# 2. BUILDING INCLUSIVE INNOVATION SYSTEMS IN DEVELOPING COUNTRIES

## Challenges for IS research

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## 2.1. Introduction

Innovation systems in developing countries are different from those in mature OECD countries in a number of ways. They need to cater for different needs; they build on institutional frameworks that tend to be much less formalised, and rules that are less enforceable; and the key agents as well as the incentives that determine their behaviour tend to be very distinct.

The innovation systems literature[1] explicitly recognizes that policies need to be context-specific. Institutions develop in response to changing economic and social conditions, and vice versa. The choice of technologies depends on initial socio-economic conditions, and, as technological learning is cumulative in nature, the decisions that are taken at the start of evolutionary processes give rise to particular trajectories. As Nelson (1994) has put it, technologies, industrial structures, and supporting institutions co-evolve. This explains why technological knowledge is deeply rooted in the specific in-

stitutions of societies, and its content and availability varies across societies, even when factor endowments are similar.

A growing body of literature deals with innovation in developing countries. This chapter shows that (despite the fact that context-specificity is recognised *in principle*) a considerable part of this literature fails to appreciate important peculiarities of developing countries. In particular, it does not systematically address the specific needs for poverty reducing and socially inclusive types of innovation. Distributional effects of policies are rarely ever investigated. Furthermore, it tends to overestimate the role of governments as agents of resource allocation and to underestimate the importance of improving basic institutions of the market economy (competition, contract enforcement, entry and exit conditions, financial intermediation). Governments are often implicitly assumed to be benevolent entities that are only, or mainly, driven by their wish to maximise social welfare (even though their limited implementing capacity is often recognized). This assumption starkly contrasts with findings from research on neopatrimonialism and rent-seeking that highlight the role of states – especially in developing countries – as entities that pursue there own economic and political interests and may even show predatory behaviour (e.g. Eisenstadt 1973; Loewe et al. 2007).

As a consequence, partly inappropriate policy conclusions are drawn. For example, policies are often biased towards selective measures to deal with particular market failures at the micro and meso level (e.g. technological clusters, technology transfer centres) rather than reforms of basic market institutions (such as governance of financial markets and simplification of entry for new firms). Selective measures often involve

high costs per beneficiary and have very limited outreach (e.g. science parks; business incubators). A similar bias exists towards the State as the main coordinator and implementer of activities to foster innovation, neglecting the potential of private corporations, non-governmental organisations, or public-private partnerships as process facilitators and programme implementers. Moreover, science and technology policies should be reoriented from their current focus on R&D towards engineering capabilities; from the pursuit of "new to the world" innovations to technology diffusion; and from supporting modern urban industries to the development of innovations that improve the livelihoods of the poor.

This chapter consists of three main sections. Section 2.2 undertakes to identify the key obstacles for innovation in developing countries, emphasising the specifics of this group of countries vis-à-vis industrialized countries and pinpointing those aspects that tend to be underrated in many studies on innovation systems. In doing so, it deliberately draws on different strands of academic literature beyond the neo-institutionalist innovation systems literature. In section 2.3, policy implications are drawn, again pinpointing those aspects that complement or even contradict standard prescriptions[2] for science, technology and innovation policy. Section 2.4 distils the most relevant limitations of the ongoing innovation system debate with regard to developing countries and identifies elements for future research.

**Box 2.1 Building inclusive innovation systems in developing countries: main terms used in this chapter**

*Basic market institutions* = are those rules and regulations that guarantee a smooth functioning of mechanisms of competitive selection and help to channel resources to activities with the highest returns. These include antitrust legislation, rules for contract enforcement, financial intermediation and measures to ease the entry and efficiently regulate the exit of firms.

*Neopatrimonialism* = describes a system where politically connected wealthy persons use state resources in order to secure the loyalty of clients in the general population.

*Rent-seeking* = occurs when an individual, organization or firm seeks to make money by manipulating the economic and/or legal environment rather than by trade and production of wealth.

*Defective democracies* = display many, but not all key elements of democratic political systems. For example, elections may be held, but serious deficits remain regarding e.g. the separation of powers or human rights. Particularly relevant in this context, lobbyists may impose their interests against the will of elected representatives.

## 2.2. Specific challenges for innovation policy in developing countries

Innovation matters for low income countries as much as it matters for developed countries. Developing countries are characterized by low incomes resulting from low average productivity. This reflects their limited capacity to develop new, or to adopt and improve upon existing, technologies.

The group of countries that is usually labelled "developing" is quite heterogeneous e.g. in terms of per capita income, technological advancement, and quality of institutions. Many of them have made remarkable progress with regard to building up manufacturing capacity and integrating in global trade. As a group, developing countries have increased their share of global manufacturing exports to 30% in 2006 (UNCTAD 2008).

A large part of this success however was achieved by a limited group of countries. In her book "The Rise of the Rest", Amsden (2001) identifies twelve countries that have acquired considerable manufacturing experience: China, Indonesia, India, South Korea, Malaysia, Taiwan, Thailand, Argentina, Brazil, Chile, Mexico, and Turkey. The vast majority of developing countries is much slower in developing manufacturing capacity. Moreover, even in the case of Amsden's fast industrialisers, the rapidly expanding industrial base does not necessarily reflect a similar advance in terms of technological and innovation capacities. In fact, the ability to produce "new to the world" innovations and knowledge-based assets which are difficult to copy and therefore enable their owners to reap innovation rents is still something quite exceptional[3] in these countries (e.g. Altenburg/ Schmitz/ Stamm 2008 for China and India). The increase of manufactures in the

industrial structure of developing countries that are classified as “knowledge-intensive” does not contradict this; the bulk of knowledge-intensive manufactures in these countries is still carried out by, on behalf of, or under licensing agreements with, leading Western corporations. Manufacturing shifts to the South, but cutting edge R&D follows only slowly and to very few locations.

