

Innovation Is a Job, Not a Miracle:

The Challenges to Innovation in Large
Latin American Firms

Santiago Gutiérrez





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The Challenges to Innovation in Large
Latin American Firms

By Santiago Gutiérrez

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**To Gabriela and Laura,
que lo son todo**

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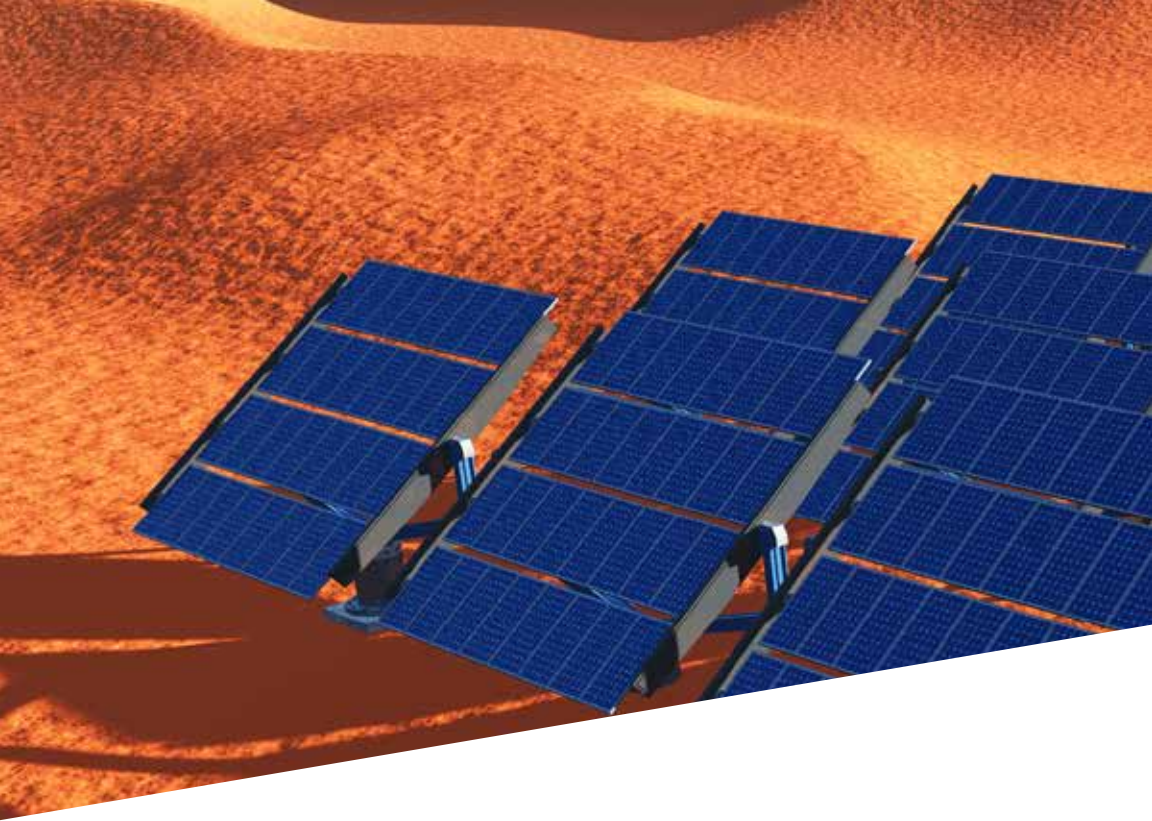
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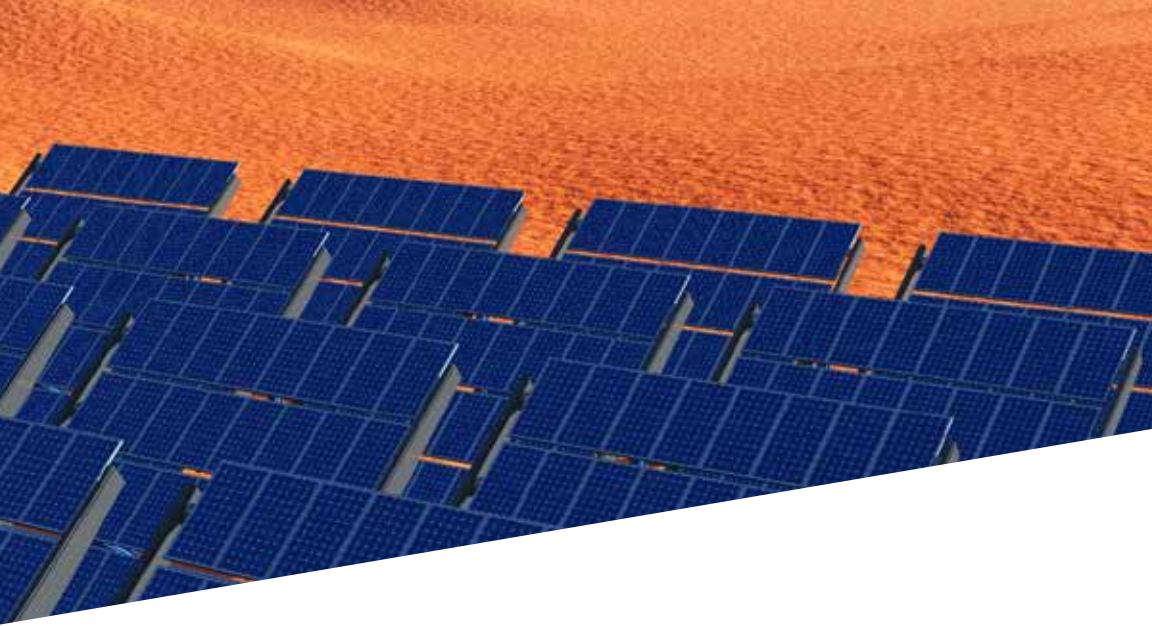
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Introduction

If one had to choose a single word to summarize the causes of economic underdevelopment in Latin America, perhaps one would have to say “productivity.” On average, a Latin American worker in the 1970s produced 82 percent of the output of a US worker. Today, this ratio would be closer to 55 percent—and, worse, total factor productivity (TFP) grows at a languid 0.5 percent a year, half the speed displayed in the 1970s. This means that it takes two Mexican, Argentine, or Colombian workers to produce what a Mexican, an Argentine, or a Colombian would produce if he or she worked in the United States.

This may sound terribly wrong, but these odious comparisons should not surprise anyone. The phenomenon of low productivity has been around for decades in Latin America, and no country—not even Chile—has been able to solve it in a definitive manner. A piece of evidence: Between 2000 and 2014, the countries in the region that



improved their productivity the most were Paraguay, the Dominican Republic, Uruguay, Honduras, and Nicaragua. But have any of these countries been perceived as undergoing a major productive revolution?

World Bank economists cite a 2016 study of two workers at Toyota Corolla plants, in Canada and Brazil. The worker in Canada produces three times more units per year, earns three times more, and the Canadian consumer benefits from the larger output, with cars priced 50 percent lower than in Brazil.¹

It is not that the size of the labor force or the stock of capital decreased, or that the education level of the population worsened. In fact, in the last few decades, these three elements grew more in Latin America than in the United States. The problem has been that Latin Americans have not yet learned to combine resources well. Today, the region has more physical assets, but it still requires two people—now better educated—to change a light bulb.

There are great rewards to improvement in productivity. In 2014, a report from the Inter-American Development Bank showed that closing the region's productivity gap against the United States would double its per capita income.

Where does one begin to work to overcome this condition? The place is technical change—with a radical modification of the production function or, in other words, with innovation.

But what type of innovation is required? Is this a matter that should be left to managers to decide? Should governments intervene, and if so, what tools should they use?

Latin Americans, in general, pride themselves on being creative, highly adaptive, and passionate. However, creativity, malleability, and enthusiasm do not necessarily translate into innovation of the type that increases productivity and sustains development.

Slow innovation is a multifaceted problem, which responds to causes such as a lack of a high-quality education or a lack of competition. But this is not the complete explanation. There seems to be a more pervasive factor, a sort of dark matter of the innovation universe—which includes several elements that largely explain the stillness of the Latin American innovation landscape but have not been directly addressed.

One such element is semantic in origin. It has to do with confusing innovation with creativity. Creativity is about coming up with the ideas, while innovation requires converting ideas into a successful business. In Latin America, ideas are overrated. There are plenty. But there is a tremendous deficit of the ordered, flawless, everyday execution required to transform them into valued goods.

Another element is the belief that innovation is about scientific breakthroughs—that it is a kind of entrepreneurial miracle that mysteriously places a Sputnik, Discman, or iPhone on the face of the Earth. The problem here lies in not being able to recognize that even revolutionary creations are the result of incrementally adding to past knowledge, and of a sustained, everyday effort to reach desired targets. This innovation is a job, an everyday job, and not a miracle.

Thus, a customary declaration on the corporate mission, or on the list of company values, about being innovative, will never do. Nor will entrepreneurial enthusiasm and optimism suffice. Innovation is a construct built around method, discipline, strong managerial skills, and impeccable execution.

Firms are one of the best instruments that humanity has to change life in the world on a significant scale. They can be used effectively to reach the shared goal of most public policy endeavors, that of garnering material prosperity that supports long, healthy, meaningful lives for current and future generations.

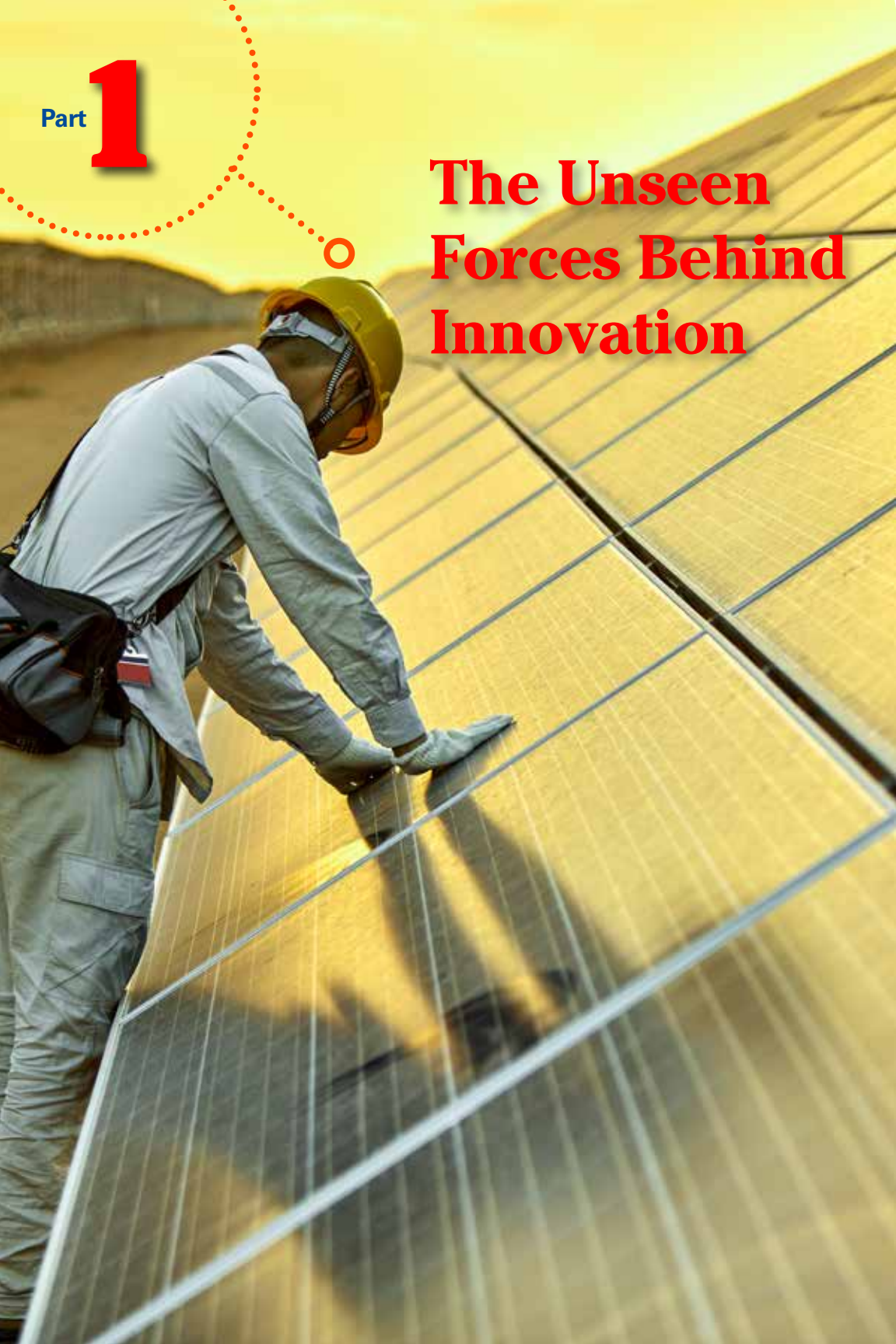
The research undertaken for this report, which was sponsored by the Vidanta Foundation, would like to add elements to the discussion of how to make large Latin American firms more innovative and productive—and thus, better engines of economic and social growth. These companies are not new on the scene. They have an established base of products, customers, and market shares to protect; and they have the needed size, resources, market knowledge, and long history of success.

The aim of the chapters that follow is to find clues for how to spur a new wave of corporate success in Latin America, by making innovative firms the norm rather than the exception.

Part

1

The Unseen Forces Behind Innovation



Chapter 1

A Road Map for Innovation

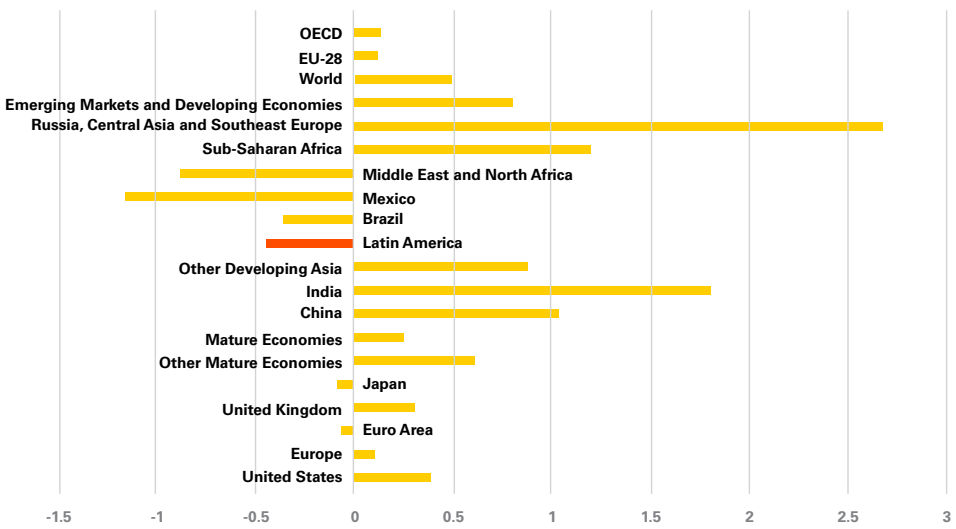
It has been widely accepted for quite some time now that productivity is the main driver of long-term economic growth. But why does productivity bring growth and not, let us say, an increase in labor or capital, the inputs to production? The economic literature has plenty of evidence to prove that the wealth of nations is more a matter of knowing how to better mix inputs than of increasing their availability.

Extreme cases like that of Singapore have been cited, perhaps ad nauseam, as examples of this productivity-versus-resources claim. Singapore—an island state only twice the size of Bogotá, with almost no natural resources and a population of 5.6 million—skyrocketed its per capita income in 50 years, from \$427 in 1960 to almost \$53,000 in 2016—a remarkable feat. In 1960, Brazil and Mexico had per capita incomes of \$200, but these had increased, respectively, to \$8,600 and \$8,200 in 2016.

Countries are less developed not only because they have less physical and human capital per worker than developed economies but also, and more important, because firms use their physical inputs (labor, capital, and raw materials) less efficiently, and because they are much less dexterous at combining technologies. They lack complementary elements, such as skills and knowledge that make technologies work. Arguments like these are now basic, agreed-upon grounds in the economic development literature.

These assertions have a strong statistical backing. One such metric is TFP, which measures how efficiently and intensively inputs to production are used. Between 2000 and 2016, on average, the Latin American region was one of the worst global performers on this indicator (figure 1.1).

Figure 1.1. The Latin American Productivity Drama
Growth of TFP Average 2000-2016



Source: Conference Board Total Economy Database (Adjusted Version), November 2017.

The region grew over the past 15 years at a sluggish, but positive, 2.7 percent a year. Over this period, economic growth was fueled by increases in employed labor, instead of production becoming more efficient. This would not necessarily be bad, if it were not for the fact that employment did not rise at particularly fast rates, and because in the future the size of workforce will inevitably decrease due to demographic trends.

Employment between 2000 and 2017 increased at an average 2 percent a year, but posted only one extraordinary 4.2 percent year (in 2004), five years of less than 2 percent growth, and three more below 1 percent.

To make it clear that this lukewarm performance was even worse, Andrés Cadena and a team of McKinsey Global researchers showed that labor has contributed 78 percent to the region's total growth in gross domestic product (GDP) over the past 15 years, while productivity has only added 22 percent.² This is a weak result compared with the rest of the planet. Labor input contributed 73 percent to GDP growth in the Middle East, 63 percent in Africa, 31 percent in North America, and just 14 percent in Asia. Productivity accounted for the rest.

Moreover, Cadena and his colleagues warned, the region's aging population will cut the growth of the Latin American workforce. Labor input will only rise at an annual rate of 1.1 percent over the period 2015–30, almost half that of the previous 15 years. Productivity is not only "critical to alleviating poverty and fulfilling the rising aspirations of global citizens," as economists rightly see it, but it also seems to be the only way to escape the pull of a growth catastrophe that looms over the region's future, when labor force growth will shrink.³

The road map to increase national productivity has been well laid out. One way is to modify the allocation of resources: to move people and capital from nonproductive activities into more productive ones. Move the unemployed, and the people employed in low-productivity activities (e.g., elevator operators and notary publics) into other occupations that will help create a higher GDP.

A second route is to have firms reorganize their productive and administrative processes to be more efficient. That is, to generate more value added per unit of input used.

A third way is to replace old technologies with new, more efficient ones. This is the Schumpeterian cycle of creative destruction, which

is more likely to be observed in nations or industries that are closer to the world's technological frontier.

If this map is so simple, why not draft a few policies to foster an accelerated rise in productivity, which would make Latin America a 9-million-square-kilometer heaven of efficiency and growth?

One reason is that there are uncharted pitfalls on this route. Some of them are surprisingly big to have been left off the map. Another reason is that jargon and clichés cloud essential elements and complexities that should be considered in policy design. These are not small details. The devil, in this case, is everywhere.

Why is it that the massive adoption of smartphones, or the avalanche of start-ups, have not taken the region to higher productivity levels? Where does this seemingly automatic process break down? If almost any country can copy institutions, why do we not have a Vale do Silício in São Paulo, or why has a new Google not yet been developed in a den in Mexico City? What about other dimensions of economic development: Can faster growth strike a balance between resource use and environmental preservation? And what about inequality or social mobility: Does productivity-led growth facilitate social inclusion, or create a sustainable income and wealth distribution?

These are questions with no easy answers, but let us embark on a journey to discover preferences, incentives, and restrictions. Perhaps some of the answers can be found there.

Let me pose yet another goal for our voyage in the pages that follow. With limited resources, Latin Americans cannot promote innovation on all fronts at once. The region's people must agree on priorities. Thus, they must decide collectively how much to bet, and on what type of innovation. Should governments invest in research and development (R&D)? Promote high-tech startups? Focus on adding value to natural resources? Subsidize the production of cultural goods? Induce universities and firms to work together? Box 1.1 gives a glimpse of this maze.

BOX 1.1. Why Do We Need More Productivity and Growth?

Latin America is a substantially different place now than it was in the 1960s. Its population has almost tripled, reaching 637 million, from 220 million in 1960. The region has become more educated; the gross school enrollment ratio in tertiary education has been multiplied by seven, to 44 percent of the total population, from 6 percent in the 1960s.

The region's people also live longer. Life expectancy has increased every decade by more than three years. A newborn will live on average to be more than 75 years of age, while in 1960 he or she would hardly have reached 59. The region's countries are better set to feed their citizens; arable land has doubled, and agricultural land has increased by more than a third.

Overall, the region has become richer. GDP per head has grown sixfold in nominal dollars, to \$15,200 in 2016 from \$2,300 in 1960.

Is this all good? On purely quantitative grounds, the answer is a clear and definite no. South Korea's GDP per capita in 1960 was \$940, one-fourth the Latin American average. In 2016, it had surpassed \$25,400, 2.7 times more than the region's average.

Some may say that a definitive qualification of Latin American performance depends on individual values and goals, and on specific collective social contracts. But still, on those grounds, the region has not done the job right. To prove it, it suffices to look at the persistence of extreme poverty. Regardless of ideology, or position in society, most would agree that leaving 10 percent of the population so far behind—living on less than \$1.50 a day—is a brutal situation that must be overcome. And the region's poverty levels are close to 31 percent, another social disaster.

The Innovation Trap

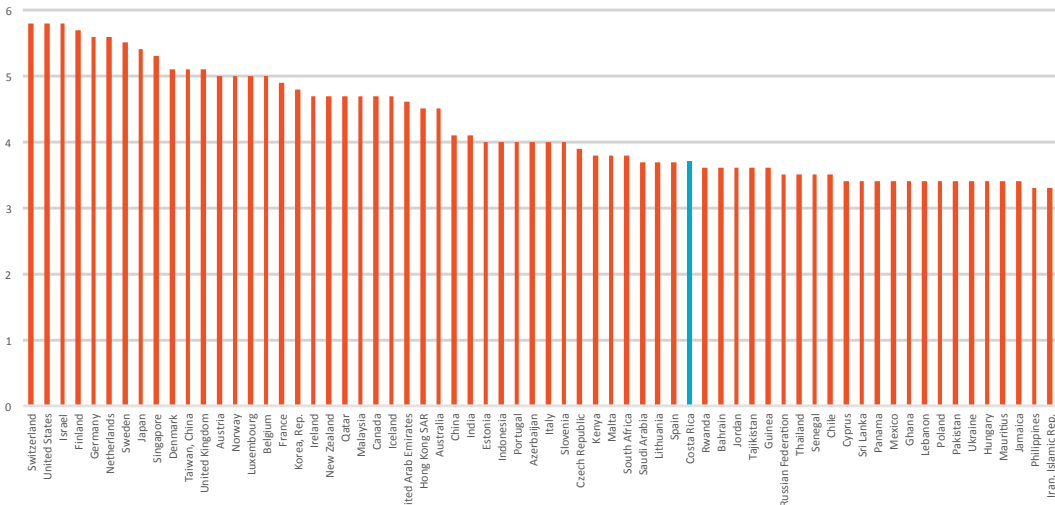
Innovation is not invention. Innovation is not just a collection of good ideas, but giving market value to ideas and inventions.

The definition of innovation that is most commonly used is that of the *Oslo Manual* of the Organisation for Economic Cooperation and Development (OECD): “An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations.”⁴ This is the definition of innovation used here. It encompasses product, process, marketing, and organizational innovation. It also comprises “all scientific, technological, organizational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovation.”⁵

Innovation is a wide concept, given that it may include “production or adoption, assimilation, and exploitation of a value-added novelty in

Figure 1.2. The World Economic Forum’s Ranking of Countries by Innovation

12th Pillar: Innovation



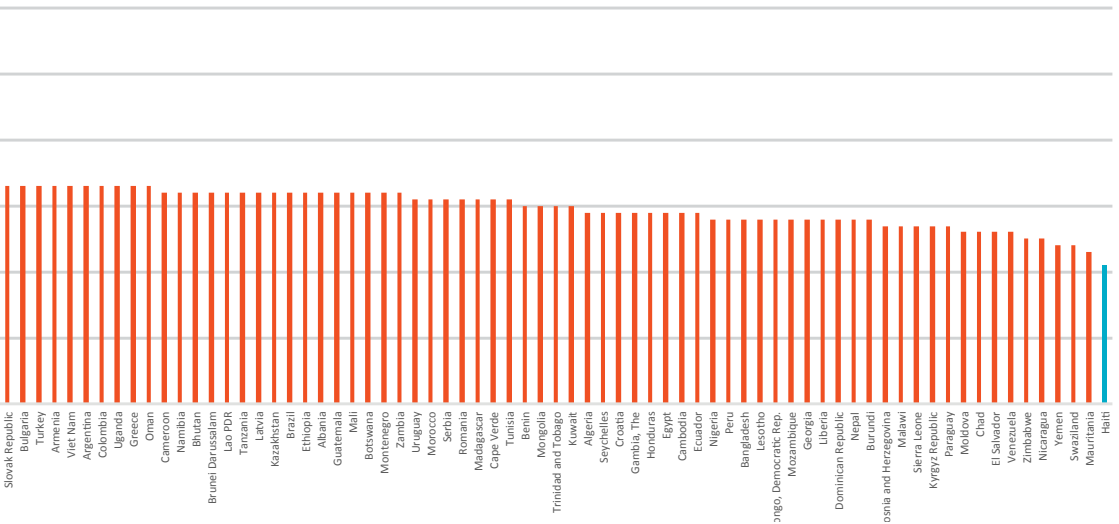
Source: World Economic Forum data.

economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems.” It is both a process and an outcome.

There are several measures of innovation at the national level. The World Economic Forum (WEF) publishes an annual scorecard, in which the best-performing Latin American country, Costa Rica, ranks 43 among 137 countries.⁶ Chile (52), Panama (55), and Mexico (56) make a second group. The rest are scattered between Jamaica (64) and Haiti (137) (figure 1.2).

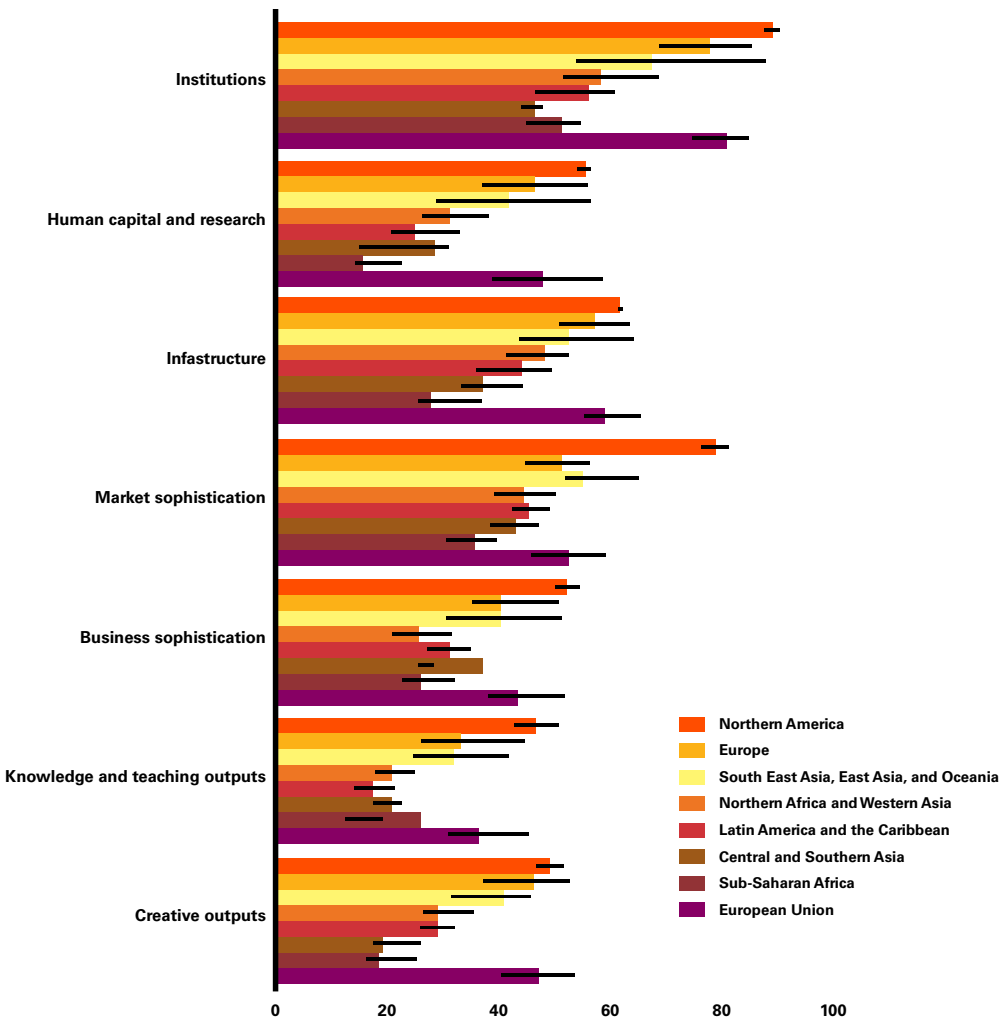
The WEF computes its index based on seven criteria: capacity for innovation; quality of scientific research institutions; company spending on R&D; university–industry collaboration in R&D; government procurement of advanced technology products; availability of scientists and engineers; and number of patents per 1 million inhabitants.

Another metric is the Global Innovation Index (GII), which is calculated by Cornell University, Insead, and the World Patent Organization. It has a more complex set of variables to score the



quality of national innovation environments. The index features five input indicators: institutions, human capital and research, infrastructure, market sophistication, and business sophistication. It also has two output indicators: knowledge and technology outputs, and creative outputs (figure 1.3).

Figure 1.3. Global Innovation Index: Median Score by Country Group and Pillar



Source: Adapted from figure 5 in Soumitra Dutta, Bruno Lanvin, and Sacha Wunsch-Vincent, *The Global Innovation Index 2017: Innovation Feeding the World* (Ithaca, Fontainebleau, and Geneva: Cornell University, INSEAD, and WIPO, 2017), 33.

The GII confirms that Latin America is a poor performer, especially on the qualification of human capital, on the amount and quality of research, and on the output of knowledge and technology goods and services. The GII also has enough historic information to observe that this is not a new situation: “Although important regional potential exists, the GII rankings of countries in Latin America relative to other regions have not steadily improved. In recent years and in 2017, no economies from this region are identified as innovation achievers,” the last edition of the GII report states.

Governments in the region should be aware of the consequences of this frail condition. “One clear observation is that the innovation divide is real, and exists between the high-income and the lower-income economies,” said Soumitra Dutta, coeditor of the GII report, at the launch of the 2017 edition. “There is an innovation divide, and the gap is not decreasing on the whole.”

The GII’s innovation metrics place much weight on scientific research and technological skills, leaving aside other aspects of innovation such as managerial changes. However, this might not be an evil bias. “Science and technology are not a hobby of rich countries, but part of the explanation of why they are rich,” argues José Miguel Benavente of Adolfo Ibáñez University. Moreover, he cites research by a group of economists including Paul Romer, whose works show that causality runs from innovation efforts measured in the GII’s way to productivity, and not the other way around.⁷

Is there a sort of national ceiling for innovation? And is there a force that pulls Latin American countries into innovation backwardness? Based on the evidence, there is. The ceiling can be found in economic headwinds, economic and social policies, and country-specific productive structures. The Northwestern University economist Robert Gordon claims that “innovation is a free good for the world as a whole, while headwinds are uniquely nation-specific.”⁸

Nevertheless, this innovation trap can be escaped. The GII shows an impressive rise in the ranking of developing China. It climbed 7 places in a decade. India scaled 16 rungs on the ladder as well, and Asia as a bloc is clearly becoming an innovation powerhouse.

