

How can government increase R&D activities in the Philippines?

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Research and development or R&D refers to the efforts of an establishment or firm to improve existing products and processes in order to increase productivity or, in some cases, develop new products. Innovation is at the heart of R&D. It is an important resource for sustained economic growth. New knowledge created by a firm has spillover effects that improve the productivity of other firms and even other sectors.

A country can supplement its R&D efforts by enticing R&D firms to locate in the country or encourage local firms and multinational corporations (MNCs) operating in the country to conduct R&D activities. According to the Presidential Coordinating Council on Research and Development (PCCRD), the Philippines' R&D standing is below the average performance for developing countries as

determined by the United Nations Educational, Scientific and Cultural Organization (UNESCO). The average spending for R&D should be equal to 1 percent of the country's gross domestic product (GDP) and the average number of scientists and engineers per million of the population should total 380. Currently, the Philippines is spending an average of 0.12 percent of GDP for R&D and has a total average of only 125 engineers for every million.

In response, former President Arroyo directed the PCCRD to conduct a study that would explore the possibility of "maximizing the country's potential as an attractive R&D location for R&D centers, units, and

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organizations.” In response to this, the Philippine Institute for Development Studies (PIDS) collaborated with the Department of Science and Technology (DOST) in the last quarter of 2009 to undertake a study focusing on the identification of factors that drive MNCs and technology-based companies to locate in the Philippines and invest in innovative activities.

The study’s objectives were to: (a) examine the trends in R&D activities by firms located in the Philippines; (b) determine the factors that attracted these firms to locate their R&D activities in the country; (c) identify the barriers that hinder the conduct of innovative activities in the Philippines; and (d) provide policy recommendations that would strengthen the factors that attract R&D investments and suggest measures that would minimize the obstacles to innovation.

This *Policy Notes* highlights the importance of R&D, summarizes the key findings of the abovementioned study, and explores the R&D policy practices that developing countries can use to attract investments in R&D. The *Notes* can be a useful tool to understand the determinants of R&D and thus help government provide more effective policies on R&D.

Why is R&D important? Some theoretical pinnings

The traditional view of economic growth emphasized the role of capital accumulation. Countries need to save and invest sufficiently

in order to augment their total physical capital stock. A higher level of investment boosts the attainable level of income by increasing the productivity of each worker who has more physical capital with which to work. However, this traditional view—which was embedded in the neoclassical framework—postulated an optimal level of capital stock, beyond which output would begin to decline. This was explained by diminishing marginal returns wherein more inputs to production would lead to greater output but at a slower rate. Ultimately, inefficiencies will dominate and increasing inputs would eventually lead to lower output.

Endogenous growth models, on the other hand, do not assume nor find physical capital accumulation to be the dominant factor in spurring economic growth or in explaining differences in income levels among nations. In endogenous growth models, a higher level of investment not only increases per capita income but also sustains high and even rising rates of income growth in the future. One reason is the consideration of the rate of accumulation as well as the initial stock of human capital. Another key input is “research” capital, that is, R&D and the creation of knowledge. R&D is treated as a purposeful economic activity, pursued in the real world by profit-driven firms and individuals operating within a specific institutional context. The development of new technology and new products is an internally driven process that is endogenous to every economy. It is this purposeful pursuit of profit

within a particular institutional context that helps to explain how economic growth occurs over the long run and why there are differences in income levels and growth rates among economies.

The key to the endogenous growth theory is the elimination of diminishing marginal returns. This is explained by the existence of positive externalities to human capital accumulation, research capital, and some physical capital accumulation to the extent that investment embodies the latest knowledge. Diminishing marginal returns are avoided through the society-wide spillover effects. When the social benefits from, for example, human capital exceed the private benefits, there are positive secondary and tertiary effects from any increase in a country's average education level or enrolment ratios that filter through the whole economy. More educated and, presumably, more productive workers not only produce more in their own tasks but also interact synergistically with their workmates so that the productivity of other workers also rises even if their level of education remains unchanged.

