

A Practitioner's Guide to Innovation Policy



Instruments to Build Firm Capabilities and Accelerate Technological Catch-Up in Developing Countries

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INNOVATION POLICY plays a central role in the growth strategies of developing and developed countries by removing barriers to business innovation and facilitating the adoption of technologies. However, innovation policies in developing countries tend to be fragmented, often mimicking conditions and designs of policies in most advanced economies, which are likely to be inadequate for domestic innovation capabilities. Thus, improving the effectiveness of these policies is critical, especially in the current context of rapid technological change and digitalization.

However, improving such policies is not an easy task. Policy makers face a shortage of information and lack of clarity about what works and what doesn't and what innovation instruments are most effective at different stages of development. This policy guide aims at filling this information gap and supporting policy makers in developing countries in their quest to design more effective policies to foster innovation.

From invention to upgrading: A broader definition of innovation is needed to enhance the impact of innovation policy

Innovation has traditionally been associated with science and research and development (R&D). This view has biased the formulation of innovation policies and institutions in many countries by focusing on a “linear” or “supply side” approach, whereby research is seen as generating R&D and inventions and then is transformed into innovations introduced by firms in markets. This view of innovation, which has been very influential in defining innovation policies, prioritizes policies that aim to create new knowledge and more radical, disruptive, and novel innovations, at the expense of efforts to adopt existing knowledge and technologies, and more generally, create and build basic innovation capabilities. While more novel or radical innovations are, of course, important, the “linear” view misses the fact that incremental innovation and upgrading are more characteristic of innovation systems in developing countries. Crucially, most firms in developing countries can obtain substantial improvements in productivity by adopting knowledge and technologies that have already been generated. Thus, a broader view of innovation that includes incremental innovation and upgrading is needed to improve innovation policies.

Related to this more inclusive view of innovation, innovation policy involves the design and delivery of an array of policy instruments through which governments attempt to overcome market and systemic failures that prevent broadly desired innovation outcomes from being attained. Thus, innovation policy encompasses a combination of instruments that interact and complement one another—the so-called *policy mix*—to encourage various types of innovation. This guide focuses on the group of instruments that target innovation in businesses, and that take the firm as the target group. These innovation instruments are typically designed to influence the behavior of firms and induce them to invest in innovation activities broadly defined, with the medium-term goal of increasing sales, employment, and productivity.

The innovation imperative in developing countries

Innovation is widely recognized as a central factor in driving economic growth. Innovation drives the Schumpeterian creative destruction process and can facilitate economic convergence for the countries farther from the frontier (Schumpeter 1942). Innovation is the critical ingredient in historical accounts of how countries achieve economic

growth and prosperity. A growing body of evidence has shown that increased innovation activity has a measurable and positive impact on firms' productivity (Mohnen and Hall 2013). This is becoming ever more important with the rapid development of new technologies. Countries and regions with vibrant innovation *ecosystems* tend to experience higher productivity rates, increased economic growth, and more robust job creation.

Innovation is becoming more important in a world that is undergoing significant and rapid technological change that is reshaping how and where goods and services are produced. Some refer to this transformation as either the Fourth Industrial Revolution or Industry 4.0, where production is characterized by the integration of cyber-physical systems such as robotics, 3D printing, artificial intelligence, and machine learning. While production processes are still transitioning to this new technological regime, a significant increase in digitalization of business and production functions is already occurring, given rise to new business models and economic activities. Some commentators see this new paradigm as an opportunity for firms in developing countries to “leapfrog” stages of development and join the leaders at the technological frontier. But there is a more plausible possibility that the technological gap and the income divide between developing and developed countries will widen. The scant evidence available documenting the adoption of general-purpose technologies supports the second view. While the speed of technology adoption (the key form of innovation for developing countries) across countries has accelerated, the intensity of adoption within countries has diverged (Comin and Mestieri 2018)—which means that most firms in developing countries may fall further and further behind. These new technologies are likely to be more demanding in terms of some of the complementary factors needed for effective adoption across firms, such as sound infrastructure, a supportive business environment, workforce skills, and core competencies in relation to key firm-level business practices, including marketing and management skills.

Technology leapfrogging is a challenging prospect for developing countries and only those countries that have well designed policies and a good support system to adopt

these new technologies will succeed. This increases the urgency for more effective and focused innovation policies that address the key challenges in adopting these new technologies.

The innovation policy challenge in developing countries

Managing complex innovation policies with scarce government competencies

Innovation is inherently risky and uncertain. Thus, firms may undertake less innovation than they should, or undertake it less effectively than they could. This is especially the case in developing countries where market and system failures that prevent investments in innovation activities are pervasive. Research quality is often insufficient, the skills base is very thin, the business environment is frequently costly and unfavorable, and markets may not reward innovation because prospective consumers lack purchasing power. In addition to these challenges, policy makers and practitioners in developing countries often do not have the necessary competencies to diagnose and identify adequate policy solutions and implement policies effectively. This situation translates into an important policy dilemma for policymakers: how to manage complex innovation policies with scarce government capabilities.

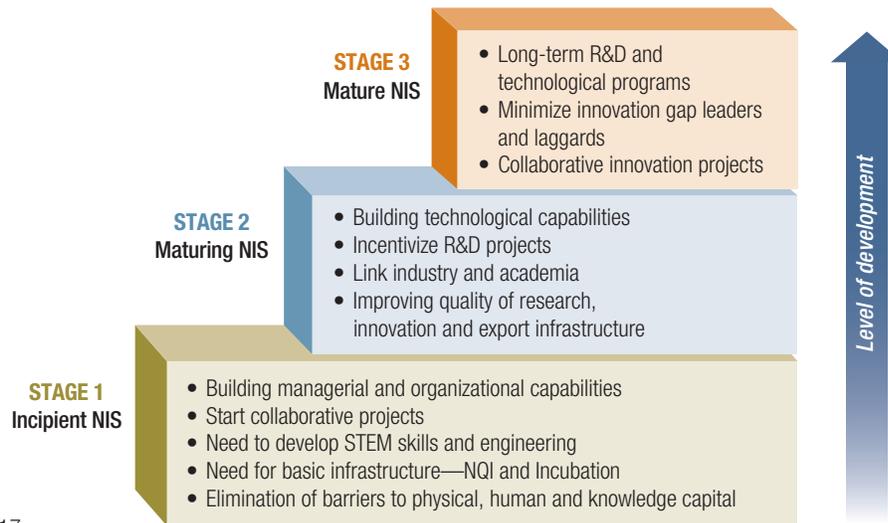
Confronting this dilemma and minimizing the risk of failed innovation policies requires action in three different areas:

- Getting the right focus and appropriate mix of innovation policies using a gradual approach and prioritizing the support to build innovation capabilities.
- Investing in government capabilities and competencies through better processes and institutions.
- Addressing the information gap about what works and what does not and in what context.

Getting the set of policies right—Supporting the capabilities escalator

Improving innovation policies starts with a clear and realistic focus on the existing capabilities the private sector has for innovation. To have a sizeable impact on innovation and

Figure ES.1 Policies variation along the capabilities escalator



Source: Cirera and Maloney 2017.

Note: NIS = National Innovation System; NQI = national quality infrastructure; R&D = research and development; STEM = science, technology, engineering, and mathematics.

productivity, innovation policies in developing countries need to aim first to ensure that most firms develop the necessary capabilities to undertake basic incremental innovation. Redressing the frequent funding bias towards R&D is crucial for effective policy targeting. The objective is not to stop funding instruments to foster R&D, but to balance the composition of budget allocations to be more aligned with the actual and evolving capabilities of the private sector.

