State Funding for Research and Development in Universities in Vietnam

Vu Cuong[1] and Nguyen Viet Ha[2],

[1]Assoc. Prof., Planning and Development Faculty, the National Economics University, Vietnam
[2]PhD Candidate, Department of Planning and Finance, Ministry of Education and Training, Vietnam
[1]Email: cuongv@neu.edu.vn, [2] Email: nvha@moet.gov.vn

Abstract

Investment in research and development is crucial to promote innovation. As a public good, R&D activity is likely to be sub-optimally invested by private sector. Government should correct market failure in R&D activity by providing incentives to investment in R&D and/or direct funding to R&D projects. Given the leading role of universities and colleges in science, technology and innovation, they are always the priority recipients of public R&D funding.

Vietnam's long-term economic development depends mostly on innovation, especially R&D. Nevertheless, the current public R&D funding mechanism has not favored R&D activities in universities, although R&D human resource with high qualification is concentrated in these institutions. The current multi-agency management arrangement over R&D budget has led to disconnection between human resource and financing on R&D and limited access of universities to R&D budget managed by line ministries and provinces. Fragmentation in financing also inhibits inter-university cooperation to conduct inter-disciplinary research. Limited competition, short-term and project-based R&D budget allocation and lack of results-based orientation in R&D funding mechanism, all together have caused poor R&D performance of tertiary education institutions in Vietnam.

Vietnam needs to urgently transform the public financing mechanism to be more transparent, result-based and competitive. Two concrete actions should be taken: (i) streamlining all fragmented R&D budgets into a single channel managed by a stronger, integrated, transparent, professional government sponsored agency with relevant expertise and rigorous peer review; and (ii) providing more open access to sufficiently large R&D projects to institutions, individuals, or group of individuals. Incentives are also needed to diversify funding sources for R&D in universities and to strengthen their linkage to industry.

Keywords: science, technology and innovation (STI), research and development (R&D), state funding, tertiary education institutions

1. Introduction

The constant high economic growth rates of about 7% per annum enjoyed over the past two decades has transformed Vietnam from one of the world's poorest nations to a lower middle-income country. Growth and macroeconomic stability are expected to be sustained over the medium term with a projected growth rate of around 6.5 percent per annum, thank for a surge of export-oriented manufacturing sector, strong domestic demand and gradual rebound of agriculture.

Looking ahead in the longer term, the future path of the Vietnamese economy may not look as good as a view of the past, since some key drivers of the past growth seem running out of steam. Mc Kinsey Global Institute (2012) has pointed out a key challenge now facing Vietnam, that is weakening labor inputs as a driver of growth. After years of growth, Vietnam's population reached about 95 million in 2017 (up from about 60 million in 1986) and is expected to expand to 120 million before tailing off around 2050. Although Vietnam's median age of 27.4 years is still relatively young, Vietnam's population is also aging. At the same time, its relative advantage of cheap labor force is eroding. After adjusting for exchange rates, Bangladesh and Cambodia now offer cheaper labor than does Vietnam (Mc Kinsey Global Institute 201, p. 21). Therefore, to maintain its economic growth momentum, Vietnam needs to increase productivity of labor and capital, which should be considered the engine of future economic growth. And the single most important driver of productivity is innovation. As emphasized by the World Bank (2014), "innovation as a way of life can permeate all activities, but in the modern, networked age, the innovation that drives productivity comes from scientific research and technological development. Progress in Science and in Research & Development (R&D) requires a combination of public support and private initiative, especially a focus on entrepreneurship".

Universities or tertiary education institutions (TEIs in general) have played a crucial role in promoting science, technology and innovation (STI) vis-à-vis their research and development activities (R&D). Unfortunately, the current public funding mechanism has not favored R&D activities in TEIs. This paper aims to analyze problems in that funding mechanism and provide recommendations for change. The paper starts with a theoretical framework on the role of government in promoting R&D in TEIs in section 2. Then, current R&D in tertiary system in Vietnam and public funding for R&D in TEIs is discussed in section 3. The last section is for recommendations.