What is keeping Latin American nations trapped at a lower level? I claim that an intricate but not too unintelligible mesh of national and corporate policy and cultural traits exerts this downward pull. The region needs to look in a different direction than it has in the past

Innovation Is Investment

One such direction is in recognizing the nature of innovation. It is not a story of a lone inventor coming up with a breakthrough discovery, or of a heroic entrepreneur in a solitary battle to conquer the world. Innovation is always a collective task. But this has yet to be recognized.

More important, in essence, innovation requires resources, which after processing and time produce outputs that are taken to market and bought (or not) by consumers. New products then gain space in the minds and budgets of consumers and one day fall out of favor or become obsolete. With this prism, it should be clear that innovation behaves just like any other productive investment. Innovation is an investment.

Hence, it is no surprise that factors that would normally affect investment should also affect innovation—including business climate, regulations that reward innovators or protect intellectual property, skills, competition, interest rates, and cash flow. In most cases, innovation decisions are made comparing the expected costs of developing, scaling up, and distributing a new good or process with the expected revenues from its sale, just as with any other investment project.

Investment on innovation is indissolubly linked to firm behavior. Perceived risk plays an important part in a decision to invest in innovation. In research, outcomes are not guaranteed. At times, proposed outcomes are never reached, or results can move in unexpected ways.

In some sectors, risks are monumental. For instance, the Pharmaceutical Research and Manufacturers of America (PhRma)

reports that it takes 10 to 18 years to develop a new drug. It claims that every successful pharmaceutical product requires \$2.6 billion in investment, and only 2 of 20 approved drugs generate enough revenues to recover the average cost of R&D.

Similarly long, complex, and costly development and trial processes are also found often in mining, oil, and agriculture. Services and software are much less demanding.

There is also market risk. This is the real litmus test for an innovator. Disruptive innovation is a demand, not a supply phenomenon—it is not a “good invention” but a product that is quickly and massively adopted by consumers. Novelty-inclined, rich, or large markets will probably accept innovations faster than conservative, uneducated, or poor markets.

Thus, innovation does not increase at will; there must be conditions to generate investments. There have been cases in Mexico, Colombia, and many other countries where a sudden increase in the funds available did not increase R&D expenditures. The additional funds were left unused.⁹

A common mistake is to believe that increasing funds for innovation is a sure way to spur it. Another mistake is to think that international comparisons and a set of good reasons suffices to move governments and investors.

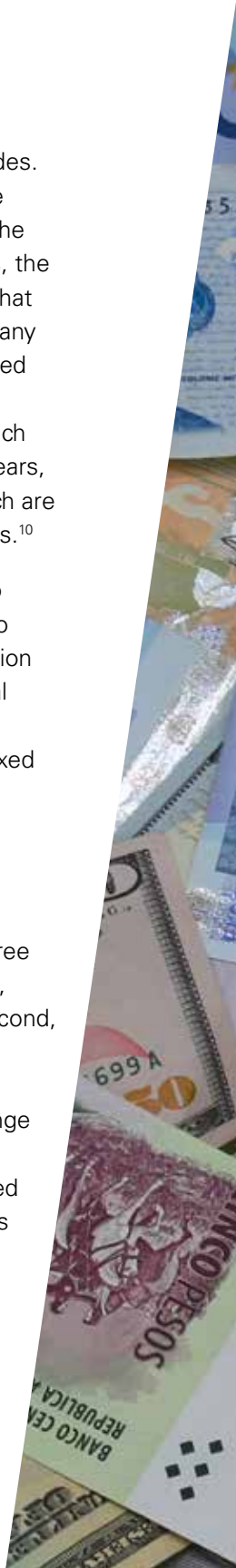
For decades, economists have tried to convince governments and firms in Latin America of the need to reach levels of R&D spending of 1.8 percent of GDP, as in China, or 2.4 percent, as in the OECD countries. But Latin America is stuck—frozen at 0.7 percent of GDP.

On another investment theme, economists have also tried to get Latin Americans to invest 6.5 percent of GDP in infrastructure to meet the needs of final consumers and companies. The result of their evangelization crusade has been extremely poor. Although the need and the benefits are widely recognized, investment in infrastructure has not surpassed 2.5 percent of GDP.

Efforts to increase innovation figures have been made for decades. Public policy to promote innovation has been in existence in the region since the 1950s. From that time until the 1970s, it took the form of supply subsidies to university researchers. In the 1980s, the focus shifted to subsidizing companies (demand), in the belief that firms are end users of academic research or, for that matter, of any type of research. From 1990 to the 2000s, policy action combined subsidies in both ends—at both the knowledge generation and company absorption sides. Finally, a new strand of policies, which will probably be mainstreamed and applied over the next few years, bring to the scene subsidies for “articulation instruments,” which are institutions that induce firms to buy knowledge from universities.¹⁰

Observers blame this investment apathy on firms. They point to them as being risk averse and lacking long-term vision. I want to challenge this view. One argument is that there is more innovation than meets the eye, in particular when measured with the usual yardsticks. Calculating innovation at the firm level is not always straightforward. It is easy to count patents, publications in indexed journals, and new products. It is harder to detect and quantify changes in production processes.

But even if firms are conservative and shortsighted, I want to claim that there are deeper explanations—the elements of the omnipresent dark matter of innovation. Essentially, there are three explanatory components of the problem. First, in Latin America, ideas, creativity, and entrepreneurial attitudes are overrated. Second, firms and entrepreneurial families lack managerial knowledge, method, and discipline. And third, governments lack innovation strategies and, more important, focus. These might sound strange as elements for a discussion of ways to foster innovation, but I want to prove that the usually assumed elements—like unbridled enthusiasm and unharnessed creativity—are not the ingredients of a successful strategy.





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UNITED STATES OF AMERICA

DOLLARS

A photograph of an industrial robotic arm in a factory setting. The arm is orange and purple, and is positioned in the foreground, reaching towards the right. The background shows various industrial components and machinery, including pipes and metal structures, all in a slightly blurred state. The lighting is bright, typical of an industrial environment.

Chapter 2

Counter to Common Wisdom

Let us go back to the beginning. Productivity, the main driver of long-term economic growth, increases in Latin America at one of the slowest paces on the planet. Innovation, by international standards, is in short supply, to say the least. Since innovation is needed to boost productivity, what levers should be pulled to make our countries more innovative? Increasing R&D and invention are the usual prescriptions, but it is a process that takes a long time to achieve tangible market results.

If invention is not Latin America's strength, then adoption or imitation could be a way out of the problem. Launching a first-to-the-world product is the sign of a true innovator, but being a decently fast follower with new-to-local-market or new-to-the-firm products is also part of the innovation continuum. Learning by doing and learning by using—when the manufacturer gets information about the best ways to use a product after it is consumed—and even piracy are part of this continuum (box 2.1, page 26).



Adoption and imitation are clearly forms of innovation. They require some degree of reverse engineering, or changes in processes or skills that, per the *Oslo Manual*, are innovation. These strategies also reduce the risk of innovation, since the outcomes are clearly known. Hence the returns to these investments are easier to calculate and easier to take.

Latin American firms are fundamentally technology adopters. They imitate and are successful to a certain extent. For instance, the regional unicorns Despegar, Mercado Libre, Totvs, Globant, OLX and B2W (tech companies valued at more than \$1 billion) are business model imitators. Firms eagerly engage in learning-by-doing and learning-by-using activities. Unfortunately, all these activities have not been sufficient to make countries grow.

Why does this happen? An explanation is that—exceptions aside—workers and firms lack the skills to adopt and imitate, let alone make new developments at the frontier of technology.

“Many companies in developing countries have proven to be unable to recognize and adopt higher-level technologies. Yet the problem is aggravated by enduring weaknesses in the public sector, which shape enabling environments that offer little support for innovative thinking and that have little capacity to design and implement policies that promote innovation through the upgrading

Box 2.1. Piracy, Not a Major Problem

Piracy, the illegal cousin of imitation, is not a major problem in Latin America. The US Chamber of Commerce estimates the size of global counterfeiting at \$461 billion, and found China and Hong Kong to be the two main culprits.¹¹ Argentina and Peru are on this list, but on a scale that cannot be compared with that of the Asians (table 2.1).

Table 2.1. The Pirates of the World

Economy	Percentage of Total Global Physical Counterfeiting
China	72.0
Hong Kong	14.0
Ukraine	.43
India	.38
Russia	.37
Turkey	.37
Argentina	.37
Thailand	.36
Indonesia	.35
Vietnam	.33
Peru	.33
Nigeria	.31

Source: US Chamber of Commerce, 2016.

Note: Two Latin American countries, Suriname and Panama, that appear on a list of provenance economies of counterfeit goods entering the European Union.¹² These are not major manufacturing centers, and most likely are distribution hubs for Asian goods.

of management techniques and firm-level processes,” said William Maloney, who is the chief economist of the World Bank’s Equitable Growth, Finance, and Institutions Practice and coauthor of the book *The Innovation Paradox*.¹³

This is a colossal waste of opportunities for growth. As Maloney states, there is a massive stock of know-how and technical knowledge that can just be adopted—not invented—by laggard countries. The capacity of laggards to tap into this stock “is a potential transfer of wealth from rich to poor of historic proportions,” he states.¹⁴ “Yet relatively few developing countries have proven able to leverage this stock of knowledge to achieve sustained catch-up with advanced countries.”

The recommendation is simple: Take one step at a time. “Firms in developing countries should focus on building the foundations for successful innovation,” said Xavier Cirera, who is a senior economist at the World Bank and coauthor of *The Innovation Paradox*.

“Innovation policies in developing countries cannot focus primarily on research and development. Instead, they must begin with strengthening managerial and organizational practices.”

Below, I return to managerial skills, the single most important tool to unlock economic growth potential. But first let me prove a point. Nothing can be well grounded if we do not look for hard facts and go beyond the jargon, the slogans, the labels, and the cheerleading about science, technology, and innovation.

The Identity of Innovators: Beyond Written Corporate Values

“The cowl does not make the monk” is a common Spanish saying that could well be used to summarize the unsettling results of a statistical experiment that Santiago Espitia and I carried out for this report. It was aimed at spotting differences in financial behavior and performance between innovators and noninnovators in Latin America.

We selected 30 firms from the list of the biggest 600, publicly traded, nonfinancial companies in the region. The ones chosen had been named the most innovative firms, on rankings published by *Forbes*, *Fast Company*, *Strategy&*, *Dinero*, *La Nación*, and other publications. In all cases, they made it onto these lists because of their reputation as product innovators.

We then built a set of indicators that could sign product or process innovation within a company. Some ratios—like capital expenditures, invested capital, cost control, efficiency, liquidity and indebtedness—were selected to show mostly managerial decisions. Others, like revenues and return on equity, were selected to show corporate performance.

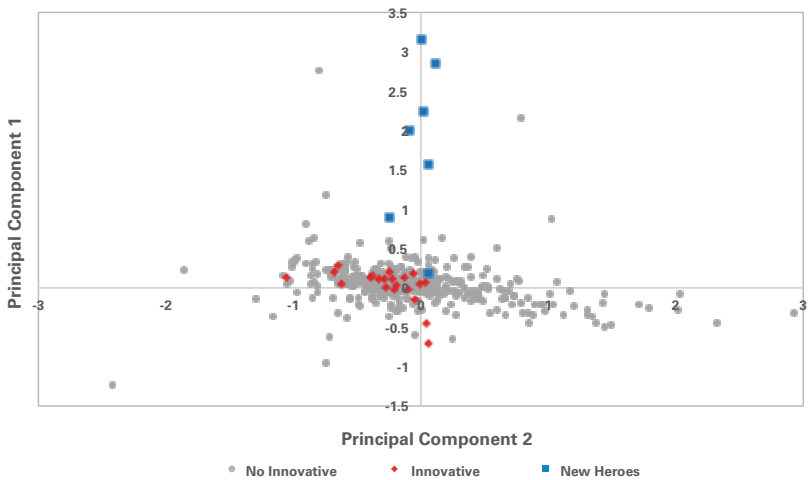
We found that firms labeled as innovative behaved and performed no differently than those classified otherwise.

We analyzed financial data of these two groups of firms using the method of principal components. In a gross oversimplification, this technique allowed us to graphically summarize the combined effect of

all the variables on two axes.

We found that firms labeled as innovative behaved and performed no differently than those classified otherwise (figure 2.1). A clue to understanding this graph: Points that are close together indicate that firms have similar values on all variables. Points that are spread apart show firms that have significantly different values in all variables. Innovative firms (in red) do not cluster together in a specific region of the figure, or leave the pack altogether. This supports the idea that they do not make up a separate group. The firms labeled as innovative behave like any other large firm would. Red dots scatter in a seemingly random way along the graph, and float with the rest, within the confines of a single cloud of points.

Figure 2.1. Product Innovators Are Not Real Champions



Source: Santiago Espitia and Santiago Gutiérrez.

A difference-in-means test—and experiments with rates of growth and levels of the financial indicators—confirmed the basic conclusion: On average, firms considered innovative report indicators that are statistically equivalent to those of firms not identified as such. Prestige and accolades do not seem to be good indicators of a strong link between firm behavior and productivity.

This exercise proved that product improvement alone, which was the characteristics recognized in so-called innovative companies, did not translate into badly needed productivity increases.

New Heroes

Now the good news. This computation unearthed a new group of champions. Out of the 600 firms, some had cut costs, increased efficiency, or grown their sales at incredible rates. These are the blue dots on figure 2.1, which leave the cloud altogether. These companies have the fingerprint of true innovators (table 2.2).

Table 2.2. The True Innovators

			Index	Efficiency	Opex	Revenue	Assets	ROE	IC
Company	Country	Sector	(0 - 1)	% Change	% Change	% Growth	% Change	% Change	% Change
Consultatio	AR	Construction	0.76	165	3	136	-2	2965	0
Celgpar	BR	Electric Power	0.68	31	-334	62	19		78
Grupo Empresas Navieras	CL	Transportation	0.62	59	-161	57	0	1475	2
Irsa	AR	Other	0.46	48	28	62	103	165	96
Tran Paulist	BR	Electric Power	0.44	25	-17	62	14	3721	15
Cresud	AR	Agri & Fisheries	0.42	25	6	37	70	-16	64
Petrolera Pampa	AR	Oil & Gas	0.39	13	2	18	8	6091	6
ISA	CO	Electric Power	0.39	9	-6	15	4	2286	5
Pampa Energia	AR	Electric Power	0.39	11	6	23	16	2792	17
Petrorio	BR	Oil & Gas	0.39	4	-18	6	3	1236	2

Source: Santiago Espitia and Santiago Gutiérrez.

It is worth noting that most of these firms are in oil and gas, and in energy generation. Efficiency gains in oil and gas firms might come as no surprise, since the value of their products nose-dived during the 2014–16 oil bust. The 50-percent-plus price reduction forced them to adjust or die. Let us briefly examine two firms that did.

Pemex. On his second day in office as chief executive of Petr6leos Mexicanos (Pemex), Jos6 Antonio Gonz6lez gathered his staff to inform them of a brutal budget cut, meant to respond to a 50 percent fall in oil prices, which would slash half of the company’s revenues.

The value of an oil company is fully dependent on its reserves, and reserves had been constantly shrinking at Pemex. To help the company’s hard-hit cash flow and to improve its valuation, the staff proposed a \$700 million deep water exploration project. Gonz6lez was not convinced. His staff insisted, but Gonzalez replied with a painfully practical question: Who of you has the \$700 million to develop it? The project was ditched. “Case closed,” Gonz6lez recalled.

However, the following morning the staff came back with an alternative: partnering. Although farmout, as it is called, is common practice in the oil world, Pemex had never partnered to develop a field. The new-to-Pemex

business model ended up saving the company's finances in the worst of times.

ISA CETEEP. Energy generation and transmission in Brazil created another group of true innovators. These results were partially driven by policy action. In 2013, the Brazilian government enacted a norm cutting electricity rates by 20 percent, forcing an extensive increase in efficiency.

In 2012, a few months before the rate cut, Colombian multilatina ISA had set a strategy to improve its asset profitability. "This implied being more efficient in capex, opex, procurement, and support area operations," said ISA's planning vice president, Patricia Castaño. Within this program, ISA's Brazilian subsidiary CETEEP had a material cost-cutting goal.

The push of regulation and the self-imposed productivity targets resulted in CETEEP becoming the best-performing electricity transmission company in the Brazilian industry. "It was the consequence of lowering costs and sticking to good managerial practices," Castaño added.

Still another piece of regulation totally transformed CETEEP's business models. Originally, electricity transmission firms had to make large infrastructure investments in power lines, transmission towers, and the like. The Brazilian government would buy these assets from them over a 30-year period. In this scenario, industry actors could increase their margins substantially, if they could get cheap bank loans to fund these projects. CETEEP, backed by Grupo ISA, did so.

A change of rulings accelerated the transfer of the infrastructure to government, and shortened the period in which firms would receive the money to pay the investment to 8 years. Their business totally changed from being a builder and operator of infrastructure to being an operator of a public network. Firms were pushed into low-margin businesses, where they had to be highly efficient to survive.

There seems to be a two-pronged moral to these stories. First, product innovation does not drive productivity gains in large nonfinancial Latin American companies. Second, companies adjusting to competitive conditions—such as changes in prices, terms of trade, and regulations—generate sound managerial practices that foster the good kind of innovation, the kind that generates productivity gains and long-term economic growth.



Chapter 3

A Note on Unproductive Activities

Directly unproductive, profit-seeking activities block the channel from innovation to growth. The economist Jagdish Bhagwati coined the term “directly unproductive, profit-seeking activities” (DUP activities) to name actions that use real resources—capital and labor—to make a pecuniary profit or income but produce no output, directly or indirectly.¹⁵

Corruption is one such DUP activity. Corporate bribe money given to a public officer does not increase GDP. It is just a transfer that does not generate more output. Large bribes, in general, cannot be quickly spent domestically on consumption or investment, because the receiving party might want to conceal the proceeds of the illicit operation.

DUP activities are a real enemy. Some might imagine that corruption greases the wheels of ill-functioning bureaucracies, making them faster and more efficient. However, most economists would now agree that empirical evidence has proved that the net effect of corruption is to “sand the wheels” of institutions because it hinders investment and, thus, economic growth.¹⁶



The breadth of corruption in Latin America is outrageous. Instituto Mexicano para la Competitividad estimates the cost of corruption in the country to be in the range of 9 to 10 percent of GDP—that is, a staggering \$94 to \$104 billion. In Colombia, the local newspaper *El Tiempo* reported that graft payments are at \$17.5 billion per year, a figure equivalent to almost 10 percent of the national budget.

The Office of the Ombudsman in Peru (Defensoría del Pueblo) reported in 2016 that an estimated annual \$3.6 billion went to corruption. Coincidentally, this corresponds to 10 percent of the annual national budget.

These numbers make the Petrobras scandal seem less extraordinary. Corrupt officials of the state-owned oil company siphoned out \$4 billion to finance political campaigns.

This practice is perniciously widespread. A 2017 Transparency International survey found that one in three users of public services had paid a bribe in the last 12 months: “We talked to more than 22,000 people in 20 countries. Based on the estimated population size of these countries, this means that around 90 million people paid bribes.”

It is hard to say if these figures are exaggerated. But any conservative estimation of the value of bribes is bone-chilling. The cost of the Panama Canal—the building of which was also plagued with allegations of corruption—was \$5.5 billion. With any metric, Latin Americans have thrown dozens of canals into the hands of bribers.

“We talked to more than 22,000 people in 20 countries. Based on the estimated population size of these countries, this means that around 90 million people paid bribes.”

Corruption is not the only DUP activity. Lobbying to increase tariffs or quotas, to divert government revenues into private hands, or to create monopolies is also unproductive. Lobbying to influence policy decisions,

like banning immigration to protect locals, could also be a DUP activity. Policy-evading actions like smuggling or tax evasion would fall in this category, when they do not increase production.

Bhagwati warned years ago about subsidies captured by pressure groups. Rents accrued by pressure groups are only a transfer—money changing hands from government, consumers, or both to firms, with no increase in output. The armies of lawyers and accountants involved in subsidy grabbing are as productive as elevator operators.

Policy is not right always. High tariffs, bans on movement of goods or labor, and some tax regimes might have severe design flaws. Bad policies might induce rule-evading behavior, but, as has been learned the hard way in the region, poor rulings are not the only force behind DUP activities.

Mobility is yet another way in which productivity is lost. Every day, traffic jams throw large groups of the population into an idle mode for hours. The annual Global Traffic Scorecard published by the transportation-analytics company Inrix suggests the size of the problem.¹⁷

An average driver in São Paulo spends almost 11 days per year in traffic congestion. In Bogotá, drivers spend 9 days; and 8 in Caracas, 7 in Mexico City, and 6 in Rio de Janeiro. Compare this with Brazil's 12 public holidays and Mexico's 7. The costs of inactivity in these five cities could easily surpass \$70 billion per year. That is almost

the value of all of Brazil's agricultural exports, which in turn are 41 percent of the country's merchandise exports.

The way governments interact with the private sector makes a difference, Bhagwati said. Some are more adversarial to private entrepreneurship, "with politicians and bureaucrats exclusively in the driving seat." Others work in a symbiotic relation with the private sector. The advantage of the second model is that "government can take decisions based on microeconomic know-how that is embodied in the entrepreneurs familiar with the industry." This information cannot otherwise be obtained by bureaucrats, he said.

Examples of public-private coordination abound, but Bhagwati mentions that of the Ministry of International Trade and Industry and Japanese firms. Their relationship was instrumental in the Japanese rise in the 1970s.

The term "DUP," and the study of these topics, fell by the wayside in the 1990s, but they might well be brought back from their academic grave to shed light on the causes of nonproductivity in the region. It is worthwhile to find ways to guide so many hands and brains away from rent-capturing, and from innovating in ways to break the law (box 3.1).

BOX 3.1. Organized Crime

Organized crime is a deeply negative DUP activity. In some instances, crime does not only deter investment but also destroys productive assets.

Some criminal activities, like drug trafficking, are growth-enhancing activities, but they have a deadly counterbalance.

Illegal drug dealing operates in value chains—from harvest, refining, transporting, and retailing to money laundering. Specialized cartels handle each part of the operation. “The one-capo business does not exist any more,” said a high-ranking Latin American police officer, who asked to remain anonymous.

The operations of these value chains have a cost. Guerrilla groups funded by drug trafficking—such as the cartels Shining Path in Peru and Fuerzas Armadas Revolucionarias de Colombia—were the direct cause of horrific acts of violence. Mexican cartels have claimed tens of thousands of lives. Narcotrafficking eroded the rule of law, fostering impunity and corruption. “Corruption is the most used form to assure success in the logistic chain,” the police officer explained.

At the same time, actions against cartels have a cost. Forced eradication efforts have caused environmental and community damage.

Money laundering is the lifeblood of this traffic. It allows new investment in the illegal business. It also distorts relative prices and diminishes national competitiveness. Honduras, with the highest global homicide rate, at 82.1 murders per 100,000 inhabitants, is paying the price for being a money transit country. “Maras and organizations in Honduras and Nicaragua work for cartels, in the surveillance of money routes.”

Jailing kingpins has proven to be a poor solution. “Organized crime is managed from jails,” the police officer said. In Brazil, crime—from car robberies to drugs, arms sales, and human trafficking—is organized from prisons, said São Paulo state attorney Fabio R. Bechara. “The Brazilian prison system is at the core of the spread of organized crime in the country.” This seems to be the case in many of the most violent countries in Latin America.

A suggested policy response is open-border justice to make judges stronger than mafias.



Chapter 4

At the Speed of Life

Innovation is investment. As such, firm behavior is central to innovation. Firms, in fact, are almost the only channel to transform innovations into productivity. This is true in both emerging economies and developed nations.

As discussed above, ideas—even good ones—or inventions—even nice ones—are not enough to foster growth. But technology—even the most sophisticated—is not sufficient either. This has been proven in places like the United States, where the flow of research and innovation outcomes has not stopped, but productivity has slumped.



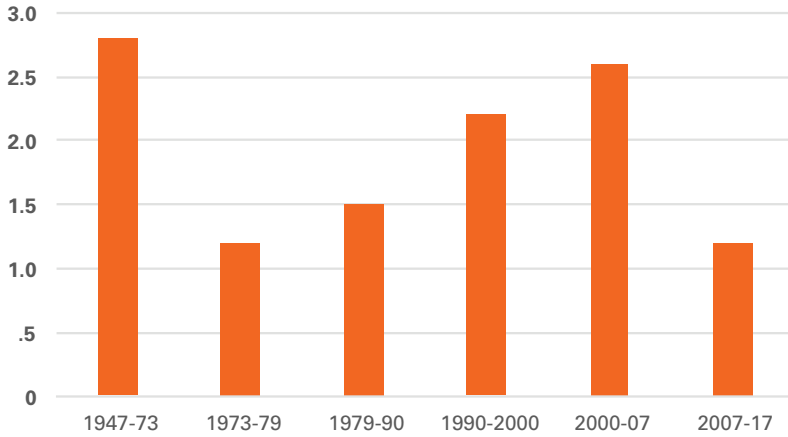
Life on the Frontier

“We can see innovation everywhere but in the productivity statistics.” This sentence, which paraphrases the economist Robert Solow, is by now a common observation in Washington, where policymakers worry about the fall in national productivity. Despite its recovery in 2017, it is still performing well under par by historical standards (figure 4.1).

The Trump administration has an explanation of this decline. It claims that invention has maintained steady growth, but it has not diffused to firms. This disconnect, in turn, is related to the lack of entrepreneurial spirit. New firms are not being created fast enough (figure 4.2).

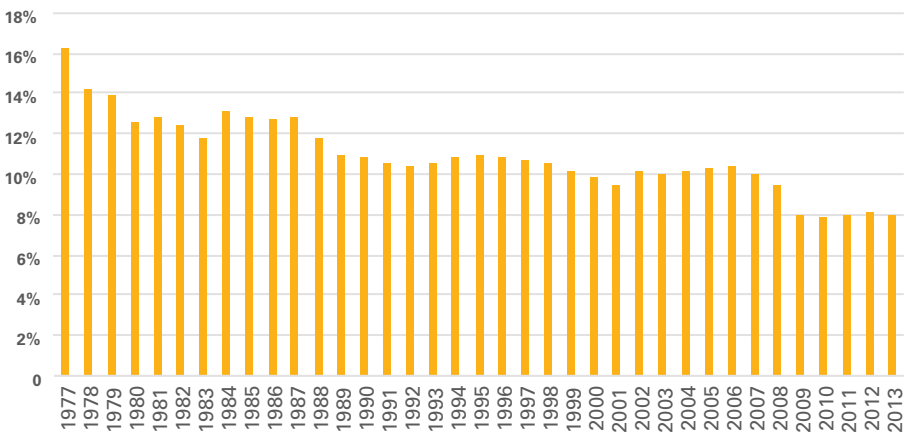
Figure 4.1. A Drastic Productivity Decline: Productivity Change in the US Nonfarm Business Sector, 1947–2017

Productivity change in the non-farm business sector, 1947-2017



Source: US Bureau of Labor Statistics

Figure 4.2. The Long-Term Trend: Fewer New Firms—the Share of New US Firms as a Percentage of All US Firms, 1977–2014



Source: US Census Bureau, Business Dynamics Statistics.

The administration puts the blame on Millennials for this slow diffusion. “Millennials are the least entrepreneurial generation ever,” said Kevin Hassett, chair of the White House Council of Economic Advisers, at a conference in December 2017.¹⁸

Data from the US Small Business Administration support this view; “at age 30, less than 4 percent of Millennials reported self-employment as their primary job, compared to 5.4 percent at that age for Generation Xers and 6.7 percent for Baby Boomers,” reads testimony before the US Senate.¹⁹ “Furthermore, research by the Kauffman Foundation shows that in 2014 young people were responsible for half the share of startup launches as they were in 1996,” the report goes on.

There are many reasons for this lessened entrepreneurial drive. Millennials stay in school longer, accumulating debt in the form of student loans; youth unemployment is on the rise; and home ownership has declined and hence access to capital is more difficult.

Other economists, led by Northwestern professor Robert Gordon, believe that the problem of productivity lies on the weak impact that information and communication technology (ICT) has had on the economy. Gordon thinks that there have been three major waves of productive innovation—commonly called industrial revolutions—in the history of civilization. The first wave came between about 1750 and 1830, with the invention of steam engines, cotton spinning, and railroads. The second, which Gordon believes is the most important, was forged in the relatively short interval of 1870 to 1900, around three central inventions: electricity, the internal combustion engine, and running water with indoor plumbing.²⁰ Other economists add more inventions to this period: the development of oil-based chemistry and pharmaceuticals, and the development of communication and information products like telephones, radio, and the cinema.

The first two industrial revolutions required 100 years to have their full effects percolate through the economy. “During the two decades 1950–70, the benefits of the Second Industrial Revolution were still transforming the economy, including air conditioning, home

appliances, and the interstate highway system,” Gordon explains. After 1970, productivity growth slowed, because the main ideas of the revolution had, by and large, been implemented by then. The Second Industrial Revolution “created an unbroken chain of 81 years in which productivity grew fast enough to double every 29 years.”

There has been a long chain of related effects. Electricity spun off in many directions. Motor vehicles brought about complementary inventions, such as highways, airplanes and personal travel, and supermarkets. Running water improved public health and reduced mortality. Gordon also mentions institutional changes, like the improvement in working conditions “that eliminated child labor and utterly changed life on the job from brutal and short to less physically demanding and more comfortable work.”

The Third Industrial Revolution evolved from the invention of the computer and the Internet. It began in about 1960 and reached an eight-year peak during the dot-com era, between 1996 and 2004. The main impact on productivity—associated with the invention of the Internet, the World Wide Web, and e-commerce—withered away after that, according to Gordon.

Peak productivity was reached by conditions that are hard to replicate. As Gordon explains, there was “an unprecedented and never-repeated rate of decline in the price of computer speed and memory, and a never-since matched surge in the share of GDP devoted to ICT investment.”²¹

The full impact of the ICT revolution has yet to be seen, Gordon thinks. It takes time for organizations to incorporate it. He offers an example of this lag: The installation of electronic check-in kiosks in airports uses a development of the 1990s, which was only implemented in 2001–4, and began to be used widely in the 2010s.

Computers were particularly useful, replacing clerical labor for tedious and repetitive tasks. Computers were used to make bank statements and phone bills in the 1960s and airline reservations in the 1970s. Personal computers, automated teller machines, and barcode scanners were adopted in the 1980s. There is also a limit

to the number of tasks that ICT can perform in an organization. In periods of productivity slumps, such as 1972–96, computers did not come to the rescue because they had been already deployed to the limits known at the time.

Another explanation for the problem of low productivity comes from Stanford University's Nicholas Bloom, and his colleagues Charles I. Jones, John Van Reenen, and Michael Webb. They state that the long-run economic growth rate depends on the product of two terms: the effective number of researchers and their research productivity.²²

They find evidence to prove that research effort is rising substantially while research productivity is declining sharply. A good example, they wrote, is Moore's Law: "The number of researchers required today to achieve the famous doubling every two years of the density of computer chips is more than 18 times larger than the number required in the early 1970s." Across a broad range of case studies, they find that "ideas—and in particular the exponential growth they imply—are getting harder and harder to find. Exponential growth results from the large increases in research effort that offset its declining productivity."

