Trade in the Shadow of Power: Japanese Industrial Exports in the Interwar years

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Working Papers in Economic History

2019-02

ISSN: 2341-2542

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Serie disponible en http://hdl.handle.net/10016/19600

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Keywords: International Trade, Empires, Trade blocs, Japan, Interwar years

JEL Code: F14, N15, N75

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During the interwar years, Japanese industrialisation accelerated alongside the expansion of industrial exports to regional markets. Trade blocs in the interwar years were used as an instrument of imperial power to foster exports and as a substitute for productivity to encourage industrial production. The historiography on Japanese industrialisation in the interwar years describes heavy industries' interests in obtaining access to wider markets to increase economies of scale and reduce unit costs. However, this literature provides no quantitative evidence that proves the success of those mechanisms in expanding exports. In this paper we scrutinise how Japan—a relatively poor country—used colonial as well as informal power interventions to expand regional markets for its exports, especially for the most intensive human capital sector of the industrializing economy.

Introduction

This paper studies the main drivers of the expansion of Japanese exports during the interwar years at a time of accelerated growth and convergence. Japan underwent a process of rapid industrialization on the basis of import substitution and imperial policies. Its newly created empire was very efficient in developing a peculiar imperial trade in the shadow of power throughout East and Southeast Asia in conjunction with a more aggressive imperial regional policy through conquest.[1]

Of course, such protectionist and imperial policies in the international economy were not confined to Japan during the interwar years. Britain, for example, instituted a policy of imperial preference with its colonies and mandated territories in the framework of the Commonwealth at the Ottawa Conference of 1932. Germany, having neither complete customs autonomy as a result of the Treaty of Versailles nor an informal or formal geographically contiguous empire, fostered a complex and domineering system of clearing arrangements with Central European and Balkan neighbours even before the Nazi regime. Trade barriers rose all over the world and the biggest economies abandoned

[1] Trade has taken place in the shadow of power for all almost all of recorded human history. We argue that power matters for trade, as critically as the traditional determinants of endowments, preferences, and technology Following Findlay and O'Rourke, 2007 and Garfinkel. et al (2012).

global multilateral free trade policies in favour of commercial exchanges within their Empires. Fragmented regional or global empires, both formal and informal, were reconciled ambivalently with bilateral agreements that included tariffs, quotas, import licenses, exchange controls, barter and clearing agreements, and other protectionist policies.

Japanese imperialist history is well known. During the Meiji Period (1868-1912), Japan annexed Ezo (Hokkaidô) in 1869, the Ryûkyû Islands in 1879, Taiwan in 1895, and Korea between 1905-10. Until the 1920s, Japan allowed free access to foreigners in their occupied territories and only then created a real imperial bloc in conjunction with an escalation of domestic trade barriers. By the early 1930s, Japan already had consolidated a decisive policy of protectionism and an empire wide regional market with trading privileges for Japanese industrial firms. Tariff policy in the Japanese occupied territories privileged Japan or was assimilated into Japan's own tariff system. Korea adopted Japan's tariff system in 1923, as would Manchuria ten years later upon the territory's separation from the Chinese custom system, allowing preferential access for Japanese manufactures.[2]

Along with the protectionist backlash experienced around the world, the development of the Japanese Imperial Bloc in the interwar years also responded to the demand of Zaibatsu heavy industrialists for exclusive access to wider markets and the military's desire to control vital strategic materials, such as oil, rubber, and iron ore. These interests were consolidated by the conquest of Manchuria as well as the regional expansion of commercial and investment networks in other areas that were later called 'The Greater East Asia Co-Prosperity Sphere'.[3]

This paper will assess how much of the expansion of Japan's industrial exports during the interwar years was based on this combination of imperial soft power and its policy of aggressive conquest in East and Southeast Asia. Specifically, we examined whether the expansion of high-skill exports to Japan's neighbours can be better explained by improvements in productivity or by imperial policy variables. For that purpose, we ascertained the mechanisms that linked Japanese imperial activity to its exports. We defined the 'Japanese Empire' (JE) as including both previously occupied colonies and

[2] See Chase (2005, 62-64).

[3] See Fletcher (1989, 144-50). Similar to the term 'Third Reich', this was one of a number of slogans and concepts used in the justification of Japanese aggression in East Asia from the 1930s through the end of World War II.

what we call 'Future Conquests'—those countries or polities in the region that were of strategic interest for Japan, as proven by their occupation between 1941 and 1945.[4] We argue that Japan exerted regional commercial influence through the creation of transnational commercial and investment networks and cultural diplomacy, which facilitated commercial information and created merchant community trust in the region. This soft power thrust, combined with a more traditional imperial policy of military conquest, was decisive for the consolidation of a new stage of industrial modernization during the 1930s.

To study the determinants of Japanese exports, we digitized Japanese commercial returns (Annual Returns of the Foreign Trade of the Empire of Japan) for several benchmark years (1912, 1915, 1925, 1929, 1932, and 1938) and created an exhaustive granular product data set of exports by country of destination for each of the chosen years. Using this data set we analysed the main determinants of Japanese exports by skill bias, focusing mainly on East and Southeast Asia, and comparing them with Japan's export performance with the rest of the world. The methodology employed for that purpose is in line with extensive and intensive marginal gravity models. The specification used in this paper includes the usual factor endowments, demand structure and trade cost variables (such as tariffs, transport cost, and political factors). The basic gravity model is augmented by a new series of freight factors from Japan to corresponding destinations (disaggregated by product line), commercial diplomacy appointments, and dependency relationships with Japan (occupation, annexation, colonisation, and lease) before and after 1932.

Japan's second stage of industrial expansion in the interwar years was mainly based on exports of high-skill manufactured goods, and this expansion was fostered by the imperial shadow of power. The literature on Japanese industrialisation in the interwar years describes heavy industries' interests in gaining access to wider markets to increase economies of scale and reduce unit costs. Yet, there exists no quantitative evidence that proves the success of those mechanisms in expanding exports to regional markets. In this paper we use a new data set and other empirical evidence to answer the following

[4] Formal colonies include: Taiwan, Korea, Kwantung Leased Territory, Manchuria (1932), and China (1938). The "Future Conquests" are: Manchuria (1912-1929), China (1912-1932),Thailand, Burma, French Indochina, Hong Kong, Dutch East Indies, British Borneo and Sarawak, New Guinea, British Malaya (including Singapore), the Philippine Islands, and the Solomon, Gilbert, and Marshall Islands in the Pacific. For more information on the main features of the colonies and future conquest territories, see Section 4.3, Appendix A.

questions. First, were improvements in Japanese relative productivity or comparative advantage the main drivers of its industrial export expansion? Or, conversely, was trade expansion driven mainly by political enforcement related to imperial privileges? Our hypothesis, in short, is that the Imperial Bloc was a much stronger driver of Japanese export expansion than the conventional reduction of trade costs or improvements in comparative advantage. Japan reacted to the interwar context of global commercial disintegration with aggressive import substitution and an imperial strategy to foster exports of manufactures, as did Britain and Germany in other ways.

2. Regional Trade and the Japanese Empire

What mechanisms link imperial expansion with increases in exports towards a determined region? Either international context or domestic industrial policy helps to understand the complex Japanese interest in East and Southeast Asia, and its expansionary policy of trade in the shadow of power.[5]

The British commercial relationship with its colonies after 1932, especially with India, with Britain turning away from almost a century of free trade policy, is probably the most well-known case study of the use of trade in the shadow of power. However, most of the literature presents the Commonwealth trade bloc as being less discriminatory towards outsiders than initially suggested by the text of the Ottawa agreement of July 1932. Nevertheless, the agreement succeeded in implementing preferential access by Britain to the dominions and vice versa. Great Britain imposed a general tariff of 10% for manufactures and other goods, and increased the Empire's share of British imports by approximately 70% between 1930 and 1933 (De Bromhead et al. (2017). The British partially closed down Indian, African, and other imperial markets, into which some competitive Japanese textiles had expanded since the end of the 19th Century. Certainly the Manchurian invasion of 1931 preceded Ottawa, but this international context influenced Japanese expansionist commercial policy towards its empire during the 1930s nevertheless (See discussion in Appendix D).[6]

The Third Reich followed other practices emulating policies of trade in the shadow of power during this period, and Germany consolidated its imperial ambitions in

[5]Garfinkel, M. et al (2012). 'Trade in the Shadow of Power'; Eichengreen, B., & Irwin, D. A. (1995).

[6] See also Cain, P. J., & Hopkins, A. G. (1980); Gallagher, J., & Robinson, R. (1953).

the Balkans and Central Europe during the Nazi regime. Germany used political enforcement and commercial influence on their neighbours to guarantee those primary and mineral resources necessary for geostrategic military considerations (Milward (1981) and Ritschl (2001))**.** During the 1930s, German trade was facilitated by bilateral clearing agreements, mainly signed with countries in Central and Southeastern Europe, but also in South America. Under this new regime, German purchases were credited against purchases by foreigners in German markets.[7]

The case of Japanese imperial policy is peculiar not only because it predated World War I but also, most importantly, because it was developed by a relatively poor developing country and was restricted to a regional framework.[8] In addition to its formal colonies, Japanese economic agents built intense business and political networks with other countries in East and Southeast Asia. The motive behind this activity was largely commercial and was manifested in the subsequent military occupations, during the Second World War, of Thailand, Burma, French Indochina, Hong Kong, the Dutch East Indies, British Borneo and Sarawak, New Guinea, British Malaya (including Singapore), the Philippine Islands, and the Solomon, Gilbert, and Marshall Islands in the Pacific.

The literature on Japanese colonialism has mainly focused on colonial trade links with Japan after occupation, although Kublin (1959) and Duus (1998) also observed that the Japanese demonstrated their interest in Korean markets when they forced the opening of Korean ports and signed the unequal commercial treaties of 1876. After occupation in 1905, colonial trade policy was directed by Tokyo in order to ensure the safe supply of foodstuffs and raw materials to Japan and to guarantee a market for Japanese manufactures. This colonial policy was modified after the global rise of protectionism following the Great Depression. Japan pursued growth with an empire-wide economic strategy. The annexation of Manchuria in 1931 and the adoption of an import substitution strategy signalled the beginning of Japanese planned industrialisation within its colonies.[9] This strategy generated an important increase in the production of high-skilled manufactures, like steel for rail construction and machinery, that was directed mainly towards the Japanese domestic market, but was also exported to foster Korean

[7]Neal, L. (1979); Gross, S. (2016).

[8] Matsusaka, Y. T. (2007).

[9] Kohli, A. (1994).

industrialisation.[10]

Another mechanism granting Japanese exports access to its colonies was the fact that the Taiwanese and Korean economies were integrated with Japan by the removal of trade barriers and the introduction of fixed exchange rates.[11] Additionally, Japan invested in the transport and communication infrastructure and imposed the assimilation of the Japanese language, which further reduced transaction costs. Commercial exchange was further facilitated by private sector investment and the establishment of Japanese companies (in fact, almost every company in Korea was owned by Japanese) along with the opening of Japanese financial institutions like the Bank of Chosen.[12]

The above scenario is what happened in the best known Japanese colonies. However, the Japanese Empire also included two other territories, which provide relevant examples. The most relevant case was Manchuria, which became a Japanese puppet state in 1931, and was considered an additional Japanese colony. The Japanese had a presence in Manchuria prior to annexation, however, and this presence became more pronounced during the First World War. Japanese economic activity consisted mainly in the establishment of large companies (such as banks, similar to the Bank of Chosen), of raising FDI flows, and of increasing Japanese private investment in transport infrastructure (aided by Government subsidies). These activities permitted the Japanese to dodge most trade barriers and to reduce other transaction costs.[13] Eckstein et al. (1974) suggested that Japanese investment before 1930 fostered Manchurian industrialisation. After the Japanese annexation of Manchuria, a puppet state was created with the primary objective of influencing the direction and materials necessary for the rapid industrialisation of the region.

The second relevant case is that of the Kwantung Leased Territory, commonly presented as the most representative example of the ‘conquer by railway’ strategy. In 1906, after acquiring the territory during the Russo-Japanese War, the Japanese government founded the South Manchurian Railway company (SMR) to operate the railway network left by the Russians. By 1930 it had become the largest joint stock

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[10] Chenery, H. B., Shishido, S., & Watanabe, T. (1962).

[11] The Taiwanese and Korean currencies were pegged at the same value to the yen from 1895 to 1946 (Taiwan) and from 1910 to 1945 (Korea) , see Schuler, K. (2004).

[12] Aziz, M. A. (2012).

[13] Bix, H. (1972); Encarnation, D. J. (ed.) (1999).

company operating in the Japanese Empire. The company diversified into other activities apart from railway construction, but it remained a strong source of demand for Japanese goods like iron, machinery, and transport equipment used for mining, manufacturing, and railway construction.[14]

The example of Manchuria illustrates the singular nature of the Japanese imperial shadow of power: a process in which Japan established economic links with neighbouring territories as a demonstration of interest or announcement of future military occupation. We follow this historical case to justify the inclusion of a sample of countries and polities as part of Japan's informal empire before they were occupied during WWII ('future conquest'). It is worth distinguishing between those territories previously colonised by European powers and those that were not. In the former case, Japanese investment was severely restricted by Europeans, whereas in the latter, Japanese investment diversification permitted an expansion of commercial relations.

Manchuria was the country in which Japan had stronger economic penetration.. Japan's presence was characterised by the establishment of Japanese Zaibatsu (main industrial conglomerates) and banks that served to elude trade barriers and to reduce transaction costs.[15] In fact, the operation of Japanese economic interests was reflected not only in Japanese exports to China but also was related to Japanese military campaigns in its neighbouring country (which prefigured the origins of Japanese conflict with the USA and Great Britain).[16]

Furthermore, Japanese economic penetration took a different shape in those places where Japan could not implement huge investments, like British Malaya, the Dutch East Indies, or the Philippines. In these areas, Japanese activity was mainly characterised by aggressive marketing strategies that were possible due to precise knowledge of the cultural and geographic characteristics of these regional markets.[17] Moreover, Japan fostered efficient distribution channels for allocating Japanese products, taking advantage

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[14]Iyenaga, T. (1912).

[15] Howe, C. (1999); Osterhammel, J. (1986).

[16] He (2007) mentions the complicity between Zaibatsu and the military power. Howe (1999), however, denies full agreement between both parties by pointing out that although Japanese businessmen asked for diplomatic sanctions against China in response to the Chinese boycott of Japanese goods, the Japanese military aim of transforming China into a population outlet during the 1930s was at odds with the Japanese business community in China, which only looked for political stability and business opportunities.

[17] Post, P. & Lindblad, J. T. (1996).

of good commercial relationships with local merchants. A final characteristic of Japan's economic links with Southeast Asia took the form of massive Japanese immigration to territories like the Philippines, with Japanese expatriates working in the trading sector, with the majority of these expatriates demanding Japanese goods.[18]

The historiography suggests that Japanese geostrategic and economic interests initially contemplated a form of economic penetration by exports and investments in territories where its economic interests would be later unequivocally confirmed by annexation during World War II. Our paper contributes to the literature on trade in the shadow of power by highlighting Japan's singularities and by providing an empirical demonstration of the success of the mechanisms linking the Japanese Empire with regional exports in East and Southeast Asia.

