

Current industrial policy: business knowledge and innovation

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1. The return of industrial policy

The prime objective of industrial policy is to help companies and sectors equip themselves with the dynamic capabilities they need to compete globally and negotiate a changing market landscape. Industrial policy has no fixed, immutable formulation as regards the measures or instruments used. In each economic period, industrial policy adopts the kinds of measures seen as necessary to cope with observed market failures. These measures can take different forms, for example: (a) encouraging the growth of advanced services markets in cases where private initiative is inadequate or lacking (incubators, technical training, financing, innovation...); (b) provision of support to emerging sectors; (c) assisting companies with the funding of their R&D activities and favouring science and technology development and transfer throughout the business community; (d) support to organisational innovation; (e) facilitating the transformation and redevelopment of obsolete industrial and business structures; and (f) supporting firms in their international expansion.

Industrial policy has diverse instruments available for these purposes: tax incentives, subsidies, government purchasing, contracting of services, soft loans, guarantees, tariffs, regulations and official review bodies (observatories, commissions). It may also make use of international agreements and other measures of recent design.

The scope of industrial policy is not confined to manufacturing, mining, energy and other branches of secondary sector activity. A substantial portion of the advanced tertiary sector depends directly or indirectly on industry (Directorate-General of SME Policy, 2007). Industry bears the brunt of global competition, and is the sector that advanced furthest in its internationalisation in the course of the 20th century, but services too increasingly compete on an international scale. The divide between industrial and service sectors is growing more and more blurred, especially since the rise of information and communication technology.

Finally, it seems, the years of unfounded rejection of industrial policy are coming to an end. The academic debate of the 1980s in the United States and Europe, in its most superficial version, tended to dismiss industrial policy as an anti-market practice and, therefore, inefficient and undesirable. The absurdity of this idea is now clearly evident, because industrial policy is not something rigid or static. Like any kind of policy it can take diverse stances, and the same industrial policy will not be right for every time and situation. Industrial policy is, or should be, responsive and innovative by its very nature.

Institutions that until just recently were reluctant to think in terms of industrial policy are now changing their tune. The European Union has approved an industrial policy programme (EC, 2005) aimed at strengthening the competitiveness of leading sectors in member countries. The Netherlands and other countries, Spain among them, have endorsed the importance and necessity of embarking on modern industrial policy programmes informed by the logic of the economy and global competition. The World Bank has adopted the New Industrial and Innovation Policy initiative to foster productive restructuring and technological dynamism.

Monetary or fiscal policies are fairly clearly demarcated and their goals and instruments have enjoyed considerable stability, conceptually and in praxis. Conversely, industrial policy can seem conceptually more ambiguous because its specific design and application, as we have stated, must not only fit with the characteristics of the country's economy but will also change over time in line with technological and institutional developments. Industrial policy must be designed as a

response to circumstances or “market failures” that undermine the technological dynamism and competitiveness gains of companies and productive activities (Porter and Kettels, 2003).

Industrial policy in the industrialised nations, including Japan, has gone through periods with differing needs and “different market failures”. For example, in the late 19th and early 20th centuries, industrial policy was dictated by the importance of the economies of scale embedded in production and the high sunk costs of investments. Western governments went hands-on in the development of heavy industry, industrial chemicals and public network services like railways, electricity and telecommunications. This public engagement also helped generate private-sector confidence and investment, hastening the advent of the Second Industrial Revolution.

In many European countries, a public enterprise sector came into being which lasted until the widespread privatisation campaigns of the 1980s and 90s.

2. Market failures

The economic analysis corpus that currently has the blessing of academia says that public intervention in markets is only justified in the presence of “market failures”. In the industrial policy area (Ono, 2002; Itoh, et al, 1991), and allowing for the discrepancies existing on the application of the model, a number of circumstances can give rise to market failures. The most important are:

- a. Production economies of scale
- b. R&D intensity
- c. External economies between firms
- d. An inadequate productive structure

While it is generally accepted that the first three cases warrant some kind of corrective public policy, the fourth situation causes sharply divided opinions. Below we look briefly at the first three cases, before pausing to consider the fourth in rather more depth.

The presence of economies of scale implies that fixed costs weigh heavily in the average and that these average costs are decreasing, even with large production volumes close to market size. The market will be organised as a natural monopoly or oligopoly with no guarantee of competition. In such circumstances, governments tend

to keep close track of companies' conduct and use regulations (anti-trust) or price controls to protect consumers.

In these days of accelerated global competition and technological development, we are witnessing a steady growth in the size of markets – less and less national and more international – and many companies are opting for growth, especially by the mergers and acquisitions route. Public competition authorities are finding it increasingly difficult to determine whether a business conduct is anti-competitive by reference to traditional indicators like the number of firms or relevant market share. Markets are ever more dynamic, potential competition is on the rise, and the time over which innovating companies conserve market power is getting gradually shorter.

Observation tells us that few markets are now safe from the potential competition deriving from swift technological change. Not even Microsoft, with its comfortable dominant position, can afford to let its guard down and set prices out of step with costs. It seems, then, that the traditional model of competition policy, as practiced in the EU, may shortly have to change, in the light of the greater discipline that potential competition now imposes on leading companies. One sign of these competitive forces is the high turnover of the companies making up the *Fortune 500* and similar lists. This is a new and revealing phenomenon.

