Productivity *Analysis*

Productivity, Innovation, and Economic Structural Change in Vietnam

Dr. Patarapong Intarakumnerd

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PRODUCTIVITY, INNOVATION, AND ECONOMIC STRUCTURAL CHANGE IN VIETNAM

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Productivity, Innovation, and Economic Structural Change in Vietnam

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EXECUTIVE SUMMARY

Economic structural change refers to a situation when a country is shifting from being a largely agricultural economy to one based on service or industry. The movement of the labor force from low-productivity to high-productivity activities is an essential step in economic development. Vietnam has been undergoing the process of structural transformation, with the reallocation of economic activities across the sectors of agriculture, industry, and services. The size of the labor force in agriculture, forestry, and fishing has decreased from 52.1% (2008) to 37.7% (2018). However, the contribution to GDP of the agriculture sector of Vietnam is high compared with other ASEAN members (17% vs. 11%). It implies that the structural transformation will still contribute significantly to economic development.

In an effort to support Vietnam in enhancing the contribution of structural change to its labor productivity improvement at aggregate level through innovation, the APO initiated research on Productivity, Innovation, and Economic Structural Change in Vietnam. In the pages that follow, the status quo of Vietnam's economy, policy measures, and initiatives for productivity and innovation is reviewed. This paper is based on a background report drafted by the Vietnam National Productivity Institute, Directorate for Standards, Metrology and Quality, Ministry of Science and Technology; with inputs from the National Graduate Institute of Policy Studies (GRIPS), Japan; and coordination by the Policy and Analysis Division of the APO.

In this paper, a few recommendations worth being highlighted include: 1) more synchronized productivity and innovation policies; 2) improved cross-ministerial coordination; 3) the creation of mass innovative firms aside from high-tech startup promotion; and 4) better leveraging of FDI enterprises.

INTRODUCTION

The Vietnamese economy has experienced several transformations since its first economic reform at the beginning of the 1960s, when the Vietnamese government nationalized private factories in the northern region. The second round of nationalization occurred after the reunification of North Vietnam and South Vietnam in the period 1977–1978. During the 1960s, 1970s, and first half of the 1980s, the entire Vietnamese economy was managed according to government plans. In this period, state-owned factories produced according to quotas assigned by government agencies. The government controlled both input and output quantities and prices, but encouraged workers and engineers to propose initiatives for technical improvements.

The planned economy started to transit from the beginning of the 1980s, when it was inaugurated by an orientation in the Conclusion Act of the Communist Party in 1980. That orientation included provisions for the financial autonomy of state R&D institutions. In 1983, the government issued new laws that recognized private-like and profitable activities; for example, state science and technology (S&T) institutions were permitted to provide research services to factories and cooperatives. This was an initial step toward accepting private-sector activities for technical development.

From about 1986 onward, in the context of macroeconomic transformation to a market economy, the government issued other legal acts covering contracts between state research institutions and factories for pilot production. This was an important mechanism for building bridges between R&D institutions and industrial companies. Mechanisms to transfer R&D results to manufacturing companies contributed significantly to the formation of the technology market in Vietnam. Two years later, in 1988 the government confirmed its recognition of multiple economic sectors, including foreign investors, in its socialist political institutions by approving the Ordinance on Technology Transfer.

Further, private and individual activities relating to S&T were recognized by the Vietnamese government in 1993. Companies were formally encouraged to invest in their own S&T capability upgrading in a governmental decree in 1999. In the following years, the government issued a series of policies to transfer ownership of state enterprises to other economic sectors and individuals and to improve awareness of investment in S&T development.

Since 2001, the government has launched a series of policies to strengthen the national system of science, technology, and innovation (STI). The first and second versions of the Law on Science and Technology were enacted in 2000 and 2014, and two national strategies for S&T development were promulgated between the two law versions. At the national level, the budget for S&T is supposed to remain at 2% of total national expenditure. In 2016, the National Assembly approved a budget for S&T activities of VND17,730.6 billion (equivalent to USD844 million), or about 1.4% of the total state budget. Of the total S&T budget, the amount allocated to R&D projects of S&T programs at national, ministerial, and local levels was VND5,000 billion (USD238 million) [1].

From 2008 to 2018, Vietnam's GDP per capita increased by 5% annually. This contributed significantly to the improvement of the quality of life of the people. One cannot deny that the economic performance of Vietnam has been impressive so far, and the government has initiated new laws and allocated more budget to STI. Vietnam is still lacking in terms of innovation and productivity improvement, however.