Innovation policies in developing countries also need a clear focus on building managerial and organizational practices to manage and accumulate knowledge and organize the business routines needed for innovation. The intuition is simple. Managing R&D projects or the introduction of new processes efficiently and successfully requires the effective use of human resources, the deployment of effective marketing strategies, and the efficient implementation of other key business functions. For example, target setting, or quality management and monitoring, are key activities to manage innovation projects across different sectors. Innovation requires internal incentives to ensure that workers are allocated to tasks where they can be more productive, and are incentivized (or not penalized) to propose improvements at early stages and later to propose and execute more sophisticated innovation. Innovation also demands a business culture with an outward focus that is curious about learning what others are doing, seeking new approaches and insights and then being prepared to implement at least some of them, and manage the change that these new approaches may induce. These basic competencies are

necessary for the successful development of innovation projects and the accumulation of learning and technological capabilities.

Improving these managerial capabilities is the building block for innovation policy. However, countries also need to foster other complementary instruments and policies to effectively support innovation. For example, a high cost of doing business will reduce the incentives to invest in knowledge, lack of skills in the workforce will make technology adoption challenging, or lack of university-industry collaboration will limit the use of the knowledge created by universities with potential to be commercialized.

One framework to guide the choice of policy instruments is the capabilities escalator (Cirera and Maloney 2017). For each country, combinations of technological capabilities differ across firms and sectors. There is no unique policy mix that can be implemented in all countries. However, the escalator suggests how to deal with these variations by focusing on changing the intensities and focus of policy support as firms in the country accumulate capabilities and climb the technological ladder. Thus, depending on the degree of maturity of the National Innovation System (NIS), a certain set of policy instruments is more likely to be appropriate (figure ES.1). The framework is helpful to structure and sequence the combinations of innovation policy instruments that are most appropriate to support existing capabilities—not only in firms, but also in governments—to implement more complex policy instruments.

Investing in government capabilities through better processes and institutions

A second critical element to improve innovation policies is to invest in government capabilities. This not only requires investing in human capital of public managers, but more importantly (1) adopting good practices in the design and implementation of policies, and (2) designing and supporting well-functioning implementing agencies. These processes require time and resources, but are key to effective implementation of complex policies.

Identifying the right cause of the innovation problem

Low rates of innovation may be driven by either failures or problems in any number of markets working directly or

through lack of indirect complementary factors such as skills and infrastructure. Policy makers need to be especially careful in ensuring that they address the true problem and do not simply “borrow” a diagnosis that is common in advanced countries. Firms may not innovate because capital markets imperfections hamper longer-term borrowing. But it is also possible that innovation activities are constrained by information asymmetries that limit learning in firms or shortages of technology and skills, or even by general distortions that weaken the business case for investing in innovation. Identifying the innovation problem, therefore, is the key to identifying the appropriate instrument. Table ES.1 pairs common innovation problems in developing countries with instruments that can provide solutions to address these problems.

Table ES.1 Common innovation problems and potential instrument solutions

Innovation problem	Instrument	What for?
1 Low general innovation performance due to low capabilities	Business advisory services Technology extension services National quality infrastructure Supplier development programs Clusters/networks Vouchers	Capabilities building (management) Capabilities building (technology) Quality and standards Capabilities building (management); Quality and standards Collaboration Collaboration
2. Use of old and outdated technology/ low technology adoption	Business advisory services Technology extension services Technology centers Loans Grants	Capabilities building (technology) Capabilities building (technology) and transfer Capabilities building (technology) and transfer Finance Finance and appropriation
3 Weakness in technology generation and commercialization	Technology transfer offices Technology centers Technology extension services	Technology transfer Capabilities building (technology) and transfer Capabilities building (technology) and transfer
4. Low number of young innovative ventures	Incubators (business advisory services) Accelerators Equity	Capabilities building Capabilities building and scale up Finance and scale up
5. Lack of collaboration leading to poor quality business innovation	Clusters/networks Vouchers Grants Technology transfer instruments	Coordination and mindset Mindset and incentives Incentives and finance University-industry
6. Suboptimal investment in R&D	Grants Loans Tax incentives	Finance and appropriation Finance Incentives and appropriation

However, even if the right problem and its cause have been reasonably identified, the impact of each intervention will depend on the quality of its design and the effectiveness of its implementation. Identifying the right problem is a necessary but not sufficient condition for success, and government failure is a potential risk. This guide offers a check list of good practices for the design and implementation of innovation policy instruments, including the need for appropriate and simple selection criteria, adequate public management practices, and thorough monitoring and evaluation (M&E). Moreover, given that innovation policy is implemented by a diverse array of institutions that have different incentives and objectives, and that are often competing for public resources and beneficiaries, having sound governance, a clear mandate and objectives, and adequate resources are critical for effectively implementing innovation policy.

Addressing the information gap on how to do innovation policy

A final challenge for innovation policy makers is that there is a lack of information about the right innovation policy tools for different problems and policy contexts. Policy makers are often unaware of the range of instruments available to address a specific innovation problem, and the institutional capacity and market conditions required for successful policy implementation. Despite important recent efforts to systematize evidence on the impact of innovation policy instruments,¹ the few existing studies and reviews focus primarily on OECD countries. Consequently, agencies often copy policy instruments from other countries without adequate consideration of these issues, which can lead to significant missed opportunities to formulate effective innovation policies and waste of public resources.

Figure ES.2 illustrates the *innovation policy space* and the different options available to policy makers to support business innovation. These instruments represent different mechanisms of intervention—grants, loans, advisory, tax incentives, services, and infrastructure—with specific goals of supporting different types of business innovation.

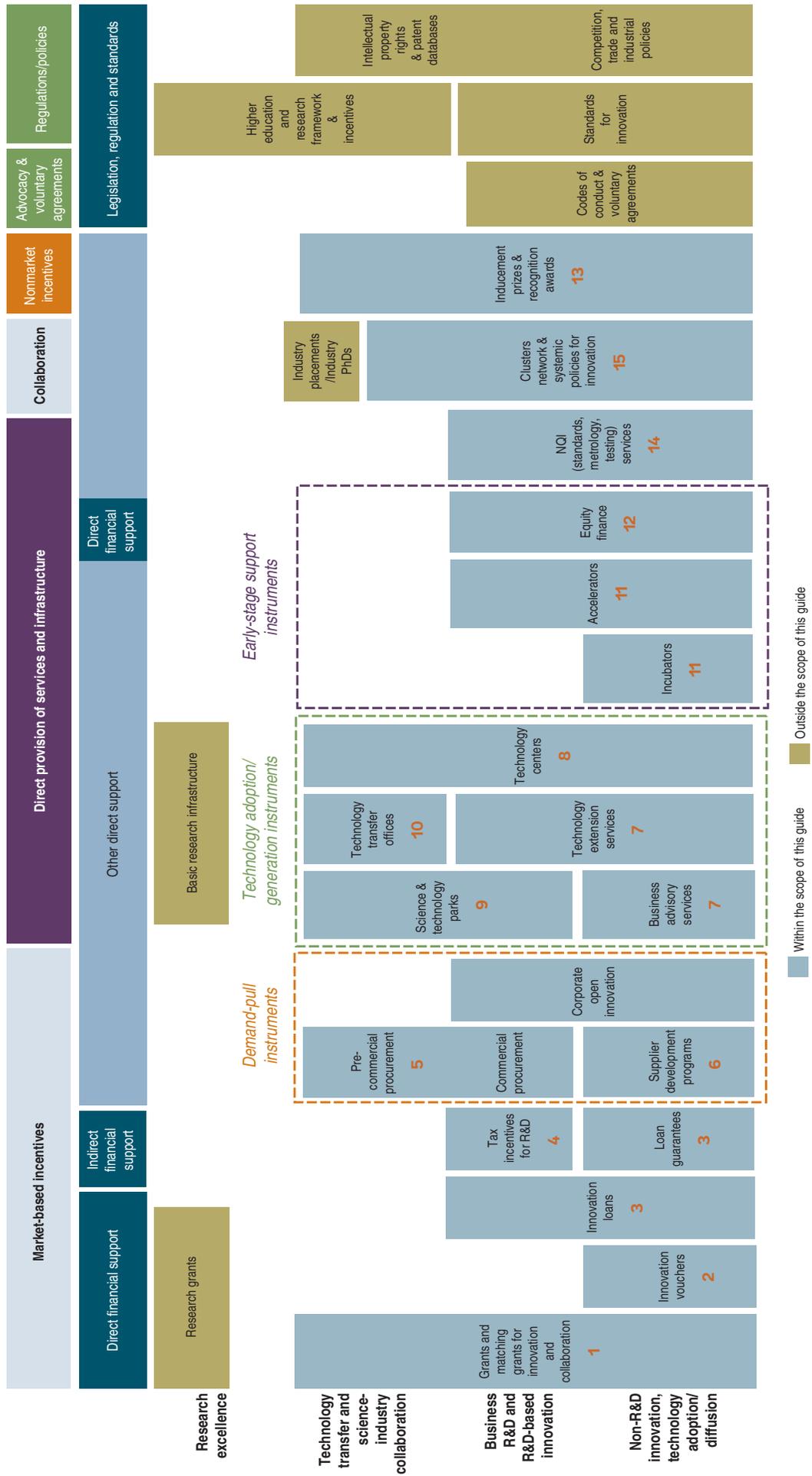
There is significant overlap between the innovation policy space with the objectives and instruments to support the development of small and medium enterprises (SMEs) and entrepreneurship, industrial/sectoral interventions, or regional growth, given that all these policy areas often focus their support on firms.

