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Knowledge and Innovation for Competitiveness in Brazil*

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Conocimiento e innovación para la competitividad en Brasil
Conhecimento e inovação para a competitividade no Brasil

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This article summarizes a recent World Bank study that examined how Brazil can improve its competitiveness in the global economy by strengthening innovation. The study, based on fieldwork undertaken in 2006/2007, found that Brazil has not taken sufficient advantage of knowledge that can be acquired from abroad; that it trails its counterparts in providing a quality education and skills to use and to create knowledge; and that it has relied too heavily on government leadership to foster major innovation, while overlooking the more cost-effective approach of pushing the private sector to undertake incremental innovation and to increase productivity throughout the economy. It details specific steps that need to be undertaken to better prepare workers and firms to innovate and compete.

El presente artículo resume un estudio reciente del Banco Mundial que examina el modo en que Brasil puede mejorar su competitividad en la economía global fortaleciendo la innovación. El estudio, basado en trabajos de campo realizados en 2006/2007, concluyó que Brasil no ha aprovechado suficientemente el conocimiento que puede adquirirse del extranjero; que arrastra retraso en relación con sus homólogos en cuanto a prestación de educación de calidad y creación de conocimiento; y que depende en exceso del gobierno para fomentar innovaciones importantes, al tiempo que ha obviado enfoques más rentables de obligar al sector privado para asumir una innovación creciente y para aumentar la productividad de la economía. Pormenoriza los pasos específicos que se deben seguir para preparar mejor a los trabajadores de las empresas para que puedan innovar y competir.

O presente artigo sintetiza um estudo recente do Banco Mundial que examinou o modo como o Brasil pode melhorar a sua competitividade na economia global fortalecendo a inovação. O estudo, baseado em trabalhos de campo realizados em 2006/2007, concluiu que o Brasil não aproveitou suficientemente o conhecimento que pode ser adquirido do estrangeiro; que se atrasou em relação aos seus homólogos na prestação de uma educação de qualidade e de competências para usar e criar conhecimento; e que dependeu excessivamente do governo para fomentar inovação importante, ao mesmo tempo que negligenciava a abordagem mais eficaz em termos de custo de levar o sector privado a realizar inovação incremental e a aumentar a produtividade na economia. Pormenoriza passos específicos que devem ser dados para melhor preparar os trabalhadores e as empresas para inovarem e competirem.



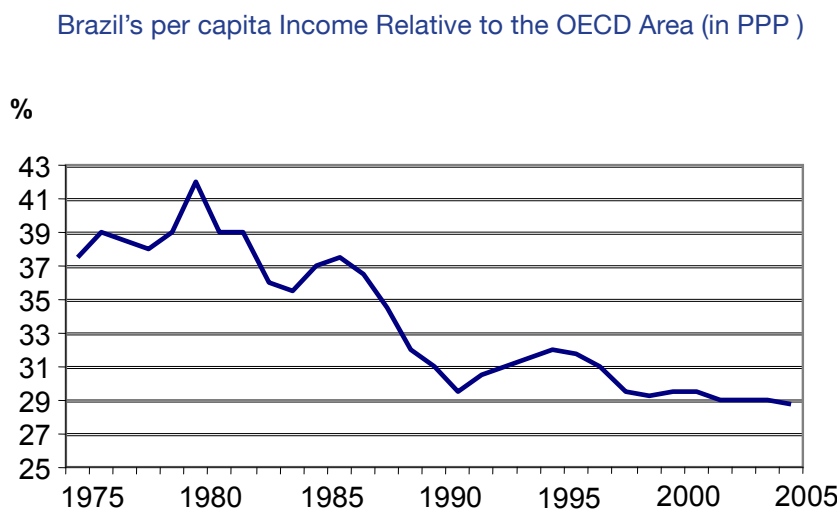
*This is a summary of report was carried out by a multidisciplinary team of World Bank staff, consultants, and Brazilian counterparts. The core team and contributors analyzed existing data, developed conceptual and econometric models, and consulted extensively with federal and subnational governments, business leaders, and academics. The research was conducted primarily between November 2006 and April 2007. The Report was published by the World Bank in 2008.

