Impediments to the Schumpeterian Process in the Replacement of Large Firms

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Abstract

Using newly-assembled data encompassing up to 75 countries and starting circa 1910, we find that the Schumpeterian process of creative destruction aptly describes the replacement of large firms by other firms, but exceptions to the norm of replacement are not rare. We document that initial firm size and political connections represent the main obstacles to the "destructive" part of the Schumpeterian process. Consistent with a theory of political capture, when accompanied by regulations that restrict entry, political connections play a formidable role in abetting large firms remaining large. When connected to Fogel et al. (2008) our results imply that political connections, in combination with barriers to entry, retard economic development.

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It is well recognized that the Schumpeterian process of "creative destruction," in which innovations are incessantly launched by new firms, leads to economic growth.[1] Fogel, Morck, and Yeung (2008) focus on the "destructive" part of this process by investigating the replacement of the largest 10 firms by new large firms during 1975-1996 in 44 countries. They document that the "destructive" part of the Schumpeterian process also leads to greater economic growth. Nevertheless, they find that, in Finland, Germany, Japan, and Switzerland, only three of the largest 10 firms were replaced. In comparison, in the U.K. and New Zealand, eight of the largest 10 firms were replaced. If replacement is so beneficial, why is it not more ubiquitous?

In a frictionless Schumpeterian world, the replacement of large firms should be the norm as the dominance of large firms is naturally and inexorably eroded over time as innovations are launched by new entrants (Schumpeter (1911, 1934, 1942)), and exceptions to the process of replacement should be "rare." In contrast to this view, two of Schumpeter's contemporaries, Steffens (1906) and Brandeis (1914, 1934), both of whom perceive big business as an evil to be combatted, argue that the biggest firms are able to entrench their positions by stifling entry.

Steffens (1906) observes that large firms maintain their positions of dominance by exercising power over the political process. That perspective was anticipated in the famous cartoon published in Puck on January 23, 1889, and republished in many economics textbooks, showing tiny legislators overseen by bloated business bosses.[2] Such observations presaged the later development of the capture theory of regulation in Stigler (1971) and extended by Peltzman (1976) in which large business enterprises exploit the regulatory process to their advantage by, among other ways, erecting regulatory barriers to entry.

[1] Grossman and Helpman (1991), Aghion and Howitt (1992), King and Levine (2003), Kogan, Papanikolaou, Seru, and Stoffman (2017).

[2] Steffens' writings and writings by other political economists are often credited with passage of the Sherman Antitrust Act (1890) and the Clayton Act (1914) that outlawed monopolies and other anticompetitive business practices.

In a slightly different spirit, Brandeis (1914, 1934) views economic activity as being dominated by "money trusts" that are connected by interlocking boards of directors, particularly those involving banks, that allow big business interests to suppress rival entrants and, thereby, remain big. To exemplify this narrative, Brandeis points to J.P. Morgan & Co. and its associates as holding "such financial power in at least thirty-two transportation systems, public utility corporations and industrial companies."[3]

Although Schumpeter proposes that, in the normal course of economic events, the founding entrepreneurs of large enterprises may reap rents for up to a few decades, he also theorizes that, although rare, some firms may remain large for extended periods by establishing cultures of creativity that support innovation. Tata Sons Private Limited is often portrayed as such a case.[4] The company, established in 1868 by Jamsetji Tata as an opium and tea trading company, subsequently ventured into iron and steel, chemicals, motor vehicles, energy production, and telecommunications and, in 2018, was the largest firm in India.

With that as background, we investigate two questions. First, worldwide, how pervasive are exceptions to the Schumpeterian process of replacement among large firms over different time intervals? Second, to the extent that exceptions to the process are not rare, what factors impede the Schumpeterian process of new large firms replacing the old?

In addressing these questions, we start with a manually assembled sample of the 20 largest firms in each of 60 countries and colonies (that later became countries) circa 1910. We focus on the largest firms in each country because those firms disproportionately contribute to their

[3] Brandeis (1914), p. 12.

[4] According to Graham (2010), "J.R.D. Tata, who was chairman [of Tata Sons] from 1938 to 1991…nurtured its reputation for integrity and innovation" and Masani (2015) states "[R. Gopalakrishnan] chaired Tata Group Innovation Forum (TGIF), a Tata Sons Ltd offspring mandated to positively influence the culture of innovation in all Tata companies."

country's economic output. (Focusing on the largest firms also enables us to compare our results with those in Fogel et al. (2008)). We continue our analysis with two more recent time intervals, one starting with 1980 and the other with 2000, both of which end with 2018. For these more recent time periods, we use a variety of data sources, including manually collected data on boards of directors and political connections, and financial data from commercial databases. The virtue of data from circa 1910 is that this ten-decade-long interval gives the Schumpeterian process an abundance of time to create and destroy. The second and third time intervals, though shorter than a century, still allow the Schumpeterian process decades to prevail.

Consistent with Schumpeter's proposition, worldwide, the replacement of old large firms with the other large firms is the norm in each of the time periods considered. However, contrary to Schumpeter's proposition, exceptions are not rare.[5] Exceptions represent 13.6% of the 20 largest firms in each country over the century-long time period, increasing to 25.0% of the largest firms over the four-decade period of 1980-2018, and increasing further to 43.8% of the largest 20 firms over the nearly two-decade interval of 2000-2018 (a figure that is very much in line with Fogel et al.'s figure for the 21-year sample of 1975-1996).

Why are exceptions so pervasive? We first consider the proposition set forth by Steffens and Brandeis that the biggest businesses are able to entrench their positions and, thereby, remain dominant over long time periods. Consistent with this proposition, we find that the largest of the large firms are disproportionately more likely to remain dominant. For example, in our base case regression, a one standard deviation increase in the book equity of one of the largest 20 firms in

[5] We recognize, of course, that what constitutes a "rare" event lies in the eyes of the beholder. The U.S. Rare Diseases Act of 2002 (https://www.congress.gov/bill/107th-congress/house-bill/4013) defines as a "rare disease" any disease affecting fewer than 200,000 persons in the U.S., i.e., fewer than 1/1,500. The European Commission on Public Health uses a threshold of 1 in 2,000 persons to define the concept of "rare diseases" (see, e.g., Baldovino, Moliner, Taruscio, Daina, Roccatello (2016)).

1910 increases the likelihood of that firm remaining among the 20 largest firms in its country over 100 years later by 6.9 percentage points, from 13.6% to 20.5%. Firm size continues to be highly statistically and economically significant in explaining whether a large firm remains among the largest 20 in its country over the other two time intervals.

How do the biggest firms remain big over extended periods of time? The results show a statistically and economically large impact of political connections, but only limited roles for innovation and board interlocks. As an example, being politically connected circa 1910 increases the likelihood of a large firm continuing to be one of the 20 largest firms in its country over 100 years later by 11.5 percentage points, a result that is both economically and statistically significant.

The results provide little support for the proposition that a culture of innovation allows big firms to remain big for a century. However, for the shorter time intervals, our proxy for innovation is statistically significant in 14 of the 18 models, lending some support to the proposition that firms can remain large by fostering a culture of intra-firm innovation.

As regards board interlocks, for the 1910 sample, for each firm, we count the number of other large firms with which the firm shares officers or directors. If a firm's nexus of interlocks includes a bank, this count is also the firm's number of bank-board interlocks. For neither the 1910 nor the 1980 samples are board interlocks or bank-board interlocks significant. In contrast, a higher number of interlocks, including bank-board interlocks, in 2000 results in a significantly higher probability of a firm being among the 20 largest in its country 18 years later providing some, albeit limited, support for Brandeis's proposition.

The positive correlation between political connections and subsequent firm size could be the result of politically connected firms being the best firms and remaining large because they are the best, rather than because of their political connections. To tackle this concern, we augment our

specifications with firm profitability, measured as return on equity (ROE), and firm growth opportunities, measured as the ratio of the market value of equity to book value of equity (M/B), as two measures of firm quality. We further augment the regressions with other control variables, as well as a variety of fixed effects to reduce alternative sources of confounding variation. The fixed effects include country and industry fixed effects, and, in some of the specifications, country x industry fixed effects. The positive relation between the propensity of a firm to remain among the largest in its country and political connections continues to be positive and statistically significant in a well-identified setting that includes all of these controls and fixed effects.

Could it still be the case that the politically connected firms are the best but we fail to adequately control for firm quality? To address this possibility, we start by recognizing that, differently from the best firms, weak firms cannot remain large when the destructive forces of competition are at work. However, barriers to competitive entry may enable weak firms to remain large. In the absence of restrictions to cross-border competition, barriers to domestic entry are insufficient. A necessary condition for weak firms to remain large is that cross-border entry be limited. *À la* Rajan and Zingales (2003), we propose that cross-border competition requires open borders to trade and access to capital. We investigate whether politically connected firms are disproportionately more likely to remain large when regulatory barriers to cross-border entry and to cross-border capital flows are in place.

We find that they are. Specifically, our tests show that openness to cross-border capital flows and openness to cross-border trade reduce the ability of politically connected incumbents to remain dominant over extended periods of time. These results are consistent with regulatory barriers to entry and barriers to cross-border capital flows being mechanisms that allow politically connected firms to impede the Schumpeterian process.

Our study connects to prior research on the effect of barriers to entry on the start up of new businesses (Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002), Klapper, Laeven, and Rajan (2006)), the role of political connections in shaping regulatory decisions affecting business firms (Kroszner and Stratmann (1998), Faccio and Zingales (2019), Akcigit, Baslandze, and Lotti (2020)), and the role of political connections and bank-board interlocks in affecting preferential access to capital (La Porta, Lopez-de-Silanes, and Zamarripa (2003), Sapienza (2004), Faccio, Masulis, and McConnell (2006), Khwaja and Mian (2005), Morck, Yavuz, and Yeung (2011), Houston, Jiang, Lin, and Ma (2014)).

As we highlight in the opening paragraph, the Schumpeterian process of creative destruction is often associated with evolutionary economic development and growth. One manifestation of that process, and the one that we study here, is whether, within countries, large incumbent firms are replaced by new large firms. Despite the salutary benefits of the process, we find evidence of factors that systematically impede the replacement of large firms from occurring. Specifically, political connections facilitate the ability of big companies to remain or become big, albeit only when their home country is closed to both trade and capital flows. The presence of regulatory barriers to entry appears to be a necessary condition for politically connected firms to remain or become dominant.

I. Data

I.A Circa 1910

We label our data as commencing circa 1910 rather than commencing in 1910 because certain of the data sources are not available in that year. We use the data source that is available and that is closest in time to 1910. The years range from 1900 to 1925.

Company size is a critical variable in our analyses. We measure size as the book value of

equity. We do so because, for 1910, that variable is far more frequently reported than are other potential measures of relative business size. Further, for the years 1980 and 2000, book value of equity correlates well with net income, operating income, book value of assets, revenues, and number of employees.[6] Thus, given our objective of measuring firms by relative size within a country, book value of equity works well. For each country, we gather data on the 20 largest companies, requiring a minimum of book equity data to be available for 10 companies for the country to be included in our 1910 sample.[7] This results in a sample of 1,115 firms from 60 countries for which book equity data are available. Appendix A lists the countries.

We use the term country to indicate a "modern-day country" that exists in 2018. Some of these countries were colonies circa 1910 and a few were part of a larger country at that time. For example, Azerbaijan was part of the Russian Empire. The data sources employed often provide the address, or, at a minimum, the main area of operations, of each firm. We use Google searches to determine the modern-day country to which each firm's address corresponds.

Online Appendix A lists the 56 sources that we employ to collect data on the book value of equity and business addresses circa 1910. The bulk of these sources are country-specific business directories. A starting point for identifying these directories is Hannah (2015). We supplement his initial list through library and internet searches. The vast majority of these sources are scanned paper directories and in a number of instances the directories cover both publicly-traded and privately-held businesses. When covered in the directories, we include both types of firms in our 1910 sample.