2. Theoretical framework and Method

According to OECD (2003), much technological knowledge (including R&D) displays the feature of a public good. R&D activities are usually expensive, not only because of high cost of equipment, labs and materials involved in R&D projects, but also of high risk of failure imbedded in most of R&D products. However, once disseminated, it is impossible to deny access of different users. This non-excludability makes most of R&D activities become market failure, because it is a source of two main problems for underinvestment of private businesses in the sector. The first is spillover of the benefits of innovation (positive externalities), the fact that the social return on innovation is usually higher than the private return (customers and competitors benefit from a firm's innovations). The second problem is another aspect of the first – the knowledge cannot be appropriated. In such a case the firm cannot capture all the benefits generated by its innovation, which lessens the incentive to invest in innovative activities. Thus, the government plays crucial role in correcting this market failure.

The government can support the innovation either by creating enabling environment to promote R&D activities or directly providing state funding for R&D activities. Many countries have developed a national innovation system, in which various efforts have been made to protect intellectual rights and patterns, provide financial incentives to innovation enterprises, and strengthen linkages between universities and industries. Not less importantly, these governments invested heavily in the sector. Top ten countries in R&D investment in 2016 has spent about 3% of GDP for R&D (UNESCO, 2018), and all of them consider universities the key drive of their national innovation systems. With an average investment of USD 100 billion for R&D, the US owned the world-leading tertiary education system, which characterized by a strong link with industries. Universities can own patents of successful R&D projects, even the projects are funded by government budget. South Korea government encourage university faculties and researchers to apply to government-funded large interdisciplinary R&D projects if such projects demonstrated their strong link to industry demand. With a vision of becoming become a knowledge enterprise, the National University of Singapore has received huge investment from the Singaporean government. Just few examples have shown that government investment in R&D activities in universities is a dispensable element of a successful national innovation system around the world.

3. Public funding for R&D in Vietnam's universities

Government spending on Science, Technology and Innovation (STI)

Despite that STI is a Vietnamese government's priority for economic development, public funding on STI is limited. The Law on Science and Technology of 2013 requires that at least 2% of total public spending be allocated to STI, but the actual spending is lower, only about 1.5% of total public spending, or equivalent to 0.4% of GDP in 2015 (see Table 1).[1]

Table 1. State budget expenditure for STI in Vietnam, 2011-2015

Year	Public funding for STI			Of which					
				Capital			Recurrent		
	VND billion	% of total state exp.	% GDP	Total	Central	Local	Total	Central	Local
2011	11,499	1.58	0.41	5,069	2,354	2,715	6,430	4,870	1,560
2012	13,168	1.46	0.41	6,008	3,018	2,990	7,160	5,410	1,750
2013	13,869	1.44	0.39	6,136	2,836	3,300	7,733	5,813	1,920
2014	13,666	1.36	0.35	5,986	2,936	3,050	7,680	5,745	1,935
2015	17,390	1.52	0.41	7,600	4,130	3,470	9,790	7,640	2,150
2016	17,730	1.39	0.39	7,259	3,710	3,549	10,471	8,121	2,350

Source: MOST (2016), *Viet Nam STI Report 2016, consolidated from Table 3.9-3.13.*

Public spending on STI is distributed in a scattered and fragmented manner between national funds managed by the Ministry of Science and Technology (MOST) and STI tasks managed by line ministries.

[1] In big cities like Hanoi or Ho Chi Minh City, the ratio of STI spending in the cities' budget is usually much higher than in other poor provinces. Similarly, among line ministries and central agencies, some has more demand for STI activities than the others.

First, MOST manages two national STI funds to support STI activities nationwide: National Fund for STI Development (NAFOSTED) and National Technology Innovation Fund (NATIF).

NAFOSTED is a national fund established by a government decision to finance basic and applied research projects in TEIs, research institutions, and individual researchers via providing grants, loans and loan guarantees[2]. The budget for NAFOSTED comes from state budget and non-stare budget. State budget funding consists of its chartered capital of VND 500 billion (which is supplemented every year to guarantee the minimum level of VND 500 billion), recurrent budget for STI in MOST to implement MOST's STI tasks and projects, government loan guarantee for special STI tasks and other. On-state revenue include revenue from the Fund's services (loan interests, loan guarantee fees…), and contributions from organizations, firms and individuals. Applicants to the fund must commit to publishing research results in prestigious domestic and international journals. Independent review is applied to select successful proposals in competitive basis. Funding is provided right after the research contract is awarded to the winner. Research results are also reviewed by an independent council.

