

RESEARCH NOTE

Technology in Latin America's Past and Present: New Evidence from the Patent Records

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In spite of important recent work on the history of technology and the dynamics of technological change in Latin America, the literature in this field remains relatively undeveloped. In part, this is due to a relative scarcity of available sources for conducting research. This research note argues that national patent records are an important and untapped source for a wide range of studies on technology and technological change. The research note announces the creation of major new comprehensive databases of patent records in several Latin American countries, part of a larger, ongoing project to compile and make publically accessible patent records across the region. We also provide an introduction to the history of patents in Latin America, followed by a discussion of both the use (and misuse) of patents as historical evidence and recent advances in collecting and using patent evidence in Latin America.

A pesar de valiosos trabajos sobre la historia de la tecnología y las dinámicas del cambio tecnológico en América Latina, no se puede afirmar que exista una extensa historiografía sobre el asunto. En parte, esto se debe a la escasez relativa de fuentes de investigación. Este artículo sostiene, precisamente, que los registros nacionales de patentes han sido muy poco explotados y pueden constituir una importante fuente para una amplia gama de estudios sobre la tecnología y el cambio tecnológico. En concreto, se anuncia la creación de nuevas y exhaustivas bases de datos históricas de patentes en varios países de América Latina, como parte de un proyecto en curso, de mayor envergadura, que pretende compilar y hacer accesible al público los registros de toda la región. Se aporta, en suma, una introducción sobre la historia de las patentes en América Latina, seguida de un análisis de las ventajas e inconvenientes de su uso como evidencia histórica, así como de los últimos avances en su recopilación.

Introduction

Humans create technology to mediate the world we live in; to control nature; to extract, produce, transform, and consume. Technology shapes how we live, how we go about our daily lives and our social interactions. Technologies of production—the ideas and expertise embodied in machines, tools, systems, and skilled workers—shape possibilities for economic growth within societies and have played a central role in the dramatically changing nature of human welfare over the past several centuries (Schumpeter 1950/1975; Mokyr 1990). In the countries of the North Atlantic—Great Britain, the United States, France, Germany, and Belgium—scholars have long been interested in the origins and dynamics of technological change as they have sought to explain the long wave of invention and innovation that drove the first Industrial Revolution (c. 1750–1850) and the experience of modern economic growth. In the nineteenth century, these North Atlantic countries constituted the global center of technology production and export, producing roughly 86 percent of global invention patents (Inkster 2002). At the end of the twentieth century, the North Atlantic, together with East Asia, still produced fully 95 percent of global patents (World Intellectual Property Organization 2014). In other words, for two centuries the world has been divided into two groups: technology exporters (the early industrializers, mostly in the North Atlantic, plus Japan) and technology importers

(everyone else, or the relatively late developers, from Eastern and Southern Europe to Latin America, most of Asia, and Africa).

The dynamics of technological change in the North Atlantic have been well studied, although explanations are still debated. In contrast, scholars have been relatively slow to systematically examine the origins and nature of technological change in much of the rest of the world. The scholarly literature on Latin America, for instance, boasts relatively few general works on the history of technological change and its impact on local economies, societies, and cultures. Some scholars have examined technological change as a side story to narratives of macroeconomic change, national policy regimes, or the learning dynamics of the industrialization process (Katz 2000; Bastos and Cooper 2005). Many historical studies are largely descriptive, without offering analytical explanations for patterns or trends (e.g., Corona Treviño 2004; Sánchez Flores 1980; López Mendoza 1988). Economic histories of the region have devoted only a few brief words to technology, without any systematic attention (Bulmer-Thomas, Coatsworth, and Cortés Conde 2014; Coatsworth and Taylor 1998; Haber 1997; Cárdenas, Ocampo, and Thorp 2000; Kuntz Ficker 2010; Cárdenas 2003). In contrast, scholars working on other regions have aggressively pushed research on technology in innovative ways: through science and technology studies (STS), social studies of technology (or of science—SST or SSS), the social construction of technology (SCOT), technological systems, studies of technology transfer, and a variety of qualitative and cliometric approaches to studying patterns of innovation and diffusion within broader business and economic histories.

Scholars' relative disinterest in the history of technology in Latin America stems in part from the view that Latin America's contribution to patterns of technological change has been largely marginal, derivative, or mimetic. Historically, new technologies in agriculture, mining, transportation, manufacturing, and even in the material activities of households frequently came to Latin America from the outside, from the North Atlantic. Many scholars of Latin America have not entirely broken from the view that imported innovation has primarily served the interest of foreign investors and their local partners, that imported technologies found little engagement with local society, and that technological change was, as a consequence, largely alien to and destructive of Latin American societies and cultures. As a consequence, the dynamics of local invention, adaptation, and engagement with imported techniques in the region remains only partly understood.

