

Industrial Policy, Information, and Government Capacity

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Abstract

Governments are resource and bandwidth constrained, and hence need to prioritize productivity-enhancing policies. To do so requires information on the nature and magnitude of market failures on the one hand, and government's capacity to redress them successfully on the other. The paper reviews perspectives on vertical (sectoral) and horizontal (factor markets, cluster) policies with an eye to both criteria. It first argues that the case for either cannot be made on the basis of the likelihood of successful implementation: for instance, educational and picking the winner types of policies both run the risks of capture and incompetent execution. However,

the profession has been able to establish more convincing market failures for horizontal policies than for vertical policies. Most of the recent approaches to identifying failures around particular goods, the paper argues, are of limited help. Hence, for a given difficulty of execution, the former are generally to be preferred. A second critical message is that improving the quality of governance in terms of collecting information, coordination ability, and defending against capture is critical to successful implementation of productivity policies and should be central on the policy agenda.

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I. Introduction

Governments routinely intervene in the economy in the pursuit of higher growth rates. Conceptually, such interventions are justified by market failures that can be found in many aspects of the economy: the production of particular goods, the accumulation of human capital, the provision of infrastructure, and in the interactions among firms. As a group, these policies are sometimes termed “Productivity Policies,” although the narrower focus on particular sectoral support has traditionally been termed “Industrial Policies.” Standard welfare theory suggests in all cases that there is a role for policy to redress these failures, ideally as close to the distortion as possible.² Historically, some state interventions, for instance, in education and infrastructure, are large and relatively uncontroversial. Others, such as targeting of particular economic sectors for support, are more so.

This paper reviews the literature in this area, albeit not exhaustively, locating it in a simple organizing framework: given finite resources, including government span of attention or bandwidth, and capacity, some rough ranking of the policy space is useful for prioritizing policies along two dimensions- the likelihood of a market failure important for growth and the likelihood of developing a successful policy to redress it. The first sections of the paper discuss the first consideration across vertical (sectoral) interventions, horizontal interventions related to factor markets and then horizontal interventions related to cluster and spatial policies. The final section considers how governments may improve their management of the information and political economy demands of productivity policies.

II. Identifying Effective Productivity Policies

In prioritizing policies, governments need to be guided by two broad considerations.

Likelihood of an important market failure: The first relates to information: can we identify with confidence the nature and magnitude of a critical market failure? More specifically, we ask two guiding questions:

1. *Can we establish a clear market failure from the data?*

² In principal, removing one of multiple market failures can be welfare reducing as per the theory of second-best (Lancaster and Lipsey, 1995).

2. *If we can, is this where policy should focus, or are there other market failures or distortions that are likely to be more important?*

Answering these questions requires substantial information. It is not enough to note, for instance, that a product is not being produced or a desirable outcome is not observed- policy makers need to identify and quantify a market failure driving these outcomes. But answering both questions is critical. Governments have limited bandwidth and capacity and hence the pursuit of one policy will necessary exclude another.

Likelihood of successful government redress of the market failure. On the other side of the ledger is the capacity of the government to design and execute an appropriate resolution of the identified market failure. The classic concerns here are the diagnostic, coordinative and executive capacity of governments, and the potential for distortionary rent seeking.

We broadly divide the policy space into Vertical and Horizontal market failures and hence interventions.

Vertical (sectoral) interventions: If producing a certain product is thought to generate externalities that make social returns higher than private, then policies that seek to increase the production of that good we consider “vertical.”³

Horizontal interventions: Market failures that do not pertain to a particular good but which are to greater or lesser degree economy wide we term “horizontal.” These tend to be related to factor markets and range from infrastructure provision, to public education, to general innovation subsidies. Though benefiting sectors that use that factor intensively disproportionately more than others (See Rybczinski 1955), they affect many sectors at once, some that do not yet exist, and hence are considered *ex ante* horizontal compared to vertical policies specifically targeting the production of a good per se. Within this group, we include *Coordination and Cluster policies* which we discuss separately in section V. Productivity advance may require the simultaneous provision of factors, pursuit of compatible

³ Unlike IADB (2014) the difference between vertical and horizontal policies lies in where the market failure inheres. We think the real debate is about whether we should be “picking winners” and not whether we resolve the manifold human capital, infrastructure or other failures that may disproportionately affect one sector.

policies, or resolution of a problem/exploitation of an opportunity involving the concerted effort of many firms. The necessary coordination may not occur naturally.

Market failures can be conceptually identified in either class of intervention. The same is true with government failures in policies designed to alleviate them. Numerous cities in even advanced countries have proved unable to generate quality secondary education for governance reasons. Infrastructure, while seemingly straightforward in terms of execution, is often plagued by corruption that can make societies resistant to invest. Cluster or other spatial policies are open to both problems and are especially sensitive to government ability to coordinate several subcomponents at once. While there is a long-standing concern around vertical policies that chosen sectors may capture the political process to guarantee continued special treatment, in fact, providers of horizontal services also have substantial and arguably more leverage with which to defend their privileges, precisely by being able to affect many sectors at once. Hence, the case for horizontal vs vertical (sectoral policies) probably cannot be based on the argument that governments will uniquely mismanage the former.

In the next sections, we review both types of interventions from the perspective of the information needed to establish a clear and important market failure, and then discuss several considerations around government implementation of remedies. We further discuss the meta-agenda of designing interventions that they are easier to implement and more insulated from possible government failures.

III. Vertical (Sectoral) Policies

The argument for promoting particular sectors generally rests on Marshallian externalities. These are local externalities that lead productivity to rise with the size of the industry and they may arise for numerous reasons – local industry level knowledge spillovers, input-output linkages, and labor pooling, for instance- but which are not captured by the market price of a good.⁴

⁴ Harrison and Rodriguez-Clare (2010) show in a simple example where world prices are taken as given that multiple equilibria exist: The market may dictate that a country specializes in the good without externalities when, with some intervention, it would more efficiently specialize in the good with externalities.

Can we establish a clear market failure from the data?

Empirically, these effects have proved difficult to document and quantify, let alone permit a ranking of goods by their potential for externalities or rents. Rodrik (2004) makes this point in *Industrial Policy for the Twenty-First Century*: “I start from generic market failures, but then I take it as a given that the location and magnitude of these market failures is highly uncertain.” (p. 3). This almost agnostic view is supported by Pack and Saagi (2006) and Harrison and Rodriguez-Clare (2010) who review much of the industrial policy literature per se.