CURRENT STATUS OF PRODUCTIVITY, INNOVATION, AND STRUCTURAL CHANGE

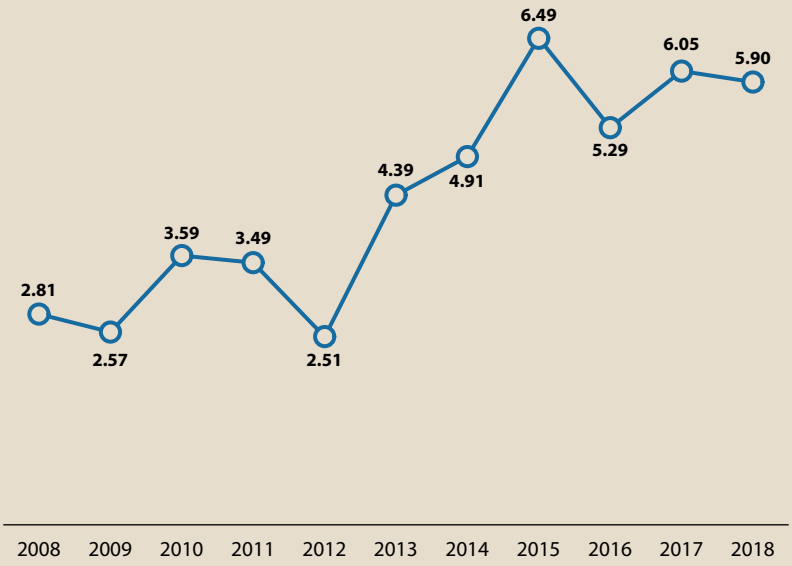
The current status of Vietnam's productivity and innovation efforts is summarized below.

Productivity

Vietnam has made significant improvement in labor productivity. From 2008 to 2018, its labor productivity increased three-fold (Figure 1).

FIGURE 1

LABOR PRODUCTIVITY GROWTH RATE, 2008–2018.

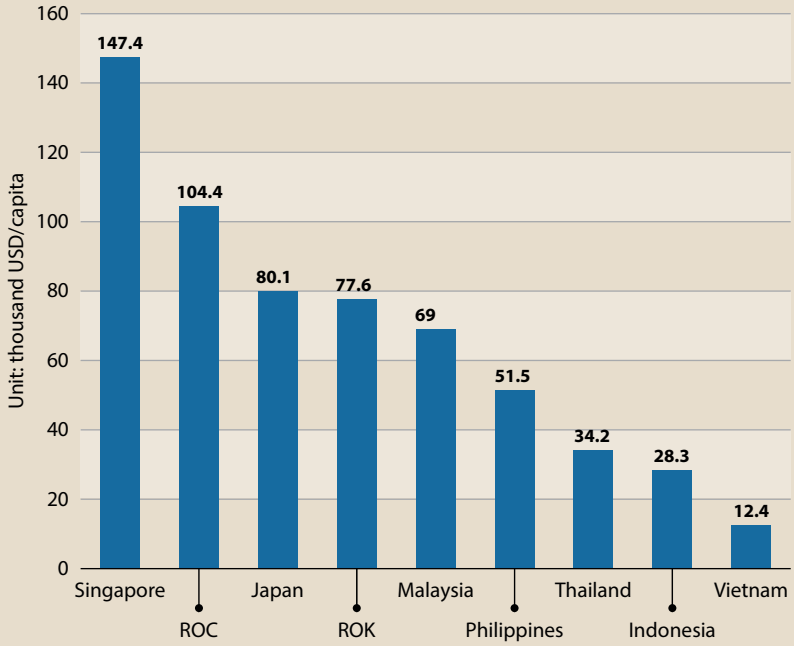


Source: VNPI calculation based on data from the General Statistics Office of Vietnam.

Although Vietnam's labor productivity is lower than in other ASEAN members (Figure 2), it has the highest labor productivity growth rate in ASEAN. As a result, the gap between Vietnam and the rest of ASEAN has decreased. For example, compared with Singapore, the best performer in ASEAN, the productivity gap between the two countries decreased from 21-fold in 1990 to 12-fold in 2018.

FIGURE 2

VIETNAM'S LABOR PRODUCTIVITY COMPARED WITH OTHER ASEAN MEMBERS AND ASIAN COUNTRIES, 2018.