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1. Introduction

Brazil has made considerable progress toward macroeconomic stability since reform measures began to take hold in the early 1990s, and its economy has produced stronger growth as a result—an average of 2.5 percent annually over the past decade. Nevertheless, from an international perspective, Brazil's level of economic growth is still a matter of significant concern. Compared with either OECD countries or competitors such as China or India, Brazil not only is growing slowly, it is falling farther behind. Indeed, as shown in the figure below, the income gap between Brazil and OECD countries has substantially widened. In 1980, Brazil's per capita purchasing power parity was about 42 percent that of OECD countries. Twenty-five years later, it had fallen to under 29 percent of OECD countries.



Source: OECD (2006)

KEY WORDS
**Brazil. Com-
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Knowledge and
innovation**

**PALABRAS
CLAVE**
**Brasil. Com-
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**PALAVRAS-
CHAVE**
**Brasil. Com-
petitividade.
Conhecimento e
inovação**

2. Where Growth Comes From

Economic growth is widely understood as the interaction between physical and human capital. Investment in either generally increases growth; moreover, when physical and human capital interact more efficiently, growth occurs more rapidly. Economists generally attribute this incremental efficiency-based growth to Total Factor Productivity (TFP). During the exceptional high-growth era of the “Brazilian Miracle” (1960–80), TFP was critical to growth; however, since then, TFP has declined dramatically. Growth-accounting exercises show that the ratio of Brazil's TFP compared with that of the United States dropped from 1.07 in 1975 to 1.02 in 1980, to 0.80 in 1995, and to 0.73 in 2000.

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The macroeconomic shocks of the 1970s and the debt crisis of the 1980s are important factors in explaining the slowdown in Brazil's growth. However, this report argues that the decline in TFP was a similarly important cause. Why did it happen? Brazil's low rate of investment is one part of the answer. Low productivity is another. The main factor, however, is that a new global "knowledge economy" has been emerging; and Brazil, despite its relatively successful implementation of adjustment policies in the mid-1990s, was not prepared to compete.

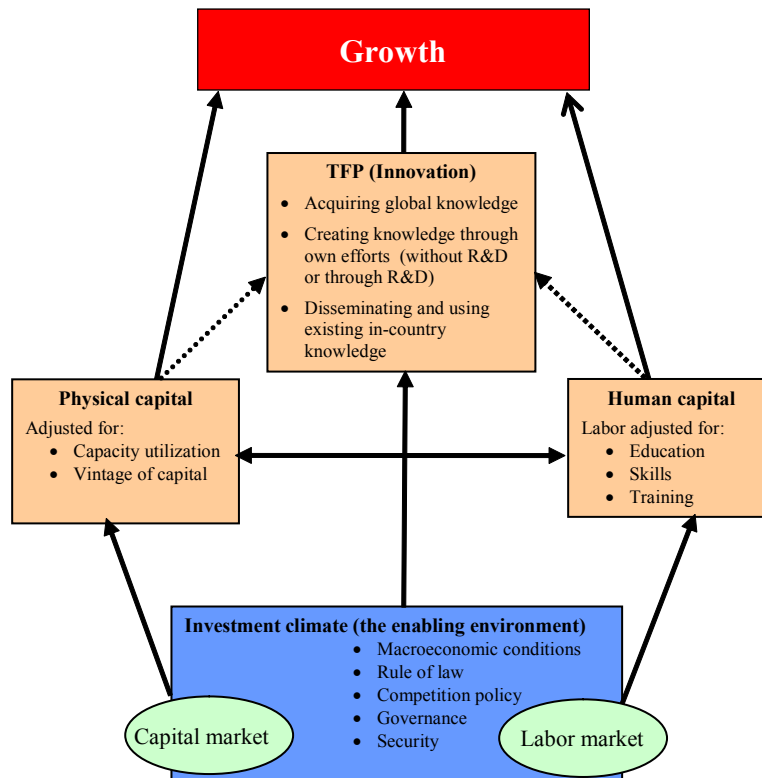
In the new paradigm for middle-income countries, knowledge—not natural resources or cheap labor—increasingly constitutes the core of a country's comparative advantage. As well illustrated by dramatic success stories such as Bangalore, the capital of the Indian software industry, technical innovation and knowledge can work hand in hand to lead a country from suffocating poverty to strong productivity and competitiveness. Indeed, the proportion of goods in international trade with a medium-high or high technology content rose from 33 percent in 1976, to 54 percent in 1996, and to 64 percent in 2003 (World Bank 1999). This period was the same one during which Brazil muddled through slow trade liberalization and weak labor reforms, and paid little attention to its lagging basic education system. Had more radical reforms been undertaken, Brazil would have been much better able to take advantage of domestic and international opportunities to spur growth, as did competitors such as China.