The market failure currently causing most concern is the shortfall in company R&D and Innovation spending; a situation that can seriously impair the near-term competitiveness of the productive system. Since Arrow developed his elegant and powerful model (Arrow, 1962), explaining that companies will lack the incentive to invest in R&D, unless they can be sure of sufficient intellectual property protection to appropriate the results of their research, there has been a broad consensus around the benefits of public support for private R&D and Innovation endeavours. Both the EU and the United States, along with remaining countries that have embarked on the growth path are prioritising innovation. We will come back later to this crucial policy area.

The presence of externalities for firms, either because they do not have to pay for all the costs they impose (pollution) or, conversely, because their investments have an earnings dividend for third parties (e.g., investment in ICT, knowledge spillovers) means production is not at a socially desirable level. In the first case, if companies do not book (internalise) all their costs they will tend to produce too much of a given good. In the case of a polluting activity, for instance, this would mean higher production and therefore pollution than is in society's interests. In the second case, the reverse is true. Companies will work to a level of production below what is socially desirable, because

the positive pay-off for outside companies does not find its way to their income statement.

Negative externalities require public action to palliate their effects (regulations, technical specifications, fines for polluting, etc.). Positive externalities become especially relevant to industrial policy when they give rise to agglomeration economies. Support policies for technological districts and innovative clusters are grounded on their positive externalities for business (Trullén, 2006; Callejón and Costa, 1996). We will have the opportunity later to return to this point.

There is no shortage of authors (Hausmann, Hwang, Rodrik, 2006; Ono, 2002) who contend that the nature of a country's productive structure, i.e., its specialisation, is what determines its technological potential and growth. Under this premise, the specialisation that comes from an economy's competitive advantage at a given point in time – its stock of specific resources: physical and human capital, natural resources and institutional quality – is not necessarily its optimal productive option. This admission makes the case for an active, pragmatic industrial policy, that does not take up arms against the dominant market forces at international level, but instead supports and encourages more international business strategies that are also more knowledge intensive. We now look at this question in greater detail.

3. Productive structure and specialisation

Economists have also detected a type of market failure associated to the pace of technological change and the catch-up time required for a country's productive structure to adapt to the changes. This lag appears when a market does not spontaneously develop new, technologically advanced activities which have either appeared previously in other countries or have the potential to be developed. The result is a productive structure in which advanced sectors are underrepresented. Japan, Taiwan and, subsequently, other Asian countries have been reasonably successful in implementing policies to combat the inertia of productive systems and their obsolescence. Indeed the most comprehensive analysis of this topic was undertaken in Japan (Ono, 2002):

The industrial policy experiences of Northeast Asian countries indicate that the so-called market economy does not have the ability itself to determine which industries are a strategic key to developing a country's economy, although comparative advantage is, theoretically, decided by factor endowment.

It is sometimes argued that now that Japan (including South Korea, Taiwan) has overtaken the advanced industrial economies, microindustrial policy is no longer needful because private industry does not want or need assistance any more. It is the case in successful private industry (e.g., motor car, shipbuilding, steel industries, and the like). However, the Ministry of Economy, Trade, and Industry is today assisting such sectors as information technology, biotechnology and nanotechnology which are on the cutting edge and is providing infrastructure and environment – technopolis and science park – for high-technology and venture capital enterprises. This is a task that belongs to the domain of functional industrial policies.

The Japanese experience confirms that all industrial policy models start to generate diminishing returns when circumstances change or objectives are modified. And if the policy stance does not change with them it may begin to exert a negative influence. In the case of Japan, the huge modernisation drive that following World War II led to overproduction in certain sectors. Similarly, in Europe and in Spain, the restructuring of declining industries has dragged on too long, despite the enormous efforts of the 1980s, and has only delayed the inevitable adaptation of parts of the productive structure to new international and technological conditions.

4. New activities, new firms

Japan's industrial policy has a lot in common with the concept of the "rising industry" that prevailed in 19th century Europe. The argument is that when a country is behind technologically in activities that require experience and large initial outlays (as happened with the United States, Germany and France compared to the United Kingdom), it is not going to develop these activities under the sole spur of market incentives. The size of the advantage gained by international competitors dissuades national firms from making the effort.

If the general belief – based on the empirical evidence – is that not all productive specialisations bring the same opportunities for economic and technological growth, the industrial policy implications are very different from the non-intervention defended by the theory of perfect markets. When the goal is to encourage the development of new activities, then public involvement may be called for.

The "cost discovery" concept put forward by Hausmann, Hwang and Rodrik (2006) provides an excellent formulation of how market failure can ensue from a lack of innovative business projects. If, as it seems, countries are what they produce, then it is

important that we understand the mechanisms determining productive specialisation. When an entrepreneur sets out to produce something for the first time, he is unsure what the final costs will be. And even if he opts for a standard technology, it will still need adapting to local conditions. The entrepreneur must explore the cost structure – in the wide sense – of the host economy with reference to this new activity, and his search will bring sizeable external economies for those who follow after. If the entrepreneur is successful, others will copy him but saving on a part of the prospecting costs. If he fails, no one else will try and the cost of failure will remain private.

The presence of knowledge externalities means the level of private investment in “cost discovery” is sub-optimal on an aggregate scale, if the government cannot find ways to stimulate it. So the number of entrepreneurs that engage in new activities demanding “cost discovery” becomes a key variable. Policies to promote entrepreneurship, innovative business start-ups, and the launch of innovative projects by existing firms acquire particular importance.

