Omnia Juncta in Uno: Foreign Powers and Trademark Protection in Shanghai's Concession Era*

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Abstract

Intellectual property (IP) institutions have been a salient topic of economic research and political disputes. In this paper, we investigate the effects of trademark protection, an underexamined form of IP protection, by exploring a historical precedent: China's trademark law of 1923—an unanticipated, disapproved response to end conflicts between foreign powers. Exploiting a unique, newly digitized firm-level dataset from Shanghai in 1870-1941 and brand-level price series, we show that the trademark law spurred growth and brand investment for Western firms with greater dependence on trademark protection, but did not lead to significant changes in prices. In contrast, Japanese businesses, who had frequently been accused of counterfeiting, experienced employment contractions while attempting to build their own brands after the law. Further, the trademark law led to greater domestic integration both within and outside the boundary of Western firms and the growth of Chinese agents. Based on a stylized model featuring heterogeneous authentic and counterfeiting producers, we show that the trademark law raised aggregate welfare by 5.4 percent via reduced information frictions and increased authentic product variety. Finally, a comparison with previous attempts by foreign powers to strengthen trademark protection — such as extraterritorial rights, bilateral commercial treaties, and an unenforced legal trademark code – shows the alternative institutions were ultimately unsuccessful.

JEL: F2, D2, O1, O3, N4

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"Omnia Juncta in Uno."

"All Joined in One" - Shanghai Municipal Seal
International Settlement, established in 1843

1 Introduction

Disagreements over the protection of intellectual property (IP) have been a prime cause of international political and economic disputes. Firms from developed countries have often urged their governments to negotiate stronger IP protection overseas, especially in less advanced economies, while developing nations have longstanding concerns over the implications of IP protection for economic growth, market competition, and consumer welfare.

Within the IP-intensive sectors of the economy, trademark-intensive industries contribute most to employment (90% in US and 78% in Europe).[1] This economic importance stands in stark contrast to the academic literature, which has focused almost exclusively on patent and copyright protection. In this paper, we aim to close the gap in the literature and investigate the economic effects of trademark protection by exploiting a historical precedent — the introduction of China's first trademark law of 1923 — and a series of newly digitized micro-level datasets in Shanghai that provide rare, first-hand insights into how firms from around the world operated and evolved in arguably one of the most volatile and complex markets before and after the birth of trademark institutions.

Different from patents or copyrights, the economic rationale for trademarks is to solve an asymmetric information problem that arises in settings when buyers are unable to observe intrinsic product characteristics at the point of purchase, e.g., product materials or ingredients that affect the quality, safety or durability of the products (e.g., Shapiro, 1982, Shapiro, 1983).[2] One way to overcome this information asymmetry problem is for sellers to use trademarks to signal the identity of the producer to the consumer (Grossman and Shapiro, 1988a).[3]

[1] See USPTO (2016) and EPO and EUIPO (2019).

[2] As defined by the USPTO, a patent is a "limited duration property right relating to an invention in exchange for public disclosure of the invention" and protects "the right to exclude others from making, using, offering for sale, or selling an invention." A copyright protects "original works of authorship" in literature, music, art, architecture as well as software. Patents and copyrights address market failures associated with the public good nature of knowledge and aim to provide incentives for innovation and knowledge creation.

[3] According to the 1875 *Trade Marks Registration Act* of Great Britain, one of the world's first trademark laws, a trademark is "a device, or mark, or name of an individual or firm printed in some particular and

Trademarks enable firms to build and benefit from reputation over time, but counterfeiting undermines the value and growth of this firm-specific asset.[4] As the jurisdiction of laws is national by nature, this poses an especially difficult problem in the context of international trade and commerce.

At the beginning of the 20th century, China emerged as one of the world's most important markets for trademark protection due to its market size and absent formal trademark institutions. As noted in the *Manchester Guardian* on June 2, 1904, "perhaps for no market in the world is it more necessary that the trademarks upon our productions should be jealously safeguarded" (quoted in Heuser, 1975). However, unlike most other trademark laws throughout history, the urgent need for trademark protection described above did not stem from disputes between foreign and domestic businesses or demand from domestic businesses, but rather fierce conflicts between foreign powers (Motono, 2011).

After the Opium Wars, gunboats from Western nations forced Qing China to conclude numerous 'Unequal Treaties' that granted extraterritorial (ET) rights to foreign powers and open new treaty ports such as Shanghai and Tianjin to foreign trade and businesses. Entering one of the oldest societies that had been largely closed to the rest of the world for centuries, foreign businesses faced a series of formidable obstacles. In addition to language and cultural barriers, businesses first and foremost faced the challenge that economic activity had been conducted in the absence of formal economic rules.

Among the foreign powers, British businesses attained early access and dominance in the Chinese market, but this status was soon challenged by Japan after the Treaty of Shimonoseki in 1895. Counterfeits of Western trademarks, especially by Japanese manufacturers, rose rapidly after the 1890s, leading to a fast-growing volume of trademark disputes between Western nations and Japan, spanning across products from tobacco and textile to food and cosmetics. Despite strong protests from European countries, the Japanese govern-

distinctive manner; or a written signature or copy of a written signature of an individual or firm; or a distinctive label or ticket."

[4]There are two types of counterfeiting: (i) deceptive counterfeiting where the authentic and counterfeited products are similar in design and packaging and unaware consumers have difficulties distinguishing the two and are deceived to unknowingly purchase (lower-quality) counterfeited goods (such as cigarettes, drugs, and cosmetics); and (ii) non-deceptive counterfeiting where consumers are able to distinguish between authentic and counterfeited products and knowingly purchase the latter (such as counterfeits of luxury goods). Given the historical context we study and the types of counterfeits documented in the relevant period, our paper considers the case of deceptive counterfeiting and the economic implications of the trademark law in such settings.

ment often chose not to revoke alleged counterfeiting activities and was unwilling to enter into an agreement with Western countries for reciprocal protection of trademarks in China (Patent and Trade Mark Review, 1907).

At the turn of the 20th century, China's leading economic partners—Great Britain, the United States, and Japan— signed bilateral commercial treaties with China promising to give up ET if China were to regulate foreign commerce along Western lines, including formal protection of trademarks. Great Britain and Japan both tried to implant their respective trademark laws involving different filing principles into China. This competition, however, resulted in an indefinite postponement of the trademark law. Britain and Japan spent the following two decades trying to negotiate the details of the Chinese trademark law, without success in reaching agreements. Neither government anticipated the Chinese government to prepare its own trademark law. In May 1923, China surprised foreign governments by passing its first trademark law. The law, completely unanticipated by the foreign community and failing to satisfy the demands of either Western or Japanese government, was broadly rejected and only later unwillingly accepted by foreign powers (Motono, 2011; Patent and Trade Mark Review, 1923). These historical characteristics of the law offer us a unique context and an arguably exogenous institution shock for studying the economic impacts of trademark protection and comparing the effects of alternative institution approaches.

In this paper, we analyze the effects of the trademark law on the growth and organization of foreign and Chinese firms and ultimately economic welfare. We examine empirically how Western, Japanese and Chinese firms, with their distinct roles in the trademark conflicts, respectively responded to the trademark law, taking advantage of a series of novel micro-level datasets that enable us to measure over-time firm outcomes from employment and organizational changes to advertising investment and prices.

The establishment of the trademark law could shape firm growth and organization in complex ways. On the one hand, trademark protection can lead to a direct market reallocation within brand-specific segments from counterfeiters to authentic producers and even increase aggregate consumer demand by raising consumer confidence of receiving authentic products upon purchase. On the other hand, unlike patents and copyrights, trademarks protect the rights to use a mark, rather than the rights to make or sell (sometimes similar) products with different marks, and cannot prohibit original counterfeiters from obtaining new marks and competing as new varieties. As a result, while trademark protection should

help authentic producers capture their brand-specific markets, it may exert ambiguous effects on competition and subsequently firm prices and investment decisions.

We empirically address these questions by implementing a difference-in-difference (DD) analysis that compares the growth and organization decisions of firms offering more or less trademark-intensive products. We construct a firm-specific measure of trademark intensity based on each firm's initial product composition and historical trademark registration data in each product category in a number of foreign countries before 1922. Given that foreign powers neither anticipated nor approved the introduction of the trademark law, we expect the timing of the law to be exogenous to the growth of trademark-intensive foreign firms, an assumption that we can test in a pre-trend analysis. We conduct the DD analysis by exploiting two unique, complementary panel datasets: an annual firm-employee level dataset from Shanghai covering 1872 to 1942 — the city that accounted for 67% of China's inward FDI in manufacturing and 73% of China's total factory output by 1930s —, and a monthly brand-specific price series covering around 30 products during 1923-1930.

Our analysis suggests that the trademark law led to significant employment and organizational changes in trademark-intensive firms and the effects varied sharply between the two sides of the trademark conflicts. The employment of Western firms grew, on average, by 5%, while Japanese businesses, in contrast, witnessed an average reduction of employment by 15%. Western firms were also less likely to exit the market and drop trademark-intensive products and more likely to invest in local advertising after the enactment of the trademark law. Japanese firms became also more likely to post advertisements and add trademark-intensive products to their portfolio, suggesting that Japanese firms attempted to build up their own brands after the law. To gauge the potential implications for consumers, we also compare brand-level prices before and after the registration of trademarks and show that brand prices did not change significantly after trademark registrations, suggesting no marked increases in the market power of authentic firms.

The impacts of the trademark law go beyond Western firm growth and market reallocation. Exploring information on domestic linkages of foreign firms, we find that Western businesses adapted their domestic integration decisions in response to the trademark law. Confronted with extensive obstacles such as language barriers and inland market access restrictions, many Western businesses turned to Chinese nationals or worked directly with Chinese businesses to explore their social networks. At the same time, however, the ab-

sence of formal legal institutions including the trademark law inhibited the establishment of a strong trust-based relationship between foreign businesses and their domestic employees and agents. Our evidence suggests that the trademark law led to greater domestic integration by Western firms both within and outside the boundary of the firm: they were more inclined to promote Chinese employees within their organizations as well as utilize Chinese employees and businesses as agents. Consequently, Chinese agent businesses witnessed a significant growth after the trademark law.

To quantify the aggregate economic effects of the trademark law, we develop a stylized model featuring heterogeneous authentic and counterfeiting producers. In the model, consumers are unable to verify the true quality of the product upon purchase and face a certain probability of encountering counterfeits. An increase in trademark protection, by lowering the consumers' probability of receiving counterfeits, leads to a direct market reallocation within brand-specific segments from counterfeiters to authentic producers and increases the number of (authentic) varieties and the output of individual authentic firms as documented in the empirical evidence. Computing the welfare change based on the model's sufficient statistics suggests that the trademark law raised aggregate welfare by 5.4%, via reduced information frictions and increased authentic product varieties.

As the 1923 trademark law was preceded by a series of alternative institutional models exploited by foreign powers to address trademark issues, we also compare the effect of the 1923 trademark law to these preceding institutional arrangements including: 1) ET, which can be interpreted as a direct import of foreign legal institutions in China; 2) bilateral commercial treaties between China and foreign countries; and 3) the legal trademark code in 1904 that had never been put into force. We find that none of the alternative institutional arrangements exerted a positive and significant effect on firm growth, highlighting the importance of the domestic institutional reform.

An extensive literature on IP institutions assesses the effects of patent laws and, to a lesser extent, copyright protection, on economic growth.[5] In contrast, there has been limited research on the economic effects of trademark protection. The main theoretical work on this topic is Grossman and Shapiro (1988a,b) who analyze the positive and normative effects

[5] See, for example, Moser (2013) and Sampat (2018) for a comprehensive review on patent institutions and Biasi and Moser (2018), Giorcelli and Moser (2020), Oberholzer-Gee and Strumpf (2007), and Li, MacGarvie, and Moser (2018) for recent studies of copyrights.

of counterfeit trade on consumers, firms and total welfare and the implications of policies designed to combat counterfeiting based on earlier work by Shapiro (1982, 1983). Recent work by Heath and Mace (2019) offers empirical evidence on the effects of trademark protection on the profits of US firms exploring the 1996 Federal Trademark Dilution Act, which granted additional legal protection to selected trademarks. The paper finds that the Act raised treated firms' operating profits, lowered entry and exit, and reduced innovation and product quality. Qian (2008), examining counterfeiting among Chinese shoe companies, finds that a loosening of counterfeit enforcement led to alternative differentiation strategies by authentic producers. Low-quality counterfeit entrants are found to induce authentic producers to upgrade product quality and invest in signaling and self-enforcement against counterfeits. In contrast, Kuroishi (2020) finds that the quality of Chinese tyre exports to Africa increased once the African countries joined the Madrid Protocol, which simplified the international registration process for trademarks.

In contrast to previous studies, our paper focuses on a fundamental, rather than incremental, change in trademark protection: the implementation of an entire trademark law. Furthermore, the historical setting provides arguably exogenous variation in the timing of the trademark law that allows us to establish a causal effect of China's first trademark law on firm growth and consumer welfare. By examining foreign firm responses to the trademark law and their domestic integration decisions, our study also offers one of the first pieces of evidence for the impact of trademark institutions on international commerce and linkages between advanced foreign firms and less developed domestic economies. Further, the quantitative analysis of the welfare effects provides important new insights on the potential aggregate impact of the trademark law.

Our paper is also related to an emerging literature assessing the historical patterns of Chinese trade during the treaty-port era, including Jia (2014), Keller, Li, and Shiue (2013), and Keller and Shiue (2020). Studying the long-run development of China's treaty ports, Jia (2014) examines the development paths of treaty ports and their neighbors and the roles of migration and sector-wise growth. Keller et al. (2013) and Keller and Shiue (2020) document the historical patterns in China's trade and FDI, and assess how these patterns compare to those of modern trade and investment.

The rest of the paper is organized as follows. Section 2 describes the historical background and timeline for the birth of China's first trademark law. Section 3 explains the

construction of the business-employee panel data, brand price series, and trademark registration database and presents several stylized facts. Section 4 implements the empirical analysis on the role of the trademark law in firm growth and reallocation, prices, and domestic integration. In Section 5, we develop a model featuring information friction and a coexistence of authentic and counterfeiting producers to estimate the effects of trademark protection on aggregate economic outcomes. In Section 6, we discuss and compare the effects of alternative institutional arrangements. Section 7 concludes.

2 History of China's First Trademark Law

China's historical use of trademarks can be traced back to the Northern Zhou Dynasty (556-580 A.D.), when merchants began to use different marks to distinguish their products and craftsmanship from others (Chang, 2014). Porcelain and ceramics are one of the oldest industries in which such marks had been used for centuries (Heuser, 1975). In contrast to the long history of trademark uses, China's formal institutions to protect trademarks has had a much shorter and complex timeline. Before the late 1800s, written Chinese law (e.g., the Great Qing Code) referred very little to the regulation of private economic activity (Kirby, 1995), with the main exceptions being the rules preventing monopolies and unfair trading. Instead, protection of trademarks had been governed by the by-laws of commercial organizations (guilds or shanghui) (Alford, 1995).

Trademark protection in pre-1949 China underwent several phases, from the imposition of foreign legal institutions (ET) to bilateral commercial treaties with major trading partners, and from the Qing 1904 code that had not been put into force to finally the 1923 birth of China's first comprehensive trademark law. In the initial phases, competition by Japanese and Western firms over their grasps of the Chinese market spurred growing Anglo-Japanese conflicts over trademark protection. These conflicts began at the end of the 19th century and remained unresolved after several rounds of failed negotiations among the British, Japanese and Chinese governments. In the midst of continuing Anglo-Japanese negotiations, the Republican-era government surprised foreign nations by introducing its first trademark law in 1923 to end the continuous disagreements between foreign powers, and as a first step towards removing ET altogether. Even though foreign governments rejected the new trademark law as it conflicted with their interests, it entered into force and remained in place even after the turnover of the government in 1927. Below we describe the three phases leading up

to the 1923 trademark law.[6]

2.1 The Clashes of Foreign Legal Institutions

After the Opium War, gunboats from Western nations forced Qing China to conclude a series of 'Unequal Treaties' which allowed foreign merchants to trade in Chinese ports, established regulations for the conduct of trade, and granted foreign citizens and businesses extraterritorial rights, sometimes known as consular jurisdiction. Cases in which foreign companies with ET were defendants would be tried at their respective Consular Courts in Shanghai following the laws of their home country, while other cases would be tried in the "Mixed Court" following Chinese jurisdiction.

This led to the coexistence of up to 22 different legal systems in Shanghai, depending on which treaties got signed, expired, or were renewed. The laws that specific firms had to adhere to changed over time and depended not only on the nationality of the specific firm, but also on the nationality of all involved parties. The coexisting legal systems and consular courts led to a complex "legally pluralistic environment," and often competed for jurisdiction and failed to cooperate with each other. By the early 1900s, the web of treaties attained such a level of complexity that "even accomplished international lawyers found extremely difficult to assess with certainty the relevant jurisdictions and obligations" (Cassel, 2012).

Around the same time, China had emerged as one of the most important markets for trade and a major source of economic hope for Western merchants and manufacturers (in particular, Great Britain) which attained early entry and dominance in Chinese imports. This dominance was then challenged by Japan which gained extraterritorial rights after the end of the first Sino-Japanese War in 1894–95 and the Treaty of Shimonoseki in 1895. As Japanese firms lagged technologically behind their Western rivals, they were sometimes found to manufacture counterfeits of Western goods and infringe on Western trademarks.[7] Western-Japanese conflicts surrounding trademark started when Great Britain discovered a series of Japanese counterfeits in 1906.[8]

[6] We refer interested readers to Motono (2011, 2013) for a comprehensive account of the history behind the trademark system.

[7] For example, the Patent and Trade Mark Review (1907) argued that "Japanese trade in China consists largely of Japanese imitations, both undisguised and colorable, of foreign goods. The trade is assuming the dimensions of a great national industry."

[8] See Motono (2011) for a detailed description of some notable cases including, for example, Sir Elkanah Armitage Sons Ltd. vs. Konishi Hanbei and the "Peacock" brand by British American Tobacco vs. the

Great Britain immediately attempted to protect their trademarks by asking British firms to register trademarks in their Chinese and Japanese consulates. The marks were then transmitted to be recorded at the Imperial Maritime Customs Service. However, this form of protection proved inadequate because neither the consulate nor the record office had a legal basis to enforce compliance with its rules — the enforcement depended on the specific legal institution that was involved, nationalities of the opposing parties, and whether their home countries had ET or not, as illustrated earlier.