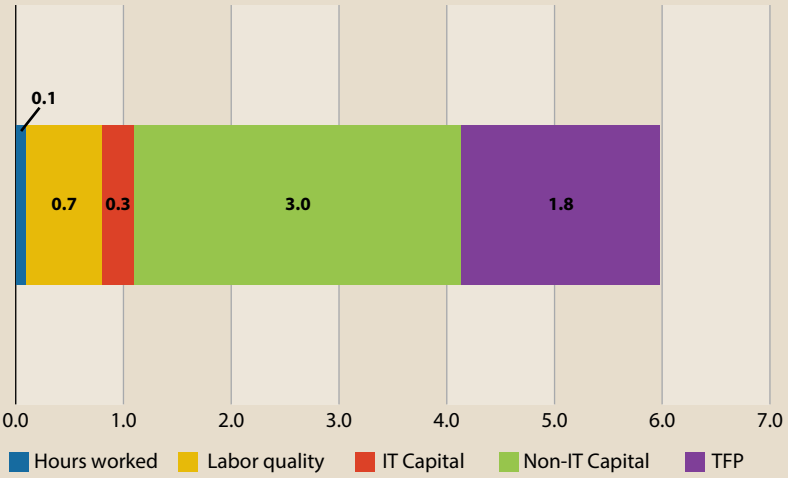


Source: *APO Databook 2019* [2].

Apart from labor productivity, total factor productivity (TFP) also increased rapidly, with growth rates of 1.1% in the period 2011–2015 and 1.6% in the period 2016–2017. The contribution of TFP to economic growth compared with other factors (like labor and capital) was also relatively high (Figure 3.) The high growth rate of TFP implies that S&T, labor skills, and management efficiency have clearly improved.

FIGURE 3

CONTRIBUTIONS TO ECONOMIC GROWTH: AVERAGE SHARES OF LABOR, CAPITAL, AND TFP, 2010–2017.



Source: *APO Databook 2019* [2].

Innovation

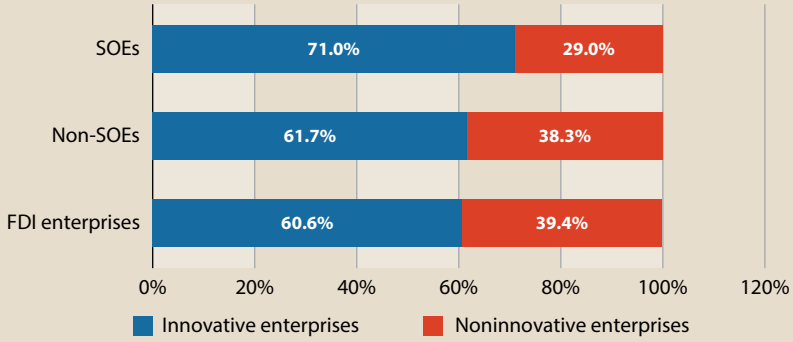
Although overall labor and TFP growth in Vietnam has been relatively high, innovation at the firm level is still not satisfactory. There is ample room for improvement, especially for SMEs.

The National Agency for Science and Technology Information, Ministry of Science and Technology (MOST), conducted a survey of innovation among enterprises in 2017. The respondents were 7,641 enterprises in the processing and manufacturing sectors, including 1,892 large enterprises (67.84% of total large enterprises), 820 medium-sized ones (90.01%), and 4,929 small ones (26.25%). Two hundred and twenty-one were state-owned enterprises (SOEs), 2,366 had foreign capital contributions (FDI enterprises), and 5,054 were not SOEs (non-SOEs).

The survey results showed that 61.6% of enterprises had conducted innovations during the 2014–2016 period, with 58.5% of small, 64.0% of medium-sized, and 68.8% of large enterprises being innovative. The larger the enterprise in terms of size of the workforce, the more innovative they were (Figure 4).

FIGURE 4

STRUCTURE OF INNOVATIVE AND NONINNOVATIVE ENTERPRISES BY FIRM SIZE.



Source: *2017 White Book of Science and Technology of Vietnam*, Ministry of Science and Technology, 2018 [1].

Comparing innovative and noninnovative enterprises, SOEs had the highest share of innovative enterprises (71.04%), followed by non-SOEs (61.69%) and FDI enterprises (60.61%). This signifies that SOEs perform relatively well, contrary to conventional wisdom.