These conclusions are not new, but Hausmann, Hwang and Rodrik’s contribution serves to strengthen, from a different angle, David Audretsch’s theory on the relationship between innovation and entrepreneurship (Acs and Audretsch, 2005; Audretsch, Aldridge and Oettl, 2006). In our next section, we look at how entrepreneurship support policies are gaining ground in the United States and other countries.

One of the biggest costs faced by new innovating firms is the cost of finance. The European Commission has warned that excessive risk aversion in financial markets may cause a shortage of finance or excessively high capital costs that discourage the set-up of innovative firms. The Competitiveness and Innovation framework programme recently approved by the EC aims basically to promote new venture capital vehicles, participative loans and guarantee facilities for new innovative and high-potential enterprises.

The playing field of global competition is changing fast in the early 21st century, and the size of the new powers emerging in Asia, along with the historical factors discussed, suggest that EU countries, however heterogeneous, confront a critical period in which what is at stake is their future position in the global economy.

In a recent communication, the European Commission referred openly to the difficulties encountered in enforcing compliance with fair competition rules – in particular, respect for intellectual property – in the new international context. While the EU, admittedly, is hardly an example of fair competition in agricultural matters, the

question is whether European companies can hold on to their leadership, with or without fair competition, in sophisticated, high-technology sectors and activities that are knowledge intensive and demand skilled personnel.

Even if the EC were to tighten up its classic anti-dumping measures, defending intellectual property rights, imposing standards for imported goods and such like, this is not a tactic that will work. Not just because such measures are hard to enforce, but because the production coming in from China, India or Russia, is not confined to low-tech goods but is rapidly evolving towards more sophisticated, higher-quality projects with an innovative component. Since 2004, the EC has been rethinking its whole approach to industrial policy, to give it a more active and pragmatic bent in both horizontal and sectoral aspects (EC, 2005).

5. The gap between Europe and the United States

No one doubts that the only way the EU can maintain its levels of welfare is by achieving technological and innovation leadership in advanced global market segments. This concern has given rise to an abundance of studies comparing Europe with the United States. Despite the differences, Europe's social and economic base is closer to that of the United States than to those of Asian countries. However, the United States' economic-technological leadership appears significantly firmer founded.

Is the US's competitive lead over Europe truly as wide as it sometimes appears?

The fact is that the average euro zone citizen earns 30% less than his US counterpart, a difference moreover that has barely varied in the last thirty years. But if we analyse the origin of this gap it is hard to identify the explanatory variable. According to a report by *The Economist* (2004), in the ten years to 2003 the United States grew its GNP per capita by an annual 2.1 percent compared to the 1.8 percent of the euro zone – not at first sight an unbridgeable difference. In fact if we strip out Germany, which was then in the midst of its reunification effort, the euro zone growth rate exactly matches that of the United States.

The biggest difference between the two is productivity growth, but here too we have to be careful with the statistics. According to the sources cited by *The Economist*, productivity per hour worked has increased 2 percent a year in the United States since 1994, against the 1.7 percent of the euro zone. But we must also consider that employment growth since 1997 has been 8 percent in the euro zone, likewise

excluding Germany, against the 6 percent of the United States. The European economy has done better at creating employment. It is true, nonetheless, that the United States wins in productivity and it is worth considering why this happens.

A frequent explanation is that Europe suffers from labour and financial market rigidities, but Olivier Blanchard (2004) offers a different view. After examining the data, he concludes that the main reason the income gap has not reduced is that Europeans use their productivity gains to enjoy more leisure time. Americans, in contrast, go on working the same hours in order to earn more money. The roots of the divergent performance therefore lie in social and lifestyle preferences. If we compare productivity per hour worked, Europe stands just 5 percent below the United States, when 30 years ago it was 30 percent below.

The comparison, then, is not that unfavourable. But though some reports make light of differences with the United States, there are causes for European concerns about competitiveness and, especially, about the localisation patterns of laboratories and R&D activities. A UNIDO survey of a sample of R&D intensive companies found they thought research centres would increasingly be located in India, China and Russia as well as the United States.

For this reason, many researchers have started to look at how business incentives differ between the US and Europe and at the direction of their respective industrial policies.

6. Industrial policy in the United States and Europe

The United States has always had a tentative and ambivalent stance towards industrial policy. When the economy is doing well, the idea of implementing industrial policy is generally scorned. American ideology is soundly based on the idea of free markets unfettered by government intervention. Under economic duress, however, America is quick to turn towards industrial policy to rectify economic deficiencies and restore American competitiveness.

In fact, despite a reluctance to articulate or acknowledge, let alone embrace industrial policy, the United States has throughout the past sixty years continued to implement a set of policies designed to enhance and promote the competitiveness of American industry. Much of America's economic performance, both positive and negative, is attributable to what others would term as its industrial policies.

To claim that the United States has consistently undertaken industrial policy is not to suggest that the American industrial policy approach has remained constant over time. In fact, a quiet and virtually unnoticed revolution has transformed American industrial policy. Where policy to ensure economic growth and job creation once looked to fiscal and monetary stimulation on the one hand, and the large corporation on the other, a new approach has emerged focusing on entrepreneurship. What once seemed as an anathema to economic efficiency and prosperity in the post-war era – new and small firms – has apparently become the engine of economic growth and job creation, not just in one economy, but spanning a broad spectrum of national, regional and local contexts.