The problem is compounded by a worsening data challenge: As production becomes more fragmented, countries trade tasks, not goods, although official statistics only measure the latter. China does not export the high tech i-phone, rather it exports low to medium skill assembly tasks.⁵ Hence, trying to identify externalities based on what is reported in the official export statistics is fundamentally misleading. A second challenge arises from recent literatures that stress that export success is less about sectoral growth than about a few “big hits,” which account for most of the export value, and where the “hit” includes a match between a very disaggregated product and a particular geographical market. This suggests that the relevant policy target is likely to be the entrepreneur rather than a sector per se.⁶

Our overall empirical blindness on these points has led to the literature developing shortcuts to identifying potentially good sectors, three of which we discuss below.

⁵ First, in a world of increasingly fragmented production where some estimate that 50% of trade is somehow involved in GVCs with substantial trade in intermediate inputs, countries are increasingly trading tasks, not goods. Trade statistics show that China exports the iPhone and Vietnam silicon chips, but in fact it only produces assembly tasks worth 1-2% of the value added of the product. In fact, electronics is one of the *lowest* value added sectors in China. Hence, while the focus probably should be on externalities pertaining to tasks, the data we have are on final goods.

⁶ See Easterly, Reshef and Schwenkenberg (2009). Similarly, Bernard et al. (2012) find that approximately 40 percent of exporting firms in the United States exported a single product to a single destination. Exporting is also rare in that a group of very large firms stands out from the rest.⁶ Therefore, the difference between successful and unsuccessful exporters is found not in the degree of sector specialization, but in the scale of the “big hits.”

Is this distortion where we should focus, or are there other market failures, distortions or considerations that are more important?

Even if we knew for sure that a particular good offered important externalities, the tremendous heterogeneity in the way in which even very narrowly defined goods are produced across countries should give us pause. Recent academic papers find vast differences in level of productivity (Foster et al. 2008 Muendler 2004, Herrendorf and Rogerson 2014) and quality (Schott 2008, Khandelwal 2010) within very disaggregated goods categories across firms and countries.⁷ Baldwin (1969), Perry et al (2002), Rodriguez Clare (2007), and Lederman and Maloney (2010) further caution that expanding a sector with potential externalities does not necessarily imply that they will automatically occur if the sector is not organized appropriately. As examples, at the beginning of the 20th century, copper mining in the US led to a knowledge network in chemistry and metallurgy that laid the foundations for subsequent diversification and industrialization, while in Chile the same industry nearly died (Maloney and Valencia 2016). Both Mexico and the Republic of Korea began assembling electronics in the early 1980s, yet only Korea has produced a truly indigenous electronic device in the Galaxy.

Absent complementary factors and distortions

These examples raise the fundamental question of whether the heterogeneity in productivity, quality, and development experience within products swamps any between-good differences in development impact. That is, whether *how* a good is produced is potentially more important than *what* is produced. If so, then attention probably should be focused more on the market failures attending more horizontal considerations such as education, national innovation systems, managerial quality, institutions, or entrepreneurial environment than the production basket itself.

⁷ Even at the very disaggregated HS 10 level (white, female cotton shirts; red wine 750 ml; leather women's shoes) the difference is huge: A bottle of red wine may sell for \$US 2 or \$40,000s ([Domaine de la Romanee-Conti Romanee-Conti Grand Cru](#)). Manolo Blahnik's shoes can be \$1,500, easily 100 times more expensive than basic Payless pumps. These diverging unit values reflect differences in the ability to generate high quality and all that implies from design capacity, to human resource organization, to marketing and employing different sets of inputs may imply very different levels of spillovers to the rest of the economy. In fact, the distinction between "quality" as measured by unit values vs "what" is being produced is arguably a data/categorization problem. We might argue that very expensive shoes or wine require very different sets of capabilities/factors of production and a more disaggregated HS 14 could be classified as "red wine, gourmet" or "leather shoes, high fashion" and then product space maps would reveal many countries transitioning among these distinct goods.

Most arguments for vertical policies focus on externalities on the production side and give short shrift to demand side considerations, in particular, rents. Krugman's classic Airbus/Boeing discussion was precisely about industrial policies to shift rents arising from increasing returns to scale toward the home country, however this is the exception that makes a critical point.⁸ In general, it is preferable to be in goods where some market power is enjoyed and where countries are not locked in ferocious competition over tight margins. This offers an immediate caution to strategies seeking to emulate the success of established leaders or rich countries. By definition, rich and very competitive countries are already producing those goods and hence entry will be difficult. A classic example here is that of Nokia in the 1980s when the government sought to push it into television production- the market was already saturated and the firm nearly failed.

Harrison and Rodriguez-Clare (2010) raise a related and fundamental point about the general equilibrium effects of identifying externalities. If the World Bank were able to reliably estimate and then publish the magnitude of externalities of all goods on <http://worldbank/externalities.com>, then many countries would choose to enter those same sectors to capture those same externalities. But this would then drive down the world price, potentially to the point of eliminating the benefit. This leads them to argue that countries should only enter goods in which they have a deep comparative advantage, beyond the assumed market failure, which will be better registered by market signals. This argument is mitigated somewhat if there are *inter-industry* externalities, that is, the spillovers accrue to the economy as a whole and hence are not being registered in the goods price.⁹ Further, to the degree that developing countries have more to gain in learning than advanced countries, they may extract a net benefit.¹⁰

⁸ The focus on these price considerations raises the issue of market structure and the desirability of reaping rents where the international product price lies above the cost of production. Though "rent seeking" carries negative connotations, in principle rents are part of value added and desirable. Such rents can arise where industries have increasing returns to scale, as Krugman pointed out in the work that won him the Nobel Prize. Both Boeing and Airbus, if they could dominate the market for airframes, would reap large rents. Since increasing returns to scale implies that moving first and fast due to large sunk costs of production acting as a barrier to entry is potentially more critical than "deep" parameters of comparative advantage, governments may engage in strategic subsidies to guarantee that their champion wins the market.

⁹ These were the arguments forwarded by Tyson (1992) in *Who's Bashing Whom* for defending the semi-conductor industry in the U.S.

¹⁰ For instance, the first Intel plant in Costa Rica may teach important economy-wide lessons about the importance of tolerances (precision), the nature of international marketing networks, the best way to spin off new firms from old, and how to provide on time quality inputs to a global supply chain. Arguably, introducing a new type of chip-driven product to Silicon Valley would have little additional learning effect there.

In sum, the information required is not only on the existence and magnitude of the market failure relative to other distortions, but very clear understanding of whether there is an intrinsic comparative advantage, and the likely market for the product. As mentioned above, in general such information is very difficult to come by and we briefly discuss three rules of thumb that have been proposed in its absence to illustrate the use of the two guiding questions.

Example 1: Natural resources are cursed

The long-standing literature on the resource curse has proved one of the most popular shortcuts. Since Adam Smith, there has been an assertion that extractives, which is really what comes to mind when people discuss the curse, had fewer spillovers than manufacturing. Further, in many poor countries, mineral wealth has seemed to generate conflict and instability.