Exceptions to this general trend are not uncommon, however. Especially in exporting activities, for example, technological change and its impact have attracted significant research efforts. That is the case, for instance, of the well-known evolution of sugar industry technology in Latin America (see, e.g., Moreno Friginals 1978; Boomgaard and Oostindie 1989; Galloway 1989, chap. 6; Tomich 1989; Dye 1998; Zogbaum 2002; Tomich and Funes 2009; Pretel and Fernández-de-Pinedo 2015). Work on railroads (e.g., Guajardo 2010) and other subjects have slowly begun to extend technology studies in Latin America (Medina, da Costa Marques, and Holmes 2014). Part of the challenge to scholars, in examining the dynamics of technological change in Latin America, lies in the scarcity of historical evidence, the subject of this research note.

We argue that the quantitative and qualitative evidence embedded in patenting activity provides one important and largely unutilized window onto patterns and problems of technological change in Latin America, subsequently opening windows onto studies of its social, cultural, and economic dynamics. This research note presents a brief introduction to the history of patents in Latin America, followed by a discussion of the use (and misuse) of patents as historical evidence and recent advances in collecting and using patent evidence in Latin America. Finally, we present new patent databases on Argentina, Cuba, and Mexico for the first globalization period (circa 1850–1914), which will be available digitally for open use, as well as a research project in progress to add new partners and create an academic hub for encouraging integrated studies on intellectual property rights (IPR) and technology in Latin America and Iberian countries (see <http://www.ibcnetwork.org/project.php?id=46>). Until now, patent data have been nearly inaccessible. On the basis of ongoing work, such as a long-term comparative analysis of the Mexican and Spanish patent systems (Beatty and Sáiz 2007) and the study of cross-patenting trends in Mexico, Cuba, Spain, and the United States, we believe that this new material can create new opportunities for researchers interested in the place of technology in human affairs.

Patent Law, Patenting, and Innovation

Modern patents are legal instruments that confer temporary property rights to inventions, to new ways of doing things, new products, and new processes. Despite significant variation in nineteenth-century national patent laws, all contained a set of common traits. As legal monopolies, patents create social costs by reducing competition and raising prices. In theory, however, these costs are outweighed by social benefits, as patent monopolies increase the incentive of individuals and firms to invest in inventive and innovative activity, whether trial-and-error tinkering or systematic research and development. Society also benefits from the

publication of new knowledge, as inventors who patent trade secrecy for monopoly rights. Patent laws may also regulate inventors' rights in other ways: by placing temporal and territorial limits on those rights, by excluding some kinds of new ideas and inventions altogether, by requiring local "working" or licensing of patented inventions, or sometimes by allowing third parties to introduce and use the inventions of others (Sáiz 2014). Patent systems assume that the social benefits of increased incentives outweigh the social cost of monopolies, although debates have come and gone and come again over the past two centuries (Machlup and Penrose 1950; Boldrin and Levine 2008; Shadlen 2009).

Governments throughout the world have long used exclusive monopoly privileges—the basis of modern patent rights—to encourage inventive and innovative activity. This was true in both the earliest industrializers (Britain, the United States, and France) and among relatively later industrializers (Germany, Russia, Japan, Latin America, and beyond). Comparative and historical studies of traditional privileges and of modern patent laws can help us understand the ways that countries have approached the challenge of inducing investment in technological change, either through inventive activity or through borrowing the inventions and expertise of others (among a large body of literature, see Macleod 1988; Khan 2005; Beatty 2001; Shadlen 2012). They also help us understand how the varying qualities of patent laws, enforcement regimes, and patent rights yield divergent outcomes across countries.

But patents are not only legal instruments that confer a property right to invention and innovation. Patenting activity also provides a window onto the dynamics of technological change: the origin of inventive and innovative activity, the level and direction of interest in innovation across fields, the social basis of inventive activity, and the relative balance of domestic and foreign engagement with patterns of technological change. Within North Atlantic countries, scholars have made extensive and creative use of patenting evidence to examine these issues (e.g., Sokoloff 1988; Khan 2005; Inkster 2000; Macleod 1991). However, this has not been the case for most of the rest of the world, with just a few exceptions (Sáiz 1999; Beatty 2002; Nicholas 2011).