The book provides a description of 21 policy instruments that can be grouped in 10 types or families of instruments according to their innovation objective. The summaries that follow provide a profile of the most important instruments. They summarize existing evidence about their impact and the institutional and contextual factors that determine their effective design and implementation. Specifically, for each instrument, the summaries present the problem that it seeks to address; the key target group that seeks to benefit; the strengths, limitations, and risks behind its use; the evidence of its impact; and the extent of its estimated replicability in developing countries' institutional settings. The latter is particularly important given the extent of inadequate replication of innovation policies. For instance, many science, technology, and innovation ministers aspire to replicate the success of Silicon Valley in their respective countries. However, given their existing domestic conditions, a “Silicon Valley solution” is probably inappropriate, especially given that Silicon Valley is the outcome of a unique mix of factors that cannot be easily replicated. Understanding all the factors needed for implementation can help policy makers ask the right questions and make informed decisions that can lead to the selection, application, and support of more appropriate and effective innovation policy instruments.

Finally, the summaries provide relevant information to address the huge information gap that policy makers face in innovation policy making. However, implementing new instruments requires experimentation and finetuning, good sequencing, and more importantly, good measurement and learning to adapt and adjust the instrument design to the local conditions. This guide is not a substitute for having good processes in place for the design, implementation, and governance of innovation policy.

1 See, for example, the Compendium of Evidence on the Effectiveness of Innovation Policy by MlOIR and Nesta (<http://www.innovation-policy.org.uk/compendium/>).

Figure ES.2 The innovation policy space



Note: NQI = national quality infrastructure; R&D = research and development. The numbers represent the order in which the summaries are introduced in the remaining of the document. This order does not represent any priority ranking for innovation policy.

1

GRANTS AND MATCHING GRANTS FOR INNOVATION AND/OR R&D PROJECTS

DEFINITION Grants are a direct provision of funding from public agencies to firms and other innovation agents to finance all or part of an innovation project. This is the most common mechanism of intervention and varies widely in complexity depending on the policy objective. Design variations occur in selection mechanism, size of grant, duration of projects, type of innovation supported, type of target firm, or whether an individual or a collaborative project.



MARKET AND SYSTEM FAILURE ADDRESSED

- Externalities and spillovers not appropriated by the firm lead to firms investing less in R&D and innovation.
- Coordination failure: high costs and lack of motivation hinder collaborative innovation.
- Capability failure: firms, especially SMEs, lack capabilities to innovate.



TARGET GROUP

- Individual firms, especially SMEs.
- Collaboration between firms or between firms and other organizations.



STRENGTHS

- Selectivity: can target specific topics, regions or types of firms where intervention is needed.
- Flexibility and control: can be designed to apply to different stages and types of innovation.
- Relatively easy to implement: most agencies already have knowledge of using grants.
- *Signaling effects*. The process of evaluating grants can also serve the purpose of assessing firms' capabilities.



POTENTIAL DRAWBACKS AND RISKS

- Potentially high management and bureaucratic costs.
- Need to be adequately funded with budget stability to ensure continuity.
- Risks of interference with selection process when poorly designed.
- Risk of crowding out private funding and capture by repeated applicants.



EVIDENCE OF IMPACT

- The evidence covers a wide range of countries/regions, but mainly from OECD countries, and mainly for R&D grants; there is limited insight into the effectiveness of grants to support innovation activities that are not related to R&D.
- The evidence suggests that grant schemes tend to have a positive impact on input additionality (increasing the resources devoted to innovation), rather than on output additionality (the outputs/outcomes/impacts).
- Policy makers might want to take publication bias (mainly successful results published) into account in making decisions based on this evidence.



KEY "MUST HAVE" FOR REPLICABILITY

- Effective marketing strategy to raise awareness among the most suitable participants.
- Simple and effective implementation mechanisms to simplify the application and disbursement processes and reduce costs; grant application process should be automated.
- If there is little experience with grants, then simple modalities are preferable over complex schemes.
- Selection of beneficiaries ideally should be based on independent assessment by experts.



DO'S

- Combine grants with mentoring to improve the quality and effectiveness of the program.
- Be specific about what group to target given that different types of firms may require different grant designs.
- Introduce matching rates to ensure commitment and also consider repayable models, given that they provide an avenue for revolving funding problems,



DON'TS

- Don't assume that grants or matching grants are the right instrument for any innovation problem or to automatically induce collaboration for innovation.
- Don't expect grant programs to generate impacts immediately and also expect some failures as innovation is risky.
- Don't design complex (and costly) application processes for applicants.

2

VOUCHERS FOR INNOVATION AND COLLABORATION

DEFINITION Vouchers are small, nonrepayable grants allocated to potentially innovative SMEs to purchase services from external knowledge providers. The main objective is to induce noninnovative SMEs to start collaborating with knowledge organizations and knowledge providers. Vouchers are often entitlement based rather than competition based. They typically have light management but strong auditing.



MARKET AND SYSTEM FAILURE ADDRESSED

- Capability failure, firms lack basic capabilities for innovation.
- Information asymmetry; firms and knowledge providers have different incentives and operating models.



TARGET GROUP

- SMEs and knowledge providers, including both public and private sector knowledge providers.



STRENGTHS

- Simplicity in design, implementation, and evaluation. Minimal bureaucracy, low cost.
- Flexibility for recipient to decide how to use them.
- Demand orientation. Projects are defined according to the objective to promote collaboration. Vouchers can trigger collaborative relationships between SMEs and knowledge providers actual need of the SME.



POTENTIAL DRAWBACKS AND RISKS

- Risk of one-off transaction, lack of long-term behavioral change.
- Difficulty of reaching the targeted group. The entitlement-based nature of voucher schemes implies a high risk of nonadditionality.
- Risks of lock-in with local knowledge providers if they are few in number.
- Poor supply of advisory services. SMEs may be restricted by the capacities and level of interest of the research and advisory sector in supplying services.
- Fraudulent use of the scheme; complicity of SMEs and service providers.