Brazil can no longer ignore the knowledge economy—and it is not. An ongoing national dialogue is taking place on reforms to sustain strong macroeconomic performance, further open trade, improve the physical infrastructure, strengthen the judicial system and legal environment, and deal with

weak and inequitable education systems that are not producing the kind of human capital required by today's global competition. This report emphasizes that Brazil has indeed made significant progress; yet the hard reality is that Brazil's competitors have too—only faster. The question has become not only how Brazil can make further progress, but how it can catch up.

The analysis in this report is based on the conceptual framework shown schematically in the figure below. Following from the conceptual framework, the report discusses three main areas for enhancing competitiveness and accelerating growth. First, Brazil needs to build upon its stable macroeconomic environment to extend reforms that will improve the investment climate. Second, higher productivity will require a focused effort to expand TFP through innovation-based growth. Third, a series of "micro" reforms are needed, of which two are urgent—strengthening incentives for firms to innovate, and upgrading the education system to improve the skills of workers entering the labor force. We present a set of specific recommendations that stem from this analysis. We also discuss possible roles for Brazilian agencies in implementing these recommendations, as well as the need to raise awareness on the urgency of this agenda.

Brazil's per capita Income Relative to the OECD Area (in PPP)



The main messages of this report cover four topics—consolidating the macroeconomic environment, boosting innovation, improving skills across the labor force, and moving from analysis to action.

3. Consolidating the Macroeconomic Environment

The report summarizes key conclusions from previous World Bank policy papers on the macroeconomic fundamentals behind Brazil's current stability and progress. It discusses improvements in the enabling environment that would serve to drive accelerated growth.

The Brazilian economy has remained stable as a result of prudent macroeconomic management—including fiscal and monetary policy, as well as debt management. Improved macroeconomic fundamentals have reinforced the benefit of favorable external demand for Brazil's primary commodities, raising international reserves to unprecedented levels. Fiscal restraint, which has included a cap on public investment, has translated into yearly primary surpluses and macroeconomic stability. However, the country's infrastructure now needs upgrading in order to increase productivity and avoid jeopardizing growth.

The challenge facing Brazil is to continue reducing public debt and improving the quality of the fiscal adjustment (that is, ensuring adequate resources for key public investments and poverty alleviation programs)—while improving the efficiency of public expenditures to create the fiscal space necessary for pro-growth investments. The ability of the government to adjust the composition of public expenditures is constrained, however, by its current high level of spending (most notably on pensions) and by an ongoing debt burden that ultimately limits the government's borrowing and spending capacity. In addition, the continuous growth in the size of government during the past decade—financed through increased taxes—has constrained domestic savings. High interest rates have acted as a disincentive to private sector investment.