As Bresnahan and Gambardella (2004, p. 1) observe, “Clusters of high-tech industry, such as Silicon Valley, have received a great deal of attention from scholars and in the public policy arena. National economic growth can be fueled by development of such clusters. In the United States the long boom of the 1980s and 1990s was largely driven by growth in the information technology industries in a few regional clusters. Innovation and entrepreneurship can be supported by a number of mechanisms operating within a cluster, such as easy access to capital, knowledge about technology and markets, and collaborators.”

It is no doubt surprising that such a consensus in the public policy community could emerge concerning the appropriate policy to generate economic growth and employment that could not only cross party lines within a country, but that is also common across a broad spectrum of disparate nations and regions. But what is even more striking is the focus of this emerging public policy approach – entrepreneurship. Just a few years earlier entrepreneurship and, in particular new and small firms, were viewed as imposing a burden on the economy. For example, the Small Business Administration in the United States was created with a clear and compelling mandate to protect and preserve firms that were burdened with size-inherent inefficiencies rendering them uncompetitive.

By the 1980s and into the 1990s a new policy approach began to appear with a greater focus on a very different set of instruments, such as R&D, university research and investments in human capital. While these instruments were certainly not new, the attention and concern they drew in public policy debates to foster growth and employment was certainly a contrast to the more macroeconomic focus of an earlier generation.

More recently, public policy has again refocused, this time towards entrepreneurship as an engine of growth. Trying to promote entrepreneurship in order to foster economic growth might have seemed unfathomable just a few years earlier.

The role of entrepreneurship in the economy has changed drastically over the last half century. During the post-World War II era, the importance of entrepreneurship and small business seemed to be fading away. While alarm was expressed that small business needed to be preserved and protected for social and political reasons, few made the case on the grounds of economic efficiency. This position has been drastically reversed in recent years. Entrepreneurship has come to be perceived as an engine of economic and social development throughout the world. For example, the view of the economy characterized by the Solow model framed the policy debate focusing on economic growth. The main mechanism in the post-war economy characterized by the Solow model for inducing higher growth rates was almost universally viewed as investments in physical capital. This model of the economy was capital-driven. Increasing labor could increase the level of economic output, but not the rate of economic growth.

While technical change was acknowledged to shift the production function, in the Solow model it was considered to be exogenous, and therefore beyond the reach of policy. Thus, the policy debate during the post-war era did not dispute the mechanism, physical capital, but rather the instruments. Something of a ferocious and vigorous dispute emerged both in the economics literature, as well as among the public policy community about which particular instruments were more conducive to inducing investments in physical capital.

The policy focus on capital as the driving input for economic growth during the Post World War II era, generated a concomitant concern about the organization of that capital, both at the industry and firm level. The emerging field of industrial organization, in particular, was charged with the task of identifying how the organization of capital, or structure of an industry, influenced economic performance. A generation of scholars produced theoretical and empirical evidence suggesting that physical capital in many, but certainly not all, industries dictated a concentration of production resulting in an oligopolistic market structure characterized by a concentration of ownership in relatively few producers.

Scholars spanning a broad spectrum of academic fields and disciplines generated a massive literature that attempted to sort out the perceived trade-off between economic efficiency on the one hand and political and economic

decentralization on the other. The large corporation was thought not only to have superior productive efficiency, but was also assumed to be the engine of technological innovation. Ironically, the literature's obsession with oligopoly was combined with an analysis that was essentially static. There was considerable concern about what to do about the existing industrial structure, but little attention was paid to where it came from and where it was going. Oliver Williamson's classic 1968 article "Economies as an Antitrust Defense: The Welfare Tradeoffs," published in the *American Economic Review*, became something of a final statement demonstrating that gains in productive efficiency could be obtained through increased concentration and that gains in terms of competition, and implicitly democracy, could be achieved through decentralizing policies. But it did not seem possible to have both, certainly not in Williamson's completely static model.

Public policy toward business in this period revolved around finding solutions to the perceived tradeoff between scale and efficiency on the one hand, and decentralization and inefficiency on the other hand. The three main policy instruments deployed to achieve the required balance in the industrialized countries were antitrust (or competition policy, as it was called in Europe), regulation, and public ownership of business.

The key public policy question of the day was "How can society reap the benefits of the large corporation in an oligopolistic setting while avoiding or at least minimizing the costs imposed by a concentration of economic power?" The answer centered on constraining the freedom of large firms to contract through public ownership, regulation, and antitrust. . The public policy question of the day was, *How can society reap the benefits of the large corporation in an oligopolistic setting while avoiding or at least minimizing the costs imposed by a concentration of economic power?* The policy response was to constrain the freedom of firms to contract. Such policy restraints typically took the form of instruments involving public ownership, regulation and competition policy or antitrust.

While a heated debate emerged about which approach best promoted large-scale production while simultaneously constraining the ability of large corporations to exert market power, there was much less debate about public policy toward small business and entrepreneurship. The only issue was whether public policy-makers should simply allow small firms to disappear as a result of their inefficiency or intervene to preserve them on social and political grounds. Those who perceived small firms to contribute significantly to growth, employment generation, and competitiveness were few and far between.

