The Changing Academy – The Changing Academic Profession in International Comparative Perspective 13

William K. Cummings
Ulrich Teichler *Editors*

The Relevance of Academic Work in Comparative Perspective

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Scope of the series

As the landscape of higher education has in recent years undergone significant changes, so correspondingly have the backgrounds, specializations, expectations and work roles of academic staff. The Academy is expected to be more professional in teaching, more productive in research and more entrepreneurial in everything. Some of the changes involved have raised questions about the attractiveness of an academic career for today's graduates. At the same time, knowledge has come to be identified as the most vital resource of contemporary societies.

The Changing Academy series examines the nature and extent of the changes experienced by the academic profession in recent years. It explores both the reasons for and the consequences of these changes. It considers the implications of the changes for the attractiveness of the academic profession as a career and for the ability of the academic community to contribute to the further development of knowledge societies and the attainment of national goals. It makes comparisons on these matters between different national higher education systems, institutional types, disciplines and generations of academics, drawing initially on available data-sets and qualitative research studies with special emphasis on the recent twenty nation survey of the Changing Academic Profession. Among the themes featured will be:

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2. Internationalization of the Academy
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The audience includes researchers in higher education, sociology of education and political science studies; university managers and administrators; national and institutional policymakers; officials and staff at governments and organizations, e.g. the World Bank.

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The Impact of Government Policies on the Profiles and Attitudes of Academics in Two Emerging Economies: Brazil and Mexico

Jorge Martínez Stack, Marion Lloyd, and Imanol Ordorika

12.1 Introduction

12.1.1 The Objectives of the Analysis

As Latin America's largest nations, Brazil and Mexico are home to many of the region's dominant universities and its most extensive systems of higher education. Together, they account for nearly half the region's tertiary enrollment and more than two-thirds of the scientific articles by Latin American scholars in international peer-reviewed journals (RICYT 2012). However, there are major differences between the two countries' higher education policies as well as in their levels of support for science, technology and innovation. These, in turn, are the result of the divergent economic development strategies adopted by both countries, which took shape during their initial industrialization period in the 1930s and accelerated during the rapid economic growth of the 1950s and 1960s. In general, Brazilian governments have focused on developing an elite, public research sector as part of a broader goal of achieving technological self-sufficiency, while leaving most tertiary enrollment in the hands of private institutions of often dubious quality. Mexico, in contrast, has paid lip service to the importance of science and technology, while in practice prioritizing access to professional education at public institutions.

The Brazilian government's longtime support for scientific research is a major factor in the country's regionally dominant position in the international university rankings, which tend to equate the institutions' scientific production with their

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overall quality[1] (Lloyd et al. 2012; Ordorika et al. 2008; Ordorika and Rodríguez 2010; Slaughter and Rhodes 2009). Of the ten Latin American institutions represented in the 2012 Academic Ranking of *World Universities*,[2] six were Brazilian while just one was Mexican. The top-ranked Brazilian institution, the University of São Paulo (USP), came in 129th place, ahead of the University of Buenos Aires (UBA), in 186th place, and the National Autonomous University of Mexico (UNAM), in 195th place. That discrepancy is largely due to USP's heavy investment in postgraduate studies and research in science and technology; according to the ARWU ranking, the USP, Brazil's largest and most prominent public institution of higher education, had the highest number of doctoral graduates among the 682 institutions for which data was available and its research budget was the third highest out of 637 institutions surveyed (ARWU 2012). While neither USP nor UNAM are representative of the two country's higher education systems as a whole, the greater volume of research produced by the Brazilian university is a reflection of the priority its government has placed on S&T and postgraduate education, while in Mexico a majority of postgraduate studies are at the master's level, and in professional areas.

What impact, if any, do such differences in higher education policy have on the perceptions and profiles of academics in the two countries? Judging by the results of the Changing Academic Professions (CAP) survey for Mexico and Brazil, the answer is quite a lot, particularly among full-time academics in the public sector. In this chapter, we use the CAP survey to explore the main differences and similarities between academics in the region's two economic powerhouses, with special emphasis on the impact of public policies on this relatively privileged subset of the academic profession; in both Mexico and Brazil, as in most developing countries, the bulk of research is conducted by tenured professors at public universities, although these represent a small minority of academics nationwide. Our analysis includes data on the following areas: professional profiles and trajectories; education levels; dominant academic fields; scientific production; teaching and research activities; and attitudes and perceptions toward workplace and work.

[1] In previous articles, we have argued that the rankings' methodologies – which tend to give primary weight to measures of scientific production, such as articles published in English-language journals – are biased in favor of a sole model of higher education institution: the elite, U.S. research university. In essence, the rankings are "harvardometers", measuring how much a university looks like Harvard. In that context, Latin American universities, which fulfill a much broader role in their country's development as "state-building universities" (Ordorika and Pusser 2007) and are generally more focused on teaching than on research, tend to fare poorly in the international rankings.

[2] The *Academic Ranking of World Universities* was the first classification of universities at an international level. It has been produced by the Jiao Tong University in Shanghai, China, since 2003. It currently ranks 500 universities primarily on the basis of their scientific production, measured on the basis of the number of articles they publish in international peer-reviewed journals (as measured by the Reuters Science Citation Index), the number of Nobel Prize laureates among their staff or graduates, among other indicators. In most of the international rankings, the USP and the UNAM tend to lead the region, although in recent years the Brazilian university has consistently come out on top.

We do not pretend to provide a comprehensive overview of the academic profession in Mexico and Brazil, given the enormous diversity of the two country's higher education systems and the intrinsic limitations of the CAP survey. However, we do seek to contribute to the discussion of the results from a Latin American perspective; so far, a majority of the studies utilizing the CAP data have focused either on single countries or on comparisons among developed regions, in particular Europe and the Anglo-speaking world. By comparing two of the world's largest emerging economies, we seek to highlight the challenges that higher education systems in the developing world face in participating in the knowledge economy, and the different strategies they are adopting to overcome historic obstacles.