In short, a stable macroeconomic environment has helped to reverse the bitter declines of “the lost decade,” and this has led to moderate growth in the past few years. However, a stable macro environment has not been sufficient to spark fast growth. Moreover, given inadequate public investment in infrastructure and sluggishness of reforms to facilitate the investment climate, prospects for significantly higher growth remain slim. While productivity improved during the past decade, as shown by historical evidence in this report, it is nonetheless lower than in previous periods when investment grew faster.

4. Boosting Innovation

Brazil's growth depends strongly on the export of manufactures and commodities, a dependence that is likely to continue. Yet with few exceptions, Brazil's manufacturing base lags with respect to innovation—especially when Brazil is compared with China or India, countries that have taken giant steps in growth-enhancing innovation. If recent trends continue, Brazil would continue to be mainly a supplier of primary commodities in world markets and an exporter of manufactured products to Mercosur and other Latin American countries. In other words, Brazil risks missing the opportunity to become a serious, diversified global competitor. Becoming so would require Brazil to adjust its path—emphasizing higher value added to products in the sectors in which Brazil already has some comparative advantages, and engaging in higher-value, more-income-elastic manufactures and services. Brazil needs not only to diversify and add value to its commodities, but it must improve its competitiveness in manufacturing and service exports as well.

Until the 1990s, the productive sectors in Brazil operated within a relatively protected economy. The government provided few incentives for private sector investment in innovation; yet that mattered less because protection from competition made private sector investment in innovation relatively less necessary. We argue in this report that two factors—a bias toward overly “theoretical” research in publicly funded universities, and significant underinvestment by a shielded private sector spared the need to compete—lie at the heart of Brazil's current relative underperformance in innovation.

The private sector needs to invest more in R&D. Recent initiatives to encourage firms to invest in innovation—for example, the Innovation Law and the Sector Funds—are welcome steps. However, as argued throughout this report, the government now needs to take

these measures further by creating a broader enabling environment in which private firms are willing to invest in innovation, take risks, and expand their productive activities into new, “less-safe” areas. In addition to increasing its overall investment rate, Brazil needs to further liberalize the economy, in part, to force firms to become more competitive.

Public investment in R&D needs to be made more effective, not just by producing more knowledge and technology, but by providing the infrastructure to commercialize and disseminate new knowledge (for example, technology parks, technology transfer offices, business incubators, and venture capital operations). Spain provides a notable example of how such efforts can work. Moreover, as we argue below, Brazil also must invest more in human capital through quality basic education and advanced skills training. Ireland, China, the Republic of Korea, and Singapore are just a few of many examples where this has been done massively and successfully.

This report proposes a broad new definition of innovation. As used here, the term refers not just to new products and processes, but also to new business processes and new ways of carrying out productive activities. We emphasize that innovation to improve TFP should not be understood simply as invention or the first use globally of a new technology, but also as the first application of a product or process in a specific setting. Because developing countries are behind the technological curve in most sectors, they need to think less about invention and more about doing things differently with available knowledge and technology that they can acquire. The report proposes a three-stranded typology of innovation—(a) creation and commercialization of new knowledge and technology; (b) acquisition of knowledge and technology from abroad for local use and adaptation; and (c) the dissemination and effective application of knowledge and technology (whether domestically created or acquired from abroad) that is already available in country though not broadly utilized. The significance of these distinctions is discussed below.

Creating and commercializing new knowledge and technology. In Brazil, investment in technological innovation comes mainly from the public sector—about 55 percent of the total, compared with about 30 percent in the United States. A research culture that is heavily and reliably financed by the public sector has excelled in the production of conceptual knowledge—for example, Brazil accounts for nearly 2 percent of articles published in internationally recognized research journals (roughly on par with Brazil’s 2 percent of world GDP). On the other hand, substantial public expenditure has been far less successful at energizing technological innovation—for example, patents that can be commercialized. According to the World Intellectual Property Organization (WIPO), Brazil accounted for about 0.18 percent of patents in 2000. This compares with 3.4 percent of patents attributable to Sweden—that is, nearly 19 times more patents than Brazil despite a much smaller population. Similarly, Korea accounted for 1.7 percent of patents, more than nine times the rate for Brazil.