3. Empire and the Determinants of Japanese Exports

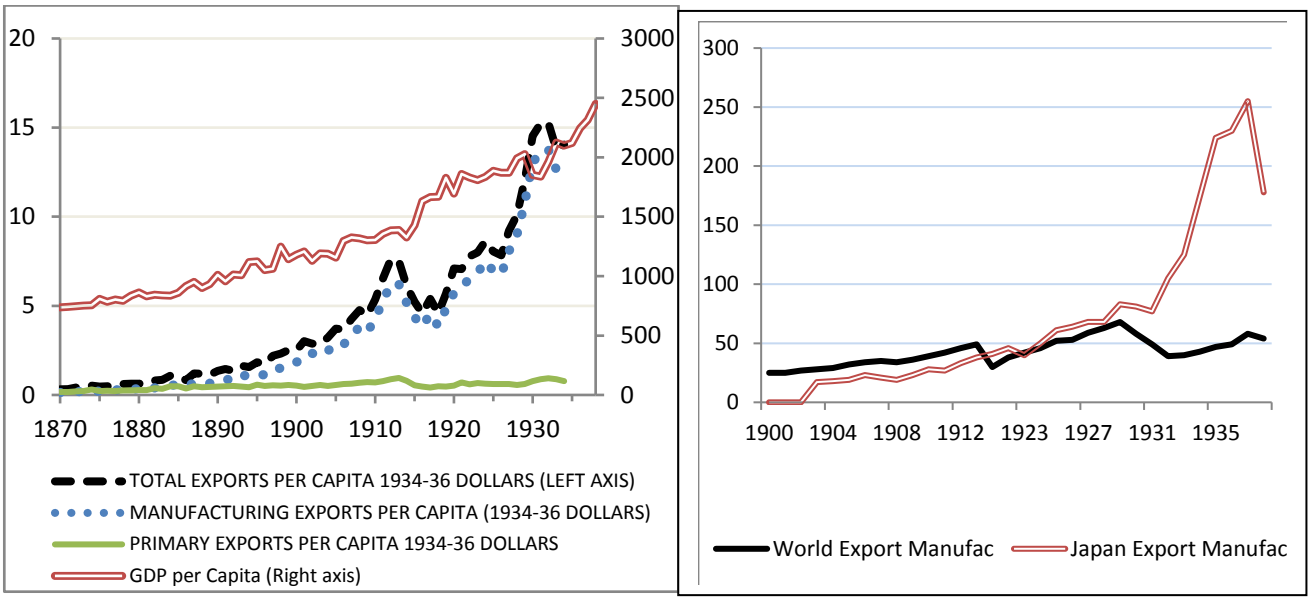
The late-19th and early-20th centuries represented a continuation of the period of industrialisation in Japan, which began in the 1850s after the forced opening of the ports by Western powers. This process permitted an important expansion of Japanese GDP per capita, as is observed in Figure 1. The expansion of exports was an important component of this remarkable economic growth, as manufacturing exports were one of the main drivers of such good comparative performance.[19] The dynamic behaviour of manufacturing exports contrasts with that of primary products, which remained almost stagnant in per capita terms for 60 years. From the end of the nineteenth century, textiles and other manufactures were the main commodities exported (see Howe (1999) and Sugiyama (2013)).[20] This process accelerated in the 1930s, with an expansion of manufacturing exports outstanding in relation to world export. This expansion of exports consolidated industrial modernization and the historical change of comparative advantage away from primary exports.

[18] Shiraishi, T. (1993); Fisher, C. (1950); and Koh Soo Jin, D., & Tanaka, K. (1984**).**

[19] See Meissner & Tang (2017).

[20] Taking into account that raw silk is sold in bulk, whereas silk manufactures are sold individually, and that most transformations needed to produce raw silk are hand-made, we include raw silk as a primary product in Figure 1, following Sugiyama (2013), Francks (2015), Smitka (1998), and Souza (2004).

Figure 1: Japanese Exports (1934-36 $) and GDP per Capita (1913 $) and Japanese and World Manufacturing Export Performance (1953=100)



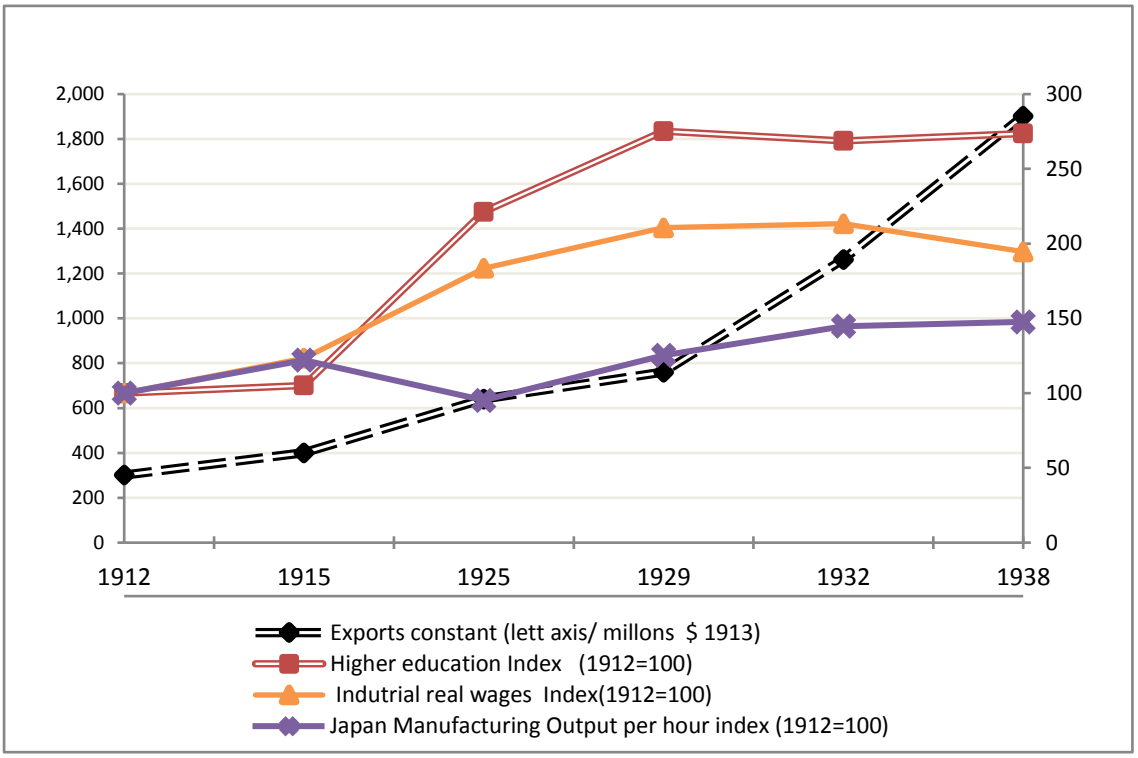
Source: *Constant exports come from Ohkawa et al. (1967-1989) Long Term Economic Statistics of Japan (LTES) and GDP per Capita in 1990 Int. dollars from Bolt, J. and van Zanden, J. L. (2014). Export shares come from Annual Returns of the Foreign Trade of the Empire of Japan and Japan and World comparative manufacture exports in volume (1953=100) from UN Historical Trade Statistics.*

Japanese industrialisation apparently generated increases in productivity that were behind the observed rise in manufacturing exports. As mentioned in the previous section, however, during the interwar years, Japan expanded imperial networks with its colonies in order to develop a market for domestic industrial exports. In that sense, we will offer some preliminary evidence to clarify whether increases in productivity or imperial mechanisms exerted a stronger influence on the expansion of manufacturing exports.

3.1 Productivity or Empire, Which was More Relevant?

The first thing to be highlighted is that, as expected, Japanese overall productivity increased importantly after WWI. Figure 2 shows that this hypothesis holds true regardless of whether one proxies productivity by tertiary education, real wages, or manufacturing output per hour worked. Nevertheless, the data also shows that Japanese productivity stagnated during the period 1932-38, which is the period in which exports experienced their greatest boom.

Figure 2: The Evolution of Japanese Productivity and Exports (1912-1938)



Note: *Exports refer to current exports in yen divided by the corresponding exports price index (base 1913). The higher education ratio is the percent of tertiary education students over total population. Industrial real wages refer to wages in manufacturing. Manufacturing output per hour refers to output in constant 1929 dollars divided by hours worked in manufacturing.*
Source: *Exports and Manufacturing output per hour come from data set, see Section 4. Education levels are from Mitchell (2003). Finally industrial wages come from Ohkawa et al. (1967-1989).*

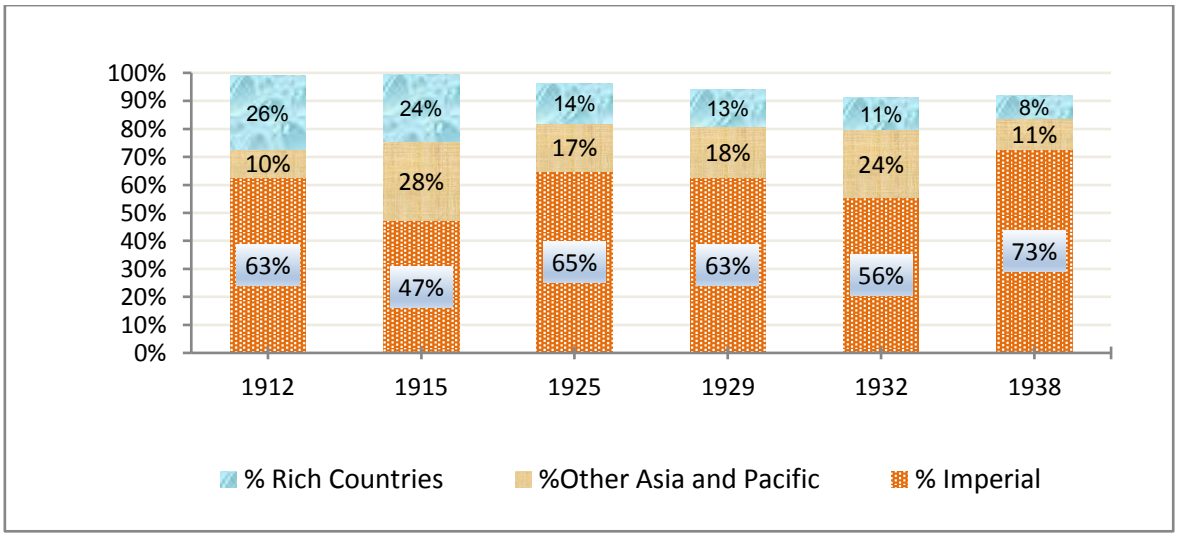
The 1930s stagnation of manufacturing productivity in comparative terms also is highlighted by Broadberry et al. (2015), who showed a process of Japan's catching up with the UK in terms of manufacturing productivity between the 1890s and 1920s and that this process relented during the 1930s and 1940s**.** This means that increases in productivity would better explain the expansion of exports before 1929 than after, when other factors would have a higher incidence of helping to understand export performance.[21]

On the other hand, Figure 3 shows that during the period of the faster growth of Japanese manufacturing exports, the main destinations of these exports were within the Japanese sphere of influence. More than 50% of exports after WWI went to territories within this sphere. (Here we include both colonies that received the majority of

[21] There is a remote possibility that past increases in productivity are related with future increments of exports. Nevertheless, our regressions deny this possibility by including a lag of productivity as a likely determinant of current exports, and past increases in productivity were not significant in any specification.

manufacturing exports and territories in Southeast Asia occupied during WWII.) Further, these territories' share of Japanese exports rose faster than for destinations outside of Japan's sphere of influence during the 1930s, reaching 73% of the total in 1938.

Figure 3: Japanese Manufacturing Exports by Region (1912-1938) (%)



Note: *The remaining share of 100% corresponds to poor countries outside Asia.*
Source: *Annual Return of Trade for the Empire of Japan (various years).*

Certainly, the international context in the interwar years had changed drastically, especially after the Great Depression, and domestic and regional market expansion was conditioned by Europe's and the United States' significant increase in manufacturing trade barriers and the development of trade blocs. What happened in the Indian market, where Japan had increased its share of textile exports in competition with Britain, is a clear example of the trade diversion forced by these policies. Japan was forced to retreat from those territories after the Commonwealth's trade bloc policy, adopted after the 1932 Ottawa conference, raised tariffs (for an extended discussion of this point, see Appendix D).

Japan's remarkable success in manufacturing exports during 1932-38 is not comparable to any other country's experience during the period (see Figure 1). Evidence of improvements in productivity does not explain such success. We think this success is principally determined by the reinforced bias of manufactures towards countries under Japanese imperial influence. This evidence may indicate that the effect of colonial mechanisms and other regional commercial influences with the future occupied territories previously mentioned were more relevant than productivity increases. The next section analyses how those mechanisms worked and what kind of exports they facilitated.

3.2 Did Empire Facilitate New Exports or Reinforce Pre-Existing Comparative Advantage?

The first thing we must disentangle is the pattern of Japanese comparative advantage. For that purpose, Table 1, based on Howe (1999), shows that among industrial products, Japanese exporters enjoyed a strong comparative advantage in textiles and clothing, which were low-skilled in nature.

Table 1: Revealed Comparative Advantage by Country in Three Main Commodities

TEXTILES/CLOTHING	1899	1913	1929	1937
BRITAIN	1.27	1.42	1.48	1.56
U.S.A	0.21	0.23	0.27	0.21
FRANCE	1.05	1.25	1.38	1.14
GERMANY	0.74	0.55	0.58	0.49
JAPAN	1.67	1.79	2.45	2.7
MACHINERY/ELECTRICAL EQUIPMENT				
BRITAIN	1.19	0.93	0.8	0.93
U.S.A	2.32	1.85	1.72	1.65
FRANCE	0.39	0.34	0.46	0.43
GERMANY	0.86	1.28	1.31	1.29
JAPAN	0	0.04	0.15	0.34
MACHINERY/ TRANSPORT EQUIPMENT				
BRITAIN	1.68	1.19	0.92	0.96
U.S.A	1.17	1.37	2.07	2.2
FRANCE	0.47	1.25	0.68	0.72
GERMANY	0.49	0.7	0.4	0.75
JAPAN	0	0.13	0.13	0.39

***Note**: Revealed comparative advantage is defined as a country's share in world exports of a particular manufactured commodity, divided by its share in the respective world manufacturing exports.*
***Source**: Howe (1999).*

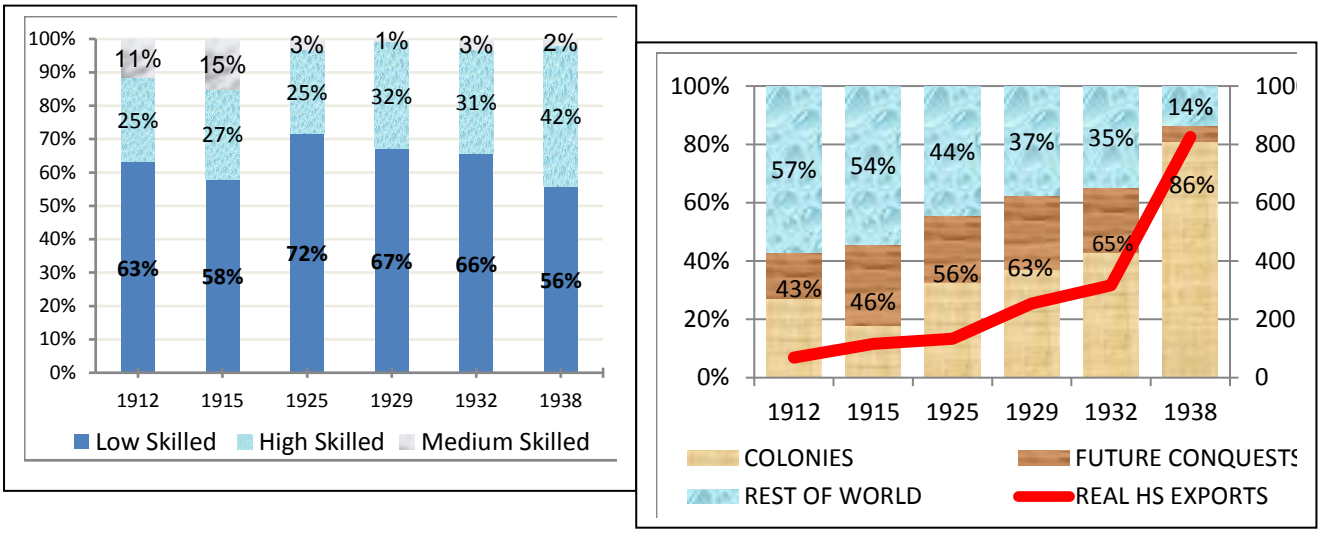
Japan's comparative advantage in textiles was a relevant part of the Japanese drive to increase manufacturing exports before the Second World War. Textiles are included in our low-skill sector (which we divide between high-end and low-end, see Appendix C)). Most of the textiles exported were low-end, representing a stable share around 70% throughout the interwar years. Before the First World War, textiles were mainly exported

to formal and informal Japanese regions of influence—mostly from Hong Kong, China, and Korea (see Meissner and Tang (2018)). But they spread to other destinations outside the Japanese sphere of influence during the 1920s, such as India. A change in the destinations of textile exports occurred after the Ottawa agreement of 1932, when textile exports directed to India, were again reallocated to Japanese colonies (more evidence on this point is developed in Appendix D).