Whether the cause is the decline of entrepreneurship or the absence of ICT spillovers, or the lack of ideas, the fact is that US policymakers are worried about the country's sustained productivity decrease. It is not a new problem, nor will it fade away soon, but it is vital for growth in a nation on the technological frontier. Replacement of old technologies and firms by new ones, the Schumpeterian creative destruction idea, is critical for these economies.

For our purposes, one can draw several conclusions from this case. One is that new, general purpose technologies take time to be fully useful. Applications must be developed and absorbed. This happens in developed as well as developing nations.

Another is the confirmation that slow economic growth and lessened productivity are not a matter of ideas. It is a challenge at the firm level to satisfy consumer needs in meaningful ways with available knowledge.

Chapter 5

The Crux of the Matter: CEO Performance

Fine—so firms are the keystone of innovation. However, the interviews carried out for this report (which are listed at the end) converged on a yet more important conclusion: In Latin America, chief executive officers (CEOs) are the jet engine and the brakes of corporate innovation. CEOs are at the heart of the problem of the lack of innovation and, hence, of national productivity.

This might seem obvious, but it is almost always overlooked when looking for policy actions to foster innovation. Firms are not abstract constructions but entities that can be well defined by their management and organizational practices.

Innovation needs CEOs leading the process. Innovation is about able leaders at the top. “The CEO is the one who has to make the tough decisions, who has to allow people to make mistakes, who has to lead a journey that is not easy to define. We know the ‘why’ and the ‘what,’ but the most important, and the most difficult element, is the ‘how,’” said Claudio Muruzábal, who is the president for Latin America at SAP.



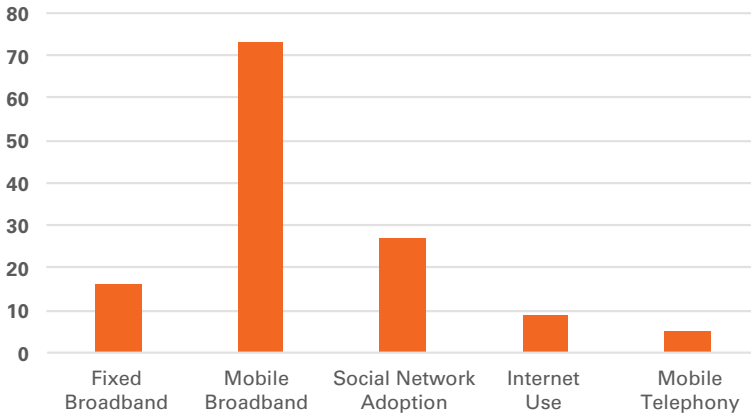
In history, leaders have set the attitude, the excitement, and the energy of truly innovative companies. “[Innovation] is all in the attitude,” said Arthur P. Molella, a historian and the director emeritus of the Lemelson Center at the Smithsonian Institution. “Charismatic leaders . . . play a crucial role in developing creative spaces, attracting inventive people and getting funding. More importantly, they connect individual practitioners with the larger scene of social and collaborative networks that define technology regions.”

A leader of innovation, Molella said, fosters creativity. He or she does not tell others what to do, but brings out their creative potential. He describes this leader as charismatic, a role model, and, surprisingly, “a bit crazy.”

Another conclusion that emerged from this research is that Latin American CEOs must improve their educational level, especially their training in some strategic areas. Obvious? Not so.

The Columbia University professor Raúl Katz showed that there has been a massive adoption of digital technologies in the past decade in Latin America (figure 5.1). However, much like in the United States, it has not increased productivity, because adopting firms have not fully used its potential.

Figure 5.1. The Avalanche of ICT Adoption in Latin America: Compound Annual Growth Rate, 2011–14



Source: Raul Katz.

Unlike the United States, the problem is not a lack of entrepreneurs. In this case, regional firms do not have complementary assets like a skilled workforce, infrastructure, and organizational abilities to enable ICT tools improve their performance.

Erik Brynjolfsson and Adam Saunders show that US companies with the highest level of returns on their technology investment are doing more than just buying technology; they are inventing new forms of organizational capital to become digital organizations. “These innovations include a cluster of organizational and business-process changes, including broader sharing of information, decentralized decision-making, linking pay and promotions to performance, pruning of non-core products and processes, and greater investments in training and education.”²³

But Katz found the real culprit of the disconnect between ICT adoption and productivity in Latin America in the office of the CEO: “The main cause is that CEOs lack knowledge about digital transformation and its implications. On 60 percent of the 150 firms surveyed, digitization is not a priority, because the CEO did not know what it meant. There is lack of interest because of lack of knowledge.”

Tech experts also point fingers at CEOs. Their comments about CEOs' knowledge of technological matters range from mild derision to higher-caliber criticism.

Serge Elkiner founded YellowPepper in 2004 to offer mobile banking services in Latin America. It operates between banks and retailers. With 61 employees, he runs a small shop by old-style metrics but handles 480 million transactions per year, for 400,000 merchants in nine countries. His company works with large banks and major merchants, such as Zara, Starbucks, McDonald's, and Nike.

Elkiner responds quickly when asked about the problems that hinder innovation in large Latin American firms. First, he says, their technological legacy systems make it difficult to integrate new things. And second, the problem is management: "Top executives are of another generation. With some exceptions, they do not understand."

The speed of change and managers' lack of knowledge scares them away from launching any serious digital strategy. "They are afraid of failing, of having to redo things, of scrapping projects, in the end, afraid of innovating," Elkiner notes; he believes that education is the answer.

Mauricio Ramos—a lawyer turned CEO of the telecommunications and media company Millicom—agrees on the need to have digitally knowledgeable leadership. "In my experience, nothing happens in a large company without clarity in leadership," In his view, CEOs must be able to ask the right questions: "They do not have to be born digital. I was not born digital, I did not study technology, but I know how to ask the correct digital questions."

It Is in What Salamanca Lends

Quod natura non dat, Salmantica non præstat (What nature does not give, Salamanca does not lend). This Latin proverb does not apply to Latin American CEOs. They must know and master the lessons taught at the top business schools.

A little-known fact is that, on average, the CEOs of the largest nonfinancial companies in Latin America have better professional training than the CEOs of the biggest companies in the world. Roughly 70 percent of the CEOs of the top 50 firms in the *Latin Trade* 500 have an engineering or business bachelor's degree; 70 percent have an advanced university degrees; and 60 percent of those with advanced degrees have a MBA.²⁴

This is a better academic background than that of other top companies in the world. Close to 60 percent of the sitting CEOs of *Fortune* 500 and S&P 500 companies have a business or engineering degree, and 65 percent have advanced degrees; 40 percent of the latter have an MBA.

One-third of the Latin American CEOs with advanced degrees mentioned here graduated from Harvard, Wharton, Northwestern, or Chicago. These universities are the alma maters of 25 percent of the CEOs of the world's top companies. Yet another 5 percent of these Latin American executives graduated from internationally renowned centers like the Massachusetts Institute of Technology (MIT), Insead, Cornell, and IMD, and the remaining 62 percent graduated from local. This is not a bad record at all. The CEOs of the top 50 Latin American companies have the same types of academic background as their peers at the largest firms in the world. They probably took the same courses with the same professors, and have the same class notes. They probably share a similar view of the world and possess the same knowledge of managerial tools.

However, the situation changes fast as one goes down the ranking of Latin American firms. Take the CEOs of firms ranked 450 to 500, the bottom 50 of the *Latin Trade* 500. A total of 74 percent of them hold an engineering or business degree, which seems very good; but only 54 percent went on to take an advanced university degree, and 82 percent of those who went to graduate school obtained an MBA.

What is not good is that the few who took advanced degrees went mainly (68 percent) to lower-quality local and international universities. Only 32 percent went to top schools like Wharton, Northwestern, and Chicago.

Why is this a problem? The answer: quality. The best-ranked Latin American university, Universidade de São Paulo, places 153 in *US News's* ranking of best universities in the world, and somewhere between the spots 250 and 300 in the *Times Higher Education Supplement's* classification. With few exceptions, the universities in the region rank well below the position of 600.

A lack of high-quality formal education is a problem. It is more important for innovation, productivity, and economic growth than many others. In this case, CEOs do need Salamanca, badly.

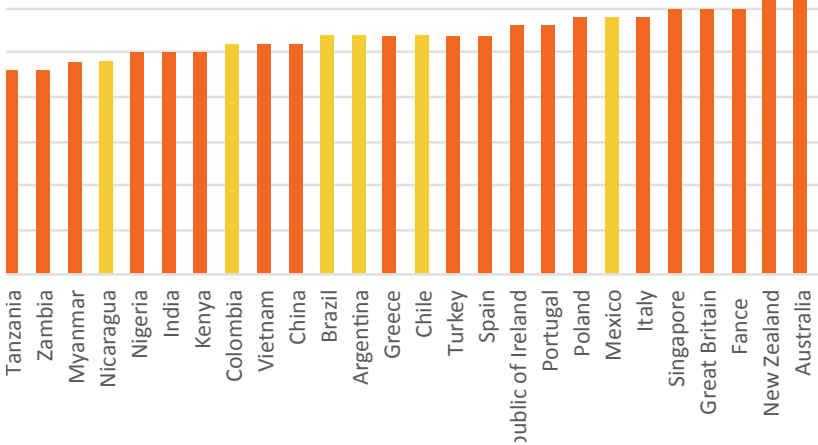
Structured Management

The role of CEOs is not limited to being the inspiration and the élan vital of innovation, or to being the visionary, making sense of the company's environment. They must also apply and enforce methods, management techniques, and best practices.

There are numerous theoretical reasons to expect management to matter for performance.²⁵ Empirical studies of this relation were virtually nonexistent 10 years ago. New data sets have given quantitative evidence to confirm that there is strong causality between managerial skills and innovation and productivity.

The World Management Survey (WMS) gives an unparalleled view of collective managerial skills in a large number of companies in 34 countries (figure 5.2). It measures 16 structured management practices in three key areas: operations management, performance monitoring, and target setting. Some of the areas measured by the WMS are introducing modern techniques, standardization, a good use of human resources, data-driven planning, adoption of best practices, performance tracking, performance review, and a balance of targets.²⁶

Figure 5.2. Latin American Managers Are Not Particularly Good: Total Scores on the World Management Survey

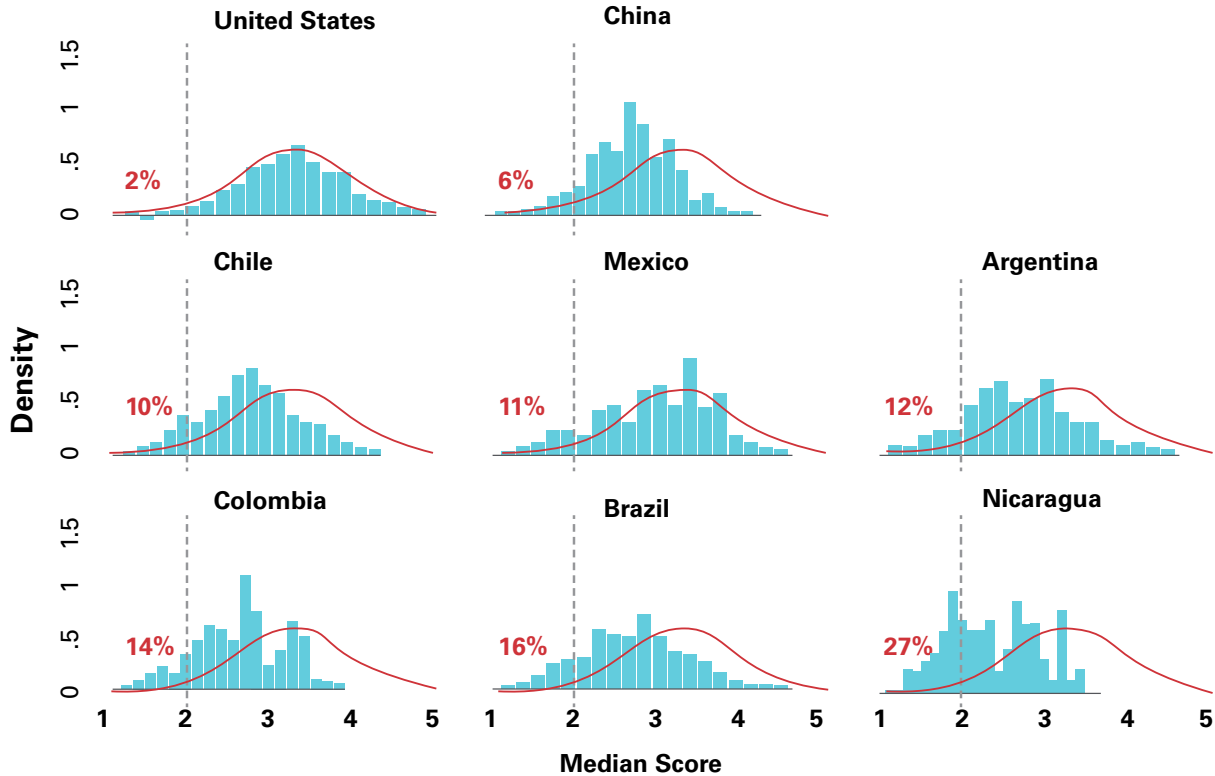


Source: World Management Survey.

Except for Mexicans, Latin American managers are weak at applying structured management practices, the WMS showed (figure 5.3). This is a gap that has not received the necessary attention.

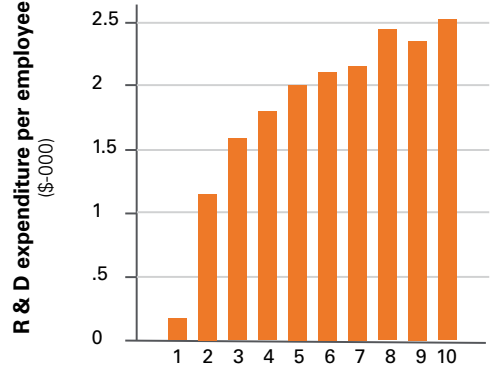
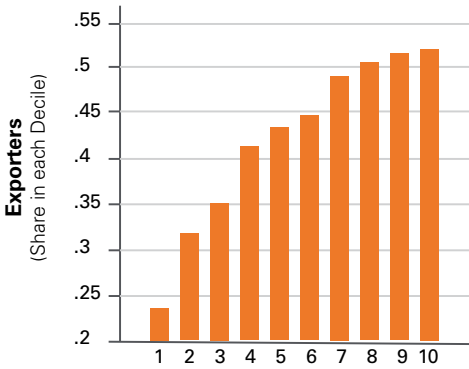
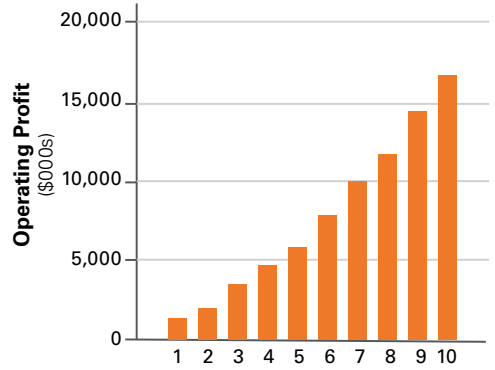
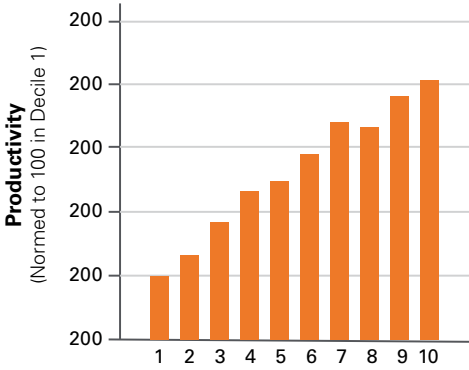
A study of the United States by a group led by Nicholas Bloom and Erik Brynjolfsson found that an explicitly structured focus on performance monitoring, detailed targets, and strong performance incentives on all 16 dimensions of the WMS were tightly linked to firm productivity, profitability, growth, and rates of survival (figure 5.4).²⁷

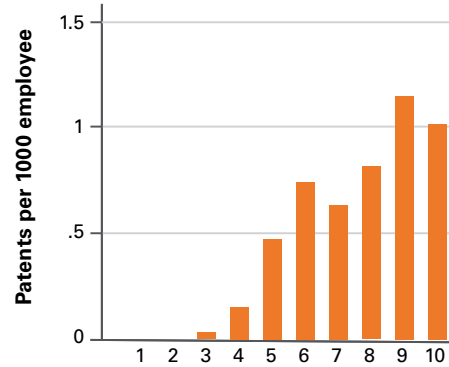
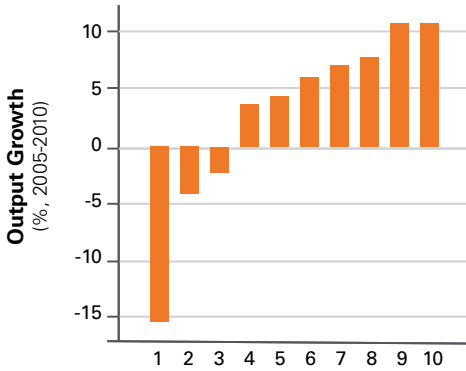
Figure 5.3. Managers Are Below Average (Except for Mexico): Dispersion Against the World Average of the WMS



Source: World Management Survey

Figure 5.4. Firm Performance Depends on Structured Management





Source: Nicholas Bloom, Erik Brynjolfsson, Lucia Foster, Ron S. Jarmin, Megha Patnaik, Itay Saporta-Eksten, and John Van Reenen, *What Drives Differences in Management?* NBER Working Paper 23300 (Cambridge, MA: National Bureau of Economic Research, 2017), <http://www.nber.org/papers/w23300>.

The group found that management, innovation (proxied by R&D and patents), information technology, and human capital potentially account for about two-thirds of the variation in TFP. However, management practices explain more than half of this effect on TFP.

Using emerging markets data, Cirera and Maloney confirmed that managerial and organizational practices have a direct impact on innovation and productivity.²⁸ Better managerial practices are tied to more innovation and higher productivity across countries, across firm size, and across country income levels. They also prove that “strong managerial and organizational practices enhance the impact of R&D on innovation and productivity and a lack of them may partly explain the lower returns to R&D found in poorer countries.” They suggest that developing managerial capabilities should be included as a key policy objective, especially in countries and firms that are more distant from the technological frontier.

What kind of management style must CEOs learn? Production management has been traditionally understood and modeled

by academics in two ways: management as technology, and management by design.

With respect to the first family of models, Francis Walker argued more than a century ago that some forms of structured management practices are akin to a productivity-enhancing technology.²⁹ Along this line of literature, in 2017 Bloom and colleagues proved empirically that the management-as-technology model better fits the WMS data.³⁰ Bloom considered management as an intangible capital input that enters production. It can be improved through investment, like in any other form of capital: “For example, by hiring management consultants, spending time developing or reinforcing improved organizational processes (e.g., Toyota’s Kaizen meetings), or paying for a better CEO.”

These models consider managerial capital to depreciate over time, like other tangible and intangible assets such as physical capital, R&D, and advertising. Finally, it produces management spillovers across plants within firms and between firms, like human capital formation. In conclusion, this view takes management to be an intangible capital stock with depreciation and externalities.

The alternative model, management by design, assumes that management practices are contingent on a firm’s environment, and on the features of its industry. Increases in managerial quality do not always increase output. In some sectors, better managers increase output; but in others, they do not—depending on the industry, the country, and other factors like firm age, size, and growth rate.

Industries that require highly skilled workers like biotech require managers that excel at hiring, at tying rewards to performance, and at monitoring output. Meanwhile, low-tech industries can do without these costly human resource practices. Likewise, Bloom and colleagues said, optimal management practices could vary by country: “Some cultures are more comfortable with firing persistently underperforming employees (e.g., the US) while others emphasize loyalty to long-serving employees (e.g., Japan).”

Bloom and his team showed that the management-by-design model

explained the WMS data well, but only when it was disaggregated into monitoring and incentives. However, overall, management as technology gave a better description of these data.

In practice, this would point CEOs to the need to learn and apply standard best managerial practices, and to worry less about the specificities of industries and countries.

There is an economic development coda to this

fantastic story. Bloom and his team showed that, on average, almost a third of cross-country TFP differences with the United States are accounted for by management: “Thus, management practices can account for a substantial portion of cross-country differences in development.”

Similarly, they found that within countries, about 30 percent of the difference in productivity between firms at the 90th percentile and firms at the 10th percentile is accounted for by differences in management practices. Productivity gaps are in general substantially large. For example, within some US manufacturing industries, Syverson found that labor productivity for plants at the 90th percentile was four times as high as plants at the 10th percentile.³¹ Syverson also found that these differences persist over time.

Larger firms have a bigger challenge. As Bloom and colleagues showed, they display more variation in management practices, due to their greater spread across different geographies and industries.

Are some practices more important than others? According to Cirera and Maloney, the keys for innovation are setting long-run targets; developing capabilities to introduce new technologies and best practices in operations; and developing human resource policies: “Setting targets and having a well-trained and incentivized labor force is critical to transform an idea to prototyping and commercialization.”

Similarly, they found that within countries, about 30 percent of the difference in productivity between firms at the 90th percentile and firms at the 10th percentile is accounted for by differences in management practices.

A strong conclusion of this section is that productivity differences are not necessarily caused by “hard” patented technological innovations, or by the acquisition of newer, more advanced equipment. They are caused by differences in management practices.

Latin American CEOs should be taught their trade—the sooner, the better. They must learn and apply sophisticated managerial practices; in other words, they must know how activity is monitored, how targets for production and other monitored performance indicators are set, and how the achievement of these targets is incentivized.

Good Times for Management Copycats?

The paragraphs above should suggest the existence of huge private returns to imitating the best practices of productivity leaders. Why are successful managerial techniques not copied by less productive firms? Why are best practices not imitated immediately by laggards?

There are several reasons. One is differential ability. Even with basic technologies, imitation requires investments in capability building that increase firms’ absorptive capacity. Cohen and Levinthal have defined absorptive capacity as “the ability of a firm to recognize the value of new external information, assimilate it, and apply it to commercial ends.”³² They note that this skill is critical for innovation.

Absorptive capacity, in turn, depends on accumulated knowledge—on the gradual accumulation of components like routines; specialized departments; and the assets acquired or developed by firms, through investments in learning and know-how.³³ This is why a straightforward copying of the protocols and management style from Google would not make another company an instant Google.

There are minimum size investment requirements that also block instantaneous diffusion of best practices. For example, some production processes need a group of highly skilled, highly paid specialists to run. Some others require a minimum market size.

In this sense, management techniques are not freely available (nonrival, in economics jargon) to all firms. They can only be readily

copied by equally sophisticated firms—in other words, to firms located at an equal or smaller distance from the managerial and technological frontiers. This is a key element for understanding innovation and management-practice diffusion.

Latin American CEOs should be taught their trade—the sooner, the better.

Management spillovers, which are produced as firms learn from each other, are easily gained by companies in the same or better “league.” Low-productivity firms are not suited to copying methods or forms from firms at the frontier. Googles can learn fast from other Googles, but a small firm in Haiti would have a hard time following Google’s ways, and would have it easier learning from firms of its technological neighborhood. This is an explanation for the persistence of low productivity, and a part of the “country ceiling” to innovation.

Another factor that limits copying is information. Not all firms are aware of the practices that would be beneficial.

A special projects manager at the innovation center RutaN in Medellín, David Sierra, offers an example. Large Colombian firms use market intelligence gathered from their sales forces, but they do not use data or big data methods in a substantial way, to study consumer behavior or desires. These firms end up not knowing what the market needs, he said.

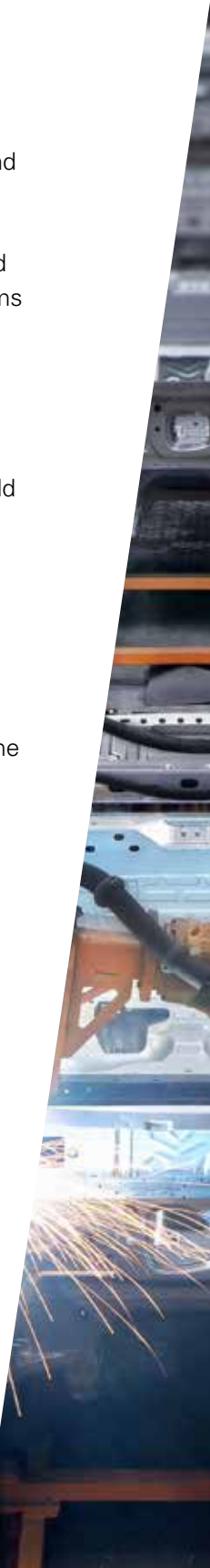
Yet another factor is that firms obsess about imitating products rather than processes. This behavior makes sense in the short run, because products and not processes are responsible for sales, market share, and cash flow. However, the foundations for sustained knowledge accumulation are never built.

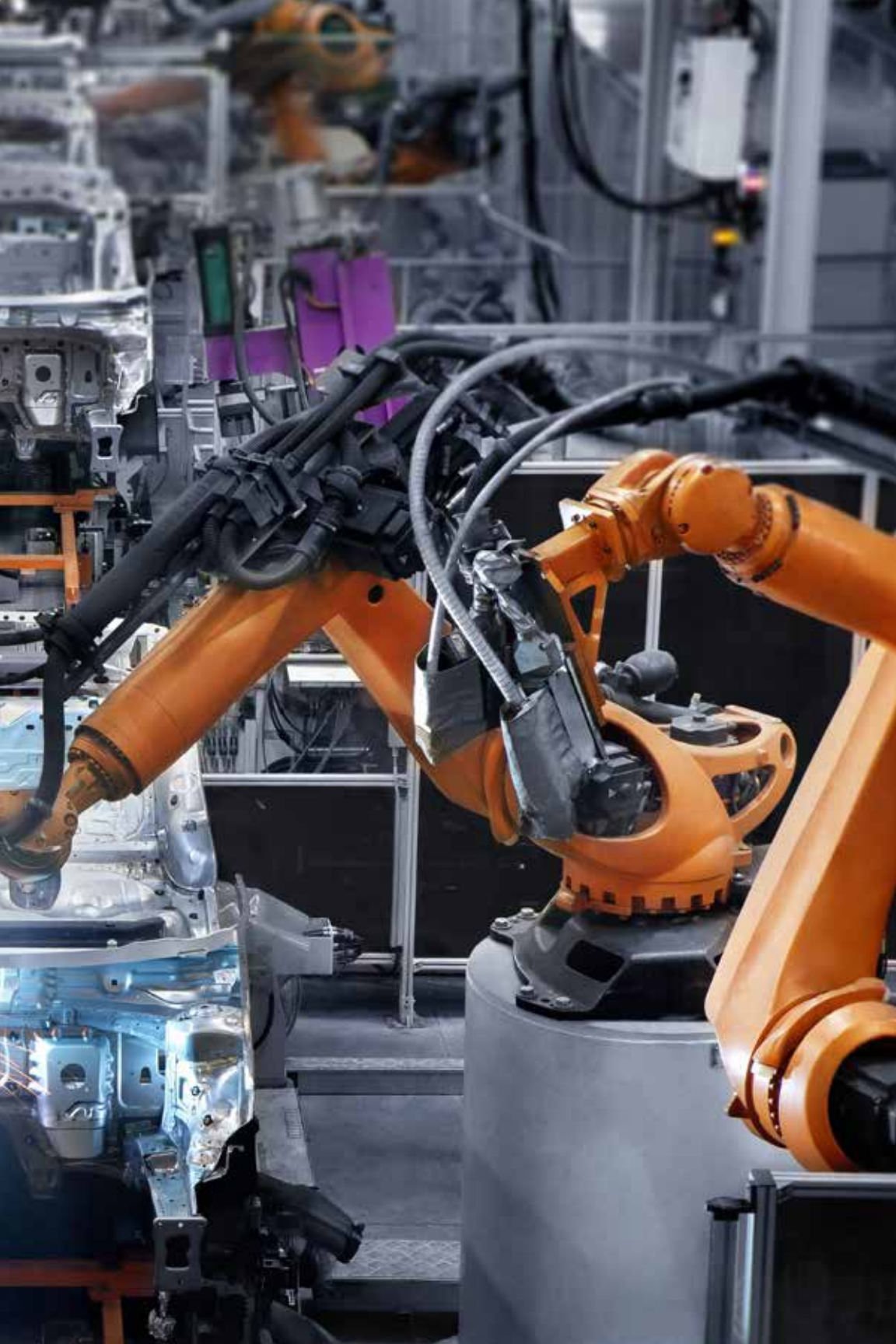
Finally, there is a factor that will surely gain relevance in coming years. Trade diplomacy will become an obstacle to copy. China’s rise to the status of innovation powerhouse was initially an ordered exercise in imitation, not invention—and thus nothing new. This was also the story of Europe in the 1940s, Japan in the 1960s, and South Korea in the 1980s.³⁴

However, there is increasing sentiment among US government and legislators that China's imitation game plan in many instances has violated intellectual property rights; that the Chinese have used the United States' immigration system at times against the United States; and that Chinese investors have acquired Silicon Valley firms to get access to key components of new technologies, avoiding government scrutiny.

The United States will probably have a stronger stance against product imitators in the future, but also about subtler forms of knowledge acquisition and information transfer. Under newer world conditions, competing countries will most likely retaliate.

Latin America needs CEOs who know what they are doing. They must have a good academic grounding, and be willing and able to lead in the adoption of best practices. They must also have in their arsenal a load of good judgment to evaluate, from the many pieces available in the world market, what works and what should be modified in their own manuals—in gastronomic terms, someone who achieves the perfect fusion cuisine, not confusion.







Chapter 6

Do Fear Failure

We know that truly innovative companies must allow for some things to go wrong. Research is about trial and error. By definition, in experiments outcomes are not known.

Hence, a common recommendation is that companies should allow corporate inventors to try new things, discard some of them, and develop others. The way innovation evangelists put it is that failure is always part of the script. They say that managers should not be afraid to fail.

However, taken out of context, this recommendation would lead to costly mistakes. It would be as false and worthless as simpleminded memes that try to make it to posterity as universal truths on social networks.

“Do not fear failure” is the right message for companies that strictly follow plans, manuals, and budgets. They must loosen up to allow a couple of trials to err. The correct advice for them is to consider research as a portfolio of risky products, where they can measure the effect of some successes and many failures.



“Do not fear failure” is clearly not sound advice for loosely managed companies. The recommendation, in fact, is pretty ignorant. To the contrary, these firms must fear failure. They should tighten their processes, and thus become precise, methodic, and accustomed to delivering on their promises.

The “do not fear failure” slogan in poorly managed firms reinforces the temptation to lead in haphazard ways, following vague ideas that amateur dreamers come up with, while sitting on their beanbags, mulling about the future of humanity, over popcorn.

Innovation requires method. The problem is that in Latin America—even in many large companies—ideas are overrated. Discipline, method, and the attitude to impeccably execute plans are in short supply.

Counter to the shallow slogan, managers of large Latin American firms should make it their concern to be afraid of failure. The reason is that they fail too often. Even worse, they are used to failing.

How, if not failure, would you call the fact that buying a SIM card at Telefónica’s Customer Experience Center in Bogotá takes 45 minutes, four people, and filling and signing three forms with information that the company already has. In contrast, buying a SIM card takes 3 minutes and no forms at an AT&T store in New York.

How else would you call the slow rates of growth of Latin American firms compared with those of Asians?