Ironically, Brazil invested in R&D infrastructure far earlier than most other developing countries. Yet this report finds that an intellectual and practical “disconnect” has now emerged in Brazil that is not always found elsewhere. The public universities and labs where most government-funded research is conducted primarily pursue “pure” conceptual knowledge. Private sector activity does not articulate with these universities and labs, unlike in other countries where entrepreneurial scientists and engineers typically have a foot in both worlds. Moreover, the private sector’s own research capacity has been diminished by underinves-

tment from companies protected by trade barriers from foreign competition. The net result is that Brazil needs to pay far greater attention to what is produced through public investment, what happens to new knowledge once it is created, and how the private sector can be mobilized as an active partner. Strengthening the institutions and norms that protect intellectual property and supporting business incubators would help immediately.

A nation's capacity to create new knowledge and technology is closely associated with advanced technical skills and a tertiary education system that is particularly strong in science, engineering, and technology application. Brazil has emphasized the humanities and social sciences at the expense of science and engineering. Despite slow but steady growth in the latter disciplines, Brazil's tertiary education system still has far too little capacity to train advanced innovators who can work at the frontier of global knowledge creation. In China, the government has tapped and supported both public and private universities to increase enrollment rapidly and to leverage respective comparative advantage. As Brazil wrestles with the coverage, relevance, and resource needs of its higher education system, the Chinese examples could be instructive.

Acquiring and adapting global knowledge and technology. For countries not already on the cutting edge, it is generally more practical to acquire rather than invent new knowledge and technology. Transfer of technology can be accomplished through several means—direct foreign investment; licensing; technical assistance; technology embodied in capital goods, components, or products; copying and reverse engineering; foreign study; published technical information, especially on the Internet; twinning; cooperative training partnerships; distance learning; and more. Trade is probably the most direct and critical means of acquiring knowledge and technology—importing the latest versions of hardware, machinery, and software. Brazil is still struggling to reconcile the relative comforts of protectionism with the inevitable need to compete in global markets. In this respect, Brazilian firms are just awakening to the full benefits that acquired foreign technology can bring. Not surprisingly, the firm-level analysis of innovation undertaken for this report found large firms (and especially multinational firms) to be far ahead in innovation and productivity.

The capacity of firms to put acquired technologies to productive use points again to the challenges of human capital formation. Technology stands little chance of being adopted and adapted successfully if workers lack the basics in reading and math; or at a higher level, the ability to reason conceptually, think outside the box, and apply the scientific method. Workers with these skills are no less critical than higher-level managers who can quickly adjust to computerization or imaginatively redesign a production strategy. If firms cannot trust in the adaptability of their employees, they necessarily become risk-averse, opting for the low road to economic survival—heavier exploitation of cheap, unqualified labor (as we found occurring in the northeast of Brazil). In essence, both basic and advanced skills are needed for a firm to maximize the rewards of acquired innovation.

Disseminating and using knowledge and technology that is already available in-country. Firm's inputs, processes, and outputs were disaggregated, broken down by sector, size, and region. Data from the World Bank Investment Climate Survey (ICS) and the Brazilian PINTEC were used for this analysis, and the results are presented in this report. Microanalysis allowed a closer look at the characteristics of firms within and between sectors, as well as comparisons with firms in other countries. Some Brazilian firms were clearly found to be

innovators, mainly large enterprises with many employees and strong outputs. In general, however, Brazilian firms were found to innovate less than those of other countries. There is relatively little demand for innovation in the unsophisticated internal market. Protection continues to undercut the need for innovation and creative risk taking. Firm productivity is low, and dispersion of productivity is enormous. In fact, the report found that the dispersion in firm productivity in Brazil was much greater than in most other countries for which data were available, including India and China.