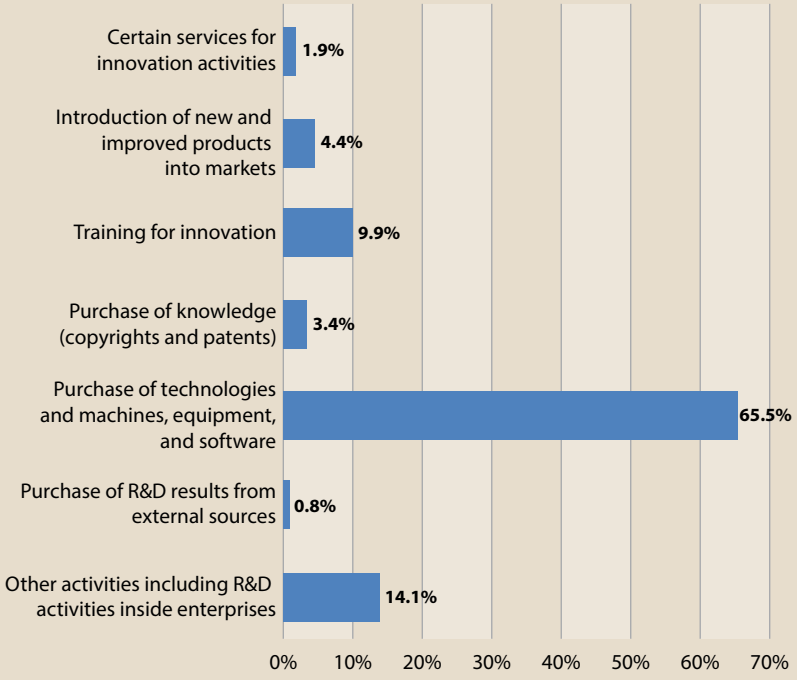
Among innovative firms, those undertaking process innovations held the top positions (39.9%), followed by those with organizational innovation, then product innovation, and finally marketing innovation (28.6%). In the group undertaking product innovation, only 31.1% of enterprises had introduced one new or considerably improved product to markets. Medium-sized and large enterprises did better in product innovation (38.2% and 37.6%, respectively) than small ones (29.0%). This is not surprising. Many firms in Vietnam are original equipment manufacturers (OEMs). They produce according to specific designs of transnational corporations. The majority of innovations are in production processes. In order to upgrade their position in global value chains, they need to undertake more product and marketing innovation (including developing their own brands and international distribution networks).

The survey also found that the sources of information most appreciated by enterprises were internal sources, customers, and competitors. Public research organizations and higher education facilities had the least important

roles, in the views of the surveyed enterprises, in providing support and information for innovation activities. Regarding expenditures on innovation (Figure 5), most expenditures were for the purchase of technologies, machines, equipment, and software (65.5%) and other activities including R&D inside enterprises (14.1%), purchase of R&D results from external sources (0.8%), training for innovation (9.9%), introduction of new and improved products to markets (4.4%), purchase of knowledge (copyrights and patents) (3.4%), and specific services for innovation activities (1.9%). This is also not surprising, as firms in Vietnam have to depend on external sources of knowledge, both in terms of hardware and software. This is an issue that has policy implications. Supporting firms in gaining access to external knowledge would be helpful for their innovation.

FIGURE 5

STRUCTURE OF EXPENDITURES FOR INNOVATION ACTIVITIES, 2016.



Source: *2017 White Book of Science and Technology of Vietnam*, Ministry of Science and Technology, 2018 [1].

Two-thirds of the total expenditures for innovation were mainly used for purchases of technological and accompanying machines and equipment or necessary technological upgrading/repair of existing machines and equipment. Only a small part of expenditures was used for R&D activities. This shows that, at the present stage, innovative enterprises do not focus investments on the development of their own intellectual assets as well as reserve efforts for R&D activities to develop new products and technological procedures to meet their own specific needs.

More than 80% of the total expenditures for R&D and technological innovation were made by large enterprises, while 70% of the total expenditures for R&D activities and 77% of the total for technological innovation were made by FDI enterprises. Non-SOEs made 27% of the total expenditures for R&D activities and 19% for technological innovation, while SOEs made only 3% of the total expenditures for R&D activities and 4% of the total for technological innovation. It is questionable why 71% of SOEs are innovative with such small contributions to the total expenditures on R&D and innovation.

The top three factors preventing surveyed enterprises from conducting innovation activities were: 1) "Too high costs of technological innovation activities" (enterprises have no ways to meet the costs); 2) "Lack of qualified expertise for participation and realization of innovation activities"; and 3) "Lack of really attractive support and stimulation measures from state policies and legal regulations."

Regarding the contribution of innovation to firms' revenues, innovation-based products made up 62% of the total enterprise turnover. The highest shares were in FDI enterprises (65.6%), followed by non-SOEs (59.1%) and SOEs (3.4%). In the total turnover coming from innovation-based products, large enterprises made 86%, medium-sized ones 5%, small ones 9%, FDI enterprises 64.2%, non-SOEs 32.4%, and SOEs 3.4%. This illustrates the limitations of Vietnamese-owned firms in translating innovation into revenue.

In terms of government support for innovation, 23.6% of small innovative enterprises, 27.7% of medium-sized innovative ones, and 28.7% of large innovative ones benefited from various forms of state support. Therefore, on average, only one in four innovative firms received government support. The main reasons why they rarely get state support for innovation activities are: 1) enterprises do not get information about the policies; 2) support offered does

not meet the needs of enterprises; 3) selection procedures for granting support are too complex; and 4) enterprises do not know how to access support sources.