EVIDENCE OF IMPACT

- The bulk of the evidence comes from developed countries. With the small samples used in evaluations and outcomes dependent on context, the generalizability of findings remains low. Nearly no experimental approaches for impact evaluation could be found; results shown in the guide rely mostly on self-reporting.
- High growth in sales, job creation, and gross value added has been reported, including for nearly four-fifths of all participants.
- In addition, there is evidence of change in attitude toward collaboration resulting from these interventions, with strong positive changes in attitude toward engaging with vendors and universities.



KEY “MUST HAVE” FOR REPLICABILITY

- Required competence from SMEs: Identifying the challenge and providing detailed description of the services required.
- Competence from knowledge providers: Capability and willingness to work with SMEs.
- Using matching and brokerage support smooths project development and implementation and reduces fraudulent use.



DO'S

- Take stock of supply/demand for knowledge services and have 'accredited' providers.
- Design simple application and selection procedures.
- Define the range of services covered.
- Design (small) voucher amounts.
- Adopt proactive advertising to reach SMEs that are not typically targets for support.
- Set up brokerage services.
- Have strong audit function to reduce fraud.



DON'TS

- Overcomplicate application procedures.
- Leave the list of service providers open.
- Underestimate the role of intermediaries in easing application paperwork.
- Have unnecessary expectations of large impact. Vouchers work best to change behavior through small projects and are a step to more significant innovation.

3

LOANS AND LOAN GUARANTEES FOR INNOVATION

DEFINITION Loans, supplied either by government or via intermediaries, have become popular due to their reimbursable nature. Credit guarantees cover a portion of the losses to lenders when firms investing in innovative projects default on loans. a guarantee applies exclusively to assets explicitly covered under its provisions, in return for a fee.



MARKET AND SYSTEM FAILURE ADDRESSED

- Imperfections in financial markets (loans only) including a lack of SME focused lending
- Information asymmetry. Commercial lenders do not understand the financial viability of innovation projects proposed by borrowing companies. SMEs' lack of collateral.
- Coordination failures. Credit guarantee schemes also can address weak institutional coordination.



TARGET GROUP

- Innovative firms that may not fulfil normal collateral requirements. SMEs that wish to innovate but remain credit constrained. An indirect target group consists of financial providers that may otherwise not service this type of innovative business.



STRENGTHS

- Can be tailored to target specific types and profiles of firms and projects.
- Operate through market mechanisms, relying on skills of specialized lenders to assess risk.
- Provide records of SME borrowers and lender capacity, allowing credit registries to improve information available.



POTENTIAL DRAWBACKS AND RISKS

- Trade-offs between innovation scope, eligibility, and outreach of SMEs (critical mass needed for viability).
- Moral hazard for banks, which can be less careful when selecting borrowers.
- The risk of government failure due to lack of expertise and to political capture of decisions on lending.
- Crowding out of private schemes.



EVIDENCE OF IMPACT

- There is ample evidence that subsidized loans promote R&D, but the evidence is often confounded by interventions that mix several instruments. Most of the evidence reports a strong positive impact on R&D intensity, particularly among technology-intensive and smaller firms. Evidence of impact on productivity is weak, but some results indicate positive results for new product and patents.
- The general evidence of impact for credit guarantees is ample, but for the specific purpose of innovation remains scarce. Results for R&D investment have been positive, but only for smaller and technology-intensive firms. Output additionality has been found in terms of positive growth in sales and productivity. Take-up rates have been higher among exporters and high-tech firms.



KEY "MUST HAVE" FOR REPLICABILITY

- Policy makers need to assess the viability of the schemes in the light of alternative choices faced by firms, the presence of a legal framework for upholding creditor rights and judicial enforcement of contracts, an adequate solvency ratio for banks, a set of transparency standards to ensure fluidity and liquidity in credit guarantee schemes.
- Firms need to acquire basic competencies to participate in credit guarantee schemes successfully.



DO'S

- Promote and advertise credit guarantee schemes (CGS).
- Provide financial and operational independence to CGS.
- Provide transparency and disclosure of public funding available, and of rules, procedures, and arrangements.
- Build an adequate governance structure for the CGS.



DON'TS

- Don't overintervene and distort market mechanisms.
- Don't expect credit guarantees to become a solution for structural problems such as weak financial regulation.
- Don't make eligibility requirements for either SMEs or lenders ambiguous. Don't expect that loans will be effective with all types of firms. Loans are more appropriate for more established firms and more developed innovation projects.

4

TAX INCENTIVES FOR R&D

DEFINITION Tax incentives reduce the tax burden of firms that invest in eligible R&D activities, representing an indirect way of supporting investments in R&D. There are two broad types:

- Tax incentives based on expenditures in R&D.
- Tax incentives based on results from R&D or related innovation activities.



MARKET AND SYSTEM FAILURE ADDRESSED

- Incomplete appropriability of potential returns.
- Coordination failure between knowledge providers and firms, often linked to transaction costs and poor interaction between stakeholders (when collaborative activities included in scheme).



TARGET GROUP

- All firms, although some are sector specific.
- Specific schemes extend to SMEs and startups by offering special terms.



STRENGTHS

- Lower administrative and compliance costs than direct support instruments.
- Simpler implementation structure.
- Flexibility for beneficiaries to choose projects. Greater efficiency in the selection of R&D projects, given that beneficiaries are most knowledgeable about their own opportunities.
- Fewer allocative distortions. Tax incentives do not crowd out market mechanisms.
- Link to efforts to attract investment. Tax incentives can encourage multinational enterprises (MNEs) to locate innovation activity in a country.



POTENTIAL DRAWBACKS AND RISKS

- Budgetary uncertainty in assessing how much revenue is being foregone.
- Difficulty in verifying eligibility of R&D activity.
- Risk of short-termism. Tax incentives tend to induce investment only in R&D projects that generate greater profits immediately.
- Difficult to target firms/types of innovation (compared to grants).
- R&D wage second-order effects. Schemes may distort labor markets, with firms overrecruiting R&D-related staff, and induce increases in the wages of R&D professionals,



EVIDENCE OF IMPACT

- There is a substantive evidence of impact for developed countries, but less so for developing countries, including a few systematic reviews. The majority of the evidence relies on econometric approaches, although some studies employ experimental and quasi-experimental approaches to build counterfactuals.
- The majority of studies report positive R&D price elasticities (but within a wide range), new product lines, new patent applications, and growth in productivity.
- Impacts have been larger for volume-based incentives because they tend to be more generous.
- Smaller firms have been more responsive to R&D tax incentives than larger firms.



KEY “MUST HAVE” FOR REPLICABILITY

- Long-term political commitment.
- High level of required skills for evaluating, monitoring and verifying eligible activity.
- Predictability and stability to underpin strategic R&D activity.
- Competencies from beneficiaries. Beneficiaries need to be able to file the required forms and applications, which often requires hiring tax experts and accountants.



DO'S

- Minimize the bureaucratic burden for applicants.
- Consider offering carryover provisions to add flexibility for young companies.
- Favor R&D activities with high potential for knowledge spillover, such as wage bills for researchers and consultancies.



DON'TS

- Don't create compliance uncertainty for prospective participants.
- Don't create unpredictability with the term of the scheme.
- Don't give disproportionate discretionality to public officials.

5

PUBLIC PROCUREMENT TO SUPPORT INNOVATION (DEMAND-PULL INSTRUMENT)

DEFINITION Uses public procurement to induce innovations from firms. Public procurement can be used to support innovation during both pre-commercial and commercial stages. Pre-commercial procurement (PCP) aims to support the development of innovative solutions from ideation to prototype or field-testing stages. Commercial-stage procurement induces innovation that is already commercially viable.



MARKET AND SYSTEM FAILURE ADDRESSED

- Information asymmetry: the immaturity of the potential market and lack of clearly articulated demand.
- Coordination failures that result from risk aversion among firms or potential buyers.
- Institutional failures that result in barriers to access the public markets.