These directories report the names of top officers and directors for all but a few of the

[6] The correlations between book equity and these other measures of size range between 0.48 and 0.99.
[7] The sample includes 10 firms in Bolivia, 19 in the Democratic Republic of the Congo, 12 in Ecuador, 10 in the French Guiana, 10 in Guinea, 14 in Kenya, 11 in Luxembourg, 11 in Peru, 18 in Senegal, 10 in Uzbekistan, and 10 in Venezuela.

largest firms in 44 countries. We use this information to identify each instance in which an officer or director of a large firm is an officer or director of another large firm in the same country. We then count the number of other large firms with which the firm has a common officer or director. If the firm's nexus of interlocks includes a bank, this count is also the firm's number of bank-board interlocks. While our classification captures interlocks with banks that are among the top 20 firms in each country, it misses interlocks with smaller, but still large banks. For example, Brandeis (1914) characterizes J.P. Morgan & Co. as being the hub of a nexus of connected firms. Because J.P. Morgan is not among the largest 20 U.S. firms in 1910, that set of bank-board interlocks is not captured by our variable.

For 17 of the countries, the directory also identifies at least one instance in which a board member holds or held a political office at some point in time. If so, we assume that the directory gives that information for all firms for which officers and board members are provided. For the US and Canada, the board directories provide no information on board members' political experience. For these two countries, however, we do have directories of US congressmen and Canadian parliamentarians. We match these with lists of board members to identify potential political connections. We, then, conduct a Google search to ensure that the board member and the parliamentarian are the same person circa 1910. We define a political connection as any instance in which a director or officer of a large firm is a member of the central government or a member of the parliament of its country (in the case of former colonies, political connections include politicians from the ruling country that are officers or directors of the firm). In total, we have political connections for 19 countries circa 1910.

The book equity in most business directories is given in the currency of the firm's country of incorporation. We use Rodney Edvinsson's (2016) Historical Currency Converter, Lobell

(2010), and the Ministère des Finances's Annuaire Statistique de l'Egypte (1910) to convert these to US dollar equivalents.

We undertake searches of company histories through Wikipedia, Google, and the London Stock Exchange "Register of Defunct and Other Companies Removed from the Stock Exchange Official Year-Book." In instances in which the company changes its name (for example, in 1998, the Compagnie Générale des Eaux changed its name to Vivendi), we continue the search with the new name. In instances in which two or more companies merge (for example, Banque Commerciale du Maroc merged with Wafa Bank to form Attijariwafa Bank), we continue with the name of the merged entity. In the case of acquisitions, we continue with the name of the acquirer, but only when the target firm is sufficiently large so as to be mentioned either in the acquiror's web page (typically under the acquiror's history) or in the acquiror's Wikipedia page (for example, the Eidgenössische Bank A.G. (EIBA) was, in 1945, taken over by the Swiss Bank Corporation). In some instances, we can find no information on the firm in any of these sources. In such cases, we assume that, as of 2018, the company is no longer in operation.

Our next step is to determine whether the large companies circa 1910 are among the largest in 2018 in each country. For countries included in Worldscope/Datastream, we compile a list of the 20 largest publicly-traded firms for which book value of equity is available. If one of the 20 largest firms from the 1910 list is among the 20 largest in its country in Worldscope/Datastream in 2018, the firm is eligible to be among the largest in 2018. Because Worldscope/Datastream in 2018 does not have book equity for some of the largest privately-held firms from 1910, we access Mergent, OneSource, and company websites to gather book equity in 2018 for these firms. From this combined set, the 20 largest firms in each country in 2018 are identified.

Of the 60 countries for which we can identify the 20 largest firms circa 1910, there are 10

that are not covered in Worldscope/Datastream as of 2018 or for which data in Worldscope/Datastream are not sufficient to create a list of at least the 10 largest firms.[8] In the analyses, we treat firms that were among the 20 largest in 1910 in these 10 countries, and that are still active in 2018, in three different ways. First, if we can retrieve book equity, from any source, for the firm in question, we assume that the firm is among the 20 largest. Second, we assume that none of those entities are among the 20 largest in their home country in 2018. Third, we exclude the countries with insufficient coverage in Worldscope/Datastream from the analyses.

We use the business directories to develop industry classifications with 14 broad industries.[9] The industry classification for some companies requires the authors' subjective judgement. As a measure of innovation, we adopt the protocol of Braggion and Moore (2013) to construct an indicator, new tech, in which a firm is assigned the value of one if the firm operates in one of five sub-sectors: Chemicals (bleaching powder, fertilizers, and explosives), Electricity supply, Electricity generation, Bicycle, or Motorcar, and zero otherwise. Firms are assigned the new tech indicator based on the description of the firm's business in the directories. Finally, we conduct internet searches of companies' histories to determine whether they became state-owned enterprises at any point following 1910.

I.B 1980s

We also consider two long but somewhat shorter time periods of analysis. The first is the nearly four decades of 1980 – 2018. It is possible that the Schumpeterian process of replacement of large firms by new large firms would appear to well-describe the circumstance over the 100-

[8] These are Algeria, Azerbaijan, Cuba, the Democratic Republic of the Congo, Guinea, Madagascar, North Korea, the Republic of the Congo, Senegal and Uzbekistan.

[9] The 14 sectors are: Agricultural, Alcoholic beverages and tobacco, Banks, Other financial, Commercial and industrial, Extractive, Gas, lighting, and water companies, Petroleum, Railroads, Other transportation, Real estate, Telecommunications, Trusts, and Various.

year interval, but, it is also possible that the process requires 99 years for such replacement to occur. We are interested in these shorter, but still long, time periods to assess whether the Schumpeterian process or its alternatives better describe the replacement (or lack thereof) of large firms through time.

We consider this second time interval for three reasons all of which are related to data availability. First, 1980 is the first year in which data on research and development (R&D) expense are available in an international commercial database. We use this as a more granular proxy of innovation. The database is Worldscope/Datastream from which we also gather accounting data, including book equity, market value of equity, net income, total assets, and firms' SIC industry codes. This data source includes primarily publicly-traded companies.

Second, 1980 is the first year for which data on officers and directors have been compiled in a single source for companies across a large set of countries. The data source is the inaugural issue of Moody's International Manual published in 1981, which provides officers' and directors' names for 2,897 entities. Using the same counting procedure as for the 1910 sample, hand-collected data from this source are used to determine, for each firm in the database, the number of board interlocks with every other firm in the database. Likewise, we follow the procedure used for the 1910 sample to count the number of firms within a firm's bank-board interlock nexus. The set of banks included in these data encompass a much larger set of banks than the circa 1910 data and, therefore, reduce potential attenuation bias in bank-board interlocks.

We further use the 1981 Moody's International Manual to supplement Worldscope/Datastream in cases in which a relevant data item is not available in Worldscope/Datastream. By combining the data sources for 1980, we have data on R&D for firms in 29 countries, and data on board interlocks and bank-board interlocks for 27 countries.

Third, because Worldscope/Datastream is an electronic database, we are able to extend the sample beyond the 20 largest companies in each country and conduct our subsequent analyses using all firms with data in Worldscope/Datastream. The virtue of the larger sample is that we can determine whether the replacement of old large firms is, at least in part, by smaller old firms as opposed to new firms. To identify the 20 largest firms in each country in 1980, firms are ranked according to their book equity in US dollars.[10] Similarly, using this data source, the 20 largest are identified for 2018. The 20 largest firms in 2018 in this analysis are slightly different from the 20 largest described in Section I.A because we consider only publicly-traded firms when using 1980 as the start point for the analysis. To track each firm over time, we use the unique identifier assigned by Worldscope.

I.C 2000

The third interval for consideration is 2000–2018. Of the three time periods considered, this is the richest in terms of data availability. For 2000, book equity along with other accounting data, industry SIC codes, and unique company identifiers are from Worldscope/Datastream for publicly-traded firms in 52 countries.[11] Data on political connections are available for firms in 47 countries from Faccio (2006) who considers a firm to have a political connection if one of the firm's large blockholders or top officers is a member of parliament, is the head of state, is a government minister, or is closely-tied to a top politician. The names of corporate officers and directors are hand-collected from the 2001 Mergent International Manuals. These names are used to count, as before, the number of other firms with which a firm shares officers or directors. The possible shortcoming of this time period is that it encompasses fewer years.

[10] In robustness tests discussed in Section VII.A, we show that our conclusions are robust to using net income as an alternative measure of size.
[11] Across three sample periods, as shown in Appendix A, the samples include firms from 75 countries.

To identify the 20 largest firms in each country in 2000, we rank firms by their book equity in US dollars. The 20 largest in 2018 are the same as described in Section I.B.

II. Empirical Results: Circa 1910 – 2018

To address Schumpeter's propositions that, over a period of several decades, the replacement of large firms by other large firms is the norm and that exceptions to that rule are rare, we calculate the fraction of the 20 largest firms circa 1910 that remain among the 20 largest firms in their respective countries 10 decades later. As shown in Panel A of Table 1, 13.6% of the 20 largest firms across the 60 countries for which we have sufficient data are among the 20 largest firms 100 years later. An implication that arises from this statistic is that, over this multi-decade interval, replacement of large firms by other large firms is, indeed, the norm. After all, of the 20 largest firms in 1910 across the 60 countries, more than 85% are no longer among the 20 largest by 2018. But, a second, important implication, is that exceptions to the norm are not rare. Indeed, perhaps astonishingly, 152 of the 1,115 largest 20 firms in the 1910 sample continue to be among the 20 largest in their home countries over 100 years later.

What are the impediments to large firms being replaced? Steffens and Brandeis assert that large firms have the power and the means to suppress competition. If this proposition is correct, large firms will remain large not by intra-firm innovation as proposed by Schumpeter but by the suppression of competition.

A measure of size for which we have data for firms in all 60 countries in 1910 is book equity. With this, we estimate linear probability models of the probability that one of the 20 largest firms in a country in 1910 was still among the 20 largest firms in its country in 2018. A key independent variable is the standardized natural log of book equity circa 1910.

To consider Schumpeter's idea that a firm can establish a culture of innovation that allows

it to overcome the natural forces of creative destruction to remain dominant, each specification in Table 2 includes the new tech indicator. The models also include country fixed effects. Because of the inclusion of country fixed effects, the coefficient of the natural log of book equity in 1910, and that of any other independent variable, shows how the dependent variable varies as the natural log of book equity in 1910, or the independent variable of interest, varies within a country. The inclusion of country fixed effects controls for any country-level time-invariant as well as time-varying factor, such as legal origin, cultural background, and events that occurred during the interval under consideration such as the rise of communism, world wars, pandemics, and so forth.

The results of the first regression are reported in column (1) of Table 2. The coefficient of size is positive and statistically significant. To consider the economic significance of size, a one standard deviation increase in the natural log of book equity increases the probability that one of the 20 largest firms in a country in 1910 remains among the 20 largest in its country by 6.50 percentage points. This compares with the 13.6% unconditional probability of a large firm remaining among the largest. Thus, size is also economically significant. In contrast, perhaps surprisingly, the new tech indicator, with a p-value of 0.67, does not approach statistical significance. Indeed, in only one of the 11 regressions reported in the table is our proxy for innovation statistically significant.

In many countries in 1910, railroads were often the very largest companies. It could be that size simply captures an industry composition effect. To address this concern, we add industry fixed effects in the second specification. Relative size in 1910 continues to be a strong predictor of remaining one of the 20 largest firms in a country more than 100 years later. Thus, size is not an industry phenomenon.

Over the century of our analysis, several countries came under the control of the communist

party. In those countries, of which there are 11 in our database as of 1910, private enterprise was essentially abolished. Of the 210 large firms in 1910 in those countries, as of 2018, only five remain as large firms in our sample. The disappearance of the largest firms in these countries potentially gives the appearance that Schumpeter's proposition of replacement of large firms with other large firms correctly describes the economic order of events in which new large firms replace the old large firms through the process of creative destruction. The disappearance of the largest firms in these countries is more accurately described as destruction without creation.