The survey classified government support into different groups. The group with policies offering the most support was credit channels (financial support through loans) (received by 15.1% of innovative enterprises); the second-ranked group offered support for technological innovation (reduction of taxes, allocation of funds for S&T development, lower interest rates on loans) (received by 12.1% of innovative enterprises); the third-ranked group was through channels of technical consulting services by experts and scientists from public organizations, research institutes, and public universities (received by only 4.6% of innovative enterprises); and the lowest shares of support for innovative enterprises came from budgets for implementation of S&T tasks and programs (received by only 3.2% of innovative enterprises).

Economic Structure

The share of agriculture, forestry, and fisheries in Vietnam's GDP is the highest in ASEAN. On average, the ASEAN proportion of agriculture, forestry, and fishery in GDP is 11%, while in Vietnam it is 17%. Industry and construction contribute 37% to GDP, and services contribute 46% (Figure 6).

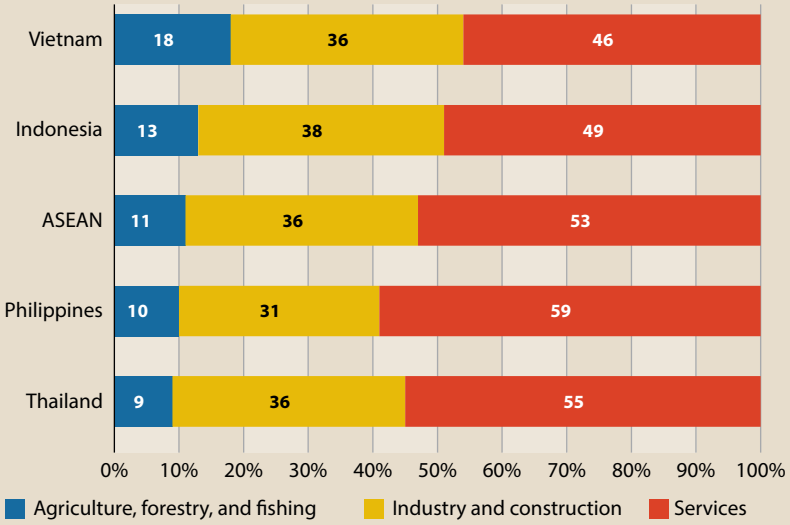
The proportion of labor in agriculture, forestry, and fisheries decreased from 52.1% in 2008 to 37.7% in 2018. Economic restructuring is considered a strong factor in increasing labor productivity. Accordingly, a country's labor productivity is motivated by a shift of workers from areas with low labor productivity (such as agriculture) to industries with higher labor productivity. Experience also shows that, when the economy is at a lower stage, economic restructuring has a greater role in increasing labor productivity.

The number of workers in agriculture, forestry, and fisheries in Vietnam is much lower than before, but there is still a high proportion in agriculture. In developed countries such as Japan and the Republic of Korea (ROK), the agriculture sector only accounts for 5–6% of the workforce. In developing countries such as Indonesia, the Philippines, and Thailand, this percentage is around 30%.

Vietnam's agriculture has always played a particularly important role in the economy, contributing to hunger eradication and poverty alleviation, ensuring

FIGURE 6

ECONOMIC STRUCTURE IN SELECTED ASEAN MEMBERS, 2018.



Source: *APO Productivity Databook 2019* [2].

food security, and contributing to sociopolitical stability. Agriculture is also an important factor in helping Vietnam become one of the world's major exporting countries.

Despite the advantages of agriculture, productivity in the sector is still low. Although agricultural output is high, its value is low. Besides exports, the large domestic market is also an opportunity for agricultural production, although this would require higher quality. Therefore, developing agriculture and fisheries to improve the quality and value-added content is a necessity in both domestic and export markets.

Contribution of Economic Restructuring to Increasing Labor Productivity

Increasing the contribution of construction and services to GDP, while reducing that of agriculture, forestry, and fisheries, is needed for economic restructuring. Currently, the share of agriculture, forestry, and fisheries in GDP is 17%. Labor

restructuring has an initial effect in the early stages of economic development, but as the economy grows, the role of intrasector productivity improvement is a prerequisite for sustainability.

The shift-share analysis (SSA) method divides the increase in labor productivity into three components: 1) the "within-effect" component, or productivity improvements within sectors that contribute to overall productivity growth; 2) the "static-shift effect," or the contribution of static economic restructuring to labor productivity growth; and 3) the "dynamic-shift effect," or the contribution of dynamic economic restructuring through the within-effect and static-shift effect.