In practice, this resulted in different trademark protection of Western firms against Chinese versus Japanese firms. If a trademark lawsuit was made against a Chinese business, it went to the Mixed Court in Shanghai, which had tended to enforce the protection of trademarks registered at the Customs.[9] However, if the case was against a firm who enjoyed ET, such as Japanese firms, the case was dealt with at the consular court, which tended to enforce trademark protection to a lesser extent. As noted in the *Daily Consular and Trade Reports* on October 30, 1923, "the difficulty in the matter of infringements does not generally arise among the Chinese, with whom the authorities are usually prompt to deal in cases of infringement, but with certain European and Oriental manufacturers who put on the China market merchandise which it is claimed by representatives of American manufacturers violates American trade-mark and patent rights." This intensified Western-Japanese tensions.

2.2 Bilateral Commercial Treaties and Failed Negotiations

In 1902 Great Britain signed a commercial treaty with China, promising to abolish their extraterritorial rights if China were to establish its legal systems along Western lines; the foreign powers might be "prepared to relinquish extra-territoriality when satisfied that the state of the Chinese law, the arrangements for their administration and other considerations warrant."[10] A year later, the U.S. and Japan signed similar treaties with China. In particular, the treaties required the Chinese government to provide protection for foreign trademarks

"Peafowl" brand by Sanlin Gongsi. The *North China Herald* also reported additional prominent cases such as British Whiskey brand "Black and White" producer J. Buchanan Co. vs. an Osaka spirit merchant.

[9]For example, Heuser (1975) noted that "In case of infringement by Chinese subjects it was possible to obtain injunctions by the Chinese authorities... The British minister mentioned in a dispatch to the Foreign Office that 'the Chinese Courts... as they have done in the past, afford substantial protection against imitation on the part of Chinese subjects'."

[10]See, The 1903 Treaty between the United States and China, cited in Alford (1995, p. 36)

and establish offices to register trademarks.[11] As noted by Alford (1995), "trademark protection was the centerpiece of the intellectual property issues addressed" in these commercial agreements.

The Qing central government, specifically, its Ministry of Commerce, responded by asking the Japanese government for help in designing a trademark law as a first step towards satisfying the conditions outlined in the treaties for abolishing ET. One difficulty was that often identical trademarks were registered by different owners in different countries, one usually being a counterfeit, and it was unclear how to decide between rival claimants (Morse, 1918). Japan suggested to use its first-to-file principle, which would continue to allow Japanese companies to counterfeit Western products as long as they filed the (counterfeit) trademark first, and at the same time prohibit Chinese merchants from copying Japanese products.

Western officials and firms, led by the British, strongly opposed the plan. Due to their protests, the Qing government postponed putting the Provisional Code of Trademark Registration into force. As noted in the Patent and Trade Mark Review (1904), "local merchants being dissatisfied with the measure, the British and German Ministers protested and the enforcement of the regulations was indefinitely postponed." In the meantime, British diplomats in China and Japan continued to discover counterfeits of Western products manufactured in Japan and exported to China via Chinese merchants. In response to the British complaints, Japanese diplomats argued that Chinese merchants initiated the counterfeit trade without Japanese firms being aware of counterfeiting, and took little actions to address the situation.

The British government then attempted to sign a mutual treaty with the Japanese government, which would enable British consuls and consular courts in China and Korea to punish any Japanese firms that infringed on the intellectual property of British businesses. However, disagreements between the two governments on issues including the protection of British unregistered trademarks that had been in use in Chinese markets before 1894 ended the negotiations. For example, Patent and Trade Mark Review (1907) wrote that "China is being swamped with Japanese imitations, and there is no redress; England has signed with Russia, Germany, France and other powers, agreements for the reciprocal protection of trade marks in China, but Japan is unwilling to become a party to these, desiring that China should first undertake the registration of trade marks. Since it is Japanese infringements and coun-

[11] See Article VII of the 1902 Treaty between the United Kingdom and China and Article IX of the 1903 Treaty between the United States and China.

terfeits that are feared and not Chinese, the justice of this position is not obvious."

After the Xinhai Revolution in 1911, the new government decided to introduce its own rules and regulations. The *Draft of Rules and Regulations of Trademark Registration* by the new government in April 1914, however, failed again to satisfy foreign diplomats. The British government was particularly disappointed to find no provisions for protecting old trademarks of British firms that had been used in China since 1842 as the draft did not adopt the first-to-use principle as requested by the British government. The objections were shared by the U.S., French and Russian governments. Even the Japanese government was unsatisfied with the draft. Negotiations for revising the draft were, however, postponed due to the outbreak of the First World War.

The British's continuing frustrations and concerns can be seen in the *North China Herald* from April 22, 1922, which highlighted an earlier article by Lord Northcliffe appearing in the *Daily Mail* warning the potential military threat Japan posed to China and comparing Japan's lack of adherence to treaties to the willingness of many of its traders to infringe others' trademarks. The third attempt to establish the trademark protection system in China with cooperation between British and Japanese governments ended again in failure.

2.3 China's First Trademark Law of 1923

While the British and Japanese governments were negotiating over the draft of the Chinese trademark regulations, neither government anticipated the Chinese government to implement a system for trademark protection on its own. After decades of failed negotiations, China saw the only way to progress with the trademark issue (and ultimately abolish ET) in confronting the conflicting parties with a fait accompli. The Chinese Congress passed the law and put it into force on May 9, 1923, and only then informed the foreign diplomats. Chinese opted to implement a compromise between the first-to-file (favored by the Japanese) and the first-to use principle (favored by the British), in which the first-to-file principle would be adopted (after a certain notice period to the public) unless two firms applied for the same trademark, in which case the first-to-use principle would apply.

At first, the foreign governments and chambers of commerce fiercely opposed the law because of skepticism over the law's effectiveness and concerns of losing extraterritorial rights. Even in March 1924, a telegraph was published on the front page of the *North China Herald* arguing that the trademark law threatened the interests of British trademark owners by

"placing the responsibility for trademark adjudication in the hands of inexperienced Chinese courts." However, the diplomats and businesses were soon overtaken by reality, as some groups such as Japanese businesses and German businesses who had previously lost ET status started to register their trademarks, fearing that their rivals would register the trademarks first. It became evident then the implementation of the law had become irreversible. Between 1923 and 1926, 13,647 trademarks were registered with the Chinese trademark bureau (see Table 3 in Motono, 2011). While Japanese and German businesses accounted for the vast majority of the initial trademark applications as reported in the 1924 Trademark Gazette, British firms later owned the largest share of registered trademarks (32%) by 1926 followed by Japan (20%), China (16%), Germany (15%), and the United States (12%). As can be seen in Figure 1, trademarks were most frequently registered in textiles (cotton textiles, clothing, woolen products, cotton yarns), chemicals (paints, medication, soap, cosmetics), as well as tobacco products.

The impact of the trademark law can be seen in the advertisements of brand manufacturers. Before the trademark law, brand producers often included warnings against imitations in their newspaper advertisements. We collected all advertisements printed in the *North China Herald*, the leading English-language newspapers in China at the time, and classified advertisements against imitation if they included strings related to "imitation" in the advertisement.[12] For example, the company "Lea & Perrins" warned their consumers: "To distinguish the original and genuine Worcestershire Sauce from the many imitations, see that the signature of LEA & PERRINS appears in *White* across the *Red* label on every bottle" – next to a picture of their product.[13]

Figure 3 shows that the share of advertisements that include a warning against trademark infringements in all advertisements declined sharply after 1923, from 6% before 1923 to virtually zero by 1925. This suggests that firms saw significantly less need after 1923 to warn their consumers about counterfeits, presumably because the trademark law was effective in deterring counterfeiting.

The Nationalist government that came into power in 1927 kept the 1923 trademark law, but offered less effective protection for foreign businesses against Chinese counterfeiters. By

[12]Keywords like "imitation" were used in the search in the *North China Herald*. We manually checked the advertisements to make sure these advertisements did in fact warn against imitations.

[13]In an advertisement published in the *North China Herald* on July 31, 1920.

1934, 7,932 Chinese companies registered their trademarks in Shanghai, accounting for 86% of the registered trademarks in the country (Motono, 2013).

3 Data

To quantify the economic impact of China's first trademark law, we digitize and construct a rich array of micro-level datasets, including a business-employee panel dataset covering the universe of firms operating in Shanghai's concession areas spanning across 1870-1940, monthly brand-level price data from Shanghai between 1923-1929, and a cross-country trademark database from 1921.[14]

3.1 Business-Employee Data in Shanghai's Concession Era

Often labeled as the "Paris of the East," Shanghai had emerged by 1930 as one of the largest cities in the world and the commercial center of East Asia with over 3 million inhabitants, vibrant manufacturing and service sectors, and remarkable openness to trade, investment, and immigrants (Osterhammel, 1989). The decades before the 1930s marked one of the most transformative as well as turbulent periods in Shanghai's history when Shanghai grew from an unknown fishing village to one of the most prominent industrial and financial centers around the world (Brandt, Ma, and Rawski, 2014). Between 1865 and 1930, trade passing through the port of Shanghai increased fourteen-fold and accounted for more than half of China's foreign trade, which itself reached more than 2% of global trade flows, a level not regained until the 1990s (Lardy, 1994). By the 1930s, Shanghai also accounted for 67% of China's inward FDI in manufacturing, while China's total inbound FDI stock amounted to U.S. $2.6 billion and 8.4% of the world's total FDI–more than nearly any other underdeveloped region (Hou, 1965). Foreign businesses dominated the early stages of China's modern industrialization, but Chinese entrepreneurs eventually grew to produce 73% of China's factory output by 1933 (Rawski, 1989). During the rapid industrial growth, the population grew from 77,000 to 3.7 million, making Shanghai the world's 7th largest city (Ma, 2008). Shanghai consisted of three areas: the International Settlement (or Public Concession), the French Concession, as well as the Chinese part of the city. The two concessions were governed by city councils independent of the Chinese government, and most foreign businesses were

[14] In section D.4 of the online appendix, we show additional analysis using product-level Chinese Customs import data from 1920-1928 to examine the trade effects of the law.

established in these areas.

We digitized and assembled an annual business-employee-level panel dataset covering the universe of firms operating in Shanghai's concession areas spanning across 1872-1941 based on the *North-China Hong List*, a business and residential directory featuring comprehensive information about firms operating in the leading port cities of northern China.[15] This annual series was published by the *North-China Daily News*, an English-language newspaper based on Shanghai that was widely regarded as the "most influential foreign newspaper of its time." The Hong Lists contain detailed information about all the firms operating in both the Public and the French concessions of Shanghai.[16] For each company listed in the Hong List in a given year, we recorded, among other things, its name, address, products, and importer and exporter status. In addition, we digitized each firm's non-production employees including their names and positions within the firm. Figure 2 below shows an example page from the 1927 Hong list.

For each firm, we also identified its nationality using a number of different sources, including the "China Importers and Exporters Directory" published 1936 by the Bureau of Foreign Trade, Ministry of Industry, Shanghai, "The Universal Dictionary of Foreign Business in Modern China", a source that contains a detailed description of a firm's ownership, history, and products; the "History of Foreign Firms", published by the Shanghai Academy of Social Science in 1932; the "Shanghai Dollar Dictionary 1943", published by the Dollar Dictionary Co.; and several documents from the Japanese Chamber of Commerce. For the remaining unmatched businesses, we manually searched them to identify sources with nationality information or assigned nationality based on the language of the firm name or the countries mentioned in the firm name (if unambiguous). Our measure of the nationality of a firm is time-invariant, as we do not have information about changes in the nationality of firms over time.

Based on the data from each edition of the Hong List, we then constructed a firm-level panel dataset as well as a firm-employee-level panel dataset covering nearly the entire 1872-

[15]The Hong Lists from 1873, 1885, 1898, and 1900 are missing and not included in the dataset.

[16]To cross check the coverage of the data, we compared the aggregate non-production employment of foreign firms, the majority of which consisted of foreign nationals, with the size of the foreign population (including both adults and children) in Shanghai reported in the Census. The comparison suggests that the employees in our data accounted for 26% to 41% of foreign population in Shanghai, which we believe reflects a plausible ratio.

1941 period by matching firms over time. The richness of information from the Hong Lists and the corresponding panel that we generated offer us a unique tool to analyze firm dynamics in one of the most volatile historical periods. The key firm-level variables in the dataset include:

- firm name: name of the firm in English, traditional Chinese, and Wade-Giles;
- year and address: the year of operation and address;
- firm activity: text description of firm activity matched to 8 broad industry categories (denoted by j in the empirical analysis below; these include: agriculture/mining, construction, manufacturing, transportation, wholesale, retail, finance/insurance/real estate, other services);
- products: description of specific products produced or sold by the firm, merged from the Appendix of the publications and subsequently matched to the NCL categories used in the trademark data as described below;
- nationality: the nationality of the firm assigned based on different separate sources as described above;
- list of non-production employees including names, titles and hierarchies; we are using a count of the firm's non-production employees as a measure of employment in the empirical analysis below;
- export and import status: an indicator of whether the firm was listed as an exporter, importer or both;
- hierarchical layers: a number that enumerates the indents in the list of employees that are used to denote hierarchical layers in Hong List;
- Chinese nationality of employees: a count of employees that have Chinese last names;[17]
- job titles: we classify job titles into sales related positions (with job titles such as sales, salesman, marketing, representative, advertising, and publicity), engineering related

[17]We use a list of Chinese last names from https://www.familyeducation.com/.

positions (engineer, engineering, technical, machinery, draughtsman, mechanic, mechanician, and technician), and manufacturing related positions (job titles that include keywords like manufacturing, manufacturer, manufactory, production, producing, and factory).

3.2 Price Data

In addition, we obtain detailed product- and brand-level price panel data by digitizing issues of *The Shanghai Market Prices Report*, published quarterly by the Ministry of Finance, Bureau of Markets, in Shanghai. More specifically, we digitized the *Wholesale Prices of Commodities at Shanghai* or *The Table of Wholesale Prices in Shanghai* (in later issues) which reported monthly price series starting in April 1923, and were used to compute price indices for Shanghai. Overall, we collected monthly price series for the period of April 1923 to December 1929.

The products reported are from eight product categories: cereals, other food products, textiles, metals, fuels, building materials, industrial materials, and sundries. Each product is "affixed with its trade mark, brand and, in some cases, the name of the company" (The Shanghai Market Prices Report, April-June 1924, p. 2). The products recorded expand over time, but we only consider products consistently reported between June 1923 (as there were some missing prices before this date) and December 1929, yielding 117 products. Out of these, 39 listed at least one brand name (instead of a generic, though narrow, product description), and we use this subset for our analysis further below.[18] The market price reports also indicate the country origin of the manufacturer in most cases, which we classified into Western, Japanese and Chinese brands.

We then manually searched all the brands listed in the price reports in the trademark registries of China, called *Shangbiao Gongbao* (商标公报) (we located all the volumes until December 1927 except for the first one). We were able to find trademark registrations for 28 products in this time period.

[18] In some instances, product prices were missing for specific months. In order to generate a fully balanced panel necessary for the method suggested by Callaway and Sant'Anna (2020), we replaced the missing data with the prices from the previous period.

3.3 Trademark Data

To measure firms' heterogeneous dependence on trademark protection, we obtain historical trademark data from the IP Portal of the World Intellectual Property Organization (WIPO). While WIPO in principle holds trademark data for 141 countries, after dropping countries with no or very sparse trademarks in the late 19th and early 20th century, we end up with trademark data for eight countries: Britain, Germany, US, Japan, Australia, Canada, Denmark and Spain.[19] The dataset lists the name of the trademark, the name of the trademark holder, the number of the trademark, the application date, and the product group(s) that the trademark is registered for. Product groups are defined according to the international *Nice classification (NCL)* scheme that was established by the Nice Agreement in 1957.[20]

For each country, we calculate the cumulative sum of all trademarks registered between 1872 and 1922, the year before the enactment of the trademark law.[21] We then aggregate the trademarks across the eight countries, yielding a total of 50,050 registered trademarks by 1922. For each NCL product category p, we then calculate its share in total trademarks, labelling this $trademarkintensity_p$.[22]

As can be seen in Table 1, the product categories with the highest trademark intensity are pharmaceuticals, cosmetics, food, alcoholic beverages, chemical products, paper and cardboard, and tobacco. Services have a trademark intensity of zero, as it was not possible to register trademarks for them. Among the goods with the lowest trademark intensities were firearms, canvas, musical instruments, leather products or dressmakers' articles.

To compute a firm-specific measure of trademark intensity, We match the product-level trademark intensity to products sold by each firm prior to 1923 and use the maximum trademark intensity across the firm's products:

$$TrademarkIntensity_i := \max_{p \in P_i} (TrademarkIntensity_p)$$

[19] We also dropped New Zealand, as its product classification scheme is inconsistent with the NCL classification.

[20] For details, see https://www.wipo.int/classifications/nice/en/ (accessed 1/20/2021).

[21] Before 1872, only a handful of trademarks were reported on Jan 1, 1801, and hence excluded in our data.

[22] Registration of trademarks for services was not possible in this time period. Nevertheless, some service trademarks appeared in the data. We drop these trademarks and use a measure of 0 trademarks for all services that appear in the Hong List data.

where P_i denotes the set of products that the firm sold in the period 1920 to 1922, i.e., before the trademark law. The firm-specific trademark intensity enables us to explore cross-firm variations in demand for trademark protection and examine the heterogeneous effect of the trademark law at the firm level.

3.4 The Trends and Compositions of Shanghai Firms

In this subsection, we describe the time trends and distributions of the firms in Shanghai documented in our data, starting with the growth in the number and size of businesses. After the forced opening of the Shanghai port, the city witnessed a tremendous growth in the number of foreign businesses. Consistent with the aggregate accounts of that period, Figure 5 shows that the number of business grew rapidly starting in the 1920s and rose from 771 to 1,624 in 1920-1930 alone. The total employment recorded in our data also grew over time as shown in Figure 5, rising from about 5,000 in 1920 to 13,000 in 1930. Some particularly notable examples of foreign corporations include British American Tobacco (BAT), Standard Oil, and Mistui Trading Company. As shown in Figure 6, BAT, formerly named British Cigarettes, consisted of about 25 main employees and a relatively simple organization structure as of 1906; two decades later, BAT's operations in Shanghai expanded to over 100 main employees and 9 departments (such as accounting, advertising, legal and traffic).