NATIF is the first national fund to provide direct support to individuals, organizations and enterprises who wish to be engaged in technology transfer, technological innovation in SMEs, and supports start-ups as well as the development of skills for technology transfer/technical improvement[3]. Funding for NATIF comes from state budget as its chartered capital of VND 1,000 billion, which is subject to be supplemented every year depending on its performance, and other sources of funding (financial institutions, voluntary contributions and interest collection on the Fund's loans). In theory, TEIs are eligible to apply for NATIF, but in reality, they do not because they are not able to develop strong proposals focusing on technology development and innovation. As a result, main clients of the Fund are currently enterprises who can develop strong proposals. Unfortunately, the Fund has not yet functioned as a bridge between TEIs and enterprises to improve the applicability and commercialization of research products.

Second, MOST is also responsible for guiding line ministries and provinces to develop an annual budget plan for STI. Competitive bidding of research proposals has become the main selection process for line ministries: each line ministry sets up a council to review and select research proposals from TEIs on a competitive basis.[4] After receiving proposals from line ministries and provinces, MOST coordinates with MPI and MOF to develop nation-wide STI recurrent and capital budget plan to submit to the Government.[5] Once the nation-wide budget plan is approved, it will be distributed to line ministries and provinces. Then, the Law on Science and Technology and Decree 95/2014/ND-CP require that budget allocation criteria to individual line ministries and provinces include the last two years' performance (total number of R&D assigned tasks, the rate of in-time completion, and STI results) and input indicator (STI workforce).[6] The silos nature of STI budget allocation and use has led to the situation that line ministries only allocate capital budget to units and organizations under their supervision. This

[2] See Decree 23/2014/ND-CP on issuance of the Operational Charter of NAFOSTED.
[3] Decision 1051/2017/QD-CP on issuance of NATIF's Operational Charter.
[4] Joint Circular 121/2014/TTLT-BTC-BKHCN.
[5] Decree 95/2014/ND-CP.
[6] Other considerations include number of ministries' staff, number of subordinate agencies under the management of the ministries, province GDPs in the last 5 years, domestic revenue, population and number of districts under provincial administration.

makes it very difficult to finance a large-scale investment to make a big difference in the field of science and technology and national innovation or development of common facilities that can be shared among TEIs.

Public spending for Research and Development

Table 2. Gross Expenditure for R&D in selected countries in 2015

Country or Economy	GERD (USD mil. in PPP)	GERD/GDP (%)	Number of FTEs (person)	Per FTE GERD (USD PPP)
28 EU nations	384,210	1.95	1,805,302	212,823
U.S.A.	502,893	2.79	1,351,903	371,989
Russia	40,522	1.13	449,180	90,213
China	408,829	2.07	1,619,028	252,515
Japan	170,082	3.59	662,071	256,894
South Korea	74,218	4.23	356,447	208,216
Singapore (*)	10,067	2.20	36,666	274,560
Malaysia (*)	9,672	1.26	61,355	157,640
Thailand (*)	5,107	0.48	65,940	77,449
Vietnam	2,434	0.44	62,886	38,705

Source: Viet Nam S&T report 2016, Table 3.20, calculated from http://data.worldbank.org/indicator; OECD, *Main S&T Indicators (database), 2016,* and www.theglobaleconomy.com
Note: (*) Data for 2014. The rest is for 2015. Number of researchers is converted into R&D FTE (Full Time Equivalent) for international comparison.

In STI activity, R&D always plays crucial role. Gross Expenditure for R&D (GERD) to GDP ratio is the most important internationally comparable indicator for a nation's R&D capacity. Vietnam's GDP in 2015 was USD 193.6 billion in power purchasing parities (PPP).[7] According to a survey on R&D activities in 2016, GERD in 2015 was USD 851.8 million or USD 2,433.8 million in PPP, equivalent to 0.44 percent of GDP. With the total number of researchers as 131,045 persons (or 62,886 full-time equivalents (FTEs)), average per FTE researcher GERD in 2015 was USD 38,075 in PPP or per non-converted researcher GERD of USD 18,572 in PPP, some increase from USD 13,623 in PPP prices in 2013. Despite that Vietnam's FTE number of researchers is equal to that of Thailand and Malaysia, and 65 percent more than that of Singapore, Vietnam's GERD is much lower than those of the comparator countries, resulting in Vietnam's per FTE GERD is only a half of Thailand's, a fourth of Malaysia's and a seventh of Singapore's (see Table 2).