This pattern is also reflected in the composition of Japanese exports during the interwar years, which was mainly focused on low-skilled manufactures, as shown in Figure 4. The figure also highlights that high-skilled exports, which did not enjoy comparative advantage, led export expansion during the period 1932-38. This fact suggests that such expansion was possible largely because these goods were directed to countries inside the Japanese sphere of influence.

Figure 4: Japanese Total Manufacturing Exports by Skills and Region.

a) Manufacturing Exports by Skills **b) Real High-Skill Exports by**



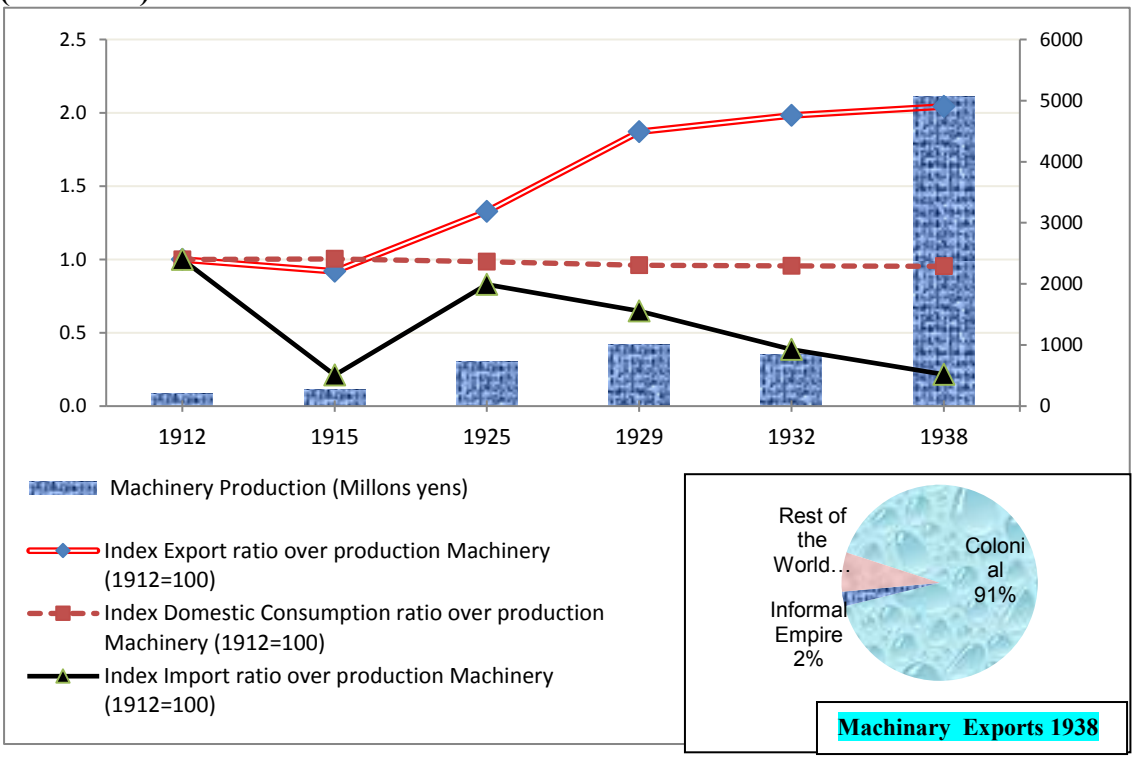
Source: *See data set, Section 4, and Annual Returns of the Foreign Trade of the Empire of Japan.*

Next, it is pertinent to provide specific examples of how imperial mechanisms fostered Japanese high-skilled exports within East and Southeast Asia.[22] Regarding

[22]Our data shows that Japanese colonies received a remarkable proportion of infrastructure and military related high-skilled exports (iron and steel for railways, cement for railroads, weapons and munitions). Those goods were mainly demanded by Japanese military colonisers. We also see, however, the rising relevance of machinery and other industrial exports devoted to the economic development of the colonies, which was demanded by Japanese businessmen established there. Some authors like Kohli, A. (1994) relate those exports to Korean future development.

Japanese colonies, it has been previously mentioned that colonial economies were strategically directed from Tokyo, and that a rapid industrialisation plan was launched in Korea and Manchuria during the 1930s. Figure 5 shows how this plan facilitated the expansion of Japanese high-skilled exports. After 1925, Japan reduced its machinery imports and began a massive increase of local machinery production, which was completed by 1938. At the same time, the percentage of exported machines over total production exploded after 1925, suggesting that this import substitution strategy was complemented by the necessary extension of exportation of machinery to other territories in order to consolidate the Japanese industrialisation process. In that sense, the right hand portion of Figure 5 shows that those new markets were located in Japanese colonies, which received 80% of total machinery exports in 1938. So, apparently, the industrialisation of the colonies was based on Japanese machinery exports, opening new markets for Japanese producers.

Figure 5: Index of Machinery Exports, Imports, and Domestic Production (1912=100)

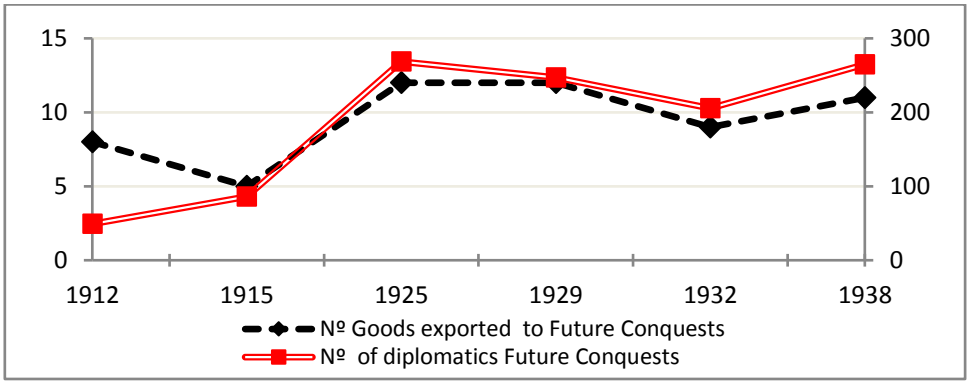


Note: *Indexes measure the evolution of the shares of exported, imported, and consumed machinery over total Japanese production from 1912.*
Source: *Ohkawa et al. (1967-1989) and Annual Returns of the Foreign Trade of the Empire of Japan.*

Furthermore, it is also crucial to understand how economic connections with other

strategic territories in Southeast Asia could facilitate Japanese exports. It is believed that those mechanisms explained in Section 2 helped to reduce information costs and uncertainty. The reduction of information costs permitted a rise in exports, especially of new products (at every skill-level), which, due to their novelty, are the ones suffering larger information-related impediments to trade (see Martinicus et al. (2010)). In that sense, the number of Japanese diplomats operating abroad is a suitable proxy for measuring transnational commercial and investment networks and cultural diplomacy. Figure 6 shows that after WWI the number of diplomats abroad and the number of new products exported by Japan to countries within the future conquests followed the same tendency. This fact suggests that Japanese interests in Southeast Asia worked mainly to facilitate the introduction of newly developed Japanese products in those countries.[23]

Figure 6: Number of Japanese Diplomats and Products Exported Towards Japanese Future Conquests (1912-1938).



Source: *The number of Japan's Diplomats abroad comes from Almanach de Gotha (various years, see Section 4.2, Appendix A) and the number of goods exported from Annual Returns of Trade of the Empire of Japan (various years).*

Previous evidence on Japanese export determinants seems to demonstrate that, although improvements in productivity might be behind Japanese export performance before the Great Depression, they do not explain most of the great increase in industrial exports during the 1930s. This increase was strongly biased towards Japanese colonies and was also directed towards territories occupied in the future, suggesting a greater influence on export expansion by imperial mechanisms. Furthermore, the provisional evidence shows that colonial mechanisms accelerated exports of high-skilled goods, for which Japan did not have a comparative advantage. Additionally, links with future

[23] Either the number of Japan's diplomats abroad or the foreign diplomats in Japan is offered in Table 3 and Table 4 in Section 4.2, Appendix A.

dominions, which consisted mainly of migration, investment, and the creation of transnational networks through cultural diplomacy in order to increase commercial influence in Southeast Asia, permitted the introduction of new products. After presenting our new data set in the next section, we will provide empirical confirmation of the imperial power hypothesis using granular data on bilateral exports with a marginal gravitational model.

4. The New Data Set

4.1 Trade Data.

As mentioned in the introduction, one of the principal contributions of this paper is the construction of a granular data set that provides a high-resolution image of the value of Japanese exports for each year and the geographical destination of exports by product at the same level of disaggregation as official Japanese trade statistics. We digitised information found in different volumes (1912, 1915, 1925, 1929, 1932, and 1938) of the *Annual Return of the Foreign Trade of the Empire of Japan.* Official statistics collected and published annually by the Japanese Bureau of Customs appear disaggregated at product level and show quantities and values exported from Japan by destination.[24] According to our data set, Japan moved from exporting 512 different products to 37 different countries in 1912, to exporting 1135 goods to 117 countries in 1938. On one hand, the increase in the number of countries is related with more precise records of destination, but also with a greater geographical diversification of Japanese exports over the period. On the other hand, we suspect that the increase in the number of goods exported might be related neither with real changes in the diversification of Japanese industrial capacity, nor with changes in market characteristics, but simply with a change in the classification rules employed in the official statistics. (For an extended discussion of this point related with the extensive margins of trade specification, see Online Appendix B.)

The main drawback of the *Annual Return* as a source is that it does not include

[24] We discuss the accuracy of the Japan trade statistics in Section 1, Appendix A. Although, we assume Japan used quite accurate declared values for exports, we assume some inaccuracy on country real destination records for goods moving through Hong Kong and Singapore. Nevertheless, we have evidence that the Hong Kong share of total China imports declined from around 40% at the turn of the century to less than 20% in the 1920s, and less than 5% in the 1930s. This implies that inaccuracy of Japan's direction of trade records due to transit is more limited for the interwar years than for previous periods (see Figure 5 in Keller et al. (2011)).

data on Japanese exports towards its main colonies, Korea and Taiwan. (Although, thankfully, they account for exports towards the Kwantung Leased Territory and Manchuria, both before and after being occupied by Japan.) In order to solve this relevant inaccuracy in the statistical records, and believing that the study of Japanese export patterns towards its colonies is vital for our research interests, we used the information on Japanese exports to Taiwan from the *Returns of the Trade of Taiwan for Forty Years* (1896-1935) and the annual *Return of Trade of Taiwan* (*Formosa*) (1936-1942), both published by the Department of Finance of the Government of Taiwan. These returns include Taiwanese imports from Japan (or, equivalently, Japanese exports to Taiwan) at product level.[25] For the case of Korea, the *Annual Returns of the Foreign Trade of the Empire of Japan* in their volumes from 1914-1920 include an appendix with data on Japanese exports to Korea at the product level. For the rest of the period, Japanese exports to Korea have been estimated by the Japanese Long Term Economic Statistics (LTES) database. [26]

The data set that we constructed includes the value of Japanese exports (in current *yen*) of each product exported to every country. Each different product exported has been categorised using the Standard International Trade Classification (SITC) Revision 2 to a 5 digit-level disaggregation to achieve a proper and precise product classification. This categorisation also permits us to distinguish new export products from those exports that are simply different varieties of the same product.[27] The different goods have also been divided according to skill-intensity using Board of Trade (1905), following Tena-Junguito

[25] The level of disaggregation included in this data set is lower than that of the main statistics after 1915, so it would underestimate Taiwan's extensive margins of trade. We have assumed that the number of products exported to Taiwan after 1915 follows the same rate of increase as that of the Kwangtang Leased Territory—the only Japanese colony for which there is full information throughout the period available in the Annual Returns of Trade of the Empire of Japan. The Kwangtang Leased Territory was the colony that received the greatest number of Japanese goods, which is why it could be considered an upper-bound for calculating the evolution of the extensive margin to Taiwan. See an extended discussion in Section 1.2, Appendix A.

[26] For 1912 and 1915, there is full disaggregation of exports at the product level. For the period 1925-1938, LTES includes data on Japanese exports to Korea in five different sectors that match our skill distribution. Thus, the number of goods at every skill-level exported by Japan will be equal to the corresponding 1915 figure assumed to evolve along the same path as that of Kwantung, which shared a similar economic structure to Korea. See discussion in Section 1.2, Appendix A.

[27] For that purpose, products sharing the same 3-digit classification will compose a single product category or sector. In Appendix B, we offer an extended discussion on the number of products recorded in the statistical records and the methodology followed in the construction of sectors used to capture the Extensive Margins of Trade.

(2010). Skill-intensity is constructed based on wages earned by workers in each sector and permits us to differentiate between high-skilled (Skill-intensity higher than 10), medium-skilled (between 9 and 10), low-skilled manufactures (between 5 and 9), and primary products (less than 5 skill-intensity).[28]

4.2 GDP and Productivity

Information on GDP and GDP per capita is taken from the latest version of the Maddison Project and refers to GDP in 1990 GK dollars or real GDP (see Bolt and van Zanden (2014)). For missing countries we took data on real GDP for 1950 and translated it to the interwar years by assuming the same evolution as constant exports found at Federico and Tena-Junguito (2018, 2019).

In addition, we estimated GDP levels and other statistics for Japanese colonies of Kwantung Leased Territory and Manchukuo (Manchuria). Population data has been obtained from Kang (1981), and the corresponding GDP is calculated as the proportion of Japanese GDP equal to the percentage each population represents over the Japanese total (the exercise for Manchuria is the same except China is used as the reference because it was part of China until 1932). We considered Kwantung's GDP to follow the same rate of growth as Japan's (because it was a Japanese colony), whereas we considered Manchuria's GDP to follow the same tendency as China's until 1932. Afterwards, we assumed Manchuria's GDP to grow at the same rate as Manchurian exports taken from Federico & Tena (2018). [29]

GDP information is complemented by data on total hours worked, found in Huberman and Mins (2007) and Maddison (2007 and 1995), to construct non-agrarian GDP per hour worked as a measure of productivity for 27 partner countries, which represent 92% of Japanese exports. The real wages index for capturing productivity evolution for 30 partner countries comes from Williamson (1995), while population density has been obtained from League of Nations data. Price indexes for deflating GDP measures are from Mitchell (2003).[30]

Finally, one key part of this analysis is the study of Japanese productivity and the

[28] In Appendix C, we offer an extended discussion of the general division of total exports by skill-intensity.

[29] For the estimation of Japanese colonies and other East Asian territories, see Section 2, Appendix C.