This chapter is divided into six sections. We begin by outlining the methodology behind our analysis of the academic profession in Mexico and Brazil, with emphasis on the challenges we encountered in comparing two such heterogeneous systems. The second section places the two countries within the economic context of Latin America, and describes the key differences in the two countries' economic models and development strategies. In the third section, we provide a brief history of their government policies on higher education, science and technology (S&T). We then describe the main differences and similarities between the two higher education systems, which help explain Brazil's stronger showing in the international university rankings. The fifth section centers on the CAP survey itself, with particular attention placed on the impact of S&T policies on scientific production and attitudes among academics. We conclude by summarizing the most significant differences between the academic professions in Brazil and Mexico, and the likely impact of public policy on the full-time academics in both countries.

12.1.2 Some Methodological Considerations

The CAP survey, in comprising data from thousands of academics in 19 countries, provides a valuable tool for understanding the changing nature of academe in highly heterogeneous higher education systems. However, certain differences in its application among countries should be taken into account when analyzing the results. In the case of Mexico and Brazil, the survey was applied to a different sample group for reasons related to differences in the two countries' higher education systems. While in Mexico, only full-time professors were surveyed, in Brazil, due to the predominance of part-time professors within the private sector, the survey also included part-time academics.

In the interest of making our data sets as comparable as possible, we have restricted our analysis to full-time professors in both countries: 612 academics in Brazil and 1,758 in Mexico. The vast majority of those academics work in the public sector, which in the case of Brazil is not representative of higher education as a whole. However, given that the public institutions are the most directly affected by government policies, we believe that an analysis of this segment of academe can shed light on the impact of the different approaches to higher education in the two countries.

12.2 Brazil and Mexico in the Latin American Context

12.2.1 Economic and Technologic Development

Latin America represents 8.3 % of the world's population and 8.2 % of world GDP (World Bank 2012), but the region's technological impact is considerably smaller. It accounts for 3 % of high technology exports (World Bank 2012) and just 0.5 % of industrial patents requests filed in the United States in 2010 (World Intellectual Property Organization [WIPO] 2010). The technological lag is apparent in the region's weak showing in the new Global Innovation Index, compiled jointly by WIPO and the France-based INSEAD business school. The study ranked 141 countries according to their innovation capabilities, defined as their overall capacity to invent new products. Of Latin American countries, only Chile ranked among the world's 50 innovation leaders, in 39th place; meanwhile, Brazil ranked 58th and Mexico 79th. The study also cited Mexico, Argentina, Ecuador and Venezuela among a group of "innovation underperformers" (WIPO/INSEAD 2012, p. 24).

In other technology indicators, Brazil is the undisputed regional leader. The South American nation invests far more than its neighbors on research and development; in 2009, it spent 1.18 % of GDP, a figure that closely trails some European countries such as Spain (1.38 % in 2009) and Italy (1.27 %), but represents half the 2.3 % average spent by members of the Organization for Economic Cooperation and Development (OECD 2011). In contrast, Mexico spent 0.39 % of GDP in 2009 (OECD 2011; RICYT 2012). Brazil also accounts for 2.41 % of the global share of scientific articles registered in the ISI Web of Knowledge, while México accounts for just 0.68 % (RICYT 2012).

Eighty years ago, Schumpeter (1942) argued that a country's rate of economic growth was dependent on its level of technological development, defined in the broader sense as its technological capacities and level of knowledge production. Today, that paradigm has become increasingly accepted among policy makers with the emergence of the so-called "knowledge societies", in which access to technology and information are viewed as the prerequisites sine qua non to development. At the same time, the economic gap between countries with strong technological capabilities and those without is growing (Persaud 2001; UNESCO 2010).

In that context, Brazil is investing much more heavily in S&T than its neighbors in hopes of widening its competitive advantage, a policy that has historic roots. The country's relatively strong and growing scientific output is the culmination of decades of government policies designed to promote economic growth through investment in S&T research, which began with the populist government of Getulio Vargas (1930–1945, 1950–1954) and continued through the military dictatorship (1964–1985), before accelerating under the democratic government of Luiz Inácio Lula da Silva (2002–2010).

Under Lula, Brazil also began to take a much more active role in international forums and to forge new pacts with economic giants such as India and China, diversifying its economy and reducing its dependence on traditional markets in the United States and Europe. In 2003, the U.S. investment firm Goldman Sachs named

Brazil, together with Russia, India and China, among the economies that would dominate international markets by 2050. At the time, the inclusion of Brazil among the elite group of BRICs (an acronym coined by Goldman Sachs using the first letter of each country) sparked skepticism, in part because the country was in the throes of chronic hyperinflationary pressures. However, after 8 years of sustained growth, Brazil surpassed Great Britain in 2011 in absolute terms as the world's sixth largest economy. Meanwhile, Mexico remained in a distant 14th place, after having held the 9th spot in 2001 (World Bank 2012). Also, by 2011, Brazil had surpassed Mexico in terms of GDP per capita—US$12,594 compared with US$10,064 in 2011—due in part to the strengthening of the Brazilian currency, the real, against the U.S. dollar (World Bank 2012).

12.2.2 One Region, Two Models

Despite similarities in the two countries, development strategies – for example, both adopted import substitution industrialization from the 1940s through the 1970s – there are key differences, which have become more pronounced in the past few decades. Such differences partly explain the variations in the two countries, growth rates since 2000.

The Brazilian model is characterized by heavy government intervention through large, state-controlled companies (Malkin and Romero 2012). The South American giant is at the head of a group of Latin American countries with similar structural characteristics: all are net exporters of commodities (whose prices have surged over the past decade due largely to the demand from China); they are working to diversify their exports to devote a smaller share to industrialized nations, giving preference to emerging nations, which have higher investment rates; and are dependent to a lesser degree on remittances from industrialized nations. Other members of this group are Argentina, Bolivia, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela as well as Trinidad and Tobago (DGEI/UNAM 2012).

For its part, Mexico has focused on free trade, open markets, and on deregulation of industries (Malkin and Romero 2012). It heads a group of countries that are characterized by being more dependent on industrialized nations' economies and on the remittances that their migrants send home; being net importers of commodities; exporting their goods and services mainly to developed markets; and having relatively low investment rates with respect to GDP. This group includes most of the Central American and Caribbean countries (DGEI/UNAM 2012).

On average the Brazilian model has proved more effective during the first decade of the twenty-first century, in part due to the strong demand for its commodities exports to economic giants China and India. Brazil also emerged virtually unscathed following the 2008–2009 economic crisis in the United States, with its growth rate slowing just 0.3 % in 2009, before growing a hefty 7.5 % in 2010. Mexico, meanwhile, was the Latin American country hardest hit, with the economy shrinking 6.9 % in 2009 before rebounding by 5.5 % in 2010 (International Monetary Fund 2012).

