual property rights issues and the administrative procedures in financing. Some scientists doubted the government's capability of commercializing R&D results. In contrast, others wished to sell R&D results for public agencies since intellectual property rights are not highly protected in any case. A very interesting comment made at Can Tho province stated that a market for R&D results can be established when the government procures R&D results that would be re-procured from the government for scientific research purposes.

The business sector, as buyers or/and end users, expects governmental R&D results procurement to help them commercialize R&D results. This opinion is in line with those from public agencies, managers, and scientists as they agree that the public sector should not directly procure R&D results and instead use public agencies to link technology demands from the business sector and support businesses' acquisition of available R&D results.

From the opposing point of view, many managers and scientists oppose R&D results procurement by government as they doubt the government's capability to apply R&D results after procurement. They suggested that government should only procure R&D results if assured they can develop and effectively use those results.

What kinds of R&D results should the government procure or not, and in what kinds of forms? Most of the reviewers agreed that public funding should be used for public purposes such as national security or environmental protection. R&D results with broad applicability should be procured so many people can benefit: "The state must be smart and responsible buyers when using budget money to procure R&D results" (Pham Thi Bang, Director of the Information Center, Department of Science and Technology, Ho Chi Minh City).

Another issue dealt with completed and incomplete R&D results. Some argued that the government should procure only completed R&D results so they can be readily applied, while others pointed out that the procurement of R&D results by government should address the difficulty in obtaining public funds for research in the development stage.

> The Agricultural Department in Can Tho University studied Trico mushrooms that can help fungi decompose organically in the soil, but while a sample has been produced, pilot production to select the most suitable product cannot be undertaken without public funds (Dr. Le Thanh Phong, Director of Services and Technology Transfer Center, Can Tho University).

The following are the issues surrounding R&D results procurement as PPI policy:

- Regarding the representation of the government in procurement activities, public agencies should be responsible for both scientific management (choosing the right R&D results to procure, and monitoring the procurement activities) and economic management (using public money effectively).
- The purposes and mechanism of the procurement of R&D results toward innovation should be forefront in decision-making.
- How to solve the valuation of R&D results and the issue of intellectual property rights?

To conclude, there is a demand for R&D results procurement, the actors are willing to participate in this activity, and a framework for R&D results procurement should be issued in which the above points are addressed.

5. CONCLUSION AND POLICY IMPLICATIONS

5.1. Comparison of Policy Context between Vietnam and EU

The decision to build up and implement PPI in EU countries comes from the need to balance demand-side innovation policy instruments with supply-side instrument. The EU has also built up and implemented PPI based on the fact that the total value of public procurement in the EU is relatively high. PPI as designed also improves public service quality and addresses societal challenges.

The Vietnamese context is different. The justifications for building up PPI policy in Vietnam are to solve problems emerging in Vietnam's S&T. Objectives include improving R&D results, mobilizing social resources invested in R&D, reducing administrative load in S&T projects funded by the state, leading new markets, encouraging R&D activities in businesses, and improving the efficiency of the commercialization of R&D results for innovation.

However, as mentioned in Section 3, there are quite a lot supply-side policies aiming to encourage investment in R&D results. However, these policies still have limitations. It is essential to have alternative approaches for boosting innovation coming from the demand side. This new approach is especially suitable for Vietnam as a developing economy where competitive advantage must come from applying S&T improvements. Particularly in the context of regarding enterprises as a center of STI activities, it is crucial to encourage them to apply technological advancement in production and achieve innovation.

It is also mentioned that the term "PPI" has no mention in Vietnam's legislation as well as in STI. Following the reasons stated throughout this study, we recommend that R&D results policy in Vietnam should be implemented as regular PPI both in theoretical and practical aspects, but policymakers need to pay attention to the specific characteristics of the STI system of their country in order to make the policy contextually compatible.

Another aspect worth mentioning is that according to the EU's experience, a decisive factor in implementing PPI is the readiness of a legal framework (intellectual property rights, R&D contracts, and standardization), a demand-supply network, and other procurement incentives.

5.2. Comparison of Objectives and Targeting Groups of PPI Policy between Vietnam and Other Nations

As mentioned, PPI policy in Vietnam is not formalized in any particular policy. Comparison between PPI policy in Vietnam and other countries is based on the context of Vietnam introducing PPI policy. The comparison is divided in the following categories: objectives; targeting groups; when, what and how PPI is implemented; and the conditions for PPI implementation.