This section focuses on those developing countries that belong to the low and lower-middle income group and are not included in Amsden’s “rising rest”. Their low incomes reflect low levels of productivity, and they typically suffer from manifold institutional weaknesses. Enormous differences exist within this group in terms of country and market size, level of income and human development, technological capabilities, etc. What is more, divergence both in terms of overall levels of development and in terms of technological capabilities has increased substantially over the past decades. Nevertheless, the group of “other” (not fast industrialising) developing countries shares many characteristics that clearly set them apart from the high-income, highly diversified and research-intensive OECD countries. The following analysis highlights some important characteristics of this group of countries from the perspective of innovative capabilities. Moreover, it underlines those aspects that, although important from a policy perspective, are often overlooked, or at least underestimated, in recent studies on innovation systems. What follows are, of course, stylised facts. It goes without saying that practical policy-making at the country level needs to go beyond such generalisations and take the distinctive features of each individual country into account.

The analysis starts with the argument that innovation policies need to set targets and priorities that substantially differ from those in rich countries (2.2.1). It further addresses specific weaknesses of important formal institutions, such as rules and regulations that ensure competition, determine levels of entry and exit of firms, and allow financial markets to provide appropriate signals to investors (2.2.2). Special emphasis is given to the argument that developing countries tend to have limited capabilities to design, implement and monitor complex policies - an argument that challenges over-ambitious expectations towards the developmental state (2.2.3). The analysis also points out specifics of the firm structure (2.2.4).

### 2.2.1. Different targets and priorities

The main distinctive feature of developing countries is poverty. With the Millennium Development Declaration, all the world's countries and all the world's leading development institutions agreed to increase their efforts to achieve eight goals by the target date of 2015, including to halve extreme poverty, to stop the spread of HIV/AIDS and to provide universal primary education.

This has two implications for innovation policy: *First*, there is a political commitment to increase the social expenditure as well as investments in other basic infrastructure and services that are directly related to the Millennium Development Goals (e.g. roads, electricity). This reduces the scope for investments in innovation programmes that are less directly related to poverty reduction, and it explains at least partly why the share of R&D (and other innovation efforts) in GDP is much lower in developing than in devel-

oped countries. *Second*, a substantial part of those funds that are specifically earmarked for supporting innovations should be targeted to activities that help to create sustainable livelihoods and increase the incomes of the poor (Utz/ Dahlman 2007:105). Potential candidates are R&D for improved agricultural yields, water management and sanitation, or the development of cures for tropical and poverty-related diseases. The challenge is not primarily to develop "new to the world" innovations, but the development and broad dissemination of affordable and adapted technologies.

Underlying the most visible poverty impacts are, of course, deficits in economic productivity and competitiveness. To foster innovation as a driver of productivity development and, hence, higher incomes is therefore at least as relevant for developing countries as it is for industrialized countries. Still, there are strong arguments to prioritise activities that are directly relevant to the poor over others that mainly cater to the needs of the better-off.

This does not necessarily exclude investments in advanced technologies. For example, science and technology efforts in modern industries may help to develop competitive advantages in international trade and to substitute costly imports. Even hi-tech developments for exclusive markets – e.g. building up an aircraft industry in Brazil or a space industry in India – may in the long term contribute to poverty reduction *if* they generate overall economic growth and technological spillover effects. This assumption however needs to be well-founded, and opportunity costs need to be considered. Prestigious national technology projects – such as space technology in India and car manufacturing in Malaysia,– often put a heavy burden on public finances, and many of them are unlikely

to pay off in terms of socially balanced economic development. This is even more obvious in the case of military research or strategic technology projects to develop nuclear power technologies, for example in Iran and North Korea.

Moreover, technologically advanced projects often have negative distributional effects. The value chains of technologically sophisticated products usually imply high entry barriers at all stages – from R&D to production and marketing – and therefore benefit only small segments of (mainly urban) highly skilled workforce and wealthy enterprises. The costs of technology development on the other hand will largely be borne by national taxpayers. Moreover, if innovation policy involves protection of domestic producers, national consumers have to pay a markup compared to free import prices.

Take the example of Malaysia's "National Car" project. Taxpayers contribute to national subsidies for the automotive industries, such as Vendor Development Schemes, and import duties are levied on imported cars to ensure a competitive domestic price of the "National Car", Proton. Consumers thus have to pay a higher price for cars. The respective rents accrue to the Proton company and its Joint Venture partner, Mitsubishi, as well as a small number of supplier companies. In short, rents are transferred from taxpayers and consumers to a small group of protected private industries and a Japanese multinational. This may be a reasonable investment in national capacity building, provided that new competitive activities are generated in the long run. In Malaysia, despite more than two decades of protection, this has not been achieved. The Malaysian International Trade and Industry Minister recently acknowledged that public efforts to expand the local automotive industry, with emphasis on the National Car, had not yielded

the desired results.[4] For example, the component costs of domestic components for the Proton are 50 % higher than in Japan.[5] Likewise, the Indian space programme has been heavily subsidised since the 1950s and still has not yielded commercial success (Baskaran 2005).