When we drop these countries from the analysis, the fraction of the 20 largest firms in 1910 that remain among the largest firms in 2018 increases from 13.6% to 16.2%. Thus, dropping the communist controlled countries makes exceptions to the replacement of large firms by new large firms even less rare. The third regression of Table 2 re-estimates the first regression after dropping the 11 communist countries. Firm size in 1910 remains positive and is a statistically and economically significant predictor of a firm being among the 20 largest in its country in 2018.

Of course, size could be a proxy for many factors. One such factor, suggested by Brandeis, is the nexus of connections among firms that allows for collusion to suppress entry. We have data on board interlocks for 44 countries. Of the 20 largest firms in each country in 1910, 60.0% are classified as having at least one board interlock with another large firm in the set of firms in the same country. This number is astonishingly high. To give a flavor of the size of the interlock nexus, the five companies with at least 10 interlocks circa 1910 are the Compagnie belge maritime du Congo (Democratic Republic of the Congo), the Erie Railroad Co. (U.S.), the New York Central & Hudson River Railroad Co. (U.S.), Recherches minières du Bas-Katanga (Democratic Republic of the Congo), and the United Steel Corporation (U.S.).

To test that possibility, we re-estimate the first regression in Table 2 and include the natural

log of the number of board interlocks for each firm (plus one). The results of the regression are given in column (4) of Table 2. The coefficient of the natural log of the number of board interlocks is not significant. As a further test of the role of board interlocks, we consider bank-board interlocks. Of the largest firms in the sample, 25.0% have a board interlock with a large bank. The fifth regression of Table 2 is the same as the fourth regression except that the natural log of the number of firms in the bank-board interlock nexus is substituted for the natural log of the number of board interlocks. As shown in the table, the coefficient of the natural log of the number of bank-board interlocks is negative and not statistically significant.

The lack of significance of the coefficient of the board interlock variables gives rise to an immediate temptation to reject Brandeis's contention. However, Brandeis focused his discussion on J.P. Morgan & Co., which was not one of the largest 20 U.S. firms circa 1910. This observation illustrates a potential attenuation bias in the board interlock variables. We return to this question when we consider the data for 1980 and 2000. In each of the regressions in columns (3), (4) and (5), the coefficients of book equity are positive and statistically significant.

A separate way in which firms may be able to remain large, as suggested by Steffens, is by capturing the political process to obtain regulations that suppress entry. To investigate this possibility, we re-estimate the first regression of Table 2 but include an indicator to identify firms with political connections. We assign that variable a value of one for firms with a political connection and zero otherwise. We have data on political connections for firms in 19 countries. Political connections are common, with 30.5% of the largest 20 firms in 1910 having at least one political connection. The results of the regression are given column (6) of Table 2. The coefficient of political connections is positive and statistically significant. Having a political connection increases the probability that one of the 20 largest firms in 1910 remains among the 20 largest

firms in 2018 by 11.5 percentage points. Compared with a 10.0% unconditional probability that, in these countries, a top 20 firm in 1910 was among the 20 largest firms in 2018, the coefficient implies a very sizable economic effect of political connections.

A concern with regression 6 is that the results are based on a sample from only 19 countries. To test whether these results are robust to including firms from all 60 countries, we assign the political connections variable defined above a value of zero for (a) all firms in countries for which we do not have data on political connections and (b) for firms for which we do not have data on board members. We also create a separate indicator variable that is assigned a value of one for all such firms and a value of zero for firms for which political connections data are available regardless of whether the firms have a political connection. The results of this regression are given in column (7) of Table 2. The coefficient of political connections remains statistically significant with essentially the same magnitude as in regression 6.

Among the 19 countries considered in regression 6 are two countries, the Republic of the Congo and Romania, that became communist. Regression 8 is the same as regression 6 except that the two communist countries are dropped. The political connections variable continues to be statistically and economically significant. The results, along with those in regressions 6 and 7, are consistent with the proposition that political connections play an important role in explaining why exceptions to the replacement of large firms with other large firms over an interval of 100 years is not rare.

Over the interval of our analysis, in many countries, a number of large firms were nationalized even excluding countries that became dominated by the communist party. Indeed, in the 17 countries included in regression 8, at least 42.3% of the large firms in the regression became state-owned enterprises at some point over the ensuing 100 years. It is possible that firms with

political connections were more likely to become state-owned enterprises. If so, perhaps it is the status of being a state-owned enterprise rather than the political connection that allowed such firms to remain large. To consider this possibility, we re-estimate regression 8 adding an indicator to denote whether a firm became state owned at any time over the period of circa 1910–2018. This variable is assigned a value of one even if the firm was reprivatized prior to 2018. The results of the regression are given in column (9) of Table 2. The coefficient of political connection remains positive and statistically significant with essentially the same magnitude as in regression 8. Interestingly, the coefficient of state-owned enterprise is negative and significant. One interpretation of the negative coefficient of state-owned enterprise is that government ownership caused the firms to become smaller. A second interpretation is that governments took ownership of the worst performing large firms.

We conduct one further robustness test of our political connections variable. Regression 10 of Table 2 is the same as regression 9 except that we now include industry fixed effects. As shown in the table, the political connections variable continues to be statistically and economically significant. The table includes one further model, column (11), to which we return in Section V.

The data that we consider in this section encompass firms from 60 countries that were among the 20 largest in their home country as of 1910. We document that, around the world, and consistent with Schumpeter's proposition, the replacement of old large firms with new large firms through time represents the normal course of economic events. We also find that, contrary to Schumpeter's proposition, old large firms remaining as large firms over 100 years later is not rare. Indeed, 13.6%, or 152, of the largest firms circa 1910 remain among the largest firms in their home countries in 2018. We further find that, among large firms, it is the very largest firms that are more likely to remain large. To be more emphatic, it is not the smaller of the largest firms that evolve to

replace the largest large firms; it is the largest firms that remain large. We, then, consider whether board interlocks or political connections are frictions that impede the process of replacement of large firms, or, perhaps, that such firms regenerate by means of intra-firm innovation. We find no evidence of board interlocks playing a role and little role for innovation, whereas, political connections are both statistically and economically significant in explaining the extent to which large firms circa 1910 remain large firms over 100 years later.

It could be that it is the best firms in each country that become politically connected. If so, political connections could be spuriously reflecting better firm quality. Data on firm profitability are, for most of the countries in our 1910 sample, unavailable. It is, thus, difficult to assess whether it is the case that the politically connected firms are the best firms. Studies based on recent data suggest that they are not. To investigate formally whether there is evidence that, circa 1910, politically connected firms were the best firms, we turn to a case study of Italy: a country for which data on profitability are available, and in which political connections were prevalent.

II.A. A Case Study: Italy in 1911

The data on Italian firms' net income, book equity and, when available, market capitalization, are manually collected from the business directory *Notizie Statistiche sulle principali Società Italiane per Azioni*, published by Credito Italiano in 1912. The directory includes balance sheet data, stock prices, detailed descriptions of each firm's business activities, and detailed information on the political experience of each director. It covers all Italian firms with a book equity of at least 1,000,000 Italian lira (192,324 U.S. dollars) as of 1911, as well as all publicly-traded Italian firms, regardless of their book equity, for a total of 793 firms.

Of the firms in the Italian directory, 25.7% have at least one political connection and two have seven or more politicians on their board: Banca Commerciale Italiana and La Fondiaria-Vita.

Of the 20 largest Italian companies in 1911, 60.0% have at least one political connection. Of the 793 firms, 18.2% are classified as new tech. The average return on equity (ROE), defined as net income over book equity, is 4.7%. The average market-to-book ratio (M/B), defined as the average between the lowest and the highest stock price during the year, multiplied by the number of shares outstanding, and divided by book equity, is 1.32. (All financial ratios, here and elsewhere in the paper, are winsorized at the 1% and at the 99% levels.) Summary statistics for these and other variables are provided in Panel A of Table 3. Of the firms in the directory, 30.8% are publicly-traded. The firms were established between 1826 and 1911.

With the data from the directory by Credito Italiano, we estimate linear probability models that explain whether a firm has a political connection in 1911. Panel B of Table 3 presents the results. In the first regression, the independent variables are firm size, measured as the natural log of book equity, the new tech indicator, ROE, and an indicator denoting whether the firm was publicly-traded in 1911. The results show that bigger firms are significantly more likely to be politically connected than smaller firms. A one standard deviation increase in size increases the likelihood that a firm has a political connection by 11.1 percentage points. The positive association between firm size and political connections is consistent with prior literature (e.g., Faccio (2006), Ferguson and Voth (2008), Braggion and Moore (2013)). The coefficients of new tech and ROE are negative but not statistically significant. That is, politically connected firms, on average, are less innovative and have insignificantly lower ROEs than firms that are not politically connected.

In regression 2, we measure size as the natural log of net income. We rescale net income so that the minimum value is 1. The results confirm a negative, albeit not statistically significant, relation between innovation and political connections as well as between ROE and political connections. The negative association between innovation and political connections is in line with

the evidence in Kim (2017), Qin and Zhang (2019), and Akcigit, Baslandze, and Lotti (2020). Political connections are also negatively related to net income. This relation is also not statistically significant. Thus, again, we find no evidence of politically connected firms being the best firms.

Regressions 3 and 4 are similar to the first regression except that we include industry fixed effects in Regression 3, and include industry, location of the registered office, and year of establishment fixed effects in Regression 4. When we do so, the results in the first regression are confirmed. In the last regression, which includes only firms with stock price available in the directory, we use M/B as a measure of firm quality. The results show that politically connected firms have an insignificantly lower M/B than non-connected firms. These results confirm evidence from studies based on more recent data (Braggion and Moore (2013), Bertrand et al. (2018)). Importantly, they provide no support for the contention that it is the best companies that have political connections.

III. Empirical Results: 1980 - 2018

The 1980 sample allows for a more refined analysis of Schumpeter's proposition that some firms create a culture of regeneration that facilitates intra-firm innovation and it is that factor that allows them to remain large. In this analysis, we use R&D expense scaled by total assets as our proxy for innovation. In instances in which R&D data are not available in Worldscope, we assign R&D a value of zero. Because doing so introduces attenuation bias, we also include an indicator variable that is assigned the value of one in instances in which R&D data are not available, and zero when R&D data are available. The 1980 data encompass up to 29 countries, depending on the variables included in the analyses. Of the firms in the database in 1980, 33.6% report R&D expenses.

The 1980 sample also allows us to re-visit the role of board interlocks and bank-board

interlocks over nearly four decades. Board interlocks with other firms in the same country are remarkably common, with, as shown in Panel B of Table 1, 71.5% of the firms in our sample have an interlock with one of the other 2,896 firms in the Moody's international database. On average, a firm in the 1980 sample shares a director or an officer with five other firms. Bank-board interlocks are also common, with 36.9% of the firms in the sample having at least one interlock with a bank in its home country.

Of the 551 largest 20 firms in each country in 1980, 138, or 25.0% are also among the 20 largest in 2018.[12] Additionally, of the 4,352 firms representing 29 countries in the 1980 sample, 191, or 4.4% are among the 20 largest in 2018. Thus, the very largest firms are disproportionately more likely to remain among the largest almost four decades later. Further, it is not uncommon that old large firms are replaced by old smaller firms, a result that is also inconsistent with Schumpeter's theory. For example, 53 (=191-138) of the smaller firms in the 1980 sample are among the largest 20 in their country in 2018. Of course, these calculations only reflect old firms for which Worldscope or Moody's report book equity in 1980. A more comprehensive investigation of the replacement of old large firms by old smaller firms is provided in Section VII.D.