To be gentle, one could also call failure the fact that the expansion of the Panama Canal was two years late and \$2 billion over budget.

Managers in the region dread the wrong enemy. They should not be haunted by the idea of strictness stifling creativity, but by productivity being annihilated by a lack of discipline. They should fear failure—the kind of failure that most professional, first-world managers do not have to worry about: a lack of impeccable execution.

Latin American CEOs should fear unpunctuality and unreliability—not delivering on time, or being over budget. It can be proven that too much room for individual creativity takes a heavy toll on teamwork.

No doubt, innovation is a corporate must have. But it should begin with firm action on being flawlessly right. Perhaps, only then, it would be time to bring in the innovation enchanters to complete the magic.

The Method

A chain of innovations is not a matter of chance but of a process that has been well laid out. It starts, like many other elements of corporate strategy, with the tone being set at the top. As we have seen, leadership is key. Innovative companies involve and empower their staff members, from the chairperson down. They incorporate ideas like collaboration, value creation, and alignment along with corporate values and corporate strategy.

Innovative firms have a system to select from among competing new projects: what to develop, what to adopt, and what to discard. They do not discuss ethereal ideas but, instead, sound business projects. Some might have a precise financial definition of goals, when they are related to imitation or technological adoption. Others, those that are closer to blue sky R&D, might not.

These firms make funds available to undertake projects, and stage gates to determine when to increase or cut funding. They always rely

on performance indicators to measure how the process is moving along, and how well resources are being used. Innovation must have a method. “If innovation is not a method, if it does not have KPIs, it will only be a headline,” said Daniel Jimenez, Millicom’s vice president for B2B.

There is a multitude of variations around this general theme, but innovative companies repeat this method day after day. They know that innovation is a job, not a miracle.

They fully realize that the history of innovation is not a succession of path-breaking inventions. “Basically all innovation is incremental,” said Smithsonian Institution historian Arthur P. Molella. Sometimes a combination of factors makes a good idea take off, but technical change is a permanent process, which requires many elements in place to run well.

Many Latin American firms have innovation vice presidents, but that is not enough. Without the chairman and the CEO on board, innovation nose-dives. If, conversely, the process is not aligned with the core business, with the strategy, and sufficiently well funded, innovation efforts will be dead upon arrival.

AES. The AES Corporation is in the business of electricity generation and distribution. AES was founded in 1981 with a staff of 8, and it grew to a staff of 10,000 in 2018. It has assets valued at \$36 billion, \$11 billion in revenues, and operations in 17 countries in 2017. It is ranked 194 by sales on the *Fortune* 500 list.

Marketwise, AES behaves much like a multilatina, because it makes 50 percent of its revenues in Latin America and 25 percent in the United States. The company is also run in part by a team of Latin American executives, beginning with Venezuelan-born CEO Andrés Gluski. Per AES’s reported revenues, the company would rank 27 on the *Latin Trade* 500 list of top nonfinancial companies.

Its explosive growth has been supported by innovation. AES developed a lithium-ion battery energy storage system in the United States and Chile, that has it in neck-to-neck competition in this field with the unquestioned innovator Tesla.

There are many lessons to be learned from AES's iterations on its method for innovation. One of them is that innovation must be a real corporate priority. "It must have the same relevance as financial performance or talent management," said COO and senior vice

"Innovation cannot be confined to a department. Everyone has ideas. The key is to develop the discipline to decide over them fast."

president Bernard da Santos.

"For our CEO, a multi-million-dollar partnership with Siemens is equally important to 10 innovation projects that get \$300,000. They receive the same attention."

The second lesson is empowerment. "Innovation cannot be confined to a department. Everyone has ideas. The key is to develop the discipline to decide over them fast," Da Santos said.

A third lesson is collaboration. Innovation at AES is not the feat of a lone inventor. "We have to involve our clients, regulators, the community, and fellow workers."

A fourth lesson is that funds for innovation should be protected. "Taking funds out of the program is like taking money out of the piggy bank," he said, to indicate that it is like stealing from future income possibilities. The COO also believes that funds guarantee action. "When things can be done, people do them," he expands.

The company should also develop a sort of patient, risk-loving, incubator mentality, about financial returns. "There has to be tolerance. We know we will lose money." Da Santos reverts to the lithium battery case to prove the point: "Only five years after we developed our energy storage technology in Chile, were we able to replicate it elsewhere."

AES uses the same method to implement incremental changes, and to create sophisticated applications in new fields. AES is exploring uses of machine learning to spot risks in activities and locations, and to set in motion prevention priorities and concrete action plans. On other turf, AES is working with artificial intelligence to find optimal fuel mixtures for different conditions in energy-producing boilers, to get the best heat distribution (boxes 6.1 and 6.2).

BOX 6.1. AES: Latin Passion and American Discipline

In January 2018, newly founded Fluence started selling lithium-ion battery energy storage systems. The new company will take the product to 160 countries, and sales are expected to grow tenfold in 5 years.

This would have been a wonderful story to fit in any of the now-all-too-common compilations of epic successes of start-ups, if it were not because this enterprise is not the result of the work of a graduate student in her garage but of the disciplined approach to innovation of *Fortune* 200 company AES, which joint-ventured with the German giant Siemens.

AES initially developed lithium-ion battery banks in 2007 in the United States, but the product only got attention when it was perfected and became a commercial success in AES Chile in 2010, according to AES's CEO, Venezuelan-born Andrés Gluski. After that, the company took its technology to eight other countries, including the United States.

Energy storage is required for solar and wind power generation to be viable additions to electric grids. Solar is not a 24/7 option, Gluski explained. It has a peak at noon and a long nighttime valley, a pattern that differs from demand needs. Batteries stabilize the grid and reduce the need to make investment in energy transmission infrastructures.

Over the last few years, AES became a world leader in lithium batteries; it competed head-on with Tesla, which has been acclaimed as one of the world's most innovative companies.

Drones and gas. AES invests 1 percent of its revenues in R&D, Gluski said. But research is not confined to labs in its Arlington, Virginia, headquarters. A helicopter accident moved the company to partner with a Brazilian university to develop drone applications for the operation and maintenance of assets. Brazil was the country of choice because regulations in the United States require drone operators to have a pilot's license.

New developments vis-à-vis this technology turned drones into accurate tools to diagnose problems quickly, while avoiding hazardous work. Drones, instead of helicopters, were since used in thermic imaging of power lines. Small unmanned vehicles are now also used for underwater inspections of dams, and to operate in confined spaces.

AES recently partnered with the drone-as-a-service company Measure to sell these services to other power and oil companies the world over.

The story has been repeated many times over. Ten years ago, to cite yet another example, AES developed the technology to take liquefied natural gas (LNG) from Trinidad to the Dominican Republic. The addition of LNG to the island's power generation matrix made supply more stable; but perhaps more important, it saved the nation \$500 million a year, an amount bigger than the subsidy Venezuela gave to the Dominican Republic under Hugo Chávez's Petrocaribe initiative, Gluski said. AES will soon be taking LNG to Panama.

A contest. The leadership team fully endorsed AES's Performance Excellence program, Apex, which annually recognizes the best innovation projects.

Every year, leaders of the company's six strategic business units select 10 projects in each area. Out of the 60 projects, the corporate leadership team and Board members select three, to make them operational and to be replicated.

There is a formal event to recognize the authors of the best projects. "Recognition is powerful, but having a project placed in the strategy of the company is much more so," Da Santos noted.

In 2017, the company financially backed 202 projects, with \$20 million. These have already generated \$37 million. Two-thirds of this amount is cost avoidance and one-third is increased revenues, said Da Santos. However, he claims, the real returns are not yet evident. "The real fruits of these projects are reaped when they are replicated."

Finally, CEO Gluski points out that scaling up and implementing new processes or products in the energy industry depends heavily on regulation. This requires building trust and have local governments listen to the company. AES does it by proving its concern for communities. “We care about the countries. We have never thrived in a country that is doing poorly,” Gluski said.

Box 6.2. The Cemex Way

“Our proven ability to permanently innovate owes to the fact that we do not consider innovation as an extraordinary phenomenon, a so-called Eureka Moment, in which we get a new and surprising idea, but as a structural business function that is conducted in a systematic way,” said Mexican cement company Cemex’s CEO, Fernando González Olivieri.

“That is, at Cemex we consider innovation as a permanent task. (It requires) appropriate organizational conditions for its development, and a long-term focus, so that it contributes to the profitability of the company and the creation of lasting value for our stakeholders,” he added.

Only nice-sounding words for a quarterly report? Not so.

In fact, Cemex is where it all started. This is very often heard in Monterrey, one of the most important business capitals in Latin America. Cemex taught Mexicans to grow and prosper in global markets.

Founded in 1906, the cement company Cemex began its national expansion in the 1960s and 1970s, a strong export drive in the 1980s, and its international acquisition push in 1992. Three years after the start of this plan, it had built a presence in South America, the United States, Central America, and the Caribbean. In 1997, by then, the third-largest cement company in the world, it expanded into Asia and Africa.

A crisis in 2010 dramatically hit the company’s finances. A few years before, the Mexican company had acquired Rinker Group, an Australian building products company, for \$14.2 billion, the largest

transaction on record in Mexico. To complete the deal, it more than tripled its debt in a few months to \$18.9 billion, from close to \$5 billion. In 2008, the world financial crisis dried up the United States market, Rinker's biggest buyer. The debt became unpayable.

Cemex sold Rinker's Australia's operation to competitor Swiss Holcim for \$1.6 billion and began a race to lower expenses and debt. In a tremendous comeback, much smaller Cemex recovered, and today it reports revenues of \$13.4 billion. It fell to fifth place in the world cement rankings, but it still has operations in more than 50 countries and employs 41,000.

Despite the difficult decade, Cemex keeps its standing as the archetypical multilatina, and it has some interesting features that make it a place to turn to for best practices in innovation.³⁵

The Cemex Way is a method to manage process innovation. It was developed to standardize practices in newly acquired firms. However, it ended up being a way to swiftly transfer knowledge from the best—wherever they were, even in acquired companies—to the rest of the organization. The method helped the company become a leader in operations and marketing innovation. Still today, the Mexican firm is one of the most efficient cement producers in the world.

The result of transferring practices from Mexico to Spain, after its first international acquisition, was very impressive. It brought about an increase of operating margins from 7 percent to 24 percent. The transfer went also in the reverse direction, from Spain to Mexico. "The company discovered, for example, that the two Spanish companies were unusually efficient due to the use of petroleum coke as a main fuel source. Within two years, the vast majority of Cemex plants began using petroleum coke as a part of the company's energy-efficiency program," Lessard and Reavis noted.³⁵

Cemex Way teams catalogued and stored practices of acquired companies in a centralized database. These processes were then benchmarked against internal and external practices. Processes that were deemed superior became enterprise standards and a part of the Cemex Way, Lessard and Reavis said.

Mastering this method reduced the time of postmerger integration

(PMI). In just eight years, the duration of PMI fell from 25 months to less than five months. In 1996, the method was tried in a curious manner. The PMI was applied to Mexico. It saved some \$85 million, but, more important, “it clearly established the principle of learning and continuous improvement through the punctuated PMI process and the continuous Cemex Way,” Lessard and Reavis stated.

Other key features. The cement company takes R&D seriously. It established a research center, Cemex Research Group (CRG), in Switzerland, “because this is one of the most innovative countries in the world,” an annual report reads. This country, in fact, has been consistently ranked as the most innovative on the planet in the Global Innovation Index.

CRG has an advanced laboratory, and experts in areas such as construction materials, sustainable construction, cementitious materials, concrete and mortar products, and mixtures and aggregates formulations. Cemex has more than 50 groups of international patents in these areas.

Cemex has pioneered in Latin America some aspects of technological and digital transformation. In 1987, it established the first satellite communication network; in 2010, a collaboration network, Shift; and in 2017, its digital platform, Cemex Go. Developed in partnership with IBM, Cemex Go is intended to simplify and streamline customer interaction with the cement company, with less administrative burden.

Also in 2017, the firm integrated several institutional academies—Commercial, Health and Safety, Supply Chain, as well as Culture and Values—under the name Cemex University. The company expects Cemex University to be an educational adviser, and to promote continuous digital learning for employees, acting as “a high-impact catalyst for our transformation,” the company’s 2017 annual report reads.

Cemex University has the support of the regional presidents as executive sponsors, and develops physical and online training programs. “Our goal is that through CEMEX University we can incorporate a growth mind-set throughout our organization and exploit the potential of our employees,” the company’s 2017 report adds.

Finally, in 2017, the company founded Cemex Ventures to be its open innovation and venture capital entity. “[It is] focused on interacting with start-ups, entrepreneurs, universities and other stakeholders that are expected to shape tomorrow’s construction ecosystem, in the face of the industry’s digital and technological challenges,” the annual report explains.

Based on industry experience, Cemex Ventures develops new opportunities in key areas outside the company’s core business. These include urban development, connectivity within the value chain of construction, and new trends and construction technologies. At the same time, it develops new sources of project financing. This strategy will improve the firm’s knowledge about what the future holds for the construction sector.

Cemex Ventures identifies and evaluates emerging technologies; finds opportunities, seeks, and incubates and scales up innovative solutions related to construction. In 2017, it analyzed more than 2,000 potential businesses, invested in three start-ups, and developed and delivered six technology reports to Cemex employees. In addition, it held its first open contest for start-ups, entrepreneurs, innovators, businesses, and employees exploring new opportunities in any of the areas of focus.

Initiatives like Cemex Go, Cemex University, and Cemex Ventures complement innovative action at Cemex. Finally, to close the circle, despite being a family-controlled company, as are the vast majority of the multinationals, Cemex’s managerial organization includes a nonfamily, professional CEO and nine independent directors of the 15 that make up the Board of Directors.

Nobody knows if Cemex will surmount the financial challenges it currently has, or survive in the world of fierce competition with the new giant Lafarge Holcim and a number of aggressive Chinese and Indian companies. Nevertheless, the method and the results in terms of innovation and productivity are there for all to see.





Chapter 7

Breeding Ground for Innovation

“We know much more today about sustaining creative cultures,” said Arthur P. Molella, historian and director emeritus of the Lemelson Center for the Study of Invention and Innovation at the Smithsonian Institution in Washington. Scholars have identified changes in the innovation processes, especially in the 19th and 20th centuries, and found ground to take a historical approach to assess complex contemporary innovation practices.³⁶

One such findings is that physical, social, and cultural proximity matter in creating and sustaining innovative environments. History has proven this time and again, and Silicon Valley is the latest proof of this claim. It is home to special mixes of people, resources, and geography that better foster innovation.

“Cluster” is a modern manifestation—and a neologism for a what has been a natural physical configuration that facilitates invention and innovation, Molella explained. Clusters of invention and innovation perhaps became more evident in the 1960s and the 1970s, but they were present in Renaissance Florence, in the Oxford–Cambridge corridor, and in 13th-century Baghdad. They are a social phenomenon



that pulls highly creative, divergent thinkers. It was the same force that in the 1870s placed Hartford, at the heart of the Industrial Revolution in the United States. The gunmaker Colt Armory “and its neighboring firms perfected the techniques of interchangeable parts manufacturing, establishing Hartford as one of the birthplaces of American mass production.” The city became home to precision manufacture of goods as diverse as firearms, sewing machines, typewriters, bicycles, and automobiles.

Historical research shows that innovative activity tends to cluster spatially. Even lone inventors always rely on teamwork, competition, and collaboration to spur their inventiveness. There is a symbiosis between the individual and the place. “Community brings a wealth of resources to the innovator, whether independent or institutionally based. Individual innovators in turn contribute their skills, knowledge, and creativity to the larger ecosystem of invention.”

However, being neighbors is not enough. Innovation is affected by social and intellectual networks, by changing forms of communication, and by intellectual property systems. Similar contexts can spark different kinds of innovations.

This is why copying institutional arrangements seldom succeeds at creating a new community of invention. “Spin-offs and replicated regions have rarely been successful,” wrote Molella in his book *Places of Innovation*.

Places of innovation have cycles. They boom and disappear. The real challenge is to keep clusters relevant as long as possible, but it is not strange to see them lose dynamism.

What kinds of environments foster innovation? In general, there must be a flexible organization, made up of people with diverse backgrounds and trainings, good communication, and a balance between individual and collective work. There is no room for what he calls “heavy management”—hierarchical, all-controlling management.

An innovative company is built, instead, by making the need to think differently an integral part of corporate culture. Molella noted that IBM always encouraged its employees to think differently; Apple placed design ahead of product, and that became part of its corporate culture; and GE survived because it completely reinvented itself.

An established firm would probably need to transform itself into an innovative enterprise, setting up the Tiger Team, led by a person who is a role model for fellow employees. The team should have some special privileges.

The team might have, for instance, the mission to explore alternative types of corporate governments, or even to reinvent the company. These firms probably should, as many innovative firms do, select a chief innovation officer, hold ample brainstorming sessions, and periodically have creative people come in to speak with the staff. But it also requires a lighter, more horizontal management structure, with top executives willing to lead by example. Molella mentioned the case of hotel chain Marriott as an example of a company that became innovative to fend off the fierce competition of other chains and of zero-asset Airbnb.

That is not all. Arthur Molella sees that truly innovative firms have “more brains.” On one hand, they have a highly skilled team, and on the other, a leader who fosters creativity, who does not tell others what to do but brings out their creative potential. Aside from “crazy” and charismatic, he describes this leader as “a model.” The leader

sets the attitude, the excitement, the energy; he or she shows, for instance, that it is possible to meet people at all levels. “[Innovation] is all in the attitude,” he said.

Firms must know that rapid knowledge creation and diffusion are more likely to flourish in places, physical or virtual, that gather inventors. If firms want to be true innovators, they should be where sparks fly. The Colombian sugarcane producer Manuelita made a great decision when it decided to buy a stake in a Brazilian company. Brazil was, at the time, the largest and most productive sugar producer in the world. Public policies to form clusters are relevant, but being in a place of invention is a corporate decision.



Chapter 8

A Jolt to Family Businesses

Like in the rest of the world, family firms are the preeminent entrepreneurial institution in Latin America. In Mexico, for example, 90 percent of publicly traded firms are family controlled, a study by KPMG and the Business Family Foundation stated.³⁷

Family firms are important in many ways. They generate 85 percent of GDP in Mexico and a large portion of GDP in countries like Ecuador, and they employ 70 percent of the private workforce in Argentina, according to the Concordia University professor Robert Nason.³⁸

Family-owned firms have notable strengths. They tend to excel at using relational contracts, explained the MIT professor Roberto Rigobón. “These are nonwritten contracts that are executed, even though it does not define a penalty for breaches.” Relational contracts operate because parties trust each other. Their conditions are barely outlined and are mostly implicit. Family firm employees execute relational contracts rather well.

Harvard Business School’s Susan Helper and Rebecca Henderson proved that Toyota’s success in the 1980s was based in part on the



use of very effective relational contracts, which could not be copied by rival General Motors.³⁹

Some strengths of family firms are backed by numbers. One is their size. Walmart, the biggest company in the world, would be a salient example. According to the firm EY, in Latin America, the 37 biggest family firms produce 8 percent of the region's GDP.⁴⁰

Other strengths sound convincing, but are not necessarily true. The audit firm KPMG annually surveys senior executives of family-controlled businesses, to get their view on their operation. In general, these executives believe that their companies offer stability to the economy; that they look after their staff better than nonfamily companies; that they see success in broader terms than simply profits and growth; that they take a longer-term perspective on decisionmaking; that they make decisions faster than their peers; and that they have an enduring entrepreneurial spirit.

But some of these commonly held views about family firms are not true. It is usual to assert that these enterprises are more likely to plan for posterity. According to EY, "Unshackled from the quarter-to-quarter pressures of their listed peers, family firms can invest for the long term, and allow good ideas the time they need to prove themselves. It's a classic example of 'patient capital' and an invaluable counterbalance to the short-termism of many public companies."⁴¹

Data counters this perception. The patient, long-term attitude is not supported by the results of the KPMG survey. In 2017, the audit firm surveyed 2,800 executives, and close to 81 percent of them said that their corporate priority for the next two years was to increase profitability, and 55 percent to increase revenue.⁴² These are much the same attitudes as for any other firm.

How do these firms behave with respect to innovation? There is also a common view that family firms are risk averse and not very innovative. A recent review of the literature by Kammerlander and Van Essen backs this assertion.⁴³ They show that family-owned firms spend less on R&D, especially when they are led by their founders. In all fairness, they also prove that R&D is more efficient in family firms than in other companies. They measure efficiency by innovative outputs (number of patents, new products, or revenues from new products) per \$1 spent. This is particularly true when firms are led by their founders instead of younger generations.

The KPMG Family Survey gives even more evidence to support the view of family business being traditional and risk averse. A rather small proportion of respondents said that their priority over the next two years would be to diversify into new products (38 percent). Even fewer said that their goal was to become more innovative (30 percent); to move into new export markets (24 percent); to attract new talent (33 percent); and to educate and train new staff (14 percent).

There are examples of innovative family-run companies like Colombian Carvajal, which completely changed its business from a paper-product maker to a business service provider. But in general, Latin American family firms are traditional and risk averse. "These firms are slow at changing things that have worked well for them. They tend to have a myopic view. Oftentimes they have grown accustomed to their daily routines," according to Matteo Grazi, a specialist in the Competitiveness and Innovation Division at the Inter-American Development Bank (IDB).

In Need of Strategy

Risk aversion and conservatism in this case are just a reflection of organizations without a clear path. The essence of the lack of creative drive in family businesses lies in the entrenched incapacity of these firms to design long-term plans.

KPMG states that entrepreneurial families are clearly ambitious, want to grow, and ensure the long-term success and stability of their business: “But it is becoming clear that many of the issues faced by the family business sector derive from a lack of strategic planning. Some family firms are doing this, and doing it well, but in our experience, a much higher proportion are absorbed in the everyday and longer-term planning is neglected.”⁴⁴

“Family firms may lack the skills to develop a robust strategic plan, and may not even know what such a plan needs to look like. Likewise, some family business owners assume that ‘thinking in generations’ means that the medium term will somehow look after itself. But it won’t.” This translates, for instance, in difficulties in having effective succession planning.⁴⁵

Succession is only a portion of the planning problem, but it is a relevant concern, given the massive change of hands of power under way in the region. Elders are passing control to family heirs like never before in history. Per *Forbes*, 42 of the 88 Latin American billionaires are in their 70s, 80s, and 90s.

EY points to this element as being particularly problematic: “Few of the region’s family businesses have succession plans. And when they do, they typically rely on the old-fashioned approach of passing the business on to the eldest son.”⁴⁶

It is more frequent to find families that sell their business as a conscious choice and consider the sale as a sign of success. But for many, not surviving the generational transition is still felt as a defeat on the way to reach their long-term ambitions.

A weak strategy might give rise to actions like placing too much emphasis on the bottom line, or investing in safe but not always productive real estate assets instead of taking riskier but necessary innovation gambles. Placing short-term family interests before those of the business has an equally negative effect. The message that comes out of this diagnostic is that the deficit of managerial skills reaches up one step, to a firm's owners.

Professional Management

Strategic planning is key for corporate performance. A plan determines successions, geographic reach, and choices of technology, which in turn are vital drivers of innovation.

Performance depends crucially on the plan, but also on the leader. It depends on what he or she knows and does, and, as is now fairly well established, on his or her kinship with the owners. Empirical evidence shows that family enterprises perform better when they are run by nonfamily executives.

One advantage that nonfamily executives have, and that has gained relevance in recent years is a different and better view of the digital future. MIT Professor Andrew McAfee studied top companies before and after the steam-to-electricity industrial revolution. The leading companies changed from one period to the next for two reasons. First, finances: steam plants could be transformed into electricity plants only at a great cost. Second, mindset: old managers could not see the opportunities that derived from getting rid of belts and pulleys. McAfee gives a more modern example of this phenomenon. Management now is "geekier": evidence-based and number-driven. Family members might be reluctant to embrace "geekiness" in their companies since they do not believe that this was the cause of their initial success.

EY believes that the presence of nonfamily C-level executives in family businesses in the region is still in its infancy, and calls for reform in that respect: "If Latin American family businesses are to

prosper in the years ahead, they will need to abandon that approach and start trusting outsiders to guide them and even to manage their businesses outright.”

The practice of promoting employees on the basis of kinship and not on merits is a form of crony capitalism, said MIT professor Roberto Rigobón. He believes this is the worst trait of family firms. The professionalization of management facilitates the implementation of better managerial practices, better governance standards, and the hiring of better talent from outside. But despite the benefits, professionalization is not a primary concern for families. Only 43 percent of the respondents of the PwC Family Business Survey 2016 mentioned the need to professionalize the business as a key priority over the following five years.

Perhaps a reason for this is that finding a CEO to match family wants is a sizable problem. “You have to try many times to get the right fit,” according to Claudia Gómez, the executive director in Colombia of the Family Business Network. She mentioned complex practical difficulties in this search: “There must be chemistry. The CEO must be fully aligned with family interest, and completely share the existing corporate culture. In turn, the family should be in a point that would allow the fit to happen.”

Hiring an external CEO might have negative consequences, like slowing down the firm’s decisions. But in general, the problem is for the CEOs. They find families reluctant to give up control; professional choices are overridden by family considerations, which do not always make business sense; or key strategic decisions are made by the family outside the strategic planning process. Often, CEOs are asked to mediate family relations—a task that is both difficult and distracts from the goal of running the firm.

A nonfamily executive must often juggle family interests. “At times he has to be close to the family as an adviser and mediator. At times, he has to confront family members who want to veer management decisions in their favor. It’s hard. He can be used, or be the object of resentments by some family members,” Claudia Gómez said. It is

easy to see why asking nonfamily CEOs to value loyalty more than efficiency self-selects the best talent out of these firms.

To learn the best practices is not so difficult, and it is not that expensive. The problem is that there is no demand for these skills.

But even great CEOs can have a rough time heading a family firm. As Gómez explains, “The executive may have all the credentials. She might, for instance, try to apply corporate governance principles in a company that probably does not have them. It is easy to fall in a professional limbo.” The statistic Gomez has about this difficult hiring process is daunting: 50 percent of nonfamily CEOs hired in Latin America resign or are fired within the first two years.

Appointing mediocre cousins in management positions leads to another crippling problem. It reduces demand for highly skilled CEOs. “To learn the best practices is not so difficult, and it is not that expensive. The problem is that there is no demand for these skills,” said Princeton professor of economics, Esteban Rossi-Hansberg. “It is not that we lack skills in our countries, but that we do not have demand for those abilities.”

“Many family firms still have more work to do to understand the value of an external CEO, and give them the freedom they need to do the job properly. If not, the risk is that they will not stay and the value to the business won’t be realized,” the PwC report concludes. Rigobón puts the dilemma in a more direct way: “Family companies that fear of losing control, lose the company.”

Education

Once again, education, especially managerial education, emerges as a vital problem for corporate Latin America, this time at the entrepreneurial family level.

“Most patriarchs over 70 have no graduate education. At the most 10 percent of them went to a university abroad,” Claudia Gómez

said. This has turned into a dangerous cultural problem. Patriarchs do not trust university graduates.

Frequently, they believe that a well-cultivated common sense is better than formal education, let alone formal international education. Patriarchs may value more managers who have emotional intelligence, people skills, or the ability to sell ideas. This is a fine choice, if these skills could come paired with sound technical abilities. As Gómez notes, “These soft skills have greater weight in family firms. A person can be disqualified if she does not have some specific set of family soft skills.”

Family firm heirs also value education less than their peers. Some feel that they do not need academic achievements to get a position that is already waiting for them. Sometimes, their high net worth makes them less eager to seek a diploma that would get them a better car or a bigger house. Others do not think they will be accepted at top universities.

Owners want companies to succeed. But when they have grown them to become large, owners tend to think they have everything under control, according to the Columbia University professor Yoni Stern: “They do not want to be told that they have to change.” To move in a different direction, they might need to be shaken, Stern believes, or persuaded: they might need a jolt.

Family firm heirs also value education less than their peers. Some feel that they do not need academic achievements to get a position that is already waiting for them.

Perhaps a gentle jolt. Patriarchs will hardly ever admit gaps in their knowledge of digital technologies or of biotech discoveries. Heirs might not have all the knowledge either. Meetings with peers, where they feel in control of things, are a good option to convince them to make the much needed moves.

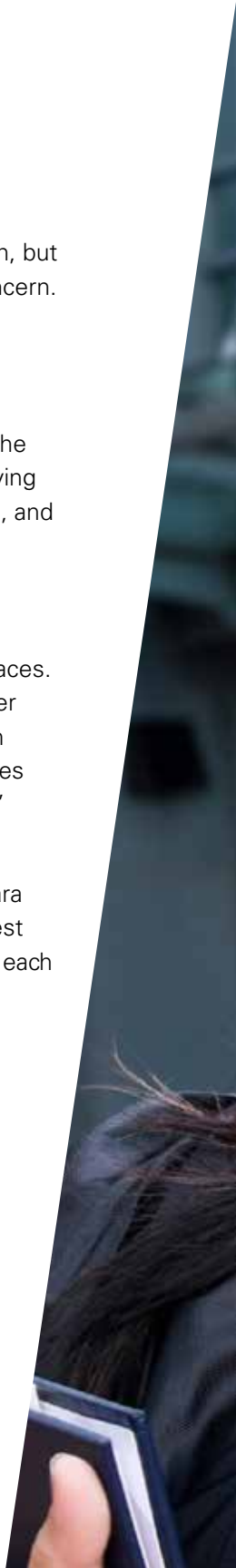
Discrimination

Poor management practices of CEOs and families are a problem, but widespread discrimination should also be a major source of concern. “In Latin America, discrimination is still a pervasive problem in hiring,” said Columbia University professor Andrés Velasco.

Yale University business school professor Seth Zimmerman demonstrated in 2016 that the likelihood of being at the top of the business community in Chile depended to a large extent on having graduated from one of the eight elite private secondary schools, and of a top—equally elite—business school.⁴⁷

A total of 41 percent of the management positions of the listed companies in the country were filled by the 1.8 percent of all university students in the country who studied at both these places. This is proof to the fact that acquaintance takes precedence over individual capacities. Meritocracy is not a major part of the Latin American business structure. “In Latin America, many employees are chosen by their social status, not by their effective capacity,” Velasco added.

In contrast, in Asia, explained Brown University professor Barbara Stallings, there is a seniority system. Top graduates from the best universities are hired by big firms. Then, the most prominent of each cohort climb faster. It is a clear form of meritocracy.







Chapter 9

Where Are the Customers?



“Invention is not disruptive. Only customer adoption is disruptive,” said Amazon’s CEO Jeff Bezos in a recent presentation, to remind the audience of this colossal truth, which is overlooked so many times. “At Amazon we have invented a lot of things that the customer did not care about at all. It’s only disruptive when customers like the new way.”

Innovation, successful innovation, does not depend only on creative geniuses but also many times on sensitive readers of human nature, and of consumer desires.

In Latin America, consumers are still young, and they do show hedonic declines, that is, decreasing enjoyment over time from consuming a product. But desires are sternly constrained by real-world possibilities, and that makes them more conservative.

Regional consumers are constrained by income, which is, on average, 15 percent of the per capita income of a person in the United States. This obviously has consequences for buying attitudes. “Banks in the region want to go digital as soon as possible. However, they hit a great problem in that consumers do not want



to spend on data packages,” said Daniel Jiménez, Millicom’s vice president for B2B. It is not an insoluble problem; but in this case, it required Millicom’s Tigo to subsidize data to increase financial transactions.