However, given the recent slowdown of the Chinese economy, it is unclear which of the two strategies will yield greater levels of economic growth over the next decade. In 2011, the Brazilian economy suffered a major drop in GDP growth, from 7.5 % to 2.7 %, while Mexico's growth rate slowed to a lesser degree, from 5 % to 4 % (IMF 2012). In one sign that the regional trade balance may be shifting, in 2011 Brazil imported more cars to Mexico than it exported to the North American country (Malkin and Romero 2012). However, the South American economy was projected to recover and grow at a faster rate between 2013 and 2018, with average growth of 4.1 %, compared with 3.4 % in Mexico (IMF 2012).

12.3 Policies in Higher Education and Science and Technology

12.3.1 The Brazilian Strategy

As mentioned in the introduction to this chapter, since the 1930s and with greater emphasis starting in the 1950s, Brazil has pursued a goal of achieving technological self-sufficiency as part of a strategy for economic development. The strategy has been characterized by strong, central state-planning designed to strengthen the S&T sector, and since the late 1960s, through efforts to create internationally competitive, U.S.-style research institutions with postgraduate studies at their core. Key landmarks in the Brazilian strategy include the creation, both in 1951, of the National Council for Technological and Scientific Development (CNPq), which is charged with promoting scientific research, and the Office for the Improvement of Higher Education Personnel (CAPES), which funds further studies for university professors and evaluates graduate programs.

In 1965, the military government created a series of government funds in order to provide long-term support for scientific research projects in Brazil. The largest of these is the National Fund for Scientific and Technological Development (FNDCT), which has become one of the major engines behind scientific research both within and outside universities in Brazil (De Negri et al. 2006). Then, in 1968, the government enacted a new higher education law that instituted sweeping reforms in response to a series of recommendations by American policy experts. The university reform law laid the foundations for a nationwide system of postgraduate studies; prescribed full-time contracts as the norm for university professors; replaced the traditional university chair system with a more modern system of faculties and departments; and substituted sequential courses with a more flexible credit system (Lei 5,540/1968 (1968); Schwartzman and Klein 1994). One of the key elements of the reform was its emphasis on scientific research, which was cited as the primary function of the university (Lei 5,540/1968 (1968, art. 1). The government also established that only institutions that conduct research and offer postgraduate programs can call themselves "universities" and that all university professors must engage in both teaching and research (Lei 5,540/1968 (1968, art. 32).

At the same time, the military government relaxed controls on private institutions of higher education, in a bid to meet mushrooming demand for college degrees among the growing middle class. The decision, which faced heavy criticism from higher education experts who worried about a decrease in quality, paved the way for the current dominance of the private sector in Brazilian higher education (Schwartzman and Klein 1994).

The 1968 reforms also served as a catalyst for the development of a modern research sector in Brazil. They included: the creation of the first large-scale research centers, primarily in the states of Sao Paulo and Rio de Janeiro; the development of long-term strategies and increased funding for the sector; a nuclear cooperation agreement with Germany; and protectionist policies for industries such as telecommunications and computers, among other changes (Schwartzman 1993). In 1985, the government created the federal Ministry of Science and Technology to coordinate the different agencies charged with fomenting S&T research, making Brazil one of the few countries in the region to have a Cabinet-level office for the sector.

Many of those changes were enshrined in the new Constitution enacted in 1988, 3 years after the return to democracy. It established the academic, financial and administrative autonomy of public universities (Schwartzman 1989), as well as setting aside a fixed percentage of taxes to go toward universities: 25 % at the municipal and state level and 18 % at the federal level (Paulo Renato 2005). In addition, it required all Brazilian states to create their own agencies to support science and technology, the most well-funded of which is the Sao Paulo State Foundation for the Support of Research, which by law receives 0.5 % of tax revenue to fund grants for graduate students and for scientific research projects (FAPESP 2012). A year later, Sao Paulo approved a new state constitution, which earmarks 9.57 % of state taxes to fund its three universities, including the country's top-ranked research institutions, the University of Sao Paulo and the State University of Campinas.

The measures came toward the end of the so-called "lost decade" in Latin America, when government spending plummeted as countries sought to respond to the debt crisis. Throughout the region, the 1980s were characterized by institutional agitation, heightened bureaucracy and budget uncertainty. However, Brazil declined to follow to the letter the austerity measures dictated by the International Monetary Fund and instead increased its spending on higher education relative to GDP, from 0.78 % in 1982 to 0.9 % in 1992 (Oro and Sebastián 1993). In contrast, Mexico slashed higher education spending from 0.79 % to 0.45 % of GDP between 1980 and 1992 (Mungaray and Valenti 1997).

In the following decade, while much of the region recovered economically, Brazil continued to battle with skyrocketing inflation, which reached a maximum of 2,000 % in 1993 (Rohter 2010). However, the 1990s were also a decade of growth for both higher education and the S&T sector. The number of Brazilian postgraduate programs nearly doubled and the number of scientific articles registered by the Institute for Scientific Information of Brazil multiplied 4.7 times to reach a record 12,686 articles in 2000 (Pinheiro-Machado and De Oliveira 2001). The

government also created the first of a series of research funds linked to specific strategic industries, such as oil, which operated under the aegis of the state-owned oil company Petrobras. The 1996 Education Law (Lei de Diretrizes e Bases (LDB) 1996) sought to strengthen the research universities by requiring full-time contracts for all staff and that one-third of their teaching staff hold graduate degrees, among other measures directed toward quality assurance. At the same time, the law also legalized for-profit[3] institutions of higher education, which now account for half of tertiary enrollments in Brazil.

The efforts to strengthen the country's research sector gained strength under President Lula, with the passage of the Innovation Law (2004) and the Good Law (2005), which created incentives for the private sector to increase its investment in research and development. Among the most ambitious of Lula's policies was the Action Plan for Science, Technology and National Development, announced in 2007, under which the government committed to increase total investment in S&T to 1.5 % of GDP by 2010 and to double the number of government grants for college students.