During this period, Shanghai's economy also experienced a significant industrial transformation, transitioning from an economy primarily dominated by wholesale and merchants to a more diverse economic landscape with a mix of manufacturing and services. As shown in Figure 7, the manufacturing sector grew from only 6.2% of the economy (measured in non-production employment) to 20% by 1930 as both foreign and Chinese businesses set up factories in Shanghai.

The nationality composition of the businesses also varied significantly over time. Across country origins, Great Britain initially accounted for 50.5% of the businesses in the data as Figure 8 shows, but the share fell significantly over time reaching 20% by 1930 while the shares of Japanese and Chinese companies grew from 2.1% to 10.4% and from 3.3% to over 20%, respectively, by 1930. Other important firm nationalities in Shanghai were the United States, France, Germany, and Russia, which accounted for 18.3%, 5.7%, 4.7%, and 2.1% of the businesses, respectively, by 1930.

4 Empirical Evidence: Firm Responses to Trademark Protection

In this section, we examine how Western, Japanese and Chinese firms, with their distinct roles in the trademark conflicts, respectively responded to the trademark law. The establishment of the trademark law, by protecting authentic producers against "competition" from counterfeits, could shape firm growth and organization in complex ways. First, the trademark law can lead to a direct reallocation of markets from counterfeiters to authentic producers. Second, by addressing information asymmetry, trademark protection may raise aggregate consumer demand as consumers gain confidence in their probability of receiving authentic, rather than counterfeited, products upon purchase. However, unlike patents and copyrights, trademarks protect the rights to use a mark, rather than the rights to make or sell (sometimes similar) products with different marks, and cannot prohibit original counterfeiters from obtaining new marks and competing as new varieties. As a result, while trademark protection should help authentic producers capture their brand-specific markets, it may exert ambiguous effects on market structure and prices.

Taking advantage of detailed firm-level data, we first examine the effects of the trademark law on different margins of firm growth and market reallocation between the two sides of trademark disputes. After assessing separate implications for Western, Japanese and Chinese firms, we then explore the interactions between foreign and domestic firms; in particular, whether the trademark law affected domestic integration decisions of Western firms, both within and across the boundary of the firm, where increased linkages may serve as potential channels of spillover to the Chinese economy. Next we investigate the effect of trademark protection on brand-level prices to understand the potential impact of the law on consumers.

4.1 Empirical Strategy

To examine the firm effects of the trademark law, we estimate a difference-in-differences specification on the sample of pre-existing firms in Shanghai (i.e., firms that we observe in at least one of the years 1920-1922), comparing the outcome of firms that sell trademark-intensive products with firms that sell less trademark-intensive products before and after the trademark law of 1923:

$$y_{ict} = \beta_0 + \beta_1 * TrademarkInt_i * PostLaw_t + FE_i + FE_{ct} + FE_{jt} + \epsilon_{ict} \qquad (1)$$

where y_{ict} is a firm-specific outcome such as the log employment for a given firm i from country c in year t, $TrademarkInt_i$ is a firm-specific measure of trademark intensity based on the firm's product composition in 1920-1922 and each product's trademark intensity (calculated based on a group of countries outside of China as discussed in Section 3), $PostLaw_t$ is a dummy that equals 1 if the year is equal to or after 1923, FE_i denote firm fixed effects, FE_{ct} denote country-year specific fixed effects that are included to absorb potential macroeconomic shocks from the home countries of the firms, and FE_{jt} denote broad industry-year specific fixed effects that are included to account for structural change across broad sectors in Shanghai. Standard errors are two-way clustered by product category and country-year. In our baseline regressions, we center on the period of 1920-1926 to compare firm outcomes in a focused time window and mitigate the effects of other historical shocks, such as the establishment of the Nationalist government. Table E.1 in the online appendix presents the summary statistics for this regression sample.

In order for our identification strategy to work, it is important to make sure that trademark-intensive firms would not have grown even in the absence of the trademark law, i.e., there are no pre-trends. To ensure that, we also implement an event study specification:

$$y_{ict} = \beta_0 + \sum_{t=1920}^{1926} \beta_t * TrademarkInt_i + FE_i + FE_{ct} + FE_{jt} + \epsilon_{ict} \tag{2}$$

Examining the elasticity of trademark intensity before and after 1923 will help detect the presence of pre-trends in our data.

4.2 Firm Growth and Reallocation

We start by examining the effects of the trademark law on firm employment and organization. As the main complainants of trademark infringements, Western firms are expected to benefit from reduced counterfeiting activity within its own market segment. However, the benefit can be mitigated when previous counterfeiters establish their own brands and compete as "new" varieties. On the other side of trademark conflicts, the effect of the trademark law on Japanese and Chinese firms is expected to be the contrary. If the trademark law led to a reallocation of market share from authentic producers to counterfeiters, one would expect the latter group to contract. However, the trademark law would not prevent previous counterfeiters from supplying a lower-quality consumer segment with their own registered brands

to offset the direct negative effect.

4.2.1 Within-Firm Employment Growth and Organizational Change

In Table 2, we show that the trademark law exerted a net positive effect on the growth of trademark-intensive Western firms. Based on column (3), our preferred specification that includes broad industry times year fixed effects, the employment of Western firms with mean trademark intensity grew by 4.6% after the enactment of the law. This implies on average adding a 1/2 employee at the mean employment of 11.2. However, for firms selling the ten most trademark-intensive products listed in Table 1, the employment growth ranged from 7.8% to 19.2% (adding 1-2 employees to the mean firm size). In contrast, firms selling the ten least trademark-intensive products listed in Table 1 saw only a 1.3-3.5% employment growth. [23]

In contrast to the growth of Western firms, trademark-intensive Japanese firms experienced a significant contraction in their employment after 1923. In terms of magnitude, the employment of Japanese firms with mean trademark intensity decreased by 15% after the enactment of the law. The effect on Chinese firms is similarly negative but mostly statistically insignificant.[24]

To ensure the results are not driven by pre-trends, we estimate equation (2) for the three types of firms. As shown in Figure 9, no pre-trends are present for Western firms: the estimated employment elasticities of trademark intensity before 1923 are not significantly different from zero, while the effect partially appears in 1923 and then fully in 1924 and after. Figure 10 shows the corresponding event study for Chinese firms, confirming the absence of pre-trends and the negative effect of the trademark law. The event study for Japanese firms in Figure 11 is noisier as we do not have as many Japanese firms in the sample, but still shows a decline in employment. Overall, these results suggest that after years of Anglo-Japanese trademark conflicts, the enactment of China's first trademark law enabled Western firms to grow their trademark-intensive operations in China while disadvantaging Japanese and Chinese businesses.

[23] As we show in Figure F.1 of the online appendix, the effect of the trademark law was not uniform across the size distribution of firms with the effects concentrated on large and medium-sized businesses.

[24] In section D.4 of the Online Appendix, we show that these effects were also mirrored in Chinese imports. The trademark law led to increased Chinese imports and new trade relationships from Western countries in trademark intensive products. In contrast, imports from Japan fell, though the effect is not statistically significant.

Next we examine whether the positive effect of the trademark law on Western firm employment indeed reflects firms' varying dependence on trademark protection rather than other firm or product attributes. While we are not aware of other major shocks in China during 1923, we want to ensure that we are measuring the effect of the trademark law on firms that are ex ante most dependent on trademark protection, i.e., the trademark-intensive firms. To check this, we interact the post-law dummy with other firm or product specific characteristics. For example, firms in trademark-intensive products may also be innovation intensive. For this reason, we control for an interaction of the post-law dummy with a firm-specific measure of patent intensity in column (2) of Table 3. We calculate patent intensity for each product as the share of patents in each product category based on data on the stock of US patents in 1922 from the historical USPTO database.[25] Trademark and patent intensity are found to be only weakly correlated, and our employment effect is not explained by patent intensity.

In columns (3)-(5) of Table 3 we check whether the estimated effect on trademark-intensive industries may instead reflect an effect on large industries or firms, as the trademark law may be particularly relevant for large (or small) industries and firms. To test this, we interact the post law dummy with the number of firms or the total employment of firms in each NCL product category and firm initial size, respectively.[26] Again, none of these size measures explain away the employment effect of trademark intensity. Finally, we show in column (6) the estimated effects are also not due to general macroeconomic shocks in home countries that had affected trademark-intensive firms differentially.[27, 28]

[25] See https://www.uspto.gov/learning-and-resources/electronic-data-products/historical-patent-data-files. Similar to trademark intensity, we use the maximum patent intensity across products for each firm.

[26] We use the number of unique firms that offer the product in at least one of the years between 1920 and 1922. In order to create a firm-specific measure, we again use the maximum size across all products a firm produces.

[27] Note that we already control for general macro-economic shocks in the home countries by including country-year specific fixed effects; here we are allowing these shocks to affect firms differentially.

[28] In the online appendix, we conduct a different set of robustness checks and test whether excluding potential interest groups, namely, specific countries, products, or firms that were expected to benefit particularly from the trademark law would affect our results. These groups include, for example, German firms, who lost extraterritoriality at the end of World War I and as a result would arguably have more interests in a domestic trademark law in China, and firms in the tobacco industry (or the largest tobacco manufacturer), who were particularly affected by trademark infringements. The analysis shows that excluding these potential interest groups does not affect our estimated effect of the trademark law on Western firm growth. Furthermore, we show in the online appendix that neither a specific country nor a specific product group is driving the results.

After establishing the effect on firm employment growth, we next explore in more detail how Western firms grew their organizations in response to the trademark law by taking advantage of information on the job titles of employees. As we do not have job titles for all firms in our sample, column (1) of Table 4 first repeats our baseline analysis on this subsample to confirm that the trademark law has a growth effect on this sample. In columns (2) to (4) we examine specific positions in firms and their decisions to employ a lawyer, sales staff, and engineers, respectively. We see that after the trademark law, Western firms were more likely to employ all of these positions, but the effect is only statistically significant for engineers. While only suggestive, this could indicate that Western firms that started by importing goods produced in their home countries became more likely to start their own manufacturing activities after the trademark law — a trend that was also visible in the aggregate statistics of Shanghai in Figure 7.

4.2.2 Entry, Exit, and Product Composition

Up to now we have studied the intensive margin, i.e., whether the trademark law affected the growth of existing firms. Next we examine the extensive margins of growth by extending the sample from firms that had existed in 1920-1922 to all firms that appeared between 1920 and 1926. We fully balance the sample between 1920-1926 and define an entry dummy as 1 in and after the year a firm entered, and an exit dummy variable as 1 in and after the year a firm exited. This allows us to examine how the law affected the entry and exit rates of firms. In columns (1) and (2) of Table 5 we see that while the trademark law had an insignificant effect on the entry of Western firms, it exerted a negative and significant effect on the exits of Western firms. Overall, in column (3) we combine entry and exit and see that the trademark law led to a positive but insignificant effect on firm existence. This suggests that the trademark law protected incumbent firms, while not necessarily leading to increased firm entry.

The trademark law could also affect firms' product composition, especially the likelihood of adding and dropping trademark-intensive products. To examine this hypothesis, in columns (4) and (5) of Table 5 we return to the sample of firms that existed in 1920-1922 and create a dummy variable to denote firms that added or dropped a trademark-intensive product in a a given year.[29] The results are similar to the firm entry and exit analysis, suggesting that

[29]Trademark-intensive products here are defined as products with above median trademark intensity.

Western firms were significantly less likely to drop products with above-median trademark intensity after 1923, but not more likely to add them.

Turning to the extensive margin for Japanese and Chinese firms, we see that Japanese were less likely to enter while Chinese firms were less likely to exit. In addition, Japanese firms were significantly more likely to add trademark-intensive products whereas there were no significant changes in the product portfolio of Chinese firms, .

4.2.3 Advertising Investment

If the trademark law helped incumbent Western firms to grow their trademark-intensive products, we may also see increased investment incentives in, for example, brand promotion, as Western firms experienced a larger return from this after the trademark law. Prior to the trademark law, the return from advertising faced a free-rider problem: any increase in market demand through brand promotion efforts would be shared by counterfeiters. This externality lowers brand producers' incentives to invest in advertising. The free-rider problem would be mitigated after the enactment of the trademark law; with reduced counterfeits in the market, brand producers would have greater motives to pay for brand promotion. At the same time, however, the need of advertising the brand to educate consumers and ensure they are able to distinguish the authentic brand from counterfeits may also decrease with strengthened trademark protection, leading to an ambiguous net effect on advertising investments.

In order to check which of the two effects dominates in the data, we downloaded all advertisements posted by firms in our sample in the leading daily Chinese newspaper *Shen Bao* (申报) during 1920-1926. Column (1) of Table 6 reports that while the increase in the likelihood of advertising was not statistically significant for Western firms, the number of advertising days in columns (2) and (3), alternatively measured as log(ads+1) or the inverse hyperbolic sine of ads, rose significantly after 1923 for Western businesses. Interestingly, we also find a higher probability to post advertisements for Japanese firms. This result offers suggestive evidence that Japanese firms reacted to the trademark law by trying to build up their own brands and invest in brand promotion.[30]

[30]In section D.5 of the online appendix, we check whether trademark protection may have exerted an effect on product quality by studying whether there had been changes in advertisements focusing on product quality. We do not find a significant effect.

4.3 Domestic Integration

Case studies of specific companies (Cochran, 2000) suggest that foreign businesses in Shanghai also adapted their domestic integration decisions in response to the changes in the economic and institutional context of Shanghai. Confronted with extensive obstacles such as language barriers and inland market access restrictions, many Western businesses, such as Standard Oil and BAT, had to rely heavily on Chinese nationals as sales agents or commercial managers or worked directly with Chinese merchants to explore their social networks. At the same time, however, Western businesses could not establish a strong trust-based relationship with their domestic employees or merchants in the absence of formal legal institutions such as the trademark law. How did the establishment of the trademark law alter the integration of Western firms with domestic employees and their links to Chinese merchants?

To understand how the trademark law affected the integration of Chinese employees in Western firms, we use the employee-level information of the Hong List and construct several variables to capture a firm's internal domestic integration. First, we separately identify Chinese employees from foreign employees based on the names of the employees reported in the Hong List. Second, we explore the position of Chinese employees in the organizational hierarchy by exploiting the indents in the employee directory as reported in the Hong List, where lower-level employees were separated from their superiors by an indent. More specifically, we check whether Chinese employees appeared in the first organizational layer, which we label as the managerial layer, and also calculate the average position of Chinese employees in a Western company's employment hierarchy. Finally, we check whether Chinese employees appeared in positions related to sales (i.e., job titles related to sales, marketing, and advertising), engineering (i.e., job titles related to engineering positions), and manufacturing (i.e., job titles related to production).

Table 7 reports the results. We find Western firms with trademark-intensive products expanded their employment after the trademark law by hiring Chinese employees (columns 2 and 3). Chinese employees were also more likely to appear in the managerial layer (column 4), and in general move up in the organizational hierarchy (column 5; a negative sign means a higher layer, as the layers are numbered from 1 (highest) to 3 (lowest).). With respect to positions, Chinese employees were more likely to be hired in sales related positions, as opposed to engineering or production related positions (columns 6-8). These results sug-

gest that Western businesses became more inclined to promote Chinese employees after the enactment of the trademark law, especially with respect to managerial and sales tasks.

Apart from setting up a foreign-owned subsidiary in a treaty port like Shanghai, a common alternative strategy to enter the Chinese market was through agents located in China. However, before the trademark law Western firms may have found it risky to use Chinese agents with the concern that Chinese merchants might mix their branded products with counterfeits, thereby undermining the brand value (Motono, 2011). We test whether Western companies became more likely to enter the Chinese market via Chinese agents after the trademark law by exploiting the list of clients that agents provided in the Hong List. In Table 8 we find that Chinese firms selling trademark-intensive products were more likely to act as agents for foreign firms after the trademark law, and that their number of clients increased significantly. In contrast, Western and Japanese firms did not experience significant changes in their numbers of clients.

This suggests that there may be heterogeneity in the effect of the trademark law on Chinese firms: those that acted as agents for foreign firms grew, while others shrank. We check this in Table 9 by estimating whether Chinese agents, merchants, or manufacturers experienced similar growth (many firms were present in more than one broad industry so the categorization is not exclusive). Indeed we see that Chinese firms that acted as agents for Western firms exhibited strong growth, rather than contraction. Chinese manufacturers also grew, while the negative effect is mostly based on other, for example retail, businesses.

4.4 Prices

So far we have documented an expansion of Western firms at the expense of Japanese businesses and increased linkages between Western clients and Chinese agents. Next, we examine how the trademark law might have influenced prices, another important outcome to not only businesses but also consumers. Ex ante, trademark protection may exert an ambiguous net effect on prices. Prices might rise if authentic producers gain additional market power as they increase market share or if consumer demand increases due to the lower risk of ending up with the less preferred counterfeits. However, the contrary may also occur if, for example, authentic producers improve economies of scale thanks to an expanded market share or lower product quality as they feel less need to distinguish themselves from counterfeiters.

Since the price data is only available from April 1923 (see subsection 3.2), one month

before the trademark law was announced, we need to undertake a different identification strategy from the one used earlier. Specifically, we manually check the Chinese trademark registry to identify when (or if) a given brand became registered, and implement a staggered differences-in-differences estimation. Since gradual adjustment of prices can bias the coefficients in the standard OLS estimation, we estimate the average effect on the treated (ATT) using the method introduced in Callaway and Sant'Anna (2020) as our preferred method.

Table 10 presents the results. Column (1) uses the potentially biased OLS, which shows a positive but insignificant effect on prices after trademark registration. In column (2) we report the ATT estimated using Callaway and Sant'Anna (2020)'s method, which is slightly negative but insignificant. In columns (3) and (4) we repeat the analysis on the sample of Western products, and the negative effect becomes stronger, but is still insignificant.