The mild case of novelty apathy hinders innovation, as it decreases demand for new goods and services, in comparison with richer, novelty-seeking societies.

There is another very significant megatrend in household consumption. Latin Americans are slowly buying more global brands, but they still prefer local names when making most of their purchases. More than 60 percent of respondents to the latest Nielsen Global Brand Origin Survey said they preferred locally branded staples such as vegetables, seafood, meat, coffee, and milk.⁴⁸

Opinion is split 40 percent / 40 percent between global and local brands in nonperishable goods like sweets, chocolates, crackers and breakfast cereals, baby food and baby formula, detergents, cleaners, and clothing. The remaining 20 percent of the respondents feel that origin is not important.

At the other end of the spectrum, in consumer electronics the survey shows a hands-down victory of global brands over local ones. More than 70 percent of the Latin American consumers surveyed said they prefer international names in cameras, laptop computers,

television sets, and mobile telephones. Finally, more than 50 percent prefer global products in the personal care category, like cosmetics, toothpaste, and shampoo, and in soft drinks.

Latin Americans mostly agree that global brands are more expensive, but they are more innovative and better quality than local names. They prefer local brands out of support for local businesses, and because they believe locals are most attuned to their personal needs and tastes.

Globalization is a trend, which will probably grow stronger in the next decade. However, in the short run, local brands still reign in their home markets. More than 50 percent of household expenditures in the region are devoted to food, housing, transportation, and communications.

According to the Instituto Nacional de Estadística y Geografía, Mexican households spend 35.2 percent of their income on food and beverages, 19.3 percent on transportation and communications, and 9.5 percent on housing and utilities.⁴⁹ They spend 12.4 percent on education and leisure, and the remaining 23.6 percent on personal care, health care, clothing, and household products.

It is not too bold to conjecture that less innovative, less expensive local brands still have a good portion (about 70 percent) of the share of Mexicans' wallets, and in general, of those of regional households. Expenditures on food will decline in proportion of total income as households become wealthier, but that is a slow process.

Will this state of affairs change with Internet access? Probably yes, but not anytime soon. Per KPMG's 2017's "Global Online Report," Latin Americans make on average 9.2 online transactions per person each year.⁵⁰ This is the lowest figure in the world (table 9.1).

Table 9.1. The Hypo-connected LAC Markets: Average Online Transactions per Person per Year

	2017
Asia	22.1
North America	19
Western Europe	18.4
Australia & New Zealand	16.1
Eastern Europe & Russia	11.9
Africa & Middle East	11.0
Latin America	9.2

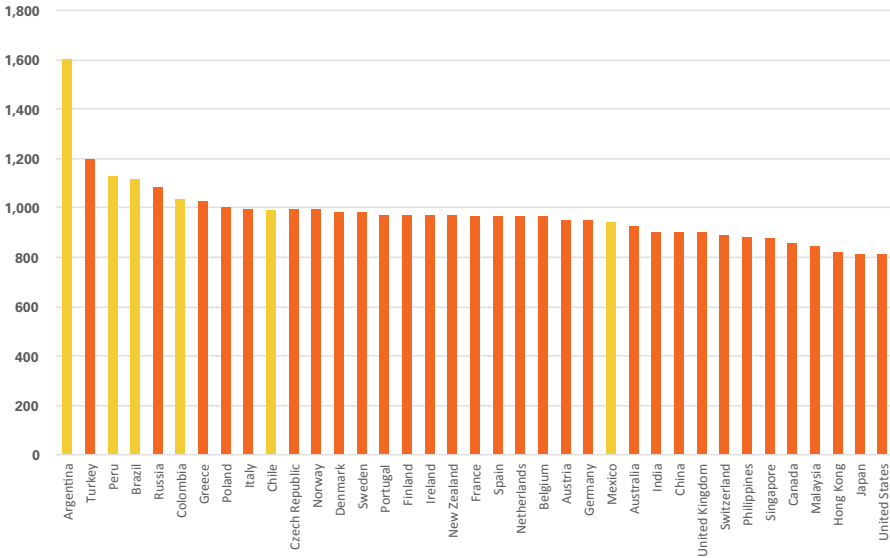
Source: KPMG (2017).

Almost half (44 percent) of transactions in Latin America are of goods imported from other regions. This is common in developing economies, but this percentage is the second highest in the world, after Africa and the Middle East (50 percent). They are distant from the 14 percent and 15 percent, respectively, in North America and Europe.

If transactions increased and the proportion of imports were maintained, global brands would clearly benefit. However, access to technology is a substantive challenge.

Price, for instance, is an issue. “Latin America is way behind in terms of policies to encourage adoption of cutting-edge digital technologies. Internet prices are expensive. Argentina has the most expensive iPhone in the world. Brazil has the most expensive iPad in the world,” said a lead economist at the World Bank, Mark Dutz (figure 9.1). Taxes and tariffs are often the reasons behind a high price tag. To protect some assemblers, governments are holding back the rest of the country, not allowing it to have consumer technologies at competitive prices.

Figure 9.1. The Most Expensive iPhones in the World: iPhone Index, 2017 (US dollars, at purchasing power parity)



Source: Deutsche Bank.

Consumers are also constrained by the available infrastructure and real accessibility. The Networked Readiness Index, calculated by the WEF, measures how well an economy is harnessing ICT to boost competitiveness and well-being. It depends on infrastructure, affordability, and skills. “Latin America lags all other regions where the World Bank operates,” Dutz said.

A straightforward conclusion is that consumers are conservative in most of their purchases. They will remain conservative as long as local industries keep innovation in low gear, and as long as real, affordable access to the best technology is unavailable. In this light, the region does not appear to be the best Petri dish for disruptive innovation.





Chapter 10

Choose Your Weapons

Brute financial force is not an option when fostering innovation in Latin America. Simple arithmetic might give an idea of the size of the resource constraints that the region faces.

The United States spends about \$500 billion on R&D annually (table 10.1). This is equivalent to 28 percent of Brazilian GDP, 48 percent of Mexican, and 92 percent of Argentine, and 78 percent more than the whole Colombian GDP; the figure doubles Chilean GDP, and it is six times Guatemalan.

At \$20 billion per year, Brazil is the only R&D superpower in the region. Still, Brazil is not financially quite as strong as some US institutions, like the National Institutes of Health (NIH), which has a \$30 billion annual budget. The country, sadly, cannot show the same type of results either.



Table 10.1. R&D Expenditures in Selected Countries 2016 (current millions of US dollars)

	GDP	R&D Expenditure	R&D / GDP (%)
United States	18,624,500	502,494.60	2.7
Korea, Rep.	1,411,250	56,705.72	4.0
Brazil	1,796,190	20,260.13	1.1
Mexico	1,046,920	5,168.02	0.5
Argentina	545,476	3,469.01	0.6
Chile	247,028	901.31	0.4
Colombia	282,463	617.66	0.2
Uruguay	52,420	171.93	0.3
Peru	192,207	106.31	0.1
Panama	55,188	42.08	0.1
Guatemala	68,763	30.72	0.0
Paraguay	27,424	24.14	0.1
Nicaragua	13,231	13.94	0.1

Source: World Bank.

Each year, NIH awards more than 57,000 research and training grants that support about 300,000 researchers, at more than 2,500 universities and organizations. Per Ricyt, the number of researchers in the whole of Brazil in 2014 was 332,017.

The researcher headcount favors Brazil somewhat, but the quality of output is quite different. A total of 148 NIH-supported researchers, including 21 intramural researchers, have been awarded Nobel Prizes. A total of 211 NIH-supported researchers, including 31 intramural researchers, have received Lasker Awards, which recognize researchers and clinicians for contributions to medicine.⁵¹

In 2015, over 93,000 articles acknowledged NIH grant support. The quality and relevance of these publications is measured by the number of citations they receive in the literature. “The publications from a single grant accumulate an average of almost 300 citations in the academic literature,” NIH reports. That same year, per Scimago Journal and Country Rank, Brazil published 67,064 scientific and technical journal articles, which received 2.4 citations per document.

From 2000 to 2013, NIH-funded researchers produced 20,441 unique patents. Over the period 2001–15, Brazilian residents filed on average 4,238 patents a year, but only 300 were approved each year. This would mean about 4,200 unique patents during the whole period. That is why, per the World Patent Organization, there were 24,153 patents in force in the country in 2016.

It might be unfair to compare an institution with a country, but the comparison helps at illustrating the size of the gap. It seems hard to imagine that any other economy in Latin America could come close to the performance of NIH, which puts out at least 100 to 120 new inventions each year.

With such tremendous resource limitations, Latin American countries should avoid the “do everything at once” strategy. The obvious recommendation would be to prioritize and focus on executing priorities.

Where to Begin?

It is time to talk about policy and government action. Where should these priorities be set? Cirera and Maloney give a clear direction on where to begin. In emerging markets, they argue, a host of weak areas curtail innovation. They find problems in the private sector, with policymakers and institutions. They suggest countries should climb a “capabilities escalator,” “where policies to support firm upgrading are prioritized consonant with the level of capabilities of all agents and ratchet up through progressively higher stages of sophistication.”⁵²

The first stage primarily should support production and management capabilities. The second should increase the focus on promoting technological capabilities. Finally, the third stage should extensively back invention and technology-generation capabilities.

The third stage’s capabilities, they warn, constitute a long-term agenda. This stage must “be started concomitantly with efforts in the earlier stages, but it cannot be considered a substitute for the policies to support stage 1 capabilities—firms need to walk before they can run.”

Philippe Aghion has a somewhat complementary view of the problem. He claims that countries and firms behave differently, depending on their proximity to the technological frontier. Increasing competition will foster innovation by firms closer to the frontier and will discourage those far from it. The latter will feel they do not stand a chance to survive world-class contenders, and will not compete harder or invest in innovation. Liberalization of labor markets would have the same effect: good in economies close to the frontier, dubious in countries far from it.

Equity financing (angel, venture, and growth financing included) is needed in advanced firms as they take on riskier, new-to-the-world activities. Bank financing is sufficient for firms that are far from the frontier, because they focus on imitation and adoption, which have lower risk.

Investment in higher education has a different effect as well. Advanced economies should invest heavily in graduate education. High-quality primary and secondary schooling and a generalized two-year tertiary education program should be the focus in countries far from the frontier.

Advanced economies get large returns from Schumpeterian creative destruction—replacing lower-technology old firms with bleeding-edge-technology new ones. Meanwhile, economies distant from the frontier have a greater opportunity of getting high returns, reallocating resources and firms from low- to higher-productivity activities.

This implies, Aghion claims, that laggard countries should reduce corruption, provide high-quality basic education and technical skills, and give access to bank lending. In the same line with Gordon and Brynjolfsson, he argues that to make advances, countries must improve managerial practices: “There is a correlation between management practices and per capita GDP.”

These results could clearly be adopted as a general policy orientation in Latin American economies. The first thing first—at least with public money—is to concentrate on the basics. This, again, makes sense considering the dramatic resource limitations noted above.

There is an unsettling coda to this argument. At times, disorganized attempts to technologically leapfrog might have costs that cannot be recovered. It could be a waste of resources.

From a global perspective, the economists Daron Acemoglu, James Robinson, and Thierry Verdier proved that, under certain conditions, in a technologically interconnected world, it is possible for two types of countries to coexist. This includes technological leaders who thrive in a cutthroat capitalism model, which greatly fosters innovation, but creates greater inequality among firms. Conversely, countries that free-ride on the innovations of the leaders may operate a “cuddly” capitalism model that offers more safety nets to entrepreneurs.⁵³

This finding suggests that fast imitation and adoption might put the firms and households of emerging economies in a comfortable,

sustainable steady state. Countries could choose to follow, copy, and adopt from leading firms, and at the same time help their firms survive with soft competition norms, and even protection and subsidies.

The problem with this approach seems to be a long-run structural national sovereignty question: Who employs and who feeds nationals? In a way, the primary obligation of a nation is to protect its citizens from hunger and malnutrition, enabling sustainable and universal access to economic and physical access to adequate food. Ask Venezuelans about the consequences of not having a good solution to the problem.

The general conclusion on government policy is to prioritize action on the basics. Adopt, imitate, and profit from others' creative destruction until your firms and your country are ready to fight frontier wars. The example to follow is China.

A Special Theory

There might be another way to foster innovation, when the problem is sliced across firms and not across countries. According to lead economist of the World Bank Mark Dutz, "There is firm heterogeneity. Some firms, including some large multinationals as well as productive local enterprises, are likely not far from the global technological frontier. If they are forced to compete more both domestically and globally, they will respond favorably."

In general, fortunes in Latin America have been made in retail, natural resources, and state-granted monopolies. Many of these firms may find it more profitable to get protection and tax deductions, and to compete in closed markets, than to compete against world-class firms. It might be simpler to lobby and seek rents.

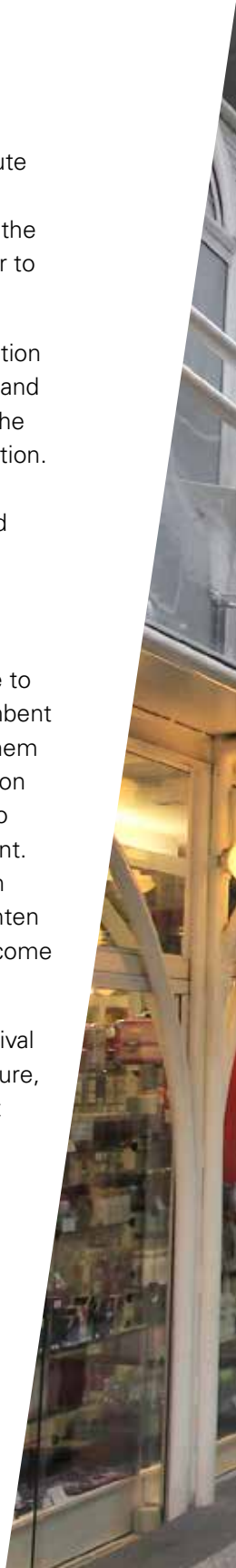
Hence, the conclusion vis-à-vis government action to foster innovation may need to be reformulated in the presence of large firms. It could be that governments make it too comfortable for big companies to get sufficient profits in protected domestic markets. "It is rational for the firms, but not for governments if they are truly acting in the economy-wide national interest rather than providing

privileges to favored firms. Asking for protection is an easier route than the risky one of making technological investments,” Dutz said. Laid-back multilatinas would not use protection to acquire the latest technologies to make better products for their markets, or to increase exports.

There is another characteristic worth noting. “Returns to innovation in large firms are very good. It is less so in midsize companies, and there is no return for small firms,” according to Gonzalo Rivas, the IDB’s division chief for competitiveness, technology, and innovation. This pattern is related to large companies having assets that complement innovation. Thus, big firms have more accumulated knowledge about the market; they have the financial resources to wait out the development part of innovation; they dominate distribution chains; and, they collude.

Rivas cited a true story: A new, cheaper detergent seemed able to make a dent in the market share of traditional producers. Incumbent retailers colluded to increase the price of shelf space to keep them out of their stores. When the innovative detergent maker went on to sell in open street fairs, incumbent manufacturers colluded to temporarily place a cheaper product alongside the new detergent. This strategy drove it out of the market. Rivas concluded: “Latin America is plagued with collusion. If competition regulators tighten and improve their action, big companies would be forced to become more innovative.”

More competition and being “fit” are not bad ideas for the survival of large companies in the region. It is no mystery that in the future, Amazon, or Alibaba, could swiftly capture the market of affluent urban buyers in, say, Buenos Aires or Mexico City.







Chapter 11

The Visible Hand of Government

Government action is crucial for innovation. Some believe that the private initiative should lead the way; but it has been proven, time and time again, that governments do affect the speed at which innovation develops in an economy.

Naturally, not all tools at the government's disposal have the same impact on innovation outcomes, productivity, growth, and economic development.

The usual rationale for government's involvement in R&D investment is the existence of a sizable social return to inventions and discoveries, and at the same time, the presence of market failures. One such failure comes with the quasi-public good nature of knowledge. Private firms cannot fully appropriate the returns to their discoveries. New knowledge is to a good extent freely available, and it can be imitated or adopted by other firms that did not have to pay the costs of development. Hence, if left to market forces, the sums invested in R&D would be lower than socially desirable.



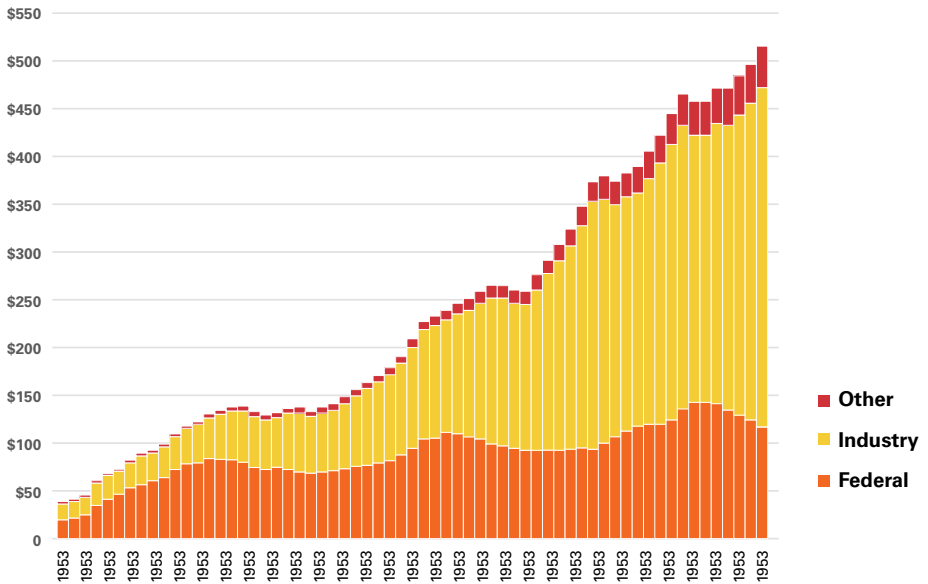
High risk and uncertainty and the long-term nature of returns are another market failure. Financing by banks, or by the firms themselves, will tend to be more expensive or could just not be available for these activities. In both cases, private firms will not engage in R&D, or not to the levels from which society could benefit.

How Much Should Government Invest?

It is often heard that the proportion of government spending in R&D in Latin America is too high. Ricyt statistics show that in 2015, 60 percent of R&D investment was funded by the government, while 37 percent had private funding. This is the reverse proportion from the developed world. This same year, private business funded 78 percent of all R&D expenditures in Japan, 75 percent in China and South Korea, 62 percent in the United States (see figure 11.1), and 55 percent in the European Union.

The usual policy recommendation is that countries should increase private involvement in this activity. Brazil is mentioned as a good example of what should be achieved. Private enterprises fund 47 percent of the country's R&D.

Figure 11.1. US R&D Spending by Funding Source (expenditures in billions of 2017 dollars)



Source: Adapted from the American Association for the Advancement of Science “National R&D By Funder, 1953-2016,” chart, 2018, <https://www.aaas.org/page/historical-trends-federal-rd>.

However, R&D was not a private activity in the United States until the 1980s. Furthermore, recent studies by Gonzalo Rivas—the division chief for competitiveness, technology, and innovation at the IDB—indicate that government could have a larger role. Rivas identified OECD countries that based their economic growth on natural resources. Norway, New Zealand, and Canada were among them. He went back in time to see the amount of government-funded R&D, when these economies had the level of per capita GDP that Latin America currently has.

He found that at that time (in the 1970s) government was, by far, the financial source of this activity. It was not the case in East Asia, and in countries that grew on the basis of manufacturing.

This pattern has a reason. Technological innovation in agriculture, forestry, mining, or fisheries takes more than a decade. In his native Chile, Rivas noted, developing a new variety of strawberry took 12 years; the creation of a new type of grape took 8 years; and stabilizing new breeds of fish may take 15 years.

If there is to be innovation in natural-resource-based sectors, there must be serious government involvement. Otherwise, there will hardly be any meaningful advances.

Government intervention in natural resource innovation is not needed to compensate for weak intellectual property safeguards. "New varieties have genetic markers. They cannot be used or copied without paying royalties to the developer," Rivas explains.

This is justified on risk grounds. R&D is extremely risky. As an example, in the United States, 80 percent of NIH-funded projects shifted outside the initial disease area. Drifting away from the initial course of research is not a coin toss. It is almost a certainty.

Contrary to what some believe, commodities are a field where there are significant opportunities for innovation. Rivas notes that "green copper would be an example." Additionally, discoveries in mining or agriculture are not low tech, as they were considered some years ago. Developing no-waste copper requires deep knowledge and complex trials. Agricultural innovations are as complex as many in the health sciences. Thus, doing away with government support for R&D is not a good idea in commodity-based countries.

Rivas's research found another interesting fact that can help policy design in Latin America. In the 1970s, research in the now-developed natural-resource-based countries was much more sophisticated than that conducted in Latin America today.

Moreover, the group of rich countries had lesser university coverage in the 1970s than Latin America currently has. With more university graduates, Latin Americans should be taking bigger strides in R&D in agriculture and mining. This is not happening, again, because there is no high-quality tertiary education in the region. It has a

clear orientation to “chalk and blackboard careers,” instead of more hands-on, problem-solving sciences and engineering, he said. “There is a very important human capital problem,” he noted, which coincides with the findings of other analyses.

Developing natural resources is a real possibility for Latin America. However, if it is to become a pillar of innovation, it would highly benefit—once again—from decisive, focused government intervention and will require a talent pool that does not exist today.

A Softer Side

Could the same principle of focused government intervention be applied to soft innovation? “Soft innovation” is a term coined by Paul Stoneman in 2010. “Much of the existing economic literature on innovation has taken a particularly technological or functional viewpoint as to what sort of new products and processes are to be considered innovations,” he wrote then. There is a type of innovation, soft innovation, that is “primarily concerned with changes in products (and perhaps processes) of an aesthetic or intellectual nature.”⁵⁴ Examples of soft innovations include “the writing and publishing of a new book, the writing, production, and launching of a new movie, the development and launch of a new advertising promotion, the design and production of a new range of furniture, and architectural activity in the generation of new built form designs.”

An economist who works on competitiveness and innovation at the IDB, Matteo Grazzi, took a closer look at innovation and creativity, the basic elements of soft innovation. Physical inputs in a \$900 iPhone, he said, might be worth around \$90. “The rest is design,” nontechnological creative inputs. “An Italian handbag has a \$600 price tag because of its design, not because of the amount of leather or other materials.”

Design has been shown many times to be an open opportunity for Latin American firms. However, they tend to consider design as a cost and not as an investment. They underspend in design, just as they would when saving on other expenses, Grazzi said.

This is a great mistake in the service sector, where the price of a product depends so heavily on consumer perception. “Latin America has to move on the path from \$60 to \$600. The region lacks soft innovation,” he argued.

The diagnostic should sound familiar by now. Creativity is an input, but it requires knowledge and investment to become innovation. The general principle of focus in government action can be well applied to soft innovation. The key would be to calculate the true size of the opportunity.

There is a market for soft innovation. The IDB estimates that the creative industries like television, music, films, software, and handicrafts (the so-called Orange Economy) in Latin America post \$175 billion a year in revenues. This is a mere one-tenth of the \$1,664 billion of the United States. Even if Latin American production never reached the same heights as that of their northern neighbor, there is still plenty of room for growth. Latin America’s orange output is already somewhat bigger than that of the United Kingdom (\$151 billion a year) or South Korea (\$110 billion). However, since orange activities oftentimes require less effort than “hard innovation,” governments tend to grossly overestimate their possibilities, and divert valuable resources toward bad business decisions around small, utterly misguided endeavors.

Mission: The Immense Power of a Focused Government

Limited resources call for focus. There are very few ways around this limitation. But innovation always requires encouragement, inspiration, and guidance. Government can provide that at little cost.

The atomic bomb is an example of the power of a mission. Over six years, the Manhattan Project organization and its predecessor—the National Defense Research Committee—grouped at different stages more than two dozen Nobel laureates; the universities of Chicago, Princeton, Columbia, MIT, the University of California, Berkeley, and

Illinois; 129,000 workers; and some \$22 billion in today's dollars.

The result of this large, though highly secretive, movement of minds and craftsmen was a weapon that ended World War II faster than any military offensive could have done.

One more military example is the 60-year-old US Defense Advanced Research Projects Agency (DARPA). It was created after the unexpected launch of the Russian Sputnik satellite in 1957. Its goal was to "be the initiator and not the victim of strategic technological surprises" in the realm of national defense.

Year after year, DARPA has convened teams to launch military applications like radar installations, satellites, missiles, ships, aircraft, and massive data handling machines. In parallel, DARPA has made discoveries for civilian uses like novel materials, and has perfected prosthetics and revolutionary instruments like the Saturn V, the Global Positioning System, and the Internet.

DARPA's projects are well funded, but at the same time, are sufficiently scientifically challenging, so they have been able to convoke minds that perhaps otherwise would not be drawn to government research initiatives.

There are of course dozens of worthy peacetime missions for Latin America: reduce extreme poverty, inequality, infant mortality, and crime; improve urban mobility, expand infrastructure, grow exports, and build food, water, and energy independence; and mitigate or adapt to climate change and natural disasters.

Focusing resources on solving difficult social problems could allow governments to attract the best local and perhaps international talents, to attain these higher societal goals. A desirable by-product of this effort should be that of building capacity to manage innovation projects.

Goals can be set in the basic sciences realm, or can be taken to be complex uses of applied sciences like management or engineering. The latter approach is no less relevant. Taking a man to the Moon was an engineering, not a basic science, problem, although along the way, needed basic science advances were made.

“Moonshot missions” now, in innovation jargon, mean solving great problems with radical solutions. This is an option as well. A country can deliberately choose to become a leader in artificial intelligence, material science, biotechnology, aerospace, or any other sector. China has shown repeatedly the power of that determination, becoming a leader in biotechnology and other tech fields.

University College London professor Mariana Mazzucato, an advocate of government-led missions, offers yet another example of mission-driven projects. Denmark, a country with 5.7 million inhabitants, intentionally became a green powerhouse. Resulting from this effort, Denmark became China’s largest supplier of climate change services. Water technology exports to China have quadrupled in the last 10 years. Danish pumps, valves, and filters set in Chinese buildings will help the biggest economy on the planet reduce water consumption by 35 percent by 2020 compared with 2013. This is one of the targets included in China’s 13th Five-Year Plan, which was approved in 2016.

Government, Mazzucato claims, should not de-risk innovation but should create new markets and let the entrepreneurial animal spirits of private actors to take the risks. This is something at which the private sector is better than government.

Well-laid-out missions that solve real-world problems—that is, putting innovation at the service of people—should also get more local political and grassroots support. It is always advisable for challenges to be selected or developed by scientists or experts, to better define the problem and judge the solutions. Government should stay at arm’s length.

Government challenges might also bring mission investors. These are financial agents that seek returns from funding worthwhile causes. These agents tend to have a longer-term vision and rid early stage entrepreneurs from the three- to five-year horizon of traditional venture capitalists. This is a particularly interesting option for middle-income countries that cannot access development funds.

Governments in Latin America in general do not connect their innovation policies to other social plans. Costa Rica’s goal to become

carbon neutral by 2021 is not an R&D or an innovation goal. But it could be.

Public Procurement

Innovation can also be fostered through government procurement, another form of market creation, which need not be used as a protectionist tool. Public purchases tend to be significant. In Mexico, they are 45 percent of the national budget. A small part of that can be used, for instance, to ready new local producers for global buyers. Andrés Velasco suggested that government may launch a public procurement program that would offer firms a percentage of national public purchases for a limited number of years—not permanent. Over this period, firms may build competitiveness. “It’s not protection. The entry of foreign products is not prohibited,” Velasco explained.

Governments can alternatively use “challenge-based acquisitions.” Marina Halac and her Columbia University team noted that, often, the lure of market exclusivity granted by patents is insufficient to promote innovation.⁵⁵ The time-limited access scheme described above might be equally insufficient. In these events, government procurement through contests or prize awards come in as “practical and proven mechanisms to procure innovations.”

There are many examples of these contests. US government agencies like the National Aeronautics and Space Administration, the Department of Energy, and the Marine Corps have conducted contests to spur innovation. In Chile, the government launched a now well-documented challenge to guide the reconstruction effort after the 2010 tsunami.

The effectiveness of challenges can be greatly improved using Contest Design Theory. Halac and her team, for instance, found conditions for prize sharing and disclosure policies that are particularly effective to spur innovation. Instead of having a single winner (a winner-takes-all scheme) and revealing at every point of

time whether a contestant has succeeded or not (a public contest), it is best to have an arrangement where every contestant who succeeds by a deadline receives an equal share of the prize, and no information is known about the winners until the end of the contest (a hidden contest).

This discussion, though technical in appearance, is deeply relevant. It places patents, which are a form of winner-takes-all contest, as a suboptimal arrangement to get innovative outcomes.

In practice, an optimal contest would have the initial bid not being specific to the total quantity procured, and it would offer a cash reward on the completion of a task. The total “prize” is awarded to multiple contractors from a single solicitation. At the end of the contest, contracts are given to those who meet the standards. Halac and colleagues mention, as an example, a \$350,000 Astronaut Glove Challenge run by the National Aeronautics and Space Administration. This challenge ended up with the winner founding a company to “manufacture gloves for the emerging commercial space flight market.”⁵⁶

There are many advantages to the model. First, contractors are paid for results and not for best efforts. Second, contests help develop a wider base of innovative suppliers. Third, as Halac and her team proved, it might be optimal to assign complex tasks to several people at the same time. That departs from the usual managerial recommendation of not assigning two people to a single task (winner takes all). In this case, to make the scheme work, the project leader must offer both contenders that one takes the full prize if only one succeeds or half if they both do.

Contests can be used in many other fields of innovation to get the desired quality for outcomes. In a traditional research tournament, the deadline is set and known, but the quality of the innovation might vary widely among contenders, and could be far from the desired goal. Conversely, “in an innovation race, the quality standard is fixed, and the date of the discovery is variable.”⁵⁷

The private sector has plenty of challenges to show. In March 2018, Google closed a challenge that offered \$30 million for a private team

that landed a spacecraft on the Moon, capable of webcasting images back to Earth. Nearing the deadline, none of the finalist teams could make a launch attempt, and the prize went unclaimed. However, it made it clear that a flight to the Moon is no longer reserved for governments, but that it could be attempted by small teams of entrepreneurs.

In a 2017 challenge, Citi demonstrated that money is not always the main driver for participants. The challenge was meant to devise technological tools that would increase public sector transparency. The winner received \$100,000, but thousands of participants received small portions of the \$5.5 million in-cash and in-kind award pool.

Innovation challenges in public procurement are not guaranteed to render desired results. There is a somewhat picturesque example to remind us of this fact. In 1934, the British Air Ministry—technologically optimistic with the advent of things like electricity, the airplane, and wireless communication—set out to find radical solutions to the threat of bombers. These machines made Britain lose its military advantage of being an island.

As part of this effort, the ministry offered a £1,000 reward to anyone who could build a “death ray” that could kill a sheep from 100 yards away. The ray was intended to kill pilots in their cockpits or bring down enemy planes. No one claimed the reward. The reason was that it was impossible for any generator of the time to send out the power needed for such a weapon. Radio-destruction was out of the question.⁵⁸ Nevertheless, the challenge fueled the development of radio-detection: using radio waves to spot enemy planes. This gave birth to radar, perhaps the instrument that most helped the Allies win World War II (and that is another story).

Challenges and contests are not infallible. But if judiciously used, they can spur idea creation and innovation. There is ample proof of this.