Thus, in the post-war era, small firms and entrepreneurship were viewed as a luxury, perhaps needed by the west to ensure a decentralization of decision making, but in any case obtained only at a cost to efficiency. Certainly the systematic empirical evidence documented a sharp trend towards a decreased role of small firms during the post-war period.

Public policy towards small firms generally reflected the view of economists and other scholars that they were a drag on economic efficiency and growth, generated lower quality jobs in terms of direct and indirect compensation, and were generally on the way to becoming less important to the economy, if not threatened by long-term extinction.

The public policy stance of the United States reflected long-term political and social valuation of small firms, that seemed to reach back to the Jeffersonian traditions of the country. After all, in the 1890 debate in Congress, Senator Sherman vowed, “If we will not endure a King as a political power we should not endure a King over the production, transportation, and sale of the necessaries of life. If we would not submit to an emperor we should not submit to an autocrat of trade with power to prevent competition and to fix the price of any commodity.”¹

Thus, public policy towards small business in the United States was oriented towards preserving what was considered to be inefficient enterprises, which, if left unprotected, might otherwise become extinct. An example of such preservationist policies towards small business was provided by enactment and enforcement of the Robinson-Patman Act. Even advocates of small business agreed that small firms were less efficient than big companies. These advocates were willing to sacrifice a modicum of efficiency, however, because of other contributions – moral, political, and otherwise – made by small business to society. Small business policy was thus “preservationist” in character.

Preservationist policies were clearly at work in the creation of the U.S. Small Business Administration. In the *Small Business Act* of July 10, 1953, Congress authorized the creation of the Small Business Administration, with an explicit mandate to “aid, counsel, assist and protect...the interests of small business concerns.”² The Small Business Act was clearly an attempt by the Congress to halt the continued disappearance of small businesses and to preserve their role in the U.S. economy.

¹ Quoted from Scherer (1977, p. 980).

² <http://www.sba.gov/aboutsba/sbahistory.html>

If physical capital was at the heart of the Solow economy, knowledge capital replaced it in the Romer economy. While the policy goals remained relatively unchanged, economic growth, the Romer model reflected the emergence of a new emphasis on a strikingly different policy mechanism, knowledge capital, involving very different policy instruments.

The new policy instruments corresponding to the knowledge-driven economy, or the Romer Model, generally involved inducing investments not necessarily in physical capital but rather in knowledge capital. While the concept of knowledge capital seemed to be vaguer and less conducive to measurement than did the traditional factor of physical capital, it clearly involved knowledge augmenting investments in human capital and research and development. Such instruments were strikingly different than their counterparts corresponding to the Solow economy. These instruments included, but were not limited to, education at all levels, but certainly at the university level, public research support, tax and subsidy incentives to encourage private R&D.

For example, investment in universities was not necessarily viewed as an instrument promoting economic growth in the capital-driven economy. After all, it was not at all clear how the output of universities, students and research, would contribute to augmenting investments in capital. While there was an important case to be made for investing in universities for political, social and even moral reasons, the case was less compelling for economic reasons, and particularly for economic growth. It was indeed possible to view investments in universities as actually detracting from economic growth, in that they diverted resources away from physical capital. But no one can dispute the primacy of investment in universities in the Romer economy.

With the emergence of knowledge as a recognized factor generating growth, entrepreneurship seemed even less relevant. As the Griliches model of the knowledge production function suggests, innovation and new knowledge are the result of large investments in R&D, which seemed to bestow the large corporation with an even greater competitive advantage than had been the case with scale economies in production. After all, Schumpeter had acknowledged, “routinization...

The “routinization” of R&D perhaps reflects a focus on the role of knowledge on the large, fairly established and mature corporations and industries, which dominated the post-war industrial landscape, such as automobiles, steel, textiles, and even mainframe computers. Such routinized R&D may be more appropriate for incremental innovations that improve existing products rather than create entirely new industries.

It may be that globalization has jolted the comparative advantage, so that production based on such routinized R&D can be increasingly outsourced to lower-cost locations, as the Vernon (1966) model had predicted. What he did not predict in his model, however, were revolutions in both technology and politics, both accelerating and extending the degree to which relatively standardized activity could be outsourced. This would suggest that perhaps the comparative advantage in the contemporary global economy is not only shifting towards knowledge, but rather types of knowledge and ideas that are focused increasingly towards the earlier stage of innovative activity.

However, as Arrow (1962) pointed out, the appropriation of investments in new ideas is not so straightforward. Burdened with high levels of uncertainty, imposing asymmetries, and significant costs of transaction, the potential economic value of a new idea is not always obvious and certainly not unanimous across economic agents. Thus, the production, or simply the existence, of new ideas can result in a divergence in their valuation, not only across economic agents, but also between knowledge workers and the decision-making hierarchies of incumbent organizations.

Divergent valuation of new ideas may make it difficult and prohibitively costly for an incumbent firm to pursue all or even most of the new ideas that are at its disposal. What happens to those ideas which are not pursued by the firm for commercialization?

Here again, Griliches (1992), but also Romer (1986), Lucas (1993) and Krugman (1991), provided an important answer – knowledge will spill over for use by other, third-party firms. In the case of knowledge spillovers the commercialization of new ideas will occur not by the firm producing those ideas through purposeful and targeted investments in new knowledge, but rather some other firm.