Before we can trust the estimates, we again need to check for pre-trends. Figure 12 shows that log prices in the months before a trademark gets registered were stable, and declined upon registration, stabilizing after about 8 months. We also formally test for pre-trends using the method described in (Callaway and Sant'Anna, 2020), and find no evidence for them. Overall, we find no evidence of authentic producers raising prices as a result of trademark registrations; if anything, they fell.

5 Quantifying the Aggregate Impact of Trademark Protection

In this section, we develop a stylized model featuring heterogeneous authentic and counterfeiting producers to estimate the effects of trademark protection on economic outcomes.

5.1 Setup

We start with the case in which the economy has no trademark protection. There are two types of firms, authentic producers and counterfeiters. Each authentic producer sells a product j with quality b_j. The true quality is known to the producer, but consumers are unable to verify the true quality of the product upon purchase. In the absence of trademark protection, consumers are assumed to encounter counterfeits in each variety with a probability of s. The counterfeits have a discounted quality compared to the authentic product, denoted as ρb_j, where $0 < \rho < 1$.

5.1.1 Consumer Demand

Consumers have a utility function with a constant elasticity of substitution (CES) ($\sigma > 1$) over a set of varieties Ω. Given the presence of counterfeits, the consumer's expected utility is given by:

$$E(U) = (1-s)\left(\int_{j\in\Omega} b_j q_j^{\frac{\sigma-1}{\sigma}} dj\right)^{\frac{\sigma}{\sigma-1}} + s\left(\int_{j\in\Omega} \rho b_j q_j^{\frac{\sigma-1}{\sigma}} dj\right)^{\frac{\sigma}{\sigma-1}} \tag{3}$$

where q_j denotes the quantity of variety j consumed. This utility function can be simplified to:

$$E(U) = \lambda\left(\int_{j\in\Omega} b_j q_j^{\frac{\sigma-1}{\sigma}} dj\right)^{\frac{\sigma}{\sigma-1}} \tag{4}$$

where $\lambda \equiv (1-s) + s\rho^{\frac{\sigma}{\sigma-1}} < 1$ iff $s > 0$.

Maximizing the utility function subject to the budget constraint $\int p_j q_j dj \leq I$ yields the demand function for each variety j:

$$q_j = \left(\frac{p_j}{P b_j}\right)^{-\sigma} Q \tag{5}$$

where p_j is the price of variety j, $P \equiv \left(\int_{j\in\Omega} b_j^{\sigma} p_j^{1-\sigma} dj\right)^{\frac{1}{1-\sigma}}$ is the aggregate, quality adjusted price index, and Q is aggregate demand with $I = QP$.

5.1.2 Authentic Firms

Each authentic firm takes into account the demand function and chooses the price of the variety that maximizes the following profit function, acting as a monopolistic competitor:

$$\pi_j^a = \left[p_j - c\left(b_j\right)\right] q_j^a - f \tag{6}$$

where $q_j^a = (1-s)q_j$, $c(b_j)$ is the marginal cost of production that increases with the quality draw of variety j, i.e., $c'(b_j) > 0$, and f is the fixed cost of production.

Profit maximization leads to the following optimal price:[31]

$$p_j^a = \frac{\sigma}{\sigma - 1} c\left(b_j\right). \tag{7}$$

Given the optimal price, each authentic producer's output is

$$q_i^A = (1-s) Q P^\sigma \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma} \left(\frac{c_i}{b_i}\right)^{-\sigma}, \tag{8}$$

and her revenue is given by:

$$r_j^a = (1-s)\left(\frac{\sigma-1}{\sigma c(b_j)}\right)^{\sigma-1} (b_j P)^\sigma Q. \tag{9}$$

The profit can be expressed as:

$$\pi_j^a = r_j^a/\sigma - f. \tag{10}$$

5.1.3 Counterfeiters

The counterfeiter is assumed to take the authentic producer's price as given, and her output equals $q_j^c = s q_j$. Because the counterfeited products have an inferior quality, we assume their unit production cost is a fraction ρ of producing the authentic variety, i.e., $c_i(\rho b_i) = \rho c_i(b_i)$, where we assume the cost function is homogeneous of degree 1. For the same reason, we assume the counterfeiter's fixed cost of production is lower than the fixed cost of authentic producers and, for simplicity, negligible. Counterfeiters hence earn the following revenues and profits:

$$r_j^c = s\left(\frac{\sigma-1}{\sigma c(b_j)}\right)^{\sigma-1} (b_j P)^\sigma Q. \tag{11}$$

$$\pi_j^c = r_j^c \left(\sigma - \rho\sigma + \rho\right)/\sigma. \tag{12}$$

5.1.4 Equilibrium Conditions

Authentic producers would be active if and only if $\pi_j^a \geq 0$. Assuming the cost function is not too convex, i.e., $\frac{c'(b_j)b_j}{c(b_j)} < \frac{\sigma}{\sigma-1}$, profits of authentic producers are increasing in b_j.[32] Then

[31] Because of monopolistic competition, the authentic producer price exhibits a constant markup and is independent of the level of counterfeiting activity. This feature of the model is motivated by the empirical result in Section 4.4 which shows trademark registrations led to insignificant changes in brand prices.

[32] This is shown in section C.1 of the online appendix.

authentic producers would only produce if $b_j \geq b^*$ where b^* is the cutoff quality defined in:

$$(1-s)\left(\frac{\sigma-1}{\sigma c(b^*)}\right)^{\sigma-1}(b^*P)^{\sigma}Q = \sigma f. \tag{13}$$

We assume that counterfeiters are present only in varieties where authentic producers are present (i.e., there cannot be a variety in which only the counterfeiter exists, but not the authentic producer). As such, they do not have a cutoff condition on their own.

Assuming that authentic producers must pay a fixed cost of entry f_e to enter the market and face a constant probability of death δ in each period, the free entry condition requires that

$$\frac{1-G(b_i)}{\delta}\cdot E\left[\pi(b_i)|\, b_i > b^*\right] \quad = \quad f_e \tag{14}$$

where $Prob(b_i > b_i^*) = 1 - G(b_i^*)$.

Next assume that labor is the only factor of production and each unit of output (including both authentic and counterfeiter output) and fixed costs of production and entry require one unit of labor at a wage that we normalize to 1. The labor market clearing condition, together with the aggregate profit equations of authentic producers, $\Pi^a = R^a - L_p^a$, and counterfeiters, $\Pi^c = R^c - L_p^c$, determines the number of varieties in the market, M:

$$M \quad = \quad \frac{L}{\bar{r}^a\left(1+\rho\frac{s}{1-s}\frac{\sigma-1}{\sigma}\right)} \tag{15}$$

where the average revenue of authentic firms, $\bar{r}^a \equiv \int_{b_i^*}^{\infty} r^a(b_i)\frac{g(b_i)}{1-G(b_i^*)}db_i$, captures the average labor demand by authentic producers and $\rho\frac{s}{1-s}\frac{\sigma-1}{\sigma}\,\bar{r}^a$ reflects the average labor demand by counterfeiters.

5.2 Model Predictions: The Effects of Trademark Protection

Now consider the case of trademark protection which reduces (and, in the case of full trademark protection, eliminates) the probability of consumers receiving counterfeits, s.

An increase in the level of trademark protection raises demand allocation to authentic producers. As in Melitz (2003), an increase in domestic demand will not change the cutoff quality or average quality and average revenue, but will raise the number of (authentic) varieties M and lower the aggregate price. This result is summarized in the following propo-

sition:

Proposition 1. *The number of authentic firms (products) M increases with the level of trademark protection, that is, when the level of counterfeiting activity s falls.*

Proof. See appendix section C. ∎

Each firm's price is unaffected by increased trademark protection due to the assumption of monopolistic competition that results in constant markups. However, better trademark protection affects each incumbent authentic producer's output in two ways. On the one hand, the lower aggregate price reduces demand per variety; on the other hand, the decrease in counterfeiting s enables each authentic producer to obtain a greater share of variety-specific demand. Overall, as we summarize in the next proposition, the net effect of stronger trademark protection on individual authentic firms' output is found positive, in line with the empirical results in Section 4.

Proposition 2. *The output of the authentic firm increases with the level of trademark protection, that is, when the level of counterfeiting activity s falls.*

Proof. See appendix section C. ∎

Now we examine the welfare change under trademark protection. The welfare under (full) trademark protection relative to the welfare without trademark protection is given by:

$$\begin{aligned} \frac{E(U(s=0))}{E(U(s>0))} &= \frac{\lambda(0)}{\lambda(s)}\left(\frac{M(0)}{M(s)}\right)^{\frac{1}{\sigma-1}} \\ &= \underbrace{\frac{1}{\lambda(s)}}_{\geq 1}\underbrace{\left(1+\rho\frac{s}{1-s}\frac{\sigma-1}{\sigma}\right)^{\frac{1}{\sigma-1}}}_{\geq 1} \geq 1 \end{aligned} \tag{16}$$

An increase in trademark protection will raise welfare by reducing (or eliminating in the case of full trademark protection) the utility discount $\lambda \equiv (1-s)+s\rho^{\frac{\sigma}{\sigma-1}}$ due to the presence of counterfeiting (reduced information frictions) and raising the number of authentic product varieties M (variety gains). This finding is summarized below:

Proposition 3. *Stronger trademark protection raises aggregate welfare.*

Proof. See appendix section C. ∎

5.3 Quantifying the Welfare Effect of Trademark Protection

In this subsection, we estimate the welfare gains from trademark protection as given by equation (16) by proceeding in the following steps.

First, we compute the change in the number of firms $\frac{M(0)}{M(s)}$ based on estimated changes in the probability of entry and exit as a result of stronger trademark protection:

$$\frac{M(s=0)}{M(s>0)} = 1 + \frac{\Delta Pr(entry) - \Delta Pr(exit)}{Pr(exist|s>0)} \tag{17}$$

Using the estimated causal effect of the trademark law on the entry and exit of Western firms in columns (1) and (2) of Table 5 (for a firm with mean trademark intensity) together with the share of firms that existed before trademark protection, $Pr(exist|s>0)$, we find an increase in the number of firms M by around 1.9%.

Second, we combine the estimated change in the number of firms with the estimated change in the size of authentic producers (based on column (3) of Table 2) to derive an estimate for s:

$$s = 1 - \frac{M(s>0)}{M(s=0)} \frac{q_i^a(s>0)}{q_i^a(s=0)} \tag{18}$$

Taken together, this results in a share of counterfeiters s of around 6.3%. This is smaller than the market share (based on employment) of Japanese (11%) and Chinese firms (16%) before the trademark law, consistent with the idea that not all Japanese or Chinese firms were counterfeiters.

Finally, we estimate ρ based on the above estimates as well as an assumption on the elasticity of substitution σ:

$$\rho = \left(\frac{M(s=0)}{M(s>0)} - 1\right) \frac{1-s}{s} \frac{\sigma}{\sigma - 1} \tag{19}$$

Using a value of $\sigma = 4$ as often assumed in the literature (e.g., Bernard, Eaton, Jensen, and Kortum, 2003), in conjunction with the other estimates, yields $\rho = 0.38$.

Taking into account the above parameters, we obtain $\lambda = 0.95$, which implies that the

consumer utility loss from potentially consuming counterfeits is about 4.8%. Incorporating this and the change in the number of varieties into equation (16) suggests that the overall trademark law caused welfare to increase by 5.4%, which is mainly caused by the increase in consumers' utility (88%), with some additional benefit from increased varieties (12%).

6 Comparing Alternative Institutional Attempts

As discussed in Section 2, the 1923 trademark law was preceded by a series of alternative institutional models exploited by foreign powers to address trademark issues. These include extraterritoriality leading to the direct imports of foreign legal institutions in China, bilateral commercial treaties with specific trademark provisions, and a subsequent legal trademark code in 1904 that had never been put into force. Our long time horizon in the data enables us to compare the effect of the 1923 trademark law to the effects of these alternative approaches and attempts.

In this section, we construct three additional variables to represent each of these approaches and attempts. First, we construct a firm-year specific measure of extraterritorial rights based on the firm's nationality and the nation's extraterritorial status in a given year. Due to geopolitical reasons such as the start and end of World War I that were arguably orthogonal to Chinese economy, certain countries were added and deleted from the list of nations that enjoyed extraterritorial status.[33] These changes in extraterritorial power caused firm-specific changes in their legal institutional settings. In legal disputes, when the defendants' home countries had extraterritorial status, the home-country law of the defendants would apply and the cases would be tried at their consular courts. However, differences in countries' legal systems such as the filing principles of the trademark law and the lack of strong domestic enforcement could lead to unresolved disputes and jurisdiction evasion.

Second, we use a dummy variable to denote the commercial treaties China signed with Great Britain, United States, and Japan in 1902 and 1903, respectively. The bilateral commercial treaties, requiring China to establish its own legal trademark system among other demands, again exhibited conflicting interests with both Western nations such as Great Britain and Japan attempting to export their respective trademark laws.

[33]The countries that lost extraterritorial status were: Australia (1901), Austria (1917), Czechoslovakia (1917), Germany (1917), Finland (1924), Hungary (1917), Latvia (1924), Philippines (1898), Russia (1917). The countries that gained extraterritorial status were: Switzerland (1918), Japan (1896).

Finally, we include a dummy variable to denote China's first attempt after the bilateral treaties to establish a domestic trademark code in 1904. The code, largely influenced by Japan's trademark system, was eventually not enforced due to protests from Western governments.

The estimation results that evaluate and compare the effects of all three alternative institutions with the 1923 trademark law are reported in Table 11 where each institutional measure is interacted with firm-specific trademark intensity.[34] The results in column (6) show that when taking into account all measures and controlling for country-year dummies, neither extraterritoriality nor bilateral treaty exerted significant, positive effects on firm employment. The unenforced 1904 trademark code, as anticipated, was also found to have no effects. Across all the alternatives, the 1923 trademark law was the only measure shown to have played a positive role in the growth of trademark-intensive firms. These findings suggest that earlier attempts involving direct imports of foreign institutions had been largely unsuccessful as means of trademark protection and a positive growth effect was not achieved until the establishment of a domestic trademark institution.

7 Conclusion

In this paper, we investigate the economic effects of trademark protection by exploiting a historical precedent — the introduction of China's first trademark law of 1923 — and a series of newly digitized micro-level datasets in Shanghai that provide rare, first-hand insights into how firms from around the world operated in Shanghai, one of the most volatile and complex markets, before and after the birth of trademark institutions.

Our empirical evidence shows that the trademark law exerted sharply different and complex effects on Western, Japanese and Chinese firms who had played distinct roles in the trademark conflicts. The trademark law spurred growth and brand investment for trademark intensive Western firms, but registrations of trademarks did not lead to significant changes in prices. In contrast, Japanese businesses, who had frequently been accused of counterfeiting, experienced employment contractions while attempting to build their own brands after the law. Further, the trademark law led to greater domestic integration both within and out-

[34]The appendix to the Hong List that lists which firms offer which type of product or service is only available during 1920-1930. In order to understand which products and services firms offer across the entire period of 1872-1936, we manually assign products to firms based on the textual description of the activity of the firm in the Hong List.

side the boundary of Western firms as they became more inclined to recruit and promote Chinese employees as well as work with Chinese agents. The Chinese intermediaries then experienced a significant growth in both the volume of foreign clients and employment.

We then develop a stylized model featuring heterogeneous authentic and counterfeiting producers to quantify the aggregate effects of the trademark law. An increase in trademark protection, by lowering the consumers' probability of receiving counterfeits, leads to a direct market reallocation within brand-specific segments from counterfeiters to authentic producers and increases the number of (authentic) varieties and the output of individual authentic firms as documented in the empirical evidence. Computing the welfare change based on the model's sufficient statistics suggests that the trademark law raised aggregate welfare by 5.4%, via reduced information frictions and increased authentic product varieties.

While the 1923 trademark law exerted significant economic effects, the preceding alternative institutional models exploited by foreign powers, including extraterritorial rights, bilateral commercial treaties, and an unenforced legal trademark code, have been found ineffective in fostering firm growth. These findings convey important implications for the distinct role of trademark protection, an under-examined form of IP, in the growth of less developed economies, highlighting the challenges of addressing international trademark disputes and the potential gains from domestic trademark institutions.