Across the seven regressions in Table 4, size measured either as an indicator denoting whether a firm was among the 20 largest in its country in 1980, or by the natural log of book equity, is both statistically and economically significant. As in the 1910 sample, this result continues to support the views of Steffens and Brandeis that size allows firms to entrench their positions to remain dominant.

The regressions of Table 4 further investigate the possibility that old firms remain or

[12] The 1980 sample includes 14 firms in Brazil, 11 in Colombia, 13 in Ireland, and 13 in Taiwan.

become large because of a culture of innovation. In the first three regressions, the coefficient of the R&D variable is positive and statistically significant, regardless of whether we include industry fixed effects, and other controls for firm quality. Thus, the results provide support for Schumpeter's assertion that the presence of a culture of innovation allows firms to remain or become big. However, as the results show, the economic impact of size trumps that of R&D. That is, although R&D is statistically significant, its economic impact is substantially smaller than that of size.

Regressions 4 through 7 of Table 4 introduce board interlocks and bank-board interlocks. The sample is reduced relative to the first three regressions as, for some companies, data on interlocks are not available in Moody's or company names could not be manually matched between Moody's and Worldscope. In none of these regressions are the natural log of the number of interlocks or R&D statistically significant. In contrast, size is statistically and economically significant in all specifications. These results do not support Brandeis' proposition that large firms are able to remain or become large because of their nexus of board interlocks.

In our analyses with the circa 1910 sample, in some of the specifications, we exclude communist countries from the analysis. There were no communist countries with stock exchanges open in 1980. Thus, the results in this section portray the process of creative destruction along with its impediments in free countries.

In sum, the 1980 results confirm that it is the largest of the large firms that remain big over these nearly-four decades. The results also indicate that intra-firm regeneration plays some role in allowing a firm to become big or remain big over this relatively extended period of time. However, over this interval, we find no support for Brandeis' conjecture that firms can remain or become big because of their network of board interlocks that enables them to pre-empt entry. We do not have

data on political connections for this sample.

IV. Empirical Results: 2000 - 2018

The 2000 sample is the most comprehensive and allows us to consider each of the obstacles to the process of creative destruction suggested by Schumpeter, Steffens, and Brandeis. The downside of the shorter time period is that, arguably, it does not give the process of creative destruction sufficient time to competitively replace the very largest firms.

Holding that concern aside, the regression results in Table 5 indicate that relative firm size in 2000 is an economically and statistically significant predictor of a firm being among the 20 largest in its country in 2018. Among the very largest firms, exceptions to the process of replacement almost become the norm over this shorter interval: as shown in Panel C of Table 1, 43.8% of the 20 largest firms in each country in 2000 are also among the 20 largest in 2018. Albeit over a different two decades, the replacement rate of 38.2% reported by Fogel et al. (2008) is very much in line with our figure of 43.8%.

Size is significant across all specifications even after including country fixed effects, 4-digit SIC industry fixed effects, and a variety of control variables. The results also confirm R&D as a statistically significant exception to the Schumpeterian process. Regardless of how we combine the standardized coefficient of the R&D/TA ratio with the coefficient of the R&D missing indicator, their combined economic impact is substantially smaller than that of size. Thus, these results support Schumpeter's claim that intra-firm innovation can allow firms to remain large at least for some period of time, although the economic magnitude of R&D is comparatively small.

We, thus, turn to the question of whether the 1910 results on political connections reflect a higher propensity for politically connected firms to engage in successful innovation. That appears not to be the case. As shown in regressions 2 – 4, controlling for size and R&D, political

connections remain statistically significant. Their significance is robust to adding a variety of controls, including industry fixed effects or country x industry fixed effects. Having a political connection increases the likelihood that a firm is among the 20 largest in 2018 by 2.5 - 3.0 percentage points. This is a large effect when compared with the 2.2% unconditional probability that a firm in the 2000 sample is among the 20 largest in 2018. These results confirm the concerns highlighted in Puck and support the proposition of Steffens that political connections enable large firms to remain large, as well as enabling smaller old firms to become large. They also complement the results in Akcigit, Baslandze, and Lotti (2020), Kim (2017) and Qin and Zhang (2019) who show that politically connected firms invest less in R&D than non-connected firms, as well as the results in Akcigit et al. (2020) who document a lower entry rate in Italian industries where connections with local politicians are more prevalent. Of course, a caveat with those results is that higher entry rates do not necessarily imply more replacement of large firms.

The number of board interlocks (regressions 5 – 7) and bank-board interlocks (regressions 8 – 10) are statistically significant for this shorter time period. Thereby, the results provide some support for Brandeis' proposition that interlocks enable large firms to remain large, at least over the shorter time period.[13]

In the 2000 regressions, we have the largest set of data but the shortest time period for the creative process to work to replace the largest firms in a country. Thus, it is perhaps not surprising that large firms tend to remain large, even to the extent that remaining large becomes close to being the norm, and replacement close to being the exception. Size and political connections appear to play a prominent role in impeding the process of replacement.

[13] Qualitatively similar conclusions are reached when we use data from Worldscope to compute the number of interlocks and bank-board interlocks. Although Worldscope covers a larger number of companies, it provides, at most, the names of five officers or directors for each company. Moody's has greater coverage of officers and directors for each company.

V. Size and Political Connections

Firm size and political connections are both statistically and economically significant variables across the time intervals considered and across the regressions in each time interval. What is size capturing? To investigate whether size is capturing political influence, we test whether its economic impact is greater in the presence of political connections. To do so, in the last regressions reported in Tables 2 and 5 for the circa 1910 and the 2000 samples, respectively, we add political connections x size as an interaction variable. For both the circa 1910 sample and the 2000 sample, the coefficient of size is more than 100% greater in the presence of a political connection. These results are consistent with the idea that size reflects political power that accompanies political connections. This power may come about in various ways, including the power of the vote that often resides in the folds of firms with large employee workforces.

VI. Is it Political Capture?

Of our results, the most prominent and robust are that size and political connections are statistically and economically significant predictors of a firm being among the 20 largest in its country decades, or even a century, later.

How do political connections enable large firms to entrench their position? It could be that politically connected firms are the best, and that is why they remain the largest. Perhaps our controls for firm quality and innovation fail to completely account for firm quality. Of course, good firms do not need protection to maintain their market position. In contrast, the capture hypothesis predicts that weaker firms can remain dominant because of the protection offered by regulatory barriers.

One extreme example of the latter comes from Zimbabwe, wherein President Robert Mugabe repeatedly intervened via regulation to explicitly impede entry into the cellular phone

market to protect a government-owned cellular phone carrier and another, private, carrier owned by Mugabe's nephew, Leo. The immediate target was foreign-based Zimbabwean entrepreneur, Strive Masiyiwa, the founder of cellular phone carrier Econet Wireless Ltd. Mugabe first attempted, by fiat, to pre-empt Masiyiwa from establishing a cell phone company. When that failed due a ruling by the Zimbabwean Supreme Court, under the direction of Mugabe, the legislature made it illegal, and punishable with up to two years in prison, for a private business to build a cellular network. Eventually Masiyiwa was able to enter the Zimbabwean market and, within two years his company, Econet, became the largest cell provider in the country (Block, 2000). This example illustrates how regulatory barriers can enable weak firms to remain dominant.

How is it that political capture protects large firms from encroachment by competitors? Presumably, as in Zimbabwe, it is by establishing regulatory barriers to entry. Rajan and Zingales (2003) propose an interest group theory of financial development in which incumbents protect their position through cross-border barriers to trade and cross-border barriers to capital flows. In their theory, both are required for incumbents to successfully protect their position. The same is true in our setting. We borrow their framework to assess whether those conditions are met.

Protection against domestic entry is, of course, meaningless absent protection against foreign entry. As in Rajan and Zingales, we use international trade flows as a de facto measure of cross-border openness to entry, i.e., the lack of international barriers to entry. Data on cross-border trade flows are from the World Bank's World Development Indicators. Trade flows are defined as the sum of imports and exports, all scaled by gross domestic product.

Entrants further require access to capital to fund their innovations. Domestic access to capital can be limited through government ownership of banks or by large firms' influence over domestic banks. Openness to cross-border capital flows interrupts this channel of control of big

firms over the domestic financial system. We follow Rajan and Zingales' lead and use a measure of demand for capital to proxy for cross-border capital flows. Their measure, an index of industrialization by Bairoch (1982), is available only for a limited number of the countries in our sample. Thus, in the same spirit, as a measure of demand for capital, we use the number of telephones per capita in 1914 from Kingsbury (1915), which is available for a substantially larger sample of countries and colonies. Further, for the more recent periods, we use a second, also de facto, measure of openness to capital flows. The second measure is the dollar value of mergers and acquisitions (M&A) in a given country and 4-digit SIC industry involving foreign acquirers as a fraction of the total dollar value of M&A. The M&A data are from Thomson ONE Banker.

When an economic system is open to both cross-border trade flows and cross-border capital flows, it is likely to be difficult for domestic politically connected firms to entrench their positions by suppressing foreign entry. We address this issue with the regressions in Tables 6 and 7. Table 6 reports regressions with the circa 1910 data and Table 7 reports regressions with the 2000 data. Each of the first two regressions includes an interaction of political connections and openness, where openness is trade flows x cross-border capital flows. In the first regression in each table, openness is measured at the country level as the interaction between aggregate trade flows at the country level and aggregate demand for capital from Kingsbury (1915). In the second regression, capital flows are measured at the country-industry level.

In the second regression of Table 6, we recognize that banks and utilities are regulated industries in many countries. Regulations often specifically limit foreign ownership in certain sectors, thus blocking capital flows into those industries. We, thus, use an indicator to distinguish banks and utilities from presumably less regulated other industries. In the second regression of Table 7, we use a measure of regulatory barriers to cross-border capital flows that is based on

recent M&A transactions for which data that are available for the 2000-2018 time period. Between Tables 6 and 7, three of the four interaction terms in the first two regressions are negative and statistically significant. Further the economic impact of openness is sizable. For example, the results of the second regression of Table 6 indicate that a one standard deviation increase in openness decreases the likelihood that a large politically connected firm remains among the largest 20 over a century later by 8.1 percentage points.

Of course, more openness does not necessarily prevent politicians from propping up weak politically connected domestic firms. If that were the case, the coefficient of the interaction between openness and political connections would be biased toward zero. Thus, propping up of the kind described here cannot generate the results above.

As do Rajan and Zingales (2003), we propose that restrictions to either cross-border trade flows or cross-border capital flows alone is unlikely to be sufficient to restrict entry of foreign competition. Regressions (3) through (5) of Tables 6 and 7 provide falsification tests in which political connections are interacted with restrictions to cross-border trade alone or with restrictions to cross-border capital flows alone. None of those interactions is statistically significant (all p-value > 0.29) showing that restrictions of either type alone are insufficient.

The important conclusion is that political connections play a key role in allowing big firms to remain or become big only when their country restricts cross-border trade and capital flows. Regulatory barriers to entry appear to be a necessary condition for politically connected firms to remain or become dominant.

VII. Other Considerations

VII.A The Case Study of Fabbrica Italiana di Automobili Torino

The evolution of Fabbrica Italiana di Automobili Torino, more popularly recognized as

Fiat, provides an illustration of the way in which size, political connections, and regulatory protection against foreign entry interact to allow a firm to become and then remain big for an extended period of time. Fiat, the major Italian auto maker, was established in 1899 with an initial capital of 800,000 Italian lira (or 153,856 U.S. dollars). At that time, worldwide the auto industry was in its infancy. The creation of Fiat clearly represented a case of revolutionary innovation. As of 1911, in terms of book equity, Fiat was the 48th largest company in Italy with a capital of 14 million lira. Fiat's capital reached 400 million lira in 1924, and 4 billion lira by 1947. By book equity, Fiat was one of the largest 20 companies in Italy in 1980, 2000, and 2018.