Innovation policy is about supporting discovery processes and necessarily involves trial-and-error (Rodrik 2004, 19). Failure of publicly supported projects is thus in principle not an argument against such support. However, there is a considerable risks that infant experiments are continued beyond the point when failure is obvious, because powerful coalitions of politicians, bureaucrats and protected industrialists benefit from the status quo. This is especially problematic in developing countries where capital is scarce and fewer checks and balances tend to be in place to correct political decisions.

Technological developments may have still other negative spillovers for the poor. The recent wave of investments in biofuels for example has led to higher food prices. Rosegrant (2008) estimates that the increased demand for biofuels is responsible for about 30 % of the recent increase in grain prices. This falls especially heavy on the poor, unless they are net food producers. Likewise, labour-saving technologies may crowd out many job opportunities, e.g. new retail technologies that require economies of scales and favour supermarkets at the expense of traditional mom-and-pop stores. Hence a trade-off exists between the need to allow and even stimulate structural change to catch up with international technological practices and the need to cushion associated negative effects on the poor.

In sum, innovation policy in developing countries should protect specific interests of the poor. The challenge here is to build inclusive and poverty-oriented innovation systems: "inclusive" in terms of ensuring that the percentage of workforce and enterprises involved in innovative activities increases; and "poverty-oriented" in the sense that the technologies developed help to achieve the Millennium Development Goals. Another key challenge is to reduce the technological gap vis-à-vis industrialised countries, bringing average productivity levels closer to international best practices. Investments in national technology capabilities should focus on operating and on design and engineering capabilities for transforming existing knowledge into new configurations (Bell 2007: 48ff.). Technology adoption, adaptation, and diffusion play a much greater role than original R&D-based development of cutting-edge innovations. Moreover, the opportunity costs of investments in technology projects need to be taken into account, particularly in developing countries that face a strong moral obligation to put poverty alleviation first. Also, indirect poverty effects and distributional effects should be considered – the latter are likely to be regressive.

Innovation research so far rarely addresses poverty and distributional effects of science and technology policies. Out of several hundred papers contributed to the first five GLOBELICS conferences, for example, only two explicitly address poverty reduction in their title. Where specific sectors are investigated, these focus more often on the development of knowledge-based competitive advantages in globalised industries (electronics, automotive and aeronautic industries) than on pro-poor solutions. The question who benefits from innovations and who bears the costs (including hidden costs via taxa-

tion or inflated consumer prices) is very rarely addressed in studies on innovation policy in developing countries.

### 2.2.2. The weakness of formal institutions

Institutions shape economic behaviour. According to North (1990), institutions are the rules of the game in a society, or, to put it differently, the human devised constraints that determine interaction. Institutions comprise both formal rules and laws and informal norms and codes. In economic life, institutions have an important role in reducing transaction costs.

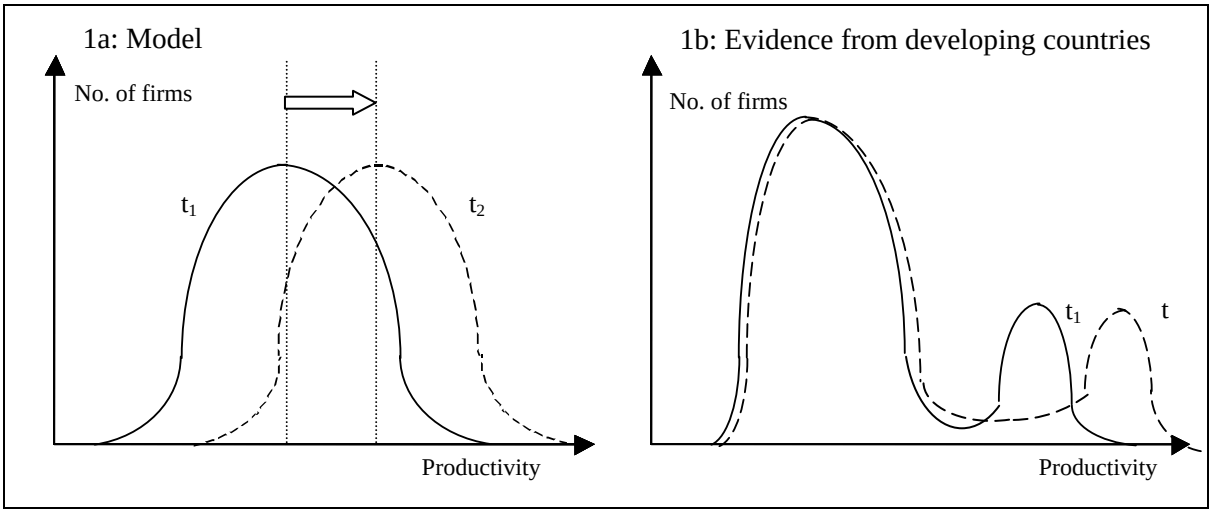
Key institutions in modern and competitive economies are markets. Markets first and foremost build on competition as a key driver of innovation. Policies that promote competition are central to raising productivity. These include antitrust legislation, fairly open trade policies, and measures to ease the entry and efficiently regulate the exit of firms.

The productivity performance of firms in a given country is usually distributed as shown in Figure 1a (see e.g. Bloom/ van Reenen 2007: 1353). In a competitive situation, the more productive firms, on the right side of the curve, will earn innovation rents, and the least efficient firms on the left side will be driven out of business. Over time, the average productivity and income increases. Several mechanisms drive this shift (see e.g. Klein/ Hadjimichael 2003: 23):

- *technological learning*: existing, but less efficient, firms will try to emulate the good performers;
- *entry and exit*: new innovative firms will enter the business using more productive methods, thereby challenging and eventually replacing established ones;
- *mergers and acquisitions*: the market for corporate control provides a better match of resources – business ideas, assets, human capital, finance. This market can be conceptualised as "an arena in which managerial teams compete for the rights to manage corporate resources" (Jensen/ Ruback 1983);
- *flows of finance and human capital*: The financial system transfers money to the best performing companies, and skilled workers move to where they can earn more.