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A Figures

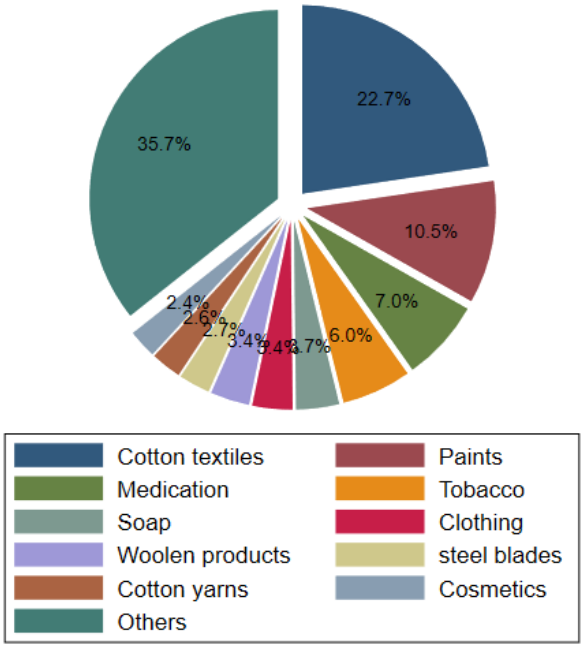
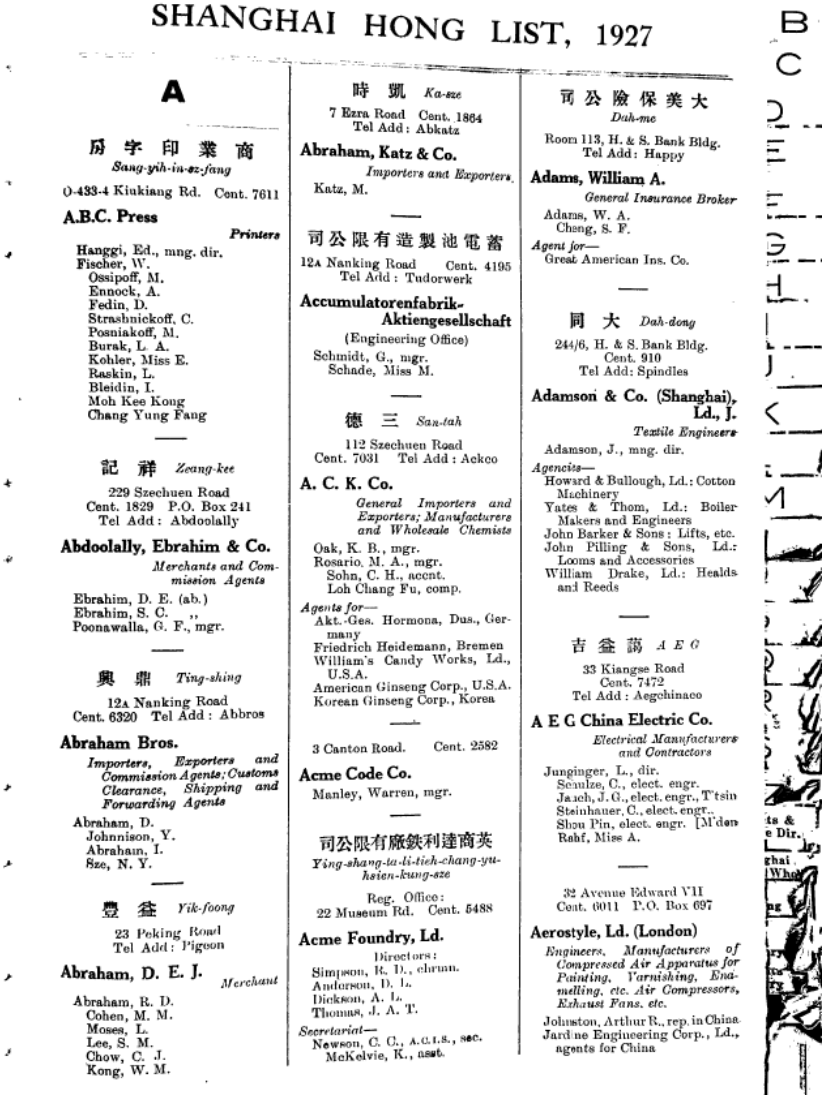


Figure 1: Most common product categories, Chinese trademark registries 1924-1927

Notes: We computed these statistics based on our own digitization of all issues of the Chinese trademark registries called *Shangbiao Gongbao* (商标公报) between January 1924 and 1927.



SHANGHAI HONG LIST, 1927

A

商業印刷所 *Sang-yih-in-sz-fang*

0-433-4 Kiukiang Rd. Cent. 7611

A.B.C. Press

Printers

Hanggi, Ed., mng. dir.
Fischer, W.
Ossipoff, M.
Ennock, A.
Fedin, D.
Strashnickoff, C.
Posniakoff, M.
Burak, L. A.
Kohler, Miss E.
Raskin, L.
Bleidin, I.
Moh Kee Kong
Chang Yung Fang

記祥 *Zeang-kee*

229 Szechuen Road
Cent. 1829 P.O. Box 241
Tel Add: Abdoolally

Abdoolally, Ebrahim & Co.

Merchants and Commission Agents

Ebrahim, D. E. (ab.)
Ebrahim, S. C. ,,
Poonawalla, G. F., mgr.

奧鼎 *Ting-shing*

12A Nanking Road
Cent. 6320 Tel Add: Abbros

Abraham Bros.

Importers, Exporters and Commission Agents; Customs Clearance, Shipping and Forwarding Agents

Abraham, D.
Johnnison, Y.
Abrahan, I.
Sze, N. Y.

豐益 *Yik-foong*

23 Peking Road
Tel Add: Pigeon

Abraham, D. E. J. *Merchant*

Abraham, R. D.
Cohen, M. M.
Moses, L.
Lee, S. M.
Chow, C. J.
Kong, W. M.

時凱 *Ka-sze*

7 Ezra Road Cent. 1864
Tel Add: Abkatz

Abraham, Katz & Co.

Importers and Exporters

Katz, M.

司公限有造製池電蓄

12A Nanking Road Cent. 4195
Tel Add: Tudorwerk

Accumulatorenfabrik-Aktiengesellschaft

(Engineering Office)

Schmidt, G., mgr.
Schade, Miss M.

德三 *San-tah*

112 Szechuen Road
Cent. 7031 Tel Add: Ackco

A. C. K. Co.

General Importers and Exporters; Manufacturers and Wholesale Chemists

Oak, K. B., mgr.
Rosario, M. A., mgr.
Sohn, C. H., accnt.
Loh Chang Fu, comp.

Agents for—
Akt.-Ges. Hormona, Dus., Germany
Friedrich Heidemann, Bremen
William's Candy Works, Ld., U.S.A.
American Ginseng Corp., U.S.A.
Korean Ginseng Corp., Korea

3 Canton Road. Cent. 2582

Acme Code Co.

Manley, Warren, mgr.

司公限有廠鉄利達商英

Ying-shang-ta-li-tieh-chang-yu-hsien-kung-sze

Reg. Office:
22 Museum Rd. Cent. 5488

Acme Foundry, Ld.

Directors:
Simpson, R. D., chrmn.
Anderson, D. L.
Dickson, A. L.
Thomas, J. A. T.

Secretariat—
Newson, C. C., A.C.I.S., sec.
McKelvie, K., asst.

司公險保美大 *Dah-me*

Room 113, H. & S. Bank Bldg.
Tel Add: Happy

Adams, William A.

General Insurance Broker

Adams, W. A.
Chang, S. F.

Agent for—
Great American Ins. Co.

同大 *Dah-dong*

244/6, H. & S. Bank Bldg.
Cent. 910
Tel Add: Spindles

Adamson & Co. (Shanghai), Ld., J.

Textile Engineers

Adamson, J., mng. dir.

Agencies—
Howard & Bullough, Ld.: Cotton Machinery
Yates & Thom, Ld.: Boiler Makers and Engineers
John Barker & Sons: Lifts, etc.
John Pilling & Sons, Ld.: Looms and Accessories
William Drake, Ld.: Healds and Reeds

吉益滿 *A E G*

33 Kiangse Road
Cent. 7472
Tel Add: Aegchinaco

A E G China Electric Co.

Electrical Manufacturers and Contractors

Junginger, L., dir.
Scaulze, C., elect. engr.
Jauch, J. G., elect. engr., Tsin
Steinhauer, C., elect. engr.
Shou Pin, elect. engr. [M'den
Rahf, Miss A.

32 Avenue Edward VII
Cent. 6011 P.O. Box 697

Aerostyle, Ld. (London)

Engineers, Manufacturers of Compressed Air Apparatus for Painting, Varnishing, Enamelling, etc. Air Compressors, Exhaust Fans, etc.

Johnston, Arthur R., rep. in China
Jardine Engineering Corp., Ld., agents for China

Figure 2: Example of a page from the Hong List, 1927

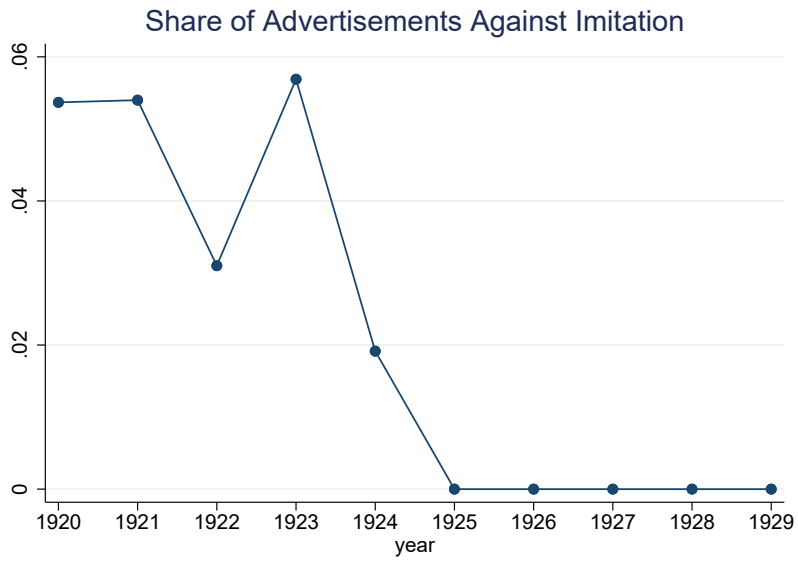
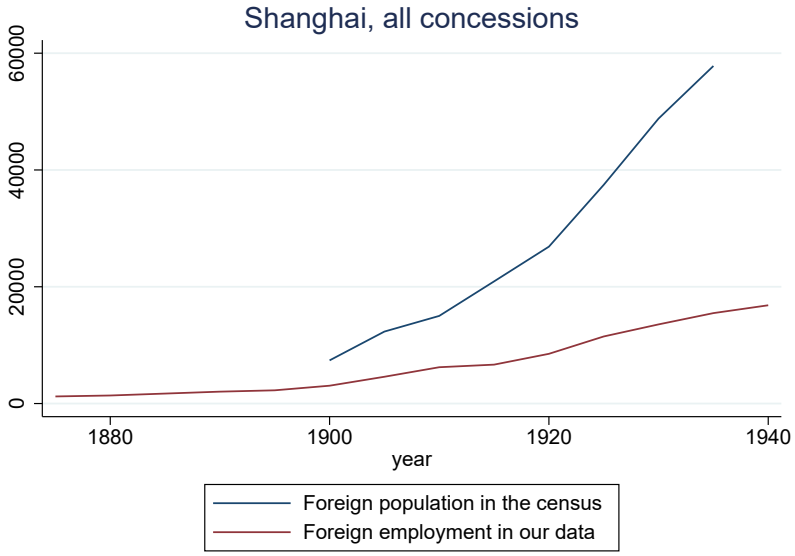
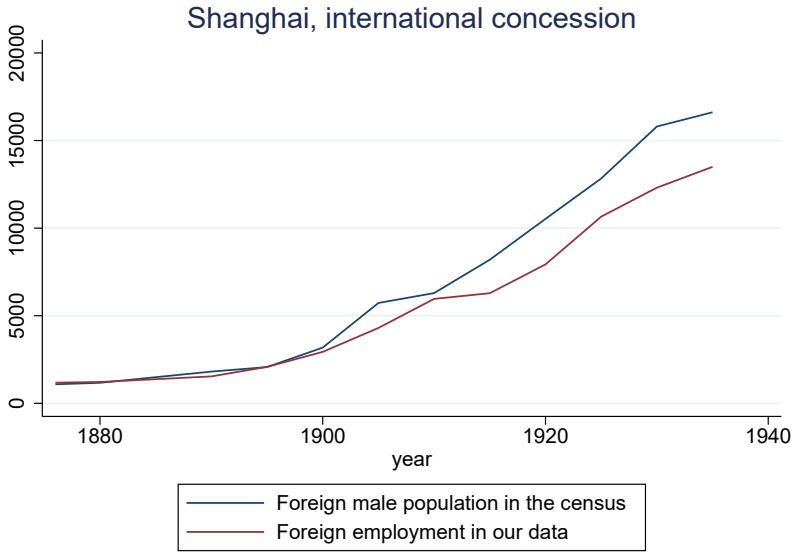


Figure 3: Share of Advertisements against Trademark Infringements in North China Herald

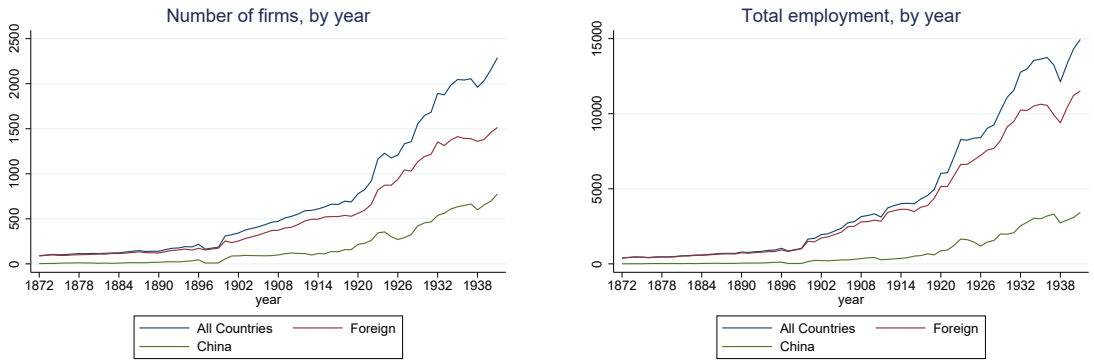


(a) All concessions



(b) Public concession

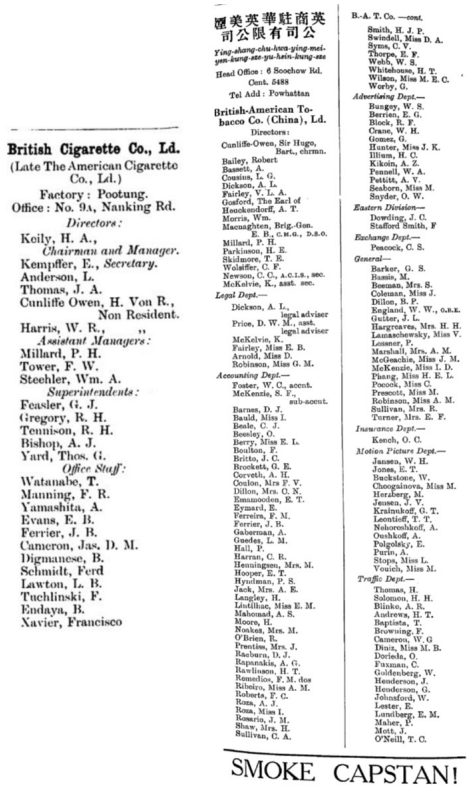
Figure 4: Data Validation



(a) Number of firms

(b) Total employment

Figure 5: Time Trends of Firms and Employment in Shanghai Concessions



British Cigarette Co., Ld.
(Late The American Cigarette Co., Ld.)
Factory: Pootung.
Office: No. 9A, Nanking Rd.
Directors:
Keily, H. A.,
Chairman and Manager.
Kempffer, E., *Secretary.*
Anderson, L.
Thomas, J. A.
Cunliffe Owen, H. Von R., Non Resident.
Harris, W. R., ,,
Assistant Managers:
Millard, P. H.
Tower, F. W.
Steehler, Wm. A.
Superintendents:
Feasler, G. J.
Gregory, R. H.
Tennison, R. H.
Bishop, A. J.
Yard, Thos. G.
Office Staff:
Watanabe, T.
Manning, F. R.
Yamashita, A.
Evans, E. B.
Ferrier, J. B.
Cameron, Jas. D. M.
Digmanese, B.
Schmidt, Ferd
Lawton, L. B.
Tuchlinski, F.
Endaya, B.
Xavier, Francisco

英美烟草公司駐滬辦事處
Ying-shang-chu-hwa-ying-mei-yen-kung-sze-yu-hsin-kung-sze
Head Office: 6 Soochow Rd.
Cont. 5488
Tel Add: Powhattan

British-American Tobacco Co. (China), Ld.
Directors:
Cunliffe-Owen, Sir Hugo, Bart., chrmn.
Bailey, Robert
Bassett, A.
Cousins, L. G.
Dickson, A. L.
Fairley, T. A.
Gosford, The Earl of
Houckendorff, A. T.
Morris, Wm.
Macnaghten, Brig.-Gen. E. B., C.M.G., D.S.O.
Millard, P. H.
Parkinson, H. E.
Skidmore, T. E.
Wolstiffe, C. F.
Newson, C. C., A.C.I.S., sec.
McKelvie, K., asst. sec.

Legal Dept.—
Dickson, A. L., legal adviser
Price, D. W. M., asst. legal adviser
McKelvie, K.
Fairley, Miss E. B.
Arnold, Miss D.
Robinson, Miss G. M.

Accounting Dept.—
Foster, W. C., acent.
McKenzie, S. F., sub-acent.
Barnes, D. J.
Bauld, Miss I.
Beale, C. J.
Beasley, O.
Berry, Miss E. L.
Boulton, F.
Britto, J. C.
Brockett, G. E.
Carvath, A. H.
Coulon, Mrs F. V.
Dillon, Mrs. C. N.
Emanoocloo, E. T.
Eymard, E.
Ferreira, F. M.
Ferrier, J. B.
Gaberman, A.
Gaelas, L. M.
Hall, F.
Harran, C. R.
Henningsen, Mrs. M.
Hooper, E. T.
Hyndman, P. S.
Jack, Mrs. A. E.
Langley, H.
Listilhac, Miss E. M.
Mahmaad, A. S.
Moore, H.
Noakes, Mrs. M.
O'Brien, R.
Prentiss, Mrs. J.
Raeburn, D. J.
Rapanakis, A. G.
Rawlinson, H. T.
Remedios, F. M. dos
Ribeiro, Miss A. M.
Roberts, F. C.
Roza, A. J.
Roza, Miss I.
Rosario, J. M.
Shaw, Mrs. H.
Sullivan, C. A.

B.-A. T. Co. —*cont.*
Smith, H. J. P.
Swindall, Miss D. A.
Syms, C. V.
Thorpe, E. F.
Webb, W. S.
Whitehouse, H. T.
Wilson, Miss M. E. C.
Worby, G.

Advertising Dept.—
Bungey, W. S.
Berrien, E. G.
Block, R. F.
Crane, W. H.
Gomm, G.
Hunter, Miss J. K.
Illium, H. C.
Kikoin, A. Z.
Pennell, W. A.
Petkitz, A. V.
Seaborn, Miss M.
Snyder, O. W.

Eastern Division—
Dowding, J. C.
Stafford Smith, F

Exchange Dept.—
Peacock, C. S.

General—
Barker, G. S.
Bassie, M.
Beeman, Mrs. S.
Coleman, Miss J.
Dillon, R. P.
England, W. W., O.B.E.
Geitzer, J. L.
Hargreaves, Mrs. H. H.
Lazarcheesky, Miss V.
Lessner, P.
Marshall, Mrs. A. M.
McGeachie, Miss J. M.
McKenzie, Miss I. D.
Pleasg, Miss H. E. L.
Pocock, Miss G.
Prescott, Miss M.
Robinson, Miss A. M.
Sullivan, Mrs. H.
Turner, Mrs. E. F.