Fiat also fits the characterization of a politically-connected firm, albeit not without interruption. Count Eugenio Rebaudengo, was a member of the company's board of directors during 1908-1944 and, at various points during 1903 through 1943, was a member of the Congress and then a Senator of the Italian Kingdom.[14] One of the company's founders, Giovanni Agnelli, was appointed as a Senator by King Victor Emmanuel III in 1923. During the Fascist era of 1922-1943, the Agnelli family exerted major influence in the political and economic life of the country, and Fiat reaped the benefits of an increasingly protected domestic market position where, in 1930, tariffs on car imports were increased from 60% to over 100%, and quotas were introduced (Rossi, 1930).[15]

Political connections, including those through some of the heirs of the founder, continued over time and included the founder's grandsons Giovanni "Gianni" Agnelli, Umberto Agnelli, and granddaughter Susanna Agnelli, who occupied positions in the Italian parliament at various time periods between the 1970s and the early 2000s. The company is well-known to have continued to

[14] http://www.treccani.it/enciclopedia/eugenio-carlo-angelo-rebaudengo_(Dizionario-Biografico)/
[15] http://www.treccani.it/enciclopedia/giovanni-agnelli_res-ba2a0a79-87e5-11dc-8e9d-0016357eee51_(Dizionario-Biografico)/

benefit from regulatory barriers after World War II in the form of high tariffs and quotas that protected their competitive position against entry by foreign auto makers (Fauri (1996)). By 2018, Fiat Chrysler Automobile NV was the 7th largest firm in Italy and the 8th largest car manufacturer in the globe with a book equity capital exceeding 28 billion U.S. dollars.

VII.B Net Income as the Measure of Size

The data for 1980 and for 2000 allow us to consider another measure of size, net income. This measure possibly more directly captures the idea of temporary rents as proposed by Schumpeter. Arguably net income better reflects Schumpeter's sentiment that entrepreneurial success is measured as a flow, i.e., rents, rather than as a stock, variable. From a univariate perspective, 21.9% of the largest 20 firms by net income in each country in 1980 are still among the largest 20 in 2018. This univariate statistic is remarkably close to the one based on book equity (Table 1, Panel B).

Thus, at least among the very largest firms, net income is also persistent, albeit somewhat less persistent when a continuous measure of size is used. Interestingly, and perhaps surprisingly, the results provide at least some evidence pointing to the persistence of rents over a nearly four-decade-long period. As shown in Panel A of Table 8, regressions that parallel those in Table 4, for the 1980 sample, we find relatively strong support that a culture of intra-firm innovation increases the likelihood that a firm either remains or becomes large. The results also provide some support for Brandeis' assertion that board interlocks, including bank-board interlocks, enable companies to remain or become large.

Of the 20 largest firms by net income in 2000, 41.7% are also among the 20 largest in 2018. Again, a statistic very similar to that based on book equity in Panel C of Table 1. The regression results in Panel B of Table 8, which parallel those in Table 5, show that net income in 2000 is

generally a significant predictor of a large firm in 2000 being among the 20 largest in its country in 2018. For the 2000 sample, it is only the extensive R&D margin that is statistically significant. In fact, the intensive margin, when significant, is negative. That is, firms that report R&D expenses are more likely to remain or become big, but reporting relatively higher R&D expenses reduces the likelihood of a firm becoming or remaining big. Further, both the statistical and economic significance of political connections is greater than in Table 5 when we use net income as the measure of size, indicating that the results for 1910 for the broad sample of countries are unlikely to be due to using a stock variable as the measure of size. Board interlocks and bank-board interlocks are both statistically significant for the shorter period when net income is the measure of size. The results using net income as a measure of size are generally consistent with those based on book equity.

VII.C Mergers and Acquisitions

Recent literature shows that, in the most recent decades, M&As have enabled dominant firms to increase their market shares by acquiring rivals (Kamepalli, Rajan, and Zingales (2019), and Cunningham, Ederer, and Ma (2020)). Perhaps, the results that we have documented spuriously attribute the ability of large firms to remain large to initial size and political connections, when the underlying factor that enables large firms to remain large are M&As. We investigate this possibility using M&A data from ThomsonONE, which are available starting in the 1980s. For each firm in our sample, we compute the total amount spent to acquire other firms either during the 1980-2018 period or the 2000-2018 period. Since our focus is on M&As explaining the ability of large firms to remain large, we focus on transactions with a deal value equal or greater than 25 million U.S. dollars. We add this aggregate expenditure as a control to our baseline specifications of Tables 4 and 5. The aggregate price paid in M&A transactions during 1980-2018 is positively

and significantly associated with the likelihood that a firm will be among the largest 20 in its country in 2018, providing support to the studies we cite at the beginning of this section. Importantly, firm size in 1980 remains significant in each of the regressions that replicate Table 4, with p-values of 0.001 or less. The aggregate price paid in M&A transactions during 2000-2018 is also positively and significantly associated with the likelihood that a firm will be among the largest 20 in its country in 2018. In models that parallel those in Table 5, political connections and board interlocks generally remain significant after controlling for M&As - - the lone exception being specification (2) in which the p-value of political connections is 0.106.

VII.D Is It New Firms That Replace the Old?

In the Schumpeterian process of creative destruction, it is *new* firms that replace the old. To wit, according to Schumpeter "new combinations are, as a rule, embodied, as it were, in new firms which generally do not arise out of the old ones but start producing beside them … Especially in a competitive economy, in which new combinations mean the competitive elimination of the old."[16] Our data show that, over a sufficiently long period of time, old large firms are largely replaced. We have not yet addressed the question of whether the old large firms are replaced by new firms. Is that the case as Schumpeter theorizes or is it that old smaller firms replace the old large firms?

As a starting point to determine a company's date of origin, we use the date of establishment reported in Worldscope/Datastream and in the Moody's international manuals. When those sources provide no information about the company's date of establishment, we conduct Google searches to determine the company's starting date. We conduct Google searches also to verify any instances in which a company's reported starting date is after 1980. For example,

[16] Schumpeter (1934), pp. 66-67.

Worldscope/Datastream gives a year of establishment of 1983 for AT&T. AT&T, however, traces to 1885. Similarly, Worldscope/Datastream gives a year of establishment of 1982 for Credit Suisse Group AG, when the company can, in fact, be traced to 1856.

We address the question of whether old large firms are replaced by new large firms in Table 9. In panel A, we consider the 20 largest companies in 2018 in the 52 countries for which data are available in 2000. Of the 1,017 large firms in this sample,[17] 450, or 44.2%, were among the 20 largest in their country in 2000; another 502, or 49.4%, were established before 2000; and another 65, or 6.4%, were established in 2000 or after. Thus, over this nearly two-decade period, replacement of old large firms by the new is truly an exception.

In panel B of Table 9, we consider the 20 largest companies in 2018 in the 29 countries for which data are available for 1980. Of the 580 firms in this sample, 138, or 23.8%, were among the largest 20 in 1980; 338, or 58.3%, were established before 1980 and, thus, are also old firms and are, therefore, old smaller firms replacing old large firms. The remaining 104, or 17.9%, are newer firms established in 1980 or later. Thus, the majority of large firms in 2018 are old firms. To the extent that replacement of large firms occurs, it is largely other old firms that replace old large firms.

As for the interval encompassing circa 1910-2018, we return to Italy. Of the 20 largest Italian firms ranked by book equity in 2018, four can be traced to companies that were among the 20 largest in 1911. An additional eight can be traced to companies that were established prior to 1911. Thus, of the 20 largest Italian firms in 2018, 12 have their origins in firms that are over a century old. Additionally, only two of the remaining eight firms have origins that commence after 1960 and none have origins that trace to post-1980. The Italian case re-emphasizes that, to the

[17] For the Czech Republic, Slovakia, and Venezuela, Worldscope/Datastream covers 17, 15, and 5 companies, respectively, in 2018.

extent that replacement of large firms occurs, it is not by new firms.

VII.E What Happens to Old Large Firms?

Of the 1,115 largest firms in 1910, 152 continue to operate and remain among the 20 largest in their home countries 100 years later. What happened to the other big companies? Through a search of companies' histories as described in Section I.A, we have determined that another 399 of them continue to operate in 2018, although they do not remain among the largest 20 in their country. Another 184 were dissolved. And we could not determine the fate, as of 2018, for 380 firms. In short, while many large firms slip from being among the 20 largest in their home countries over 10 decades, they do not die and some, in fact, remain relatively large.

VII.F Replacement at the Industry Level

Although Schumpeter allows for the possibility that, over time, industries can be replaced by other industries (for example, trains replaced stage coaches), a natural curiosity is what happens to replacement within each industry in each country. Our earlier focus on replacement at the country-level allows for the type of revolutionary creative destruction considered by Schumpeter. The analyses described in this section, by contrast, take a more narrow approach. To allow for competition across industries, we define industries broadly at the 2-digit SIC level. We ask the question of whether size, political connections, innovation and board interlocks increase the probability that a firm will remain or become one of the largest five in its industry and country by 2018. We focus on the five largest companies in each industry in 2018 rather than the 20 largest because, in many of the countries in the sample, an industry comprises far fewer than 20 publicly-traded firms.

For 1980 and 2000, we estimate regressions (not shown in a table) like those in Tables 4 and 5 in which the dependent variable is an indicator taking the value of one if a firm is among the

five largest in its country and 2-digit SIC industry in 2018, and zero otherwise. The independent variables are the same as those in the Tables 4 and 5 with two exceptions. The "20 largest firms" indicator is replaced with a "5 largest" (in the country-industry pair) indicator, and all regressions include country x (2-digit SIC) industry fixed effects in lieu of the country fixed effects.

The results show that size in 1980 or in 2000 is an economically and statistically significant predictor of the likelihood that a firm is among the five largest in its industry and country in 2018. In both 1980 and 2000, R&D expenses are generally not significantly related to the likelihood that a firm is among the five largest in its industry and country in 2018. Board interlocks are significant in the industry-level regressions only in 2000 while bank-board interlocks are never significant. For 2000, the year for which we have political connections data, this variable continues to be positively and significantly related to the likelihood that a firm is among the five largest in its industry and country in 2018. Thus, the two variables that are consistently significant in the country-level regressions, size and political connections, are also significant in country-industry level regressions.

VII.G How Long Does It Take for Exceptions to Become the Norm?

Over the various time intervals considered so far, replacement of old large firms is the norm. Exceptions, however, become increasingly less rare as we shorten the time interval under consideration. Exceptions become the norm, i.e., represent more than 50% of the observations, when the time interval is 16 years or shorter.

VII.H Endogeneity of Political Connections

Some readers will object that political connections are endogenous. Specifically, the best firms will tend to match with the best politicians, and vice-versa. However, because in the Schumpeterian world rents are *temporary*, the endogenous matching between the best politicians

and the best firms (which is rejected empirically in Braggion and Moore (2013), Bertrand et al. (2018), Kim (2017), Qin and Zhang (2019), and Akcigit et al. (2020), among many others) would not explain why politically connected firms remain large decades or even a century later.

VII.I Robustness of the Results for the 1910-2018 Period

The results reported in the tables using the 1910 sample rely on the assumption that, for countries with insufficient coverage in Worldscope/Datastream, a firm is among the 20 largest in its country in 2018 if book equity can be retrieved from any source. In robustness tests, we re-estimate the regressions assuming that none of those firms are among the 20 largest in their home country in 2018 or we exclude the countries with insufficient data from the analyses. In regressions not reported in a table, the coefficient of size is positive and significant in 18 of the 22 regressions, and its interaction with political connections is significant in the two regressions with the interaction term. The coefficient of political connections is positive and significant, with a p-value of 0.046 or lower, in all specifications that do not include an interaction term. Thus, the results for the 1910 sample are not specific to using book equity to classify firms as being among the 20 largest in their countries in 2018.