[figure 2.1 about here]

Figure 2.1 Distribution of firms by level of productivity – model and evidence from developing countries




Source: own

These mechanisms of competitive selection are the major driving forces of innovation in market economies. Its dynamic however presupposes the smooth functioning of the underlying selection mechanism. Bloom/ van Reenen (2007) for example show that the "tail end" of less productive firms disappears faster if product market competition is strong. Most importantly, competition should not be hampered by monopolies; entry of newcomers should not be restricted to protect incumbents; exit of firms should not be held back by inappropriate bankruptcy laws; and resources should be allowed to float freely from less to more remunerative activities (World Bank/IFC 2007). Especially financial markets have a key role as a signalling device that helps to channel resources to activities with the highest returns, which tend to be the most competitive and innovative ones.

In developing countries, formal rules and laws are less well developed and, more importantly, their enforcement tends to be unreliable and arbitrary (ibid.). Moreover, governments influence resource allocation in many ways. This often reflects well-intentioned efforts in the pursuit of developmental goals, e.g. to strengthen activities that are expected to generate important spillovers; but interventions are also often abused to favour politically connected entrepreneurs, clans, industries, or regions, or to extract rents for politicians or bureaucrats. In the real world, both motives may often be interwoven. The results of such interference rarely stimulate innovative behaviour. IFC's series of Doing Business Reports shows that the governments of less developed countries tend to impose comparatively heavy administrative burdens on firms. Especially cumbersome

licensing procedures hamper the entry of new firms (Djankov et al. 2002). Moreover, tariff and non-tariff barriers to trade limit the entry of foreign competitors; financial and labour markets are often heavily regulated, and superposed by informal rules that distribute credits and jobs according to criteria other than efficiency; state monopolies and arbitrary pricing policies protect domestic firms from private sector competition; severance laws to protect small privileged groups of formal sector workers hamper labour mobility, etc. (Biggs/ Srivastava 1996; Botero et al. 2004). Even those policies that are explicitly intended to strengthen national industries rarely lead to success. Lall (2000: 31), for example, summarises the results of industrial policy in Africa as “abysmal”.

The lack of transparent and efficient legal institutions is another key problem. It makes contract enforcement very difficult and increases investment risks and transaction costs. Informal institutions that are based on trust and reciprocity can only partly substitute binding economy-wide rules, and they often systematically exclude outsiders. As a result, long-term investments are discouraged, and entrepreneurs induced to concentrate on activities that promise quick returns (e.g. import trade rather than manufacturing). Likewise, firms tend to avoid dependence on other firms, either by producing in-house or importing from abroad. This reduces the benefits of inter-firm specialization and interactive learning and leads to typically short value chains (Dussel Peters/ Piore/ Ruíz Durán 1996).

Innovation systems research rarely explores the importance of markets and market-enhancing institutions in a systematic way. It recognizes, of course, the role of well-functioning markets and “market-supporting institutions related to the security of prop-

erty rights, good governance and measures to restrict corruption" (Lundvall/ Intarakumnerd/ Vang 2006, 4). Moreover, it relaxes overly rigid assumptions of neo-classical economics and introduces institutions as constraints. This is a great merit as it allows us to address innovation as a complex systemic process that is embedded in manifold institutions (many of them non-market !), and it highlights the quality of institutions and their functionality for technological learning.

As Cimoli et al. (2006) put it, "non-market institutions (ranging from public agencies to professional associations, from trade unions to community structures) are at the core of the very constitution of the whole socio-economic fabric. … they offer the main governance structure in many activities where market exchanges are socially inappropriate or simply ineffective." Consequently market failures – e.g. collective action problems, asymmetries in information markets – occupy a centre stage in research. This is not least because innovation research focuses on information, knowledge, and learning – all domains where market failure is especially pervasive. Studies rightly emphasise the non-rival and non-excludable character of information, increasing returns to information, the tacit aspects of knowledge, etc. (Greenwald/ Stiglitz 1986). With regard to trade policy for example, innovation systems research has shown that it is not so much the degree of openness to trade and foreign direct investment that explains performance, but the ability to take advantage of them in terms of technological learning (Fagerberg /Srholec 2005: 44), and it has provided insights on how to shape institutions in order to exploit positive spillovers.

As a consequence, a strong research focus is placed on the role of *non-market* institutions. A growing body of literature deals with knowledge brokerage and network building, the role of university-enterprise linkages, science and technology parks, and other public support mechanisms for technology transfer and learning. These also constitute the core of Science, Technology and Innovation Policy reports – for industrialized and developing countries alike (e.g. UNCTAD 2005). The effects of administrative entry barriers for small firms, financial sector regulation, markets for corporate control, competition policy, labour market regulation, etc. on firm productivity are an important subject of traditional neoclassical economic research (de Soto 1989; Botero et al 2004, Levine 1999), but not addressed systematically in the neo-institutionalist and evolutionary research community, and often not reflected in policy reports. Reviewing for example the lists of GLOBELICS conference papers or recent editions of pertinent journals[6] these topics rarely appear. What is more, the neoclassical research is rarely quoted, or challenged.