To answer the first question about whether we can quantify these negative externalities, the common approach has been to run regressions of growth on resource exports or production. These have proven unrobust (See Lederman and Maloney 2006, 2010) and perhaps the most solid regressions (see Sala i Martin 1997, Manzano and Rigobon 2001, Brunnschweiler and Bulte 2008) find a positive impact of sub soil wealth. This is maybe not surprising – the Chilean and US examples above suggest both modest and stellar experiences with copper; while Nigeria has arguably underperformed, Norway has created a very innovative oil and gas industry with substantial linkages and become one of the richest countries of the world.¹¹ While there are acknowledged problems in managing exchange rates and volatility around natural resources, a curse cannot be a curse if much of the time it is a clear blessing. The heterogeneity of experiences suggests exactly that we should be looking more at the *how* than the *what* again. That is, the problem may well be in the weakness of the national innovation system or weakness of institutions, both of which will affect most activities, not just extractives.

¹¹ It has leveraged these resources to generate a “Norwegian School of Petroleum Exploration” as well as accelerating a manufacturing industry supporting the sector (Cappelen et al. 2000, Fagerberg et al. 2009) much the ways the US did with copper, or Australia, Canada, Finland, Sweden with their mineral resources.

Example 2: Complex goods

In a provocative application of network analysis, Hausmann and Hidalgo (2011) have generated an *Atlas of Complexity* that generates a map of the product space by a factor extracted that is common to goods produced by on the one hand, few countries and on the other, very diversified countries. They term this factor “complexity” and it is argued that more complex goods require more types of skills which poor countries do not have. The possible inter industry externality however, arises from the idea that producing a complex good generates more of these skills- as Hidalgo notes “countries become what they make” – which can, in turn, be used to produce even more complex goods which are presumed to be better.

Though the logic of accumulating skills/ learning by doing is very compelling, how the actual empirics relate to this and whether we have documented market failures pertaining to particular goods in the Atlas is unclear. To begin, we cannot be sure that the relationships they document are emerging from the supply side- they could as well be reflecting that consumers in rich countries both value diversity and consume boutique higher end goods and this is reflected in the country’s production structure (See Imbs and Wacziarg 2005). Second, even if the Atlas were reflecting production considerations, we do not know if the common underlying factor is, in fact, related to complexity somehow, for instance, as the number of steps in production, as do Levchenko (2007), and Krishna and Levchenko (2013). Third, even if there were, there is no guarantee that the absence of a greater alphabet of capabilities is the binding constraint on producing more complex goods. Blanchard and Kremer (1997) and Levchenko (2007) for instance posit weak contract enforcement as the barrier to producing goods with more stages, and there may be no feedback from producing complex goods to improving the institutional environment and hence no externality. Fourth, since we do not know what the “complexity” measure is aside from being highly correlated with income per capita, its robustness in growth regressions is of unclear import. Fifth, the analysis uses final goods export data which do not capture which tasks a country is really undertaking - again, China is not producing sophisticated manufactures when it exports the iPod, it exports assembly tasks.

In sum, we cannot be sure whether there is a market failure to redress pertaining to particular goods and, if so, whether the *Atlas of Complexity* is helping us locate it. The approach shares the intuition of

the “Monkey and Tree” analogy to capture the evolution of economies – certain goods (trees) allow an easier transition to other goods (monkeys can jump to other trees in the forest), and hence, a continuing dynamic growth process (Hausmann and Klinger, 2006; Hidalgo et al., 2007). In principle, it might be useful for identifying trajectories in the product space based on successful experiences in other countries, much like the “Flying Geese” pattern of development articulated by Akamatsu (1962). However, with the second guiding question again in mind there is no guarantee that if Korea assembles complex products, accumulates new capabilities, and is able to move into more sophisticated products, that Mexico will as well. To rephrase our *how* vs. *what* question, the quality of the monkeys may be more important than the particular trees they are climbing- better monkeys will climb faster, jump to more distant trees, and perhaps explore previously undiscovered parts of the forest. Breeding better monkeys may result from more horizontalish considerations such as education, firm upgrading policies, and well-integrated innovation systems.

Example 3: Smart Goods

Finally, several authors (Hausmann and Rodrik 2003, Hausmann Hwang and Rodrik 2007, Lall, Weiss and Zhang 2006) have suggested that more technologically sophisticated or high tech goods generate knowledge spillovers that foment growth. Hausmann and Rodrik (2003) offer the most cogent conceptual statement of the view, and the subsequent empirical implementation by showing that export baskets heavy in goods more often produced by rich countries (a high EXPY) are correlated with growth. However, as Lederman and Maloney (2012) show, the inclusion of garden variety covariates such as investment over GDP undermines the result, raising the question, again, about whether it is the goods per se that have the impact, or rather the environment that supports higher levels of investment (absence of credit market failures, favorable business climate, stronger entrepreneurship) where we should be focusing.

And again, we must be attentive to demand considerations: whether with the *Atlas* or a list of smart goods we will also have the General Equilibrium offset, especially from countries that have read the respective papers. The disappointing performance of these three recent shortcuts seems to support Rodrik’s (2004) agnosticism about our ability to identify and quantify product related market failures. Hence, in terms of our initial two criteria, these would seem to rank low on the certainty of the relative magnitude of the postulated market failure.

IV. Horizontal (Factor Market) Interventions

Several areas of market failure particular to factors of production—broadly horizontalish policies—have been accepted as requiring substantial government intervention. Many are directly concerned with the *how* of producing goods.¹²

Can we identify a clear market failure?

Many of these factors of production have markets characterized by long established failures. Infrastructure, or rather the service it renders, is associated with market failures, in the traditional form of public goods, externalities (including network externalities), decreasing costs (leading to natural monopolies), or merit goods (positive consumption externalities). Social rates of return are thought to exceed private rates of return for primary and secondary education (Moretti, 1999; Acemoglu and Angrist, 1999). Educated workers may raise the productivity of less educated co-workers or, more generally, an economy with a higher average level of human capital may lead to a higher incidence of learning from others. Credit markets classically fail in the face of information asymmetries or inadequate collateral (Besley, 1994). Information asymmetries can affect market exchange more generally and therefore create the need for institutions that reduce inefficiencies associated with contract incompleteness—this may include the rule of law, social norms and regulatory frameworks (North, 1990). Last, but not least, innovation suffers from standard appropriation externalities and hence subsidies, tax write-offs and patents have been long accepted remedial policies. The same logic supports public institutes that disseminate best practice such as agricultural extension programs and research institutes and university departments specializing in basic research. A long literature stresses the coordination failures among such non-market institutions in National Innovation Systems and centrally stresses failures surrounding the acquisition of firm capabilities.