[30] See Appendix A for an extended discussion on GDP per hour worked differentials (Section 3.1) and on real wages and productivity differentials by country and sector (Section 3.2).

study's determination of exports by skill-level. In order to disentangle this relationship, we employed data on Japanese manufacturing output in different sectors and the respective employment per sector. We used data derived from total hours according to the Long Term Economic Statistics of Japan (LTES) database from Hitotsubashi University to approximate hours worked at every sector.

4.3 Trade Costs

Distance between countries is the most common variable to measure transport costs in the literature on gravity, but this variable is time and product invariant. This paper makes an effort to overcome the implications of this limited assumption on the measure of transport cost. So we use a data set of estimated freight factors (cost of transport per ton/product price per ton) between Japan and each partner country, for every single product exported by Japan for each of our corresponding benchmark years. In our strategy geographical distance between Japanese partners is combined with different freight rates, routes, and differences in freight factors by composition of products.[31]

The information on the number of Japanese diplomats operating in each different country has been obtained from the *Almanach de Gotha* (various years), which includes a section with the names and country of origin of every diplomat operating in every country. We have meticulously counted the number of Japanese diplomats that worked in each country. Additional variables representing trade costs are average levels of tariff protection, which come from Blattman et al. (2003), and exchange rate control, obtained from various sources, including Bethell (1994), Eichengreen (1996), Meisel (1990), and Reinhart and Rogoff (2002).[32] Finally, bilateral nominal exchange rates with the Japanese yen, determined as being the quantity of foreign currency per one yen, are found in Federico and Tena (2018). In addition, we have used Federico and Tena-Junguito's (2018, 2019) data set on nominal imports to capture the differences introduced by the protectionist backlash between domestic and international demand, especially in the 1930s.

[31] The alternative use of the conventional great-circle distance in our equations offers weak results similar to the use of freight cost by products and regions. Apparently, this happens because freight factors of manufactures are low. Additionally, international freight rates during the interwar years were volatile but stagnant. See an extended discussion in Appendix E.

[32] Tariffs between Japan and its colonies are assumed to be zero.

5. The Gravity Model

The traditional gravity model assumes that trade flows travel between two countries attracted by two main forces. Countries' economic size attracts trade flows, whereas distance between countries discourages flows. The most basic form of the Gravity model takes the following specification according to Burger et al. (2009):

$$E_{it} = K \frac{{M_{it}}^{\beta_1}}{{D_{it}}^{\beta_2}} \qquad \text{EQ (1)}$$

It is important to mention that sub-indexes "*it*" indicate that we used panel data to estimate our equations. M_{it} represents the economic size of country *i* in period *t*, while D_{it} is equal to the distance to country *i* in period *t*. After taking logarithms on both sides, the model can be estimated by OLS following Eichengreen & Irwin (1998). The equation would take the following form in which the log of *K* is a constant that can be substituted by more conventional β_0:

$$lnExp_{it} = lnK + \beta_1 M_{it} - \beta_2 D_{it} + \varepsilon_{it} \qquad \text{EQ (2)}$$

Nevertheless, Santos Silva and Tenreyro (2006) argue that OLS is not a desirable method of estimation for gravity models because there are many periods and many countries to which exports are zero, so taking logarithms of the dependent variable would not account for those zeros, causing the researcher to lose much valuable information. They suggest employing Poisson Pseudo-Maximum Likelihood (PPML), an estimation method that has recently become popular. Thanks to this model there is no need to take logarithms of Japanese exports, thus keeping all information contained with regard to those zeros. Furthermore, Gómez-Herrera (2013) mentions that PPML provides unbiased estimates in cases of heteroscedasticity. The independent variables (with the exceptions of dummies) are nevertheless logged for the sake of simplicity in their coefficients' interpretations because this practice would permit us to interpret them as slopes.

This model, of course can be augmented by controlling for more variables, which is a common practice in the literature. Two groups of variables are included, first, those variables associated with comparative advantage, CA_{it} (related either with productivity, relative wages, factor endowments, or similar demand structure), and second, those variables associated with trade or transaction costs (transport cost, tariffs, exchange rates, and empire connexions). The included Empire dummies would be part of the latter group, but differentiated as potential reductions in transaction cost promoting trade.

In the comparative advantage group, first, we used relative productivity measures, such as the Japanese GDP per hour worked relative to partner countries.[33] Second, we used a variable measuring relative real wage trends as ratio, so that a rise of the variable reflects increases in Japanese wages relative to a trading partner. Next, a third type of variable refers to differences in demand structure (proxied by GDP per capita differentials) and captures whether Japanese exports responded to the pattern determined by Linder (1961), in which trade between countries would be more intensive the more similar their demand structures. This hypothesis has been successfully tested by Restrepo and Tena (2016) for Latin America and by Meisner and Tang (2017) for Japan.[34] Finally, we checked whether Japanese trade followed a Hecksher-Ohlin pattern in which exports are intensified when differences in factor endowments (population density in this case) are high, as explained by Ohlin (1952), among others.

On the trade cost group, we include a variable called TC_{it} that is intended to measure the effects of trade costs like average freight factors, average levels of protection in partner countries, exchange rates with the Japanese yen, imposition of exchange controls, or the number of Japanese diplomats abroad. Following our previous discussion on the relevance of Empire, we add other transaction cost variables which are the key ones in our analysis including: $COLONY_{it}$ (a dummy taking the value 1 if a country is a Japanese colony) that captures all those mechanisms by which Japanese imperial aims fostered exports, and $FUTURE\ CONQUESTS_{it}$ that determines whether Japanese exports were already biased towards countries occupied during WWII.

Finally, two additional variables are intended to capture the difference between international and domestic demand occasioned by trade distortions and other path dependence fundamentals. The first variable controls for Japanese partners' imports and is especially devoted to capturing the trade blocs and other trade diversion protectionist measures that affected bilateral international demand above domestic GDP variations.

[33] The variable refers to GDP per hour worked excluding agriculture productivity. Additionally, for sector-level analysis, we include Japanese product per hour on high- and low-skill manufactures found in LTES. Then it is compared with the partner's overall productivity following the same methodology as for real wages. For further discussion regarding this variable, see Section 3, Appendix A.

[34] The log of the absolute differences in GDP per capita between Japan and the corresponding partner proxies for differences in demand structure. We have also tried to measure differential in demand structure as the product of the bilateral income share (Yi)/(Yi+Yj)* (Yj)/(Yi+Yj), obtaining similar results because taking logs reduces the differences between relative and absolute figures. Finally, several authors suggest the use of differences in the degree of urbanisation or industrialisation as a proxy, these measures are very controversial as representative of differential in demand structure, however, and in our case, it is very difficult to collect representative data.

This variable would be especially relevant during the 1930s. The second one β_t represents time dummies that permit us to control changes that are related with the passage of time (like inflation or the First World War international disintegration) and ε_{it} are standard errors clustered by country partner. Equation 3 is the one that we are going to estimate.

$$Exp_{it} = \beta_0 + \beta_1 lnGDP_{it} + \beta_2 CA_{it} + \beta_3 TC_{it} + \beta_4 COLONY_{it} + \beta_5 FUTURE\ CONQUESTS_{it} + \beta_6 IMPORTS_{it} + \beta_t + \varepsilon_{it} \quad \text{EQ (3)}$$

Another novelty of this article lies in the employment of a margins of trade framework that allows us to determine by which channels the different independent variables affected Japanese exports. In that sense, margins have been constructed in a similar fashion as Meissner and Tang (2018), in which the extensive margin represents the number of active sectors in which an exporter, Japan in this case, is exporting to each country (*i*) and during each period (*t*). In our case, sectors are defined according to the 3-digit level of the SITC Revision 2 description, in the sense that all products sharing the first three digits will be collected within the same sector so we avoid accounting for different varieties of existing products as though they were new goods (for an extended discussion of this issue see Appendix B).[35] By this methodology we observed that Japan moved from exporting in 117 sectors to exporting in 164. The intensive margin, on the other hand, represents the average nominal exports per sector exported to each country in every period.[36] Structural changes are usually related to an expansion in the extensive margin, that is the number of different sectors exported. In this sense, Equation 4 displays the extensive margins by employing the number of active sectors exported as the dependent variable and Equation 5 uses exports per sector to country *i* in period *t* for presenting intensive margins.

$$Nº SECTOR_{it} = \beta_0 + \beta_1 lnGDP_{it} + \beta_2 CA_{it} + \beta_3 TC_{it} + \beta_4 COLONY_{it} +$$

[35] We also employed a method similar to Huberman and Meisner (2017) in which the extensive margin represents each single good exported by Japan. Results hold very similar. This method has been disregarded, however, because it might bias our results as this method might show different varieties of existing products as new products. See Appendix B.

[36] IM= $\frac{Nominal\ exports_{it}}{Number\ of\ Sectors_{it}}$

$\beta_5 FUTURE\ CONQUESTS_{it} + \beta_6 IMPORTS_{it} + \beta_t + \varepsilon_{it}$

EQ(4)

$$ExpSECTOR_{it} = \beta_0 + \beta_1 lnGDP_{it} + \beta_2 CA_{it} + \beta_3 TC_{it} + \beta_4 COLONY_{it} + \beta_5 FUTURE\ CONQUESTS_{it} + \beta_6 IMPORTS_{it} + \beta_t + \varepsilon_{it} \quad \text{EQ(5)}$$

Finally, the model might experience some modifications because the dependent variable could also be changed in order to determine how the variables of interest affected Japanese exports by different skills products (high- and low-skills manufactures and primary products) or what were the main determinants of exports to a specific region.

6. Results

6.1 Presentation of Results

The descriptive statistics presented in Section 3 showed that Japanese exports increased significantly between 1912 and 1938, especially during the 1930s. These data suggested also that, although Japanese improvements in productivity contributed to the expansion of exports (either by different product varieties or more diverse destinations), especially prior to 1929, they were not the main determinant of the structural change in Japanese industrial exports. Evidence presented in previous sections suggested also that among industrial exporters, Japan persisted with a comparative advantage in low-skilled manufactures, such as textiles, although high-skilled exports increased substantially during the 1930s. That evidence leads to our main hypothesis, developed in Section 3, that imperial mechanisms, not productivity, were the main drivers that facilitated high-skilled manufacturing exports, and links with future conquests fostered the introduction of new Japanese products in the region.

This section will test the resilience of that hypothesis using a gravity model strategy that takes advantage of the granular data that disentangles Japan's trade margins. First of all, we examine which factors determined Japan's total exports during the whole period. Independent variables (with the exception of dummies) are expressed in logs to interpret them as elasticities.

Table 2 shows how the measures employed for approximating Japanese relative

productivity are significant when we do not control for Japanese colonies. However, upon the inclusion of the colony dummy and other potential links with future conquests in Southeast Asia, both productivity measures cease to be significant. This would reinforce the *trade in the shadow of power* hypothesis that Japanese imperial connections might compensate for lower productivity in facilitating overall exports. In that sense, the bias of Japanese exports towards its colonies has the expected reaction. Furthermore, it is also appreciable that Japan already had established certain economic relations that facilitated exports towards those territories, which Japan subsequently occupied during WWII.[37]

According to the literature, another variable that may capture Japanese economic interests in a territory before annexation is the number of diplomats in that territory, which in this case is positive and significant, although its influence on Japanese exports vanishes when we account for informal imperial links. This would suggest, as mentioned in Section 2, that the number of diplomats abroad and Japanese informal empire links worked through the same mechanisms.[38] Regarding the Japanese specialisation pattern, we can appreciate how Japan tended to export more towards countries presenting greater differences in demand structure (GDP per capita) and in population density (factor endowments). This fact contradicts the Linder hypothesis for interwar Japan and places its exports pattern closer to a Hecksher-Ohlin model. Assuming that Japan's GDP per capita was converging with rich countries and diverging with poor ones, this could indicate that Japan specialised in exporting towards poorer countries. Finally, it is also remarkable how among all the possible trade costs undermining Japanese exports, the only significant ones are tariffs set by foreign countries and the relative appreciation of the yen.

[37] Larch et al. (2017) shows that the interpretation of dummy coefficients like Colony or Informal Empire is the following: $e^{2.612} - 1 = 1263\%$ higher exports for colonies in comparison with non-colonial territories and $e^{0.842} - 1 = 132\%$ for future occupied territories.

[38] Table 11 in Appendix E shows that diplomats are still significant when only colonies are employed as a control. The number of diplomats ceases to be a significant variable only when we account for informal empire.

Table 2: Japanese Total Export Determinants

	VARIABLES	**No Empire**	**Empire**	EXPECTED SIGN
Gravity →	GDP	1.435***	1.328***	+
		(0.398)	(0.428)	
Comp. Advantage	RELPRODUCTIVITY	0.444*	0.432	+
		(0.267)	(0.389)	
	RELWAGES	0.990***	0.412	+
		(0.347)	(0.398)	
	POPDENSITYDIFF	0.587***	0.532***	+
		(0.213)	(0.178)	
	GDPCAPABSDIFF	1.220**	1.505***	+
		(0.502)	(0.462)	
Trade Costs	FREIGHTS	-0.175	0.00824	-
		(0.227)	(0.219)	
	EXCHCONTROL	0.583	-1.128	-
		(0.593)	(0.816)	
	EXCHRATE	-0.525***	-0.457***	-
		(0.113)	(0.122)	
	TARIFF	-0.992***	-0.329*	-
		(0.121)	(0.169)	
Trade diversion →	IMPORTS	0.102**	0.167	+
		(0.0508)	(0.151)	
Empire	COLONY		2.612***	+
			(0.762)	
	FUTURE CONQUESTS		0.842**	+
			(0.332)	
	DIPLOMATS	0.185**	0.104	+
		(0.0788)	(0.0932)	
	Constant	-5.362	-7.741*	
		(5.375)	(4.574)	
	Observations	674	674	
	R-squared	0.651	0.640	

Note: *Standard errors clustered by country. Time dummies included in the regression but excluded from results display.* *** *p<0.01, ** p<0.05, *p<0.1*

Once it becomes clear that imperial connections were more relevant than productivity improvements on the determination of the direction of Japanese exports, it is important to see which kinds of exports were affected by those mechanisms. Table 3 confirms our previous insights that Japanese comparative advantage determinants especially affected low-skilled exports because relative productivity and real wage increase had a bigger effect on these kinds of goods, suggesting that, according to market

forces, Japan was competitive producing low-skilled manufactures.

On the other hand, colonial and other political mechanisms played a large, positive role in every export category. Furthermore, the results in Table 3 show that being a Japanese colony was by far the main factor attracting high-skilled exports (its effect being much greater than that of productivity), suggesting that colonies became new markets for those Second Industrial Revolution goods in which Japan did not possess a comparative advantage. This market for high-skill goods was possible due to the mechanisms previously explained. Contrary to total exports, the 'future conquest' regions are more relevant to explain export growth on low-skill intensity exports. This would mean that informal power mechanisms established in Southeast Asia before the Second World War apparently reinforced Japanese comparative advantage within the region. [39]

Table 3: Japanese Export Determinants by Skill Level

	(1)	(2)
VARIABLES	High Skills	Low Skills
GDP	0.373	0.714***
	(0.311)	(0.212)
REL PRODUCTIVITY HS	0.939***	
	(0.336)	
REL PRODUCTIVITY LS		1.083***
		(0.182)
RELWAGES HS	0.0432	
	(0.321)	
RELWAGES LS		0.618**
		(0.303)
POPDENSITYDIFF	0.502**	0.586***
	(0.202)	(0.123)
GDPCAPABSDIFF	1.737***	0.383
	(0.565)	(0.433)
FFHIGHSKILL	-0.229	
	(0.224)	
FFLOWSKILL		-0.259
		(0.164)
EXCHCONTROL	-1.094	-0.605
	(0.726)	(0.438)
EXCHRATE	-0.597***	-0.544***
	(0.194)	(0.0920)
TARIFF HS	0.0497	
	(0.116)	
TARIFF LS		-0.298***
		(0.0982)
COLONY	4.076***	3.096***
	(0.578)	(0.355)
FUTURE CONQUESTS	1.270***	2.517***
	(0.416)	(0.446)
DIPLOMATS	0.0815	0.243**
	(0.122)	(0.113)

[39] Table 7 in Section 2, Appendix C, shows a disaggregated regression for high- and low-end textiles. Both display similar behavior and present little difference with the overall determinants of low-skill exports.