Also during Lula's administration, although not directly as a result of government policies, the country's public universities also began implementing affirmative action policies for public high school graduates and members of disadvantaged racial groups, in particular Afro-Brazilians, who comprise more than half the population but have suffered historic discrimination. As of 2010, at least 70 % of state universities had implemented such policies (Downey and Lloyd 2010; Lloyd 2009). In August 2012, the federal government followed suit, mandating that half the seats at federal universities be reserved for graduates of public high schools; those seats in turn will be distributed among black, mixed race and indigenous students proportionally to the racial composition of each state.

Lula's successor, President Dilma Rousseff, has expanded on his policies for the S&T sector. In 2011, she announced that her government would spend US$1.8 billion to offer 75,000 scholarships for students to pursue university degrees in the world's top universities under the Science without Borders Program. The private sector pledged to fund an additional 25,000 scholarships, which are restricted to students in the STEM fields (science, technology, engineering and mathematics). Her government has also continued to expand the federal university system, a process that begun under Lula, with particular emphasis on underserved areas of the country.

[3] While most private institutions are money-making ventures, the form in which they utilize their profits determines their legal and fiscal status in most countries. In general, not for profit institutions are legally required to reinvest their profits in the institution in exchange for receiving tax exempt status, while for-profit institutions distribute profits among shareholders or their owners, and are required to pay taxes on a share of their earnings. The enormous growth in the for-profit model of education providers in recent years has sparked controversy in many countries, with critics arguing that the market logic should not apply to education, while proponents argue that the institutions offer a low-cost and flexible alternative for students who are not accepted into the public universities (Bok 2003).

12.3.2 The Mexican Strategy

Mexico has the region's second largest S&T sector, measured in terms of the number of scientific articles and patents produced each year. However, the country lags significantly behind Brazil in both areas. Brazil had 37,000 scientific documents registered in ISI in 2009, compared with 11,000 by Mexico. Similarly, residents of Brazil made 7,242 patent requests in 2008, compared with 685 requests by Mexican residents. Still, the number of patents actually granted was quite low for both Brazil and México—529 vs. 197, respectively—due to the relatively low level of technological innovation and commercialization in both countries compared with more industrialized nations (Lloyd 2013).

Mexican S&T policies are more recent than those of Brazil and have been characterized by a lack of long-term vision and funding, a reflection of the Mexican political system in which government programs are typically designed to last a single, 6-year presidential term (Mexican presidents cannot be reelected) (Campos Ríos and Sánchez Daza 2008). Government S&T policies tend to set ambitious goals, which later go unmet, and there is little coordination among the different agencies charged with designing and carrying out government policies (Canales 2011). Mexico's National Council of Science and Technology (Conacyt) was founded in 1970, nearly two decades after its Brazilian counterpart, and received little initial government support. Even today, the agency is hamstrung by a lack of financial and administrative autonomy to carry out its wide array of tasks, which include funding a majority of research projects and scholarships for graduate students in Mexico and abroad. Conacyt also oversees the National System of Researchers (SNI), a financial stimulus program introduced in 1984 in an effort to stem the exodus of top researchers due to the debt crisis. Since then, the number of SNI members has grown from 1,396 to more than 15,000 in 2009, when members received monthly bonuses of between $400 and $1,900 (Conacyt 2011). However, while a similar program in Brazil run by the CNPq requires recipients to spend half their grant money on research, in Mexico the funding primarily serves to supplement—or as much as double—researchers' salaries.

Despite such efforts, the scientific community has long warned that the overall low level of investment in S&T in Mexico represents a major brake on the country's future economic growth (Canales 2011). While government officials have publically recognized the problem, there has been little effort to resolve it through effective, long-term policies for the sector (Canales 2011). One example is the Global Development Plan (1980–1982), which set the goal of achieving scientific and technological "self-determination" by strengthening the S&T sector. It also mandated that spending on the sector should double within 2 years, to reach 1 % of GDP. However, the timing couldn't have been worse, with the country on the verge of the biggest economic debacle in a century. Two years later, Mexico defaulted on its international loans, triggering a ripple effect throughout the region; as a result of the debt restructuring, between 1980 and 1988 investment in S&T had shrunk from 0.41 % to 0.25 % of GDP (Canales 2011).

By the early 1990s, the worst of the crisis was over, and Mexico secured a series of loans from the World Bank to support scientific research. Then, in 1995, the government again set the goal of doubling investment in the sector, as well as increasing the private share. However, by 2000, industry accounted for just 20 % of spending on S&T—compared with 40 % in Brazil—and the total share remained below 0.5 % of GDP (González-Brambila et al. 2007). In 1999, the Congress passed the first legislation governing the sector, the Law for the Promotion of Scientific and Technological Research, which called for greater coordination between higher education and industry, and well as the decentralization of S&T research away from the capital. After the 2000 election, which put an end to 71 straight years of one-party rule in Mexico, then-President Vicente Fox again vowed to make S&T a central part of his economic strategy. His government sponsored its own legislation, the Law for Science and Technology (2002), which was reformed in 2004 to impose mandatory spending on S&T, from combined public and private sources, equivalent 1 % of GDP. However, the mandate did not include penalties for non-compliance nor specify mechanisms to achieve the goal.

There are many historic reasons that help explain Mexico's lack of sustained support for science and technology; for example, the country's proximity to the United States has made it relatively cheap to import technology from abroad (Cárdenas 2010). Mexico's incorporation in the North American Free Trade Agreement and the Organization for Economic Cooperation and Development, both in 1994, has further increased the country's technological dependence with relation to the industrialized nations (Cárdenas 2010; Park 2011). Mexico is by far the largest producer of high-tech products in the region, exporting $37.6 billion in such products in 2010 compared with $8.1 billion by Brazil (World Bank 2012). However, most of those exports are assembled at foreign-owned maquiladora plants, with little resulting technology transfer to Mexican companies (Hill 2002; Sklair 1992). Mexico has also relied on its massive oil reserves to fuel development; today, profits from the state-owed oil company, Petróleos Mexicanos (Pemex) account for 40 % of the federal budget. In contrast, Brazil has had a greater incentive to develop its own technological capabilities, given its geographic isolation from the world's economic powers and its lack—until recently—of major petroleum reserves (Brainard and Martinez-Diaz 2009; Rohter 2010).