Is this distortion where we should focus, or are there other market failures or distortions that are more important?

However, here again, it is not always clear that the identified market failure or bottleneck is the most critical barrier. Pritchett (2001) argues that the low impact on growth of education may be due to,

¹² And, in fact, Rodrik concludes, for example, that we probably want to target activities rather than goods such as raising the quality of education and management, basic infrastructure, reliable energy, etc.

among other factors, incentives that reward its application to unproductive activities making failures on the supply side of second order. Numerous countries, for example, have established subsidies or tax write-offs for R&D expenditure with little to show for it, despite the success of these policies elsewhere. But it may be that the key failure is in the accumulation of knowledge capital (innovation) per se, or whether there is a more pressing problem in accumulation more generally—capital markets, barriers to entry and exit, labor restrictions, management quality or a lack of demand (see Maloney and Rodriguez Clare 2007). Hausmann and Rodrik's (2003) discovery externality can be seen as a subset of knowledge externalities more generally—it may not make sense for a potential entrepreneur to enter if others can free ride on another's investment in identifying the suitability of a product for the local context, but it may rather reflect the inability of local entrepreneurs to recognize productive opportunities in the first place.¹³ And on the management side, Bloom et al. (2013) argue that investments in managerial upgrading could pay for themselves in a year, yet firms do not do it. As McKenzie and Woodruff (2013) argue, whether this is a question of information asymmetries, imperfect credit markets, or missing institutions to diversify risk is not clear.

In short, we need to ask the same two questions about horizontalish policies that we ask about vertical policies. This said, there is a larger literature documenting market failures in these areas than around particular goods.

V. Coordination/Cluster Policies

Like factor market policies, coordination and cluster policies approach the “how” of production. They do have an industry or geographical focus, but there is not necessarily a presumption of externalities characterizing particular goods. Governments may seek to resolve coordination failures or enhance clusters across geographical and product space.

¹³ It is not clear, in practice, how large this particular failure is. In the case of a small price-taking country, the entry of new local producers will not appreciably affect the price, hence the loss of rents must happen through competition for factors of production which may or may not be scarce. That salmon had to be introduced by Fundación Chile because potential first movers were concerned about competition for extensive fiord space or even unskilled labor is not obvious. There is, in addition, a countervailing agglomeration effect: I can share building infrastructure, worker training, disease research, establishment of trade networks if others pool their resources with mine. The vast number of high tech firms in Penang, Malaysia would seem to suggest that these benefits are significant. In short, we do not really know if it is an information failure or a problem of entrepreneurial ability.

Can we identify a clear market failure?

Coordination failures can prevent a country from fully exploiting its comparative advantage: though the potential for tourism in a zone may be clear, until the road is built, no one will build a hotel and there is no point to building a road that goes nowhere; manufacturers need to know that there is an electrical grid nearby or logistics and transport networks are in place, yet providers are unlikely to invest unless demand is assured. Establishing basic city plans for transport and infrastructure in their early phases coordinates subsequent development with large impacts on productivity. In very poor countries where several factors of production may be absent at the same time, these kinds of coordination failure may be particularly binding.

Grouping firms or industries in clusters may enable the realization of these complementarities (Porter 2000, Duranton and Puga 2004).¹⁴ First, a larger cluster of firms will make it more efficient to construct indivisible facilities, such as infrastructure or, for specialized input providers, to pay a fixed cost and enter the (larger) local market. Secondly, a larger market allows for a better matching between employers and employees, buyers and suppliers, or entrepreneurs and financiers. Thirdly, direct interactions between economic agents in a cluster can also facilitate learning about new technologies, market evolutions, or new forms of organization. Localized input-output linkages, labor pooling and industry-level knowledge spillovers are externalities that typically result from being close to a large cluster of firms in the same industry/sector (see Krugman, 1991; Marshall, 1920). However, more general “urbanization economies” arise from having a large number of producers, albeit in different industries/sectors, in the same place, e.g., a management consulting company can benefit from locating near business schools, financial service providers, and manufacturers (Rosenthal and Strange, 2004).

¹⁴ Porter (2000) uses the concept of a “competitive diamond” to explain the “competitive advantage” of clusters, which he defines as “a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities”. The central part of this diamond is a dynamic “local context” infused with “vigorous competition” within firms. It relates to innovation of products, processes, and markets, adaptation of new technologies, and new partnerships among productive forces, such as workers, suppliers, service providers, and buyers. This central element, in turn, feeds into four interrelated areas indicative of the surrounding microeconomic business environment: (i) the quality of factor conditions, (ii) the context for firm strategy and rivalry, (iii) the quality of local demand conditions, and (iv) the presence of supporting industries and institutions. The interactions between the different components of the diamond generate the “competitive advantage” of the cluster.

Industrial clusters can spontaneously grow out of the concentration of economic activities based on market forces over a long period of time. The initial pull factor that stimulates natural clusters to arise could vary—availability of raw material; suitable climate condition; proximity to markets; availability of educated work force or R&D facilities. And coordination can be achieved due to the strategic actions of a large player (e.g., a university or a multinational) or private groups such as export business associations, credit cooperatives and industry associations.¹⁵ The persistence of geographical agglomerations over millennia suggests that these coordination issues are extremely powerful.¹⁶ However, firms may not cooperate and organize themselves in order to take advantage of these agglomeration economies. These external benefits are not priced by the market and hence cannot be internalized by private players, giving rise to coordination failures. Big push theories (see Rosenstein Rodan 1943, Murphy, Shleifer and Vishny 1989) argue for massive and coordinated policies to kick start industrial regions.

Government initiatives may include the establishment of special economic zones (SEZs) such as export processing zones or industrial and technology parks, which offer a range of financial incentives (e.g. tax breaks, subsidies), infrastructure facilities (e.g. uninterrupted electricity supply) and access to land combined with the promise of protection from government interference (Hausman et al. 2005). Such public investment and policy/regulatory changes can induce a critical mass of private firms to enter and invest. Similarly, development corridors, which typically provide transport connectivity between two important hubs of economic activity, can cluster firms along corridors or at their nodal centers. This is expected to help develop surrounding areas, including through catalyzing other investment from within and outside the region.

Growth poles are similar to SEZs and development corridors in that they attract firms to invest in a region through tax incentives, infrastructure development, and other business support facilities to build private sector capacity. However, they involve simultaneous, coordinated investments, typically anchored in a group of dynamic industries that are built around a particular resource or opportunity

¹⁵ For example, research has established that Stanford University was a key player in the emergence of the information technology cluster in Silicon Valley (Saxenian, 1994). The Colombian flower growers' association was critical to solving issues relating to air transportation and market access to the United States (IDB, 2014).