VIII. Conclusion

In this study we investigate the competing propositions set forth over a century ago by Schumpeter, Brandeis, and Steffens. As theorized by Schumpeter "…new combinations are, as a rule, embodied, as it were, in new firms which generally do not arise out of the old... Especially in a competitive economy, in which new combinations mean the competitive elimination of the old … Exceptions are rare..."[18] Or by Brandeis "[t]he practice of interlocking directorates is the root of many evils. It offends laws human and divine. Applied to rival corporations, it tends to the

[18] Schumpeter (1934), p. 66-67 and p. 156.

suppression of competition..."[19] Or by Steffens "big business … is the crux of the situation. Our political corruption is a system, a regularly established custom of the country, by which our political leaders are hired, by bribery, by the license to loot, and by quiet moral support, to conduct the government of city, State and Nation, not for the common good, but for the special interests of private business."[20]

Using various samples of large firms encompassing as many as 75 countries and covering up to ten decades, we find that Schumpeter's proposition that large firms are replaced by other firms over time is largely accurate, but inconsistent with his proposition, exceptions to that proposition are not rare and, to the extent that large firms remain large, as proposed by Steffens, they are disproportionately politically connected. Further, to the extent that old large firms are replaced, they are largely replaced by old smaller firms.

Over shorter periods of time, and consistent with Schumpeter's observation, a culture of intra-firm innovation allows large firms to remain large. What we do not find is strong evidence in support for Brandeis' contention that it is the nexus of board interlocks among large firms that enable big business to stifle entry and, thereby, remain large. Nevertheless, we do find that political connections enable big businesses to remain large, particularly when regulatory barriers to cross-border entry and cross-border capital flows are in place. The implication is that in an unimpeded market the Schumpeterian process of creative destruction of large firms is likely to prevail. To the extent that it does not, the data suggest that it is because the political process impedes entry.

Fogel et al. (2008) have documented that the replacement of large firms is beneficial to economic growth. An implication of our results is that, by impeding the replacement of large firms, political connections in combination with barriers to entry, retard economic development.

[19] Brandeis (1914), p. 51.
[20] Steffens (1906, p. 4-5).

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Table 1. Summary Statistics for the Cross-Country Samples.

Variables are defined in Appendix B. Accounting ratios are winsorized at the 1% and 99% levels.

Panel A: Summary Statistics for the 1910 Sample

	N. Obs.	Mean	Std. Dev.	Median	Min	Max
Top 20 in 2018 | Top 20 in 1910	1,115	0.136	0.343	0	0	1
Book Equity ($ 000)	1,115	19,200	61,300	4,301	8	984,000
New Tech	1,115	0.045	0.207	0	0	1
Board Interlocks	720	0.600	0.490	1	0	1
Bank-Board Interlocks	720	0.250	0.433	0	0	1
Number of Board Interlocks	720	1.731	2.236	1	0	13
Number of Bank-Board Interlocks	720	0.856	1.920	0	0	11
Political Connections	331	0.305	0.461	0	0	1
State-Owned Enterprise	291	0.423	0.495	0	0	1

Panel B: Summary Statistics for the 1980 Sample

	N. Obs.	Mean	Std. Dev.	Median	Min	Max
Top 20 in 2018 | Top 20 in 1980	551	0.250	0.434	0	0	1
Top 20 in 2018	4,352	0.044	0.205	0	0	1
Top 20 in 1980	4,352	0.127	0.333	0	0	1
Top 20 in 2018 | Top 20 in 1980 NI	547	0.219	0.414	0	0	1
Top 20 in 1980 NI	4,352	0.126	0.332	0	0	1
Book Equity ($ 000)	4,352	414,552	1,487,859	110,030	-104,000	49,400,000
Net Income ($ 000)	4,255	50,628	263,344	11,908	-1,709,700	9,327,395
R&D/TA	4,352	0.008	0.021	0.000	0.000	0.116
R&D Missing	4,352	0.664	0.472	1	0	1
Board Interlocks	1,144	0.715	0.452	1	0	1
Bank-Board Interlocks	1,144	0.369	0.483	0	0	1
Number of Board Interlocks	1,144	5.010	8.324	2	0	90
Number of Bank-Board Interlocks	1,144	3.651	8.209	0	0	90
M/B	3,250	1.281	0.761	1.028	0.629	5.670
ROE	4,253	0.127	0.137	0.124	-0.532	0.641
Leverage	4,268	0.238	0.211	0.186	0.000	0.963

Panel C: Summary Statistics for the 2000 Sample

	N. Obs.	Mean	Std. Dev.	Median	Min	Max
Top 20 in 2018 | Top 20 in 2000	1,028	0.438	0.496	0	0	1
Top 20 in 2018	30,891	0.022	0.146	0	0	1
Top 20 in 2000	30,891	0.033	0.179	0	0	1
Top 20 in 2018 | Top 20 in 2000 NI	1,027	0.417	0.493	0	0	1
Top 20 in 2000 NI	30,891	0.033	0.179	0	0	1
Book Equity ($ 000)	30,891	421,041	2,511,835	47,287	-20,700,000	210,000,000
Net Income ($ 000)	30,779	39,483	401,344	1,875	-7,738,450	16,000,000
R&D/TA	30,891	0.019	0.066	0.000	0.000	0.462
R&D Missing	30,891	0.683	0.465	1	0	1
Board Interlocks	7,000	0.590	0.492	1	0	1
Bank-Board Interlocks	7,000	0.090	0.287	0	0	1
Number of Board Interlocks	7,000	2.182	3.389	1	0	40
Number of Bank-Board Interlocks	7,000	0.617	2.562	0	0	40
Political Connections	11,416	0.033	0.179	0	0	1
M/B	26,739	2.317	4.372	1.130	0.435	35.723
ROE	28,557	-0.160	1.036	0.060	-7.911	0.888
Leverage	28,251	0.264	0.312	0.188	0.000	1.986

Table 2. Regression Results: Circa 1910 Sample.

The dependent variable is assigned the value of one if the firm is among the largest 20 in its country (by book equity) in 2018, and zero otherwise. Independent variables are defined in Appendix B. Accounting ratios are winsorized at the 1% and 99% levels. Continuous variables are standardized. P-values based on robust standard errors are reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ln(Book Equity)	0.0650***	0.0645***	0.0770***	0.0822***	0.0810***	0.0761**	0.0634***	0.0889***	0.0972***	0.0434	0.0321
	(0.003)	(0.001)	(0.002)	(0.002)	(0.002)	(0.013)	(0.004)	(0.008)	(0.004)	(0.129)	(0.254)
New Tech	0.0219	0.1052*	0.0375	0.0023	0.0004	-0.0911	0.0208	-0.0882	-0.0731	0.0341	0.0468
	(0.666)	(0.083)	(0.567)	(0.975)	(0.995)	(0.364)	(0.685)	(0.380)	(0.465)	(0.755)	(0.667)
ln(Number of Board Interlocks + 1)				-0.0092							
				(0.456)							
ln(Number of Bank-Board Interlocks + 1)					-0.0033						
					(0.820)						
Political Connections						0.1148***		0.1163***	0.1230***	0.0748**	0.0601*
						(0.004)		(0.008)	(0.004)	(0.026)	(0.063)
Political Connections, set to 0 when Missing							0.1114***				
							(0.006)				
Political Connections Missing							-0.0022				
							(0.960)				
Political Connections x ln(Book Equity)											0.0410**
											(0.043)
State-Owned Enterprise									-0.1468***	-0.1472**	-0.1536**
									(0.006)	(0.014)	(0.010)
Number of Observations	1,115	1,115	905	720	720	331	1,115	291	291	291	291
Adjusted R-squared	0.192	0.308	0.179	0.254	0.253	0.184	0.197	0.185	0.203	0.439	0.442
Country Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Industry Fixed Effects		Y								Y	Y
Countries Included	All	All	Non-communist	All	All	All	All	Non-communist	Non-communist	Non-communist	Non-communist
Number of Country FEs	60	60	49	44	44	19	60	17	17	17	17
Number of Industry FEs		14								12	12

Table 3. Italian Sample, 1911.

Panel A reports summary statistics for the full sample of Italian firms, in 1911, from the directory by Credito Italiano. In Panel B, the dependent variable is assigned the value of one if the firm is politically connected in 1911, and zero otherwise. Independent variables are defined as in Appendix B, except that the variables are measured in Italian lira. Accounting ratios are winsorized at the 1% and 99% levels. Continuous variables are standardized. P-values based on robust standard errors are reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Summary Statistics for the Italian Sample

	N. Obs.	Mean	Std. Dev.	Median	Min	Max
Political Connections	793	0.257	0.437	0	0	1
Book Equity ($ 000)	793	1,025	2,805	433	69	40,388
Net Income ($ 000)	762	58	219	22	-1,077	3,423
Market Capitalization ($ 000)	207	3,270	7,990	1,189	15	83,834
New Tech	793	0.182	0.386	0	0	1
ROE	762	0.045	0.116	0.058	-0.571	0.421
M/B	207	1.324	0.736	1.125	0.200	4.340
Listed	793	0.308	0.462	0	0	1
Year Established	793	1899	12.341	1905	1826	1911

Panel B: Y = 1 if the Firm is Politically Connected in 1911

	(1)	(2)	(3)	(4)	(5)
ln(Book Equity)	0.1112***		0.1002***	0.1053***	0.1450***
	(0.000)		(0.000)	(0.000)	(0.000)
New Tech	-0.0141	-0.0129			
	(0.722)	(0.752)			
ROE	-0.0247	-0.0186	-0.0246	-0.0241	-0.0046
	(0.106)	(0.271)	(0.142)	(0.190)	(0.863)
M/B					-0.0200
					(0.595)
ln(Net Income + |Min| + 1)		-0.0119			
		(0.434)			
Listed	-0.0928***	0.0030	-0.0701*	-0.0888*	
	(0.007)	(0.931)	(0.061)	(0.076)	
Intercept	0.2870***	0.2573***			
	(0.000)	(0.000)			
Number of Observations	762	762	756	699	144
Adjusted R-squared	0.055	0.000	0.075	0.078	0.253
Sector Fixed Effects			Y	Y	Y
Location of Registered Office Fixed Effects				Y	Y
Year Established Fixed Effects				Y	Y
Number of Sector FEs			70	67	33
Number of Location FEs				49	9
Number of Year Established FEs				49	24

Table 4. Regression Results: 1980 Sample.

The dependent variable is assigned the value of one if the firm is among the largest 20 in its country (by book equity) in 2018, and zero otherwise. Independent variables are defined in Appendix B. Accounting ratios are winsorized at the 1% and 99% levels. Continuous variables are standardized. P-values based on robust standard errors are reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(Book Equity)		0.0471***	0.0363***	0.1199***	0.1171***	0.1140***	0.1153***
		(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Top 20 in 1980	0.2561***						
	(0.000)						
R&D/TA	0.0064**	0.0099***	0.0091*	0.0349	0.0352	0.0329	0.0388
	(0.023)	(0.001)	(0.054)	(0.107)	(0.106)	(0.116)	(0.234)
R&D Missing	-0.0012	0.0004	-0.0070	0.0417	0.0428	0.0470	0.0650
	(0.850)	(0.959)	(0.478)	(0.317)	(0.306)	(0.273)	(0.325)
ln(Number of Board Interlocks + 1)				0.0067			
				(0.582)			
ln(Number of Bank-Board Interlocks + 1)					0.0135	0.0188	-0.0065
					(0.235)	(0.202)	(0.770)
M/B			0.0019			-0.0186**	-0.0105
			(0.604)			(0.042)	(0.624)
ROE			0.0102**			0.0219**	0.0002
			(0.028)			(0.031)	(0.992)
Leverage			0.0099			-0.0226	-0.0485
			(0.151)			(0.282)	(0.115)
Number of Observations	4,352	4,332	2,672	1,141	1,141	642	432
Adjusted R-squared	0.167	0.110	0.173	0.148	0.150	0.163	0.331
Country Fixed Effects	Y	Y	Y	Y	Y	Y	Y
Industry Fixed Effects (4-digit SIC)	N	N	Y	N	N	N	Y
Number of Country FEs	29	29	25	27	27	24	21
Number of Industry FEs			394				112

Table 5. Regression Results: 2000 Sample.