In sum, Brazilian higher education policies clearly place a higher premium on scientific research. In Mexico, the government invested far less in promoting S&T, despite laws requiring total spending in the sector to reach 1 % of GDP, and instead has focused on expanding access to the undergraduate level. Such differences, we argue in this chapter, necessarily have an impact on the academic profession in both countries.

12.4 Higher Education in Brazil and Mexico

In both Brazil and Mexico, more than half the scientific research is conducted in public universities and research centers, with a few, large research universities accounting for the lion's share of production. For example, the National Autonomous

University of Mexico produces 33 % of all articles published by Mexico-based academics in international, peer-reviewed journals, while the University of Sao Paulo accounts for 23 % of Brazil's share of articles in ISI (Lloyd 2013). However, public universities fulfill quite different roles in Brazil and Mexico; in the former, until very recently, they were bastions of the mostly white elite, while in the latter, public universities, particularly at the state level, draw from a fairly wide socioeconomic base.

Both Brazil and México have undergone massive growth in their higher education systems over the past decade. Today, Brazil has 6.5 million students in higher education (MEC/INEP 2011), while Mexico has 3.1 million (Subsecretaría de Educación Superior 2011). However, despite major gains over the past decade, the gross enrollment rate in both countries still lags behind the regional average; Brazil has 34 % enrollment and México 27 %, compared with an average of 37 % for Latin America as a whole (UNESCO 2011).

Brazilian higher education is essentially divided into two parallel systems (Schwartzman 2003): a minority public sector, which includes the country's most prestigious and competitive research universities and enrolls just 25 % of students (INEP 2011); and a minority private sector, which conducts little research and is comprised mostly of corporate, for-profit institutions. Most students at the tuition-free, public universities are still graduates of private high schools, which tend to better prepare their students for the highly competitive admissions process to the public universities. Meanwhile, the graduates of public high schools pay to attend private institutions, many of them of dubious quality (Schwartzman 2003). The socio-economic and racial composition of the public universities, however, is starting to change with the implementation of affirmative action policies over the past decade.

The public system includes 280 higher education institutions, of which roughly 100 are universities and the rest are technological institutes (MEC/INEP 2011). In general, the Sao Paulo state universities and a handful of federal universities are considered the most prestigious, and competition for limited study places is extremely fierce (Schwartzman 2003). The rest of the students attend a vast universe of more than 2,377 private institutions (MEC/INEP 2011), a majority of which are of questionable quality, with the exception of some of the Roman Catholic institutions. Roughly half the students in private institutions are enrolled in night courses and two thirds attend for-profit institutions (Schwartzman 2003; Pedrosa 2010). In fact, Brazil has one of the region's largest shares of private-sector enrollments, 73 %, compared with 46 % in the region as a whole in the mid-2000s (IESALC 2006).

The Mexican higher education system is more egalitarian, although only a small minority gains admission to the top federal universities. Despite increasing inroads by private higher education providers, 68 % of tertiary enrollments are still in the public sector, which in 2010 included a total of 740 institutions: 166 public universities, including 8 federal universities, 34 state universities, 11 intercultural universities, and 28 polytechnic colleges, as well as a vast system of technological institutes and teachers colleges (ExECUM 2011). A majority of students in the public sector are graduates of public high schools, some of which are run by the

universities themselves. The private sector includes nearly 1,500 institutions, of which about a dozen compete with the public universities for top students and prestige. Unlike in Brazil, few higher education institutions declare themselves as for-profit, but in practice, institutions that are owned by U.S. for-profit providers represent the fastest growing sector in the country's highly diverse higher education system (ExECUM 2011).

In general, the two countries have adopted markedly different strategies for expanding enrollment in higher education, which in turn have implications for their public-sector institutions. In the following section, we will analyze the possible impact of public policy on full-time, public university professors in both countries.

12.5 The CAP Survey

12.5.1 Key Theme Addressed

Our analysis of the CAP survey is divided into four parts. We begin by comparing the personal and academic profiles of full-time academics in both countries, including their gender, the share that have undergone doctoral and postdoctoral studies, and whether those degrees were earned at home or abroad. We then examine their main areas of study, research activities, and academic production in terms of the number of articles, chapters and books published over a given period. We go on to review their academic preferences, their views on the quality of their research facilities, and whether these have improved or declined since they began their academic careers. Finally, we analyze the perceived degrees of influence of different actors in the institutional context, as well as the perceptions of academics in both countries of their own influence within their departments or universities.

As mentioned in the introduction, our analysis of the CAP study involves a subset of full-time faculty at public institutions in Mexico and Brazil. We have focused our comparisons on areas in which the differences among Brazilian and Mexican academics are particularly significant. In all cases, we attempt to draw conclusions in the broader context of public policies in both countries.

12.5.2 Personal and Academic Profiles

While several of the survey questions refer to personal characteristics, such as age, length of career and gender, we found the greatest discrepancies between academics in the two countries in terms of the final category. In general, the survey showed significantly greater gender parity among full-time faculty in Brazil than in Mexico. The ratio of males to females among the Brazilian sample group was 334 (55 %) to

278 (45 %), respectively; in contrast, in Mexico there were 1,159 men (66 %) and 599 women (34 %). In both cases, the gender gap within countries widens the higher up the education ladder you go, although there was a greater proportion of female academics in Brazil at all levels. Of Brazilians with doctoral degrees, 42 % were women, compared with 29 % of Mexicans. Similarly, of those who had undergone post-doctoral fellowships, in Brazil 30 % were women and in Mexico, 26 %. Such discrepancies indicate the persistence of a "glass ceiling" in academe in both countries, particularly among those at the highest levels, although there seem to be fewer entrance barriers for Brazilian women.

While the emphasis in Brazil on post-graduate education does not explain the greater gender parity within the Brazilian system vis-à-vis Mexico, it does suggest correlations in other areas. For example, a far greater proportion of Brazilian academics reported holding PhD's (see Table 12.1): 73 % versus 31 % of Mexicans. Similarly, a greater share of Brazilians had also undergone post-doctoral fellowships: 21 % compared with 5 % in Mexico. Of those with a PhD or higher, a greater proportion of Brazilians earned their terminal degrees in their home country: 85 % of Brazilians with PhD's versus 61 % of Mexicans; and in the case of post-doctoral studies, the relationship was 42–13 %, respectively.