Key findings from the surveys¹

A survey of 15 firms operating in the Philippines was conducted to determine which factors are deemed important and which areas find the Philippines to be inadequate. The surveyed firms were limited to those located in Greater Manila Area, which encompasses the National Capital Region and CALABARZON.² The respondents of the study were divided into four groups: (a) the first group consists of local

firms conducting R&D in the country; (b) the second group includes affiliates of MNCs; (c) the third are firms focusing solely on R&D; and (d) the fourth group refers to companies which can conduct R&D but opted not to. In addition, two rider questions were also included in a survey of 203 firms which was conducted in collaboration with a PIDS joint study with the Economic Research Institute for ASEAN and East Asia (ERIA). It should be emphasized that the common questions in both surveys yielded consistent results.

The key findings of these two surveys are summarized below.

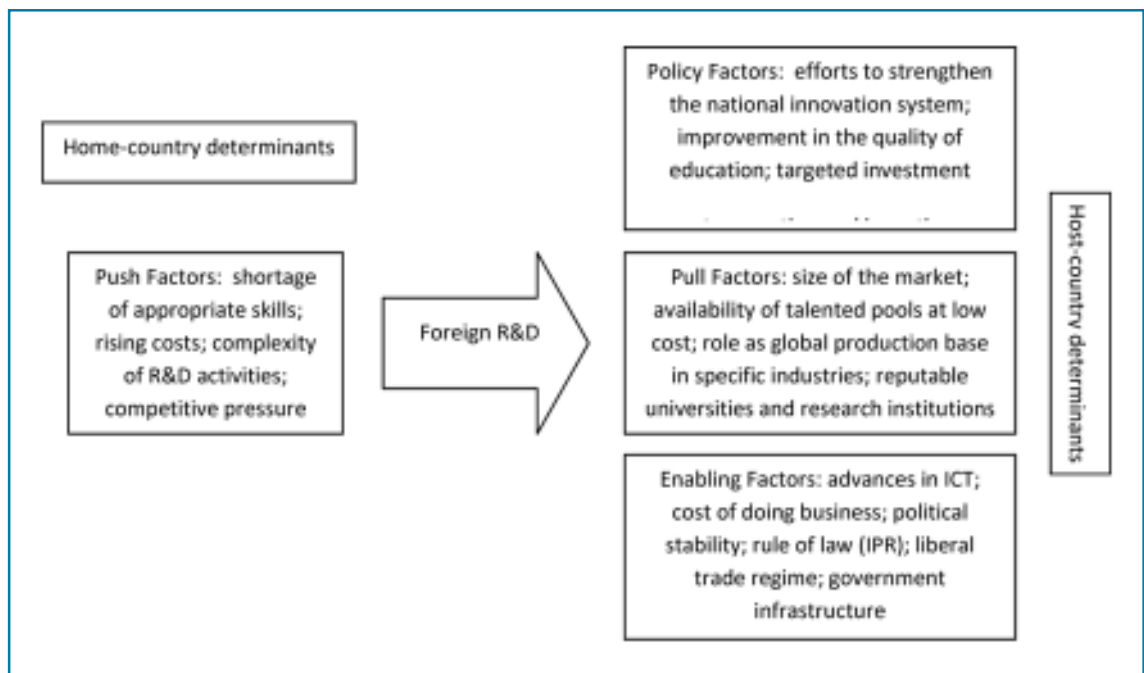
Factors that influence firms to establish R&D operations in the Philippines. The possible factors that influence the R&D operations of the surveyed firms are grouped into four. These are the push factors, pull factors, policy factors, and the enabling factors as shown in Figure 1.

- About half of the 15 respondents said that competitive pressure is very important for them to continue with their R&D activities. Almost all the factors mentioned in the push factors—namely, the shortage of appropriate skills in own country; rising costs of R&D in own country; and complexity of R&D—were considered to be very important.

¹ For the complete results of the survey, please see K. Gonzales, M. Macasaquit, and J. Yap, Determinants of locating R&D activity in the Philippines: policy implications, PIDS Discussion Paper No. 2010-07 (Makati City: Philippine Institute for Development Studies, 2010).