This report argues that using the knowledge already in Brazil provides the quickest and most-promising route for increasing productivity and competitiveness to spur growth. Through this third type of innovation—which is arguably the least expensive and most accessible—Brazil could increase productivity across all sectors. The report underscores the critical importance of firms being able to identify productive practices within the country and then having the inputs to replicate, enhance, and increase their own productivity. This third kind of innovation requires relatively greater effort at disseminating knowledge through channels such as industrial and service extension programs, technical information centers, and cluster-based technology improvement programs. Some innovation requires newer machinery and better physical inputs, as well as better management and organization. Equipment is not a magic bullet however. What matters is what happens on the shop floor. Can workers observe new practices first-hand, and is there an environment that rewards increased efficiency and productivity? Indeed, can workers accomplish the same things through better use of the equipment and inputs that they already have?

The fact that job tenure in Brazil is generally low—and lower still for less-skilled workers—might be expected to increase the flow of good practices between firms. In reality, however, this does not appear to be happening. We suggest that the lack of basic skills among workers is probably the single most significant obstacle to the use of new technology and equipment or the free flow of innovative practices across firms. Indeed, unskilled workers are likely to be risk-averse and more comfortable with the simple routine of procedures that do not demand additional formal training. Moreover, high job turnover may discourage effective firm-level training. Our study found that Brazilian firms do invest significant time and resources training their employees; however, in most cases this training focuses upon basic skills deficits that should have been addressed by the formal education system, not on the introduction of innovation to improve productivity on the shop floor.

One notable exception is the production chains that have been developed by SMEs that act as suppliers to large innovative firms such as Embraer, Petrobrás, Gerdau, Ford, and others. These smaller firms frequently are able to enhance their productivity by using technologies adapted from the larger innovative companies. Cases such as these tend to occur in specific geographic clusters. The local qualifications of human resources—both advanced and basic—are crucial to these processes, as the experience of Embraer demonstrates.

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5. Improving Skills across the Labor Force

Brazil's unemployment rates worsened for all workers during the 1990s—ranging from those with no education through those with primary, secondary, and tertiary education. The proportion of unemployed university graduates rose to 16.4 percent, compared with an unemployment rate of 9.3 percent for the population at large. This is highly suggestive of a mismatch between the skills of formal educational system graduates and the needs of the labor market, rather than a sign that the labor market does not require advanced skills. The extremely high rate of secondary school dropout similarly reflects weakness in the school-to-work transition. Older secondary students, in particular, drop out because they know that staying in school will not necessarily provide additional opportunities for jobs or for meaningful job-oriented training. In addition, there are insufficient graduates from nonuniversity institutions and short-duration professional programs, such as those typically offered by community colleges in the United States and postsecondary technical institutes in Europe.

Strengthening tertiary education. It is well accepted that more and better education improves employability and earnings. However, average educational attainment for the Brazilian population 15 and older is still only 4.3 years. With only a quarter of the university-age population attending a tertiary institution, Brazil has the next-to-lowest gross enrollment rate among the larger Latin American countries, well below the continental average of 30.3 percent. The low enrollment rate in universities is mirrored by the very small proportion of the labor force with tertiary-level educational qualifications, 8 percent.