The insight by Arrow (1962) that knowledge is non-excludable and non-exhaustive has triggered a vast literature and policy concern about the role of intellectual property rights and other instruments to protect and facilitate the appropriation of returns accruing from investments in new economic knowledge. But what if a new idea is not valued by any incumbent firm, whether it is the firm originally generating the new knowledge or any other incumbent organization? There are many reasons to expect a positive correlation across firms in evaluating new ideas. First and foremost, the same challenge confronting the firm producing the new idea may confront all firms – the high degree of uncertainty, asymmetries and costs of transaction. It is those knowledge workers who produced the idea in the first place and understand the ideas the best who may value its potential differently, if not correctly, than incumbent organizations.

In this case there will be no knowledge spillover. Investments were made in creating new knowledge, both privately from the firm, but also publicly, if generation of the new knowledge utilized any type of public knowledge emanating from research at universities or publicly provided investments in human capital. However, in the absence of knowledge spillover, such investments will not be appropriated either by the firm or by society. It must not be forgotten that the social investments of education and research are also expected to generate a return in terms of growth and employment.

Thus, the spillover of knowledge that exists by assumption in the Griliches (1992), Romer (1986), Lucas (1993), and Krugman (1991) models, may, in fact, not be so automatic, but in fact impeded by a filter, or what is referred to in Chapter Three as the knowledge filter. The knowledge filter serves to impede, if not pre-empt, the spillover and commercialization of knowledge.

Entrepreneurship can contribute to economic growth by serving as a mechanism that permeates the knowledge filter. It is a virtual consensus that entrepreneurship revolves around the recognition of opportunities along with the cognitive decision to commercialize those opportunities by starting a new firm. If investments in new knowledge create opportunities that are asymmetric, in that they are more apparent or valued more highly by economic agents (potential entrepreneurs) than by the incumbent firms themselves, the only organizational context for commercializing that new idea will be a new firm. Thus, by serving as a conduit for knowledge spillovers that might otherwise not exist, entrepreneurship permeates the knowledge filter and provides the missing link to economic growth.

Those conditions generating entrepreneurial opportunities – high uncertainty, asymmetries and transactions costs – are even more prominent in earlier stage activity. As economic activity involves earlier stages of innovative activity, the knowledge filter therefore becomes more severe. Thus, entrepreneurship gains in importance as the missing link in the process of economic growth. Globalization has resulted in the emergence of the entrepreneurial economy as the mechanism by which (public) investments in knowledge can be appropriated in terms of growth, employment and competitiveness

While we do not want to argue that the view of the youthful Schumpeter (1911) was wrong that “.....”. It does seem that 21st century entrepreneurship has more to do with *creative construction*. By facilitating the spillover of (knowledge) investments that might otherwise remain uncommercialized, entrepreneurship takes little away from the incumbent enterprises, but instead creates alternative opportunities for employment.

Rather, the *destruction* comes from the side of globalization that presents competitive alternatives to standardized production in high-cost locations such as the United States.. This destructive element, emanating from globalization comes with or without entrepreneurship. The exposure of an economy to global competition has less to do with its endowment of entrepreneurship capital and more to do with its traditional source for economic activity.

By contrast, the *construction* comes from an entirely different source – the entrepreneurship capital of that *Standort*. Perhaps because he dealt with a singular closed or unglobalized economy in both his early (1991) and later (1942) writings, Schumpeter did not consider that the *destructive force* would actually come from opportunities coming from outside of the domestic economy. By contrast, the entrepreneurial opportunities come from within the economy that might not otherwise have been pursued. Thus, rather than serving as a force for destruction of the status quo, entrepreneurship serves as a *constructive force* for a new economic alternative from knowledge and ideas that otherwise might have not been commercialized.

Thus, while from the perspective of the singular or effectively closed economy at the turn of the last century may have led Schumpeter (1911) to conclude that the contribution of entrepreneurship is through the destruction of the status quo by displacement by new firms, in the globalized economy of the twenty-first economy, the destruction comes from global competition. *Creative construction* of new possibilities and sources of growth comes from entrepreneurship.

Perhaps the role of entrepreneurship in generating creative construction rather than creative destruction explains the emergence of entrepreneurship policy at the heart of the new emerging American approach to industrial policy. As the comparative advantage in physical capital is lost, investments in knowledge, both private and public, are needed to create new jobs. Whether or not such knowledge investments at a *Standort*, both private and public, actually result in a public return in terms of growth and employment, may depend on the existence of entrepreneurship capital. The emergence of promoting entrepreneurship in the American industrial policy approach can be interpreted as an effort to create an entrepreneurial economy, which can be defined as one in which entrepreneurship plays a key role in generating economic growth.

7. The risks of industrial policy. Its political economy

Much of the reticence towards industrial policy shown by experts and academic media has to do with two arguments. The first argument centres on the risk of trying to “pick winners”. Governments, it goes, are not always better than the markets at detecting the future direction of demand, and the kind of technologies that will catch on in society. The second objection is that governmental discretion in support policies for private agents can encourage the formation of lobbies, and tempt companies into “rent seeking” activities when they should be devoting their energies to competing on the market.

As regards whether governments are more or less skilled at strategy-making, it is clear that no government can replace the market as a mechanism for the efficient allocation of resources. The failure of centralised planning is proof enough. But industrial policy does seek to replace, but only to correct or supplement. Some governments, in certain historical periods, have been successful in their strategies, as Japan was before the last decade. Likewise, many European governments contributed decisively to their countries’ industrialisation at the end of the 19th century and in the later inter-war period. More recently, the decision to build Airbus has proved to be a major achievement for the countries of Europe. The market may be useful to determine marginal movements in the allocation of resources, but it is less effective when an economy needs wide ranging reforms.