² Cavite, Laguna, Batangas, Rizal, and Quezon.

Figure 1. Factors affecting location of R&D activities



- When asked what factors drew them to their present location, the size of market in the country and the availability of reputable universities and research institutions were thought to be somewhat important factors.
- Six respondents stressed that it is very important for intellectual property rights (IPR) to be protected while 8 respondents said that it is somewhat important that there should be incentives for R&D activities.
- Presence of science/technology parks, advances in ICT, and availability of R&D support services were considered to be very important by 6 respondents, each followed by local firms forming strategic R&D alliances with MNCs with 5 respondents. Surprisingly, political stability was thought not to be a very important factor by 3 respondents.

Philippines as a location for R&D activity. The respondents were asked to rate the Philippines as a location of R&D activities. Most of them rated the Philippines as good in the following aspects: communication links, presence of other companies from the same country, and availability of low-cost and skilled labor, and professionals. However, respondents rated 'availability of government grants/loans and availability of other government support/advice' poorly. This confirms the fact that the government lacks support efforts or the institutional structure that will enhance the technological capabilities of both local and multinational companies. Overall, 5 respondents rated the Philippines as fair and good as a location for R&D activity.

Obstacles and incentives. The following are the more serious obstacles according to the respondents:

- High tariffs on equipment and materials necessary for innovation
- High price of R&D support services
- No tax break or accelerated depreciation system
- Protection of IPR not sufficient
- Technical skills of engineers, researchers, and other appropriate manpower are weak.

Meanwhile for the incentives, the respondents were able to avail of advisory services, assistance in networking with other organizations, and training courses, an example of which is the Technical Education and Skills Development Authority (TESDA) training facility.

Factors that influence firms to establish R&D operations in the Philippines (response from supplemental survey). The results for the first rider question were similar to the aforementioned results for the 15 firms. That is, the need to respond to competitive pressure is considered as a very important push factor. Two pull factors remain prominent: availability of talented skills at low cost and the size of the market in the Philippines. The same is true for policy factors where good quality of education and protection of intellectual property rights continue to rank highly. Surprisingly, respondents ranked “strong national innovation system” highly, too. Meanwhile, low cost of doing business dislodged advances in ICT as one of the more important enabling factors. However, the latter is still considered as very

important by many of the respondents. The legal system and presence of good communication and physical infrastructure remain as important enabling factors.

Factors that discouraged the firms to conduct R&D operations in the Philippines (response from supplemental survey). For the results of the second rider question, two aspects are prominent in terms of the obstacles to setting up R&D activity in the Philippines, namely: (a) high cost of R&D equipment and technology; and (b) lack of technical manpower/engineers. The responses are consistent with the survey of the 15 firms shown above.

R&D policy practices

R&D policies vary significantly among countries and governments. These policies are important to encourage firms especially in developing countries to invest in R&D. R&D policies can include policies to grant R&D projects and R&D tax incentives, education and employment policies with impacts to increase R&D, and other policies that involve innovation and IPR-related policies. The study of Manil (2005) explains that the role of R&D policies is particularly important for developing countries because most firms in these countries rely primarily on the acquisition and adaptation of foreign technologies.³ In order to have foreign

³ Manil, Sunil, How governments can boost business R&D, *Science and Development Network Online*, <http://www.scidev.net/en/south-east-asia/policy-briefs/how-governments-can-boost-business-r-d.html>, 01 September 2005 (accessed 01 June 2010).