¹⁶ Davis and Weinstein (2002) document persistence in Japanese population densities over millennia. Maloney and Valencia (2016) document high correlation between pre-colonial densities in the Western Hemisphere and present population and economic activity.

that already exists at a specific location. (Perroux 1950). The growth of these dynamic industries, through backward and forward supply and demand linkages, stimulates the growth of ancillary services and other related industries. Growth poles are therefore broader than SEZs or development corridors.

Is this distortion where we should focus, or are there other market failures or distortions that are more important?

The observed dispersion in productivity or quality within goods, across countries, can be partly ascribed to the inability to take advantage of such externalities. Hence, cluster policies often receive focus as ways of improving productivity, etc.—part of improving the “how” of production. However, this focus can blur the point that the direct source of the coordination failure is not industries/sectors/goods, but the activity or technology affected by a coordination failure which keeps firm productivity low (Feser 2002). And this is important for the design of policy. For instance, providing trade protection through tariffs, export subsidies and tax breaks to a particular sector in a SEZ may stimulate a cluster, but not overcome the coordination failure that prevents the adoption of a modern technology, since it increases the profitability of operating without that technology. Similarly, providing incentives to MNCs to kick start a cluster may not work if large and vertically integrated firms do not rely much on the output of other firms as inputs in their production and/or if local firms lack the capacity to be providers. Further, a cluster that has not emerged organically may lack dynamism because of an absence of trust, collaboration and tacit flow of knowledge between firms (Duranton, 2011). In the limiting case, it is very difficult to know if a cluster does not exist or is weak because of one or more of these failures, or because the underlying comparative advantage is simply not there—that is, the tourist destination was not that nice or really, this was not a profitable place to locate an EPZ. The danger here is that the embrace of the cluster precedes a fair evaluation of the underlying fundamentals.

Also at issue is the spatial level at which the market failure impinges. Focusing policy on only the local or regional dimension – as cluster policies typically do – may leave out key dimensions of interdependence that have real implications for competitiveness. It is natural for formal and informal business linkages to occur at all spatial scales (e.g., labor pools at the regional level, shared knowledge at the global level, etc.).

Last, but not least, in the absence of complementary factors that cannot be remedied, cluster policies may be counterproductive. For example, if labor is sufficiently immobile due to strong frictions in labor markets, cluster policies are unlikely to deliver benefits associated with labor pooling. In the case of land, which is by definition an immobile factor, the more relevant concern is the fact that it may be used for different activities, including agriculture and green open spaces.¹⁷ In other words, efforts to strengthen clusters may conflict with other existing policies and, if left unresolved, will inhibit the possibility of achieving agglomeration economies.

Mapping the policy space

The discussion thus far has stressed the information challenges of identifying and quantifying a particular market failure that would justify market intervention. This, we argue, is perhaps the central challenge for policy makers. It is not enough to show conceptually that an externality *could* exist around a good or factor—policy makers need to know if a particular intervention is likely to generate higher growth than the one displaced on the development agenda. And once they have an idea of the likely impact of the intervention in principle, they need to weigh this against the likelihood that the intervention will be well implemented.

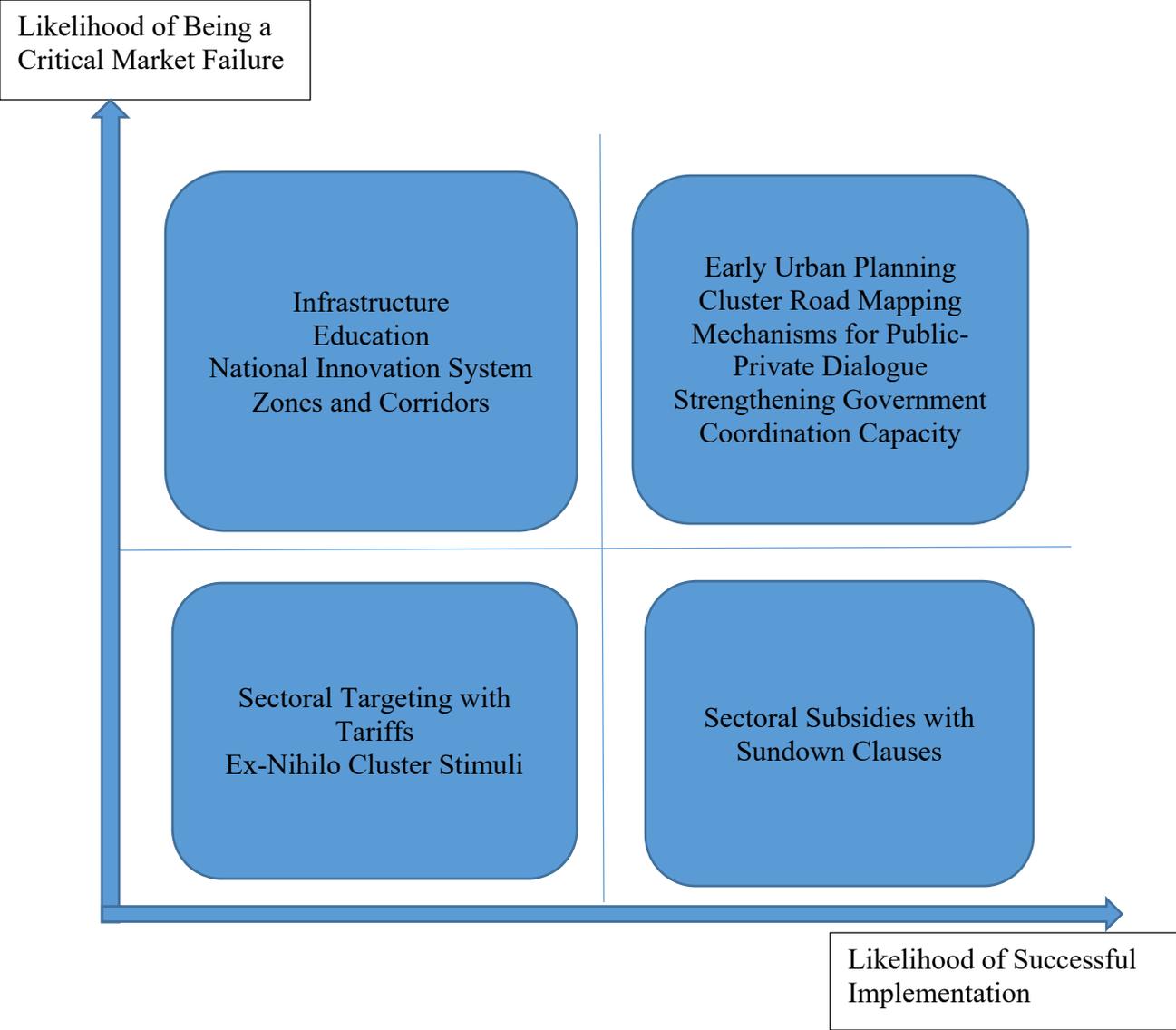
Figure 1 provides a mapping of policies by their information and implementation characteristics. It is meant as a heuristic—purely to make the above points. On the vertical axis, we have the likelihood of an important growth impact of an intervention if well implemented. On the horizontal axis, we have the likelihood that government capabilities and the political economy context will permit such implementation.