Economic Integration

One more way to create markets is to promote strong regional economic integration. A large unified trade bloc would help local producers learn to sell to the world, first selling in the neighborhood. The strategy would be particularly effective in services, the sector in which Latin America will possibly be more competitive, Velasco said. Thus, governments in the region should strongly promote the integration in services trade. The regional market would be a ladder to bring them closer to global markets.

There is no need to elaborate here on the advantages of having larger markets and factor mobility within the larger market.

Management, Again

Governments can create markets, but they can also create management skills. There are several good examples. One of them is the Foundation for the National Institutes of Health (FNIH—not to be confused with the NIH, as described above). This government-created but privately run nonprofit, puts together ideas from research institutions, and money from investors. But, more importantly, they are professional innovation project managers. They are the trusted translator of material science to financiers and CEOs, and of marketing jargon to white-coated scientists. In essence, the FNIH serves as manager and financial overseer.

“The FNIH forges public–private partnerships and alliances to advance breakthrough biomedical discoveries that can change and improve the quality of people’s lives,” its website states. The FNIH raises funds, provides scientific expertise, and administers research programs for a wide range of health problems like Type 2 Diabetes, malaria, dengue, and the spread of the Zika virus, it further explains.

The recently created Advanced Research Projects Agency–Energy (ARPA-E) of the United States is another salient example: “In 2005, leaders from both parties in Congress asked the National Academies

to ‘identify the most urgent challenges the US faces in maintaining leadership in key areas of science and technology,’ as well as specific steps policymakers could take to help the US compete, prosper, and stay secure in the 21st century;” the history of ARPA-E reads.⁵⁹

“The National Academies called for decisive action, warning policymakers that US advantages in science and technology—which made the country a world leader for decades—had already begun to erode.” Hence, the academy recommended the creation of an agency within the US Department of Energy, modeled after DARPA. In 2009, ARPA-E received its first appropriations of \$400 million, to fund its first projects.

An extremely clever and efficient way in which ARPA-E de-risks R&D is that they are experts on the whole R&D process from start to end. Very few organizations can see the transition from one stage to the next. Scientists hardly ever have to deal with IPO problems. ARPA-E can explain to them what lies behind the fence of their current phase, and ease the transition.

Careful stage gating is part of ARPA-E’s task. It helps evaluate the risk of the project at each demarcation and to determine its financial health and financial needs, and, in the end, its success or failure.

ARPA-E experts guide researchers on actions that might not be so obvious. For instance, they may suggest the generation of early side applications to a technology, to get revenues that give air to the central, long-term target.

Yet another benefit to the agency’s intervention is that the private sector values ARPA-E’s due diligence. This facilitates its taking stock on a project. Private involvement is key to get market insights not available to government or to researchers.

In summary, ARPA-E’s role is to add managerial vision and skills to the complex path from lab to market. In nine years of operation, as of February 2018, ARPA-E-financed projects have produced 1,634 peer-reviewed journal articles and 248 patents. Project teams have formed 71 new companies, 109 have partnered with government agencies, and 136 have raised more than \$2.6 billion in private funds.

The message, once again, is to populate the ecosystem with good managers.

Smart Specialization: Non-R&D Innovation

“You will not have high-tech everywhere. It is developed in a limited number of places. Some localities will never be a high-tech hub,” said Francesco Lissoni, an economist and innovation expert at the University of Bordeaux. This is a truth to which we had better grow accustomed. “You may see high-tech developing in São Paulo, and Santiago, but perhaps not in isolated North Brazil,” he added.

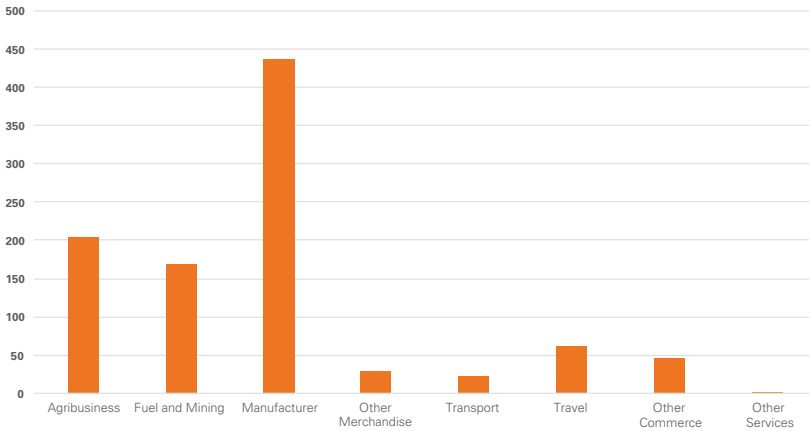
It is not easy to think of the names of big traditional firms that morphed into tech powerhouses either. In fact, Lissoni only knows of one case: Nokia. The Finnish company went from being a paper, rubber, cable, and forestry conglomerate to become a leader in telecommunications. Nokia, however, made its change under hard-to-replicate, unique political and economic conditions, namely, privatizations after a socialist government, and the birth of mobile telecommunications.

To nurture complex innovation, countries or cities could go the path of cluster development. Many have tried, with diverse levels of success. Most attempts to copy Silicon Valley have failed miserably.

As a national policy, it should be easier to advance in sectors closer to local expertise. “Move in sectors like those you currently have, or apply the same technology to sectors where the ‘translation’ of the technology is easy,” Lissoni recommends.

Latin American workers and managers have developed experience in mining, agribusiness, oil and gas, and, in Mexico, in manufacturing. This has been the region’s export footprint for decades. Export information reveals some emerging activities like travel (tourism), and “other commerce” (construction, financial services, telecommunications, and information services) (figure 11.2). In this sense, regional governments should specialize their innovation in these areas.

Figure 11.2. Revealed Skills in Latin America: Exports to the World, 2016 (\$ billions)



Sources: World Trade Organization; Latin Trade.

Lissoni offers an illustration. Italy was a developing economy in the 1950s. Milan and Turin had some auto and pharma manufacturing, but in general, Italian firms were in traditional woodwork, textiles, and ceramics.

Chairmakers in northern Italy began differentiating their products by signing in designers to work with them. Soon, craftsmen became more skilled, and the region became well known for the making of high-quality furniture.

In the 1950s and 1960s, northern Italians serviced and repaired German and French machines used in their local textile and ceramic factories. Succession problems led to crises in the largest machine suppliers abroad. Small Italian firms began manufacturing these machines. The new builders did not require much training, as they knew the trade and the workings of the imported devices. Soon Italy became a leader in the manufacturing of specialized machines.

Nineteenth-century Colombians, in the Antioquia department, generated amazing stocks of cash from gold mining. Miners invested their cash surpluses in two activities: large-scale coffee plantations and manufacturing. Both coffee growing and manufacturing existed, but were rudimentary at the time. They needed the miners' managerial abilities, and their long-term vision of business, to flourish.

The "follow the easy path first" strategy was used by Mexicans as well. Over the years, the basic *maquilas* of the 1970s were transformed into car-making, aeronautics, and medical device operations.⁶⁰

A coda: The European Union is using this idea of building on existing knowledge in so-called peripheral economies like Portugal and the Eastern European countries. These nations face the same substantial resource constraints Latin American countries. "It is useless to try to get patents or heavy R&D. There is no capital to do that," was Lissoni's observation.

Is worth noting that the Italian transformation was done without government aid. "Firms were clever not to wait for national intervention," Lissoni said.



Chapter 12

Business Models, Not Tech or Labs

Building on existing knowledge is a natural route to follow for innovation-policy design. But with limited resources, it is also advisable to take into consideration the essential fact that innovation is not R&D or technology adoption. As stated above, innovation is about taking ideas to market. And thus, it is also about changing business models. This is often the best way to look at innovation in large firms, most of which are trapped by legacy technologies, methods, and protocols.

For instance, in the early 2000s Mexichem was a commodity producer. Its product lines were basic chemical staples: salt, chlorine, caustic soda, fluorspar, and sulfuric acid—as commodity as you can get.

In 2003, under CEO Ricardo Gutiérrez, the company made a crucial decision. It devised a strategy to grow by acquiring competitors, and—surprise—suppliers and clients. By vertically integrating, the company could increase its margins and avoid the catastrophic harm of commodity price volatility.



The Board of Directors of the time placed a strict goal on management, dubbed 20–20–20: 20 percent revenue growth, 20 percent rate of return on equity, and 20 percent EBITDA (earnings before interest, taxes, depreciation, and amortization) margin. Indebtedness was also severely limited, but it gave management carte blanche on other “whats” and “hows.”

“I deeply knew the firms I was acquiring. They had been my competitors or clients for years. I knew the synergies I could get,” former Mexichem CEO Ricardo Gutiérrez explained. Thus, the costs of due diligence and firm vetting were reduced to a minimum.

Moreover, the synergies obtained from these vertical and horizontal integrations were so large that management could offer sellers extraordinary prices without compromising returns. “We did not get deals right always, but we improved the numbers during integration,” he confessed. But they got things right most of the time. Mexichem became one of the world’s biggest PVC resin producers and a leading world player in the manufacturing of pipes. The company was valued at 13 times EBITDA, much higher than its peers, Gutiérrez said.

A new strategic shift occurred in 2014, when management decided to focus on products with a higher value added, a natural step for a firm that had clearly escaped the pull of the commodity world. The company completed 26 acquisitions of 82 companies, and it now operates in 38 countries and sells in 100 countries.

A brief note on families. Mexichem is controlled by the Del Valle family. As Gutiérrez notes, "Protection of (managerial) independence is a family principle. It is in their ancestry. Operation is never given to a family member." In addition, the Board of Directors has independent directors. "This helped us a great deal validating our strategy, our expansion plans, and protecting our financial statements," Gutiérrez concluded.

Bold moves like these are not commonplace in Latin American firms, but they are more frequent in Mexican companies. Alfa is a diversified conglomerate, in petrochemicals, aluminum auto components, refrigerated foods, and telecommunications. It is the seventh-largest firm in Mexico, and it takes innovation seriously. Alfa innovates as if running away from disaster. "We are committed to not being a *maquiladora*," said Alfa's corporate vice president of innovation and sustainability, Erich Meyer. "To do that, we must develop our own technologies." All business units have R&D centers, staffed with 300 professionals with master's and doctoral degrees, he said.

Alfa's information technology and telecommunications subsidiary Axtel operates a start-up accelerator that takes in enterprises from areas that are not necessarily related to the company's core business. "These projects are supported because Axtel can learn in the process."

Alfa subsidiary Nematik, maker of aluminum components for the automotive industry, embarked on a government-backed R&D program. It used funds from the Mexican innovation agency, Conacyt, to finance the program, and quickly became the Mexican company with the most number of patents filed. By the end of 2016, Nematik had made 62 inventions, protected by 283 patents.

The Alfa group knows that bigger companies have an edge over small ones in R&D. "[Big firms] have the advantage of critical mass, and market leadership; innovation is a slow process and needs resources," said Meyer.

M&A are still another weapon in Nemark's knowledge-building arsenal. A memorable deal, Meyer recalls, was the acquisition of the Italian firm Teksid in 2006. It gained the Mexicans complete access to Rotocast, a technology needed to fill complicated molds, typical of engine heads and blocks they cast for carmakers like Audi and Porsche. It was a major success. "The Aztec Empire overtakes the Roman Empire," a company presentation heralded, years later, to highlight the relevance of the operation.

Innovation can be built far away from the product and tech labs, on the whiteboards of corporate planning officers. New business models and strategies are strong complements but, sometimes, substitutes for cutting-edge technology.

Talent, Aesthetics, and Sports

Another option available to innovators is to change the aesthetics or the intellectual content of their products (soft innovation), or to pursue stronger marketing strategies. It is nice to find that companies can avoid high-tech research, or the need to advance in complex manufacturing techniques, as long as these deficiencies are traded for deeper, methodic observation of consumers, or for more sophisticated marketing practices.

Peruvian gastronomy, led by chef Gastón Acurio, one of the recent marvels of Latin American inventions, is a case of successful soft innovation. As the writer Ignacio Medina stated, 60 microclimates and 25,000 species of food were part of the armory deployed by Acurio, and after him, by thousands of young chefs, to place *cebiche* and *causa* on the map of global cuisine.⁶¹ Biodiversity, which Medina calls a "monumental treasure," was put to good use.

Cocina peruana, since the Acurio revolution, has built a cluster that makes \$500 million a year in tourist revenues in Peru, and an unmeasured amount in over 700 Peruvian restaurants open in the United States. Above that, it has changed the nation's culture and promoted inclusion in a tremendously efficient way in Peru.

Innovation principles still apply: the value of a leader; an enterprise with a method; and persistent, focused work in areas where skills abound.

This research did not delve into soft innovation deeply enough to make strong claims about which strategy to follow, but it seems natural to argue that there are right and wrong ways to foster innovation.

Boca Juniors is a true maker of successful soccer players. The Argentine team has a disciplined method to breed and attract top footballers. To prove it, Boca has 22 international titles, which makes it the second (or fourth depending on the source) in the world in terms of number of internationally recognized titles. Diego Armando Maradona and Martín Palermo are just two outstanding players who resulted from serious, yearly campaigns to reach a title.

José Antonio Abreu's National Youth and Children's Orchestra and Choir System in Venezuela is another case that obtained extraordinary results by tying potential talent with impeccable talent development execution. The world-renowned conductor Gustavo Dudamel is part architect and part product of "the System," as it is called. Hundreds of children, many of modest means, have moved up the Venezuelan social ladder and, now, to prestigious international orchestras.

These are efforts that make markets, and like Peruvian cuisine, increase social mobility and economic prosperity for wide-ranging groups of people.

A different social impact is achieved when talents are placed on value chains outside the region. Little League Baseball in the United States recruits a large number of Dominican and Venezuelan teenagers to feed Major League teams. Per *Mother Jones's* Ian Gordon, "At the start of the 2012 season, players born in Latin American countries made up 42 percent of minor leaguers and 24 percent of major leaguers."⁶²

Historically, the influx of players has not been small. Per Wikipedia, there have been 700 Dominican and 737 Venezuelan Major League players since 1950. In December 2011, more than half of the

Latin American players in Major League Baseball came from the Dominican Republic, “the most from any country outside the United States,” Gordon wrote.

It is an awfully rewarding job for them. With a \$30.5 million contract in 2018, the Venezuelan Miguel Cabrera is the fourth-best-paid baseball player in the United States. At \$29.5 million, the Cuban Yoenis Céspedes is fifth; at \$28 million, the Dominican Albert Pujols is eighth; and at \$27.3 million, the Venezuelan Félix Hernández is ninth.

Social benefits for the country of origin are not so clear, aside from showing young followers that baseball is a worthwhile career. In a way, it is the equivalent of the extractive industry model, where the benefits accrue mostly to the final transformer of raw inputs. This could be the case for musicians like Shakira and Daddy Yankee as well.

Individual artisanal work, much like that of a lonely Olympic medalist, is not the solution to productivity, growth, or development. To drive national value creation, as in the cases of Boca or the System, soft innovation must outgrow the small artisanal shop format to incorporate strong managerial practices that preserve its authenticity, and appeal to a desired audience. Otherwise, extraordinary talents, like Shakira and Daniel Barenboim, will bloom elsewhere.

Baumol’s Cost Disease

In finding the right way to foster soft innovation, there is a need to recognize that the technology of some aesthetic or intellectual activities poses a serious long-run problem. This was diagnosed by William Baumol and William Bowen in 1966.⁶³

An irrevocable performing arts truth is that if one is to hear Beethoven’s string quartet Opus 130 in B-flat major just as the composer intended it to sound, it must be played by four—two violinists, a violist, and a cellist. This is as valid when it was first performed in March 1826 as it is today. It also takes about 45 minutes to play, then and now.

The technology of live performances leaves little room for productivity-increasing innovation and thus, according to standard economic theory, for wage increases. But why are dancers and musicians now paid more in nominal terms than in, say, 1826?

The answer resembles the one offered by Baumol and Bowen in the 1960s. Wage increases in rising productivity sectors push wage increases in all human-performed tasks, regardless of the sector. If wages did not increase sectors where productivity did not increase, those tasks would become lower-quality or would not be carried out at all.

In that situation, entrepreneurs in the arts and culture sector would see payroll costs increasing, but would not have the offsetting benefit of increased productivity. If ticket prices cannot rise at least as fast as costs, impresarios and their firms would face financial challenges, and in the end, would disappear. When costs increase as a result of productivity surges elsewhere, the sector faces what is now known as Baumol's Cost Disease. "The root of the cost pressure which besets the arts is the nature of their technology," Baumol and Bowen wrote. There is hardly any effective way to increase the productivity of a string quartet in a live, concert hall performance.

Many human-performed activities—such as the arts, education, sports, health care, design, home delivery, and hairdressing—thrive alongside highly productive (high-income) sectors, where wages, incomes, and wealth are high enough to pay well for these services.

They can also fall victims of the disease. When the cost increase in human services is too severe, or when such services cater to a superfluous need, activities will tend to disappear. For society, it means losing jobs, efforts, and often history.

In the Latin American context, generalized low productivity (low wages) has deferred the disappearance of some human-performed tasks. This does not mean that they are not vulnerable to the disease.

There is another conclusion, which is very important to the innovation debate, that follows from Baumol’s insight. In a discussion on the low impact that artificial intelligence has had on growth, Philippe Aghion and two colleagues raise the point that “growth may be constrained not by what we are good at but rather by what is essential and yet hard to improve.”⁶⁴ A predominantly “string quartet nation” will have a harder time making successful bets on innovation.

Cut on R, and Fuel Marketing

It is no mystery that highly innovative, high-tech firms are also incredible marketing machines. Innovative companies like Salesforce and Twitter invest a substantially larger amount of money in marketing than in R&D. The “last mile” is a costly venture; see table 12.1.

Table 12.1. Marketing Machines: Expenses as a Percentage of Revenues, 2016

Type of Expense	Salesforce	Twitter	Embraer	Pacasmayo
Research and development	18	28	1	—
Marketing and sales	59	38	6	3
General and administrative	15	12	3	16

Source: Company reports.

Hence, there is another weakness of large Latin American firms on the diffusion flank as well. This is not in the sense of the dissemination of scientific knowledge, but in communicating the attributes of finished goods to consumers.

Per Zenith, advertising in 2017 was a \$541 billion global market.⁶⁵ The United States and Canada get the lion's share on ad spending, with 38 percent of the global figure (\$207 billion). Asia gets 33 percent (\$182 billion); Europe, 19 percent (\$100.6 billion); and Latin America, 7 percent (\$38 billion). Regional ad spending only tops that of Eastern Europe, at 3 percent (\$17.9 billion), and the Middle East and North Africa, at 0.4 percent (\$2.2 billion).

Market growth in Latin America is also expected to be lukewarm in the future. Zenith believes it will grow in the range of 3 to 5 percent a year until 2020, much less than the 8 to 10 percent in the Asia-Pacific region. This is not to say that big regional firms should spend more right away, but this indicator may point to the fact that marketing might need additional financial fuel when the time to compete or expand comes.

Overlooked No More: Standards, the Forgotten Treasure

In the previous sections, there is a constant worry expressed about large Latin American firms not having to face competition—the lack of which has been proven to stunt innovation, productivity, and inclusive and sustainable growth. Competition is the greatest incentive for innovation. An increased supply of Peruvian and California avocados motivated Mexican avocado growers to make hard cash investments to place their product ahead in the minds of consumers. A major move was to invest \$10 million in a TV spot ad during the 2017 Super Bowl, said Enrique Perret, who is Promexico's regional director for the North American Free Trade Agreement (NAFTA).

But this level of competition is not always present. While most top *Fortune* 500 companies did not exist 20 years ago, the names of top Mexican companies have been the same for the last 30 years, Perret noted. "They have done well, and in many cases, they do not have competitors."

Fostering rivalry is a slow process. While competition is stimulated, governments can simulate competition, rising quality and operational standards. This seems to be a tremendously interesting option since it almost always depends on the executive branch's will.

Rising required operation, product quality, and even labeling standards—requiring International Organization for Standardization, green, or other certifications—are ways to force investment in innovation at firms that are too complacent. It is also training for exports.

The human resources consultancy Manpower Group's CEO for Latin America, Mónica Florez, believes that NAFTA forced Mexican managers to up their act: "We now speak English; we adopted new technologies; we know about other cultures, and are more diverse." More important, the trade pact placed higher quality standards on Mexican production. Firms had to embrace them to sell in the United States. "Now we can compete at a global level."

Amancio Ortega, the sixth-richest person in the world, and the richest retailer, tried out the "instant fashions" model for his store Zara in Spain from 1975 and into the 1980s. In 1990, Zara expanded to France. "The entry in France was costly. It almost bankrupted the firm," European University Institute professor of economics Ramón Marimón remembered. Still, Amancio persisted. "He knew that if they could sell in France, he would anywhere else in the world," Marimón added. The self-imposed goal to reach a standard paid off. Zara quickly became a global brand, with a higher value than Santander or Telefónica.

Standard compliance is a necessary tool for trade and international market development. Eleonore Pauwels, the director of the AI Lab at the Woodrow Wilson International Center for Scholars, offers an incredible Chinese example. Precision medicine, which aims at tailoring all medical decisions to individual patients—from diagnostics to therapies to products—requires artificial intelligence algorithms to be trained in all sorts of environments, and with as many genetic types as possible. Chinese genomic characteristics might differ from those of white Europeans or mestizo Latin

Americans. To remove this obstacle, Chinese companies became US-standard compliant, which allowed them to participate in the international genome-sequencing market. The result of this strategy has been phenomenal.

In 2015, for instance, the UK's National Health Service, outsourced the sequencing of approximately 100,000 genomes from approximately 70,000 patients with cancer, and patients with rare diseases and their families. Because of its experience and its standards, Chinese firm WuXi Nextcode got part of this contract. For the company, it was the opportunity to "train" its algorithms with new, UK data, which could improve their effectiveness substantially.

Finally, a strong, demanding domestic market is also a way to foster innovation through quality improvement. This is nothing new. The now-aging Porter Diamond Model proved the virtues of having finicky or strict consumers. Consumer strength might also be built through government-imposed standards.

Exports and Internationalization

All economic miracles in the world have had an international trade component. Thus, if large companies are not exporting or investing abroad, the government should not only encourage their expansion beyond the national borders but also require them to do so.

In South Korea in the 1970s and 1980s, government banks lent to large firms but imposed a specific condition. The banks said, "You have to export," explained Brown University professor Barbara Stallings. Private companies were asked to take risk while the government provided credit and guarantees to cap hazards. The idea to export and invest abroad could prove superior to directly funding innovation.

Mexico's Conacyt has struggled to give money to subsidize innovation. "There was a goal of \$181 million, and we have given \$77 million," said Jesús Martínez, the technical secretary of the Commission of Science and Technology of the Mexican Senate.

Besides, there are the usual problems of “fake innovation,” where outputs do not increase producer sophistication or product diversity. “We have not seen the expected impact of the program,” Martínez said. He complains that sometimes companies have used subsidy funds to buy a few laptops.

Fake invoicing in exports might also occur, but selling seems to be more in the spirit of any Latin American entrepreneur than innovating. Francesco Lissoni believes that governments can strike a quid-pro-quo deal with large firms. Government would represent their interests in, say, the World Trade Organization, in exchange for increased exports or investment abroad.

Export and investment promotion is a tool that can always be used. Promoters should know how to better serve their local businesses. “For a company to increase exports, there must be more clients. It is the only formula,” said Promexico’s Enrique Perret. For small firms, this means going to trade shows and conferences. For large firms, opening new channels is a more focused task. “You must seat the executive in front of the person who wants her products,” Perret stated. The conversation is very precise: “I already sell to Costco, take me to Whole Foods.”

The prerequisite for firms to want to increase exports—no surprise here—is an internationally minded CEO. “Exports come with leaders,” Perret states. Promexico persuades CEOs to become interested in exports by exposing them to the global scene. They take trade missions to Davos, to Hannover Messe, and to the president of India. “Being exposed, outside your usual space, meet other executives, see other brands. That builds a lot of enthusiasm,” he said.

“Success stories are inspiring as well,” according to Perret. These stories include the cases of Mexican Kidzania, which will be opening 14 centers in the United States; of Cinemex, which is actively investing in Florida and Texas; and of Mexican restaurants like Olvera, which is opening in New York. Storytelling is also a way to promote investments, Perret seems to imply.

However, exports and investment abroad need more than optimism of entrepreneurs. Governments or private associations can de-risk sales and investment abroad by systematically documenting successes, and failures.

Juan Domingo Beckman, CEO of the tequila maker Casa Cuervo, has a fantastic example of reaching success through unsuspected routes. The company had sold its products in China for decades, but still found this market extremely complex. To increase its market share, Beckman's team members discovered a terrific roundabout strategy. They focused on being well known and respected in New York and major European capitals. Chinese buyers appreciate this status, and they buy goods that are well positioned in these aspirational markets. The largest tequila producer in the world has since been making inroads in this promising market.

Tech Diplomacy

Diplomacy is another tool available to governments. The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) was signed by the World Trade Organization's country members in 1994, and was later ratified in 2001 in the Doha Declaration.

TRIPS unified intellectual property norms to resemble those of the United States and Europe. These norms should be used to protect local discoveries. "Latin American countries should market new, differentiated, innovative products, for instance in the food and agriculture sectors," said Lissoni. He suggests the use of intellectual property norms to defend against foreign products such as seeds: "Argentina could use these norms to avoid being squeezed too strongly with IP on chemicals."

There is a complementary strategy. China has found ways to aggressively transfer technologies home, through partnerships, acquisitions, and exchange programs.

Latin American governments have done similar things in the past. The development of acclimatized soy in Brazil, one of the all-time wonders of Latin American innovation, was the result of a prolonged collaboration between Embrapa, the US Department of Agriculture, and US research centers.

A recent usage of tech and export diplomacy is the agreement reached by the Argentine government and Chinese e-commerce giant Alibaba to offer goods from Argentine small and medium-sized enterprises (SMEs) on its platform.

South–South tech cooperation could be a requisite placed on investment-hungry Chinese, Russian, or Indian companies, to have permission to further buy assets in Latin America. Training local students and scientists in Beijing can be an easily accepted compensation.

A group of Latin American export-investment and innovation agencies could join to set up incubators for local companies in China. Government-to-government cooperation would probably make this happen.

Countries like the United States will probably harden regulations on knowledge acquisition through buying shares in high-tech companies, or studying in local labs. Recent developments on United States–China tech relations will complicate this option in the future. Perhaps the best time to try this is now.

Forget Patents

Patents are one of the most talked-about policy instruments to protect and promote inventions and innovation. Patents give innovators a temporary monopoly over a new, potentially commercial product or process. Instead of leaving pioneers competing openly with their creations, rents stemming from the monopoly make the whole activity—from R&D to market—financially attractive. In

exchange, patent holders must make technical information about the invention publicly available in the patent document.

MIT economist Daron Acemoğlu noted that patents and patent enforcement have been the bedrock of innovation of the past 100 years. He claimed that patent enforcement to protect intellectual property was a major factor in Britain's growth after the Industrial Revolution. Patents, he further argued, created a market for ideas, by giving individuals the incentive to put effort into developing new concepts.

But patents have partially lost their appeal, Acemoğlu warned. In some industries, like information technology, they are not sufficiently agile to incentivize innovation. Approval processes are bureaucratic and slow. Moreover, patent trolls have made it their business to sue product makers on the patent rights they represent. This adds more risk and a layer of legal complexity and fees that make it hard for small players to enter this field.

Patent infringement lawsuits are a real threat when venturing onto the grounds of deep-pocket players. Risk is so serious that most funds would not invest in companies when they perceive this liability.

Patents are best used by sectors with long, complex, and costly product and process development. Pharma, energy, and mining would be the archetypical cases. A new drug, for example, takes 10 to 18 years to develop, according to Richard Moscicki, the chief medical officer of the Pharmaceutical Research and Manufacturers of America, PhRma, in a presentation at the Brookings Institution. Furthermore, he noted that every successful pharmaceutical product takes \$2.6 billion in investment, and only 2 of 20 approved drugs generate enough revenues to exceed the cost of R&D. Monopoly rents would be justified in such sectors that have costly, high-risk scaling-up and trial protocols.

Some other aspects, like patent duration, are the object of heated debates. An 18-year development process uses half of the patent's life. That would pose a serious challenge to the profitability of new drugs. However, in practice things are easier. Companies have

learned to tweak a patented product close to its patent expiration date, to make a credible novelty argument, and extend the life of their monopoly.

There is also the suspicion that a monopoly around invention might unbalance the progressiveness or the horizontal equity of tax systems, making it a somewhat undesirable instrument.

The truth is that the world of invention and research could do without patents. Bordeaux University professor Francesco Lissoni brings forth the example of the 19th-century Netherlands. For a 25-year period, this nation suspended patent protection. Exactly at that time, the world-renowned innovators Philips and Unilever were founded, and thrived without the safety net of patents.

In fact, patents are irrelevant for industries like information technology. Firms use copyrights and survive with other protection strategies—including secrecy, exploiting the productivity gains obtained from moving down the learning curve, and acting faster than competitors, based on the idea that imitators take time to take their “me too” products to market.

A survey carried out by Lissoni reports that European CEOs believe that taking advantage of lead time is the most effective to protect a new process. They give this strategy a 5.1 score on a scale of 1 to 7. Moving down the learning curve follows, with a 5.0 score; and then come differentiation with sales and service efforts, at 4.6; secrecy, at 4.3; and only then comes patents, with a lackluster 3.5.

Simpler protection strategies also require some additional assets and institutions to fully work. Firms opting for the secrecy or lead-time strategies might need to change their employment contracts with key employees, to preserve confidentiality and to retain them. Some, for instance, allow inventors to participate on the upside of successful projects.

Where We Stand

The world of patent applications by residents is undisputedly dominated by China.⁶⁶ Chinese filed 1.2 million applications in 2016. Then came a second group of distant followers, which includes the United States (residents filed 295,327 in 2016), Japan (260,000), South Korea (163,000), Germany (49,000), and Russia (26,800). A third group includes—perhaps unexpectedly—Iran (14,900) and the traditional innovators France (14,200), the United Kingdom (13,900), and India (13,200).⁶⁷ Then comes the peloton.

In 2016, no patent authority in Latin America granted more than 50 percent of the applications it received.

Conversely to the grim narrative that usually accompanies the description of Latin American R&D, Brazil and

Mexico do well. Brazil's residents filed 5,200 patents, giving the South American nation a respectable 13th place on this 106-entry table, head and shoulders above Canada, the Netherlands, Sweden, and Denmark. Mexico ranks 26th, with 1,300 applications.

However, pride quickly turns into dismay with a little more analysis. In 2016, no patent authority in Latin America granted more than 50 percent of the applications it received. On the extreme, Ecuador and Dominican Republic granted 4 percent and 6 percent, respectively. There are normal backlog levels, and of course not all applications should be approved. Yet, slow, bureaucratic procedures are effective innovation killers. On the patent-grant ranking, Brazil and Mexico fall to the 27th and 29th places, and the tail of Latin American countries reaches as low as the 90th spot on the 92-country list.

Experts also criticize patents in Latin America on other grounds. "Patents do not mean a thing," said Felix Rozanski, coordinator of Cediquifa, a health research promotion organization. "We have many patents in Chagas," he stated. Yet these patented advances have not been sufficient to develop a vaccine against the disease that affects some 7 million people in the region. "Patents repeat things that we already know. Researchers have brilliant slideshows, but no clinical trials."