Table 1. R&D policy practices in Austria, Finland, Ireland, Netherlands, and the USA

Country	Policy Practices
Austria	<p>Kplus Centres are established to face the challenge of improving the effectiveness and efficiency of Austria's innovation system. Austria Kplus Centres are generally founded through formal partnerships between universities and enterprises which focus on the creation of a new culture of collaboration and are based on the principle of nondiscrimination. To support interdisciplinary and complementary cooperation in specific scientific fields, foreign-owned firms are encouraged to participate. Today, there are 18 active Kplus Centres that carry out R&D on an internationally competitive basis in networks with about 270 partners from industry and 150 from science and technology.</p>
Finland	<p>Tekes' technology programs provide opportunities to participate in networking and to gain from spillovers from other R&D projects. Over half of Tekes' R&D funding for large enterprises are now directed through technology programs with a strategy for the internationalization of R&D based on four elements: selective project funding, national technology programs, promotion of innovative activity, and development of innovation environments. Tekes' technology programs are in principle targeted or mission-oriented and are open to participation by foreign companies in four ways:</p> <ul style="list-style-type: none"> ● <i>Joint projects</i> based on a common objective, shared resources, and tasks. Each party covers its own costs and uses the results as agreed among the participants; ● <i>Subcontracting</i> gives participants the possibility to purchase services from a foreign entity to complement the project, provided no domestic source is available; ● <i>Technology transfer</i> enables project participants to purchase licensed or existing technology from a foreign entity to complement R&D project work; ● <i>Collaboration</i> for marketing and distribution of the project results allow project participants to collaborate with foreign enterprises to bring products to the market.
Ireland	<p>In order to attract new investments, Ireland has, since the end of the 1990s, used a very bold and expensive set of instruments, thereby upgrading the physical infrastructure of the universities and making massive investments in strategic R&D in biotechnology and ICT. The Science Foundation Ireland (SFI), an agency of the industry ministry, offers very large grants to foreign-based researchers willing to move to Ireland and establish research groups, followed by smaller grants open to nationals as well as to those from abroad. Other incentives include inward mobility schemes for individual researchers and those with key skills, and reduced fees for non-EU postgraduate students. Furthermore, there is an innovation support program aimed especially at strengthening the capabilities of Irish plants, and corporation taxes are still low.</p>
Netherlands	<p>Since the Netherlands is the home base of a number of significant multinational enterprises (MNEs), there have for some time been concerns that corporate R&D might migrate out of the country. Accordingly, a major policy challenge is to improve the climate for innovation and therefore enhance international networking. One approach that helps to make the Dutch economy more dynamic is the establishment of the twinning centers, a sophisticated cluster approach that combines a local competence center and an incubator model with strategic networking with global lead markets. For this purpose, networks of local companies have been activated, and leading foreign companies and universities are integrated into these networks. Public incentives encourage an increase in new companies, especially in the ICT sector, through funding, coaching, and networking.</p>
USA	<p>There are four key steps which US policymakers consider in making their R&D the most vibrant and attractive in the world:</p> <p><i>Expand the R&D tax credit.</i> Perhaps the most straightforward and effective way</p> <p><i>Create a National Innovation Foundation.</i></p> <p><i>Ensure an adequate supply of skilled researchers.</i> While costs are a key driver in offshoring to developing nations, ensuring an adequate supply of talent is an important factor in helping ensure that companies conduct more R&D in the United States.</p> <p><i>More vigorously combat other nations' efforts to force US companies to move R&D offshore.</i> Some nations tie access to their markets to company investments in R&D in their nation. US government ensures that other governments do not pressure its firms to move R&D offshore.</p>

Tekes - Finnish Funding Agency for Technology and Innovation

Source: Organisation for Economic Co-operation and Development, Science, Technology and Industry Outlook (Paris: OECD, 2006) and US Committee on Science and Technology Report.

technologies adapted to local conditions, firms in developing countries need to undertake some R&D activity. This means that governments must provide effective R&D policies and incentives to promote R&D. Table 1 shows the current R&D policy practices in selected developed countries that can be applied in developing countries.

Policy recommendations and concluding remarks

The survey results showed that a significant number of respondents were aware of the importance of having R&D and identified the need to develop R&D activities. In general, the firms are willing to develop R&D provided there are adequate resources and government support. Policies like government's strengthening of intellectual property (IP) protections can stimulate R&D, innovation, and ultimately, productivity growth. IP rights encourage R&D by making it easier for firms to reap the rewards of their work.