IMPORTS	0.338*	0.160***
	(0.177)	(0.0404)
Constant	1.322	-1.342
	(4.031)	(4.668)
Observations	676	676
R-squared	0.550	0.630

Note: *Standard errors are clustered by country. Time dummies are included in the regression but are excluded from the results display. *** p<0.01, ** p<0.05, *p<0.1*

Finally, Table 4 distinguishes export determinants according to their effects on either the number of different sectors in which Japan exported (extensive margin) or the value exported per sector (intensive margin). This process is also replicated at skill-level. The results show that relative productivity did not affect any margin and that the Japanese Empire especially favoured exports in new sectors, which is linked with industrial development and innovation.

Table 4: Japanese Export Determinants According to Extensive and Intensive Margins

VARIABLES	(1) Extensive Total	(2) Intensive Total	(3) Extensive HS	(4) Extensive LS	(5) Intensive HS	(6) Intensive LS
GDP	0.361***	0.262***	0.283***	0.194*	0.275***	0.701***
	(0.112)	(0.0914)	(0.101)	(0.112)	(0.101)	(0.224)
REL PRODUCTIVITY	-0.216	-0.226				
	(0.238)	(0.204)				
REL PRODUCTIVITY HS			0.125		0.0661	
			(0.108)		(0.103)	
REL PRODUCTIVITY LS				-0.504**		1.015***
				(0.247)		(0.162)
RELWAGES	0.220	0.225				
	(0.195)	(0.182)				
RELWAGES HS			-0.202		-0.365**	
			(0.161)		(0.173)	
RELWAGES LS				0.673***		0.560*
				(0.173)		(0.313)
POPDENSITYDIFF	0.00190	-0.0166	-0.0255	-0.0261	-0.0404	0.496***
	(0.0631)	(0.0543)	(0.0742)	(0.0663)	(0.0649)	(0.113)
GDPCAPABSDIFF	-0.00312	0.00267	0.155	0.0339	0.0832	0.251
	(0.217)	(0.179)	(0.232)	(0.217)	(0.201)	(0.377)
FREIGHTS	-0.286**	-0.192				
	(0.139)	(0.124)				
FFHIGHSKILL			-0.422***		-0.317***	
			(0.122)		(0.122)	
FFLOW SKILL				-0.282*		-0.291*
				(0.152)		(0.175)
EXCHCONTROL	-0.373*	-0.554***	-0.699**	-0.505**	-0.655***	-0.535
	(0.224)	(0.212)	(0.325)	(0.241)	(0.223)	(0.448)

EXCHRATE	-0.0776	-0.0167	-0.101**	0.0136	-0.0220	-0.503***
	(0.0506)	(0.0405)	(0.0515)	(0.0454)	(0.0497)	(0.0879)
TARIFF	-0.160*	-0.151**				
	(0.0943)	(0.0747)				
TARIFF HS			0.0122		-0.0145	
			(0.0723)		(0.0637)	
TARIFF LS				0.000150		-0.327***
				(0.0887)		(0.0970)
COLONY	0.754*	0.400	0.788***	0.437	0.498*	2.957***
	(0.400)	(0.344)	(0.295)	(0.370)	(0.302)	(0.354)
FUTURE CONQUESTS	0.776***	0.494**	0.511	0.467	0.393	2.535***
	(0.228)	(0.194)	(0.382)	(0.430)	(0.350)	(0.461)
DIPLOMATS	0.100	0.136**	0.130*	0.116	0.140*	0.209
	(0.0752)	(0.0647)	(0.0733)	(0.0715)	(0.0739)	(0.144)
IMPORTS	0.0352	0.0229	0.0248	0.0269	0.0187	0.143***
	(0.0453)	(0.0301)	(0.0406)	(0.0412)	(0.0349)	(0.0289)
Constant	-0.490	-2.764**	-1.152	-1.188	-3.680***	-2.951
	(1.522)	(1.259)	(1.384)	(1.308)	(1.305)	(2.355)
Observations	674	674	676	676	676	676
R-squared	0.488	0.506	0.506	0.411	0.471	0.755

Note: *Standard errors are clustered by country. Time dummies are included in the regression, but are excluded from the results display. *** p<0.01, ** p<0.05, *p<0.1*

The most important conclusion we reach disaggregating this study by skill-level is that high-skilled exports are more sensitive to the extensive margin than low-skill exports. The greater connection between fixed costs and increases in new export products in the high-skilled sector helps to understand that greater sensitivity. We can also appreciate how improvements in Japanese productivity and comparative advantage only increased the intensive margin for low-skilled products, which is apparently the sector less linked to new technological products or innovation. On the other hand, being colonized by Japan was the main driver of new extensive exports of high-skilled manufactures, suggesting that those newer and more sophisticated products were not internationally competitive and were preferred to be traded under the shadow of power in Japanese colonies. This situation does not exclude the fact that both colonies and future conquests also facilitated low-skilled exports at the intensive margin in a relevant way.

This section confirms some of the hypotheses offered in the descriptive analysis. In contrast to the influence exercised by colonial mechanisms, Japanese productivity played a marginal role in determining total Japanese exports during the interwar years. Additionally, it seems that prior to Japanese occupation there was an increase in economic and commercial exchange with Southeast Asia. We have also found that Japanese comparative advantage and increases in productivity were more related to low-skill than

to high-skill manufactures, which were directed towards poor countries. Most importantly, we found that mainly Japanese colonies facilitated exports of high-skilled goods, whereas informal empire mechanisms reinforced the existing comparative advantage in the export of low-skilled goods within the region. Finally, we have also determined that colonial and other economic links built prior to the annexation of Southeast Asian territories permitted Japan to introduce new kinds of products not previously exported to the region. In other words, it seems that the Japanese shadow of power permitted the country to complete its industrialisation process by developing an imperial market for its more sophisticated manufactures.

6.2 Robustness Checks

In order to check whether our results are robust, we tested whether the previous conclusions still held when we employed different estimation methods and limited the potential endogeneity between the key variables. In that sense, Table 5 shows our main results estimated by a Tobit estimator, employing OLS, and a later panel estimation using Random Effects to finish with some checks on endogeneity.

Our results generally hold true to our hypothesis that Japanese relative productivity did not affect Japanese exports regardless of the different estimation methods employed. First, being a Japanese colony was always the most important determinant of Japanese exports. Second, being part of Japan's future dominions was a significant additional attractor of Japanese exports in all estimation methods. Finally, trade costs and comparative advantage worked in the same direction as before.

Table 5: Japanese Export Determinants Using Alternative Estimation Methods

VARIABLES	(1) Tobit	(2) OLS	(3) Panel Random Effects	ExpectedSign
GDP	0.769***	0.769***	0.737***	+
	(0.152)	(0.243)	(0.198)	
REL PRODUCTIVITY	0.525	0.525	0.134	+
	(0.343)	(0.587)	(0.449)	
RELWAGES	0.488	0.488	0.535	+
	(0.338)	(0.502)	(0.447)	
POPDENSITYDIFF	-0.146	-0.145	-0.114	+

	(0.140)	(0.207)	(0.160)	
GDPCAPABSDIFF	0.713**	0.712	0.874***	+
	(0.288)	(0.525)	(0.286)	
FREIGHTS	-0.498*	-0.499	-1.044***	-
	(0.269)	(0.339)	(0.210)	
EXCHCONTROL	0.116	0.116	-0.232	-
	(0.855)	(0.540)	(0.609)	
EXCHANGERATE	-0.870***	-0.870***	-0.639***	-
	(0.111)	(0.192)	(0.157)	
TARIFF	-0.534***	-0.535***	0.0789	-
	(0.147)	(0.200)	(0.157)	
COLONY	2.642***	2.637***	3.020***	+
	(0.610)	(0.825)	(0.784)	
FUTURE CONQUESTS	1.686***	1.683***	1.405**	+
	(0.331)	(0.533)	(0.587)	
DIPLOMATS	0.453***	0.452**	0.304**	+
	(0.134)	(0.205)	(0.152)	
IMPORTS	-0.0334	-0.0334	0.0143	+
	(0.0327)	(0.0525)	(0.0472)	
Constant	7.009***	7.017**	5.496***	
	(1.876)	(3.532)	(2.096)	
Observations	314	314	314	
R-squared	0.1532	0.523	0.3607	

Note: *Standard errors are clustered by country. Time dummies are included in the regression, but are excluded from the results display. *** p<0.01, ** p<0.05, *p<0.1*

We also checked the determinants of exports in the formal and informal empire across benchmarks years to detect the different influences of change in imperial policy throughout the period. Table 6 shows that Japanese productivity was significant only in 1932, but not in 1938, when regional exports reached a peak. On the other hand, being a colony strongly affected Japanese exports in a positive way after WWI. The importance of this factor being much greater in 1938, when Japanese trade policy was clearly directed towards its dominions.

Table 6: Japanese Export Determinants Towards Countries Inside Its Formal and Informal Empire

VARIABLES	IMPERIAL EXPORTS	EXP SIGN
GDP	0.133	+
	(0.248)	
RELPRODUCTIVITY 1915	3.450	+
	(2.299)	
RELPRODUCTIVITY 1925	2.344*	+
	(1.253)	
RELPRODUCTIVITY 1929	1.542*	+
	(0.816)	
RELPRODUCTIVITY 1932	2.943**	+
	(1.260)	
RELPRODUCTIVITY 1938	2.050	+
	(1.297)	
RELWAGES	0.599**	+
	(0.304)	
POPDENSITYDIFF	0.906***	+
	(0.319)	
GDPCAPABSDIFF	-0.390	+
	(0.535)	
FREIGHTS	-0.841	-
	(0.551)	
EXCHCONTROL	0.248	-
	(0.585)	
EXCHRATE	-2.618***	-
	(0.903)	
COLONY 1915	0.374	+
	(0.643)	
COLONY 1925	1.764***	+
	(0.523)	
COLONY 1929	1.177***	+
	(0.412)	
COLONY 1932	2.152***	+
	(0.590)	
COLONY 1938	3.835***	+
	(0.582)	
IMPORTS	0.158***	
	(0.0443)	
DIPLOMATS	0.0969	+
	(0.162)	
Constant	6.022	
	(4.486)	
Observations	96	
R-squared	0.900	

Note: *Standard errors are clustered by country. Time dummies are included in the regression, but are excluded from the results display.* *** *p<0.01,* ** *p<0.05,* * *p<0.1*

Finally, one important drawback of our results could be the presence of endogeneity in different ways. First, there is a possibility that our results suffer from endogeneity by simultaneity in the sense that a military occupation and the creation of colonies might increase Japanese exports, but there is also a possibility that previous economic and commercial links might motivate a military intervention. This fact could explain why the impact of Japanese colonies on exports found in our results is so large. Fortunately, the case of Manchuria, which for most of the period was not a Japanese colony, and which was occupied in 1931, might be useful for controlling for such endogeneity.

For that purpose, Japanese exports to Manchuria before and after military annexation are exploited to run a diff-in-diff estimation. In this case, Manchuria will be considered the treated group, as it was invaded by Japan in 1931. This event will be considered the intervention. Thus, the periods before 1932 are defined as the pre-treatment period and that afterward as the post-treatment period.[40] The control group will be all of those countries inside the region, whose performances as recipients of Japanese exports were similar to that of Manchuria before the intervention. Additionally, Japanese intervention in Manchuria will be considered as an exogenous event in the sense that, controlling for economic and diplomatic characteristics and transport costs, every country inside Japan's sphere of influence could have been colonised instead of Manchuria.[41] We used the following diff-in-diff equation to estimate the effects of Japanese military intervention on Japanese exports towards Manchuria.

$$Exp_{it} = \beta_0 + \beta_1 Treated_{it} + \beta_2 Post1932_{it} + \beta_3 Treated * Post1932_{it} + \beta_4 X_{it} + \beta_t + \varepsilon_{it} \text{ EQ (6)}$$

In this equation $Treated_{it}$ is a dummy that represents Manchuria, which is the only country in the sample that became a consolidated colony during the interwar years. (Part of China was also considered a Japanese colony by 1938, but it was not consolidated at all.) $Post1932_{it}$ is a dummy which equals 1 in 1938 (the post-intervention period).

[40] The military intervention took place in late-1931, but the colony was not established until early-1932. For that reason, it seems unlikely that the effects of colonisation would be evident on 1932 exports. That is why 1938 is considered as the only post treatment period.

[41] In reality Japan was more likely to intervene in China or Manchuria for political and strategic reasons than in any of the other countries in the region, but theoretically the assumption is plausible.

Finally, $Treated * Post1932_{it}$ is the diff-in-diff variable that represents the true effect of Japanese colonisation on exports to Manchuria.[42] X_{it} represents the controls previously explained, including a control of countries that were part of Japanese dominions during WWII, whereas β_t are time-specific fixed effects. We used this equation to estimate the effects for countries inside the Japanese sphere of influence.

The results are given in Table 7. First, we note that Japanese total and high-skilled exports to Manchuria were lower than to the rest of the region for the whole period. Second, the results also show that both kinds of exports are higher after 1938 than before (although not significantly). Finally, and more importantly, the diff-in-diff variable is positive and significant, meaning that controlling for other variables, exports to Manchuria rose after occupation relative to the rest of the region. This suggests that once colonization endogeneity is avoided, the Japanese imperial export driver is robust as the explanation of export expansion. Furthermore, the effect of military occupation on high-skill exports is still very relevant and significant. This fact reinforces our premise that colonisation was the main driver for Japanese introduction of Second Industrial Revolution goods into East Asia.

Table 7: Diff-in-Diff Estimation for Japanese Exports Before and After Colonisation

	(1)	(2)
VARIABLES	Total Exports	High-Skilled
TREATMENT	-1.874***	-3.307***
	(0.420)	(0.404)
POST1932	0.682	0.529
	(0.501)	(0.472)
TREATMENTPOST1932	1.331***	3.617***
	(0.271)	(0.311)
Observations	96	96
R-squared	0.938	0.968

Note: *Standard errors are clustered by country. Time dummies and the rest of controls included on previous*

[42] Effect of intervention in the treated country=$(\beta_0 + \beta_1 + \beta_2 + \beta_3) - (\beta_0 + \beta_1) = \beta_2 + \beta_3$
Effect of (non)intervention in the control group= $(\beta_0 + \beta_2) - \beta_0 = \beta_2$
Total effect of military intervention= $(\beta_2 + \beta_3) - \beta_2 = \beta_3$

*regressions are accounted in the calculations, but are excluded from the results display.*** p<0.01,** p<0.05, *p<0.1*

Another potential source of endogeneity comes from the impact that export growth may have had on productivity growth, transport cost, or commercial diplomacy. We offer some reverted explicative equations in Appendix E. Table 9, shows that exports did not affect Japanese productivity during the interwar years (or did so only in a weak way) and the potential that trade costs and exports were bidirectional because increasing exports might have further reduced trade costs between countries. Appendix E shows that this bidirectionality was real for Japanese exports and its diplomats abroad. To avoid the possibility that this phenomenon might spoil the effect of trade determinants, we lagged the independent variables. The results in Table 8 show that the main conclusions still hold after avoiding the potential for current exports to affect previous trade determinants. We can also see that our productivity and trade costs measurements (including empire) have a robust effect on exports, which persists at least for one period ahead.