The dependent variable is assigned the value of one if the firm is among the largest 20 in its country (by book equity) in 2018, and zero otherwise. Independent variables are defined in Appendix B. Accounting ratios are winsorized at the 1% and 99% levels. Continuous variables are standardized. P-values based on robust standard errors are reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ln(Book Equity)	0.0365***	0.0719***	0.0636***	0.0505***	0.0727***	0.0698***	0.0582***	0.0725***	0.0697***	0.0568***	0.0480***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
R&D/TA	0.0032***	0.0103***	0.0066***	0.0048***	0.0021	0.0017	0.0001	0.0023	0.0022	0.0005	0.0047***
	(0.000)	(0.000)	(0.000)	(0.005)	(0.497)	(0.620)	(0.976)	(0.456)	(0.506)	(0.887)	(0.006)
R&D Missing	-0.0043**	-0.0011	-0.0096**	-0.0013	-0.0113*	-0.0112*	-0.0044	-0.0114*	-0.0111	-0.0044	-0.0009
	(0.046)	(0.776)	(0.032)	(0.775)	(0.055)	(0.099)	(0.573)	(0.052)	(0.102)	(0.575)	(0.843)
Political Connections		0.0249*	0.0252*	0.0297*							-0.0363**
		(0.095)	(0.093)	(0.064)							(0.042)
ln(Number of Board Interlocks + 1)					0.0060**	0.0072**	0.0069*				
					(0.041)	(0.033)	(0.052)				
ln(Number of Bank-Board Interlocks + 1)								0.0089**	0.0107***	0.0158***	
								(0.014)	(0.009)	(0.001)	
Political Connections x ln(Book Equity)											0.0713***
											(0.003)
M/B			0.0092*	0.0009		0.0140***	0.0087		0.0139***	0.0087	0.0009
			(0.071)	(0.688)		(0.006)	(0.130)		(0.005)	(0.124)	(0.693)
ROE			-0.0105***	-0.0113***		-0.0103***	-0.0064		-0.0103***	-0.0063	-0.0108***
			(0.000)	(0.000)		(0.000)	(0.130)		(0.000)	(0.146)	(0.000)
Leverage			0.0124***	0.0084***		0.0141***	0.0125***		0.0138***	0.0118***	0.0086***
			(0.000)	(0.001)		(0.001)	(0.004)		(0.001)	(0.006)	(0.001)
Number of Observations	28,660	11,126	10,522	8,142	6,842	5,981	4,067	6,842	5,981	4,067	8,142
Adjusted R-squared	0.114	0.178	0.215	0.426	0.151	0.193	0.371	0.153	0.195	0.376	0.429
Country Fixed Effects	Y	Y	Y		Y	Y		Y	Y		
Industry Fixed Effects (4-digit SIC)			Y			Y			Y		
Country x Industry Fixed Effects				Y			Y			Y	Y
Number of Country FEs	52	47	43		46	41		46	41		
Number of Industry FEs			694			557			557		
Number of Country x Industry FEs				1,548			1,000			1,000	1,548

Table 6. Regression Results: Openness and Political Connections (1910 Sample).

The dependent variable is assigned the value of one if the firm is among the largest 20 in its country (by book equity) in 2018, and zero otherwise. Independent variables are defined in Appendix B. Accounting ratios are winsorized at the 1% and 99% levels. Continuous variables are standardized. Columns (3)-(5) report falsification tests. P-values based on robust standard errors are reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

			----------FalsificationTests----------		
	(1)	(2)	(3)	(4)	(5)
ln(Book Equity)	0.0862***	0.0391	0.0892***	0.0864***	0.0413
	(0.010)	(0.175)	(0.008)	(0.010)	(0.154)
New Tech	-0.0948	0.0016	-0.0860	-0.0959	-0.0046
	(0.353)	(0.991)	(0.395)	(0.344)	(0.969)
Political Connections	0.1082***	0.1054	0.0965**	0.0969**	0.1043
	(0.010)	(0.410)	(0.035)	(0.020)	(0.414)
Political Connections x Openness	0.0262				
	(0.491)				
Political Connections x Openness Ind. Level		-0.0872*			
		(0.064)			
Trade x (Non-Bank & Non-Utilities)		0.0031			
		(0.982)			
Political Connections x (Non-Bank & Non-Utilities)		-0.0681			(0.0442)
		(0.604)			(0.741)
Political Connections x Trade			-0.0814		
			(0.391)		
Political Connections x Telephones per 100 People in 1914				0.0351	
				(0.320)	
Number of Observations	291	291	291	291	291
Adjusted R-squared	0.184	0.422	0.185	0.187	0.423
Country Fixed Effects	Y	Y	Y	Y	Y
Industry Fixed Effects	N	Y	N	N	Y
Number of Country FEs	17	17	17	17	17
Number of Industry FEs		12			12

Table 7. Regression Results: Openness and Political Connections (2000 Sample).

The dependent variable is assigned the value of one if the firm is among the largest 20 in its country (by book equity) in 2018, and zero otherwise. Independent variables are defined in Appendix B. Accounting ratios are winsorized at the 1% and 99% levels. Continuous variables are standardized. Columns (3)-(5) report falsification tests. P-values based on standard errors clustered at the country level are reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively.

			----------Falsification Tests----------		
	(1)	(2)	(3)	(4)	(5)
ln(Book Equity)	0.0714***	0.0481***	0.0713***	0.0714***	0.0489***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
R&D/TA	0.0107***	0.0068***	0.0106***	0.0107***	0.0065***
	(0.001)	(0.004)	(0.001)	(0.001)	(0.004)
R&D Missing	0.0003	-0.0122	0.0003	0.0003	-0.0139
	(0.970)	(0.273)	(0.963)	(0.965)	(0.230)
Political Connections	-0.0029	0.0230	0.0187	0.0029	0.0261*
	(0.882)	(0.124)	(0.242)	(0.910)	(0.081)
Political Connections x Openness	-0.0403**				
	(0.016)				
Political Connections x Openness Ind. Level		-0.0167**			
		(0.047)			
Fraction Foreign Transactions (Industry-country Pair)		-0.0045			-0.0013
		(0.277)			(0.669)
Openness Ind. Level		0.0052			
		(0.176)			
Political Connections x Trade			-0.0002		
			(0.976)		
Political Connections x Telephones per 100 People in 1914				-0.0258	
				(0.298)	
Political Connections x Fraction Foreign Transactions (Industry-country Pair)					-0.0117
					(0.456)
Number of Observations	10,905	9,255	10,905	10,905	9,401
Adjusted R-squared	0.179	0.169	0.179	0.179	0.168
Country Fixed Effects	Y	Y	Y	Y	Y
Industry Fixed Effects (4-digit SIC)		Y			Y
Number of Country FEs	45	44	45	45	45
Number of Industry FEs		607			607

Table 8. Net Income as the Measure of Size.

The dependent variable is assigned the value of one if the firm is among the largest 20 in its country (by net income) in 2018, and zero otherwise. Independent variables are defined in Appendix B. Accounting ratios are winsorized at the 1% and 99% levels. Continuous variables are standardized. P-values based on robust standard errors are reported in parentheses. *, **, and ***, denote statistical significance at the 10%, 5%, and 1% levels, respectively. Panel A reports the results for the 1980 sample, and Panel B reports the results for the 2000 sample.

Panel A. 1980 Sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ln(Net Income+|Min|+1)		0.0128	0.0119*	0.1158**	0.1148**	0.0865	0.0417
		(0.237)	(0.069)	(0.022)	(0.024)	(0.108)	(0.475)
Top 20 in 1980 NI	0.2015***						
	(0.000)						
R&D/TA	0.0072**	0.0075**	0.0125***	0.0409*	0.0418*	0.0291	0.0571*
	(0.020)	(0.024)	(0.007)	(0.081)	(0.077)	(0.215)	(0.091)
R&D Missing	-0.0040	-0.0125	-0.0146	0.0324	0.0320	0.0080	0.0454
	(0.578)	(0.110)	(0.186)	(0.445)	(0.452)	(0.862)	(0.510)
ln(Number of Board Interlocks + 1)				0.0321***			
				(0.010)			
ln(Number of Bank-Board Interlocks + 1)					0.0272**	0.0297*	0.0228
					(0.017)	(0.053)	(0.321)
M/B			-0.0067*			-0.0271***	-0.0236
			(0.050)			(0.005)	(0.329)
ROE			0.0098**			0.0001	-0.0229
			(0.035)			(0.990)	(0.144)
Leverage			0.0041			-0.0230	-0.0471
			(0.498)			(0.267)	(0.123)
Number of Observations	4,352	4,255	2,676	1,099	1,099	642	432
Adjusted R-squared	0.124	0.058	0.102	0.064	0.064	0.063	0.144
Country Fixed Effects	Y	Y	Y	Y	Y	Y	Y
Industry Fixed Effects (4-digit SIC)	N	N	Y	N	N	N	Y
Number of Country FEs	29	29	25	27	27	24	21
Number of Industry FEs			394				112

Panel B: 2000 Sample.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
ln(Net Income+|Min|+1)	0.0260***	0.0334***	0.0328***	0.0261**	0.0579**	0.0468**	0.0345	0.0589**	0.0475**	0.0345	0.0235*
	(0.009)	(0.002)	(0.004)	(0.036)	(0.012)	(0.035)	(0.205)	(0.011)	(0.033)	(0.203)	(0.052)
R&D/TA	-0.0020***	-0.0014	0.0003	-0.0010	-0.0046	0.0025	0.0039	-0.0050*	0.0028	0.0041	-0.0008
	(0.000)	(0.301)	(0.873)	(0.589)	(0.116)	(0.402)	(0.190)	(0.087)	(0.359)	(0.169)	(0.691)
R&D Missing	-0.0137***	-0.0191***	-0.0248***	-0.0176***	-0.0281***	-0.0257***	-0.0213**	-0.0294***	-0.0272***	-0.0216**	-0.0174***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.026)	(0.000)	(0.001)	(0.026)	(0.000)
Political Connections		0.0346**	0.0277*	0.0330**							0.0124
		(0.016)	(0.065)	(0.039)							(0.392)
ln(Number of Board Interlocks + 1)					0.0175***	0.0144***	0.0123***				
					(0.000)	(0.000)	(0.003)				
ln(Number of Bank-Board Interlocks + 1)								0.0123***	0.0097**	0.0141***	
								(0.001)	(0.012)	(0.003)	
Political Connections x ln(Net Income+|Min|+1)											0.0519***
											(0.002)
M/B			0.0087	0.0045		0.0029	0.0025		0.0031	0.0026	0.0044
			(0.100)	(0.152)		(0.265)	(0.296)		(0.300)	(0.285)	(0.150)
ROE			0.0017	-0.0005		0.0064**	0.0074*		0.0067**	0.0075	0.0001
			(0.446)	(0.852)		(0.024)	(0.099)		(0.019)	(0.101)	(0.954)
Leverage			0.0058**	0.0034		0.0110***	0.0117***		0.0108**	0.0111***	0.0038
			(0.044)	(0.197)		(0.009)	(0.005)		(0.010)	(0.007)	(0.150)
Number of Observations	30,814	11,399	10,522	8,142	6,987	5,981	4,067	6,987	5,981	4,067	8,141
Adjusted R-squared	0.093	0.119	0.179	0.403	0.129	0.175	0.329	0.127	0.174	0.331	0.409
Country Fixed Effects	Y	Y	Y		Y	Y		Y	Y		
Industry Fixed Effects (4-digit SIC)			Y			Y			Y		
Country x Industry Fixed Effects				Y			Y			Y	Y
Number of Country FEs	52	47	43		46	41		46	41		
Number of Industry FEs			694			557			557		
Number of Country x Industry FEs				1,548			1,000			1,000	1,548

Table 9. Tracing the Origins of the 20 Largest Firms in Each Country in 2018.