In the 2005–2010 period, the within-effect component had a stronger impact on labor productivity growth (contributing 53.5%). But in the period 2010–2018, the increase in intrasector productivity had a dominant role, contributing up to 66.8% to increasing labor productivity. Table 1 summarizes the decomposition of the shift-share effect on labor productivity growth in Vietnam in both periods (2005–2010 and 2010–2018). The increased contribution of the within-effect component to overall labor productivity confirmed the premise of pursuing innovation as the driver of productivity across sectors in Vietnam, which will be elaborated on in the recommendations.

TABLE 1

SHIFT-SHARE DECOMPOSITION OF LABOR PRODUCTIVITY GROWTH IN VIETNAM.

Contribution to overall labor productivity growth	2005–2010 (%)	2010–2018 (%)
Within-effect component	46.7	66.8
Static-effect component	53.5	28.9
Dynamic-shift component	0	4.3

Source: Calculated by the Vietnam National Productivity Institute based on Government Statistic Office data [3].

GOVERNMENT POLICIES TO ENHANCE PRODUCTIVITY AND INNOVATION

To a certain extent, the government acknowledges the importance of enhancing productivity and innovation. There have been new initiatives to address this crucial issue in recent years, especially after 2015.

New Laws and Changes in Bureaucracy to Lead the Productivity Movement

In 2017, the government issued the Action Program for Policy Innovation, Growth Model, Improving Labor Quality, and Competitiveness. It assigned 16 major tasks and 120 specific tasks to ministries, sectors, and localities. The Ministry of Planning and Investment (MPI) became the lead agency to facilitate the Action Program and report progress to the government and party organizations. It had the responsibility of monitoring relevant indicators including labor productivity, TFP, and contribution of within-industry productivity. This task was previously under MOST. MOST, in turn, was given the task of building and operating a database for enterprises to benchmark against best productivity practices. However, the actual implementation of the policy was problematic, as collaboration among implementing ministries was difficult. The National Productivity Council was formed in 2019 [4], but it is too early to evaluate whether this supraministerial body can mitigate cross-ministerial coordination problems and lead the productivity movement in the country.

Consolidation of STI Policies and Organizations

In 2015, MOST made an important decision to consolidate the government's STI activities for the period 2016–2020. Main policy focuses in this period were: 1) reformation of STI organizations, managerial mechanisms, and activities; 2) concentration of resources for core STI development; 3) enhancement of national STI capability; 4) development of STI markets, ST

enterprises, and ST services; and 5) promotion of STI international integration. The following specific quantitative targets were set:

- High Global Innovation Index ranking within ASEAN;
- Transformation of 100% public STI organizations into autonomous entities;
- Development of ST management agencies at all levels in which 100% of STI managerial personnel were trained and standardized;
- At least 200 enterprises funded by the National Technological Innovation Program with a maximum of 30% matching grants to develop innovative technologies and products;
- Annual 10% increase in state-funded research with commercialized results;
- Creating at least five Vietnamese brands for national products;
- Development and issuance of 2,000 Vietnamese standards, of which 60% were to meet international (and regional) standards; and
- 100% of research results were to be recorded and saved in national STI information repository systems.

The following new organizations and tasks were set up:

- Vietnam Institute of Science Technology and Innovation (VISTI) to conduct STI policy research and foresight, advise the government, offer Master's and PhD programs in STI policy, and conduct training in STI policy and management;
- Vietnam–Korea Institute of Science and Technology (VKIST) to conduct applied near-market research;
- S&T funds (or budgets) in ministries, sectors, and localities, and if possible in most SOEs;

- Government-owned venture capital firms;
- Monitoring and evaluation of imported technologies and equipment;
- S&T intermediary entities, especially in Hanoi, Danang, and Ho Chi Minh City;
- Hanoi IT Park in 2016, Danang IT Park in 2017, and Dongnai Biology Park in 2018;
- Network of Centers for Intellectual Property and Technology Transfer in universities, research institutes, and enterprises in 2016; and
- Hoalac Hi-tech Park Incubator, HCMC Hi-tech Park incubator, Business Startup Support Center (for youth), Hanoi IT incubator, and Vietnam Silicon Valley Accelerator [5].

At the same time, private firms have pushed for technology upgrading and innovation. Large local firms have established R&D institutes, such as the Vin High-tech Institute of the Vin Group, FPT Research Institute, and Hau Giang Fishery Institute [6]. To promote startups, private accelerators were set up by foreign firms and large local firms, such as the CLAS–Expara Vietnam Accelerator by Microsoft Vietnam and Startup Accelerator Fund (VIISA) supported by the FPT, Dragon Capital Group, Korean Kanwha, and BIDV Stock JSC.