There were also differences in the level of support academics in both countries received while pursuing their doctoral degrees. In Brazil, 68 % of those with doctoral degrees reported receiving grants, compared with just 38 % of Mexicans (see Table 12.2).

Those results are not surprising, given the relative strength and scope of Brazilian graduate programs at the public universities, which were in turn bolstered by a shift in government policy in the 1990s. After sending thousands of graduate students abroad in the 1970s and 1980s, the government began diverting that funding to strengthen domestic graduate programs staffed by foreign-earned PhDs (Knobel 2012). In that context, Brazil's Science without Borders program represents a return to past policies, however with a new emphasis on training a generation of scholars in the STEM fields. In contrast, Mexico has gradually increased the number of scholarships for graduate studies abroad over several decades, although, when compared with the new program in Brazil, the numbers remain extremely small, with 2,799 scholarships reported in 2010 (Conacyt 2011).

Table 12.1 Distribution of survey groups by gender, highest degree earned

Country	Degree	Male	Female	n Total
Brazil	Doctoral	256 (76.3 %)	193 (69.4 %)	449 (73.4 %)
	Post Doctoral	88 (26.3 %)	38 (13.7 %)	126 (20.6 %)
Mexico	Doctoral	388 (33.5 %)	159 (26.6 %)	547 (31.1 %)
	Post Doctoral	69 (6.0 %)	24 (4.0 %)	93 (5.3 %)

Source: CAP survey
N = 344 male and 278 female academics in Brazil, 1,159 male and 599 female academics in Mexico

Table 12.2 Place of study and financial support received by academics Brazil and Mexico 2007

Country of doctoral degree		
	Brazil	Mexico
In home country	84.7 %	61.1 %
Abroad	15.3 %	38.9 %
Scholarship or fellowship (doctoral degree)		
	Brazil	Mexico
Yes	68.2 %	38.2 %
No	31.8 %	61.8 %
Country of post-doctoral degree		
	Brazil	Mexico
In home country	42.0 %	12.8 %
Abroad	58.0 %	87.2 %

Source: CAP survey

12.5.3 Areas of Study and Research Production

The CAP survey also reveals variations in the distribution of academics among different fields, which in turn have repercussions in terms of the number of scientific articles produced in both countries. In Mexico, one-fifth (20 %) of academics surveyed earned their highest degree in the combined fields of architecture, engineering, manufacturing and construction, areas that have little presence in ISI. In contrast, in Brazil the highest concentration of academics (18 %) hold degrees in the combined fields of medical sciences, health and related sciences, and social services, followed by 14 % with degrees in physical sciences, math and computer science—fields which are disproportionately represented in the scholarly journals indexed in ISI. In Mexico, the second largest concentration of academics (13 %) is found in the fields of business administration and economics, and in the physical sciences, math and computer science (see Fig. 12.1).

Those differences may be partly explained by the strong tradition of professional education in Mexico. For example, Mexico has the highest number of engineering graduates of any country in Latin America—52,000 per year in 2008 (National Science Foundation 2012)—in what is typically an undergraduate major. In addition, the proportion of engineering students in Mexico (20 %) is twice that of Brazil, Argentina and the United States, according to World Bank figures (2012). That tendency is on the rise, with the massive growth over the past two decades of government technological institutes, which now comprises 25 % of total enrollment in higher education in Mexico (Rodríguez 2012).

In contrast, in Brazil, the dominant fields are medical and physical sciences, both of which have a strong presence at the post-graduate level. However, while that distribution may favor production of scientific articles, the shortage of engineering graduates in Brazil is often cited as a key obstacle to economic development. A recent study by the Relações do Trabalho, a Brazilian network of experts on labor relations, found that the country only graduates 33,000 engineers each year, one-third of the 90,000 it needs to meet demand in expanding sectors such as the oil

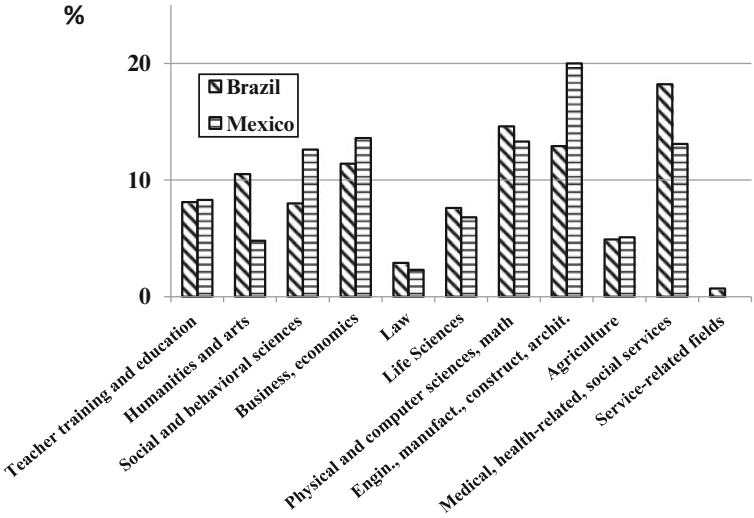

Fig. 12.1 Highest degree of academics in Brazil and Mexico 2007 by field of the highest degree (*Source*: CAP survey)

industry (Boas 2011). The Brazilian government is hoping that Science without Borders Program will vastly increase the number of highly skilled graduates in STEM fields, and boost the number of engineers in particular. However, it has so far had difficulty finding enough students proficient in English and other foreign languages to take advantage of all the available scholarships (Knobel 2012).

The different concentration among scholarly fields is also reflected in the professional activities of academics in both countries. In general, Brazilian academics spend more time on research and produce more in terms of scholarly publications and papers. For example, when asked about their academic contributions over the previous 2 years, the Brazilians delivered an average of 6.5 presentations in academic congresses, compared with 4.0 by their Mexican colleagues; produced 1.7 research reports on a funded study, compared with 0.7; published 5.3 articles in a book or journal, compared with 3.2; edited or coedited 0.28 books, versus 0.26; and authored or coauthored 0.6 scholarly books, compared with 0.47 by their Mexican counterparts. In sum, the only case in which Mexican academics reported marginally greater production was in academic book editing.