With its focus on non-market institutions, however, the innovation systems research risks to lose sight of market-enhancing institutions that are key for any national innovation system, most notably competition policy; financial sector governance; regulations of firm entry and exit; labour market regulation; and rules for corporate control. This is not a plea for returning to the rigid assumptions of neoclassics.[7] Instead, neo-institutionalist perspectives are needed to better understand how these institutions interact with national innovation systems and how these should be shaped to enhance technological learning.

### 2.2.3. Less effective and accountable governments

Innovations are prone to market failure. Governments thus have an important role in overcoming these market failures and fostering the development of competitive advantages. This holds especially for developing countries where many markets are not fully developed and where sophisticated institutions that increase the transparency of markets have not yet evolved. Moreover, innovation policy in these countries needs to address poverty problems, as shown in section 2.2.1. Many of these problems are unlikely to be solved by market forces alone, e.g. the empowerment of poor people or the provision of basic health services. Governments thus have a role in, for example, disseminating information, supporting grassroots innovators, creating specific incentives for researchers to provide knowledge inputs to the poor, or setting up funds to acquire rights to pro-poor technologies (see e.g. Utz/ Dahlman 2007: 117 ff).

It would be naïve, however, to assume efficient welfare-maximizing bureaucracies. Industrial and innovation policies are always prone to political capture (Pack/ Saggi 2006; Rodrik 2004). Studies on the political economy of the State highlight that the latter is an autonomous entity that pursues its own interests. On the one hand, bureaucrats benefit from expanded State activities and therefore have a strong incentive to increase their scope of activity. “Since bureaucrats derive utility from higher salaries and greater power of their bureaux, it is rational for them to maximise the budget of their bureaux rather than to optimise the social output.” (Chang 1996: 22). On the other hand, interest groups may influence public regulation for their own benefit. The State may thus be

conceptualised as an arena within which economic interest groups or normative social movements struggle for the allocation of funds and the shaping of regulations in a way that benefits them (ibid: 20). Moreover, even if the selfish interests of bureaucracies and the influence of interest groups are “assumed away”, there are serious doubts about the *ability* of states to take appropriate decisions that improve innovative performance. There is little reason to presume that public officials are better informed about current and future markets than entrepreneurs.

Industrial and innovation policies thus necessarily carry the risk of government failure. This is not an argument against such policies; but it calls for careful consideration whether the expected benefits in terms of corrected market failures can be expected to be greater than the costs of government intervention in terms of expenditure plus eventually decreased effectiveness of distorted markets.

This applies to industrial and innovation policies anywhere. In developing countries, however,

the risk of government failure tends to be much greater than it is in mature democracies. First, the ability of administrations can be expected to be lower as these have fewer resources and are less well-organized. Second, and more importantly, there tend to be fewer checks and balances. In mature democracies, policymakers are held accountable through a variety of instruments including democratic bodies (e.g. parliaments, political parties), an independent judiciary, general accounting offices, compulsory evaluation routines, taxpayers organizations, and an independent press. Such institutions of control are often weak, not fully independent, or even missing in developing countries.

This applies not only to authoritarian regimes. Many of the formal democracies in developing countries are categorised as "defective" (Merkel/ Croissant 2004) or "hybrid regimes" (Diamond 2002) in the sense that they combine democratic and authoritarian elements. In such systems, the exchange of favours between politicians and interest groups is a widespread phenomenon. Politicians and bureaucrats often use access to public funds as a means to stabilise their power. As bureaucracies are often poorly financed, and submitted to fewer controls, corruption is more widespread. All this greatly increases the risk that government programmes are "captured" by politicians, bureaucrats and/or industrial elites. The World Bank's Worldwide Governance Indicators (WGI) for "government effectiveness", "regulatory quality" and "control of corruption" show a very clear pattern, whereby OECD countries occupy the upper percentiles and developing countries the low percentiles (Kaufmann/ Kraay/ Mastruzzi 2008).

It is therefore not surprising that only a relatively small number of success stories are reported from developing countries where government action has been instrumental to spur new or to strengthen knowledge-based activities. These examples mostly come from middle-income countries that rank fairly high on governance effectiveness indicators (e.g. salmon farming in Chile; aircrafts in Brazil; electronics in Malaysia).

Innovation systems research on developing countries largely shares the view that "in contrast to the neoclassical position that the removal of governments restores economic efficiency, it is the strengthening of governments that is needed to make markets work properly" (Lall 2000: 34). Most studies identify numerous market failures and claim a

more active role of public policy, often providing lists of desirable corrective government policies (e.g. contributions to Muchie/ Gammeltoft/ Lundvall 2003).

It is mostly acknowledged that few governments of developing countries are *capable* of applying sophisticated policies on a level equivalent to developed countries, whereas the *willingness* of governments to act in the best long-term interest of broad-based technological learning seems to be taken for granted. The risks of government failure in terms of waste of funds, corruption, additional red tape, crowding out of private service providers, or further distortion of incentive systems are rarely addressed. Hence it is implicitly assumed that more state activity is normally conducive to innovative development.

This assumption needs to be tested. While there is no doubt that even weak states have a certain role in correcting market failure, the limitations of political systems with few checks and balances need to be part of a comprehensive policy analysis. The challenge is to design innovation policies in a way that reflects the ability of governments and the risks of political capture. In many poorly governed developing countries this may mean to favour instruments that are relatively simple and easy to monitor (e.g. self-targeting ob beneficiaries, simplification of procedures), non-selective (because selection of beneficiaries may be arbitrary) and implemented through non-governmental channels (private service providers, business associations, NGOs). Further research is needed to define appropriate sets of policies for countries with different levels of government effectiveness.