TARGET GROUP

- Prospective innovative suppliers, often innovative SMEs.
- Contracting authorities; particularly relevant for agencies with large research funding and appetite for leading-edge technologies.
- End users (if different from procurers).



STRENGTHS

- For PCP: Can encourage novel R&D and solutions through risk-sharing between public and private sectors.
- Provide an immediate market and generate turnover for beneficiaries.
- Generating positive externalities *and guiding strategic investments*. Can be oriented toward addressing societal challenges.



POTENTIAL DRAWBACKS AND RISKS

- Requires a high level of capacity of public agencies and government procurement systems.
- It is challenging to balance typical drivers of public procurement (cost, reliability) with the desired innovation outcomes.
- Risk of no commercialization. Suppliers face the risk of spending time and effort on concept development that leads to little return.



EVIDENCE OF IMPACT

- The use of PCP as a large-scale innovation mechanism primarily originated in the United States, with subsequent strong interest from European policy makers. The evidence-base is strongly biased toward the US Small Business Innovation Research (SBIR) program. The series of assessments done by the US National Research Council (NRC) suggest that around half of the beneficiaries reported increased investment in R&D.
- Evidence on commercial-stage procurement is mostly qualitative, focused on implementation rather than effectiveness. The reviewed studies mostly confirm positive results such as improved public services, innovative solutions, and newly created jobs.



KEY “MUST HAVE” FOR REPLICABILITY

- The complexity of PCP and commercial procurement programs require a high level of capacity of both policy agencies and targeted firms.
- Sector-specific agencies can potentially perform as implementors of innovation procurement because they have the technical expertise to assess technologies and they may have access to procurement budgets.



DO'S

- Before rolling out a full program, try experimenting with pilot schemes in environments with the most appropriate conditions, such research-intensive regions or state-owned enterprises.
- Define procurement requirements using criteria in performance terms instead of technical terms.



DON'TS

- Don't seek a one-size-fits-all approach, as expertise related to procurement and technology tends to vary across sectors and regions in developing countries.
- Don't ignore international regulations on procurement when using procurement for innovation domestically.

6

SUPPLIER DEVELOPMENT PROGRAMS AND CORPORATE OPEN INNOVATION (DEMAND-PULL INSTRUMENTS)

DEFINITION Supplier development programs (SDPs) support firms in upgrading product quality and processes, aiming to link them with existing large buyers, often multinational enterprises (MNEs). Corporate open innovation instruments (COIs) are a variation of SDPs that try to identify new opportunities for supply chain in large companies and link them to potential suppliers.



MARKET AND SYSTEM FAILURE ADDRESSED

- Information asymmetry and coordination failures that exist between MNEs and local SMEs in developing countries.
- Missing markets: Local SMEs often struggle to find markets to achieve sustained growth.
- Capability failure: Local SMEs often lack capabilities to supply international market without support.



TARGET GROUP

- Local SMEs and entrepreneurs in developing countries, which often need support in information, capabilities, and financing to serve large domestic and international buyers.
- Large companies (often MNEs) that can benefit from integrating with local suppliers.



STRENGTHS

- *Achieve multiple policy goals in an integrated way.* Can link the supply and demand sides together along value chains, addressing goals, including technology transfer, SME upgrading, access to markets, and access to finance.
- Helps develop standards of quality and operations in participating firms that can be diffused to other firms.
- Encourage networking and group learning among SMEs.



POTENTIAL DRAWBACKS AND RISKS

- Uncertainty on outcomes: SDPs do not guarantee access to buyers or the duration of that access, but only increase the chance for SMEs to gain markets.
- Transaction costs can be high, given the schemes require sophisticated brokering and facilitation.
- May require NQI services that are not locally available.



EVIDENCE OF IMPACT

- Evaluating supplier development programs is challenging due to high complexity and layers of expected outcomes and impacts. The few program evaluations reviewed suggest that SDPs can generate positive impacts in terms of establishing new supplier linkages, helping SMEs gain new contracts (domestically and internationally), and improving the value added per contract, as well as labor skills and wages.
- From a supply chain perspective, the evidence suggests that SDPs have been able to help enhance competencies, create jobs, reduce costs, and improve overall productivity.



KEY “MUST HAVE” FOR REPLICABILITY

- Commitment from participants is essential given that SDPs are “matchmaking” efforts to bring supply and demand together.
- Need to integrate the agenda work of Investment promotion/export agencies and innovation SME agencies to cover supply and demand.
- Accurate identification and measurement of demand, as well as good diagnostics of suppliers, is critical.
- Beneficiaries need to have the competencies that make them potential suppliers to participate.



DO'S

- Ensure that there are high-quality program managers to interact effectively with large and small companies.
- Customize the instruments to suit the industry/firm-specific needs (such as specific industry standards).
- Utilize group activity and incentivize peer learning as much as possible.
- Use performance-based model, firms that demonstrate improvement and capacity building deserve ongoing support



DON'TS

- Don't treat these initiatives as stand-alone programs; they can work together with other innovation programs.
- Don't treat all supply chains as similar; different industries have very different dynamics and relationships.

BUSINESS ADVISORY SERVICES AND TECHNOLOGY EXTENSION SERVICES

(TECHNOLOGY ADOPTION AND GENERATION INSTRUMENTS)

DEFINITION Building firm capabilities and promoting the use of new and improved technology is essential to increase the productivity of firms in knowledge-based economies. Business advisory services (BAS) and technology extension services (TES) focus directly on equipping firms with the capabilities to use and/or generate technologies.



MARKET AND SYSTEM FAILURE ADDRESSED

- Information asymmetry: firms do not value this type of support.
- Coordination failures: Business associations do not organize themselves to offer this support.
- Capability failures: SME owners have trouble identifying what their constraints are and how to overcome them.



TARGET GROUP

- BAS: SMEs, advisory service and knowledge providers (public, private, and NGOs).
- TES: Same as BAS, plus knowledge providers, such as research organizations, universities, and public laboratories.



STRENGTHS

- Offering BAS as a bundle of services can increase efficiency in delivery.
- Availability of diagnostics enables programs to be tailored to SME clients.
- Provision of advisory services is relatively inexpensive.
- BAS often support the building blocks of SME innovation capability.



POTENTIAL DRAWBACKS AND RISKS

- Potential to crowd out market providers.
- Risk of mismatch between demand and supply.
- Target beneficiaries may not be able to pay.
- Firms may misdiagnose their issues so interventions may be poorly targeted.
- Consultants are not always incentivized to transfer knowledge.
- Measurement challenges. Ascribing particular results to specific advisory services is challenging, particularly given the length of time building capabilities can take.



EVIDENCE OF IMPACT

- Evidence of the impact BAS on innovation exists as many developed and developing countries have introduced and evaluated them. Effectiveness has been positive for behavioral practices and for sales growth, patenting, and employment. Uptake among SMEs has been limited, and effects of cost-effectiveness ambiguous.
- The evidence for TES is less available than for BAS and it comes mostly from developed countries. Outcomes have been beneficial, but vary by context, and the combination of services offered.



KEY "MUST HAVE" FOR REPLICABILITY

- Need mix of services that can help build capabilities sequentially according to SME needs.
- Face-to-face delivery of support for groups of SMEs is ideal.
- Strike a balance between tailored and standardized services.
- Determine payment according to local conditions and observed results.
- Requires relatively high agency capacity to manage high quality TES.
- Need quality service providers, or for these need to be developed.



DO'S

- Conduct market and feasibility analyses before launching programs.
- Ensure that appropriate resources are available to build program awareness.
- Have high-quality delivery staff.
- Ensure that managers are versed on technology.



DON'TS

- Don't decentralize at the expense of losing local delivery flexibility.
- Don't assume SMEs will understand the value of BAS and TES, ongoing marketing will be needed.
- Don't disregard the importance of research systems as a condition for technology transfer.