Panel A includes the firms in the countries for which data are available in Worldscope/Datastream in 2000; Panel B includes the firms in the countries for which data are available in Worldscope/Datastream or Moody's in 1980.

	N. Obs.	Fraction of Total
Panel A: Number of 20 largest firms in 2018 in the 52 countries in the 2000 sample	1,017	
Of which:		
Firms that were also among the 20 largest in 2000	450	0.442
Firms established before 2000 that were not among the 20 largest in 2000	502	0.494
New firms, likely established in 2000 or later	65	0.064
Total	1,017	1.000
Panel B: Number of 20 largest firms in 2018 in the 29 countries in the 1980 sample	580	
Of which:		
Firms that were also among the 20 largest in 1980	138	0.238
Firms established before 1980 that were not among the 20 largest in 1980	338	0.583
New firms, likely established in 1980 or later	104	0.179
Total	580	1.000

Table 10. What Happened to the Large Firms from the 60 Countries in the 1910 Sample?

The table reports outcomes, as of 2018, for the largest 20 firms in each country in the 1910 sample.

	N. Obs.	Fraction of Total
Still among the 20 largest in 2018	152	0.136
Still active but not among the 20 largest in 2018	399	0.358
Dissolved	184	0.165
Unknown	380	0.341
Total	1,115	1.000

Appendix A. Sample Composition.

Countries	Circa 1910 Sample			1980 Sample		2000 Sample		
	Included?	Political Connections	Board Interlocks	Included?	Board Interlocks	Included?	Political Connections	Board Interlocks
1. Algeria	yes		yes					
2. Argentina	yes	yes	yes			yes	yes	yes
3. Australia	yes	yes	yes	Yes	yes	yes	yes	yes
4. Austria				Yes	yes	yes	yes	yes
5. Azerbaijan	yes		yes					
6. Belgium	yes		yes	yes	yes	yes	yes	yes
7. Bolivia	yes							
8. Brazil	yes		yes	yes	yes	yes	yes	yes
9. Canada	yes	yes	yes	yes	yes	yes	yes	yes
10. Channel Islands						yes		
11. Chile	yes		yes			yes	yes	yes
12. China	yes					yes		yes
13. Colombia	yes			yes	yes	yes	yes	yes
14. Cuba	yes							
15. Czech Republic						yes	yes	yes
16. Dem. Rep. of the Congo	yes		yes					
17. Denmark	yes	yes	yes	yes	yes	yes	yes	yes
18. Ecuador	yes							
19. Egypt	yes					yes		yes
20. Finland	yes			yes	yes	yes	yes	yes
21. France	yes			yes	yes	yes	yes	yes
22. French Guiana	yes		yes					
23. Germany	yes	yes	yes	yes	yes	yes	yes	yes
24. Greece	yes		yes			yes	yes	yes

25. Guinea	yes	yes	yes					
26. Hong Kong				yes	yes	yes	yes	yes
27. Hungary						yes	yes	yes
28. India	yes			yes	yes	yes	yes	yes
29. Indonesia	yes		yes			yes	yes	
30. Ireland				yes	yes	yes	yes	yes
31. Israel						yes	yes	yes
32. Italy	yes	yes	yes	yes	yes	yes	yes	yes
33. Ivory Coast	yes	yes	yes					
34. Japan	yes			yes	yes	yes	yes	yes
35. Kenya	yes		yes					
36. Latvia	yes		yes					
37. Luxembourg	yes		yes			yes	yes	yes
38. Madagascar	yes	yes	yes					
39. Malaysia				yes	yes	yes	yes	yes
40. Mexico	yes	yes	yes	yes	yes	yes	yes	yes
41. Morocco	yes	yes	yes			yes		
42. Myanmar	yes							
43. Netherlands	yes			yes	yes	yes	yes	yes
44. New Zealand	yes	yes	yes	yes	yes	yes	yes	yes
45. Nigeria	yes		yes					
46. North Korea	yes		yes					
47. Norway	yes			yes	yes	yes	yes	yes
48. Pakistan						yes		yes
49. Peru	yes					yes	yes	yes
50. Philippines						yes	yes	yes
51. Poland	yes		yes			yes	yes	yes
52. Portugal						yes	yes	yes
53. Republic of the Congo	yes	yes	yes					

54. Romania	yes	yes	yes					
55. Russian Federation	yes		yes			yes	yes	
56. Senegal	yes	yes	yes					
57. Singapore				yes	yes	yes	yes	yes
58. Slovakia						yes		
59. South Africa	yes		yes	yes	yes	yes	yes	yes
60. South Korea	yes		yes	yes	yes	yes	yes	yes
61. Spain	yes		yes	yes	yes	yes	yes	yes
62. Sri Lanka	yes	yes	yes			yes	yes	yes
63. Sweden	yes		yes	yes	yes	yes	yes	yes
64. Switzerland	yes		yes	yes	yes	yes	yes	yes
65. Taiwan				yes		yes	yes	yes
66. Thailand						yes	yes	yes
67. Tunisia	yes	yes	yes					
68. Turkey	yes		yes			yes	yes	yes
69. Ukraine	yes		yes					
70. United Kingdom	yes	yes	yes	yes	yes	yes	yes	yes
71. United States	yes	yes	yes	yes		yes	yes	
72. Uruguay	yes							
73. Uzbekistan	yes		yes					
74. Venezuela	yes					yes	yes	yes
75. Zimbabwe	yes		yes					
Number of Countries	**60**	**19**	**44**	**29**	**27**	**52**	**47**	**46**

Appendix B. Variables Definitions.

Variable name	Definition
Top 20 in 2018 | Top 20 in 1910	is an indicator that is assigned the value of one if a company that was among the 20 largest, by book equity, in its country in 1910 is still among the 20 largest in its country in 2018, and zero otherwise.
Top 20 in 2018 | Top 20 in 1980	is an indicator that is assigned the value of one if a company that was among the 20 largest, by book equity, in its country in year 1980 is still among the 20 largest in its country in 2018, and zero otherwise.
Top 20 in 2018 | Top 20 in 2000	is an indicator that is assigned the value of one if a company that was among the 20 largest, by book equity, in its country in year 2000 is still among the 20 largest in its country in 2018, and zero otherwise.
Top 20 in 1980	is an indicator that is assigned the value of one if the company was among the 20 largest, by book equity, in its country in year 1980, and zero otherwise.
Top 20 in 2000	is an indicator that is assigned the value of one if the company was among the 20 largest, by book equity, in its country in year 2000, and zero otherwise.
Top 20 in 2018	is an indicator that is assigned the value of one if the company is among the 20 largest in its country in 2018, and zero otherwise.
Top 20 in 2018 | Top 20 in 1980 NI	is an indicator that is assigned the value of one if the company that was among the 20 largest, by net income, in its country in 1980 is still among the 20 largest in its country in 2018, and zero otherwise.
Top 20 in 2018 | Top 20 in 2000 NI	is an indicator that is assigned the value of one if the company that was among the 20 largest, by net income, in its country in 2000 is still among the 20 largest in its country in 2018, and zero otherwise.
Top 20 in 1980 NI	is an indicator that is assigned the value of one if the company was among the 20 largest, by net income, in its country in year 1980, and zero otherwise.
Top 20 in 2000 NI	is an indicator that is assigned the value of one if the company was among the 20 largest, by net income, in its country in year 2000, and zero otherwise.
Top 20 in 2018 NI	is an indicator that is assigned the value of one if the company was among the 20 largest, by net income, in its country in year 2018, and zero otherwise.
Book Equity ($000)	is the "shareholders' investment in a company" (Worldscope datatype WS03501) in either 1980, 2000, or 2018, converted into thousands of U.S. dollars. When the data are available, Book Equity for the circa 1910 sample includes both reserves and preferred stock.
Fraction Foreign Transactions (Industry-country Pair)	is the ratio of the dollar value of mergers and acquisitions, during 2000-2018, in a given country and 4-digit SIC industry involving foreign acquirers divided by the total dollar value of M&A, during the same period.
Leverage	is the ratio of total debt, defined as "all interest bearing [debt] and capitalized lease obligations" (WS03255), divided by total assets, defined as "the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets" (WS02999).
Listed	is an indicator that is assigned the value of one if the company is publicly-traded, and zero otherwise.
M/B	is the ratio of the market value of equity, defined as "Market Price-Year End * Common Shares Outstanding" (WS08001) divided by book value of equity, defined as the "shareholders' investment in a company" (WS03501). M/B for the Italian sample of 1911 is defined as the number of common shares outstanding multiplied by the average between the maximum and the minimum stock price for the year, all divided by book equity.

Net Income ($000)	is the net income available for common shareholders (WS01751) either in 1980, 2000, or 2018 in, thousands of U.S. dollars.
New Tech	is an indicator that is assigned the value of one if the firm operates in one of five industry sub-sectors: chemicals (bleaching powder, fertilizers, and explosives), electricity supply, electricity generation, bicycle, or motorcar, and zero otherwise.
Number of Bank-Board Interlocks	is, if a firm's nexus of interlocks includes a bank, the number of other firms (including banks) with which the firm shares officers or directors, and zero otherwise. The 1910 bank-board interlocks only include interlocks with other large firms.
Number of Board Interlocks	is the number of other firms with which the firm shares officers or directors. The 1910 board interlocks only include interlocks with other large firms.
Openness	is the interaction between Trade and Telephones per 100 People in 1914.
Openness Ind. Level	is, for the 1910 sample, defined as the interaction between Trade and an indicator denoting firms operating in industries other than banks and utilities (i.e., gas, lighting, and water companies). For the 2000 sample, the variable is defined as the interaction between Trade and the fraction of incoming foreign M&As, defined as the ratio of the dollar value of mergers and acquisitions, during 2000-2018, in a given country and 4-digit SIC industry involving foreign acquirers divided by the total dollar value of M&A, during the same period.
Political Connections	is an indicator that is assigned the value of one if a director or officer of the firm is a member of the central government or a member of the parliament of its country. For the 1910 sample, in the case of former colonies, political connections include politicians from the ruling country. For the 2000 sample, political connections also include close-ties to politicians.
Political Connections Missing	is an indicator variable that is assigned a value of one for (a) all firms in countries for which we do not have data on political connections and (b) for firms for which we do not have data on board members, and zero otherwise.
Political Connections, set to 0 when Missing	is an indicator that is assigned the value of the Political Connections indicator when data on political connections are available, and is assigned the value of zero for (a) all firms in countries for which we do not have data on political connections and (b) for firms for which we do not have data on board members.
R&D Missing	is an indicator that is assigned the value of one if data on R&D are missing, and zero otherwise.
R&D/TA	is the ratio of R&D expenditures, defined as "all direct and indirect costs related to the creation and development of new processes, techniques, applications and products with commercial possibilities" (WS01201), divided by total assets, defined as "the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets" (WS02999), either in 1980 or in 2000. R&D expenditures are set equal to zero when the data are missing.
ROE	is the ratio of net income, defined as net income to common shareholders (WS01751), divided by book equity, defined as "shareholders' investment in a company" (WS03501).
State-Owned Enterprise	is an indicator that is assigned the value of one if the firm became state owned at any time over the period of circa 1910 – 2018, and zero otherwise.
Telephones per 100 People in 1914	is the number of telephones per 100 residents, in the country (or colony), in 1914, from Kingsbury (1915).
Trade	is defined as the sum of imports and exports, all scaled by gross domestic product. All items are from the World Bank's World Development Indicators. Trade is averaged over 1960-2018 (1960 is the first year for which data are available from the World Bank) for the period starting circa 1910, and is averaged over 2000-2018 for the period starting in 2000.
Year Established	is the year in which the firm was established.