Although England's Statute of Monopolies (1624), the US Patent Act of 1790, and the French patent law of 1791 are the forerunners of modern patent legislation, patent laws have not been the exclusive domain of the industrialized economies over the past two centuries. Exclusive privileges that aimed to promote local innovation originated in fifteenth-century Venice. Spanish monarchs granted limited monopoly protection to innovations on an ad hoc basis as early as the 1470s, and royal policy carried the practice to Spain's American colonies in the sixteenth century (Sáiz 2002). Spanish viceroys conferred dozens, perhaps hundreds, of exclusive privileges to inventors and innovators of new practices through the long colonial era (Sánchez Flores 1980). Like the exclusive privileges used to promote innovation and protect economic activities in early modern Europe, these colonial *privilegios* conferred vaguely defined and loosely regulated privileges to a wide range of new techniques and activities (David 1992; Beatty 2001). In Portuguese America, the Charter of the Prince Regent João VI, enacted in Brazil in 1809, constituted a first attempt for establishing a general legal framework for granting fourteen-year privileges to inventors and producers of new machines (Barcellos 2010).

Following independence from Spain and Portugal in the 1820s, political and business leaders in Latin America viewed the acquisition of new technologies from abroad as central to any vision of national progress (Rodríguez 2006; Medina 2011; Medina, da Costa Marques, and Holmes 2014; Sarlo 1992; Tenorio 1996; Beatty 2015). Most of Latin America's new nations initially inherited Ancien Régime practices—the nonnormalized privilege system—with Spain's first modern patent laws of 1820 and 1826. Subsequently, every Latin American country adopted their own legislation: Brazil in 1830, Mexico in 1832, Chile in 1840, Venezuela in 1842 and 1860, Paraguay in 1845, Colombia in 1848, Uruguay in 1853, Bolivia in 1858, Argentina in 1864, and Peru in 1869 (Aracama-Zorraquín 1971; United Nations 1975; Vidaurreta 2007). Surviving colonial territories such as Cuba and Puerto Rico remained under Spain's 1826 patent law, formally adopted in both islands in 1833 (Fernández-de-Pinedo, Pretel, and Sáiz 2010).

These early Latin American laws, like those in many European latecomers, established rudimentary legal statements concerning the protection of technologies. Patents or privileges were granted for ten to twenty years, depending on the country, without technical exams (in some countries, such as Chile, Argentina, and Cuba, commissioner reports were required). All had compulsory working or implementation clauses, and all allowed patents for the introduction or importation of machines or industries, even when they were not specifically mentioned in the law (Mayor 2005, 80–83). These legal texts did not differ very much from the first European patent laws, which mainly followed the revolutionary French tradition and differed from the US model. There were substantial differences in the administration and enforcement of patent laws; similar legal texts in distinct contexts may produce very different results.

Moreover, through the half century following independence, administrative frailty and relatively weak market demand for technological innovation in the Latin American economies meant that these early patent laws were little used and patenting was haphazard and infrequent, rarely exceeding a dozen or so grants a year, and often fewer (**Figure 1**). When the rising tide of Atlantic trade and investment began lifting Latin American economies after about 1870 or so, governments in the region joined an international movement to reform and standardize patent legislation and to more vigorously promote technological innovation. Venezuela adopted a new patent law in 1878, Brazil in 1882, Uruguay in 1885, Mexico in 1890 and 1903, Colombia in 1902, Argentina in 1903, Bolivia in 1916, and Paraguay and Chile in 1925 (in the last case after several amendments throughout the 1880s and 1890s). Similarly, Peru introduced improvements to its 1869 patent law in 1896, while Cuba and Puerto Rico adopted in 1880 the new 1878 Spanish patent law (Beatty 2002; Escobar 2014; Vidaurreta 2007; Kresalja 2009; Cristaldo 2009, 11). Patent laws were passed for the first time in Ecuador in 1880, Guatemala in 1886, Costa Rica in 1896, Nicaragua in 1899, the Dominican Republic in 1911, and Honduras and El Salvador in 1913 (Reyes 2006; Guerra 1886, 350–353; Palacios 1997; Secretaría de Estado de Fomento y Comunicaciones de la República Dominicana 1917; Congreso Constitucional de la República de Costa Rica 1896).