Table 8: Japanese Exports Determinants (Lagged Independent Variables)

	(1)
VARIABLES	EXP
GDP	0.977***
	(0.300)
RELPRODUCTIVITY	0.544*
	(0.292)
RELWAGES	0.125
	(0.140)
GDPCAPABSDIFF	1.035**
	(0.408)
POPDENSITYDIFF	0.601***
	(0.125)
FREIGHTS	-0.219
	(0.177)
TARIFFS	-0.338**
	(0.140)
EXCHCONTROL	-1.757
	(1.097)
EXCHRATE	-0.457***
	(0.109)
COLONY	2.638***
	(0.706)
FUTURE CONQUESTS	0.832***
	(0.305)
DIPLOMATS	0.375***
	(0.109)
IMPORTS	0.156*
	(0.0861)
Constant	-4.937
	(3.044)

Observations	673
R-squared	0.741

Note: *Standard errors are clustered by country. Time dummies and the rest of controls included on previous regressions are accounted in the calculations, but are excluded from the results display.*** p<0.01,** p<0.05, *p<0.1*

7. Conclusions

Trade blocs in the interwar years were used as instruments of imperial power to foster exports and as a substitute for productivity in encouraging industrial production. We have assumed here that the imperial shadow of power in interwar Japan predicted the regional trade bloc formation of 'The Greater East Asia Co-Prosperity Sphere'. Although this bloc was achieved only by means of military intervention in the 1940s, it began by working through certain economic interests that fostered regional exports in East and Southeast Asia. Certainly, this research calls for a deeper study of the specific trade finance connections between banks and large companies (Zaibatsu), which, in concert with strategic military measures, encouraged bilateral trade with territories belonging to the present and future colonial empire.

During the interwar years, and especially in the 1930s, as a reaction to the strong disintegration of the international economy, Japan activated a complex industrialisation policy to foster industrial production in the Second Industrial Revolution sectors of steel, machinery, and mechanical engineering. This policy was based on an overlapping of protectionist import substitution and imperial policies to stimulate exports in its region of influence. That new policy reshaped previous Japanese export specialisation patterns, which had been based on exporting low-skilled manufactures to poor countries. After the First World War, Japan built a strong comparative advantage in the region, exporting low-skilled manufactures to countries with different demand preferences and climatic characteristics. Later, old colonies were used to foster the demand of new railway infrastructures and machinery. Additionally, previous Japanese investment and distribution channels, built around polities and countries that were subsequently occupied during WWII, reinforced comparative advantage in low-skilled exports by facilitating an expansion of the number of products exported to those territories. We proved that this expansion occurred even before annexation. In that sense, we can identify a dual relationship between Japanese economic imperialism and military imperialism. In non-colonial territories of China and Southeast Asia, economic imperialism anticipated military occupation whereas in the colonial territories, military conquest (also preceded

by economic penetration) exacerbated commercial exchanges in high-skilled manufactures and fostered deeper industrialisation in Japan.

We are aware that a potential endogeneity problem exists that relates import dependence or bilateral trade connections with military interventions (see Bonfani and O'Rourke (2014)). Nevertheless, we believe that these results reasonably prove the colonial trade bias mechanism used by imperial institutions, inversely related to productivity, in order to support Japanese industrialisation in the first half of the twentieth century. Apparently, the market potential for high-skilled manufactures was very limited. Colonial intervention, therefore, was used to expand the market of the most intensive human capital sector of Japanese industrialisation. The implicit counterfactual hypothesis would be that without imperial intervention in the region, Japan would not have expanded its high-skilled exports and would not have exported such a variety of new products. In other words, Japan's industrialisation process would have been much less pronounced.

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APPENDIX

APPENDIX A

Database Methods and Sources:

1 Trade data by product and country.

1.1.Japanese trade data

We have constructed a granular database of the value of bilateral Japanese exports by product for different benchmark years at the same level of disaggregation as those offered by the official Japanese trade statistics. We have digitised information found in different volumes (1912, 1915, 1925, 1929, 1932 and 1938) of the *Annual Return of the Foreign Trade of the Empire of Japan.* Official statistics collected and published annually by the *Japanese Bureau of Customs* include a section that collects Japanese exports to every country, disaggregated by single product. Japan used a quite accurate declared values c.i.f system, for imports and f.o.b valuation for exports, and gold and silver are excluded from trade statistics. Japan followed as far as possible the origin-destination method of crediting trade by countries. However, one faces difficulties in getting information on country of origin and destination for goods moving through Hong Kong and Singapore.[43] As we have evidence that Hong Kong's share of total Chinese imports reduced from around 40% at the turn of the century to less than 20% in the 1920's and less than 5% in the 1930´s, we assume that the inaccuracy of the Japanese direction of trade records due to transit is more limited for the interwar years than for previous periods (see Figure 5 in Keller et al (2011).[44] According to our database, Japan moved from exporting 512 different products to 37 different countries in 1912, to exporting 1135 goods to 117 countries in 1938.[45] On one hand, more countries records is related with a more precise record of destination, but also with a more extended geographical diversification of Japanese exports. On the other hand, we suspect that the increment in the number of goods exported is neither related with true changes in the Japanese

[43] See Chapter 4 and Chapter 5 in Allen and Elly (1953).
[44] By instance, Meissner and Tang (2018) do not make any adjustment to overcome Hong Kong and Singapore transit trade problems on Japan geographical trade records assignment before 1910.

[45]The category "Exports to other countries" has been omitted because its inclusion didn't permit us to control for partner country characteristics.

industrial capacity nor with changes on market characteristics, but simply with a change in the classification rules followed by the official statistics. For an extended discussion of this point related with the extensive margins of trade specification, see Appendix B.

In addition, it is important to clarify that we also include the zero values of countries to which Japan exported in a determined period, so zeros are included in our database and in the main regressions.

1.2 Main Colonies bilateral trade data with Japan

The main drawback of the official Japanese trade records is that they don't include data on Japanese exports towards its main colonies, Korea and Taiwan (although, thankfully they account for exports towards Kwantung province and Manchuria both before and after being occupied for Japan). In order to solve this relevant inaccuracy of the statistical records, and believing that the study of Japanese export patterns towards its colonies is vital for our research target, we have obtained information on Japanese exports towards Taiwan from the *Returns of the trade of Taiwan for forty years* (1896-1935) and annual *Return of trade of Taiwan* (Formosa) (1936-1942) both published by the Department of Finance of the Government of Taiwan. Such returns also include Taiwanese imports from Japan (or equivalently Japanese exports to Taiwan) at the product level. The quality of this database is acceptable; however the level of disaggregation is not the same as the one of the *Annual Return of the Foreign Trade of the Empire of Japan* as it includes a lower disaggregation by product, a fact which could underestimate the extensive margin for Japanese colonies. This is a problem in our data that remains impossible to fullysolve, but we have taken several steps to remedy the problem. First, we take the bilateral trade records of Japan with Taiwan in 1915 as a base year because it is the last year in which the number of goods exported to Taiwan employs the same disaggregation level as the other Japanese bilateral records, and then we assume that every 3 SITC category follows the same tendency as the respective ones of the Kwantung Leased Territories.

For the case of Korea, the *Annual Returns of the Foreign Trade of the Empire of Japan* in their volumes from 1914-1920 include an Appendix with data on Japanese exports to Korea disaggregated at the same product level as Japanese exports to the rest of the countries. For the rest of the period, however there is no alternative available source in English that breaks down Japanese exports to Korea at the product level. This is problematic for our research because Korea was probably the most important colony

throughout the period. In order to solve this we have obtained from the Long Term Economic Statistics of Japan (LTES tables J1411__001 to J1411__007) at Hitotsubashi University (http://www.ier.hit-u.ac.jp/English/databases/ltes.html) a collection of Japanese exports to Korea disaggregated in this case at the 5 sector level (which include: I Agricultural Marine and Forest Products, II Mineral Products, III Manufactured Processed Food, IV Textiles and V Chemical, Metals and Machinery) Sectors I and II correspond to Primary products according to our skill classification, sectors III and IV to our low skilled manufactures and sector V to our high skilled. Finally, in order to obtain the extensive margin of Japanese exports to Korea for 1925-1938 we have used, as in the case of Taiwan, 1915 as a base year of skill disaggregated margins and assumed that the number of goods exported inside each sector follows the same tendency as the one of Kwantung, so as to keep the skill breakdown of total exports to Korea unaltered.

We make a conscious decision on the uncontrolled potential bias introduced by this in our data base, but we believe this is our best option and an acceptable assumption for several reasons: first, because Kwantung is the only stable Japanese colony throughout the period, it is affected by the same political changes as Korea and Taiwan. Kwantung was at first strongly influenced by the railway construction like Korea and the economic structures of those three colonies were similar, being its industrialization after the 1930s resemblant to the one experienced by Korea; second, because Kwantung is across from Manchuria, the territory receiving the biggest number of Japanese product varieties records, rising from 339 products received in 1912 to 911 in 1938, by employing it as a reference we are computing an upper bound on Korea and Taiwan's extensive margin growth.

2. GDP domestic demand

Information on GDP and GDP per capita is taken from the last version of the Maddison project and refers to GDP in 1990 GK dollars or real GDP (see Bolt and Van Zanden (2014). This database does not provide information for every country to which Japan exported during the period 1912-1938, but it includes information for future periods. This information is interpolated back to the interwar years by assuming that they have followed the same rate of change as total exports of the corresponding countries (in constant prices) obtained from Federico and Tena-Junguito (2018, 2019). This last method is far from perfect because exports didn't grow at the same rhythm as total GDP but is a method generally accepted for computing upper bounds on GDP growth.

Another addition to the literature is the estimation of GDP levels and other statistics for Japanese colonies of Kwantung Leased Territories and Manchukuo. Population data has been obtained from Kang (1981) and the corresponding GDP is calculated as the proportion of Japanese GDP equal to the percentage each population represents over the Japanese total (the exercise for Manchuria is the same but using China as a reference because until 1932 it was part of China). The Kwantung GDP is considered to follow the same rate of growth as the Japanese one (since it is a Japanese colony), whereas Manchuria's follows the same tendency as China until 1932.[46] Afterwards, its GDP is assumed to grow at the same rate as Manchurian exports taken from Federico and Tena-Junguito (2018, 2019).

There still remain a group of territories that are provinces, colonies or autonomous territories belonging to European Empires for which no data is available but which appear as independent entities on Japanese statistics and for that reason are treated as such in the present research. So, we use also marginal data recorded for Africa and the Caribbean polities. We include their GDP proxied as a proportion of its colonizer's GDP, according to total population. Population from those territories is obtained either from the League of Nations or from censuses obtained on the mainland official statistics (like Annuarie Statistique de la France, Spanish INE data, Annuario Statistico Italiano, British Parliamentary papers etc…). This procedure allows us to extend GDP estimations for as many countries as possible in order to get partners' demand by their respective economic size growth (dividing it by population obtained from the League of Nations and Mitchell).

3. Productivity estimation and sources

3.1 GDP per hour worked differentials

Productivity is estimated through the division of GDP by the corresponding data on total hours worked found mostly in Huberman and Mins (2007) in order to construct GDP per hour worked. Working hours refer to total hours worked per worker (male and females) in productive non-agricultural activities. This first source only includes data of hours worked per employee for 15 advanced countries. Our database is complemented with information on total working hours for 9 peripheral countries in Europe including

[46]Kang includes data for 1912 and for the period 1924 to 1941. Population for Manchuria in 1915 has been obtained by multiplying 1912 data by the rate of change of total Chinese population and for the case of Kwantung Leased Territories the same has been done but assuming the same rate of change of Japan's population (as it was a Japanese colony) in order to differentiate development of Japanese colonies from other East Asian territories

Russia obtained from Maddison (2007) and Maddison (1995). Information on both databases is not annual, so it has been translated to our benchmark years assuming constant annual rates of change.

This data is likely to refer to a subset of economic activities, excluding agriculture that is a sector with complex seasonal working hours. Huberman (2007) and Maddison (1995) would show that the average number of hours per worker decreased substantially during the first third of the twentieth century. We know, according to Federico (2005) that the number of hours and part time work in advanced countries reduced the number of working hours in agriculture, probably at a slower rate, but adapting to the general trend of the wide economy in the period. Unfortunately, Federico's (2005 Table 4.2 p.63) data on agricultural working hours is too scarce and provisional to be used to introduce a different correction for agriculture than for the general data on the wider economy. In order to avoid measurement errors in the construction of the variable we have decided to deduct agrarian output from total Maddison GDP. Agrarian share over National product is found in Mitchell (2003) and we subtract the corresponding percentage from Maddison's data in 1990 GK dollars. To estimate non-agrarian GDP per hour worked for those 24 countries and for Japan we multiply hours worked on average by the employment in the non-agrarian sector which is also obtained from Mitchell (2003).

Finally, all this information is complemented with data on GDP per hour worked for Taiwan (representative of productivity in Japanese colonies), Indonesia (representing productivity in Japan's future dominions), India (which is the leader among other Asian poor territories outside the Japanese sphere of influence) and bigger South American countries like Argentina and Brazil. We use total hours per worker for those territories in 1950, from Maddison (1995), multiplied by non-agrarian employment obtained in Mitchell (2003). We interpolate back in time assuming they follow the same trend as total employment (excluding agriculture), following the same source.[47] All in all, GDP per hour worked in non-agrarian sectors is a variable that in this database is offered for Japan and 27 country partners which represent 92% of Japanese exports. In order to capture Japanese productivity improvements relative to partner countries we divide Japanese non agrarian GDP per hour worked by the corresponding partner's one.

3.2 Real wages and productivity differentials by country and sector

[47] India and Indonesia total hours in 1950 are assumed to be equal to the ones that appear under the section "other Asia".

We also use relative real wage growth between Japan and its partners as an additional variable to capture productivity gaps. The use of this variable generates controversy among scholars, because when there is no perfect competition, as in Japan during the interwar years, real wage differentials may not reflect productivity differentials.

The first strategy consists of building a wage index ratio by dividing Japanese real wage growth in relation with the corresponding partner along benchmarks (so an increase of the index means that Japanese wages are rising faster than those of its trade partners). Data for real wages is obtained from Williamson (1995) which includes information for 30 countries on the five continents including the Japanese colonies of Korea and Taiwan and future conquests like the Philippine Islands, Indonesia or Siam. Regarding countries with no information, as is the case of GDP per hour, we include a zero value.

The second strategy is based on the assumption that Japanese comparative advantage was not necessarily related with higher wages that might reflect higher quality production, but perhaps sectoral lower unit costs. Following this idea, we estimate an additional productivity measure to capture, as much possible, the differences in the evolution of relative skill sectoral productivity in Japan. We have found data on Japanese manufacturing output in different sectors and their respective employment during the period. We use the machinery sector to capture the evolution of the high skilled sector and the cotton textiles sector for low skilled manufactures. Data is offered in LTES (Long Term Economic Statistics of Japan, tables JPA19__008, JPA19__002 and JPA16__008 respectively) from Hitotsubashi University. We use the employment share of each sector over total hours worked as a proxy of the number of hours worked in every sector. This allows us to construct two productivity differential indices for Japan in high skilled and low skilled manufactures. We use each of them divided by partners' overall productivity.

Lastly, information regarding population density as a proxy for the difference between Japan and its commercial partner's factor endowments has been obtained from League of Nations (1927-1945) Statistical Yearbooks data.

4. Trade costs

4.1 Transport costs

The most common variable employed in the literature on gravity to measure transport costs is distance between countries, but it is time and product invariant. This

paper makes an effort to overcome the implications of this limited assumption on the measure of transport costs. A relevant contribution of this paper is the construction of a database of estimated freight factors (cost of transport per ton/product price per ton) between Japan and each country partner, for every single product exported by Japan for each of our corresponding benchmark years. In our strategy geographical distance between Japanese partners is combined with different freight rate routes and differences in freight factors by composition of products. freight rates are better proxies for transport costs than simple geographical distance, as they reflect the variations in number, size, tonnage, speed and oil consumption on vessels employed in the different routes or the freight price differentials driving by shipping competition along each route.