### 2.2.4. Less diversified and integrated firm structures

The structure of the private sector in developing countries and its performance differ strongly from those in industrialised countries. This reflects largely different framework conditions including, for example, weaker legal systems (less secure property rights, less reliable contract enforcement, higher transaction costs), different demand conditions (considerably lower purchasing power, demand for fewer and less sophisticated products, often small market size), deficient infrastructure (higher transport and production costs), weaker education systems (from primary education to vocational training and universities), and higher macroeconomic and price volatility. Many of these conditions hamper innovations. While a comprehensive analysis of specific features of private sector development in developing countries and its innovative capacities is beyond the scope of this paper,[8] five of the most striking characteristics shall be highlighted due to their implications for specific innovation policies.

First, the **sectoral composition of the economies tends to be different and less diversified**. The economy, and exports in particular, often depend to a great extent on agriculture and extractive industries. Manufacturing is mostly dominated by simple consumer goods for basic subsistence (food, clothing) given that the vast majority of consumers only demands a limited range of standardized products. Policy therefore needs to emphasise economic diversification.

Second, the **private sector engages less in innovation**, in particular of the "new to the world" and "new to the market" type (according to classification provided by OECD 2005). Most firms are limited to non-innovative purchase of technology or minor improvements (Bell 2007, 25). Enormous productivity leaps can be achieved by bringing average productivity closer to international best practice. The focus of innovation policy should therefore lie on diffusion of existing technologies that are nevertheless new to firms in developing countries. Likewise, research and development should not be seen as the main input to innovation; instead, innovation in these countries is an "engineering-centred" process (ibid.: 28), and capabilities should mainly be developed that enable forms to incorporate and upgrade existing technologies.

Third, **informality is a widespread and increasing phenomenon.** Figure 1b shows that the distribution of firms according to their levels of productivity differs from the model distribution 1a that has been verified for industrialised countries.[9] Several specifics are remarkable. First, there are two productivity peaks, reflecting the co-existence of two segregated subgroups of firms. The majority of firms – generally micro and small firms in the informal sector – display considerably lower levels of productivity than the rest of the firms. Second, productivity in the less efficient group hardly increases, whereas the more productive group does increase its productivity. As van Biesebroeck (2005) observes, "transitions between size classes or movements in the productivity distribution are very slow (…). Large firms remain large, and more productive firms remain at the top of the distribution. Smaller and less productive firms have a very hard time advancing in the size or productivity distribution."

This suggests that the Schumpeterian dynamics of creative destruction – whereby more efficient new firms challenge incumbents and drive less efficient firms out of business, and resources are reallocated to the higher productivity end – does not work well in developing countries. Why is this the case? Empirical evidence shows that entry and exit happens very frequently. In fact, small firms in developing countries are short-lived. The striking phenomenon is that great numbers of new informal enterprises enter the market with the same obsolete levels of productivity as those that exit.

Mead (1994) provides a plausible explanation for the finding that poor countries tend to have many start-ups without increasing productivity. He distinguishes between "supply-push" and "demand-pull" entrepreneurship. While "demand-pull" entrepreneurs are "pulled" into entrepreneurship because they have a business idea that challenges incumbents and promises high returns on investment (the "Schumpeter effect"), "supply-push" entrepreneurs are pushed by unemployment. Poor unemployed people create new micro-enterprises or become self-employed in order to compensate for the declining family income, even if they see market opportunities for their activities getting worse. "Supply-push" enterprise formation is symptomatic for poor developing countries lacking social safety systems. As founders of firms typically lack specific skills and seed money, their economic activities are restricted to traditional activities with low entry barriers, which translate into over-supply, fierce price competition and very low profits. As a result, not only exiting firms but also entering firms are often less productive than incumbents on average (Tybout 2000, 28), and high firm turnover is coupled with stagnant productivity. So far, the implications of this segregation for the formation of integrated national innovation systems have not been investigated. From a policy perspec-

tive, support mechanisms are needed to reduce the (currently widening) productivity gap and to ease the transition of firms towards the high end of the productivity distribution.

Forth, **levels of specialization and interaction among firms are low**. The availability of domestically produced intermediate and capital goods is often limited, thereby leaving firms with the choice to conform with low quality inputs, to integrate vertically, or to import. In addition, market volatility and the difficulties to enforce contracts make inter-firm cooperation risky. As a result, value chains tend to be short and incomplete. Most firms sell directly to final customers (Tybout 2000, 17). Although some cases of impressively innovative enterprises can be found in developing countries, these typically remain isolated and encapsulated, lacking linkages with complementary dynamic enterprises upstream and downstream in the value chain and with specialized technology institutions (Arocena/ Sutz 2001, 58). Hence they fail to give rise to national clusters or broader patterns of specialization. In fact, local clusters of small enterprises tend to be less specialised internally than their counterparts in rich countries (Altenburg/ Meyer-Stamer 1999). Hence inter-firm cooperation – one of the key drivers of technological learning in industrialised countries – is comparably weak. The policy challenge is thus to strengthen inclusive value chains and diffuse technological learning from existing “islands of efficiency”.