Insurance Dept.—
Keech, O. C.

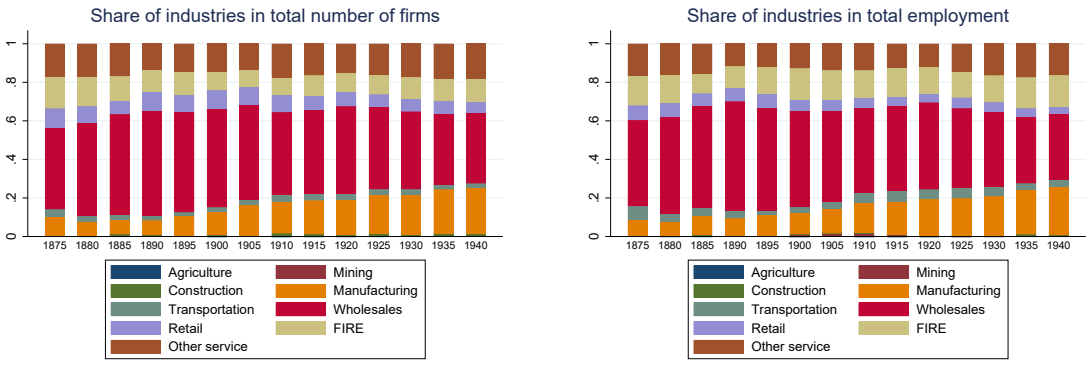
Motion Picture Dept.—
Jansen, W. H.
Jones, E. T.
Buckstone, W.
Chogolanova, Miss M.
Herzberg, M.
Jansen, J. V.
Krainukoff, G. T.
Leontieff, T. T.
Nekorenkhoff, A.
Onshkoff, A.
Polgolsky, E.
Purin, A.
Stops, Miss L.
Vouich, Miss M.

Traffic Dept.—
Thomas, H.
Solomon, H. H.
Blinko, A. R.
Andreeva, H. T.
Baptista, T.
Browning, F.
Cameron, W. G
Dinis, Miss M. B.
Dorlels, O.
Faxman, C.
Goldenberg, W.
Henderson, J.
Henderson, G.
Johnsford, W.
Lester, E.
Lorelberg, E. M.
Mabet, F.
Mott, J.
O'Neill, T. C.

SMOKE CAPSTAN!

Left: BAT-Shanghai in 1906; Right: BAT-Shanghai in 1926

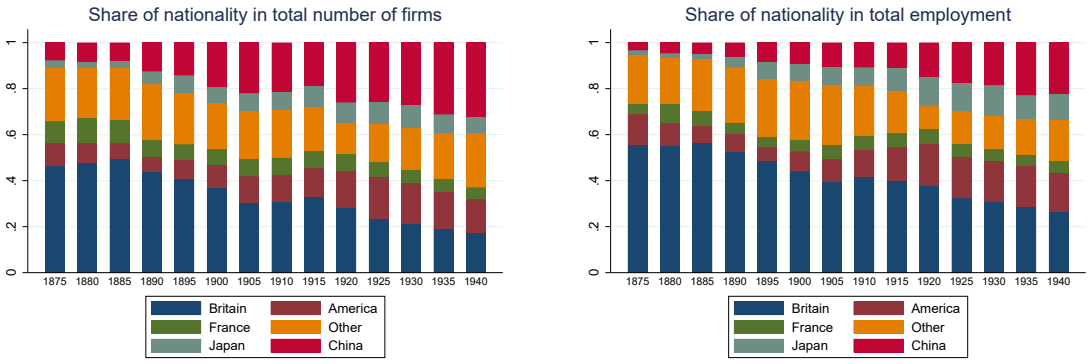
Figure 6: Employment of British American Tobacco in 1906 versus 1926



(a) Share of firm numbers

(b) Share of total employment

Figure 7: Industry Composition of Businesses in Shanghai's Concessions



(a) Share of firm numbers

(b) Share of total employment

Figure 8: Nationality Composition of Businesses in Shanghai's Concessions

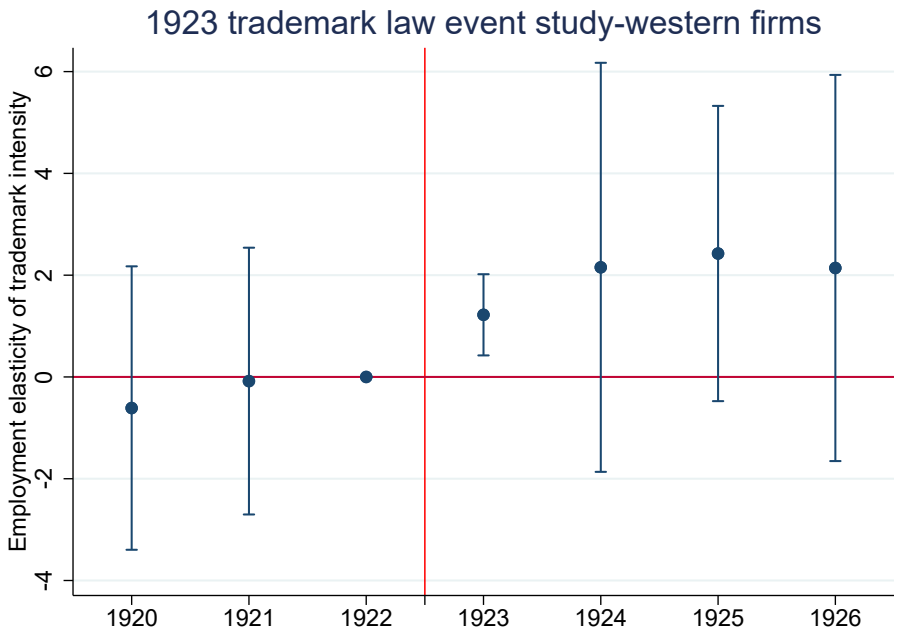


Figure 9: The Effect of Trademark Law on Western Firm Employment: Event Study

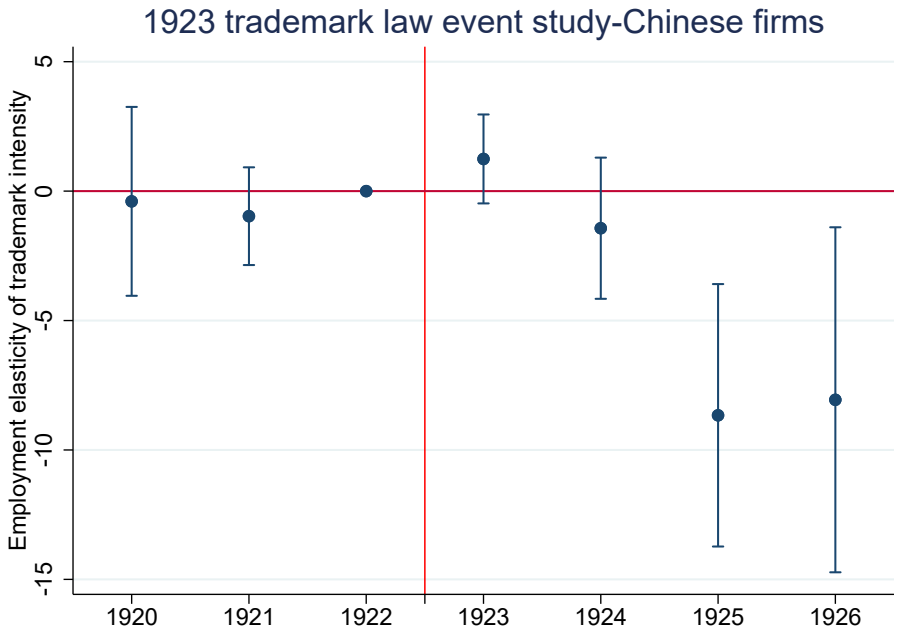


Figure 10: The Effect of the Trademark Law on Chinese Firm Employment: Event Study

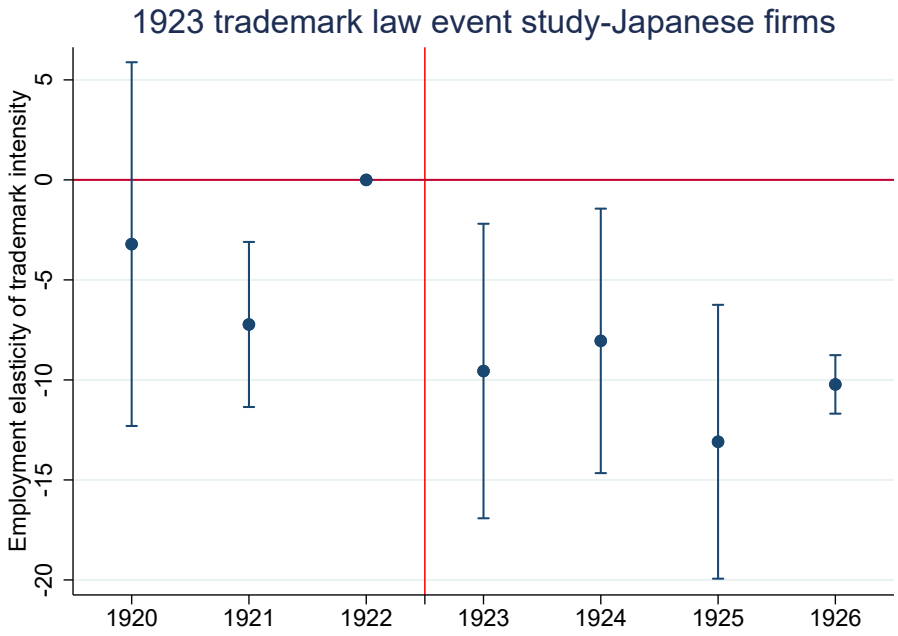


Figure 11: The Effect of the Trademark Law on Japanese Firm Employment: Event Study

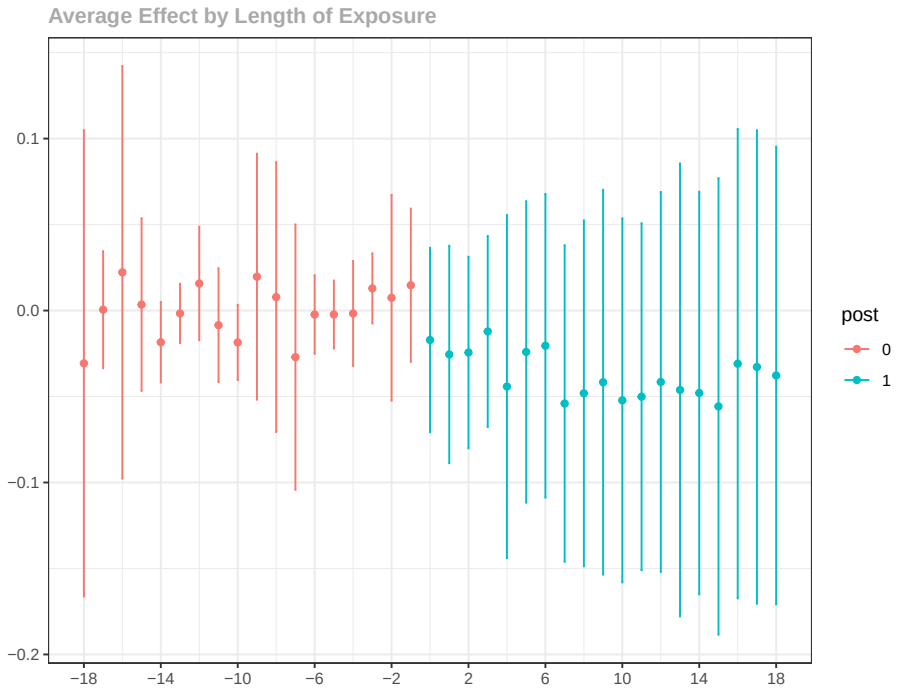


Figure 12: The Effect of the Trademark Law on Price: Event Study

Notes: The graph is produced based on the method and R program described in Callaway and Sant'Anna (2020). Blue bars represent log prices after trademarks are registered, red bars represent the months before trademark registration. Time on the x-axis is in months.

B Tables

Table 1: Trademark-intensity across product categories

NCL product category	Trademark int.	NCL product category	Trademark int.
Pharmaceuticals	0.088	Fabrics and fabric covers	0.016
Non-medicated cosmetics and toiletry	0.076	Toys, games, sports equipment	0.016
Foodstuffs of plant origin	0.073	Precious metals, jewellery, clocks, watches	0.013
Foodstuffs of animal origin	0.048	Medical equipment	0.013
Alcoholic beverages	0.047	Furniture	0.013
Chemical products	0.046	Natural or synthetic yarns	0.012
Paper, cardboard and office goods	0.045	Dressmakers' articles	0.012
Tobacco	0.041	Leather and leather goods	0.010
Non-alcoholic beverages; beer	0.040	Musical instruments	0.008
Machines, motors and engines	0.036	Canvas and other materials	0.008
Hand-operated tools	0.035	Firearms	0.006
Paints and colorants	0.034	Scientific and technological services	0
Scient. instruments and audio equip.	0.034	Food and drink services	0
Metals	0.031	Telecommunications services	0
Clothing, footwear and headwear	0.030	Transport; packaging and storage of goods	0
Industrial oils and fuels	0.029	Legal, security, and personal services	0
Small, hand-operated utensils	0.026	Medical and veterinary services	0
Live animals and plants	0.024	Construction services; mining and drilling	0
Environmental apparatus	0.024	Business services	0
Vehicles	0.021	Treatment and recycling	0
Electrical, thermal, acoustic insulating materials	0.021	Insurance, financial and real estate services	0
Materials, not of metal	0.018	Education, entertainment, sports	0

Notes: Trademark intensity is measured using each product's share in total pre-1923 trademarks recorded at the historical trademark database from the World Intellectual Property Organization (WIPO) IP Portal.

Table 2: The Effect of the Trademark Law on Firm Employment Growth

	(1) ln(empl)	(2) ln(empl)	(3) ln(empl)	(4) ln(empl)
Post 1923 * trademark intensity				
– Western	1.409*	1.753**	2.179**	2.227**
	(0.822)	(0.774)	(1.060)	(1.064)
– Japanese Firms	-0.403	-0.071	-6.849***	-8.897***
	(2.115)	(2.599)	(1.840)	(2.337)
– Chinese Firms	-1.845	-1.814	-3.096	-3.965*
	(1.652)	(1.678)	(2.395)	(2.252)
Observations	3,216	3,182	3,045	4,557
R-squared	0.906	0.908	0.913	0.890
Firm FE	Yes	Yes	Yes	Yes
Ctry*Year FE		Yes	Yes	Yes
Ind*Year FE			Yes	Yes
Sample until	1926	1926	1926	1930

Notes: This table compares the effects of the trademark law on the employment of Western, Japanese and Chinese firms. The sample includes Western, Japanese and Chinese firms located in Shanghai's concessions with employment and activity information between 1920-1926. The dependent variable is the natural log of a firm's employment in a given year between 1920-1926. Post trademark law is a dummy denoting the period after the establishment of the trademark law in 1923. Trademark intensity is a firm-specific measure of trademark dependence based on each firm's pre-1923 product mix and product-level trademark intensity calculated using each product's share in total pre-1923 trademarks. Standard errors clustered by product category and country-year. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Controlling for Alternative Product and Country Attributes

	(1) ln(empl)	(2) ln(empl)	(3) ln(empl)	(4) ln(empl)	(5) ln(empl)	(6) ln(empl)
Post 1923*trademark intensity	2.179**	2.068*	2.164**	2.156**	1.698*	2.818***
	(1.050)	(1.047)	(1.024)	(1.037)	(0.945)	(0.944)
Post 1923*patent intensity		0.434				
		(0.560)				
Post 1923*ln(number of firms in product category)			-0.002			
			(0.015)			
Post 1923*ln(total employment in product category)				-0.002		
				(0.009)		
Post 1923*ln(avg firm employment 20-22)					-0.089***	
					(0.023)	
Trademark intensity*ln(real GDP)						-4.575
						(5.049)
Observations	1,935	1,935	1,935	1,935	1,898	1,935
R-squared	0.913	0.913	0.913	0.913	0.915	0.913
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind*Year & Ctry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the estimated effect of the 1923 trademark law on Western firms' employment when controlling for other product attributes and using an alternative measure of trademark intensity. The sample includes Western firms located in Shanghai's concessions with employment and activity information between 1920-1926. The dependent variable is the natural log of a firm's employment in a given year. Post trademark law is a dummy denoting the period after the establishment of the trademark law in 1923. Trademark intensity is a firm-specific measure of trademark dependence based on each firm's pre-1923 product mix and product-level trademark intensity calculated using each product's share in total pre-1923 trademarks. Patent intensity is a similar firm-specific measure based on each firm's pre-1923 product mix and product-level patent intensity calculated using each product's share in total pre-1923 patents. Number of firms and total employment are the number of firms and the total number of employees, respectively, in a product category. "ln(real GDP)" is the real GDP of the home country of the firm from the *Maddison Project Database*, interpolating data for missing years, see Bolt, Inklaar, de Jong, and van Zanden (2018) and Fouquin and Hugot (2016). Standard errors clustered by product category and country-year. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: How did Western Firms Grow? Effect of Trademark Law on the probability of hiring in certain positions

	(1)	(2)	(3)	(4)
		Dummy if firm has:		
	ln(empl)	Lawyers	Sales staff	Engineers
Post 1923*trademark intensity	3.566**	0.915	0.452	0.732*
	(1.310)	(0.576)	(1.164)	(0.392)
Observations	1,480	1,480	1,480	1,480
R-squared	0.920	0.834	0.698	0.786
Firm FE	Yes	Yes	Yes	Yes
Ctry*Year FE	Yes	Yes	Yes	Yes
Ind*Year FE	Yes	Yes	Yes	Yes

Notes: Standard errors are clustered by product category. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Entry, Exit and Product Composition