In the NE corner, we have policies with arguably proven track records with reasonably high success rates. Here we may have early stage city planning—the basic laying out of roads and rational infrastructure planning which will coordinate subsequent activity and which if not done is extremely costly in lost output. The coordination issue is clear and the evidence on well-ordered vs non well-

¹⁷ For instance, although the land use regulations in the Bay area around San Francisco may appear suboptimal to many observers, the quality of life for local residents in San Francisco would in all likelihood decline if all “obstacles” and “constraints” on land use were to be removed (Duranton, 2011).

ordered cities is compelling. Further, the demand on state capacity is relatively small. Hence, as Romer argues, this type of policy is a relatively safe bet.¹⁸

Figure 1: Productivity Policy Space



¹⁸ Paul Romer (2017) presentation to WB SD network.

On the western half, we have policies that are more challenging to the state. Here we include not only industry targeting, but also education and infrastructure issues. However, we place the latter two in the upper quadrant, since there is a sizable body of work that supports the externalities surrounding education and the public goods nature of infrastructure, and sectoral targeting projects in the lower for the reasons detailed in section II. These “rankings” of course reflect our impression of the evidence. But the point we are making is that while the argument against sectoral policies is often based on capture, the better argument is greater uncertainty surrounding the actual impact of the policies.

VI. Considerations on Government Implementation

The previous diagram describes an “average” intervention with “average” implementation capability and hence clearly assumes away the heterogeneity issues that have been central to the discussion. Here we take up selected issues on government capability.

Consideration 1: Policy amid imperfect information

Given that having confidence about the efficacy of an intervention if well implemented is central, the issue of how governments collect and process information becomes paramount.

Exploiting market signals. Most basically, arguing the existence of an externality does not obviate the importance of market signals. First, in the absence of knowledge about the magnitude of the externality, the cost of making an industry viable gives a lower bound for the spillovers that policy makers should be expecting. Embraer is a successful aircraft company, but with no measure of the subsidies received during the period when it was a military project, it is impossible to know if the ex post realized externalities were worth it. Second, as Harrison and Rodriguez Clare (2010) note, in general equilibrium where the externalities are universally known and hence to some degree offset, countries should focus importantly on deep comparative advantage which price signals reveal. In cluster policy, the literature debates how much effort should be focused on targeting specific cluster geographies versus leveraging existing business synergies and Porter(2000) argues, there “there should be some seeds of a cluster that have passed the market test before cluster development.”

Broader vs. narrower interventions-diversifying targeting risk. The difficulty in identifying externalities pertaining to very disaggregated goods does not necessarily imply that we know nothing about which seem to be long run growth sectors broadly construed. Hence, countries often attempt to develop “platforms” and skills—metallurgy, bio-technologies, etc.—with the idea that they are setting up petri-dishes of technologies, skills and expertise from which new products may emerge. This is somewhat of an intermediate position where the risks surrounding the vertical bet are arguably more diversified. Again, even with this somewhat more horizontal approach some market signal that the country has a latent comparative advantage in this area is likely to dominate an *ex nibilo* bet on an area.

Similarly, the inability to know where new clusters should emerge, particular barriers to their existence or growth, and what spatial level the externality operates at raises the question of whether government intervention in cluster programs should focus on developing clusters in specific sectors/industries or on activities that enable agglomeration economies across sectors and which would fail to catch on in the absence of support, e.g., investing in secondary and (professional and technical) higher education, subsidizing early stage finance, encouraging technology adoption, investing in infrastructure, improving regulation and helping firms forge international links (Harrison and Rodriguez-Clare 2010, Bresnahan and Gambardella 2004). These, again, wind up being more *ex ante* horizontalish policies than vertical.¹⁹

Improving the government-industry information flows. Since the private sector is likely to better understand about the location and nature of the market failures and barriers that inhibit industrial development, a fluid dialogue with the government is an important source of policy relevant information. Rodrik (2004) refers to “public-private coordination councils”, which could seek out and gather information on investment ideas, achieve coordination among different state agencies, push for changes in regulation to eliminate unnecessary transaction costs, and generate a package of relevant financial incentives for new activities when needed.

¹⁹ Feser (2002), for instance, argues that the approach of viewing clusters as a tool for leveraging existing synergies among businesses or local value chains has distinct advantages. It is agnostic with respect to the level of geography in which business linkages manifest themselves. It can also leverage connections to non-market institutions, such as universities, labs and network brokers, even when firms are not part of concentrated regional agglomerations.

Some caveats are in order. First, this assumes an informed and objective private sector representing broad interests forwarding economic growth. Reality is more complicated. First, firms and industries often do not know what they do not know. Bloom and Van Reenen's (2010) surveys of LDC firm management suggest weak managerial practices and poor diagnostics of their own firms, let alone sectoral shortcomings and needs. A variety of policies have emerged to improve the dynamism of existing clusters, identify bottlenecks and generate a coherent plan. Managerial extension services, professional cluster analysis are used to facilitate benchmarking and develop a vision of sectoral needs. "Roadmapping"—a technique developed by the business community in the 1980s—which can plan the key steps to arrive at, and execute, a shared vision of an organization's future goals has proven useful in this regard (Kappel, 2001; Willyard and McClees, 1997). It has been used by industrial consortia, research institutes and governments for supporting sector-level foresight initiatives (Kostoff, 2001; McCarthy, 2003). In the case of "big-push" style cluster initiatives, it can be used by government as "light-touch"/ "exploratory" industrial policy—explore all future possibilities and barriers through discussions with relevant stakeholders, structure the vast amount of information to arrive at an overview of alternatives that are desirable and feasible, and then identify (and effectively communicate) the priority investment decision (Groenveld, 1997; Garcia 1997; Rinne, 2004).²⁰ Overall, the idea that the government can provide an informational public good directly rests critically on its capacity to collect or generate frontier information and stay up to date and hence the design of diffusion agencies is critical.²¹

Second, chambers of commerce, industry associations and labor groups may not be prevalent and developed enough to distill quality information in a representative way for communication to government. In particular, SMEs are often not represented in the large industrial associations most prevalent in emerging countries. In many countries, networks of banks, chambers and government functionaries facilitate the identification of problems, as well as potential high growth firms. Hence, cultivating inclusive networks may be considered a policy end in itself.