Industry 4.0 Is Still in Its Infancy

The Prime Minister's Directive on Capacity Building for Industry 4.0 was signed in May 2017. In the same month, the prime minister also signed a Decision on the Digital Vietnamese Knowledge System. The most relevant ministries in the Industry 4.0 promotion policy strand are the Ministry of Information and Communication, MOST, and Ministry of Industry and Trade (MOIT). These three ministries had implemented several studies and conferences on Industry 4.0 issues before the prime minister signed the Directive on Industry 4.0 in 2017. In the same year, MOST advocated the concept and practices of Industry 4.0 through the media and in society by providing standardized documents [1]. In April 2019, MOST also inaugurated the IoT Innovation Hub in Hoalac Hi-Tech Park for Industry 4.0.

Linking STI Policies with the Sustainable Development Goals

The UN Sustainable Development Goals (SDGs) are frequently mentioned on the websites of government agencies. However, for decades, the government has taken practical steps to promote hard and soft measures for global environmental protection and, more recently, for the development of smart communities. Programs and projects involving environmental protection are mainly implemented under the management of the Ministry of Natural Resources and Environment, while those involving mitigation of greenhouse gas emissions are mainly managed by the Ministry of Agriculture and Rural Development, Ministry of Natural Resources and Environment, and MOIT. Environmental protection, disaster prevention, and responses to climate change are important research agenda items.

Promotion of Smart Cities Not Yet Synchronized

Smart city projects are the responsibility of local governments. Smart cities have the potential to be driving forces for socioeconomic development across the country. Vietnam has over 830 urban areas with an urbanization rate of 38.6%. Economic growth in urban areas averages 12–15%, or 1.5–2-fold higher than the national average. About 30 cities and provinces nationwide have implemented smart urban construction projects. However, the current development of smart cities is still inadequate. Some localities have started deploying basic applications and services for smart cities. Hanoi, for example, has achieved initial results from the construction of information infrastructure, applying corporate information, management of government agencies, and residential data. Ministries and agencies continue to research and complete building guidelines, mechanisms, and policies for smart cities [7].

CONCLUSION AND POLICY RECOMMENDATIONS

Overall, Vietnam's labor productivity and TFP have increased significantly, especially compared with other countries in ASEAN. Concerning innovation, which is very closely linked to increased TFP, the Innovation Survey conducted by MOST found that more than 50% of Vietnamese firms had undertaken innovation. However, product and marketing innovation, which is necessary for upgrading firms' positions in global value chains, is still relatively uncommon. There are critical policy issues to be addressed to improve productivity and innovation in Vietnam. The following are policy recommendations to achieve this.

Recommendation 1: Synchronize Policies on Productivity and Innovation

Although the government recognizes the importance of both productivity and innovation, the policy concept, content, and implementation of these two issues are still separated. The agencies and policies on productivity improvement tend to focus on improving labor productivity, for example, through programs to develop the skills and expertise of workers, upgrade production capability (such as through kaizen), and implement industrial and technical standards in factories (such as those of the ISO). They mention the significance of innovation, but only as a buzzword. The issues of enhancing the technological capabilities of firms beyond production capability and quality control through advanced engineering, product and process design, and R&D are not specifically stipulated and worked out in detail in mainstream productivity improvement plans and strategies.

On the other hand, mainstream STI policies and responsible agencies emphasize major investment in R&D infrastructure, education of scientists and researchers, and new internationally fashionable issues like smart cities and the SDGs. They do not adequately focus on productivity improvement on the shopfloors

of factories, especially in SMEs that represent the majority of enterprises in Vietnam. Therefore policymakers and implementers of policy should work together wholeheartedly to synchronize their policies, strategies, and actions.

Strategizing and implementing Industry 4.0 is one way to bring the two sides together. The idea has been recognized, but detailed strategies should be conceived and implementing mechanisms should be designed (this is linked to recommendations 2–5). For example, in the ROK, from 2017 the public and private sectors set the goal of having more than 30,000 such factories operating with the latest digital and analytical technologies by 2025. The government provides support to help train 40,000 skilled workers to operate fully automated manufacturing sites through various educational programs. The government also offers incentives to companies focused on developing technology related to smart factories, including big data, cyberphysical systems, smart sensors, and collaborative robots by injecting USD189.3 million into their R&D projects as of 2020.

Recommendation 2: Improve Cross-departmental/ Ministerial Coordination

It is a good idea to have the National Productivity Council in place as a supraministerial body. Nevertheless, to effectively implement policies, cross-departmental/ministerial coordination is very important. Ministries and agencies should be able to coordinate among themselves without going through the council. In particular, coordination mechanisms between the MOST, the MOIT, and MPI should be strengthened through projects jointly developed and implemented by different agencies. Cross-departmental/ministerial personnel rotation and regular discussion forums should be initiated and carried out regularly. In Japan, for example, government officials are rotated among departments every two to three years. This helps to enhance their management ability and effectiveness in policymaking and implementation processes that require collaboration across departments.