Despite many top-quality enclaves at the tertiary level, the overall lack of consistent high quality (especially in the absence of performance standards) is critical. Brazil is the world's eighth-most-populous country, yet no Brazilian university is to be found among the 100 top-ranked universities worldwide. Research production is concentrated in a very small group of elite public or state universities. A second tier of public and private universities has many pockets of excellence; but beyond that point on the spectrum—that is, in the vast majority of small underfunded private universities—quality is worse than uneven; and serious research is neither financed nor rewarded. At the federal universities, 83 percent of instructors are full-time academics, in contrast to about a third of instructors in the municipal universities and a fifth in the private institutions. In private universities, most instructors are part-time employees. Basically they earn an hourly wage, and they are paid according to the number of classes that they teach. The proportion of academics with a doctoral degree rose from 15 percent in 1994 to 21 percent in 2004. At the federal universities, the rate doubled from about 21 percent to 42 percent. The vast majority of academics not only have not been trained in research through doctoral training, they have virtually no opportunity to participate in publicly funded basic R&D. That does not mean, however, that they are more likely to engage in “practical” research or that they engage in outside-the-university research with private sector counterparts. To the contrary, the university and private sector realms remain consistently separate across the board. Unlike the Silicon Valley or Route 128 “models” in the United States—where well-trained innovators may constantly shift from university to private sector and back throughout their careers, or simply maintain a permanent presence in both—their Brazilian counterparts remain remarkably segregated. To an astonishing extent, the two worlds do not intersect, much less cross-fertilize. Similarly, only a relatively small minority of Brazilian faculty study abroad. In 2005, only 2,075 students were officially

sponsored for graduate studies outside Brazil. Only 1,246 foreign students attended Brazilian universities.

Other postsecondary training is offered by private providers and, in particular, by a set of institutions that form the “S-system.” These nine institutions constitute the largest consolidated professional training system in Latin America, created by the National Confederation of Industry (CNI) and the State Federations of Industry. The system is financed through a compulsory 2.5 percent payroll tax. Present in about 60 percent of Brazilian municipalities, the S-system offers an estimated 2,300 courses per year and enrolls about 15.4 million trainees annually. While effectiveness of its training (and cost-efficiency of the system itself) has been hard to assess, the S-system plays a crucial role in providing specific training for workers, and could serve as the cornerstone for a lifelong learning framework in Brazil.

Access to tertiary education—especially at the most prestigious universities—is skewed heavily toward upper-income families. While approximately 69 percent of the population is classified as low income in Brazil, about 90 percent of students at UNICAMP (generally regarded as one of the top two universities) are not low income. This unequal distribution at UNICAMP is hardly unique; it reflects a continuing pattern of unequal opportunity across the system more broadly. At the secondary level, for example, about 90 percent of children from the highest income decile complete school, compared with only about 4 percent of children from the lowest decile of families.

Improving basic education. If a weak and relatively small tertiary education system presents a challenge for Brazil’s innovation system, basic education is also at the heart of the country’s low productivity and competitiveness. Besides too few educational opportunities in the absolute sense (and setting aside the social inequities of who benefits), the Brazilian education system is significantly deficient in the quality of education that it offers. As shown in this report, schools at the primary and secondary levels are failing to provide the minimum literacy and numeracy skills necessary for active citizenship, let alone productive participation in a technology-based labor market. According to the international PISA tests, approximately half of Brazilian 15-year-olds have difficulty reading or cannot read at all; and about three-fourths cannot manage basic mathematical operations. It is therefore unsurprising that this report found that while Brazilian firms invest significant resources in worker training, these efforts are mostly geared toward filling the basic skill gaps left by the formal education system. Companies should be building upon basic skills, not having to provide them.

As discussed in the report, there are many reasons for the unsatisfactory performance of the nation’s schools, not least of which is the management and incentives of the teaching profession. Relatively, Brazil’s 1.5 million teachers are reasonably well paid. They earn 56 percent more than the average national salary overall. (By contrast, teachers in OECD countries on average earn about 15 percent less than the average salary in their country). The pay gradient for Brazilian teachers is tightly defined by seniority. With few exceptions, neither penalties nor rewards are available as incentives for teacher performance, much less student learning. Unsurprisingly given the pace of enrollment expansion in recent years, funding for math, science, and technology enrichment has lagged far behind school construction and teacher hiring as a budget priority. Nearly a third of those who teach Brazil’s 45 million students have not completed university training, and only about 20 percent hold masters degrees. For the most part, the training of those who are university-educated tends to be very

strong in pedagogical theory—but very weak in the applied art of teaching.