In order to do so, we have first delimited the world into three freight regions: Europe (including Africa), America (North and South) and Asia (including Oceania), the latter crucial for the study and subsequently divided into three further regions: the East Asia route, which includes those Asian countries which were closer to Japan and with which it had strong colonial or other political relationships, the Southeast Asia route, including countries conquered by Japan and annexed to the Empire during WWII, and the Other Asia and Pacific route, with very distant Asia and Pacific countries with which Japan did not have any economic nor political stake.

Those freights also vary between product sectors since we have a different freight factor for every 3-digit- SITC, making our trade costs variable sensitive to changes in trade composition by trade partners and in consequence by skill level. We are able to compare these results only for the general equation without skills with those obtained using the conventional method of Great Circle Distances (in kilometres) between Capital Cities (Source: own calculations using Latitude and Longitude data from worldatlas.com), and in this case the results are very similar, with coefficients presenting almost the same levels and significance as is shown by Table 3, the coefficient of Colonies and Future Conquests being even more powerful.

Table 1: Main Regression Employing Distance Instead Of Freights.

VARIABLES	(1) EXP
GDP	1.351*** (0.424)

RELPRODUCTIVITY	0.479
	(0.395)
REL WAGES	0.460
	(0.389)
POPDENSITY DIFF	0.544***
	(0.179)
GDPCAP ABSDIFF	1.516***
	(0.453)
DISTANCE	0.157
	(0.280)
EXCHCONTROL	-1.081
	(0.772)
EXCHRATE	-0.468***
	(0.124)
TARIFF	-0.357**
	(0.178)
COLONY	2.858***
	(0.983)
OCCAFTER1938	1.006**
	(0.391)
DIPLOMATS	0.116
	(0.101)
IMPORTS	0.162
	(0.139)
Constant	-9.224
	(5.819)
Observations	674
R-squared	0.636

The procedure for obtaining our freight factor data base is the following one: we have first delimited the world into three freight regions or transport cost routes, assuming a common freight per route which will vary between countries according to their distance with Japan. The main Japanese trade routes in our paper are Europe (including Africa), America (North and South) and Asia (including Oceania). The latter route is crucial for the study and subsequently is divided into three further regions like the East Asia route, which includes those Asian countries which were closer to Japan and with which it had strong colonial or other political relationships, the Southeast Asia route, including countries conquered by Japan and annexed to the Empire during WWII, and the other Asia and Pacific route, with more distant Asia and Pacific countries with which Japan didn't have any economic nor political stake. We have 5 routes in total.

The next step was to find at least a representative freight rate (cost of transport per single ton of a determined product to a specific destination) for each route during the period 1912-1938. Cost of transport per ton mileage has been adapted to the different mile distance of Japan's trade partners for each route. East Asian freight rates were found in Yasuba (1978) and were based on the freight of coal between Nagasaki and Shanghai for the years 1910, 1920, 1930 and 1935. From this source we also taken the freight rate of

cotton between Japan and Bombay in 1912, which is employed as the basis for computing the Other Asia and Pacific freight rates. In both cases, the corresponding freights are translated to our benchmark years by using an index offered also in Yasuba's charts, which covers the years 1880-1940. Freights for the Southeast Asia route are found in Ellinger, B., & Ellinger, H. (1930) and are based on cotton manufactures freights between Osaka and Batavia in 1929, which are then translated to the rest of the years of interest using Shimizu, H. (1988), which describes the percentage variations of general freights between Japan and Indonesia from 1902.

Additionally, for the European and American routes for which more freight information is available, we have chosen two freights as references: light (where the transport cost is small compared to the price) and heavy freights (where the opposite occurs). Specifically, they are tea on the London-Shanghai route (found at "Freights 1800-1938" http://www.uc3m.es/tradehist_db in Federico& Tena-Junguito (2018)) and coal on the Wales-Hong Kong route obtained from Isserlis (1938), respectively, for the case of Europe. For the case of America, the freights are raw cotton and iron and steel between USA and Japan obtained from Sanderson (1926) and Sanderson (1940). It is necessary to mention that the different freight rates employed are denominated using different currencies and units of measure. However, all of them have been translated into sterling pounds per ton by using market exchange rates from Federico & Tena (2018) after taking equivalences between different units of measurement.

When we had obtained a complete series of freight rates (in pounds per ton) for each of our five routes, we translated them to every country belonging to each route. The procedure followed consists of dividing every route representative freight by the total distance covered (for example the East Asia freight is divided by distance between Nagasaki and Shanghai) in order to calculate the route specific cost of transport per ton and per mile.

TABLE 2. Japan Freight rates in different routes (1912-1938)

	EAST ASIA	SOUTHEAST ASIA	SOUTH ASIA	EUROPE AND AFRICA LIGHT	EUROPE AND AFRICA HEAVY	AMERICAS LIGHT	AMERICAS HEAVY
1912	0.000135	0.000099	0.000217	0.000199	0.000169	0.000352	0.000176

1915	0.000190	0.000180	0.000213	0.000285	0.000208	0.000455	0.000506
1925	0.000188	0.000399	0.000615	0.000096	0.000167	0.000523	0.000299
1929	0.000176	0.000399	0.000607	0.000127	0.000175	0.000429	0.000245
1932	0.000133	0.000319	0.000504	0.000202	0.000109	0.000663	0.000379
1938	0.000328	0.000528	0.000488	0.000162	0.000113	0.000438	0.000166

Data: in Pounds per Ton per Mile

Source see text.

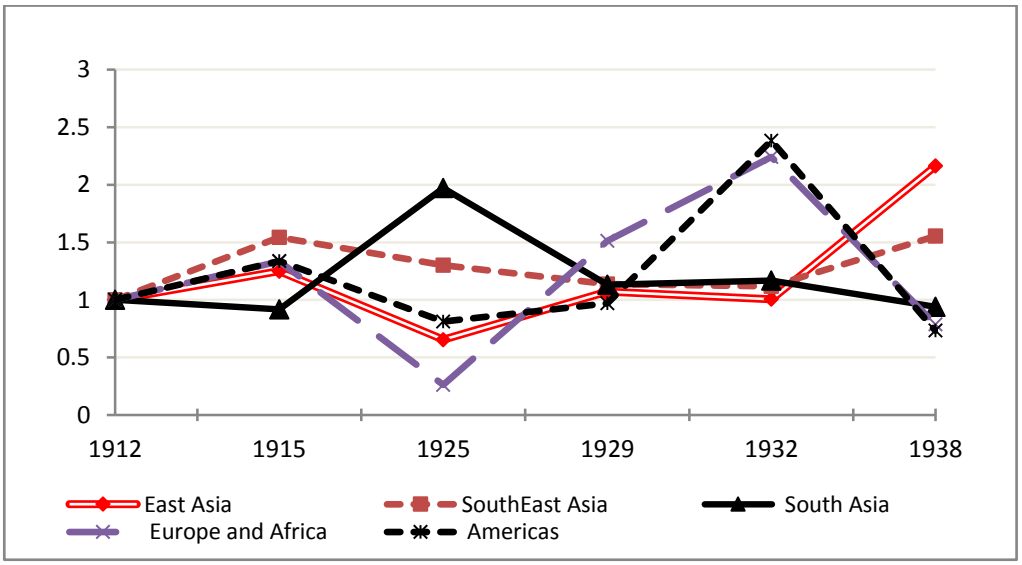
The next step was to multiply each of the route specific freight rates above by the distance between Japan and the different countries inside every route, in order to build the freight rates of Japanese exports (pounds per ton) to each country. These freight rates are then divided by the international price in pounds per ton of each selected commodity (found in Federico & Tena-Junguito (2018, 2019). By doing this we obtain freight factors (cost of transport as a percentage of products' price for 5 goods (coal, cotton manufactures, raw cotton, tea and iron and steel).

Finally, to vary transport costs across different sectors we translate those 5 benchmark freights to the rest of products. We apply freight factor equivalences between products obtained in Moneta, C. (1959), which employs freight factor equivalences for almost 80 products imported by Germany in 1951. The procedure consists of multiplying the freight factor of each route's reference product (remember, five routes, five different reference products) by the proportion that each corresponding good represents over the reference one. As an example, if the freight factor of meat is 5.3 times bigger than tea's freight factor (one of our references), then we multiply tea's freight factor by 5.3 in order to obtain the freight factor for meat exports. This process is repeated for each product. As a rule we assume that products sharing a 3-digit SITC classification have the same freight factors. In addition we also assume that freight factor equivalences did not change too much between our period (1912-1938) and 1951.[48] Graph 1 shows the evolution of the freight factors created on this article by means of an index number (1912=100) capturing changes in the average freight factors for each trade route. Those averages have been weighted according to the proportion that each corresponding product possesses in total

[48] That's a strong assumption but this is the best possible option for translating our freight factors to every single product exported by Japan.

Japanese exports. The graph shows how freights fluctuate considerably, reflecting technological, market and trade composition factors, as opposed to distance, which is fixed. Furthermore, it is remarkable to observe that during the 1930s, the period in which Japanese exports towards East and Southeast Asia experienced their sharpest raise, freight factors to both routes increased.

Figure 1. Freight Factor (trade-weighted by route) 1912-1938 (1912=100)



Source see text

4.2 Tariffs, diplomats and exchange controls

Average levels of tariff protection come from Blattman et al. (2003) and represent total import duties collected by each country as a percentage of total imports.[49] This database has been extended following the same procedure using data obtained from the British Parliamentary Papers and the Annuarie Statistique de la France for their respective colonies all over the world (including Africa and the Caribbean). For other countries, we assume that levels of protection are the same as those of their respective Metropolis.[50] All in all, we have data on tariffs for every country to which Japan exported during the interwar years.

Finally, we have obtained a subset of other variables representing trade costs such as exchange rates by country with the Japanese Yen (relative exchange rates from

[49]Tariffs between Japan and its colonies are assumed to be zero.
[50] An example of this could be the Canary Island on Spain. For an extended discussion on tariffs sources and methods see section 4.2 Appendix A.

Federico and Tena-Junguito (2018, 2019). This source gives nominal exchange rates between local currencies in different territories (among which Japan is included) and the dollar, expressed in local currency/dollar. The new rate is expressed in local currency per Yen and obtained through the division of partners' currency nominal exchange rate (foreign currency per dollar) by Japanese nominal exchange rate (Yen per dollar) and has been created for 44 partners. In other words, an increment of this variable reflects a relative nominal appreciation of the Yen. This assumes that nominal devaluation with the Yen affects trade independently of the behaviour of their respective partners domestic price. Unfortunately, there is a scarcity data on domestic prices for the cross-section of countries, which impedes the inclusion of bilateral effective real exchange rates in our gravity equations. Furthermore, we have also obtained data on exchange rate controls obtained from various sources including Bethell (1994), Eichengreen (1996), Meisel (1990) and Reinhart & Rogoff (2002).

Finally, we collect information on the number of Japanese diplomats operating in each country, which has been obtained from Almanach de Gotha (various years), which includes a section with the names and country of origin of every diplomat operating in each country. We have meticulously counted the number of Japanese diplomats that worked in each country and the number of foreign diplomats that worked in Japan.

Table 3 Number of Japanese Diplomats Abroad

	1912	1915	1925	1929	1932	1938
AFGHANISTAN						3
KENYA						1
FINLAND				1	1	2
MORROCCO						1
LEBANON						1
IRAN				1	4	5
ITALIAN AFRICA						1
GERMANY	15	RUPTURE	23	17	13	15
LATIVA						2
USA	21	22	33	27	23	22
HAWAII	1	1	1	1	1	1
PHILIPPINES	1	1	1	1	1	2
ARGENTINE	1	1	4	4	5	7
AUSTRIA-HUNGARY	8	RUPTURE	7	5	3	3

BELGIUM	6	6	12	8	7	6
BOLIVIA			1	1	1	1
BRAZIL	5	5	11	10	10	11
CHILE	4	4	6	5	5	5
CHINA	40	38	67	68	60	20
COLOMBIA			1			3
CUBA			1		1	1
DENMARK	1	1	1	2	2	1
EGYPT			3	2	2	5
SPAIN	4	3	7	4	6	3
FRANCE	13	10	25	22	18	13
FRENCH INDOCHINA	1	1	2	3	2	2
GREAT BRITAIN	16	14	32	21	17	19
INDIA	2	2	3	4	5	4
STRAITS SETTLEMENTS/MALASYA	1	1	2	1	1	2
CANADA	2	2	3	2	6	8
AUSTRALIA	3	2	6	1	1	2
NEW ZEALAND	1		2			
SOUTH AFRICA	1		1	1	1	1
HONG KONG	1	1	2	1	1	2
SRI LANKA	1	1	1	1		1
GREECE			2	2	2	
HUNGARY			1			
ITALY	13	14	16	14	9	9
LATVIA			3		1	2
LUXEMBOURG			1			1
MANCHUKUO				1		15
MEXICO	3	6	6	7	8	8
NORWAY	1	1	1	1	1	1
PANAMA			1	1		1
NETHERLANDS	5	5	7	5	4	5
INDONESIA	1	1	2	2	1	1
PERU	1	4	6	4	4	6
POLAND			4	6	4	6
PORTUGAL			4	3	1	4
ROUMANIE			5	4	2	2
EL SALVADOR						1
RUSSIA	14	18	1	23	18	16
SIAM	3		3	4	3	2
SWEDEN	4	5	10	6	5	2
SWITZERLAND	1	1	9	4	3	4
TURKEY			1	9	6	6
URUGUAY			1	1		
CZECHOSLOVAKIA			2	5	2	2
TOTAL	**195**	**171**	**344**	**314**	**266**	**256**

Sources: Japan's Diplomats abroad comes from Almanach de Gotha (various years)

Table 4: Number of foreign diplomats in Japan

	1912	1915	1925	1929	1932	1938
AFGHANISTAN						2
EGYPT					1	1
CANADA				1	5	4
HONDURAS				1	1	1
IRAN						1
LUXEMBOURG				1	1	1
MANCHUKUO						11
NICARAGUA						1
DOMINICAN REPUBLIC					1	
EL SALVADOR				1		1
GERMANY	15	RUPTURE	8	11	10	12
USA*	20	19	32	18	26	35
ARGENTINA	3	3	2	3	5	2
AUSTRIA-HUNGARY	5	RUPTURE	1		1	1
BELGIUM	7	6	7	4	2	4
BOLIVIA		2	6	4	2	3
BRAZIL	9	6	7	4	6	5
CHILE	8	4	6	3	4	5
CHINA	20	16	19	12	14	30
COLOMBIA			2	1	1	2
CUBA			4	1	3	2
DENMARK	3	4	8	5	6	1
ECUADOR			1	1		
SPAIN	6	5	6	4	7	1
FINLAND			2	2	3	2
FRANCE* (1)	10	10	10	12	10	14
UK	24	22	21	19	20	19
GREECE		1	3		1	
ITALY	5	6	6	7	7	8
MEXICO	6	6	3	5	3	4
NORWAY	6	5	8	2	4	2
PANAMA			1	1	1	1
PARAGUAY			1		1	1
NETHERLANDS	7	9	8	5	8	5
PERU	2	2	5	6	3	4
POLAND			3	6	4	3
PORTUGAL	3	5	8	2	2	2
PERSIA					2	
ROUMANIA			1	3	3	4
RUSSIA* (3)	21	19	1	12	14	14
SIAM	2	2	3	3	4	4
SWEDEN	4	2	10	5	3	3
SWITZERLAND	2	2	2	2	1	2
CZECHOSLOVAKIA			3	3	2	3
TURKEY			1	1	2	5
URUGUAY						1

VENEZUELA		1	2		1	1
TOTAL	**188**	**157**	**211**	**171**	**195**	**228**

Sources: Foreign diplomats in Japan comes from Almanach de Gotha (various years)

4.3 International demand by Imports

Lastly, we believe that the general international protectionist backlash prevalent in Europe,the USA, and other relevant markets for Japan, such as India, during the 1930s influenced Japan's commercial focus on its Empire and regional markets. In order to capture the global trade diversion generated by the Great Depression, we have included in our database a variable capturing the contraction of international trade over domestic demand represented by the GDP. It is represented by total imports for every Japanese country partner in each of our benchmark years. Information is obtained from Federico and Tena-Junguito (2018,2019) and refers to total imports in current dollars. This source includes information for almost every Japanese trade partner. Exceptions are Hong Kong, Kwantung and Manchuria (1912-1929, our source contains information for 1932-1938), which were part of Japan's future dominions and colonial possessions, respectively. In order to account for these omissions, we have obtained Hong Kong imports from the British Parliamentary Papers (Statistical Abstract for the British Empire 1924-1938). The rest of the years have been extrapolated assuming Hong Kong exports to follow the same path as British Malaysia as both were British Colonies and were famous entrepots (British Malaysia includes the Singapore entrepot). To calculate Kwantung imports, we assume them to be equal to the proportion of Japanese imports based on the percentage of the population of Kwantung represented over the Japanese population and assuming parallel trends. Finally, Manchurian imports have been interpolated back from 1932 to the previous benchmarks by assuming imports to evolve at the same rate as its population.