During this second stage, divergence among Latin American patent laws increased. Mexico, for instance, abandoned patents of introduction and compulsory working clauses and converged with the US model. Some countries quickly joined the International Union for the Protection of Industrial Property, and others remain outside for decades. Differences in national histories, geographies, industries, and relationships with the North Atlantic powers also shaped local patent regimes and practices. In all countries, patent agents became increasingly essential to navigate the particularities of national systems.

Through the late nineteenth century, patenting applications rose rapidly as a result of the increasing supply of new technologies from the North Atlantic, rising demand for innovation within Latin America, and a reformed institutional basis for patenting in many countries. Applications came from foreign inventors and firms as well as from local tinkerers, inventors, speculators, and firms (see **Figure 1**). Brazil, for example, conferred nearly 9,000 patents between 1882 and 1914, Argentina nearly 12,000 between 1866 and 1914, and Mexico about 15,000 between 1872 and 1914, while Cuba awarded about 4,500 patents from 1830 to 1914—apparently independent of the Spanish imperial system even before 1898—and Chile about 3,600 from 1840 to 1911 (World Intellectual Property Organization 1983; Federico 1964; Fernández-de-Pinedo, Pretel, and Sáiz 2010; Castillo and Álvarez 2010, 48).

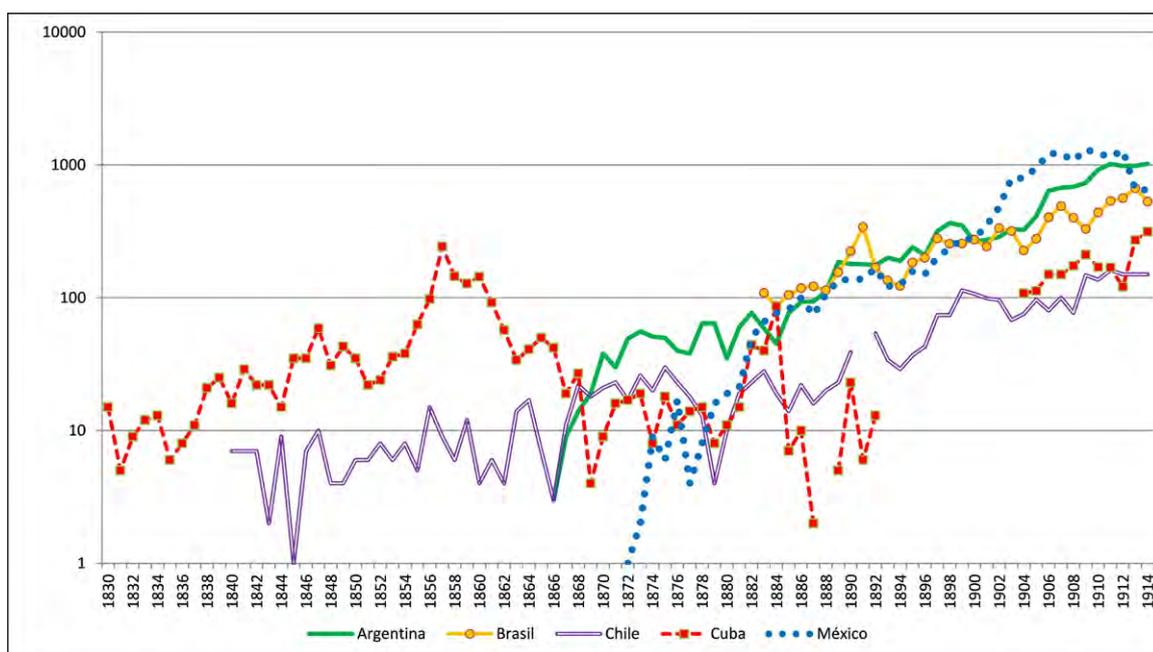


Figure 1: Patent grants in Argentina, Brazil, Chile, Cuba, and México (1830–1914).

Source: World Intellectual Property Organization 1983; Federico 1964; and ongoing databases for Argentina, Cuba, and Mexico.

What exactly do the thousands of patents issued by Latin American governments represent, and how can scholars use patent records to investigate technological change in the region's past or present? Scholars typically care about two aspects of technological change: its origins, or understanding the creative process of invention and development, and its effects or outcomes, or understanding the commercial innovation, use, and the diffusion of new techniques and products, and consequently the impact of technological change on productivity, growth, and welfare. Although invention and innovation are fundamentally distinct activities, patents offer a window onto both, but they do not give us an entirely clear or full view.