Probably the most incisive argument against government activism is that it encourages the formation of lobbies to try and influence the direction of public policies and procure subsidies and protection. But governments now have effective tools, primarily transparency, to protect against lobbies, so the risk may be far less than in the past.

8. Industrial policy in Spain

Spain’s current industrial policy is a pro-market one, designed to foster domestic and foreign competition, and to promote productivity and competitiveness gains through the medium of knowledge and of business innovation. It bears mention here that non technological innovation is just as crucial as technological innovation, particularly in service sectors and mature manufacturing industries.

It should also be acknowledged that some sectors are strategically important for their technological dynamism and demand growth (e.g., aeronautics, biotechnology,

pharmaceuticals, renewable energies), meaning priority should go to actions that increase their weight in our productive structure.

The job of government is not to prolong the life of inefficient sectors and companies – a “solution” of no practical use in the medium term – but to develop a coherent framework to steer Spain’s productive structure through its technological change, while trying to predict the direction of the structural changes wrought by the knowledge-based economy.

Recognising the role of knowledge also means acknowledging the importance of the sectoral dimension of industrial policy. Technological advance and innovation occur mainly in the context of “technological pathways” developing out of a specific knowledge base. Other conditioning factors for business competitiveness – demand, suppliers, production factors – also tend to be sector-specific to a certain extent. So today’s industrial policy cannot be entirely horizontal as per the official line of the past few years; industrial policy must also be sectoral.

This does not mean neglecting horizontal aspects. Economic analysis endorses the importance of the institutional environment for improving the levels of efficiency in an economy. That is, institutional in its broadest sense, embracing both the tacit operation of markets and contracting variants, and formal rules: commercial law, the tax and labour-market framework, diverse types of regulations. The importance assigned to institutional factors has been growing with time, and nowadays both the OECD and World Bank as well as the European Union recommend streamlining regulations and reducing the administrative burden that weighs on company decision-making.

The government should work to create a supportive climate for the development of business initiative, but investment and management decisions are down to companies themselves. Firms that wish to prosper and stay in profit must be constantly alert to what is happening in the market, and do their utmost to translate scientific knowledge into technological advances in products and processes. In parallel, they must go on exploring possible changes in organisation and logistics, seeking out alliances opportunities and new demand niches and ensuring the continuous training of their human resources.

The important effort required of the Spanish productive system also calls for the involvement of all economic agents – companies, business associations and trade unions, all levels of government and political parties, research institutions, financial institutions – in a coordinated joint offensive to build our competitiveness.

The importance of such institutional cooperation cannot be exaggerated. Spain has come a long way in the last few decades. The first democratic governments laid the foundations for the modernisation of Spanish society: construction of a genuine welfare state accessible to all citizens, painful but necessary industrial redevelopment, progress in economic liberalisation, membership of the European Union, decentralisation of powers to the regions, a more prominent place in the international political arena, opening up to the world and new knowledge. But we are also aware that the world is in constant progression. Many countries – some richer, others poorer than ourselves – are being strenuous in their innovation efforts, and we have to embark on at least an equivalent innovating and modernising offensive if we wish to avoid being left behind.

Spain has shown an exceptional economic performance in the last few years. But weak points have also come to light: the performance of our schools is certainly improvable, especially in occupational and technical training and languages; Spanish companies are at the tail end of the EU by R&D and Innovation spending, with a few front-runner companies but not nearly enough; small and medium-size enterprises need to gear up their innovation capacity and should be looking more to international markets.

There is still considerable work to be done in acquiring business management skills, which will mean addressing each of the multiple variables at work in determining competitive capacity. One such is the accumulation of human capital: a factor that may not strictly belong to industrial policy but is vital for its success. Human capital formation starts with the birth of each individual. Obtaining the best possible result – in which each individual attains his or her optimal development, and qualifications are well matched with social demand – in the circuit that runs from pre-school education through to the university stage and, finally, the research sector is among the prime determinants for progress in living standards and the competitiveness of our productive system.

9. Business innovation policy in Spain

The intention here is not to list all current measures classifiable under industrial policy, but just those geared to fostering innovation among small and medium-sized firms.

The intensity of R&D and Innovation (RDI) effort is the key to the international competitiveness of Spanish companies. Spain still has a long way to go to meet the main objective of the Lisbon strategy: RDI investment in Europe averaging 3% of GDP by the year 2010, converting it into the leading world economic power. Spanish RDI spending is presently 1.13% of GDP. Of this amount, 48% is put up by the private sector against the two-third share targeted by the European Union.

In 2005, the Spanish government launched the INGENIO 2010 programme aimed primarily at closing the RDI spending gap with respect to leading European countries. The goal is to raise RDI investment to 2% of GDP by the year 2010 with 55% drawn from the business sector. INGENIO 2010 includes actions that could be deemed part and parcel of industrial policy, in particular the CENIT consortia bringing companies together with research centres in shared large-scale projects. The Avanza programme too has a competitiveness focus in that it seeks to enlarge SME take-up of information and communication technologies.