The Brazilians were also more likely than their Mexican colleagues to have conducted research activities during the previous year. Fifty-eight percent of Brazilians reported preparing experiments and research, compared with 49 % of Mexicans; 46 % supervised a postgraduate research team, versus 36.5 %; 58 % conducted their own experiments or research, against 50 %; and 92 % of the Brazilians reported writing academic articles that contained the results of their research, compared with 70 % of their Mexican colleagues.

When questioned about a broader range of academic activities during the current year, there were also significant differences between the two groups. For instance,

the largest share of Mexicans (64 %) reported serving as a member of a national or international committee, compared to 42 % of Brazilians. In contrast, the most widely cited activity by Brazilians (68 %) was serving as a peer-reviewer for scholarly journals, research foundations or institutional evaluations, while just 35 % of the Mexicans surveyed reported participating in the peer-review process. In addition, 25 % of Brazilians reported serving as a book editor, compared with 14 % of the Mexicans. However, a similar proportion of both groups (about one-fourth) reported serving as elected officials or leaders of professional or academic organizations, as members of community organizations or having participated in community projects.

12.5.4 Views Toward Research and Work Environment

Perhaps not surprisingly, given the different ways Brazilian and Mexican academics spend their time, they express variations in preferences in terms of research and teaching, and regarding their work environment in general. Asked where their primary interests lay, Brazilians expressed a stronger preference for research than their Mexican counterparts, although they also tended to see the two activities as complementary – a likely reflection of the indivisibility of both activities within Brazilian universities. For example, 6.6 % of Brazilians said they were primarily interested in research and 50.6 % said they were leaning toward research, for a combined 57 % preference for research, compared with 44 % who expressed preferences for teaching. In contrast, 7.2 % of Mexicans said their main interest was research and 38 % said they were leaning toward research (a total of 43.5 %), compared with 56.5 % who preferred teaching. Of particular relevance given the professionalizing nature of Mexican higher education, 18.8 % of Mexican academics said they were primarily interested in teaching, compared with just 5.4 % of Brazilians. In fact, judging by the previous description of their professional activities, teaching may likely be the sole activity of many of the Mexican academics surveyed.

Nonetheless, despite the divisions between teaching and research within Mexican universities, in both Mexico and Brazil, a majority of academics disagreed with the affirmation that "teaching and research are not compatible"; their responses averaged 4.2 on an inverted Likert scale of 1–5, in which 5 equaled "strongly disagree". Brazilians were even more in disagreement, averaging 4.5 on the scale. Such converging views may reveal more about socially constructed ideals of the academic profession than about the actual daily practice, particularly in the case of Mexico, where a significant share of academics surveyed conduct little or no research.

When asked about the day-to-day realities of their profession, however, the two groups expressed more divergent views. For example, Brazilians were slightly more critical of their profession, with a larger – if still minority – share saying that it was a poor time to start a career in academe (3.9 on average, compared with 4.2 for Mexicans, on a scale where 5 means "strongly disagree"), and that if given the chance, they would not have chosen to be an academic (4.0 versus 4.5). Brazilians

on average were more likely to see their job as a source of "considerable personal strain" (3.2 compared with 3.5 for Mexicans)—a sentiment reflected by the 143,000 Brazilian professors and other federal university employees who went on strike for weeks starting in May 2012 to demand higher pay and better working conditions. The strikers were protesting the increase in student-teacher ratios and classroom crowding in what was once an elite sector, following a decade of government efforts to increase enrollment (Downey 2012; Micheloni et al. 2012).

For their part, a majority of Mexican academics say that faculty within their discipline have a "professional obligation to apply their knowledge to resolving problems in society" (1.8 compared with a score of 2.4 among Brazilians), a likely reflection of the stronger emphasis placed on social responsibility within Mexican universities. Mexicans were in general more satisfied with their jobs (1.8 vs. 2.2)—perhaps because they feel less stress. They were also more likely to agree that research funding should be directed toward the most productive researchers (2.5 vs. 3.1). The latter view could simply reflect the status quo in Mexico under the Conacyt stimulus program, the SNI, which awards significantly larger bonuses to its top-ranked scientists than the program operated by its Brazilian counterpart, the CNPq.

When asked about their specific work environments, however, Brazilian academics were more positive—or rather, less negative—than their Mexican counterparts in evaluating all of the following areas: research funding (3.5 vs. 3.9); support staff for research (3.5 vs. 3.8); laboratories (2.8 vs. 3); and research equipment and instruments (2.95 vs. 3.3). Overall, both groups rated those areas at average or below average, with Mexican respondents giving particularly scathing criticism of the amount of available research funding. When it came to evaluating their overall working conditions, however, the results were the opposite: nearly half (45.9 %) of Mexican academics saw improvements in both higher education as a whole and within research institutes (46.6 %), compared with 36.9 % and 34.9 % for Brazilians, respectively. That disparity may reflect the fact that public universities in Brazil received greater government investment than their Mexican counterparts starting in the 1960s, and have recently begun facing shortages due to expansion in enrollment. Alternatively, the respondents may simply be reflecting different cultural perceptions of the ideal work environment.

12.5.5 Who Wields the Power?

A final area of comparison is the degree to which academics in both countries see themselves as influential actors within their institutions or departments. That is, who really wields the power? In general, Brazilian academics view themselves as more influential than their Mexican counterparts and their institutions as a whole as wielding more autonomy vis-à-vis the government (see Fig. 12.2). However, in both cases, the degree of influence is directly proportional to the size of the sphere of influence. For example, 80 % of Brazilian academics consider themselves

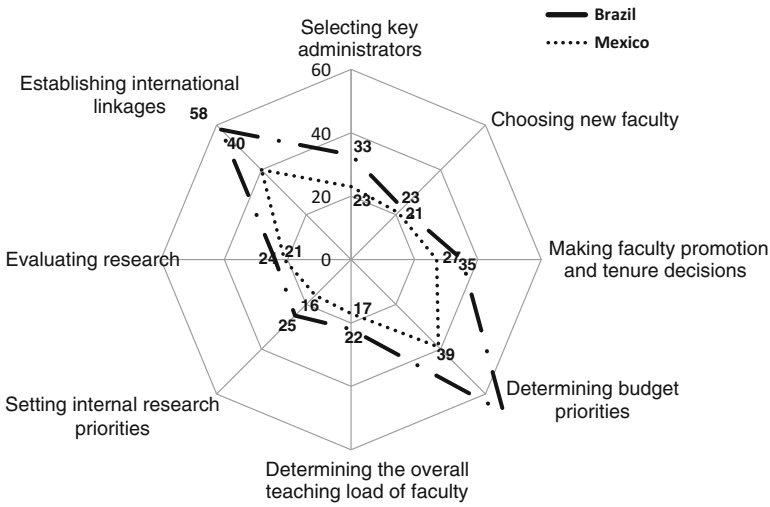

Fig. 12.2 Perceived primary influence by Government or external stakeholders – academics in Brazil and Mexico 2007 (percentage) (*Source*: CAP survey)

somewhat or very influential within their department or similar academic unit, 56 % within their academic body, school or similar unit; and 31 % at an institutional level. In comparison, among Mexicans the share who considers themselves influential is 66 %, 49 % and 26 %, respectively.