Recommendation 3: Create a Critical Mass of Innovative Firms in Addition to High-tech Startups

Vietnam's recent policies emphasize creating high-tech startups through facilities like high-tech parks, incubators, and accelerators. However, to upgrade the national position in global value chains, it is imperative to have a

critical mass of innovative companies. Such companies do not necessarily have to be new startups in high-tech industries like IT, biotechnology, and nanotechnology. Traditional SOEs and SMEs need to be upgraded to become more innovative. Programs, budgets, and implementation efforts should be directed at enhancing technological capabilities, especially in long-established enterprises in traditional resource-based and labor-intensive industries like coffee products, seafood, and textiles and garments, which are major exports of Vietnam. In Thailand, for instance, the government is trying to promote startups in food, service, and culture-related industries, not only high-tech ones.

Recommendation 4: Make More Effort to Develop Policy Instruments and Implementation Mechanisms

As in many developing countries, the Vietnamese government has spent a lot of time and resources on drafting new laws and policy planning. Strategies to link policies to implementation, new policy instruments, and implementation mechanisms are still lacking, however. According to the Innovation Survey, a lack of government support is one of the three most important factors obstructing firm innovation. Most current policy instruments are related to S&T infrastructure, regulations, training in operating skills, and industrial standards. Policy instruments like financial incentives in terms of matching grants for developing advanced engineering, product design, product/process/marketing innovations, and R&D like those in the Republic of China (ROC), ROK, and Singapore are needed. Although the National Technological Innovation Programme was established to provide matching grants at a maximum of 30% to SMEs, the number of recipients is small and its implementation is rather slow and cumbersome. Autonomous, flexible funding agencies like the New Energy and Industrial Technology Development Organization (NEDO) and Japan Science and Technology Agency (JSTA) in Japan, and Agency for Science, Technology and Research (ASTAR) in Singapore should be set up. These agencies are outside the government bureaucracy, allowing them to be more flexible and faster in initiating new grant schemes and free from the rigid bureaucratic procedures of government ministries.

Capacity building of implementing government agencies should be given high priority as well. These agencies are not only at national level. Local-level agencies are important in implementing policies in Vietnam. More significant

budgets should be given to these agencies to enhance the skills of their personnel, employ more staff with updated technical backgrounds, improve performance incentives, and restructure outdated organizational work processes.

Recommendation 5: Leverage FDI Enterprises More Effectively

Vietnam has attracted massive FDI. The Innovation Survey confirmed that most of total expenditures on R&D and innovation are from FDI enterprises (transnational corporations). Samsung, for example, has already set up three R&D centers in Vietnam. However, in general, knowledge and technological transfer and unintended spillover impacts from these foreign enterprises to SOEs and local SMEs are rather limited.

Policies targeting more technology transfer and spillover impacts should be emphasized. In effect, investment promotion policies should not only focus on attracting new investment and generating employment but also on upgrading the activities of transnational corporations in Vietnam beyond simple assembly. This would allow local firms, both SOEs and private SMEs, to benefit more from FDI in terms of productivity improvement and knowledge transfer. It is necessary to develop better links between investment promotion policy and productivity improvement and innovation policy. A government measure like the Local Industrial Upgrading Programme (LIUP) in Singapore to pay for differences in the salaries of engineers and technicians of transnational corporations who would work for two years in local SMEs in order to develop the critical skills and knowledge necessary for upgrading technological and innovation capabilities should be seriously considered.

At the same time, programs to enhance the absorptive capacities of local firms such as upgrading their abilities to select, utilize, and upgrade external knowledge should be implemented through various policy mechanisms like technology-specific and government-subsidized training courses and consultancy services (by international and local experts in the industry, not only university professors).

Recommendation 6: Improve the University System

It is recommended that the Government of Vietnam invest more in improving the university system, especially the top engineering schools. Vietnam should

also look into establishing more technical colleges (called *kosen* in Japan) to provide human resources in order to grow its manufacturing sector.

Recommendation 7: Promote Innovation in Agriculture and Fisheries

There should be a policy to support innovation in the agriculture and fisheries sector, since it is still a significant part of Vietnam's economy. Technology extension centers in rural areas and fishing port towns can play an important role in improving productivity in agriculture and fisheries (aquaculture, etc.). These centers can be the initial sites for the introduction of ITC and data-driven management practices as well as network hubs for local innovation.

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