²⁰ Chile contracted the services of the Boston Consulting Group (BCG) to identify "desirable" sectors through a forward-looking market intelligence exercise, and to determine whether or not the country has the required capabilities to produce a product competitively and, if not, how easy it would be to acquire them.

²¹ Chang (2009) argues that state marketing help can be crucial, especially for smaller exporters, as exemplified by the cases of JETRO and KOTRA – respectively, the state trading agency of Japan and Korea. In contrast, Braguinsky & Hounshell (2015) note that the Japanese government's technological transfer engineer entrusted with upgrading the flagship textile sector at the turn of the century gave inappropriate and dated advice leading to those receiving the government advice performing significantly worse than those not using government services.

Finally, large business associations may be involved in quasi-corporatist relationships with government where personnel may be closely linked to political parties or families, for example, and hence the objective function being maximized is not necessarily the growth rate of the economy. Too much proximity may imply that the private sector is unlikely to criticize government policy or provide accurate information on broader business realities and, at the other extreme, may simply be an alliance for joint rent seeking (Grossman and Helpman, 2002). In this case, the problem goes far beyond information asymmetries to complex political economy impediments which dwarf the market failures that are the focus of this paper. The critical institutional challenge therefore is to balance the risk of political capture, on the one hand, and the need to maintain channels of communication with the private sector to identify coordination opportunities, on the other (Rodrik, 2004). This requires at a minimum, mechanisms of accountability and transparency.

Evaluation: Making well-designed evaluation a central feature of every significant policy both reveals information on what interventions work and develops a performance mindset. The double challenge of “Where is the implicit market failure?” and “Do we have evidence that the proposed solution will work?” offers an important disciplinary device for policy makers and provides cumulative evidence on which interventions, in fact, will have impact.

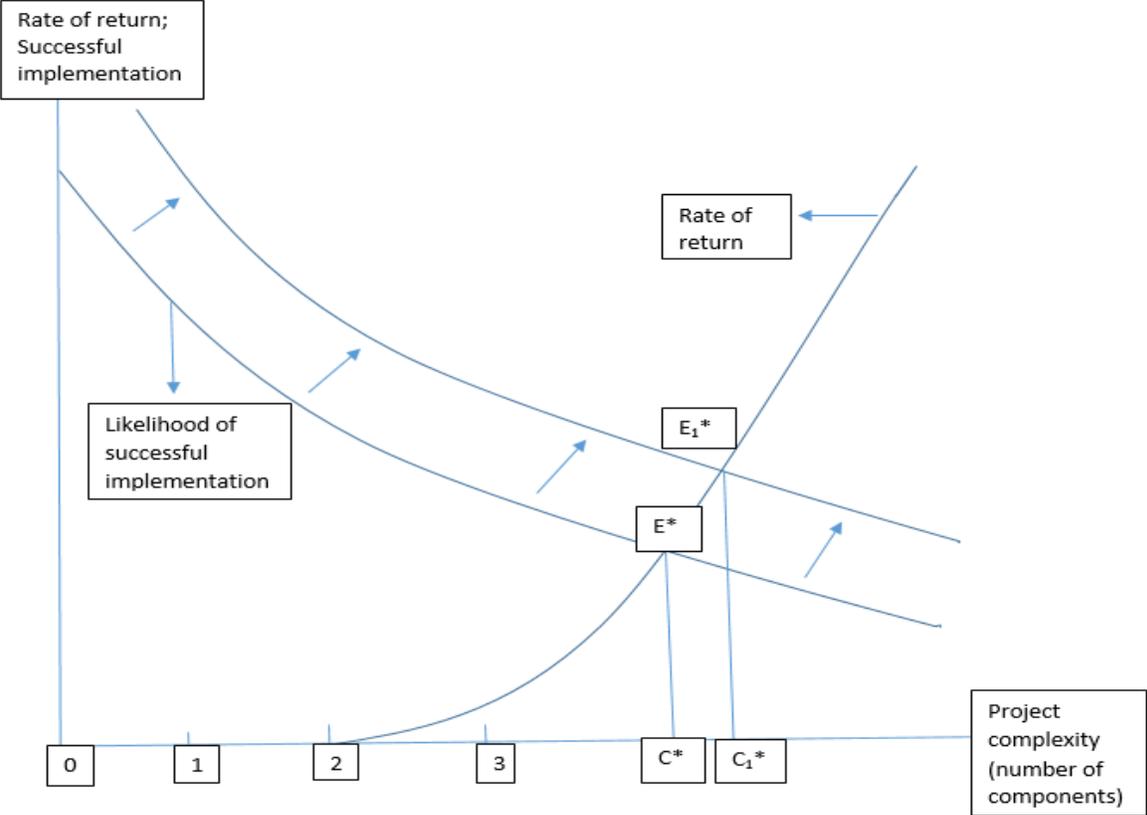
Consideration 2: Managing complex policies

As noted above, governments are often called upon to resolve coordination failures. In spatial or cluster policies, high return projects are often thought to require several components.²² Successful National Innovation Systems require the coordination of numerous non-market institutions to function. However, such projects are limited by the capabilities of authorities to successfully manage this complexity.

²² For instance, Gelb et al. (2015) identified the most complex World Bank project (in Madagascar) had 5 interventions – one macro level investment climate intervention, one micro level matching grant intervention and three separate meso-level “growth pole” agglomeration interventions.

Figure 2 offers a way of viewing the policy issues at stake here. The upward sloping curve captures the fact that the ability to combine complementary factors in complex projects allows undertaking projects of higher rates of return.

Figure 2: Complex Projects and Government Capacity



The downward sloping curve attempts to capture the idea that the more components a project has, the higher the likelihood of government failure and hence the lower expected return to these projects. If the components are extremely complementary—the hotel and road example above—success depends on the government’s successful implantation of all components at once, as in O-ring models (Kremer 1993). In this case, the risk of project failure is a multiplicative function of the probability of failure of each subcomponent. For instance, a project where each component has a 90% chance of implementation and perfect complementarity has an 81% chance of succeeding if there are two complements, a 65% chance if there are 5, and a 35% chance if there are 10. Hence, the expected return falls accordingly.

Given the above, projects with complexity beyond C^* , however conceptually promising, will not be feasible. As an example, Colombia's Integrated Rural Development (DRI) pilot in Caqueza sought to create a modern *campesino* by bringing together a collection of programs of technological transfer, credit, health, and transport among others. Though the program showed the potential to increase agricultural yields, a deficient transport component implied that this greater output was absorbed by the local market, driving down prices and creating debt service problems for the farmers (Zandstra et al 1979). Scale-up of the program further undermined the comprehensive nature of the project—it made far more political logic to give a single component to multiple municipalities than to direct all to one area as conceived.