A patent presents a snapshot of just one moment in a much longer stream of activity—they capture only the information that the applicant deems necessary to register their claim of producing new knowledge. Patents provide little direct commentary on what happens “upstream” of the application: inventive activity, or the efforts of inventors and firms to develop new ideas and techniques through serendipity, trial and error, or systematic research and development. Nor do they offer any glimpse of what happens “downstream” of a patent's conferral: innovative activity, or placing new techniques into commercial use as investors and entrepreneurs work to buy and sell patent rights, integrate new tools and methods and machines into productive activity, and place new products in the market. Patent documents typically offer little or no direct indication whether the invention is ever commercialized. As a result, patent records offer only a weak proxy of both inventive and innovative activity; the relationship between patent evidence and patterns of invention and innovation is “erratic and tangential at best” (Macleod 1988, 157). Skeptics and proponents alike offer multiple reasons for caution: not all inventions are patented or patentable; not all patents actually represent new and useful inventions; patents treat all inventions equally, even though they can range in commercial value from the fundamental to the frivolous; the propensity to patent can vary widely by industry, country, and technology; and what is described in the patent application is often not what actually constitutes the useful invention (Pavitt 1988; Griliches 1990; Archibugi and Pianta 1996; Sokoloff 1988). These caveats are amplified when patents are conferred under simple registration systems—typical in nineteenth- and twentieth-century Latin America and elsewhere—without undergoing examination for novelty and utility. Vaguely defined and poorly enforced patent rights may do more harm than good. Despite the appearance of clarity and specificity conveyed by the technical descriptions and drawings in patent documents, they offer the historian only a blurry and indirect representation of the inventive and innovative activities that they purport to represent.

Nevertheless, scholars have made judicious use of patent evidence to examine invention, entrepreneurship, technological innovation, and broader economic trends in many countries. Two approaches are common. First, scholars have used patent documents in their studies of inventors, industries, sectors, and firms, as well as in social or cultural histories of science, technology, invention, and entrepreneurship. Patent documents typically contain certain kinds of information. At a minimum, these include the name(s) of inventors (individuals or corporate), their residence and/or nationality, a short description or title of the claimed invention, a patent number, and the date of application and/or conferral. Patent laws typically require a “specification” of the claimed invention—a technically detailed description of the claim of novelty, together with technical drawings. Accompanying materials may also contain information on applicants' occupation; records of sale, transfer, assignment, and licensing; as well as administrative memos and correspondence. Administrative or judicial records of opposition, infringement, or nullification suits can complement and extend the record of the original patent files. In the North Atlantic, scholars have used patent records in a wide variety of histories and technology studies. Some have built social histories of innovation on extensive use of patent records, while others have used them in a more anecdotal fashion, to augment or complement other kinds of historical materials (e.g., Thompson 1989; Cooper 1991). Until now, Latin American historians have not had easy access to patent documents.

Second, patent statistics enable historians to examine the rise and fall of patenting activity across time as well as differential patterns across industries or sectors. But what exactly do patent statistics represent? Although skeptics question whether a “bad approximation [of inventive activity] such as patent statistics is better than no approximation at all” (Mokyr 1990, 251), others conclude that “patents reflect a meaningful . . . proportion of the total amount of inventive activity carried out, and much of their variation mirrors corresponding differences in the resources devoted to invention” (Sokoloff 1988, 819). Scholars working with patent statistics in several countries have generally found a close and consistent relationship between patenting trends and other indicators of economic activity across sectors, countries, and time (Schmookler 1966; Nelson 1962; Dutton 1984; Sullivan 1990; Sokoloff 1988; Beatty 2001). Like investment in inventive activity and in technological innovation generally, investment in patent rights reflects patentees' interest

in profitable returns—their interest in new economic opportunities. Trends in patenting statistics provide a rough indication of the changing level and direction of interest in innovation, often the only indication available.

As in many parts of the world, Latin America's early patent systems simply registered applications. Only the United States, Germany, and Sweden instituted rigorous examination systems in the nineteenth century. This does not mean that patent statistics in countries with registration systems are useless, as studies of the UK evidence demonstrates (e.g., Macleod 1988; Macleod et al. 2003). Indeed, we need further studies of Latin American patenting experiences to better understand the relationship between patent data and questions of inventive and innovative activity. For instance, the thousands of patents conferred in Latin America to individuals and firms from the North Atlantic can help us examine critical questions of foreign investment across countries and industries, as well as corporate technology strategies, business practices, importing practices, and many other issues. Domestic inventive activity and innovative entrepreneurship in low-tech countries are also key issues, and patent data will help us understand the technological and entrepreneurial niches targeted by local inventors and businesses, as well as the ways in which local technicians in Latin America responded to the great wave of foreign imports during this era of intense globalization.