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TECHNOLOGY CENTERS (TECHNOLOGY ADOPTION AND GENERATION INSTRUMENTS)

DEFINITION Technology centers (TCs) are public or public-private infrastructure dedicated to providing TES, technology awareness, innovation services and skills upgrading. They tend to be sector specific and accumulate deep sector technology expertise, often developing new technological solutions or adapting existing market technologies to the needs of the domestic sector.



MARKET AND SYSTEM FAILURE ADDRESSED

- Coordination failures between providers of technological solutions and firms.
- Information asymmetries: particularly for information about available technologies.



TARGET GROUP

- SMEs that lack awareness about new technology, the funding or capability either to build internal capacity in specialized technological areas or to purchase equipment.
- Larger companies that are seeking to upgrade their suppliers and vendors.
- Industry organizations with sectoral or technological focus.



STRENGTHS

- Anchoring training and services close to the industry.
- Important instruments to support the diffusion of innovation and building SME capability.
- Can act as market developers and bridge availability gaps for advisory services.



POTENTIAL DRAWBACKS AND RISKS

- Risk of capture, which may allow narrowing of services to suit insiders.
- Difficulty of maintaining relevancy to the industry while operating under government rules and statues (caps in salary scales).
- Risk of too much focus on physical infrastructure and equipment rather than providing quality services.



EVIDENCE OF IMPACT

- Evidence for TCs remains extremely scarce. Five independent studies, from both developed (Japan, United States) and developing countries (Mexico), find no systematic reviews for this instrument.
- The evidence suggests that these centers have been effective in improving performance of SMEs (Japan, Mexico, United States), but that their performance, relevance, and ability to collect fees for services depends on contextual factors and the capabilities of the center (customer orientation, relationship management skills, and quality of technical staff, including PhD-level experts).



KEY “MUST HAVE” FOR REPLICABILITY

- Cluster of relatively strong firms/industry who need and will support the center.
- Sufficient initial investment to provide quality services.
- Business model reflects industry capability needs.



DO'S

- Consider the TC as part of a broader strategy and define a focus for intervention.
- Engage with the private sector in designing and delivering the intervention.
- Ensure sufficient funding for set-up and maintenance stages.
- Seek strong buy-in from industry stakeholders to ensure relevance.
- Strike the right balance in the mix of services provided between diffusion of established knowledge, and cutting edge technologies.
- Ensure center governance has strong private sector focus.



DON'TS

- Don't just treat the TC as physical infrastructure, the service quality will make or break success.
- Don't ignore the importance of maintenance and updating of equipment, this is capital intensive but is vital for continued relevance.
- Don't run TCs as bureaucratic agency; they need to be responsive to customer needs.

9

SCIENCE AND TECHNOLOGY PARKS (TECHNOLOGY ADOPTION AND GENERATION INSTRUMENTS)

DEFINITION Science and technology parks (STPs) typically feature physical spaces offering infrastructure and various support services to high-tech and R&D-intensive firms. STPs aim at exploiting the spillover benefits from the agglomeration of R&D and technology transfer activities between multinational enterprises and other organizations. STPs typically have formal linkages with universities, such as being located close to campuses.



MARKET AND SYSTEM FAILURE ADDRESSED

- Coordination failures among different actors in local innovation systems that hinder collaboration.
- Create agglomeration economies and knowledge spillovers between universities and on-site firms.



TARGET GROUP

- High-tech and R&D-intensive enterprises.
- Universities and public research institutions.



STRENGTHS

- Maximize spillovers and network effects by agglomerating innovative activities in a specific location.
- Can serve as the vehicle to implement a mix of policy instruments, such as grants, vouchers, tax incentives, procurement, loans, and advisory services to park users.



POTENTIAL DRAWBACKS AND RISKS

- STPs present high risk of becoming real estate development operations.
- When lack of commercialization is due to either poor research quality or intellectual property incentives, STPs as an instrument on their own can do little to improve the situation.
- STPs are less suited for early-stage support, as tenants tend to be established firms.



EVIDENCE OF IMPACT

- Assessing impacts of STPs is difficult given the huge diversity of STPs, and the complex impacts coming from the dynamics STPs stimulate. Qualitative methods have an important role to uncover the underlying causal linkages that are not typically addressed through quantitative methods.
- Geographical coverage of the evidence is skewed toward a few countries, such as the United Kingdom, the United States, Spain, and China.
- Factors affecting the functioning of STPs include capabilities of managers, proximity to prestigious universities, and commitment from the central and local governments. Regarding output additionality, the reviewed literature reports either positive impacts or neutral effects of STPs on firms' performance.



KEY "MUST HAVE" FOR REPLICABILITY

- Strong, specializing economies with a good local innovative ecosystem form a sound basis for successful STPs.
- The presence of competent knowledge institutions that already produce applied research with commercial potential.
- A local labor market of highly qualified workers to work on innovation projects.
- An attractive residential and living environment to retain the skilled labor force.
- Available sources of financing to support the operations of STPs.



DO'S

- Carefully assess whether the preconditions of setting up STPs can be met.
- Make sure that incentives are in place for universities to participate in contract research and commercialization.
- Have a long-term vision from the perspective of urban planning.



DON'TS

- Don't try to copy experience from one region to another without taking local circumstances into account.
- Don't merely pursue quantifiable outputs; benefits of STPs can come from informal interactions.

DEFINITION Technology transfer offices (TTOs) are the dedicated entities created by universities and public research institutions to support and facilitate different aspects of technology transfer, managing activities related to intellectual property rights, such as disclosures, patent filing and licensing, relationships with industry, industry placements and research contracts.



MARKET AND SYSTEM FAILURE ADDRESSED

- Information asymmetry resulting from uncertainty about the valuation of scientific discovery.
- Externalities and lack of appropriation of knowledge that prevent firms from investing in innovation activities.
- Coordination failures that hinder interactive learning between firms and universities/public research institutions.
- Capabilities failure. The technology transfer process requires access to a number of informational, financial, and human resources, which are usually scarce in developing countries.



TARGET GROUP

- Knowledge providers such as research centers, universities, and government laboratories.
- Innovative businesses such as big firms, SMEs, and small startups.



STRENGTHS

- Can stimulate ongoing business improvement activities within SMEs and cooperation between firms and research centers.
- High potential to accelerate commercialization of new solutions.
- Can support exchange of people between research and industry, as well as knowledge.
- TTOs are an integral part of the third-stream mission of knowledge creation institutions. TTOs enable knowledge exchange and cocreation of knowledge with private actors.



POTENTIAL DRAWBACKS AND RISKS

- Subject to failure if quantity and/or quality of knowledge creation is low.
- Cannot overcome the absence of incentives to support commercialization of knowledge.
- Often subject to complicated government procedures.
- Considerable time, capacity, and resources are required to enable TTOs to function effectively.



EVIDENCE OF IMPACT

- The existing evidence look at impacts of TTOs in the contexts of technologically advanced economies, using indicators such as number of licenses issued and income generated. The studies tend to focus on heterogenous outcomes and issues, so it is difficult to form a general conclusion on TTO's impact.
- A comparative study shows that European TTOs performed comparably to their US counterparts but earned significantly less revenue from licensing activities.
- Studies in the United States show that most TTOs emphasize licensing over scientist start-ups and economic development, that spin-off activities can occur without IP being formally licensed, and that social capital matters.



KEY "MUST HAVE" FOR REPLICABILITY

- A precondition for any TTOs to work is a good research system that either produces applied and potentially usable research results or has physical assets and services that are valuable and relevant to the private sector.
- High capabilities of TTO staff are essential, and the staff should understand both science and industry.
- The research institutions themselves need to support the business model of their TTOs with a long-term commitment.
- The presence of a transparent and well-articulated intellectual property rights regime, as well as an efficient court system, is necessary to encourage technology transfer.