Over the past 20 years, the number of places in primary and secondary schools has increased dramatically; and access to primary education is now virtually universal. It is less certain, however, that the quality of education has increased. This is related less to absolute lack of financial resources (public educational expenditure rose from 3.9 percent of GDP in 1995 to 4.3 percent of GDP in 2005) than to management factors. For example, it is estimated that about 60 percent of school principals obtained their jobs based on political criteria. Computers in the schools (approximately 2 per 100 students compared with 28 per 100 in Korea) tend to be used by teachers and administrators, not by students—all the more significant for future technological innovation in a country where the vast majority of families do not have a personal computer at home.

The report also discusses the pedagogical and curricular factors that contribute to low quality in basic education. Classroom teaching at the primary level (especially in rural areas) is still conducted very much as it was a generation ago. That means students passively copy what the teacher writes on the board and are expected to learn by rote memorization, an approach diametrically opposite to the kind of active learning that rewards flexible thinking, conceptual reasoning, and problem-solving skills—in other words, the very traits that adult workers need for competitiveness in a knowledge economy.

In summary, the low level and skewed distribution of education among Brazilians explains more than the oft-studied cycle of poverty and inequality. Here, we argue that basic and advanced skills are critical inputs for the nation to harness innovation, increase productivity, enhance competitiveness, and accelerate economic growth—and that these needs presently are not being met.

6. From Analysis to Action: Who Needs to Do What?

The report proposes concrete actions in six key areas—the enabling environment, knowledge creation and commercialization, acquisition of foreign knowledge, leveraging and dissemination of technology use, basic education and skills, and tertiary education (advanced skills). Taken together, these recommendations represent a first step toward a comprehensive national plan for innovation. Continued analysis, increased public awareness, and a vigorous national debate can translate these recommendations into an integrated national strategy to foster innovation-led growth.

Leveraging innovation for economic growth necessarily encompasses a broad spectrum of issues and actors. This ranges from the overarching framework of the economic and institutional regime to highly technical specialized applications relating to R&D, foreign investment, and technology transfer; information technology; standards and quality control; finance and venture capital; education; and so forth. The final chapter recasts the broad array of recommendations from the perspective of which actors need to take what actions. The chapter addresses the many entities of government, the private sector, and civil society that will have to implement recommendations if ideas are to be translated first into action and then into reality.

Not all of the recommendations are of equal weight and priority; and for technical or political reasons, some will be far more difficult to implement than others. Some actions would require new laws through Congress. Some would require significant changes in policies or the regulatory environment; while others could be achieved by exerting a reasonable amount of political will. Some could be carried out with existing resources. Others would require significant mobilization of public and private funds. Some actions could be done rapidly. Others will require years of sustained efforts. Some actions will be difficult because they affect the interest of groups who benefit from the system the way it is.

Our work does not go so far as to prioritize or suggest details for a particular plan. That is necessary—including all the hard choices and tradeoffs that concrete action implies—though it is beyond the scope of the present report. What is clear is that Brazil needs to undertake a broad, systemic reform process in order to increase the competitiveness of its economy and to accelerate growth. There is a danger that the recently improved trade performance—driven by the current boom cycle in commodity prices—will improve economic performance enough to temporarily justify complacency. Given the fundamental changes that are taking place globally, that short-sighted approach would be costly.

Neither the government nor Brazilian society as a whole appear to be fully cognizant of the international trends and opportunity costs of failure to respond. Most governments and citizens of Asia do understand these trends, and they are responding—and that is an important reason why Asia is rising as the new base of economic power. For Brazil, the next step is to mobilize a mass campaign to raise public awareness. Brazil needs to see its performance in the broader global context, to analyze the new global challenges that it faces, and to discuss in a transparent way what must be done. The process of stocktaking and building stakeholder awareness is inherently a domestic political process. It needs to be locally driven and locally owned. It is hoped that this report will provide useful input into launching such a process.

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