Like all kinds of qualitative or quantitative evidence, patent data and statistics must be used with caution. Longitudinal analyses of patenting trends, for example, must account for legal reforms that change the cost or the criteria for patenting, and thus alter the propensity to patent. Cross-sectional comparisons must account for differences in patenting behavior across industries and sectors. Comparisons between countries are particularly problematic, given large institutional differences in patenting costs, procedures, and criteria as well as in social contexts, among other factors. We need to know more about the gap between patent applications and patent conferrals, and about the duration, termination, and enforcement of patent rights. We need to better understand critical differences in patent scope and quality, both within and between countries. In other words, patent records provide a blurry but nonetheless useful window onto the dynamics of technological change. Individually, patent documents offer an additional source of archival information that can enrich accounts of inventive and innovative activity. In the aggregate, patent statistics offer a measure of interest in upstream invention and downstream innovation across sectors and through time; they represent one window onto the stock of new ideas available for commercial use in Latin America. More research is necessary, and patent records provide the essential foundation for this work.

Patents Records in Latin America

If scholars in the technology-producing and technology-exporting nations of the North Atlantic have argued that patents offer some reflection of inventive activity, this is far less clear for the technology-importing nations of Latin America. For more than a century, between 50 percent and 90 percent of all patents conferred in Latin American countries have gone to foreign applicants (Beatty 2002, table 3). This was little different, of course, from the experience of most relatively late industrializers in Europe, like Spain and Norway (Sáiz 2002; Basberg 2006). What exactly do these foreign patents represent? Some represent a direct interest in technological innovation in Latin America, and others represent efforts to stake out export markets, with little or no interest in direct innovation.

At the same time, patenting by domestic applicants was not insignificant. Individual and corporate inventors and entrepreneurs in Latin America applied for and received thousands of patents, including many that engaged global frontier technologies or actively pushed the frontier of particular industries. Some domestic patents reflect significant pockets of localized inventive activity, as inventors developed new techniques or new products. Others reflect ways in which foreign advances stimulated local responses: to copy or imitate foreign technologies; to extract rents from foreign firms; to “patent around” foreign patents; or to modify, adapt, or innovate foreign advances. In other words, individual patent records and aggregated patent statistics in Latin America do not necessarily reflect the same kinds of activities as patents in the North Atlantic, and the questions facing scholars interested in the dynamics of technological change are very different. In an economic and cultural environment dominated by technology imports, inventive activity recedes into the background while questions of innovation—the acquisition, adaptation, use, diffusion, and replication of imported knowledge and techniques—become more central. From the first efforts to introduce railroads, steam engines, sewing machines, and typewriters in the nineteenth century to the manufacture and marketing of consumer electronics, genetically modified plants, and pharmaceuticals today, so-called technology transfer has been at the center of technological change in Latin America (e.g., Beatty 2015; Shadlen 2009).

Yet despite the utility of patent records as evidence, few scholars of technology, business, entrepreneurship, or culture in Latin America have used them extensively. In large part, this is because national patent

records have often not been available, searchable, or easily compiled. Indeed, one of the reasons we have relatively few systematic studies of the history of technology and business in Latin America is the relative scarcity of firm-level archives and historical documents—like patents—that can provide a window onto inventive, innovative, and entrepreneurial activities. Patent records in Latin America are often difficult to locate and access, especially for the nineteenth and early twentieth centuries. Archival collections of original patent application materials are often incomplete and fragmentary, and rarely indexed. As a result, it has been difficult or impossible to locate patent records on specific inventors, industries, or technologies, and nearly impossible to compile patenting statistics and assess longitudinal or lateral patenting trends.

We have compiled new and comprehensive databases of patents issued in nineteenth- and twentieth-century Latin America. Inspired by Patricio Sáiz's (1999) project to organize and present more than 150,000 Spanish patents issued between 1826 and 1939 (available at <http://historico.oepm.es>), and envious of the rich and accessible patent evidence available to researchers in the North Atlantic and especially in the United States, we hope that our efforts will support similar endeavors to catalog and compile patent records and patenting histories in the region. Although we began this work to support our own research on Argentina, Cuba, and Mexico, we are making our data publically available for use by other scholars, and we seek to expand this effort to the rest of Latin America. Here we offer a brief introduction of our efforts to date.