	(1)	(2)	(3)	(4)	(5)
	Extensive margin			Product scope	
	Firm entry	Firm exit	Firm exist	Adding tm-int product	Dropping tm-int product
Post 1923 * trademark intensity					
– Western Firms	-0.282	-0.797**	0.515	-0.624	-0.717**
	(0.648)	(0.321)	(0.771)	(0.715)	(0.267)
– Japanese Firms	-1.594*	0.035	-1.629	2.334***	-3.193
	(0.893)	(0.728)	(1.345)	(0.189)	(2.538)
– Chinese Firms	-0.345	-1.423**	1.077	-0.586	-0.094
	(0.746)	(0.596)	(0.853)	(0.641)	(0.344)
Observations	7,652	7,652	7,652	2,815	2,815
R-squared	0.667	0.572	0.556	0.340	0.342
Firm FE	Yes	Yes	Yes	Yes	Yes
Ind*Year	Yes	Yes	Yes	Yes	Yes
Ctry*Year	Yes	Yes	Yes	Yes	Yes

Table 6: Advertising Investments

	(1) Advertising dummy	(2) ln(advertising days+1)	(3) $\sinh^{-1}$(ad-) vertising)
Post 1923 * trademark intensity			
– Western Firms	0.540	3.323*	3.373*
	(0.878)	(1.889)	(1.953)
– Japanese Firms	3.464**	3.060	3.680
	(1.456)	(2.012)	(2.259)
– Chinese Firms	-0.315	0.627	0.549
	(0.574)	(2.133)	(2.215)
Observations	3,135	3,135	3,135
R-squared	0.697	0.809	0.806
Firm FE	Yes	Yes	Yes
Ctry*Year FE	Yes	Yes	Yes
Ind*Year FE	Yes	Yes	Yes

Notes: This table reports the estimated effects of the trademark law on the advertising of Western firms on Shen Bao. The sample includes Western firms located in Shanghai's concessions with employment and activity information between 1920-1926. The dependent variables are the dummy of having advertisements on Shen Bao in a specific year, logged numbers of advertising days of advertisements, and the inverse sine of advertising days of advertisements, respectively. Trademark law is a dummy denoting the trademark law established in 1923. Trademark intensity is a firm-specific measure of trademark dependence based on each firm's pre-1923 product mix and product-level trademark intensity calculated using each product's share in total pre-1923 trademarks. Standard errors clustered by product category and country-year. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Domestic Integration within the Boundary of Western Firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				Hierarchy		Job titles		
	ln(empl)	ln(foreign empl)	Dummy Chinese empl	Dummy Chinese mgr	Avg layer of Chinese empl	Dummy Chinese sales staff	Dummy Chinese engineers	Dummy Chinese manuf staff
Post 1923*trademark intensity	2.179**	1.649	1.993**	0.718***	-0.818***	0.130**	-0.689	-0.386
	(1.050)	(1.023)	(0.782)	(0.191)	(0.273)	(0.062)	(0.528)	(0.432)
Observations	1,935	1,935	1,935	1,935	811	1,480	1,480	1,480
R-squared	0.913	0.933	0.758	0.521	0.510	0.671	0.742	0.376
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ctry*Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the estimated effects of the trademark law on the organization of Western firms. The sample includes Western firms located in Shanghai's concessions with employment and activity information between 1920-1926. The dependent variables are the number of layers in a firm's management hierarchy and Chinese employees' average rank/layer in the management hierarchy, respectively. Trademark law is a dummy denoting the trademark law established in 1923. Trademark intensity is a firm-specific measure of trademark dependence based on each firm's pre-1923 product mix and product-level trademark intensity calculated using each product's share in total pre-1923 trademarks. Standard errors clustered by product category and country-year. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: The Client Growth of Chinese Agent Firms

	(1)	(2)
	Dummy having clients	ln(num clients+1)
Western*post 1923*trademark intensity	-0.249	-1.865
	(0.633)	(2.279)
China*post 1923*trademark intensity	1.607***	2.673***
	(0.458)	(0.593)
Japan*post 1923*trademark intensity	-0.036	-3.601
	(0.823)	(2.558)
Observations	3,045	3,045
R-squared	0.769	0.785
Firm FE	Yes	Yes
Ctry*Year FE	Yes	Yes
Ind*Year FE	Yes	Yes

Notes: The number of clients counts the list of firms for which Shanghai firms act as agents. Two-way clustered standard errors by product category and country-year in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: The Employment Growth of Chinese Agents and Manufacturers

	(1) ln(empl)	(2) ln(empl)	(3) ln(empl)	(4) ln(empl)
Post 1923*trademark intensity	-3.657	-5.057	-4.052*	-7.865**
	(2.415)	(3.222)	(1.926)	(2.653)
Post 1923*trademark intensity*agent	14.855*			16.137*
	(7.196)			(7.883)
Post 1923*trademark intensity*merchant		4.756		4.597
		(2.967)		(3.250)
Post 1923*trademark intensity*manuf			1.884	4.498*
			(1.635)	(2.127)
Observations	870	870	870	870
R-squared	0.881	0.881	0.880	0.882
Firm FE	Yes	Yes	Yes	Yes
Ctry*Year FE	Yes	Yes	Yes	Yes
Ind*Year FE	Yes	Yes	Yes	Yes

Notes: Sample includes all Chinese firms. Standard errors are clustered by product category. *** p<0.01, ** p<0.05, * p<0.1.

Table 10: The Effect of Trademark Registrations on Prices

Sample:	(1) All products	(2) All products	(3) Western products	(4) Western products
	ln(price)	ln(price)	ln(price)	ln(price)
Post trademark registration	0.039	-0.010	0.041	-0.032
	(0.038)	(0.034)	(0.043)	(0.037)
Observations	3,042	3,042	2,418	2,418
R-squared	0.140	n/a	0.132	n/a
Method	OLS	CS	OLS	CS

Notes: Columns (1) and (3) estimate OLS regressions of log monthly prices on an indicator variable that is 1 after the product's trademark is registered in China, including time and product fixed effects. Standard errors are clustered by product category. Columns (2) and (4) computes the average treatment effect based on the method of Callaway and Sant'Anna (2020) (labelled 'CS') which is appropriate for staggered differences-in-differences settings, and implicitly allows for product and time fixed effects. Columns (3) and (4) restrict the analysis to products manufactured by Western companies. *** p<0.01, ** p<0.05, * p<0.1.

Table 11: Comparing Alternative Institutions

	(1) ln(empl)	(2) ln(empl)	(3) ln(empl)	(4) ln(empl)	(5) ln(empl)	(6) ln(empl)
Part I: ET						
ET	0.063	0.137	0.185	0.185	0.130	
	(0.092)	(0.134)	(0.143)	(0.143)	(0.152)	
ET*trademark intensity		-2.383	-3.532	-3.533	-2.137	-4.475
		(2.651)	(2.719)	(2.714)	(3.110)	(3.825)
Part II: Bilateral Treaties						
Treaty			-0.295*	-0.295*	-0.286*	
			(0.147)	(0.147)	(0.149)	
Post 1904*trademark intensity			-7.271***	-7.134***	-6.988***	-9.373***
			(2.551)	(1.575)	(1.558)	(2.555)
Treaty*trademark intensity			3.549	3.548	3.209	5.636
			(3.043)	(3.041)	(3.076)	(4.446)
Part III: Provisional Trademark Code						
(Post 1906)*trademark intensity				-0.145	-1.421	-1.323
				(2.317)	(2.214)	(2.538)
Part IV: 1923 Trademark Law						
(Post 1923)*trademark intensity					3.581**	3.929***
					(1.336)	(1.451)
Observations	20,051	20,051	20,051	20,051	20,051	19,797
R-squared	0.765	0.765	0.766	0.766	0.767	0.777
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Ind*Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Ctry*Year FE	No	No	No	No	No	Yes
Country-year controls	Yes	Yes	Yes	Yes	Yes	No

Notes: This table compares the effect of the trademark law with earlier institutions including extraterritoriality, bilateral treaties, and the 1904 trademark code. The sample includes Western firms located in Shanghai's concessions with employment and activity information appearing between 1872-1936. The dependent variable is the natural log of a firm's employment in a given year. ET is a firm specific dummy denoting a firm's status of extraterritoriality in a given year. Treaties is a country-year specific dummy denoting the treaties between China and Great Britain, the U.S. and Japan, respectively. 1904 trademark code is a dummy denoting a trademark code proposed in 1904 but not enforced. Trademark law is a dummy denoting the trademark law established in 1923. Trademark intensity is a firm-specific measure of trademark dependence based on each firm's product mix as described in the activity text of the Hong List of each year and product-level trademark intensity calculated using each product's share in total pre-1923 trademarks. Controls are: dummy variables indicating the 'equal treaties' that China entered with Germany and Austria in the 1920s, ln(GDP/capita), ln(population). Standard errors clustered by product category and country-year. *** p<0.01, ** p<0.05, * p<0.1.

C Proofs

C.1 Profits of authentic producers are increasing in b_j

Consider the profits of the authentic producer:

$$\pi_j^a = \left(\frac{1}{\sigma-1}\right)\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}(1-s)QP^\sigma b_j^\sigma c_j^{1-\sigma} - f$$

Taking the derivative with respect to quality b_j:

$$\frac{\partial \pi^a(b_j)}{\partial b_j} = \left(\frac{1}{\sigma-1}\right)\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}(1-s)QP^\sigma\left(\sigma b_j^{\sigma-1}c_j^{1-\sigma} + b_i^\sigma(1-\sigma)c_j^{-\sigma}c'(b_j)\right)$$

This is positive if

$$\begin{aligned} c(b_j)^{1-\sigma}\sigma b_j^{\sigma-1} &> (\sigma-1)c(b_j)^{-\sigma}c'(b_j)b_j^\sigma \\ \frac{\sigma}{\sigma-1} &> \frac{c'(b_j)b_j}{c(b_j)} \end{aligned}$$

C.2 Proof to Proposition 1

Proof. Taking the derivative of the expression for M given by equation (15) with respect to s yields:

$$\frac{\partial M}{\partial s} = -\frac{L}{\bar{r}^A}\frac{\rho^{\frac{\sigma-1}{\sigma}}\frac{1}{(1-s)^2}}{\left(1+\rho^{\frac{s}{1-s}\frac{\sigma-1}{\sigma}}\right)^2} \leq 0$$

■

C.3 Proof to Proposition 2

Proof. The output of an authentic producer is given by equation (20). Total income I is given by income paid to workers at the wage rate of 1, i.e., $I = L$, and this is fixed and hence does not depend on s.

The price index in equilibrium only depends on the number of products actually produced, i.e., the mass of firms active in the market, M, and average quality:

$$
\begin{aligned}
P &= \left(\int_{b_i^*}^{\infty} b_i^{\sigma} p(b_i)^{1-\sigma} M \frac{g(b_i)}{1-G(b_i^*)} db_i \right)^{\frac{1}{1-\sigma}} \\
&= \left(\int_{b_i^*}^{\infty} b_i^{\sigma} \left(\frac{\sigma}{\sigma-1} c(b_i) \right)^{1-\sigma} M \frac{g(b_i)}{1-G(b_i^*)} db_i \right)^{\frac{1}{1-\sigma}} \\
&= \left(\frac{\sigma}{\sigma-1} \right)^{1-\sigma} M^{\frac{1}{1-\sigma}} \left(\int_{b_i^*}^{\infty} b_i^{\sigma} \left(c(b_i) \right)^{1-\sigma} \frac{g(b_i)}{1-G(b_i^*)} db_i \right)^{\frac{1}{1-\sigma}} \\
&= \left(\frac{\sigma}{\sigma-1} \right)^{1-\sigma} M^{\frac{1}{1-\sigma}} \left(\tilde{b_i}^{\sigma} c(\tilde{b_i})^{1-\sigma} \right)^{\frac{1}{1-\sigma}}
\end{aligned}
$$

Average quality is independent of s, because it only depends on the quality cutoff b_i^* which is determined in the zero profit condition equation (**??**) that does not vary with s.

Taken together, we can thus rewrite the output of the authentic producer as:

$$
q_i^A = (1-s)\bar{r}^A \left(1 + \rho_C \frac{s}{1-s} \frac{\sigma-1}{\sigma} \right) \left(\frac{\sigma}{\sigma-1} \right)^{-(1-\sigma)^2-\sigma} \frac{b_i^{\sigma} c_i^{-\sigma}}{\tilde{b_i}^{\sigma} c(\tilde{b_i})^{1-\sigma}}
$$

Now consider the ratio of the size of the authentic producer with (full) trademark protection relative to without trademark protection given by:

$$
\frac{q_i^A(s=0)}{q_i^A(s>0)} = \frac{1}{(1-s)\left(1+\rho \frac{s}{1-s} \frac{\sigma-1}{\sigma}\right)} \tag{20}
$$

The expression given in equation (20) is larger than 1, because $\rho - 1 \leq 0$:

$$
\begin{aligned}
\frac{1}{1-s} &\geq \left(1 + \rho \frac{s}{1-s} \frac{\sigma-1}{\sigma} \right) \\
\sigma &\geq \sigma - s\sigma + \rho s\sigma - \rho s \\
0 &\geq s\sigma(\rho-1) - \rho s
\end{aligned}
$$

■

C.4 Proof to Proposition 3

Proof. We measure welfare by expected utility:

$$\begin{aligned} E(U) &= \lambda \left(\int_{\omega \in \Omega} b(\omega) q(\omega)^{\frac{\sigma-1}{\sigma}} d(\omega) \right)^{\frac{\sigma}{\sigma-1}} \\ &= \lambda \left(\int_{b^*}^{\infty} b_j q_j^{\frac{\sigma-1}{\sigma}} M \frac{g(b_j)}{1-G(b_j^*)} db_j \right)^{\frac{\sigma}{\sigma-1}} \\ &= \lambda M^{\frac{\sigma}{\sigma-1}} \left(\int_{b^*}^{\infty} b_j q_j^{\frac{\sigma-1}{\sigma}} \frac{g(b_j)}{1-G(b_j^*)} db_j \right)^{\frac{\sigma}{\sigma-1}} \end{aligned}$$

Plugging in optimal quantities

$$q_j = IP^{\sigma-1} \left(\frac{\sigma}{\sigma-1} \right)^{-\sigma} \left(\frac{c_j}{b_j} \right)^{-\sigma}$$

yields

$$\begin{aligned} E(U) &= \lambda M^{\frac{\sigma}{\sigma-1}} IP^{\sigma-1} \left(\frac{\sigma}{\sigma-1} \right)^{-\sigma} \left(\int_{b^*}^{\infty} b_j^{\sigma} c_j^{1-\sigma} \frac{g(b_j)}{1-G(b_j^*)} db_j \right)^{\frac{\sigma}{\sigma-1}} \\ &= \lambda M^{\frac{\sigma}{\sigma-1}} IP^{\sigma-1} \left(\frac{\sigma}{\sigma-1} \right)^{-\sigma} \left(\tilde{b_i}^{\sigma} c(\tilde{b_i})^{1-\sigma} \right)^{\frac{\sigma}{\sigma-1}} \end{aligned}$$

where the last expression uses the expression for average quality adjusted cost, which only depends on the quality cutoff but not on s.

Plugging the expression for P from proof to Proposition 2 into the expression for expected utility yields:

$$E(U) = \lambda(s) L M(s)^{\frac{1}{\sigma-1}} \left(\frac{\sigma}{\sigma-1} \right)^{-(1-\sigma)^2-\sigma} \left(\tilde{b_i}^{\sigma} c(\tilde{b_i})^{1-\sigma} \right)^{\frac{1}{\sigma-1}}$$

Since expected utility depends on s only through $\lambda(s)$ and $M(s)$, and we know that both λ and M depend negatively on s (the latter from Proposition 1), we show:

$$\frac{\partial E(U)}{\partial s} = \psi \left(\underbrace{\frac{\partial \lambda(s)}{\partial s}}_{\leq 0} M(s)^{\frac{1}{\sigma-1}} + \lambda(s) \frac{1}{\sigma-1} M^{\frac{2-\sigma}{\sigma-1}} \underbrace{\frac{\partial M(s)}{\partial s}}_{\leq 0} \right) \leq 0$$

where $\psi = L \left(\frac{\sigma}{\sigma-1} \right)^{-(1-\sigma)^2-\sigma} \left(\tilde{b_i}^{\sigma} c(\tilde{b_i})^{1-\sigma} \right)^{\frac{1}{\sigma-1}} > 0$.

■

ONLINE APPENDIX

D Additional Analysis

D.1 Restricting the Analysis to Goods Only

In our main paper, firms in both goods and services sectors are included in the analysis. In this subsection, we examine the robustness of the results when restricting the analysis to goods only. Note that as many of the firms in our sample sell both goods and services, this analysis drops firms that sell only services.

The results are reported in Table E.2. We find that the estimated effect of the trademark law to increase in magnitude when considering goods only, and are statistically significant in most specifications.

D.2 Excluding Potential Interest Groups

We also conduct a different set of robustness checks and test whether excluding certain interest groups, namely, specific countries, products, or firms that were expected to benefit particularly from the trademark law, would affect our estimated effects of the trademark law on Western firm growth. The analysis is reported in Table **??**.

For example, German firms lost extraterritoriality at the end of World War I and as a result would arguably have more interests in a domestic trademark law in China. We drop German firms in column (2) and find the results remain unaffected. Relatedly, among the different products, cigarettes were a product that was particularly affected by trademark infringements.[1] At the same time, the cigarette industry was heavily concentrated, with *British American Tobacco (BAT)* being one of the big players. Big business groups could in principle have been lobbying for the introduction of the trademark law, thereby potentially violating the exogeneity assumption. While this seems unlikely given the historical context described in Section 2.3, we drop BAT in column (3) and the entire tobacco industry in column (4). The analysis shows that this does not affect our estimated effect of the trademark law, either.

D.3 Dropping a Country or Product

Next, we examine whether the estimated growth effects of the trademark law are due to a particular country or product. In Figures F.2 and F.3 below, we show that neither a specific country nor a specific product group is driving the results. The results are very similar in magnitude and mostly significant when we drop a country or product group at a time.

D.4 The Effect of the Trademark Law on Chinese Imports

In addition to firm growth, we would expect the trademark law to similarly affect China's imports of trademark-intensive products.

To investigate this, we compile bilateral product-level import data between China and the world for the period of 1920 to 1928.[2] The source for the import data is the annual

[1] This is highlighted in Motono (2011), and also reflected in the data on advertisements that we describe in Section 2.3.