Rozanski recalls a case when a firm presented what it claimed was a new type of insulin. There was an important event to unveil the product. “The minister of health went to the launch,” he said. As his story progressed, Rozanski’s temper seemed to sway between mild discomfort and rage. The punch line: “This type of insulin had existed for 10 years.”

Policy Ideas on Patents

An efficient patent system is important in special cases of innovation. It is not necessary, and not desirable in most cases.

Without the tremendous burden of believing that R&D and innovation depend on this instrument, patent law in Latin America could evolve faster than in other regions to reach a more sophisticated level. The economist Daron Acemoglu proposes overhauling two aspects. The first is relaxing patent norms in areas where there are well-established best practices and standards. And the second is replacing patents with copyrights altogether in areas like software development.

A single Latin American patent office would also be a viable option. After all, there is efficiency to be gained having more clever and better-trained eyes judging the novelty of an invention. Secrecy is not an issue, because patents are designed to provide information to inventors and firms.

Financially De-Risking Innovation

There are alternatives to patents—and to subsidies or tax credits, for that matter—to de-risk innovation. The director of the Laboratory for Financial Engineering at MIT, Andrew Lo, and University of Minnesota professor Richard Thakor found a mechanism to optimally finance R&D-intensive firms, to eliminate underinvestment in R&D.⁶⁸

They considered R&D's unique features, including large capital outlays, long gestation periods, a high upside, and low probabilities of R&D success. This, in turn, explains why R&D-intensive firms, in general, are relatively low users of debt, have large cash balances, and underinvest in R&D.

Firms can always finance themselves with debt, provided they have pledgeable assets, but this type of financing, these researchers found, leaves R&D unfunded, because of adverse selection about R&D viability, asymmetric information about the upside potential of R&D, and moral hazard from risk shifting.

Lo and Thakor come up with a mechanism, consisting of two put options, that can be used in combination with equity to eliminate underinvestment. The options are meant to insure funders against adverse results; investors offer firms insurance against R&D failure, and firms offer investors insurance against very high R&D payoffs not being realized. This is yet another reason to make government focus on market creation, and not on risk-sharing with private firms.





Chapter 13

Time Is a Terrible Thing to Waste

Innovation needs optimism. But it also needs a great dose of pragmatism, to go beyond the mantras of innovators and behind the interests of technology salespeople.

There are right and wrong moves. Innovation in developing countries does not always demand deep R&D, or the use of bleeding-edge technology. It might not need patents. These are not obvious truths, but hopefully shared views by now.

It does need good education, but not universities teaming up with local firms. It requires inventors, but not the massive transformation of young workers into entrepreneurs. Trying to force trends in these areas might be, to put it mildly, a waste of time. To be more precise, it could be a waste of real resources that are a matter of life or death in the most unequal region of the planet.



Universities and Firms: A Good Marriage?

There is a widely shared agreement about the role that universities play vis-à-vis innovation. In general terms, it is believed that building a good triad of firms, government, and academia is a necessary condition for innovation. But what if we take a different stance, and claim that in Latin America it might not even be advisable.

The expected effect of putting firms and academia together is two-sided. On one hand, it would swiftly diffuse basic and applied research to firms and products; on the other hand, it would have universities steer research in the direction of relevant, practical market problems. Governments usually facilitate this process with financial or fiscal incentives.

It is true that some of the most potent innovation corridors in the world have been built around universities. Silicon Valley, one of the latest, had its origins in Stanford. The tech innovation ecosystem in Boston evolved around MIT and Harvard. The Smithsonian's Lemelson Center for the Study of Invention and Innovation has documented many other cases, like the Medical Alley in Minneapolis in the 1950s, which formed alongside the University of Minnesota.

An optimistic view on the power of the triad induced many Latin American university presidents to try to follow this model. Stanford was a favorite. In the 1940s, Frederick Terman, the MIT engineer behind the university's fantastic success, specialized the institution in a few specific areas, to compete with East Coast educational powerhouses and to attract military grants and corporate clients.⁶⁹

Terman developed a bold approach to link academia with the corporate community. As Arthur Molella and Anna Karvellas recount in their book *Places of Invention*, "Terman encouraged his faculty to consult for local firms, arranged for local industrial researchers to teach specialized courses on campus, and set up an Honors Cooperative program so that corporate employees could earn their degrees while working full time."⁷⁰

Some universities, like Mexican Instituto Tecnológico de Monterrey, which had its origins in private grants, have moved successfully in this direction. Mexico, like other Latin American countries, also passed a law that allowed public university professors to receive royalties from the commercialization of their inventions or stipends from a consultancy. However, with exceptions, linking academia and firms has proven to be a failure in the region.

This problem has several facets. One is that large firms do not trust universities. If they have a serious problem, they would probably hire McKinsey or BCG, to take advantage of their deep industry knowledge and their global view. The same goes when they face a relevant operational challenge. Companies would probably be right to buy an SAP, Salesforce, or Alfa Laval solution instead of a university-developed software program or machine.

To make things worse for local universities, even when strictly academic knowledge is required, nothing stops large firms from hiring Wharton or MIT. In fact, regulations might play against locals. "I've heard from Brazilian multinationals that there is a problem with

regulation. There are so many regulations in local universities, that they go abroad," the director of a major Brazilian MBA program said.

This leaves local institutions with a smaller market of SMEs that cannot pay the more expensive brands. That is not necessarily bad, but it perpetuates the situation in which complex, more interesting problems are left to high-capacity, international players to solve.

Conversely, professors at any school worthy of its license are required to enter a tough competition to publish in indexed journals. This, in many cases, has forced research to lose the practical relevance that local companies seek, according to Javier Serrano, the former vice rector of Colombian Universidad de Los Andes. Often, local data sets are not available or locally relevant topics are not interesting to major journal editors, so consequently they do not get explored.

Should bridging these diverging interests be a national goal? In general, the answer is no. Having good firms and good universities is always a requisite for growth, but joint R&D efforts are desirable only under special circumstances.

If the goal is to have more inventors, for example, universities would not necessarily be the best long-run policy instrument (box 13.1.)

Box 13.1. Who Becomes an Inventor?

MIT professor John Van Reenen and a group of researchers characterized the factors that determine who becomes an inventor in the United States.⁷¹ They took data on 1.2 million inventors from patent and tax records. Their findings are enlightening.

First, children from the families with the top 1 percent of incomes are 10 times as likely to become inventors as those from below-median-income families. Second, exposure to innovation during childhood increases the propensity to become inventors. "Growing up in a neighborhood or family with a high innovation rate in a specific technology class leads to a higher probability of patenting in exactly the same technology class," report Van Reenen and colleagues. Third, the financial success of inventors is extremely skewed and highly correlated with the scientific impact of their work, as measured by citations.

If these patterns are similar in Latin America, the conclusions would be that early exposure to invention is needed to have more inventors, and that tertiary education would play an interesting social equalizing role if it takes children from median-income families and, through educational excellence, enables them to become inventors in relevant scientific fields.

More important, these researchers' conclusions imply that increasing exposure to innovation in childhood "may have larger impacts on innovation than increasing the financial incentives to innovate, for instance by cutting tax rates."

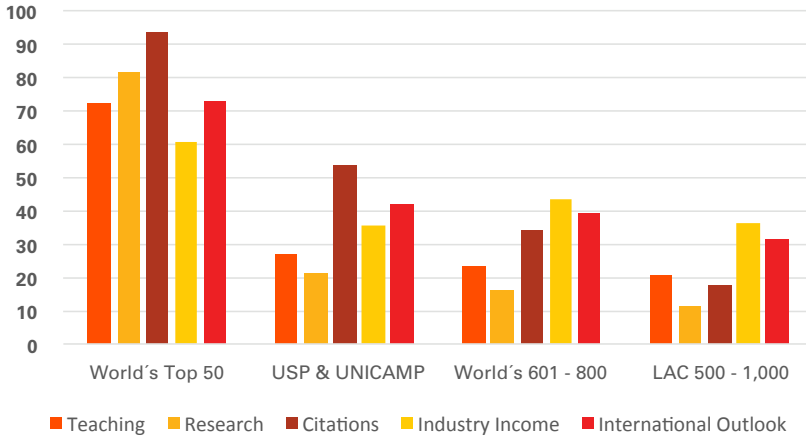
High-Quality Education: How Good Is Good Enough?

Universities must, first and foremost, concentrate on building their quality and academic prestige. The best schools in Latin America have recognized this objective, which calls for the constant dedication of minds and other resources, since most institutions lag too far behind by world standards.

Universidade de São Paulo, the best Latin American university on the *Times Higher Education Supplement's* world's university ranking, was classified in a group that holds the spots 250 to 300. Universidade Estadual de Campinas, the second-best ranked, is somewhere between 400 and 500. The remaining 63 follow.

There is always controversy about the criteria used on the rankings, but it is clearly a useless discussion when the gap is so wide. The *Times Higher Education Supplement* considers indicators like teaching, research, citations, industry income, and international outlook, which might give a good idea of relative institutional strength. Performance on each of these categories is depicted in figure 13.1. If Latin American institutions are to move up on the classification, they must improve in all of them, but more on research and citations, as USP and Unicamp have. This implies, in line with Serrano's comment, that researchers should have a greater incentive to look at problems that mainstream peers consider relevant, and less on local CEO concerns.

Figure 13.1. Latin American Universities: Distant Followers in Scores—Groups of the Top 1,000 Universities in the World



Sources: Times Higher Education Supplement, 2018; Latin Trade.

US News’s ranking is gentler with Latin American tertiary education institutions. There are 7 among the top 400 in the world. Universidade de São Paulo ranks 153. Distant followers are Universidad Católica de Chile, 315; Universidade Federal do Rio de Janeiro, 338; Universidad de Buenos Aires, 341; Universidad Estadual de Campinas, 344; Mexican UNAM, 374; and Colombian Universidad de los Andes, 385.

The career consultancy QS ranks 13 regional institutions among the top 400. However, it is worth mentioning that 40 percent of their final score is given by expert-judged academic reputation. When only academic credentials are considered, citations per faculty indicator for instance, these universities are sent back to a sad academic barren land (table 13.1). Only two institutions make the top 500 cut: Universidade Estadual de Campinas (414) and Universidade de São Paulo (459). The rest vanish.

Table 13.1. Latin American Universities Rank Low among the World's 400 Best

The Higher Education	US News	QS
251–300 Universidade de São Paulo, Brazil	153 Universidade de São Paulo, Brazil	75 Universidad de Buenos Aires, Argentina
	315 Universidad Católica, Chile	121 Universidade de São Paulo, Brazil
	338 Universidade Federal do Rio de Janeiro, Brazil	122 UNAM, Mexico
	341 Universidad de Buenos Aires, Argentina	137 Universidad Católica, Chile
	344 Universidade Estadual de Campinas, Brazil	182 Universidade Estadual de Campinas, Brazil
	374 UNAM, Mexico	199 Tec Monterrey, Mexico
	385 Universidad de los Andes, Colombia	201 Universidad de Chile, Chile
		254 Universidad Nacional de Colombia, Colombia
		256 Universidad de los Andes, Colombia
		311 Universidade Federal do Rio de Janeiro, Brazil
		331 Universidad Austral, Argentina
		337 Universidad de Belgrano, Argentina
	364 Universidad Católica, Argentina	

Sources: Times Higher Education Supplement; US News; QS; Latin Trade.

It is unfortunate, but probably fair to conclude, that most universities are still not delivering on their basic social mandate of offering their students the best possible education. This is measured with the rod that places unquestioned world leaders—like Oxford, Cambridge, and MIT—at the top of the list.

Hence, they must focus on quality. They need to find ways to attract top-rated faculty members, who are versed on research topics that are interesting material for the best journals, while they seek to improve their teaching effectiveness (box 13.2).

Latin American universities should probably not focus on aspects like patenting. In the United States, China, and Germany, firms are by far the leaders in patent filing. In Latin America, universities, not firms, are the most prolific patent filers. As we have seen in the country results above, these patents have not fostered enough commercial applications to induce productivity increases.

This effort does not need to take 20 years. Loans and training to get professors admitted at the top 10 universities, or setting up matching services to have them coauthor papers with professors at better-ranked institutions, would be in the employing school's best interest, a quick multiplier of quality, and a booster for the probability of alumni being later admitted to top schools.

Monetary rewards for publications and academic research are a strong incentive for basic and applied research. It might sound like a tired idea, but Russia, for instance, recently included a provision on its innovation policy, to grant financial incentives to researchers who publish in the best-indexed journals. This becomes like the pecuniary reward some governments give Olympic medalists.

Chinese universities have done a fantastic job at closing the quality research gap in a decade. Now they have better labs and are doing better research. Their formula has a wide mix of interesting strategies—ranging from international cooperation, to clever investments, to training teachers, to opening international doors for their students, to opening their classrooms to international faculty.

The Shanghai Institutes for Biological Sciences co-ventured with the French Institut Pasteur and collaborated with the German Max Planck Society in two of its eight institutes. These institutes recruit faculty from China and abroad, and grant scholarships to students who want to work overseas, with their collaborator labs, for a year or two.⁷²

The Chinese Academy of Science's Institute of Biophysics acquired a bleeding-edge-technology microscope, developed powerful microscopy techniques, and gave ample access to the microscope itself. The strategy facilitated the hiring of top researchers. At times, advanced, costly instruments are bought in China by sharing the budgets of various universities.

Global recruitment is also a reason for Chinese universities' success. The Department of Immunology at Tianjin Medical University has already awarded 119 honorary and visiting professorships to foreign scholars. The result of this and other efforts is that Chinese students can interact with leading visiting scientists from around the world, and in many instances, students can also be candidates for research scholarships abroad.

Good university governance is important to improve research, and it is key to attracting talent. Successful industry-sponsored postdoctoral programs in China offer good pay packages, but they place independence at just the same level.

Regional universities will have to come up with creative formulas to improve their quality. Probably trying to compete head on with resource-rich first world institutions is not advisable (box 13.3).

Box 13.2. How to Make Nobel Laureates

In 1982, the Department of Economics at the University of Minnesota became the research headquarters of four professors who changed economic theory. Perhaps this would not be such a salient story for innovation if it were not because Minnesota was a public university, located in a place better known to corn and soy

farmers, and not usually recognized as a scenario for extraordinary scholarly achievement.

This is not a case of overnight success. In fact, as with most “overnight successes,” this one took 12 years to evolve. It required a singular mix of personal leadership, commitment to rigorous academic training, impeccable team selection, and setting the right motivations for the team to work.

In 1970, the Department of Economics had already built some prestige for excellence. Milton Friedman (Nobel, 1976), Robert J. Shiller (Nobel, 2013), George J. Stigler (Nobel, 1982), and Leonid Hurwicz (Nobel, 2007) had been faculty members. A widely used book in microeconomics had been coauthored by Minnesota professor James M. Henderson. There were some well-respected alumni, like Daniel McFadden (Nobel, 2000), moving on their tenure track at Ivy League schools.

Walter Heller had been at the helm of the department since the 1960s. He was former chairman of the Council of Economic Advisers to President John F. Kennedy, and was a champion in the defense of good academic research. In about 1970, “Heller thought of macroeconomics as a mathematical control problem, and was interested to see how it could contribute to policymaking,” according to former Minnesota professor Ramón Marimón.

Heller’s idea was theoretically intriguing and technically challenging. And it was exciting enough to get the interest of a young Harvard mathematician turned econometrician, Christopher Sims. Heller hired Sims in 1970. A year later came another Harvard economist, Thomas J. Sargent, and then, in 1974, a University of Chicago graduate, Neil Wallace.

By 1980, the small, 22-person department was exploding with path-breaking ideas, especially those tied to the construction of the Rational Expectations Theory. In that same year, Heller hired a mathematician and Carnegie Mellon economist, Edward Prescott, to complete the super-team.

The group shared a common interest in the complex and stimulating dynamic, stochastic, general equilibrium approach to economics. However, they worked on different topics, from causality, to the business cycle, to monetary and fiscal coordination rules. Oddly enough, one of the initial building blocks of the team, the view that economies could be modeled as control problems, was proven to have deep time-consistency flaws and was abandoned by the group.

Their research was fueled by collaborations with Carnegie Mellon and the University of Chicago. The “Four Horsemen”—as Prescott, Sims, Sargent, and Wallace were known—had personal ties with these two schools. “Prescott and Robert Lucas (Chicago) knew each other from Carnegie Mellon,” Marimón pointed out.

Diverging views also raised the quality of their intellectual creation. A well-known disagreement on method and policy recommendations had created two schools. The “freshwater economics” side had its stronghold at Minnesota, Chicago, and Northwestern universities, near the Great Lakes, while the opposing “saltwater economics” side lined up scholars from universities on the United States’ East Coast.

“Though Neil Wallace, Tom Sargent, Ed Prescott, and I were seen by many outside Minnesota as a package of ‘freshwater’ innovators, from inside the Minnesota department we seemed to ourselves to represent sharply distinct viewpoints. We argued, and stimulated each other and our students. Actually, much of the ‘arguing’ was implicit in the conflicting advice we sometimes gave our shared PhD students,” reads a part of Christopher Sims’s autobiography.

Inside Hanson Hall, the brick-and-concrete building where the department was housed, the keys to advancing research were autonomy and total research independence, said Edward Foster, former chair of the department. Heller and James Simler, who was department chair from 1967 to 1991, placed freedom as a key principle to keep the team motivated.

“The Minnesota Economics Department did as well in the 1980s as it had in the 1970s—in part due to the skills of the chair, Jim Simler.

Here is another person who created an environment in which good things happened: Consensus was reached quickly, and there was hardly any politicking. This made the Minnesota department unique," Edward Prescott said years later.

A challenging problem, extraordinary talent, ties to other research centers, competition, research autonomy, and a nonbureaucratic environment were some elements that favored creation. Marimón added two more: permanent discussion and mutual respect. Respect, he said, was a tradition that had been set by Leonid Hurwicz years before.

Compensation was less of an issue because the Federal Reserve Bank of Minneapolis offered Minnesota faculty joint appointments, said Edward Foster. Better financial conditions and interesting research challenges perhaps made up for long, cold winters and for staying out of the private university realm.

The end result: a string of Nobel Prizes for the University of Minnesota researchers of the 1980s. Edward C. Prescott received the Nobel in 2004. "He showed that economic policies are often plagued by problems of time inconsistency. Demonstrated that society could gain from prior commitment to economic policy. Introduced new ideas about economic policy design and the driving forces behind business cycles," were the reasons given by the Stockholm panel that selected him.

Leonid Hurwicz was given the Nobel Prize in 2007, "for having laid the foundations of mechanism design theory." And Thomas J. Sargent and Christopher A. Sims received the prize in 2011, "for their empirical research on cause and effect in the macroeconomy."

Perhaps one more name should be added to this story, that of Lars Peter Hansen (Nobel, 2013), who participated as a student in the emergence of the revolution. He graduated from Minnesota in 1978.

Budget cuts and disagreements on the role of econometrics in graduate training dismantled the group in the 1990s. Minnesota gave a good lesson on how to make the Nobel selection committee turn its eyes in a certain direction. Could this be replicated in Santiago, Asunción, or Curitiba?

Box 13.3. Building Up Strength

Financial strategies must be clever in poor, resource-constrained countries. Providing good education is costly. The annual cost per student at the public Universidade Federal do Rio de Janeiro is estimated by the daily *Globo* at \$22,000.

The richest universities on the planet have enough financial strength to permanently improve their quality. The combined value of the endowments of the 50 richest universities in the world reached \$362.4 billion in August 2017. That is equivalent to 7 percent of Latin America's GDP. Each year, governments in the region spend an equivalent of 5.3 percent of GDP on all education levels, from early childhood to tertiary.

The 50 richest universities charge undergraduates annual tuitions in the range of \$30,000 to \$50,000. Top private universities in Latin America charge from \$9,000 to \$11,000 a year, 20 percent to 30 percent of their developed counterparts, and in line with global income differences. GDP per capita in Latin America is 21 percent that of high-income countries.

It does not appear wise for Latin American universities to follow the same path as rich universities, with one-fifth of their resources. A mix of quality improvement and heavier deployment of financing tools—like the securitization of student loans, insurance, and contingent claims—may be formulas to consider. Some of them are used timidly in the region.

The Best Applied Research

Does a thrust toward basic and applied research induce innovation? Not always; but a move toward high-quality education, pulled by high-quality research, would amount to a revolution in Latin America.

It is widely known that firms complain about the pertinence of formal training. They are mostly pessimistic about there being a practical solution to this problem. At the same time, the absence of well-paid jobs for graduates has increased middle-class disenchantment with tertiary education. This nasty conjunction might, in the end, shape an unwanted shared skepticism about the usefulness of education, let alone world-class, high-quality education.

It would be a quantum leap to convince societies that the way out of underdevelopment is in part to offer ample access to high-quality education. "Enough" is not a word that should exist when referring to education. It is easier to build stronger, more innovative societies with the resources of well-educated citizens.

Managers should also adhere to the cause, but for a different reason. They would be dead wrong to believe that high-quality education does not have a short-run impact on business.

As we have said, there is abundant evidence that universities can greatly foster corporate innovation by training managers, and by exposing board members, family firm owners, and CEOs to global trends and the best managerial and performance-tracking practices.

Developing strong managerial skills, strategic vision, and impeccable results-based execution could be the single most important tool for fostering innovation in companies, both big and small, in Latin America. The natural means to educate top management is none other than the traditional research-and-teach universities. There is no need for dramatic developments. To make up for an eventual lack of deep global or industry knowledge, local universities can always partner with international schools.

ProMexico devised a remarkable program to upskill its board members. But there is a catch: It does not involve local universities.

In 2017, the Mexican agency started a program to train the current board members of leading global companies. The program is run in partnership with Southern Methodist University. ProMexico will soon offer its alumni's expertise to a group of US firms that want to take Latin American market knowledge to their boardrooms. It is easy to think about the benefits that this kind of program can bring to the quality of management of local firms.

Put differently, building better CEOs should be a major endeavor in every country. The relevance of formal management training can never be overstated. Management research and teaching should be raised to the rank of the most needed sciences in the region. As a society, we should make sure that those who are entrusted with the handling of our assets and our factors of production do it well.

A Feeble Bridge

Now back to the beginning of this discussion: What about the ties between universities and firms? There is an option to link them. Universities could promote endowed chairs, Serrano suggests. This financially strengthens universities and, at the same, develops meaningful research agendas for donor industries.

Academically solid universities may also convince governments to support Brazilian-style sectoral funds for long R&D-cycle industries like mining, oil, energy, pharma, and agriculture. Governments could be key to convince universities to work on locally relevant problems. (Box 13.4.) University technology transfer offices may also be more effective if they focus on a few sectors.

Building an entrepreneurial university requires a different approach. Much as with professional athletes, training and running are not the same thing; nor do they require the same skills.

Frederick Terman, the MIT Engineer behind Stanford University's fantastic growth, knew that to get closer to entrepreneurs and to foster the creation of new companies, he needed entrepreneurs in his ranks. "Professor Dean A. Watkins was director of the electron devices laboratory and codirector of the Stanford Electronic

Laboratories. Terman recognized qualities in Watkins that he knew would make him a good businessman," according to a study by Carolyn Tajnai.⁷³ A research university, instead, needs academics.

This story is well known to human resources managers, but it is often forgotten by university presidents. Good hiring is never about finding the best available person, but the one best suited for the job. To tie in with corporate innovation, a good researcher must be taught about the microeconomics of a specific industry, a thing that he or she might not even be interested in or trained for.

It is nice to have university professors marketing their ideas, if they know how to. If they do not, it probably is a social waste. Lower-quality schools, as most in Latin America are, perhaps would do better to keep professors closer to the blackboards and their computer screens, refining their knowledge and their analytic arsenal, than having them "learning by part-time doing" in SMEs.

If nothing else, ideas and rigorous academic training can help nations advance. Ask Chileans if the ideas and the teachings of University of Chicago professor Arnold Harberger did not have a larger impact on that country than all the companies accelerated by all universities, combined.

Box 13.4. Stanford University: The Quality Secret

Hero selection is crucial for economic development. Stanford is always a good hero for universities to have, but rectors and policymakers trying to imitate its feats may do well to remember that Stanford's ability to leap tall buildings in a single bound requires more than a cape.

Counter to common wisdom, this university's success does not lie in incubating start-ups. In 2015–16, Stanford received \$94 million in gross royalties from 779 technologies developed there. This is a nice sign of good institutional eye for spinning off intramural start-ups.

More important than this, however, faculty and students have consistently proven that they have a highly effective method for analyzing business environments, identifying opportunities, and growing corporations around their ideas and research.

The list of companies that alumni have created proves this. There are old economy names like Gap, Nike, Dolby Laboratories, and Charles Schwab; first settlers of Silicon Valley like Hewlett-Packard, Cisco, and Sun Microsystems; and new-economy icons like Google, Netflix, Tesla, and Instagram.

But strong academic performance is the element that backs its success. Academic excellence is the true enabler; it has attracted government grants to fuel research since the 1920s. Per Stanford's website, 6,000 projects drew \$1.3 billion in federal funds during the years 2016–17 (13 times more than royalties).

Academic quality and resources helped create a virtuous environment to further knowledge creation and attract top talent. Stanford boasts having 19 living Nobel laureates, and 13 more who have passed away.

Starting Up a Mistake

Another much-publicized way to foster invention and innovation is to change the public attitude toward risk. Governments embark on large-scale programs to develop entrepreneurial spirit among their populations.

Creating entrepreneurial behavior and attitudes seems like a good idea. It might seem much like acupuncture in a medical treatment: It may help. And even if it does not, it will not hurt. However, this is not the case.

Launching and growing a company is a complex venture. It takes much more than an idea, enthusiasm, and business mantras. It requires consumer and market knowledge, financial resources, technical expertise, and managerial sophistication.

Entrepreneurship is risky. In the United States, only 20 percent of new businesses survive past the first year. They fail primarily because of poor profits or a lack of financing.

A calculation for Colombia illustrates the Latin American case. This South American country has a fair amount of venture promoters: government-run Innpulsa and Telefónica's Wayra, Ventures, among others. Start-ups compete for their resources and awards, which include cash grants and useful in-kind prizes. Along the way, contestants are incubated, and accelerated, getting a substantial number of hours of mentoring and advice.

Nine out of 10 of these privileged start-ups, which were specially cared for in their initial stages, went out of business within the first three years. The most cited causes for their exit are a poor reading of the market; not having the technical, commercial, or financial means to reach the needed market size; and new market entrants—even large incumbent firms—doing things better. At times, the original maker of copied international products enters the market with better product and execution. These firms also have a limit on the number of years they can withstand being in the red. They try to shorten the money-losing period as much as possible.⁷⁴

Seven out of 10 that survive the first three years do not grow. Cash flow is the main reason cited. “Without cash, they cannot invest and can easily become obsolete, just like big firms. Their problem is that they only have one or two products,” said María Mercedes Barrera, the director of the Knowledge Unit at Grupo Empresarial Antioqueño.

Only one in 10 survivors crosses the \$350,000 barrier. “They received all the help possible, including mentoring from McKinsey,” Barrera stated.

The arithmetic is somewhat disappointing. First, it proves that entrepreneurship is a high-risk pursuit. In Colombia it has a success ratio of 1 to 3 percent—or 7 percent, if you stretch the definition to include no-growth subsistence. Oil exploration is widely considered high-risk. Chances of success of exploration oil wells in new areas, with no previous exploration, are 10 to 20 percent; they climb to 60 percent in areas close to production zones.

Second, it has a low return. After three years, 100 Colombian start-ups would have used \$7.1 million from the ecosystem and would be selling \$700,000 per year. The private internal rate of return of having incubated and accelerated these start-ups is –2 percent, in 10 years.

Should Colombian society be willing to put money into this activity? The answer, naturally, depends on expected social returns. There are gains from having 200 or 300 hands-on-trained people in business administration. Nonetheless, at \$23,000 to \$35,500 per head, it could be worth comparing the program with a massive enrollment in top international universities (see box 13.2). The comparison is also meaningful because the Colombian experience show that ecosystem resources concentrate in a few firms, those that are the most appealing to judges. “Winners in one contest apply and usually win in others,” Barrera explains.

There could be social gains when big, established companies bring start-ups as suppliers, or partner with them to improve products or business processes. The problem, then, is quality. The German firm Bayer is said to have looked for start-ups to invest in Colombia, and could not find one that would give them value.

Large firms solve their problems with Silicon Valley start-ups that have a proven record of success in the application of cutting-edge technologies. Grupo Empresarial Antioqueño's affiliate, Grupo Sura Ventures, is a minority investor in several Silicon Valley fintech companies. The goal is to support the parent firm Sura to better deliver or manage consumer loans, housing loans, or health insurance. Their stake in these start-ups significantly widens the scope of the tools available. "It's a technological leap," according to Grupo Sura's CEO, David Bojanini.

The quality problem is not exclusive to Colombia. The director of the Entrepreneurship Center at IAE Business School, Silvia Torres, found that, in the last 17 years, Argentina has created a good number of entrepreneurs, "but it exhibits problems in the quality of these firms, in their survival rate, and in the perception of opportunities for entrepreneurship that the population has."⁷⁵

Social returns could increase if large companies were to develop a method to scout the start-up scene, select value-adding firms among them, and place entrepreneurs close to the CEO, where their drive would not be suffocated by corporate bureaucracy.

Then there is the ever-present lure of striking gold and starting up a unicorn, a company that sells more than \$1 billion. In the 30 or so years during which formal entrepreneurial ecosystems have operated in Latin America, there have been seven unicorns, according to international ICT adviser Diego Molano—two in São Paulo (Totvs and B2W), four in Buenos Aires (Despegar, Globant, Mercado Libre, and OLX), and one in Santiago (Crystal Lagoons).⁷⁶ This is, roughly, one every four years in choice cities.

The São Paulo ecosystem has started between 1,600 and 2,900 firms, and the Santiago system has started between 500 and 700. Hence, the probability of building a unicorn is still slim. This is something to include on expected social return calculations.

What about the return to de-risking innovation by teaching wide groups of the population to be risk takers? Would this game plan create more Yolanda Fernándezes, the Guatemalan inventor of what

became McDonald’s revolutionary “Happy Meal”? The response to this question amply exceeds the bounds of this report. It might be true, as risk-loving, adventurous people like the 16th-century Spaniards or 17th-century Dutch proved. It could also be the origin of major social disasters. Between 1958 and 1960, close to 40 million Chinese died from starvation, when Mao Zedong tried to turn his country into a steel-making world power, based on a model of small furnaces.

However, it must be noted that meritocracy, discipline, and teamwork are also formidable elements in development. Barbara Stalling noted that Chinese, Japanese, and Koreans are not risk takers. In fact, they are very much risk averse, in the entrepreneurial sense. They would rather be employed by a big company. And statistics show that these countries lag far behind North America and Europe in their number of start-ups (see figure 13.2).

Figure 13.2. China, Japan, and South Korea: Not Very Entrepreneurial—Start-Ups Founded by a Global City



Source: Zara Matheson, Martin Prosperity Institute in Richard Florida “The New Global Cities,” City Lab, 2013, <https://www.citylab.com/life/2013/06/new-global-start-cities/5144/>.

Asian miracles rode on their social ability to work together in large enterprises, and not on diversifying their bets among hordes of boys in garages. To find the true north, once again, policy should avoid the trap of overly optimistic fables.