Argentina (Yovanna Pineda)

The Argentine database is an ongoing project that will eventually contain data on all patents issued in Argentina from 1866 to 1982. Currently, the data set includes nearly twelve thousand patents issued between 1866 and 1914. There is no single archival or published work for Argentine patents until the early twentieth century. Patent notices were printed in various government publications and periodicals—such as the *Boletín Oficial*; *Monitor de Sociedades Anónimas*, and the 1910 volume *Patentes de Invención, Nómina de las patentes concedidas, clasificación de su archivo, etc., Años 1866 a 1900*—as well as in two specialized serial publications: *Patentes de invención y marcas de fábrica, de comercio y de agricultura* and *Patentes y Marcas: Revista sudamericana de la propiedad intelectual e industrial, patentes, marcas, enseñanzas, obras artísticas y derechos de autor*. These latter two series are available at three locations for on-site consultation: in Argentina at the Instituto Nacional de la Propiedad Industrial (INPI, <http://www.inpi.gov.ar>), at the New York Public Library (<http://www.nypl.org>), and at the British Library (<http://www.bl.uk>; search catalog for “Argentina: Intellectual Property Documentation”). Beginning in 1990, INPI has listed patent records online.

The main database fields include the following: (1) date issued; (2) name of patentee(s); (3) brief description of the invention; (4) expiration dates; (5) patent type (e.g., new, renewal, foreign revalidation, transfer); (6) region or home location of the patentee, if available; (7) legal status (individual or corporation); (8) country of residence; (9) nationality; (10) patent term; (11) gender, when available; (12) patent agent, if applicable; and (13) patent number. Additional patent data include notices of rejections, transfers, renewals, and annulments for failure to use within two years.

Cuba (Patricio Sáiz and Nadia Fernández-de-Pinedo)

The Cuban patent database collects and systematizes patents granted on the island during the nineteenth century. From 1833 to 1898, Cuba remained under Spanish command, which included the enforcement of the 1826 and 1878 Spanish patent laws that were extended to Cuba in 1833 and 1880, respectively. Hence, the Spanish patent system developed an independent patent grant just for Cuba (as occurred with Puerto Rico and Philippines) that, though integrated in a single system after 1878, was de facto separately managed. Notwithstanding the possibility of taking a patent for the Cuban territory from Madrid, the distance and the delay caused by patent administration from the peninsula facilitated autonomous patent management, meaning that the full process of application, grant, and administration of the majority of Cuban patents was executed by local governments on the island.

Thus, organizing a nineteenth-century Cuban database requires consulting archives and libraries on both sides of the ocean. At the Oficina Española de Patentes y Marca (OEPM) headquarters in Madrid, there are approximately five hundred files related to Cuban patents (or to Cuban residents) before 1898, and in the Sección de Ultramar of the Spanish Archivo Histórico Nacional, also in Madrid, there are several bundles with lists and news from patents issued within the Cuban territory. However, the majority of Cuban patents never reached Spain. The register books and original files are in Havana at the Archivo Nacional de la República de Cuba (ANRC) distributed among the following sections: Gobierno Superior Civil, Real Consulado y Junta de Fomento, Gobierno General, Intendencia General de Hacienda, and Reales Cédulas y Órdenes. The patent files were separated and many technical drawings and descriptions are in the ANRC's *mapoteca*. The

collection continues at the Oficina Cubana de la Propiedad Industrial, where there are a hundred historical files from 1867 to 1906, and the entire patent series from 1907 onward. The *Boletín Oficial*, published from 1906, is also an essential source.

Data collection at Cuban institutions, especially at the ANRC, has been very complex, and the Cuban historical database still needs verification and improvement. Nevertheless, we have approximately 2,500 patent records cataloged from the 1830s to 1898. The main database fields include the following: (1) name of the applicant(s); (2) legal status (individual or corporate); (3) gender, when available (4) nationality, (5) residence, (6) province, and (7) country of residence, as well as (8) profession and (9) agent of the applicant, and then (10) a brief description of the invention; (11) patent type; (12) patent term; (13) application, (14) grant, and (15) expiration dates; as well as (16) sectorial and (17) international patent classifications; and finally (if any) (16) assignments and (17) legal disputes.