DO'S

- Where necessary, be prepared to invest in building the capacity of TTO staff as this is an unusual skillset.
- TTOs should aim to benefit businesses as well as the wider community rather than just focus on the institution itself.



DON'TS

- Don't simply set up TTOs without assessing the supply side of knowledge production of the country.
- Beyond TTO efforts, policy makers should not overlook the bigger picture of promoting academia-industry collaborations in general.

DEFINITION Incubators and accelerators target innovative companies and sectors, and are linked to public research organizations in order to support the commercialization of knowledge. The interventions seek to exploit the benefits of networking and spillover effects arising from co-location but vary as to the extent and duration of advisory services that may be provided as part of their suite of services.



MARKET AND SYSTEM FAILURE ADDRESSED

- Information asymmetry (accelerators).
- Capability failures (incubators).
- Network and infrastructure failures (incubators).



TARGET GROUP

- Incubators: Early-stage enterprises in specific sectors.
- Accelerators: Early-stage enterprises with high growth potential, presenting a viable business that could be scaled up.



STRENGTHS

- Network effects, technology transfer, and spillover effects.
- Economies of scale in fixed costs and service provision.
- Dedicated advisory assistance.
- Signaling and enabling high-risk investment at early stages.
- Accelerators can help identify and filter out poor business models resulting in more efficient firm development.
- Peer interaction and learning. Accelerators allow group interaction and learning among entrepreneurs.



POTENTIAL DRAWBACKS AND RISKS

- High cost of running programs and limited outreach.
- Lack of clear policy on selection criteria.
- Proliferation of programs without effective screening mechanisms.
- Risks of not achieving self-sustainability financially.
- Risk of duplicate investment. When there is insufficient coordination between different acceleration programs, some ventures might end up being accelerated multiple times.



EVIDENCE OF IMPACT

- Evidence relies on a limited number of evaluations, and there is no generally accepted approach to analyzing the effectiveness of (and distinguishing between) incubators and accelerators.
- Approaches to identification of impact, and the set of metrics, vary. Less evidence is available from developing countries than from developed countries.
- The evidence shows mixed outcomes, that are highly context specific. Some studies have found that treated firms performed better, but others show that treated firms did not perform significantly different than nontreated firms in terms of patenting, employment generation, and sales growth. Accelerator programs have been found to increase the level of company survival rates but by only the fifth year following exit. Finally, some studies have found that entrepreneurship education leads to significant increases in venture fundraising.



KEY "MUST HAVE" FOR REPLICABILITY

- Conduct a feasibility study for setting up an incubator to understand the current landscape of the entrepreneurial ecosystem, target market, and strategic direction.
- Financial commitment: Incubation takes time to achieve results.
- Competent, innovative, and knowledgeable management is critical to the success of an incubator or accelerator plus good mentors and potential investors.



DO'S

- Plan the governance structure carefully.
- Enable an accessible physical location.
- Ensure that mentors, managers and investors are seasoned business professionals.
- Develop linkages and networks.
- Understand your potential market, the deal-flow of entrepreneurs, and their needs.



DON'TS

- Don't use incubators, accelerators, and science parks interchangeably.
- Don't set up unrealistic targets and milestones.
- Don't ignore the financial sustainability strategy.

12

EQUITY FINANCE FOR INNOVATIVE ENTERPRISES (EARLY-STAGE SUPPORT)

DEFINITION Equity finance instruments involve the government providing capital used to invest in the equity of small and young high risk innovation-intensive companies, to support their growth. There are various equity finance mechanisms, which include coinvestment with individuals or angel investor groups, government run funds, or co-investment funds.



MARKET AND SYSTEM FAILURE ADDRESSED

- Information asymmetry between the entrepreneur in need of financing, and the private investor who often lacks motivation to fund early-stage ventures given the difficulty of conducting due diligence.
- Coordination failures that lead to high costs of project appraisal for investors, and high search costs for innovators looking for investment.



TARGET GROUP

- Private investors such as institutional investors and individuals.
- Venture capital (VC) fund managers, who put together prospective funds and marshal private co-investments.
- Entrepreneurs, as the ultimate beneficiaries.



STRENGTHS

- Alignment of interests: Both the investors and entrepreneurs are equally motivated to succeed.
- Risk sharing through the participation of private investors.
- Leverage the expertise and investment from the private sector.
- Spillovers to the entrepreneurship ecosystem. Incentives such as tax concessions for investors can attract experienced investors to this market segment, and they bring both capital and knowledge.
- Business angel networks as direct channel of communication between entrepreneurs and investors.



POTENTIAL DRAWBACKS AND RISKS

- The complexity of programs demands scarce policy skills and ecosystem infrastructure.
- Risk of government failure, such as lack of competence in running a fund, inappropriate decision criteria, and crowding out private investment.
- Early-stage equity can crowd out private sector resources. If interventions are not limited to cover the equity gap, there is a risk that public support of innovative start-ups and SMEs can crowd out private sector resources.
- Investments have long time frames. These interventions do not typically provide quick impacts or results.



EVIDENCE OF IMPACT

- Given that equity finance is a relatively new instrument, there are not enough data and/or methodologies to conduct rigorous evaluations.
- The reviewed studies reach mixed conclusions: five out of the eight studies report positive impacts generated by government-funded VC, while three report negative impacts.
- Several studies find that government VC schemes provide value creation only when combined with private investment
- A few studies show that managers of public funds are less involved in value-adding activities than private VC managers.



KEY “MUST HAVE” FOR REPLICABILITY

- The high complexity of equity finance requires a high level of capacity; policy makers in developing countries with underdeveloped ecosystems might consider having overseas experts train fund managers and investors.
- Schemes should follow international norms of the VC industry to attract overseas and diaspora investment.
- Effective policy design should be built on an in-depth understanding of the size, developmental stage, and availability of a country's early-stage ecosystem.



DO'S

- Ensure that there is a sound legal and investment climate environment for early-stage investors to operate within.
- Ensure that there is reasonable and growing flow of investible business opportunities.
- Always look to crowd in private investment.



DON'TS

- Don't assume there will be quick wins; this is a long-term intervention.
- Don't expect there will be many commercial successes, as most investments will fail.
- Don't assume that professionals with a banking or private equity background can adjust to being effective early-stage fund managers.

13

INDUCEMENT INSTRUMENTS (PRIZES, COMPETITIONS, CROWDSOURCING, AND HACKATHONS)

DEFINITION Inducement instruments—prizes, competitions, crowdsourcing, and hackathons—aim to trigger contestants’ additional effort to address identified problems/challenges. Inducement prizes encourage external parties to develop an innovative solution. On the one hand, this type of prize can generate effort from competitors in developing the innovative solution; on the other hand, it externalizes the risk of parties that are not able to develop a successful solution.



MARKET AND SYSTEM FAILURE ADDRESSED

- Positive externalities from tackling challenges hindering societal development that cannot be addressed by pure market mechanisms.
- Institutional failures that often prevent the development of certain technologies, especially nascent ones that possess high social value.



TARGET GROUP

- Innovation providers—any entities, including individuals and firms.
- Innovation seekers (sponsors).
- General public (innovation users).



STRENGTHS

- Openness: Can attract innovative solutions from unconventional areas.
- Distribute risks among participants and leverage public spending.
- Publicity, which might lead to public enthusiasm, venture capital investment, and contracts for innovators.



POTENTIAL DRAWBACKS AND RISKS

- Due to the ad hoc nature of technological requirements and the resulting target group, this is not a stable tool to support the build-up of deep knowledge over time.
- There is a danger of disconnection of results from a viable social solution if the prize is defined solely by the policy maker.
- Transfer of risk and inefficiencies. Prizes can generate too much effort and risk taking by those developing innovative solutions, given that most teams will not reap the reward of the innovative solution produced.