In three consecutive R&D surveys conducted by MOST, GERD to GDP ratio has increased from 0.19% in 2011 to 0.44% in 2015, primarily owing to intensive investment by the business sector, typically IT enterprises. In 2015, R&D funding from the business sector accounted for 58 percent of GERD, or more than doubled public spending (Table 3). Firms spend a relatively large amount on R&D primarily because Decree 95 requires state owned enterprises to spend 3-

[7] With a PPP conversion factor of 0.3517.

10% of their pre-tax profits on their S&T Funds. If they cannot spend this sum, then they must transfer the unused funds to relevant line ministries or provinces.

Table 3. R&D expenditure by sector and funding sources, 2015

Unit: VND billion

Sector	Total	Source of funding					
		State budget		TEIs	Domestic Businesses	Others	FDI
		Central	Local				
S&T organizations	4,763	3,082	455	51	198	794	183
TEIs	1,063	671	134	123	26	65	44
Public S&T service agencies	276	75	145	1	15	34	6
Administration units	628	128	439	1	8	40	13
Businesses	11,766	700	280	0	10,498	0	288
Total	18,496	4,656	1,453	175	10,745	933	534

Source: Viet Nam S&T report 2016, Table 3.18.

Issues with public spending for R&D in universities

Public spending for R&D in TEIs has demonstrated two critical issues regarding universities' accessibility to R&D funding and deficiency of the financing mechanism.

The biggest issue with public spending on R&D in Vietnam is the disconnection between human resource and financing. R&D human resource with higher qualifications is concentrated in TEIs: the tertiary education sector contributes 50 percent of the total R&D workforce in the country, with 67 percent of PhDs and 70 percent of masters (see Table 4). However, as shown in Table 4, they have very limited access to State R&D budget. In 2015, while S&T research organizations—most of which are national specialized research institutes or academies under line ministries and national research institutions - received nearly 60 percent of total public spending on R&D, TEIs received only 13 percent. At the central level, public S&T organizations accounted dominantly for 66% while TEIs for only 14% of the central budget for R&D. Ironically at the local level, a majority of R&D public funding was for local R&D institutions and public administration units (together, this group accounted for more than 60% of local public funding for R&D), while universities and colleges could access to less than 10% of the total. It is obvious that with the current public R&D budget allocation mechanism, line ministries and provinces tend to favor their "owned" S&T organizations to TEIs. Consequently, TEIs must join specific R&D programs or national-level R&D tasks managed mainly by MOST to be eligible for submitting research proposals and/or facility development proposals.

Because of Decree 95, contribution of business sector (including that of domestic and FDI enterprises) to R&D budget was substantial (VND 10,786 billion or 58% of GERD). However, R&D projects conducted by themselves was somehow equivalent (VND 11,766 billion). It also

implied that TEIs have no way to access to R&D budget in business sector and the linkage between universities and industry is negligible.

Table 4. R&D human resource in TEIs relative to other sectors, 2015

Sector	Total	By function				By degree (for researchers only)			
		Researcher	Technical	Seconded	Other	PhD	Master	Bachelor	Other
S&T organizations	38,628	29,786	2,410	4,523	1,909	3,781	9,405	15,661	939
%	*23%*	*23%*	*21%*	*27%*	*23%*	*26%*	*18%*	*26%*	*19%*
TEIs.	77,841	65,628	2,716	7,839	1,658	9,624	35,922	19,279	803
%	*46%*	*50%*	*24%*	*46%*	*20%*	*67%*	*70%*	*32%*	*17%*
S&T service agencies	3,909	2,417	737	605	150	71	638	1,607	101
%	*2%*	*2%*	*6%*	*4%*	*2%*	*0%*	*1%*	*3%*	*2%*
Administration units	21,255	13,752	2,333	2,304	2,866	695	3,932	8,296	829
%	*13%*	*10%*	*20%*	*14%*	*35%*	*5%*	*8%*	*14%*	*17%*
Businesses	26,113	19,462	3,326	1,663	1,662	205	1,231	15,876	2,150
%	*16%*	*15%*	*29%*	*10%*	*20%*	*1%*	*2%*	*26%*	*45%*
Total	167,746	131,045	11,522	16,934	8,245	14,376	51,128	60,719	4,822
%	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*	*100%*

Source: Vietnam S&T Report, 2016 and Survey on R&D activities in TEIs in 2011-2016 (July 2017).
Note: Number of researchers is converted into R&D FTE (Full Time Equivalent).