Mexico (Edward Beatty)

The Mexican database collects data on all patents issued in Mexico from the 1830s to the onset of the Mexican Revolution in 1911, totaling approximately fourteen thousand. Data collection was supported by a grant from the National Science Foundation (No. 0217001). There is no single archival or published source for Mexican patents issued over the course of the long nineteenth century. The *ramo* “Patentes y Marcas” in the Archivo General de la Nación (AGN) contains files on only about 1,400 patents, or one-tenth of the total issued. Many of these files represent rich sources of detailed evidence on inventions and patent claims by applicants, containing application letters, technical drawings, administrative notes, and sometimes additional materials. Jorge A. Soberanis (1989) presents a catalog of these materials in his “Catálogo de patentes de invención en México durante el siglo XIX (1840–1900): Ensayo de interpretación sobre el proceso de industrialización del México decimonónico” (see also López Mendoza 1988; Mendoza Solís 2014). But the materials in the AGN represent only a small fraction of the patents issued by Mexican governments over the course of the century and thus offer no useful guide to broader patterns or trends.

Compiling a comprehensive database required consulting the daily, monthly, or annual volumes of four publications: the *Memorias* of the federal Development Ministry and annual volumes of Dublán and Lozano’s *Legislación Mexicana* for the period before 1890; the *Diario Oficial de la Nación* from 1890 until October 1903, and the *Gaceta Oficial de Patentes y Marcas* from 1903 to the onset of the Mexican Revolution in 1911. Locating every monthly volume of this last publication required visiting libraries in Mexico City, Washington, DC, New York, and Boston. Each of the approximately fourteen thousand records in the database contains (1) the name of the applicant(s) or inventor(s), (2) the applicant’s legal status (individual or corporate) and (3) nationality, (4) a brief description of the patent, (5) the legal date of issue, and (6) patent number. Many records also contain information (7) on the residence of the applicant, (8) whether the applicant employed a patent agent, and notations on (9) patent terms, (10) renewals, (11) fees, and (12) official classification by economic sector. Researchers interested in patenting activity during the mid- to late twentieth century can begin their search by using the digitized *Gacetas* available on the website of the Instituto Mexicano de Propiedad Industrial (IMPI), at <http://siga.impi.gob.mx>.

Conclusions

If technology and the dynamics of technological change constitute significant research issues for multiple fields—including social, economic, business, and cultural approaches—then patents offer one source of historical evidence. Although patents must be used cautiously, they can contribute to our understanding of the origin, evolution, and consequences of the social and technological bases for innovation. Individually, patent documents can illustrate brief moments in the movement of new ideas from invention to commercialization; in the aggregate, patent data offer an indication of entrepreneurial interest in innovation across time and across economic activities.

While patents and patenting trends have been widely analyzed in North Atlantic countries—those producers and exporters of technology through the past two centuries—they have been largely neglected in Latin America and in other technology importers. Yet many Latin American countries adopted their own patent legislation very early in the nineteenth century, and all had developed intellectual property regimes before World War I. As a result, as in Europe or the United States, patent documents and long patent series are available in Latin American archives and patent offices.

In this research note we have presented an ongoing effort to build and organize historical patent databases in Latin America, beginning in Argentina, Cuba, and Mexico. Although we have established contact

with scholars developing similar work in Chile, Colombia, and Peru, this research note is also a call for collaboration in the field to widen the project scope by adding other Latin American countries and to consider connections with other intellectual property rights realms such as trademarks and industrial design. We offer open access to our patent databases as we create and expand a common website as a Spanish–Latin American patent hub, where we hope to extend the geographical and temporal scope of the databases and to include new material and sources. Researchers may contact the authors and for updates see <http://www.ibcnetwork.org>.

These patent databases and the website itself will allow scholars, policy makers, and graduate students to use the data to debate issues of invention, intellectual property rights, and technology, and to write articles or monographs across disciplines. In countries where such accessible databases already exist, scholars have shown the possibilities that patent research offers. These new patent databases will help close the gap in the literature that tends to focus innovation studies on the developed nations of the world.

Acknowledgements

We acknowledge research funding from the following sources: the Oficina Española de Patentes y Marcas and the Universidad Autónoma de Madrid collaborative agreement for cataloging and studying of the historical archive of patents and trademarks (1999–2014), the Spanish research and development project Scientific Culture, Perception, and Attitudes towards Science and Innovation in the Spanish Business Sector (CSO2014-53293-R), and the US National Science Foundation (Award No. 0217001).

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How to cite this article: Beatty, E, Pineda, Y and Sáiz, P. Technology in Latin America's Past and Present: New Evidence from the Patent Records. *Latin American Research Review*. 2017; 52(1), pp. 138-149. DOI: <https://doi.org/10.25222/larr.46>

Submitted: 19 February 2015

Accepted: 31 August 2015

Published: 19 July 2017

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