EVIDENCE OF IMPACT

- The evidence is limited, and the contexts involved have been diverse in terms of different jurisdictions, real-life settings versus laboratory settings, and ownerships of the schemes. Evidence comes from ex ante assessments, exploring design principles, rather than from reviews of ex post impacts.
- For input additionality, a few studies confirm the ability of inducement prizes in leveraging private sector investment in innovation, and the ratio of leveraging can be as high as 10 times.
- For output additionality, a few studies report evidence on prizes’ ability to stimulate new technologies, solutions, or even new innovators.



KEY “MUST HAVE” FOR REPLICABILITY

- When designing schemes, it is critical to understand the social desirability of new solutions to ensure the effort is worthwhile.
- Policy makers in developing countries should be particularly cautious in embarking on this instrument, given the uncertainty on its impact.
- Engaging with stakeholders can benefit all stages of inducement prize schemes, from sponsorship and challenge definition, to execution, and further to prototype testing and dissemination.
- Competency requirements from participants. Inducement prizes schemes are “open” to all innovators, but those innovators without resources or innovation capabilities are excluded from the process.



DO'S

- Assess the appropriateness of launching inducement schemes in the first place.
- Consider carefully the various roles government could/should play in inducement prizes (program owner, coordinator, or contributor).
- Map the various stakeholders involved and their incentives and create win-win solutions.



DON'TS

- Don't merely focus on the potential leveraging effect and ignore issues of cost and quality control.
- Don't assume that inducement schemes are low cost, since participants’ investments can be large and could be used in projects with potentially higher returns.

DEFINITION The national quality infrastructure (NQI) is part of a country's innovation system. It helps determine whether a product, process, or service meets a defined set of requirements. These functions are delivered through services that support the development of local standards, and their application, including metrology, inspection, certification, accreditation, and conformity assessments.



MARKET AND SYSTEM FAILURE ADDRESSED

- Coordination failures. Need to bring stakeholders together to develop new standards.
- Dissemination of market specifications of product characteristics.
- Information asymmetry. Firms may not know what quality standards they require or how to upgrade to meet them.



TARGET GROUP

- Firms, particularly SMEs, and industry, but also relevant for service providers and intermediaries (R&D practitioners, research labs, and scientific associations).



STRENGTHS

- Encourage positive network effects.
- Essential for ensuring product quality and consistency which are building blocks for more sophisticated innovation.
- Support internationalization of innovation processes.
- Improving innovation efficiency. Standards that reduce variability promote economies of scale and learning, with suppliers saving costs.
- Serving as a building block of innovation capability. The introduction of standards at the firm level can be an important step in building the capability for more complex innovation.



POTENTIAL DRAWBACKS AND RISKS

- Potential conflict of interests and weak governance structures.
- Imposition of obstructive requirements and technology lock-in.
- Significant compliance and conformity costs.
- Risk of private capture and constrained competition.



EVIDENCE OF IMPACT

- Most of the evidence comes from developed countries, and industries with network effects. The evidence for standards on innovation is conditional on product markets characteristics and the focus of the standards. Many of the impact effects have been modelled, and do not rely on experimental methods.
- Most of the evidence suggests that standards have a positive influence on economic growth, in terms of both GDP and employment.
- Certification has led to productivity increases.
- A few self-reported studies have found that standards were a reliable source of information for innovation activities.



KEY "MUST HAVE" FOR REPLICABILITY

- Policy makers should institute good governance that is independent from political influence. Accreditation agencies should be independent from metrology and standard bodies, to avoid perverse incentives and loss of credibility.
- Metrology, accreditation, and standardization bodies must refrain from participating in the issuance of technical regulations.



DO'S

- Engage SMEs in quality standards.
- Ensure political commitment to NQI development and standardization.
- Engage private stakeholders from the beginning.
- Avoid technological lock-in through open standardizations.



DON'TS

- Don't create parallel organizations and flat structures in setting up NQIs.
- Don't apply restrictive and mandatory technical regulations.
- Don't allow fragmentation of responsibilities over NQI and dominance from the public sector.

DEFINITION Clusters and networks supporting policies represent interventions that bring groups of firms together with other stakeholders to undertake joint innovation-related activities. These interventions can be geographically proximate (clusters) or in the same sector but spatially dispersed (networks). Innovation can include joint technology diffusion, R&D, and product development. As a mechanism to aggregate activity, clusters and networks usually work in connection with other instruments (such as grants, research centers, and/or advisory services).



MARKET AND SYSTEM FAILURE ADDRESSED

- Coordination failures that hinder firms' interactions and collaboration and cannot be addressed by firms themselves due to the costs required to run those schemes.



TARGET GROUP

- Innovative firms of all sizes.
- Related organizations, such as research organizations, technology centers, finance institutions, public agencies, NGOs, associations, and local agencies.



STRENGTHS

- Enhance policy effectiveness by benefitting from economies of scale.
- Potential for higher policy implementation efficiency enabled by geographical/virtual proximity.
- Low costs of program administration and more participation from the private sector in management.
- Enable spillovers and learning among beneficiaries. Often supports complementary activities like joint export and skill development.



POTENTIAL DRAWBACKS AND RISKS

- Risk of lock-in into clusters that have lost dynamism and competitiveness.
- Difficulty of assessing effectiveness because a wide diversity of motivations, rationales, activities, outputs, and outcomes are involved.
- Cluster management entities can absorb considerable resources but achieve little if they are not well structured and staffed.
- Complexity. Cluster interventions that generate real spillovers are inherently complex because they involve building collaboration and mutual activity across a range of actors.



EVIDENCE OF IMPACT

- There is a considerable body of literature on clusters. However, evidence on the effectiveness of deliberate cluster policy initiatives remains very limited. Given the complexity, it is hard to attribute observed outcomes to the intervention. The evidence often addresses issues related to operations of clusters/networks and "soft" impacts.
- The limited evidence suggests that the effectiveness of cluster policies in generating R&D input additionality is questionable, although innovation outcomes may increase as a result of R&D spillovers. Different participants perceive the effectiveness of clusters/networks differently. The evidence, however, is too thin to show how robust these findings are.



KEY "MUST HAVE" FOR REPLICABILITY

- Tailoring policies to the context. The reviewed studies suggest that cluster policies must be tailored to the level of sophistication of the sector. Need pre-existing industry agglomerations to work with.
- Ensure high competences of cluster managers, as well as high motivation and contribution from potential beneficiaries.
- Engage early with private sector actors and find industry champions to embed market orientation into cluster policies. The motivation and contribution from potential beneficiaries are important preconditions for cluster policies to be effective.
- Policy makers, while facilitating the set-up and maintenance of networks, should give enough space and autonomy to participants.



DO'S

- Conduct thorough assessments to identify cluster candidates, based on solid methods/data and expert views.
- Be prepared to stop support if stakeholders are simply not engaging.
- Utilize the potential of network structures to aggregate needs and coordinate the delivery of policies to industry groups.
- Identify quick wins that can prove value to participants.



DON'TS

- Don't overintervene or micromanage the dynamics of clusters and networks.
- Don't ignore the importance of effective cluster/network management for success.
- Don't try to apply clusters policies to all industries; select only the ones with potential to maximize competitive advantage.

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Rapid technological change is increasing the pressure on policy makers to improve the effectiveness of innovation policies needed to reap the benefits of innovation and technological catch-up. However, there is little information about what works when it comes to innovation policy, particularly for developing countries. Moreover, market and systemic failures that hamper innovation are pervasive in developing countries, but the institutions tasked to design and deliver innovation policies often lack the capabilities to design and implement policies that successfully address them. This practitioner's guide aims to fill this gap and support policy makers in developing countries in their quest to design more effective policies to foster innovation. It does so by rigorously describing the range of innovation policy instruments available, the evidence of impact, and more importantly, the conditions and institutional capabilities necessary to successfully implement these policy instruments in developing countries.