Policies can look into the host country factors that do not rate highly and also address the areas that are evaluated poorly. An example of the former is strategic alliances between local firms and MNCs. Policymakers should also be aware of the source of outward R&D spending which are mainly firms from the US and Japan. Most R&D by these firms are conducted in the ICT, automotive, and pharmaceutical industries.

At present, the Philippines does not have specific policy measures targeting the

In the future, the government should focus more on the development of policy instruments that can offer a better support for R&D activities like how to incorporate local and indigenous materials to develop and improve new products.

promotion of R&D from abroad. There is need to do in-depth analysis of how to promote R&D collaboration among players in the national innovation system. However, the importance of R&D has been progressively taken into account by creating different policy measures and programs to address R&D activities (Table 2).

In the future, the government should focus more on the development of policy instruments that can offer a better support for R&D activities like how to incorporate local and indigenous materials to develop and improve new products. Parallel to this, other policies that the government can provide are: (a) increase its spending on R&D which will motivate firms to boost their investment in R&D; (b) strengthen its cooperation with different research organizations; and (c) begin to look at R&D as a profitable investment.


Finally, the government can also initiate and support joint R&D efforts among firms in a specific sector given that there will be significant spillover effects in this type of endeavor. 

Table 2. Summary of the existing policies and programs related to the factors that influence a company/firm to locate its R&D in the Philippines

Possible Factors Influencing the Decision of the Company to Locate R&D in the Philippines	Existing Policies/Programs
<i>Push factors</i>	
1. Need to remain competitive	National Competitiveness Council (NCC) was created to address this
<i>Pull factors</i>	
2. Availability of talented skills at low cost	DOST's HRD Program/Scholarships in S&T; TESDA manpower training in specific skills
3. Size of market in RP	NCC/DTI policies/programs
4. Role of global production base in the industry	NCC/DTI
<i>Policy factors</i>	
5. Good quality education	S&T scholarship programs in the undergraduate and graduate courses in science and engineering
6. Incentives for R&D	R&D incentives provided under Investment Priorities Plan (IPP) [*]
7. Protection of intellectual property rights	Addressed by the Intellectual Property Office (IPO)
8. Strong national innovation system	DOST Filipinnovation Network initiatives
<i>Enabling factors</i>	
9. Low cost of doing business	NCC/DTI policies/programs
10. Good physical and communication infrastructure	Continuing physical and communication infrastructure development of the government; technology parks, PEZA, etc.
11. Availability of R&D support services	RDIs from government and universities can be tapped for support services
12. Advances in ICT	ICT policies/programs
13. Presence of science/technology parks	DTI/PEZA policies/programs
14. Legal system	DTI/DOJ policies/programs
<i>Discouraging R&D activity factors</i>	
15. High cost of R&D equipment and materials	Tax exemptions for importation of R&D equipment available under IPP; Philippine Coordinating Council for Research and Development (PCCTD) instructed DOST to study how to fast track importation of R&D raw materials and equipment
16. Lack of technical manpower/engineers	Continuing S&T HRD programs in engineering and S&T courses by DOST-SEI and Councils; ERDT Program of UP
17. Lack of technical/R&D cooperation with local government, local business organizations and local universities & RDIs	DOST R&D Contract Program; Need to review policies to promote R&D collaboration
18. Weak national innovation system	Filipinnovation advocates strengthening national innovation system through four strategies
<i>Others</i>	
19. No cooperation among individual firms in R&D	Need to review policies/programs to promote R&D collaboration
20. Lack of strategic R&D alliances between local firms and R&D	-do-

^{*} Detailed 2010 IPP can be found in the Board of Investment website.

Source: Department of Science and Technology

NCC/DTI - National Competitiveness Council/

Department of Trade and Industry

PEZA - Philippine Economic Zone Authority

ICT - Information and Communications Technology

DOJ - Department of Justice

DOST-SEI - Department of Science and Technology-

Science Education Institute

ERDT - Engineering Research and Development for Technology

RDIs - Research and Development Institutes

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