There were also notable differences in views regarding which actors exert the most influence over decisions affecting their institutions (see Fig. 12.3). Mexicans perceived a much greater government or external influence; 59 % said that external actors exerted the primary influence in terms of personnel selection; 40 % saw external actors as critical in establishing international ties; and 39 % cited these actors as key in determining budget priorities, on a par with institutional managers. In contrast, Brazilians viewed institutional managers as exerting by far the greatest influence over those and other decisions; 68 % saw them as the key agents in determining budget priorities and 58 % cited their role in establishing international ties.

Such perceptions suggest that Brazilian academics feel a greater sense of institutional autonomy than their Mexican counterparts. This could be a result of "the university reform of 1968 and the 1988 federal Constitution, both of which sought to remake Brazilian higher education largely in the U.S. model. In Mexico, where academic autonomy has long been a buzz word on campus, and many universities carry the word "autonomous" in their names, in practice the government continues to wield significant power over the day-to-day operations of the institutions, particularly in the case of state-run universities. However, in both cases, a small minority of academics feel that they wield influence over their institutions as a whole.

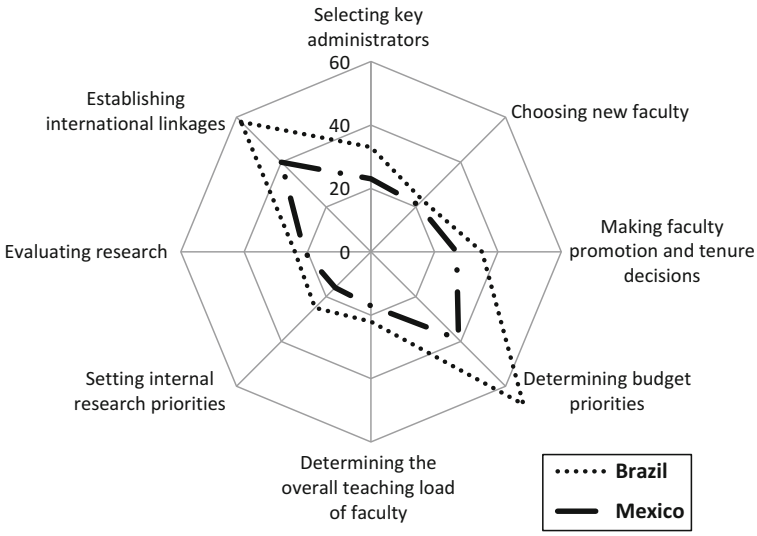

Fig. 12.3 Perceive primary influence by managers – academics view in Brazil and Mexico 2007 (percentage)

12.6 Conclusions

While it would be irresponsible to draw sweeping conclusions from a limited subset of academics in Mexico and Brazil, the results of the CAP survey suggest certain patterns that are worthy of further study. This is particularly true given the growing influence of both countries in the global economy (Mexico forms part of the expanded BRIMC group of future economic powers), a paradigm in which higher education systems play a key role. Brazil is betting on its relatively strong and growing support for S&T research to improve its competitive advantage in the knowledge economy, although it faces challenges in transforming that research into a catalyst for development. In Mexico, in contrast, the government has prioritized opening its markets ahead of developing a domestic knowledge base, a strategy that is reflected in the overwhelming foreign ownership of patents and other indicators of innovation.

Such policy choices are reflected in many of the responses to the CAP survey, in particular in areas related to academic research. While full-time academics at public universities produce the majority of scientific research in both countries, most, if not all, Brazilians surveyed are involved in those endeavors, while in Mexico a sizeable share of academics conducts little or no research. Brazilians are also more prepared to carry out research, with nearly twice the percentage holding PhDs and four times as many having undergone postdoctoral research. That gap is particularly pronounced between men and women in both countries, with just 9 % of Mexican

female academics holding PhDs, compared to 32 % of the Brazilians. In addition, twice as many Brazilians received financial support while undergoing their studies, and in general, they have a more positive view of their research facilities. Not surprisingly, Brazilians are both more likely to prefer research and to conduct it, producing a significantly greater share of articles, chapters and books than their Mexican counterparts. They are also more likely to feel empowered within their work environment, and to view their institutions as more autonomous from the government and other external actors.

Despite those seeming advantages, however, Brazilian academics are on the whole less satisfied than their Mexican counterparts with their overall work environment. The Mexicans report feeling less stressed; nearly half believe that the work conditions at their institutions and research centers are improving and a third see no change, while a small minority holds a more pessimistic view. Mexican academics are also more likely to view their work as having a social imperative—both in terms of teaching and in research. Even as they tend to prefer teaching over research, they support rewarding the most productive researchers and a majority sees the two activities as compatible.

Those differences mask many similarities among full-time academics in the two countries. Both groups enjoy a privileged status compared with a majority of their peers, either with those in the private sector (in the case of Brazil) or with part-time professors in the public sector (in Mexico). In both those cases, the professors are typically paid by the class, lack basic job benefits such as health care and pension plans, and have little or no time for research. Nor are they eligible for government stimulus programs for researchers or full-time professors, which, particularly in Mexico, can more than double their salary.

Such a diverse academic workplace is common throughout the developing world, and even within heterogeneous systems such as that of the United States. However, in both Brazil and Mexico, enrollment in higher education remains low, even by regional standards, meaning that the current competition for resources between teaching and research will likely become even more extreme. How the two countries address the challenge may have lasting repercussions, not only for their higher education systems, but for their future role in the knowledge economy.

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