TABLE 4. Comparison of PPI Policies between Vietnam and Other Nations

	PPI in EU		PPI in Vietnam
	Pre-Commercial Procurement	Public Procurement of Innovative Solutions	
Objectives	To steer the development of solutions towards concrete public sector needs while comparing/ validating alternative solution approaches from various vendors	To act as launching customer/early adopter/first buyer of innovative commercial end-solutions newly arriving on the market	To improve R&D results, mobilize social resources invested in R&D, reduce administrative load in S&T projects funded by state, lead new markets, encourage R&D activities in businesses, improve the efficiency of the commercialization of R&D results, and promote innovation
Targeting groups	Beneficiaries and third parties Buyers group Lead procurer Subcontractors		Buyers/users group Sellers group Subcontractors
When	- Challenge requires R&D to get new solutions developed. - Problem clear, but pros cons of several potential competing solutions not compared/ validated yet. No commitment to deploy (PPI) yet.	- Challenge requires solution almost on the market or already on the market in small quantities but not meeting public sector demand. - No R&D involved (R&D already done, or no R&D needed to solve problem)	For public expenditure For provision of public services
What	Public sector buys R&D to steer development of solutions to its needs, gather info about pros/cons of alternative solutions to be better informed to make specs for a follow-up PPI possibly later, to avoid supplier lock-in (create competitive supply base)	Public sector acts as launching customer/early adopter/first buyer for innovative products and services that are newly arriving on the market (not widely commercially available yet)	All types of applied research results or completed innovative solutions
How	Public sector buys R&D from several suppliers in parallel (comparing alternative solution approaches), in form of competition evaluating progress after critical milestones (design, prototyping, test phase), risks & benefits of R&D (e.g. IPRs) shared with suppliers to maximize incentives for wide commercialization	Public sector acts as facilitator establishing a buyers group with critical mass that triggers industry to scale up its production chain to bring products on the market with desired quality/ price ratio within a specific time. After testing/ certification/labeling, the buyers group buys a significant volume of solutions.	- Government acts as the catalyst in public procurement to bring R&D results, providing for business sectors. - Government also acts as the end user of R&D results in order to procure R&D results for public purposes in which government is the supplier.

Conditions	Readiness of legal framework (intellectual property rights, R&D contracts, standardization…), demand-supply network and other procurement incentives.	- Capability of R&D institutions, business, public agencies in innovation process. - Appropriate financial mechanism for procurement. - Readiness of public contracting organizations.
Fields	Environment, healthcare, infrastructure construction, transportation	

Source: Adapted from Bos (2014)

5.3. R&D Results Procurement by Public Funds as PPI Policy in Vietnam

5.3.1. Policy Point of View

R&D results procurement policies by state budget comes from the functions of the government and the role of the state budget for the financing of science, technology, and innovation.

International experience shows that PPI policies are one of powerful demand-side policy tools where the state acts as a leading consumer to stimulate innovation, coordinates to create domestic markets for some special field, reduces initial costs for innovative solutions, and thus promotes the spread of innovation. The state can act as the final user or intermediary for connecting R&D results owners and users.

R&D results procurement by government policy for promoting innovation should be designed to complement existing policies but not as a public funding policy in which the relationship between owners/sellers and users/buyers are based on market conditions.

5.3.2. Objectives

R&D results procurement by state funding policy should be given a new financial mechanism added to the existing instruments aimed at increasing R&D results, mobilizing social resources invested in R&D, reducing the administrative burden of state-funded S&T projects, leading new markets, encouraging R&D activities in business, improving the efficiency of R&D results commercialization, and promoting innovation.

Public services R&D (in the fields of health, agriculture, the environment, and defense and security) results should be procured using state funding policy investing in completed technology for commercialization.

5.3.3. Kinds of R&D Results Procurement by Public Funds

State funding may be used by public agencies and enterprises to use to purchase applied research results or completed innovative solutions that are introduced to the market for the first time. Such results include organizational solutions, social management or technology, materials and products,

and inventions. Buyers can organize to procure results for continuing to develop solutions to address their needs, and gather information on the advantages and disadvantages of these alternatives as a basis for public procurement of innovative solutions that can be carried out later and to avoid becoming a locked-in supplier.

5.3.4. Targeting Group in R&D Results Procurement through State Funds

Buyers

- Group 1: The ministries, ministerial-level agencies, government agencies, People's Committees of provinces, and other organizations and agencies wishing to procure R&D results using the public budget for science to procure research results;
- Group 2: Enterprises as beneficiaries of R&D results providing a financial commitment to procurement. When this group accounts for a large enough quantity, the R&D results can apply towards improving the quality and efficiency in the areas where the state has interest.

Sellers

- Individuals, organizations of any economic sector that could sell their R&D results to the government.
- R&D results financed by the public fund have to comply with current regulations on intellectual property rights and transfer of publically funded R&D results.

Subcontractors

The subcontractor is the winning bidder selected by the buyer to provide R&D services and innovative solutions. These subcontractors are not included in the contract between the seller and the buyer.

5.4. Key Findings

This paper outlines the rationales, potential and necessary framework conditions for the use of PPI in Vietnam. From both theoretical and practical perspectives, R&D result purchasing policy in Vietnam must be understood and implemented as regular PPI. This finding implies that PPI should not be a supply-side innovation policy instrument as intended by policymakers but a demand-side innovation policy instrument for fostering demand in R&D results, especially from SMEs.

SMEs should be an additional target group of the policy and the state should play a catalytic role. Another important point is while designing the policy, policymakers must pay attention to the characteristics of the STI system of the country in order to make the policy adaptable to the context.

This paper also suggests that PPI in Vietnam should be implemented with a ready legal framework including intellectual property rights, R&D contracts, and standardization; the increased capability of R&D institutions, business, and public agencies in the innovation process; the demand-supply network; and other procurement incentives.

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