Fifth, the **share of FDI in total fixed capital formation tends to be high**, especially in high-productivity sectors (Bell 2007). Foreign corporations play an important role as their productivity levels tend to be far above average, and they may be a valuable source

of new technology for local firms. Foreign firms may bring in technological know-how, marketing and management skills, export contacts, reputation. Conversely, they may also discourage domestic technological efforts if they are far superior to their local competitors. A number of econometric investigations using firm-level data have been carried out in order to verify to what extent such spillovers occur in developing countries. Their findings are quite diverse and depend on the country and sectors examined (Görg/ Greenaway 2004). Aghion et al. (2006) show that the effects depend on initial capabilities of incumbents. For innovation policy it is crucial to understand when the entry of foreign firms encourages and when it discourages technological learning. This lays the basis for promoting the entry of firms that are likely to stimulate national economic development, and regulating entry where it is harmful. Moreover, it is crucial to improve the absorptive capacities of national joint venture partners and local suppliers in FDI-driven value chains.

In sum, innovation systems research needs to take the peculiarities of developing countries in terms of firm structure and dynamics into account. More research is needed to explain the barriers to technology diffusion towards the informal sector. Despite several decades of discussion on the informal sector there is still no consensus on the reasons for the astonishing persistence of large segments of low-productivity firms. While neoclassical economists mainly blame labour market segregation and administrative entry barriers, structuralists emphasise multiple market failures in financial, educational and information markets as the main reasons (see Chen 2004 for a literature review). Future research should look into knowledge flows and barriers within the informal sector and between formal and informal firms.

## 2.3. Key elements of innovation policies for developing countries

As the analysis in the previous section has shown, the needs and conditions for innovation policies in developing countries are quite different from those in mature industrial economies. This section draws policy conclusions that result from the specific features of innovation systems in developing countries.

Developing countries are often trapped in a vicious circle where poverty limits the scope for investments in innovative capacities as well as for building up efficient institutions; the lack of efficient and accountable institutions in turn creates incentive structures that favour rent-seeking rather than innovations. The role of the state is thus ambivalent: On the one hand, a greater role is required to compensate for pervasive market failures; on the other hand, overregulation and political capture of scarce public resources are especially common in these countries. This diagnostic calls for a heterodox reform agenda that combines elements of deregulation, public sector reforms, and selected pro-active government programmes.

Many policy needs are similar to those in developed countries. As in developed countries, there is a need to support product differentiation and sectoral diversification since development is path-dependent on the opportunities opened by the capacities generated by previous activities. The public sector has an important role in dealing with the information and coordination externalities inherent to new activities. The following para-

graphs however address key elements that are specific to, or at least especially relevant for, developing countries.

Especially in poor countries, **innovation policy should focus on inclusive innovations and their diffusion**. Innovations are inclusive if they benefit the poor in terms of additional income and employment. Although creative destruction is part of the process of innovation, the emerging productive activities that replace less efficient ones should be accessible for poor people. While labour market rigidities may explain part of the problem, skills development is most likely to be the key binding constraints for integrating poor workforce in competitive industries. Especially relevant are innovations in those areas where poor people live and work, e.g. a focus on upgrading of agriculture (incl. forward and backward linkages, post-harvest handling etc.). Moreover, policies should focus on outreach. Many selective industrial and innovation policies benefit only small percentages of the target population – e.g. a few dozen industrial clusters at the village level, but hardly all villages – since the number of beneficiaries is limited by the amount of subsidies. Moreover, these programme are often not sustainable as they expire when governments run out of funds (Committee of Donor Agencies 2001). Sustainable policies in contrast intend to develop markets for enterprise services, e.g. subsidies are channelled through commercial service providers. This enables users to choose between different service companies; competition puts pressure on suppliers to offer good quality and behave in a customer-oriented way.

The **focus of policies should shift from selective micro or meso level interventions to improving the functioning of basic market institutions**: improved governance of fi-

nancial markets, competition policy, simplification of business procedures, property rights reforms, labour market reforms, etc. It has been shown that these institutions are important to speed up the process of learning and shifting resources to more productive uses. Also, improvements in these areas may benefit firms across-the-board, rather than few privileged beneficiaries. It is important to note, however, that this does not call for wholesale deregulation. Institutions are to be designed in a way that triggers technological learning in a socially inclusive way. With regard to labour market policy, for example, cutbacks of excessive obligatory severance payments may be required on the one hand (because they induce labour market rigidities) while it may be necessary to create new incentives for firms to invest in human capital, on the other. Likewise, certain meso institutions are essential for the functioning of markets. A coherent system in the field of Metrology, Standardization, Testing, and Quality Assurance for example is important to enhance transparency, create incentives for upgrading, and enable firms to comply with the demands of international trade.

The **role of non-governmental agents as policy implementers and drivers of change should be encouraged**. Formulating and implementing successful sector policies requires a "highly capable, coherent economic bureaucracy closely connected to, but still independent of, the business community" (Evans 1998: 66). As shown in the previous sections, this capability can not be taken for granted; and more importantly, governments may use their mandate and resources to increase the political power or even extract personal rents.

Non-governmental agents are therefore a promising alternative for developing public goods. One option is full or partial privatisation of basic services (World Bank 2003). Services may be delivered through Non-Governmental Organisations. In India and Bangladesh, NGOs already play an important role as facilitators of rural innovations. The Self-Employed Women`s Association's Trade Facilitation Centre in India engages in market research, product development, capacity building, development of software in local languages and a number of networking activities (Utz/ Dahlman 2007: 123). Likewise, international networks of not-for-profit organisations (e.g. Global Initiative for the Eradication of Malaria; Global Research Alliance) complement or substitute functions of national innovation systems. Last but not least, private corporations provide innovation services on a non-commercial basis, sometimes as part of their Corporate Social Responsibility Engagement, partly encouraged through matching grants schemes. While non of these non-governmental agents can and should fully substitute sovereign governments, they can play important complementary roles. More research should be devoted to exploring the role of these actors in national innovation systems.