The Overton Window, also known as the window of discourse, is the range of ideas tolerated in public discourse. This window has moved too far to the side of viewing entrepreneurship as the means of redeeming Latin America from underdevelopment. Pessimistic and unpopular as it may sound, pulling the window of discourse toward the side of better corporate design and meritocracy is now much needed in the region.

Building a nation of entrepreneurs with public funds should be an effort guided by probabilities, not by innovation populism. Otherwise, it would be a terrible waste of social time.





RECTORIA

Chapter 14

Is It Money or Managers?

The death of start-ups is tied many times to the absence of capital. Indeed, global metrics show that financing for new enterprises (entrepreneurial finance) is a particularly scarce resource in Latin America (table 14.1).

Table 14.1. New LAC Firms Are Unattractive to Financiers: Expert Ranking of Entrepreneurial Finance, 2018

(1 = highly insufficient; 9 = highly sufficient)

	Entrepreneurial finance
North America	5.07
Asia & Oceania	4.69
Europe	4.48
Africa	3.66
Latin America	3.52

Source: Global Entrepreneurship Monitor.



Venture capitalists provide seed capital to start-ups, or to support the expansion of small companies. Venture capitalists invested \$500 million in Latin America in 197 deals in 2016. It was a record figure, but still small compared with the \$69.1 billion invested in the United States or the \$127 billion financed globally in the same year. Brazil received 56 percent of venture capital dollars invested in the region, Mexico got 26 percent, and the remaining 18 percent went to other countries. Information technology start-ups received 68 percent of all the money invested in Latin America.

Venture and private equity capitalists are a potent tool for start-up development because, more than money, they bring managerial expertise to the table. Money alone is not the answer. Angel investors—usually high-income patrons—who are not experienced enough in an industry, have proven time and again that in the long run they become a problem to the receiving firm.

A good venture capital (VC) brand is also a fantastic signal to the market. Tech giant Google, and many other new economy names, were backed by well-respected VC brands, which show other investors that they have a good chance of succeeding.

However, VC financing is not beneficial for every type of firm. Venture capitalists tend to have a three- to four-year investment horizon, after which they want to divest and move on. Companies with projects in areas such as climate change, pharma, medical

devices, or mining may not get funded because of their long project development cycles. If they are funded, it is hard to envision a happy ending to their financial partnership, unless it is clear from the onset that VC might provide follow-on resources.

To attract venture capitalists, innovators should offer exciting areas of investment, in an activity where competition is fierce. A medium-size VC firm in the United States receives 1,000 projects per year, almost four every working day.

A Bit Too Serious

Venture capitalists in Latin America seem to be quite serious. “There is very little money being invested in superfluous things, like an app that puts moustaches on a person’s photo,” said Julie Ruvolo, director of venture capital at the Latin American Venture Capital and Private Equity Association, Lavca. Funds go to projects to facilitate payments, to get loans, or to solve problems of the population at the bottom of the economic pyramid.

In general, she said, Latin American start-ups have focused on solving problems that are important but very specific to the region. That is why fintech and e-commerce are the most popular areas of new developments, and perhaps, it is also why start-ups from this part of the world are not on the list of most attractive businesses that come from the United States, Asia, or Israel, she claims. There are no self-driving cars or deep machine-learning-based projects.

Mexico’s Sr.Pago is a good example of what is being financed. This firm facilitates cashless payments among the unbanked, who make up some 70 percent of the country’s population. It provides individuals with debit cards with no maintenance fees, and unbanked store owners with Bluetooth readers to accept debit or credit card payments.

The Guatemalan start-up Kingo raised capital to finance the sale of prepaid solar energy kits to almost 50,000 low-income households

across Central America. Mediação Online, a legal dispute mediation service for Brazilian businesses and consumers, also received funding to sell low-cost mediation services, amid what some call Brazil's stratospheric number of litigation proceedings.

The surprise comes from the small amounts invested in agribusiness, with Brazil, Argentina, Uruguay, Paraguay, and Mexico being world powerhouses in this sector, and Peru and Chile not far behind. Per Ruvolo, start-ups in agriculture or livestock only received 1 percent of all the funds invested by venture capitalists in the region. "It's a new category," she said. Global investors as diverse as Monsanto and Qualcomm are beginning to consider investing in agritech enterprises. Monsanto is interested in new seeds and biotech, and Qualcomm is interested in the applications of the Internet of Things, artificial intelligence, and big data to agribusiness. She expects deals will be made, and activity will pick up speed rapidly.

To charm venture capitalists, start-ups solving local problems should also turn their eyes to education and health care, or to projects that span more than one country. Venture capitalists will probably follow soon afterward, Ruvolo anticipates.

Across industries, project quality and managerial skills are a major stumbling block for venture capitalists entering Latin America. Ten years ago, according to Ruvolo, nascent companies could hardly find seed capital. Five years ago, start-ups had an easier time obtaining initial capital, but resources to expand (growth capital) were almost nonexistent. "That's starting to change. Increasingly, big names in finance are making growth funds available, because the quality of start-ups improved."

Funds will probably be more accessible, as venture capitalists share risk in new ways. Ruvolo sees more funds co-participating on individual deals, or pooling resources to invest in a portfolio of firms. These practices will also foster better diffusion of information among the start-ups themselves.

Enter Multilatinas

The opportunity for the region appears to lie in having large companies fill the VC void. Large firms have financial resources, market knowledge, and more sophisticated management than newly founded companies.

Columbia University professor of economics Graciela Chichilnisky is a world authority on global environmental issues. She has a clear view of how her knowledge could be transferred to businesses in Latin America. "Working for a big company makes no sense because they cannot innovate. It's a waste of time. At the same time, the problem with small firms is that they do not have the money."

The answer, she believes, is venture investment: large companies making minority investment in innovative companies. "By their very nature, large firms are averse to risk, which is essential to the innovation process," she said.

The job of larger firms could be to put the feet of newly minted entrepreneurs on solid market ground. "There is plenty of valuable innovation in Latin America. It is commercialization that requires a different mind-set." The condition for success, she added, would be that large companies do not dominate the day-to-day business decisions of their investees.

How much should societies want to see large firms invest? There is a well-known 10-to-1 relation between R&D investment and VC money invested in the world, Chichilnisky noted (roughly \$1.500 billion in R&D and \$150 billion in VC investments). Firms can use this relation: Instead of investing in R&D, she claims, they can invest 10 percent of their own equity in risky projects. "Then everything would work. They would bring-in innovative people."

Barbara Stallings also thinks that there is a clear opportunity in linking large and small businesses. "Large firms are not able to do everything. Small firms can take up the slack," she said. She sees acquisition of small firms as a major trend; but at the same time,

she feels that a simple, well-written contractor agreement could work for both sides. "Subcontracting is the advantage of small firms. Innovation is hard to promote in a garage."

In sum, venture capital is not present in the region because exciting, financially promising developments are not being advanced in Latin America. Smart money does not follow good ideas, but good ideas in the right activities. Perhaps if new entrepreneurs work on health, education, security, agribusiness, or mining, financiers will seriously consider this part of the world.

A VC presence would be highly advantageous because private capital or venture funds tremendously ratchet up managerial skills on their investees. For the time being, large firms can fill the investment gap, benefiting from increased innovation.



Chapter 15

Skills to Change a Nation

The talent shortage is a common bottleneck for employers worldwide. In 2016, the human resources advisory ManPower Group reported that 40 percent of the 42,300 employers surveyed annually across 43 countries reported having difficulties filling vacancies. This, they said, was the highest number since 2007. The shorter skill life cycle, due to changing technologies, has made the problem worse.

Employers usually blame government and academia for the mismatch between the skills acquired through formal schooling and the needs of the real business world. Government and academia, indeed, have a role to play, but possibly corporate whining about the problem is a poor strategy to solve this deficiency.

ManPower's 2016 Talent Shortage Survey also found internal training as a new trend. Some 50 percent of employers upskilled their existing workforce to fill open positions. The figure was 20 percent a year before.

Economists have found that on-the-job training has tremendous private and social returns. In Latin America, for instance, IDB



economists Carolina González, David Rosas, and Roberto Flores, found that a 1-percentage-point increase in the proportion of trained employees raised productivity by 0.7 percent in firms with more than 100 employees.⁷⁷

Despite its labor market problems, the region seems to be in the right path as far as in-firm training is concerned. In 26 Latin American countries, González and colleagues showed that firms offering on-the-job-training ranged from 26 percent of the firms in Jamaica to 60 percent in El Salvador. The proportion of workers trained ranged from 38 percent in Uruguay to 79 percent in Colombia. These are good numbers compared with other emerging areas.

There are flaws, however. Firms do not train temporary workers because their leaving the company becomes a loss on their investment. It is also a skewed mechanism. Skilled workers receive much more training than unskilled workers, so existing skills gaps tend to be amplified, González and her team noted.

Is there a space for large firms to develop high-quality training programs? It has been done in the past, with great social and private returns. Citibank in the 1970s was a sophisticated banking school. New hires received a thorough immersion in banking from a solid theoretical perspective, but with an utterly practical grounding. Citibankers were, by far, the best in the Latin American financial sector. Citi knew that just a few of its recruits would stay, but it still invested heavily in their upskilling.

Society ended up free-riding on this private training ground. Many vice presidents and presidents of other Latin American banks were Citi alumni. The bank still benefited from getting top professionals to the middle-management level, and it had a reputation for being ahead of its competition.

Recently, other companies have moved in this direction. In 2017, Cemex launched Cemex University. It will integrate four corporate academies—Commercial, Health and Safety, Supply Chain, and Culture and Values. The new organization for company training will be an education advisory service, which will promote continued digital learning for employees. “It will act as a high-impact catalysts for our transformation,” a company report reads.

Cemex University has the support of regional presidents, who act as executive patrons. “Our objective is that through Cemex University, we can instill a growth mind-set across our organization, and increase our employee’s potential,” notes the firm’s 2017 annual report.

Waiting for the ministries of education and universities to graduate the perfectly trained hire might be pointless. Some hours in front of a computer may be enough to find the optimal proportion of investment in on-the-job education, and some additional time with legal councils might suffice to draw the optimal contract.

Yet other companies have found interesting ways to solve their staffing problems while addressing social issues. The youth unemployment rate in the region is 19 percent, more than double the total unemployment rate of 8.4 percent. This is a bone-chilling figure, considering that 10 million of the 26.4 million unemployed people in Latin America are young.

A prime ordeal is an employability challenge. The young lack the right skill set, and thus getting their first job is a major difficulty.

Arcos Dorados—the largest McDonald’s franchisee in the world—is the biggest first-time employer in the region. The company has made it a goal to help young people get their first job and to learn skills

that will help them the rest of their life. "We teach them soft skills: Arrive on time, be a good team member, be courteous," said Arcos Dorados' chairman, Woods Staton. New hires are also taught how to have a job interview and how to write a résumé. These skills clearly outlive their 10-month average stay at McDonald's.

Arcos Dorados has a flex-time policy and encourages employees to use their salary and their free time to get a formal education. One in three executives began their careers at Arcos Dorados in one of their restaurants. Most of them went on to get an MBA, Staton said.


The company partnered with governments on a program to aid young "at risk of getting in trouble," he said. The kids work for eight months repairing restaurant refrigeration equipment. At the end of the program, they receive a certificate, recognized by a government entity, as technicians in refrigeration and electricity. "In eight months they leave McDonald's with a degree and a curriculum. They have a higher probability of being employed than if they did not have those two," he said. They also served the company. "They did their job well, and covered vacant positions."

Part

2

Additional Thoughts on Policy and Action





Large Latin American corporations have the financial resources and the microeconomic knowledge that are possessed by no other agent—researchers, start-ups, or the government. This is a colossal strength that should be used to leverage economic development.

They are powerful machines. Revenues of the top 500 nonfinancial companies and the top 100 banks are equivalent to 21 percent of the region's total GDP. Large regional firms are 10 times more productive than small firms, while they are 5 times more productive in China and twice as productive in the United States. This is a tremendous force for progress in the region.

Latin American-based multinationals, multilatinas, have another formidable characteristic. Economic protectionism, closed economies, or a lack of exports are traits of national economies. Multilatinas instead, are inherently open. The conditions of tradability of inputs, labor for instance, change when these firms are involved.

A multilatina can choose where to buy its inputs, what tariffs to pay, and what markets to serve from what source. They pay taxes where they want, hire in different countries, and promote either nationals or foreigners. Multilatinas select a common official language, and impose values and missions across borders.

Multilatinas acquire competitors to increase their market share or their knowledge stock. They export, teach, develop practices, and managerial abilities . . . or do just some, or only a few of the ones mentioned above.

The task at hand is to find ways to promote the great power of these organizations, and to harness it in favor of innovation, productivity, and sustainable national economic growth.

How is this done? It can be done much in the way that Australia promoted its productivity surge of the 1990s. The economist Dean Parham described this process, in a book published by the National Bureau of Economic Research, as reforms “intended to realize catch-up gains by forcing and enabling businesses to improve technical efficiency (moving toward best practice), reduce or close inefficient operations, and adopt a more innovative, market-driven culture.”⁷⁸ It is a mix of forcing and enabling.

Policy should clearly signal that all companies must get involved in the task of innovating to increase their productivity. To let managers and entrepreneurial families know that they must take good care of the resources they are entitled to, to produce a first-rate outcome.

National microeconomic reforms could be called for in areas like electricity, gas and water, communications, financial intermediation, transportation, storage, health care, and government services.

Reforms need not be huge, but they must be smart. In Colombia, cargo insurance policies have an explicit exclusion. Insurers will not pay any theft claim if commercial goods were being transported at night (from 6 p.m. to 6 a.m.). The consequence is that truckers stop virtually all the Colombian fleet at dusk. A simple calculation—which includes some of the usual delays on the part of the shipper, truckers, and ports along with this night stoppage phenomenon—renders unexpected results. A coffee container moved from Medellín to the port of Cartagena would take 42 hours, the equivalent of having traveled the route, interruption free, at 9 miles an hour. A sizable part of the productivity problem in Colombia is logistics. It is not a lack of infrastructure; it is that roads are used at 50 percent capacity due to an insurance provision.

Have Each Play Its Part

Big companies in Latin America must do their job. Firms in mining, oil, electricity, agriculture, and pharmaceuticals should invest in R&D, just as best managerial practices dictate.

Francesco Lissoni believes that some countries and sectors have clearly underperformed. He thinks Brazil should do better: “Brazil has a sizable public sector R&D investment. They are important in research, not laggards.” And the oil sector and other extractive activities should have more patents: “The United States invented fracking. There is no reason for not having new mining techniques developed by big Chilean firms.”

How can large firms be induced to increase R&D spending? Lissoni offered the idea of a quid-pro-quo deal. If a sector wants government to represent its interests at the World Trade Organization, then the sector should show some R&D investment.

In other sectors, companies should follow safer adoption or imitation innovation strategies, or follow a fast development path, protected by copyrights or just by cleverly using lead-time advantage.

However, large firms are slow at this task. As has happened for centuries, slow technological adoption may spell the demise of older, more established firms. In “Fifty Years of Empirical Studies of Innovative Activity and Performance,” Wesley Cohen reported that smaller firms account for a large share of innovations, and that incumbent firms appear to be reluctant or incapable of making drastic changes to their products or their business models.⁷⁹

The Yale economist Mitsuru Igami finds four forces that induce or delay an incumbent’s innovation timing: cannibalization, differential costs, preemption, and institutions.⁸⁰ First, old firms might not be willing to innovate to avoid cannibalizing their own products, that is, introducing new goods that could kill their old sources of revenue. In theory, costs, the second force, can work either for or against innovation in established firms. Organizational inertia may make

innovation costlier for incumbents or, in the opposite direction, may facilitate R&D or other forms of innovation, because of their size or their stock of accumulated knowledge. The third force, preemption, seems to go in just one direction: Older firms innovate faster than new ones, to preempt potential rival entry to their markets. Finally, these three forces combine differently in different institutional environments (the fourth force), that govern patents, market size, and the like.

Igami himself showed empirically, for specific industries, that cannibalization made incumbents reluctant to innovate, despite strong preemptive motives and the cost advantage they had over entrants. Interviews for this research with large Latin American firms heavily coincide with his results.

Thus, the question is how cut product life cycles in a way that induces firms to do new things, in a different manner, more often—how to put a cost on “sameness.” The answer could be, as we have outlined, in forcing exports, allowing imports and competition, creating markets or raising standards.

These are just examples from areas where government, firms, and consumers all must play their part in this innovation-building aspiration.

In closing, I outline several actions that are available to each party.

1. Firms

CEO, CEO, CEO. There is no way around it. Innovation and productivity begin with a convinced, charismatic, knowledgeable CEO.

Take it to Salamanca. The best managerial practices are learned. The manual, with local adaptations that a smart CEO can make, can be adopted to improve productivity. CEOs, and management teams in the top decile of the biggest Latin American companies by revenues, have world-class management educations; the ones below must get more, and better, education.

Adopt structured management practices. These include a number of things: Set clear, shared goals, and build a strong corporate culture to steer in their direction; establish merit-based incentives; be fanatical about performance measurement; empower employees; and hire the right people and let them attempt risky projects.

Method. Innovation is a job, not a miracle. All innovation is incremental, not a succession of illuminated breakthroughs. New products and processes need more than a prominent line in the statement of corporate values, an enthusiastic chief technology officer, and a few good ideas. They need an environment favorable to new thoughts and designs; a procedure to select from among competing ideas; funds to develop projects, and criteria to ditch a few of them along the way; and a strong commitment to execution.

R&D. Research and development are a must in oil, energy, mining, biotech, and agribusiness. Place R&D centers in technological clusters, and ensure that customer and market information reaches these scientists. Manage the process at all times.

Beat isolation. Customer-centered and open innovation models are almost required. “Inclusive operating models, such as open innovation, design thinking, and co-creation with partners, customers and suppliers, are now all embraced more than traditional R&D—and by a wide margin,” reads a PwC report that summarizes the findings of a survey of 1,200 executives in 44 countries.⁸¹ “Almost twice as many companies favor these models compared to R&D.”

PwC reports that the executives surveyed said that they engage customers from the early ideation phase: “Companies that engage customers throughout the innovation process team with business and technology partners, and bring together the right business leaders, strategists, and employees from across the organization can help close the strategy-to-execution gap.”

A word of warning from the CEO of Amazon, Jeff Bezos: “Customers are always dissatisfied. Even when they do not know it. Even when they think they are happy, they actually do want a better way. They just don’t know yet what that should be. Customer

obsession is not just listening to customers. Customer obsession is also inventing on their behalf. Because it is not their job to invent it for themselves.”

Mergers and acquisitions. Acquire markets, technologies, and knowledge. Diffuse best practices to the rest of the company, in a sort of Cemex way.

Innovation and productivity. The holy grail of CEOs and shareholders, and the keystone of economic development—productivity—is achieved most often through business model transformation and not through product innovation.

Adopt, imitate. This is the best way to minimize R&D risks while innovating. Have no regrets: Acquire new machinery, equipment, and software permanently.

Rethink products, processes, and organizations. Morph analog processes to fit the digital world. This is an old recommendation that still holds true. Do not build information structures around current organizations and processes. Rethink them in digital terms, before digitizing them.

Train the champions. Waiting for universities to send out the perfectly trained hire is a waste of time. Hiring well and developing employees is a great builder of competitive advantage that should not be neglected. Some hours in front of an Excel spreadsheet may be enough to find the optimal proportion of investment in on-the-job education, and some additional time with legal councils will probably define the form of the optimal job contract.

Incubate or invest in start-ups. These are fine. Just remember to place start-ups very close to the CEO in the organizational chart. Buy a stake in ultrasophisticated US start-ups while you can.

Cluster. Innovation is never a lonely task. Never. Search for, and be part of, clusters of invention. Do not wait for someone to place a copy of Silicon Valley in your city. In fact, most attempts to imitate Silicon Valley, brick by brick, have failed miserably.

Align innovation and strategy. This is just good management, but it is so important and so often forgotten that it is a point worth mentioning. According to a 2017 PwC survey in 44 countries, there is a strong correlation between strategic alignment and corporate financial performance.⁸² Companies that align business and innovation strategy tend to outperform their competitors. Companies that ranked in the top third in “coherent innovation,” as PwC calls it, showed a 22 percent higher profit and 18 percent higher market cap growth than other companies. “Without strong alignment with a company’s strategy, there is little chance that those [innovation] efforts will advance the business. Much as any corporate merger or acquisition must be part of an overall business strategy or risk failure, organic innovation investments and processes need to support the company’s strategic goals,” the PwC report stated.

2. Families

Let go. Hire the best-qualified professional managers to run family firms. Appoint independent directors to the board of directors. Have clear, agreed-upon family protocols, to allow executives to concentrate on the business and not on family feuds.

Let nonfamily capital in. This could force beneficial changes in governance and management style.

Take to Salamanca. Paying salaries and taxes is as much a responsibility for the owner of a big Latin American firm as it is to know about the business and its future, and about best sectoral practices. Formal education at top schools, or other means of staying abreast of this knowledge, is a must.

Challenge what you think you know. Export and invest abroad. These activities foster innovation. But to gain clarity about the global environment, get as much international exposure as possible. Business diplomacy, guided by a national embassy or an export promotion agency, is extremely useful.

Smart family offices. Most ultra-high-net-worth families in the region manage their wealth, investments, and tax and estate planning from family offices. These organizations have an investors' approach to business, and they are willing to take on risky activities with a small portion of their portfolio in order to increase returns.

"Past generations invested in real estate, but that is boring for the young," said Lourdes Casanova. Her suggestion is to foster a passion for technology and innovation: "Give a talented grandson 10 percent of the portfolio to make risky investments in artificial intelligence or big data." Perhaps, with some white-robed and gray-haired mentoring, the idea would also render unsuspected financial and business returns.

Strategy. The magnitude of the generational change in leadership of corporate Latin America has no record in history. New generations are more international, better educated, and technologically more literate than the region's patriarchs. Have heirs learn to think in strategic terms, and develop a long-term view, knowing that a long-term view is now challenged by shorter product life cycles. This would completely change the business landscape in the region.

3. National Governments

Focus. With scarce resources for innovation, which is the norm in the region, a laser focus is a requisite for progress. Trying to do all at once with public funds is the ultimate mistake. It is innovation populism. Target investments selectively, and invest better, not more.

Innovation policy is sector specific. Advancing mining technology is different from promoting software development. Co-invest or de-risk R&D in sectors that need it to grow, like mining, agriculture, oil, energy, and health care. A few well-designed sectoral funds might be a good tool to foster innovation among big players.

Create markets. Missions, challenges, smart public procurement, exports, the promotion of investment abroad, and setting stricter standards—these are all proven means to foster innovation that do

not require complex fiscal structures, and that may render results as valuable as placing a man on the Moon. Inspiring tasks like socially desirable challenges have the advantage of being a magnet for highly able individuals and institutions. Public spending should emphasize public goods provision instead of subsidies, to support entry into new markets.

Integrate national innovation promotion agencies. Do this at least in some of their efforts. A bigger goal and more money will attract more minds. A well-designed program could diversify individual country risk. The European Commission's Horizon 2020 is a good example of a well-crafted, multinational program to encourage research and innovation.

Populate the ecosystem with good management. Public agencies that specialize in management of innovation projects have a tremendously important role to play. It is fine if they bring money along, but the real benefit comes from their administrative expertise. These agencies (which may follow the styles of ARPA-E or the FNIH; see the discussions above) facilitate the movement of projects through set stage gates, from ideation to market. Additionally, their due diligence in the project selection phase signals private-sector participants, which might be attracted to co-fund them. Private participation is clearly needed, to add the market and consumer knowledge that government and researchers lack.

Harness evil. War has been a source of invention because it raises banal peacetime problems to the level of life and death matters. Take the problem of quickly spotting distant objects in the sky. Solving it led to the development of tubes that could see planes on a radar screen, and to deep changes in remote sensing devices. Unbeknownst to many, Silicon Valley has received the patronage of the military. "The Department of Defense was the valley's original 'angel' investor and an ideal client," historian Stuart Leslie has argued.⁸³ Pioneering electronics firms like Litton and Varian grew rapidly in the 1950s from sales of their microwave tubes for use in radars, electronic countermeasures, and guided missile defense. "... the military essentially subsidized most technological innovation in

the valley's burgeoning electronics industry...⁸⁴ Put military minds and budgets into the innovation mix.

International exposure. Have families and firms explore and understand businesses beyond national borders. In general, staff members of Latin American firms cannot meet key players and policymakers abroad on their own, without government help.

Offshore incubation. Locate entrepreneurial "sandboxes" and incubate firms—large and small—in the United States, Europe, China, and India.

A crusade for exports. Force large companies to increase their exports. Selling abroad improves their competitiveness and fosters innovation. State-owned banks and government agencies could back firms that commit to this goal. The weakening of local currency and other exchange rate policies should be left out of this conversation.

Capital markets. Deeper, perhaps integrated, capital markets facilitate the transformation of family firms into publicly traded companies, which require professional managers and methods. Liquid markets are also exit doors for investment funds that capitalize local firms, with a fixed investment horizon. These funds are valuable because they bring in money and managerial skills. Take-over-friendly legislation is a necessary complement.⁸⁵

Raise standards. Simulate competition by raising standards on products, processes, and service delivery. Ensure that domestic firms meet the needs of affluent consumers in advanced markets by requiring these firms to comply with these consumers' quality standards. This action will also make for a more demanding local consumer base. It is a voluntary or government-imposed tool that can be used to make businesses sustainable and actively useful vis-à-vis societal goals.

Need geniuses? Find heroes. If a country needs inventors, it is not enough to increase its science, technology, engineering, and mathematics skills. Early exposure to invention and innovation is required. Exposure to innovation heroes and innovation in childhood

may have a larger impact on innovation than increasing the financial incentives to innovate, for instance by cutting tax rates. A value chain is also needed to reap the benefits of new talent. Otherwise, the “Dominican Little League Model” holds—whereby one country gets them ready but another polishes their skills and gets the payoffs.

Create data. Promoting the creation of data on innovation has proven to be very important. For instance, the former vice minister of ICT in Colombia, Daniel Quintero, stated that public policy must induce as many people as possible to try new things, and de-risk the process by having all agents know not only about successes but also about mistakes, so that followers might avoid them. Quantitative information is crucially important for understanding these processes.

Mismeasurement is all too common in innovation. Young researchers do not report R&D in their tiny labs, and their activity is not measured by official statistics. More relevant, data collection methods are not well geared to pick up instances of applied research.

Keep the pack together? The distribution of productivity among firms in a country is modified differently by local development and adoption aspects. Development pushes the country’s technology frontier outward, thus increasing the gap between leading innovative firms and the rest. Conversely, the adoption of readily available ideas compresses the distribution as laggards catch up to leaders and increase competition. This is an interesting industrial policy choice, considering, for instance, that Latin American societies favor gregarious behavior over that which promotes individual gains.

If adoption is to increase, lower tariffs on imports, lower taxes on Internet access, and even lower airport fees might be of good use.

Imitation takes a good amount of risk away from the product or process development equation. There is some reverse engineering involved, but innovators know the problem, and the answer. Imitation also sets bounds to financial needs. Hence, as Philippe Aghion argues, for imitators, commercial bank loans suffice to move the engine.

A Singel reminder. Innovation is an investment. Stable, high interest and tax rates decrease the returns to innovation. Riskier projects with long gestation periods will not be undertaken with high or volatile interest rates. Tax rates do have an effect. Property taxes in Amsterdam were based on the width of the house's street-facing side. The 6-foot-wide, Singel 166 house stands in front of the Singel Canal, as a reminder that taxes do change investors' behavior.⁸⁶

4. Analysts and Media

Look through the cycle. Business professors Mary Benner and Ram Ranganathan found how analysts modify their assessment of corporate strategy, following a major technological change in publicly traded companies. At first, when the strategic change is announced, they pressure firms to reverse it, because they tend to be at odds with income metrics. Next, as the firm's income indeed declines after the technical change is implemented, managers frame and justify their strategic decisions on growth, not income metrics. Finally, analysts, now more convinced of the growth effect of the decision, favor the changes they previously opposed.⁸⁷ This cycle hurts innovation because it positions stakeholders against innovative management. An analysis that applies solid growth metrics from the outset, and that is able to look through the cycle, might better serve creative firms.

Value the pipeline. Analysts tend to overlook innovative potential and its financial value when they fail to explore the richness or poverty of a company's new product and process pipeline.

Create information, not novels. Overly optimistic, rosy stories are good for inspiration, but not necessarily for innovation. Basic journalism principles are the best guide for how to write about innovation. In particular, discern between optimism and concealed sales pitches; find context in history and academia; and follow facts, not common wisdom. An example: Overnight successes are more a measure of the attention of the beholder than of business realities. Amazon's "overnight success" took at least seven years to forge.

Go beyond the memes. In real business contexts, such sayings as “Do not fear failure,” “Creer es crear,” and the like are lousy truths, and are often literally ignorant claims. Fact-based policies and actions are almost always better than faith-based policies and actions.

Promote a consensus around the need to be innovative and productive. Help make this part of entrepreneurs’ sense of duty, and also especially of managers of big firms in Latin America. This might be the way to have economic development finally reach the launchpad.

Interviews

Omar Aguilar, partner, Deloitte

Ana Paula Assis, general manager for Latin America, IBM

María Mercedes Barrera, director of the Knowledge Unit, Grupo Empresarial Antioqueño

Fabio Bechara, attorney, State of São Paulo

Philippe Behn, CIO, Walmex

José Miguel Benavente, professor of business, Universidad Adolfo Ibáñez

David Bojanini, CEO, Grupo Sura

Ana Mercedes Botero, Director Social Innovation, CAF

Lourdes Casanova, lecturer for the Emerging Markets Institute of Cornell University

Patricia Castaño, Planning Vice President, ISA

Graciela Chichilniski, professor of economics, Columbia University

Andrés Conesa, CEO, Aeroméxico

Gustavo Crespi, leader for competitiveness and innovation, Inter-American Development Bank

Bernard da Santos, COO, AES Corporation

Maxence de Royer, vice president for strategy and business development in Mexico, Nestlé

Mark Dutz, lead economist, Trade and Competitiveness Practice, World Bank

Serge Elkiner, founder, YellowPepper

Ricardo Ernst, professor of business, Georgetown University

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Diego Molano, information technology and innovation consultant

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Luis Alberto Moreno, president, Inter-American Development Bank

Claudio Muruzábal, CEO for Latin America, SAP

Eric Olson, deputy director of the Latin American Program, Woodrow Wilson International Center for Scholars

Carlos Pacheco, CEO, Fapesp

Eleonore Pawels, Director of the Anticipatory Intelligence Lab, Woodrow Wilson International Center for Scholars

Enrique Perret, regional director for NAFTA, Promexico

Daniel Quintero, vice minister, Ministry of ICT, Colombia

Mauricio Ramos, CEO, Millicom

Roberto Rigobón, professor of business, MIT

Gonzalo Rivas, division chief, competitiveness, technology, and innovation, Inter-American Development Bank

Esteban Rossi-Hansberg, professor of economics, Princeton University

Felix Rozanski, coordinator, Cediquifa

Julie Ruvolo, director, venture capital, Lavca

Javier Serrano, professor of business, Universidad de los Andes

Barbara Stallings, professor in the Watson Institute, Brown University

Yoni Stern, professor of business, Columbia University

Andrés Velasco, professor of economics, Columbia University

Hans Vestberg, CEO, Verizon

Roberto Wagmaister, CEO, Grupo Assa

Irene Wu, fellow, Kissinger Institute on China and the United States, Woodrow Wilson International Center for Scholars

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