[2] We are grateful to Robert Bickers, Hans van den Ven, and their team for sharing with us their digitized

series "Foreign Trade of China" published by the *Statistical Department of the Inspectorate General of Customs*. For each source country and year, the data report the quantity and value of Chinese imports in a given product.

We harmonize countries and products over time, resulting in data for 40 countries and 246 harmonized product categories and covering all years between 1920 and 1928. Harmonizing products over time is challenging, as the product classification system changed significantly in 1925. We harmonize products based on the description of product categories, and verify our matches using the publication in 1925 that also provided import data for the previous years 1924 and 1923 under the new classification. Overall, we are able to match 91% of trade data in terms of imports value in 1924 either exactly over time (35%) or closely (56%) with deviations of less than 1% of trade value in either product classification in both 1923 and 1924).[3] In our analysis we focus on the products that we can exactly match over time, and show robustness checks that include the remaining product categories.

In order to examine this, we use bilateral product-specific import data and estimate the following equation:

$$\ln(imports_{pct}) = \beta_0 + \beta_1 * TrademarkInt_p * PostLaw_t + FE_{pc} + FE_{ct} + \epsilon_{pct} \quad (21)$$

where $imports_{pct}$ are China's import values in product category p from country c in year t, $TrademarkInt_p$ is the trademark share of product p as defined in the previous section, $PostLaw_t$ is a dummy that equals 1 if the year is equal to or after 1923, FE_{pc} are product-country specific fixed effect, and FE_{ct} are country-year specific fixed effects. As different product categories can be of different size, we use the average import value between 1920-1922 of the product category in each country as weights in the regression. We cluster standard errors by product category p, in line with Bertrand, Duflo, and Mullainathan (2004). We run the regression on the sample of all countries except Japan, as we will study Japan separately further below. We also drop rice from the products, as rice imports were unusually low in 1919 and 1920 due to poor harvests leading to rice shortages in all of Southeast Asia (Kratoska, 1990).[4]

Table E.3 presents the results. Column (1) shows that the imports of trademark-intensive products increased significantly after the establishment of the trademark law. Column (2) shows that the result is very similar when using country-year fixed effects instead of year specific fixed effects, our preferred specification. The magnitude of the effect is sizeable: imports in the most trademark-intensive products in the trade data (i.e., tea and coffee with a trademark intensity of 0.073) increased by 1.2%, while imports in the product category with mean trademark-intensity (i.e., chinaware with a trademark intensity of 0.026) increased by

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data covering a large share of the final trade dataset.

[3] As sometimes errors in the trade data from previous years are updated in later publications, it is not entirely clear whether mismatches are due to mistakes in product assignment, or correction of previous mistakes in the official trade data.

[4] The recovery of rice imports from the rice crisis appeared as a pre-trend in our data, which would overestimate our effect.

0.4% after the trademark law.

Columns (1) and (2) of Table E.3 explore the effect of the trademark law on the intensive margin of imports by using log of imports as the dependent variable, which by definition excludes observations with zero trade (70% of observations). In columns (3) to (5) we explore the inclusion of the extensive margin in a variety of ways. Column (3) uses log (imports + 1) as the dependent variable, and column (4) uses the inverse hyperbolic sine transformation of imports. The effect of the trademark law remains positive and significant when including the extensive margin. Column (5) uses the simple import dummy and confirms that the trademark law also led to the establishment of new trade relationships in trademark-intensive products.

As with the firm data, in order for our identification strategy to work, it is important to make sure that there are no pre-trends indicating imports of trademark-intensive goods might have grown even in the absence of the trademark law. To check for this, we estimate a full event study version of equation (21) by estimating:

$$\ln(imports_{pct}) = \beta_0 + \sum_{t=1920}^{1928} \beta_t * TrademarkInt_p + FE_{pc} + FE_{ct} + \epsilon_{pct} \qquad (22)$$

Figure F.4 shows the estimation results. Again, there is no evidence of pre-trends: the coefficients before 1923 are by an order of magnitude smaller and insignificantly different from zero, while coefficients after 1923 are consistently large, and mostly significantly different from zero. There, however, appears to be a slight decline in the effect of the trademark law over time.

Next we consider the effect of the trademark law on Chinese imports from Japan. If a large share of China's imports from Japan were counterfeits, we should expect the trademark law to have a smaller effect on imports from Japan. In Table E.3 the results confirm what we have seen in the analysis of employment growth; imports from Japan fell, though the effect is not significant. The full event study for Japan is reported in Figure F.5; while the event study is noisier than the one for Western imports in general, it does not find imports to grow after the trademark law.

D.5 The Effect of the Trademark Law on Quality Ads

The previous literature has also suggested that trademark protection may exert mixed effects on product quality. On the one hand, firms may improve product quality as they capture a larger market share, charge potentially higher prices, and/or experience larger demand for their products as consumers become less concerned about receiving counterfeits. On the other hand, authentic producers may have more incentives to offer a higher quality without trademark protection, in order to make it harder for counterfeiters to copy their products.

We explore these hypotheses using information available in the advertisement data. Specifically, we classify a subset of advertisements as "quality ads", if the text of the advertisements stresses the quality of the product, using words such as 质 (quality), 特效 (effective), 功效 (efficacy), 功用 (effect). In columns (1) to (3) of Table E.4 we find an insignificant increase in firms' advertising highlighting product quality.

E Online Appendix — Tables

Table E.1: Summary statistics

	(1) Observations	(2) Mean	(3) Std.dev.	(4) Min	(5) Max
Employee number	3263	10.159	20.744	1	387
Share of Chinese employees	3263	0.297	0.382	0	1
Number of products	3263	1.633	1.219	1	11
Trademark intensity	3263	0.022	0.024	0	0.088
Western firm dummy	3263	0.644	0.479	0	1
Chinese firm dummy	3263	0.277	0.447	0	1
Japanese firm dummy	3263	0.080	0.271	0	1

Notes:

Table E.2: The Effect of the 1923 Trademark Law on Employment of Western Firms: Goods only

	(1) ln(empl)	(2) ln(empl)	(3) ln(empl)	(4) ln(empl)
Post 1923*trademark intensity	2.533**	2.437*	2.508	2.557*
	(1.082)	(1.271)	(1.551)	(1.385)
Observations	863	850	816	1,221
R-squared	0.904	0.910	0.908	0.893
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes			
Ctry*Year FE		Yes	Yes	Yes
Ind*Year FE			Yes	Yes
Sample until	1926	1926	1926	1930

Notes: The trademark intensity measure used in this table only considers products but not services of firms. Firms that only sell services are therefore dropped. Standard errors are clustered by product category. *** p<0.01, ** p<0.05, * p<0.1.

Table E.3: Trademark Law and Import Growth — Western Countries versus Japan

VARIABLES	(1) ln(imports)	(2) ln(imports+1)	(3) $\sinh^{-1}$(imports)	(4) Import dummy
Trademark intensity * (Post $\geq$ 1923) * All countries excl. Japan	16.263**	22.591**	23.029**	0.637**
	(7.415)	(9.194)	(9.337)	(0.290)
Trademark intensity * (Post $\geq$ 1923) * Japan	-2.433	-7.967	-8.299	-0.476
	(11.321)	(12.705)	(12.896)	(0.517)
Observations	11,071	14,958	14,958	14,958
R-squared	0.906	0.863	0.858	0.583
Country-year FEs	yes	yes	yes	yes
Country-prod FEs	yes	yes	yes	yes

Notes: This table reports the estimated effects of the trademark law on China's imports, separately from all countries excluding Japan and from Japan. The sample includes products that can be matched exactly across different product classification schemes over time and excludes rice. The dependent variables are the natural log of the import value, the natural log of the import value plus 1, the inverse sine of the import value, and a dummy for the existence of imports, respectively. Post law is a dummy denoting the period after the establishment of the trademark law in 1923. Trademark intensity is a product-level trademark intensity calculated using each product's share in total pre-1923 trademarks. All regressions are weighted by the import value of the respective product in the country averaged over 1920-1922. Standard errors are clustered by product category. *** p<0.01, ** p<0.05, * p<0.1.

Table E.4: Quality Advertisements

	(1) Quality adv. dummy	(2) ln(quality advertising days+1)	(3) $\sinh^{-1}$(quality advertising)
Post 1923 * trademark intensity			
– Western Firms	0.116	0.974	0.991
	(0.426)	(0.689)	(0.750)
– Japanese Firms	n/a	n/a	n/a
– Chinese Firms	-0.364	-0.003	-0.120
	(0.269)	(0.664)	(0.696)
Observations	3,135	3,135	3,135
R-squared	0.581	0.668	0.666
Firm FE	Yes	Yes	Yes
Ctry*Year FE	Yes	Yes	Yes
Ind*Year FE	Yes	Yes	Yes

Notes: This table reports the estimated effects of the trademark law on quality advertising of Western firms on Shen Bao. The sample includes Western firms located in Shanghai's concessions with employment and activity information between 1920-1926. The dependent variables are the dummy of having quality advertisements on Shen Bao in a specific year, logged numbers of quality advertising days of quality advertisements, and the inverse sine of quality advertising days of advertisements, respectively. Trademark law is a dummy denoting the trademark law established in 1923. Trademark intensity is a firm-specific measure of trademark dependence based on each firm's pre-1923 product mix and product-level trademark intensity calculated using each product's share in total pre-1923 trademarks. There is no effect estimated for Japanese firms, because there are no Japanese advertisements highlighting quality in our sample. Standard errors clustered by product category and country-year. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

F Online Appendix — Figures

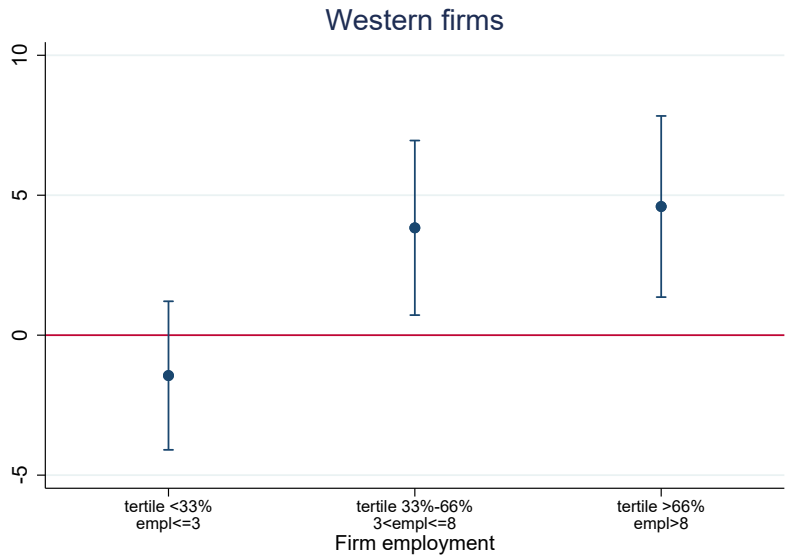


Figure F.1: The Heterogeneous Effect of the Trademark Law across Western Firms

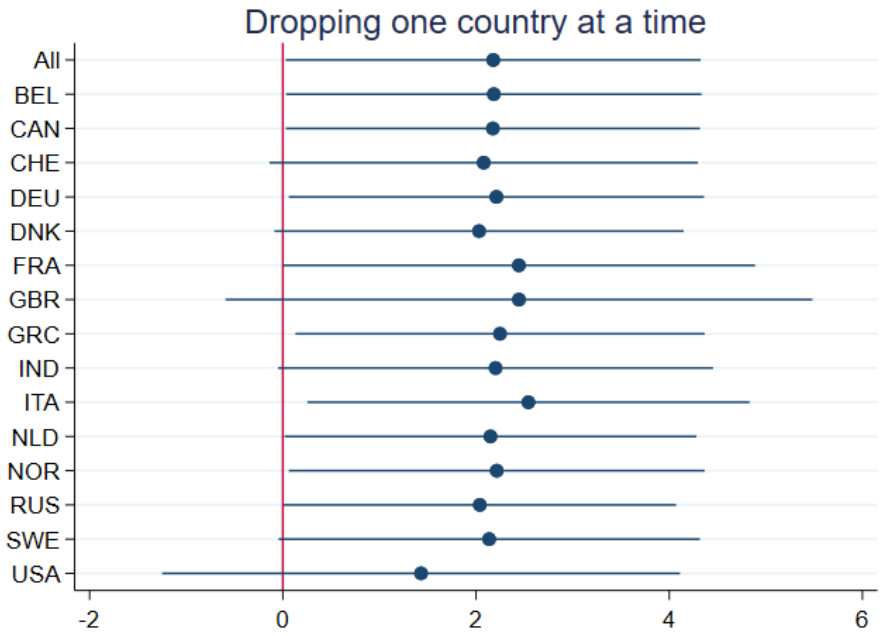


Figure F.2: The Effect of the Trademark Law on Employment of Western Firms, dropping one home country at a time

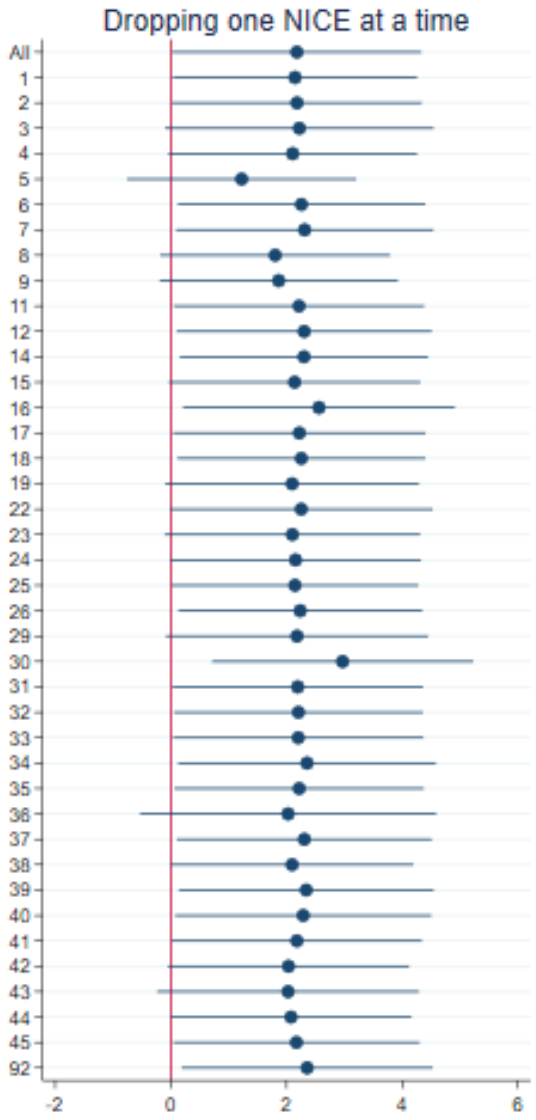


Figure F.3: The Effect of the Trademark Law on Employment of Western Firms, dropping one NCL product category at a time

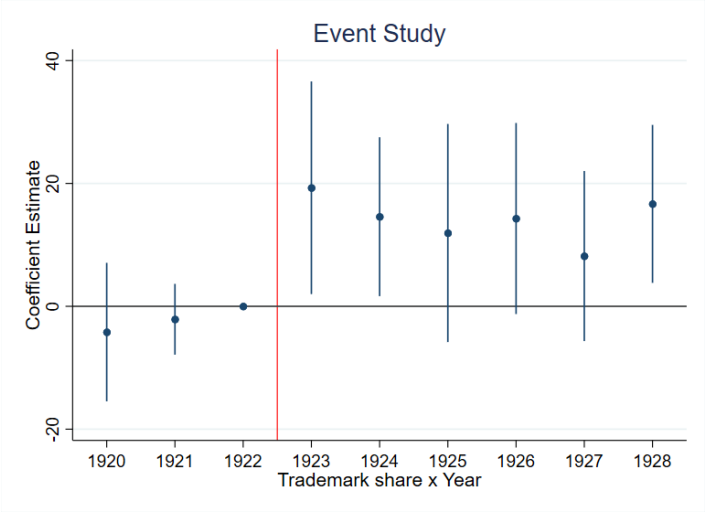


Figure F.4: The Effect of the Trademark Law on Chinese Imports from Western countries: Event Study

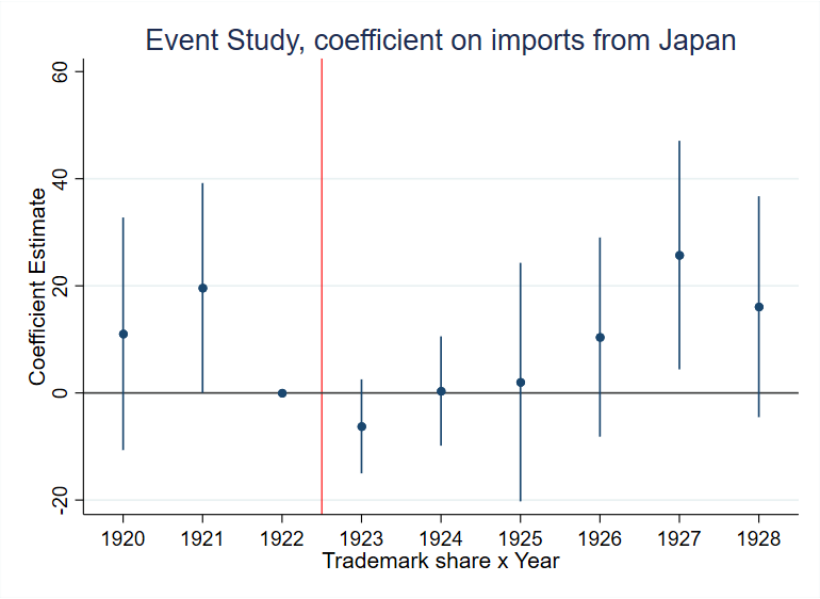


Figure F.5: The Effect of the Trademark Law on Chinese Imports from Japan

Notes: Estimating equation (21) is appended by observations from Japan, and all coefficients are estimated separately for Japan and non-Japanese countries. The figure just plots the time varying coefficients for Japan, as the coefficients for non-Japanese countries are identical to Figure F.4.