**Governments should always be held accountable for policy outcomes.** It has been shown that developing countries lack checks and balances. As a consequence, politicians and bureaucrats can, and do, employ public programmes in exchange for political or material favours. Establishing checks and balances should be a *conditio sine qua non* especially in countries where favouritism is widespread.

Due to the scarcity of public resources, the risk of political capture and the need for public legitimacy, it is especially important that decisions about sectors and activities to

be supported are based on a fair amount of research and experts opinion, considering a range of views and options (Bullock/ Mountford/ Stanley 2001: 14). Once decisions have been made, they should be subject to continuous, automatic monitoring and independent third-party evaluation. Monitoring and evaluation must be guided by prior defined performance criteria and benchmarks and include the views of all stakeholders. Performance should be measured in terms of outcomes rather than outlays.

Furthermore, bureaucracies require incentives to improve their performance, e.g. to increase their customer-orientation and ensure business-like service provision. Getting the incentives right seems to be much more important than creating new organizations. Such incentives include to separate funding from service delivery; to encourage competition among service providers; to define conditionality and sunset clauses so that barriers for removing benefits will not emerge and policies remain flexible to changing needs.

## 2.4. Conclusions for the study of innovation systems in developing countries

The previous sections have revealed some gaps and biases in the current academic debate on innovation systems in developing countries. Three aspects are particularly worrying and call for additional research:

First, the **neglect of poverty reduction and distributive effects of policies** in the analysis of innovation systems. As shown in section 2.2.1, innovation systems should, and partly do, pursue goals and set priorities that are different from those in rich countries. Poverty reduction is a key concern, and poverty impact assessments should be part of any policy. Innovation necessarily involves "creative destruction" of less efficient ventures, which are likely to be the ones that are run by poor and unskilled people. This is not necessarily a bad thing if the displaced persons find new income-earning opportunities in more productive organisations; reality shows, however, that structural change is not a smooth process, and certain protection or support may be required to make it socially inclusive. Current research on innovation systems however is largely de-linked from the poverty reduction debate and only rarely addresses distributional aspects. Future research should correct this, focusing more on questions of who benefits from innovations and how these affect the livelihood of the poor. Of particular relevance is the phenomenon of stagnant productivity in the informal sector. Research is needed on the generation, absorption and diffusion of knowledge in informal firms and the barriers to knowledge transfer between formal and informal firms.

Second, the **lack of studies addressing the political economy of the public sector** in innovation policy. Governments in developing countries are not only less effective on average than their counterparts in OECD countries, but they also show higher levels of favouritism and corruption. Innovation systems studies frequently claim a more active role for the public sector – without systematically addressing the risks of government failure. This reflects quite heroic assumptions about benevolent developmental states. More emphasis should therefore be given to analysing the political economy of the

public sector, e.g. looking into the trade-offs between selective policies and favouritism, exploring ways of insulating policy formulation and implementation from rent-seeking, and investigating innovative mechanisms of service delivery through non-governmental channels or public-private partnerships.

Third, the **neglect of basic institutions of the market economy**. Innovation systems research and most Science, Technology and Innovation Policy reports for developing countries focus on non-market (e.g. publicly financed learning networks, technology transfer centres) rather than market institutions. The latter however explain a considerable part of the innovative performance of developing countries. Reforms are needed to improve financial sector governance, simplify business registration in order to speed up entry of firms; ensure competition; or to increase the flexibility of labour markets. More research is needed to understand how these institutions interact with national innovation systems and selective policies, and how they should be shaped to enhance technological learning. In a similar vein, innovation systems research emphasises selective policy instruments (e.g. specific sector policies, technology networks, incubators and science parks). Such policies often have limited outreach, benefiting relatively small groups of firms. Policies that improve the allocative efficiency of markets in general – e.g. the above reforms – in contrast can be expected to have nationwide impacts. This again calls for more research on the functioning of basic institutions of the market economy.

As shown, the above misperceptions have led to partly inappropriate policy recommendations. Addressing these research gaps and correcting certain biases will increase both

the explanatory power of innovation systems research and its relevance for policymaking in developing countries.

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NOTES

[1] I refer here to the body of literature that goes back to new institutionalist and evolutionary research approaches (Freeman 1987; Lundvall 1988; Nelson/ Winter 1982) and stresses the role of intangible investment in knowledge accumulation and systemic characteristics of technological development.

[2] See for example UNESCO's African Science, Technology and Innovation Policy Initiative and UNCTAD's Science, Technology and Innovation Policy Reviews, e.g. UNCTAD (2005).

[3] With the exception of South Korea and Taiwan which have developed strong innovative industries and whose science and technology indicators are comparable to those of other technologically leading countries.

[4] http://thestar.com.my/news/story.asp?file=/2008/7/16/nation/21830454&sec=nation

[5] Ibid.

[6] E.g. Research Policy; Industry and Innovation; and Technovation.

[7] Elsewhere we have discussed the limitations of, for example, the influential Doing Business reports by World Bank/IVC (Altenburg/ von Drachenfels 2006; Arruñada 2007).

[8] For an overview see e.g. Tybout (2000).

[9] For lack of consistent and reliable data the curve is not based on consistent data sets; rather, it has been constructed in a stylised way from different sources, e.g. van Biesebroeck (2005) for Africa and Weller (2000) for Latin America. Both studies confirm that productivity differentials between small and large firms are enormous and widening, as productivity in micro and small firms hardly increases.