Other government programmes, particularly those sponsored by the Ministry of Industry, Tourism and Trade, zero in on innovation among small and medium-sized businesses, most of whom need access to advanced services to supplement their management and innovation capabilities. Three such programmes will be explored here in greater detail: the support programme for Technology Centres; the Innoempresa programme to foster innovation and modernisation in technology and management; and the AEI programme of innovative clusters.

Technology Centres

Technology Centres are among the most active agents in Spain in promoting business investment in RDI. Of the 92 Innovation and Technology Centres figuring in official registers, 65 are also affiliated to Fedit (Federación Española de Entidades de Innovación y Tecnología). All are well established at regional level with the support of their respective regional authorities. However, the choice and scope of services on offer varies widely from one centre to the next, as does the size of regional government support.

In Spain, as in other European countries, most Technology Centres have come into being in response to the felt needs of the corporate sector. Support has generally been forthcoming, albeit to an unequal degree, from the competent regional governments, who have recognised the worth of Technology Centres and joined in initiatives for their development. The General State Administration has also demonstrated a firm and growing commitment to the Technology Centres programme.

Centres biggest asset, and their key differential strength, is that they are a product of business initiative. More than half the income of privately-owned TCs comes from billings to companies in respect of applied research services and agreements. Unlike other, public research bodies, Technology Centres depend on the market for their survival and expansion, on companies' interest in engaging their services. So when it comes to turning knowledge into competitiveness, dynamic firms and skilled employment, the advantage TCs have over other system agents is their power to deliver direct, tailored, advanced and timely solutions for market projects.

Since support to Technology Centres is also an indirect way of supporting innovation in their client companies, the Ministry of Industry, Tourism and Trade has developed a number of incentive schemes: i) for the conducting of applied research projects of interest to the centre itself; ii) for joint projects involving TCs from three or more autonomous communities, as a means to encourage TC networking; iii) for the creation or consolidation of new TCs.

TCs are active partners in the EU's R&D framework programmes, where they have obtained rates of return bordering on 10%, close to the returns achieved by public research council CSIC and actually surpassing it on a per researcher basis. They will accordingly take part in the "Activation Plan for Spain's Participation in the Seventh Framework Programme EuroIngenio" which envisages the payment of premiums to any TC that obtains returns exceeding the previous threshold.

Competitiveness and Innovation Programme for Small and Medium-Sized Enterprises

The new InnoEmpresa 2007-2013 is a programme to promote technological and organisational innovation among small and medium-sized businesses. Recent analyses show that innovative investment in technology generates diminishing returns if the company does not also innovate in its organisation and business model to gain a competitive advantage in the marketplace. InnoEmpresa supports all types of innovation and works in close collaboration with the autonomous communities.

InnoEmpresa is targeted on companies eager to innovate and grow, to adopt advanced management practices in product design, logistics and marketing, etc., and to advance technologically.

Innovative Clusters (Agrupaciones Empresariales Innovadoras, AEI)

We have said before that externalities between firms are an area that calls for public intervention, given their marked tendency to generate market failures. A new Ministry of Industry, Tourism and Trade programme sets out to foster inter-company collaboration through innovative clusters (Agrupaciones Empresariales Innovadoras or AEIs). This term refers to a set of companies, advanced training centres and innovation and knowledge transfer centres sharing the same geographical location that decide to work together on shared projects of an innovative nature. AEIs must have sufficient size to attain international visibility.

The companies and centres making up an AEI must develop an integrated strategy for shared interest projects, with priority going to:

- technological development and innovation,
- the acquisition and implementation of advanced skills in management and commercialisation,
- international visibility and expansion.

In order to encourage the set-up of AEIs, the government offers a series of support measures for their management, the drafting of strategic plans and the advancement of common projects, in partnership always with the corresponding regional authority.

Business services and finance

Industrial policy does not confine itself to industrial activities. Many activities that 50 years ago were handled within large industrial firms (maintenance, transport, engineering, staffing) are now outsourced to specialist service providers. It is no longer relevant to talk about an industrial policy devoted to manufacturing industries. There is no such thing as an isolated, self-sufficient enterprise.

Finance provision is also part of today's industrial policy. New innovative firms may have trouble raising finance in traditional banking circuits. The Ministry of Industry, Tourism and Trade is putting more weight behind its financing vehicles for innovative

and technology-based investments in the form of venture capital or participative loans (Neotec, ENISA) and/or the provision of underwriting facilities to Mutual Guarantee Societies (CERSA).

10. Conclusions

Industrial policy should be geared to the correction of market failures and other obstacles in the way of business competitiveness. The current weak point in competitiveness is the scale of business investment in RDI and it is here that public policies are being redirected. Knowledge transfer and the exploitation of positive externalities, along with the promotion of innovative business start-ups, are the main action areas for modern-day industrial policy.

Innovation and entrepreneurship programmes are more of a tradition in the United States than in Europe. But European Union countries have now adopted the same priorities. The problem is that many governments, Spain's among them, still have to cope with the redevelopment of the regions worst hit by industrial decline.

The biggest enterprise collective and the one with the highest proportion of ailing businesses in the small firm sector. And medium-size firms also need to be more forward-looking and embrace change. In Spain, a number of government programmes are aimed at persuading firms to adopt competitive strategies. And there are signs now that many Spanish companies have crossed the maturity threshold, and assumed ownership of the goals of growth, innovation and competitiveness from their positioning in the most knowledge-intensive segments of the economy .

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