The other issue is deficiency of the public financing mechanism for R&D in tertiary education, including:

Firstly, fragmentation in financing: As previously discussed, research funding is managed by many agencies, including MOST, line ministries, and/or provincial authorities. The fragmentation in financing inhibits cooperation between different universities and research organizations, especially those belonging to different ministries/localities. This also creates barriers for interdisciplinary research since most of universities/research institutes in Vietnam are mono-disciplinary. Another consequence of the fragmentation is a high potential for overlapping and/or double research financing. Authors from different organizations may apply top different funds for similar research projects.

Secondly, limited competition: Except MOST-managed funds (NAFOSTED and NATIF), other agencies normally limit the competition within their span of control (e.g., universities, research institutes under their supervision).

Thirdly, short-term, project-based rather than long-term, program-based research funding: Most research funding has been operating on a short-term, project-based basis. The funding calls for application for specific research projects (from 1 to 3 years) with specific outputs. Continuity of the projects as well as capacity building have not been very clear in financing for R&D.

Finally, lack of result-based financing: The financing system has been heavily input- and process-based. This creates a cumbersome administrative procedure and non-transparent financing process. A result-based financing has been partly applied by NAFOSTED, but that experience has not been shared to other funding agencies.

R&D performance of Vietnam's TEIs

While TEIs contributed significantly to the R&D results nationwide, the R&D performance of the sector was still modest relative to other countries in the region. According to statistics from the Web of Science, for 2011-2016 period, the total number of international publications of Vietnam in the ISI system is 16,104 articles, of which universities contributed 5,738 articles, accounting for 50%. In 2015, for the first time in Vietnam, the number of scientific publications in the Web of Science database exceeded the threshold of 3,000 articles/year, in 2016 exceeded the threshold of 4,000 articles (increased by nearly 25% from the previous year's level). However, citation frequency of Vietnamese articles tends to decrease, reflecting relatively low quality of international publications and/or derail of paper topics from the internationally common interests. Sub-sectors having the highest number of international publications are natural sciences (physics, mathematics, chemistry, engineering), accounting for over 40% of the total. International publications in the fields of agriculture, health, social sciences and humanities are handful. Based on this indicator, Vietnam ranks 4th in ASEAN (like Indonesia, but juts a third of the third ranking country - Thailand) (see Table 5).

Table 5: International publications of Vietnam and selected countries, 2011-2016

Country	2011	2012	2013	2014	2015	2016
US	524,962	550,169	560,639	586,076	599,371	605,590
China	175,381	201,680	239,228	275,194	310,701	341,390
South Korea	52,099	57,668	59,334	64,424	68,083	69,152
Singapore	11,520	12,977	13,748	14,946	16,211	17,130
Malaysia	8,843	9,574	10,504	12,226	13,795	16,095
Thailand	6,977	7,690	7,728	8,264	8,764	10,298
Vietnam	1,586	1,970	2,520	2,794	3,234	4,098
Indonesia	1,513	1,709	2,041	2,503	3,454	4,540
Philippines	1,229	1,295	1,434	1,586	1,858	2,093

Source: Web of Science, accessed 16/05/2017, cited from *Vietnam S&T Report* (*2016)*, Table 4.6

It is evident that for Vietnam to move towards having (regionally) leading research universities, it needs to transform the public financing mechanism to be more transparent, result-based, and competitive. Thus, the issues of fragmentation of funding, cumbersome administrative procedure, and short-term orientation in financing need to be addressed.

4. Recommendations

There are two concrete actions for more effective R&D funding. First, it is essential to streamline the fragmented funding channels into one for all R&D funding. R&D funding should be managed by a stronger, integrated, transparent, professional government sponsored agency with relevant expertise and rigorous peer review, which could be transformation of NAFOSTED or a creation of a new funding body. To build the credibility of the selection process, in the beginning,

peer reviews could be done by internationally reputable professors. Second, R&D funding can be provided for institutions, individuals, or group of individuals and should promote transnational research collaboration. It should be large enough to be significant to TEIs and researchers. Even though state funds are used for research, the ownership of patents should be granted to TEIs and researchers to motivate them (like the US experience).

In addition, the TEIs' capacity to raise non-state revenues through tuitions and other income-generation activities should be encouraged as additional funding for R&D activities in TEIs. Wherever possible and appropriate, the government should promote public-private partnership activities between universities and industries by providing a clear regulatory framework and various incentives such as tax reductions, flexible use of facilities and land, government loans, and matching funds. Such incentives should also encourage private investors to invest in R&D in TEIs.

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