Reducing the complexity of interventions. Efficient projects would be those whose design maximizes social return while minimizing stress on governance. A first approach would seem to be complexity minimization: careful identification of what are truly necessary complementarities and which may be sequenced, altering the goals of the program, or identifying alternate providers of the complementarities. This would shift the upward sloping curve left and raise the possible returns for a given level of government capacity. As examples, the final design of DRI II recognized both the complementarities and political reality and focused on areas, primarily in more prosperous Antioquia, where several components, including infrastructure, were already established. This simplification did not come without costs as the refocusing necessarily meant that the poverty alleviation motive of the program was downgraded. The presence of an existing major player, such as a multinational manufacturer, can also reduce the dimensionality of the government problem in the sense that such firms will already possess the know-how to develop training, marketing, etc., and may also apply pressure on the relevant agencies to execute.

Public-Private Partnerships: More generally, public-private partnerships can help in the design and implementation of complex industrial policies. For instance, the European cluster experiences in the 1980s/1990s emphasized the delegation of functions to a wide range of nongovernmental institutions (Humphrey and Schmitz, 2000). Governments can assume a greater role in the initial stages, such as guiding the cluster mapping and/or location selection, as well as in the final stages, such as monitoring and evaluation (where they could also partner with international development agencies). In the intermediate stages, governments can hire technical project management consultants for demand identification, analysis of firm-level competitiveness and market and product segmentation, and/or

designing and financing of the SEZ/industrial parks. Similarly, “constructors” and “operators” in the private sector can construct the parks and manage their operation and maintenance.

Decentralization to subnational entities? Though national governments are in theory able to coordinate across sectors or regions, rivalries and transaction issues among large ministries, their distance from the front line can make them less nimble and potentially committed than agencies at the local level. Subnational governments may feel more accountable for resources, and policy is likely to have a constituency to pressure for execution that may be missing in the case of policies parachuted in from the national level. Further, subnational governments may be better able to focus on land-use planning and the provision of local public goods, such as roads, urban transport, etc. That said, in many countries, subnational governments may be very weak in executive capability which may offset these considerations.

Designing policies that are robust to political economy considerations. This has been a leitmotif in the Industry Policy literature in general, for instance in the recommendation on budget subsidies with clear sunset clauses relative to tariffs and quotas because they are relatively transparent and under budget. Private provision of training with an infra-marginal government subsidy and an element of market discipline will be superior to state driven training facilities. Similarly, research institutes and universities with substantial requirement for private sector financing, or school vouchers that skirt distortionary union influence may all provide more robust policies in difficult political economy contexts. In general, having private sector skin in the game along with associated responsibility provides a disciplinary mechanism. This said, the complexity of the underlying political economy often implies that admonitions to “take the local context into account and not impose cookie cutter policies” is probably less helpful than appears at first blush. International aid teams, even local officials, may find it difficult to decode the local political economy and even less the particularities of the present and future governments that will be implementing these projects.

Consideration 3: Strengthening government capacity

Clearly, improving government's capacity to design and execute projects shifts the "likelihood of successful implementation" curve to the right and enlarges the scope of feasible projects, up to C_1^* . However, in many countries, a shortage of administrative skills, technical competencies, financing and more generally vision (Rodriguez-Pose and Hardy, 2012) limits the effectiveness of governments (especially local agencies and municipalities) to sustain the momentum of complex industrial policies. Hence, a key agenda item for productivity policy needs to be improving the quality of governance. Chang (2009) argues that contrary to what is generally believed (i.e. that East Asian countries were exceptionally lucky to have inherited high-quality bureaucracies from history), Republic of Korea and Taiwan, China, did not start their economic "miracles" with high-quality bureaucracies. He argues that their experience suggests that a high-quality bureaucracy can be built pretty quickly from a low base.²³ This said, recent reviews of World Bank projects to improve governance and reduce corruption suggest that the present approaches have had only limited impact in this area (World Bank 2011).²⁴ Rodriguez-Clare (2005) also posits the possibility of giving greater responsibility to "islands of efficiency", i.e., those government agencies that have a proven record of being able to design and implement policies. Of central importance, sending potential functionaries abroad to learn not only academic knowledge, but also to see how advanced societies function offers a vital way of establishing where the goal posts are.

VII. Conclusions

This paper focuses on issues of information and government capacity to clarify some central issues in industrial or productivity policies. We begin with the idea that identifying market failures as justification for intervention remains a useful disciplining device, and the first guiding question for

²³ For example, until the late 1960s, Korea used to send its bureaucrats for extra training to – perhaps surprisingly – Pakistan and the Philippines. Taiwan, China, also had a similar problem of generally low bureaucratic capabilities in the 1950s and most of the 1960s. These countries could construct high-quality bureaucracies only because they invested in better training, organizational reform, and improvement in incentive systems. There was also a lot of "learning-by-doing".

²⁴ There is certainly a role for capacity upgrading through traditional methods – personnel policies that attract the right talent, competitive salaries to retain that talent; promotion policies that reward performance and technical skills, and good training programs (IDB, 2014). International development partners can also play a part by providing assistance to governments for institutional upgrading (UNIDO). At the same time, Pritchett, Woolcock and Andrews (2010) argue that it is the process of identifying problems and learning how best to address them through iteration and adaptation that really develop capabilities for policy design and implementation.

policy makers is whether there is substantial evidence that a market failure exists in the production of a particular good, or in factor markets. Reviewing the attempts to date to establish the location and magnitude of market failures suggests that we have limited knowledge of the benefits of targeting particular sectors, while there is support for a set of policies that stress firm infrastructure, education, long run development of the national innovation system, road mapping of existing clusters among others—generally more *ex ante* horizontalish policies.

Further, even where theory or empirics suggests the presence of a market failure, a second guiding question is whether that is the critical failure that policy should focus on. The extraordinary heterogeneity in productivity, quality and development impact of similar products across countries suggests that the *how* is potentially more important than the *what*—that market failures common across numerous sectors may swamp any pertaining to a particular sector.

A third guiding question is whether the government is able to address the identified market failures. Projects that require very complex interventions or take place in very adverse political economy contexts, however desirable, may not be feasible, or at least not in the first best way. A central message of the paper is that this consideration affects all three types of policies: it is not *ex ante* clear that providing well-designed incentives to a sector is harder either in terms of competent execution or preventing capture than generating a good education system or national system of innovation. We would argue, then, that the critical argument against vertical policies is that the economics profession to date has been unable to offer robust information on the nature or magnitude of the presumed market failures.

A final message is that increasing government capacity is an essential element of productivity policy. This will require a double focus on improving the quality of governance, strengthening of government capacity to resolve coordination failures and facilitate information collection on the one hand, as well as improving the design of interventions along the lines of robustness to weak information, implementation capacity, and political economy issues.

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