4. 4 Japanese colonies and future conquest territories' main features

Among the variables chosen to be part of the model there are two that are related mainly with political factors that imply severe changes in trade costs related with changes in the connection of different territories within the Japanese Empire over the period. As has been explained in the literature review section in the paper, this two forms: the first one consisted of the Japanese creation of formal colonies in the conventional way and the second one consisted of an economic penetration that anticipated future conquests. We

believe that both kinds of imperialism allowed Japan to reduce trade costs with its neighbours and we build two separate dummies for representing them. The first one captures Japanese trade bias towards its colonies, whereas the second tries to measure the extent to which Japan's interest towards its future conquered territories implied bigger exported quantities than what is suggested by the rest of the model's variables. The following tables summarizes which countries were part of Japan's Colonies and future dominions and their main characteristics.

MAP.1: JAPANESE CONQUESTS DURING IMPERIAL PERIOD (1880-1945)

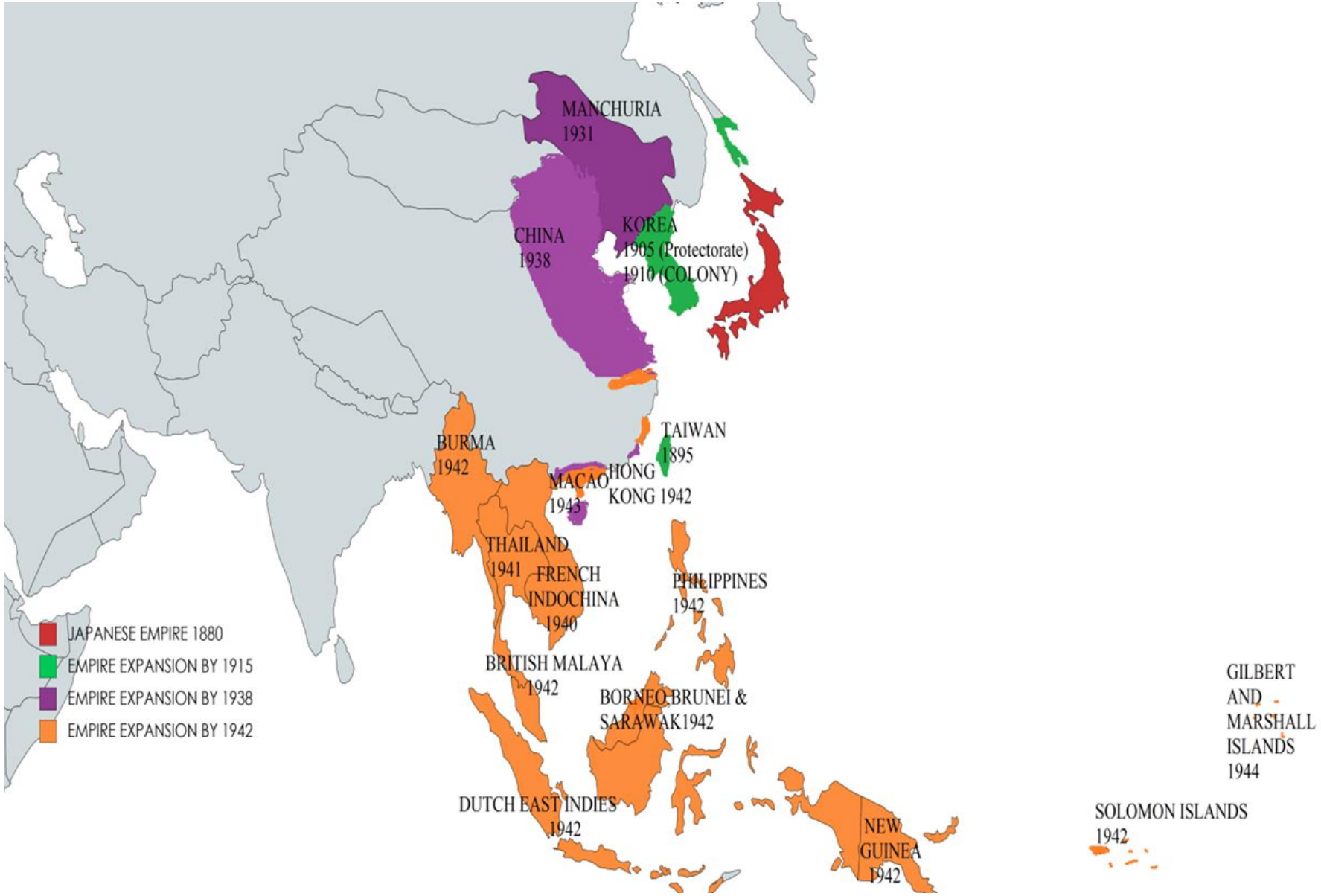


Table 5: Japanese Colonies Status and Main Features.

Japanese Colonies (Formal Empire)	Annexation Date	Period As Colony	Distance (Nautical Miles) With Japan	Pop 000s (1912)	Pop 000s (1938)	GDP Mill. 1990 Dollars (1912)	GDP Mill. 1990 Dollars (1938)	Tariffs (1912)	Tariffs (1938)	Share Over Japan's Exports (1912)	Share Over Japan's Exports (1938)	Main Product Traded (1912)	Main Product Traded (1938)
Taiwan	1895	1912-1938	920	3,411	5,552	2,297	7,252	0%	0%	7%	8%	Cotton Cloth	Sulphate Of Ammonium
Korea	1905 (Protectorate) 1910 (Colony)	1912-1938	449	10,422	15,381	8,789	24,895	0%	0%	8%	23%	Gray Shirtings	Iron Manufactures And Gray Shirtings
Kwantung Leased Territories	1905	1912-1938	920	596	1,750	218	544	0%	0%	4%	14%	Gray Shirtings	Metals And Machinery
Manchuria	1931	1932-1938	768	30,857	40,354	11,288	42,307	0%	0%	0%	8%	No Trade	Machinery And Wheat Flour
China	1937	1938	735	432,375	513,336	158,176	288,653	3%	27%	19%	8%	Cotton Yarn	Spinning Machines And Wheat Flour

Notes: *Tariffs represent tariffs with Japan, except in the case of China in which they represent average tariff*

Table 6: Japanese Future Conquests And Main Features

Future conquests (informal empire)	Annexation date	Periods as informal empire	Distance (nautical miles) with japan	Pop 000s (1912)	Pop 000s (1938)	Gdp millions 1990 dollars (1912)	Gdp millions 1990 dollars (1938)	Tariffs (1912)	Tarifs (193)	Share over japan's exports (1912)	Share over japan's exports (1938)	Main product traded (1912)	Main product traded (1938)
Manchuria	1931	1912-1929	768.4	30,857	40,354	11,288	42,307	0%	0%	0%	8%	No trade	Machinery and wheat flour
China	1937	1912-1932	734.9	432,375	513,336	158,176	288,653	3%	27%	19%	8%	Cotton yarn	Spinning machines and wheat flour
Hong kong	1942	1912-1938	1,341	450	1,479	164	300	0%	1%	4.7%	0.4%	Coal and cotton	Coal
British malaya	1942	1912-1938	2,777	3,025	5,207	2,486	7,089	3%	17%	1.5%	0.1%	Coal	Railways wagons
British borneo	1942	1912-1938	2,496	208	301	171	303	11%	20%	0.0%	0.0%	No trade	Iron manufacture
French indochina	1940	1912-1938	1,760	16,990	23,164	433	838	16%	8%	0.1%	0.1%	Coal	Asphalt and raw silk
Indonesia	1942	1912-1938	3,264	51,105	71,484	42,818	80,044	5%	10%	0.7%	2.6%	Coal and matches	Shirts and other textiles
Philippines	1942	1912-1938	1,432	9,206	15,934	8,390	22,948	12%	12%	0.9%	0.8%	Coal	Cotton under-shirts
Siam	1941	1912-1938	2,268	8,559	14,980	3,012	2,380	7%	28%	0.2%	1.0%	Steam vessels	Steam vessels
Burma	1942	1912-1938	2,359	12,220	16,145	7,348	11,942	13%	18%	0.0%	0.4%	No trade	Cotton tissues
Gilbert and ellice	1944	1912-1938	3,422	31	34	162	451	17%	20%	0.0%	0.0%	No trade	Jeans
New guinea	1942	1912-1938	2,484	380	670	1,979	4,186	16%	16%	0.0%	0.0%	No trade	Cotton manufacture

Notes: *Tariffs represent tariffs with Japan, except in the case of China in which they represent average tariff*

APPENDIX B

Number of products and the Extensive Margins of Trade

One of the biggest concerns regarding the exploitation of historical margins of trade records is related with the treatment of statistical sources. For example, the easiest way to compute trade margins is to assume that the extensive margin is represented by the total number of different goods exported by a country. This simple procedure was followed by Huberman & et al (2017) and we have replicated it as shown in Table 9 of the paper.

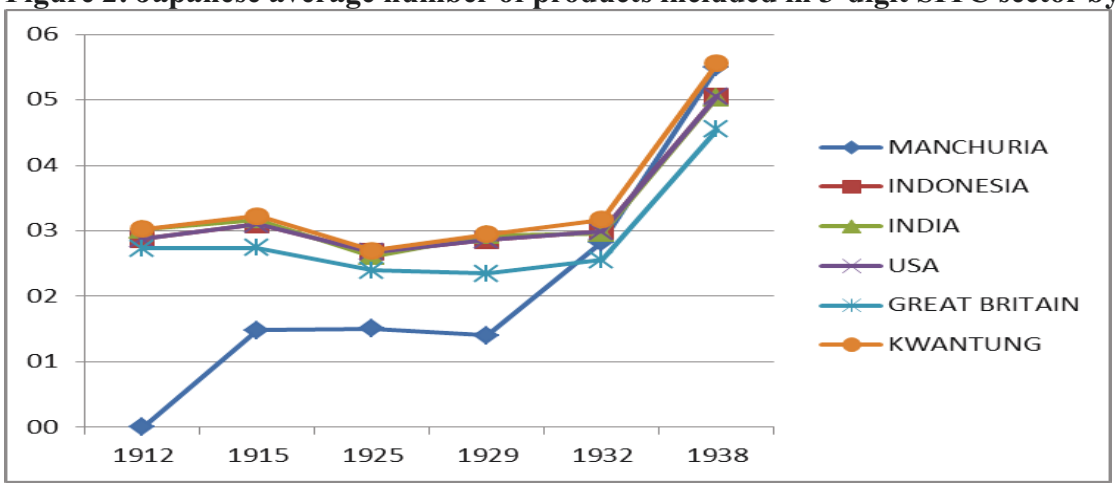
Nevertheless, the granular analysis of Japanese margins of trade might be biased because Japanese official records experienced an important increase in the number of products recorded. This phenomenon is wide spread across international trade records and it is related mainly with the increased diversification of tariffs on imported manufactures, the general improvements in trade bureaucracy and the standardization in the commodity classification of international records promoted by the League of Nations Brussels convention of 1913 and during the interwar years (see chap. 4 of Allen and Ely (1953)).

In this sense, increases in product coverage could overestimate our extensive margin of trade during the 1930s. This means that 1938 accounts for different product varieties of the same good, artificially incrementing the number of goods exported by Japan.[51] If the extensive margin collects the number of new products exported by Japan, it will be much higher in 1938 than in 1932, but this could merely reflect statistical modification rather than a structural change in Japanese exports.

Figure 5 provides partial confirmation of this phenomenon. The number of product varieties in the same sector exported to different countries increased in all cases around 100% between 1932 and 1938, thus artificially raising the number of goods exported by Japan.

[51] A casical example: cotton fabrics may be subdivided into unbleached, bleached,printed, dye . It is one commodity or four? Anothe example Egypt in its export estatics list nine varieties of raw cotton how many commodities are one or nine? (see cp. 4 Allen and Ely (1953)

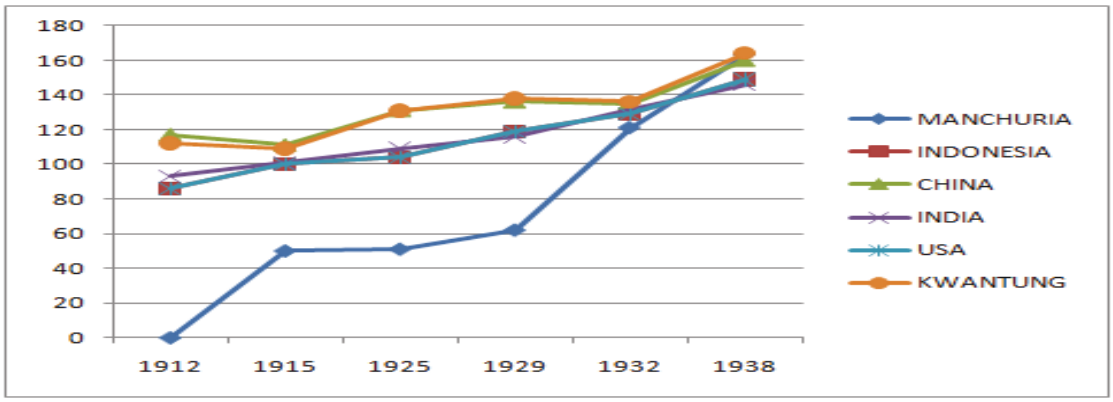
Figure 2: Japanese average number of products included in 3-digit SITC sector by region



Source: Annual Return of trade for the Empire of Japan (various years).

The database constructed includes the value of Japanese exports (in current yen) of each product exported to each country. Each different product exported has been categorised using the 2nd Revision of the Standard International Trade Classification (SITC) at a 5-level digit disaggregation in order to achieve a proper and precise product classification. This categorisation also permits us to distinguish new export products from those exports that are simply different varieties of the same product. For that purpose, products sharing the same 3-digit classification compose a single product category or sector used in this paper. This is similar to the strategy employed by (Meisner & Tang 2018). Through this method we observe that Japanese industrialization and imperial mechanisms, along with reductions in trade costs, permitted Japan to increase exports from 117 to 164 sectors, as can be observed in figure 3.

Figure 3: Japanese number of sectors by region



Source: Annual Return of trade for the Empire of Japan (various years)

Table 6: Japanese Export Determinants at the Margins of Trade
(Extensive Margin as Total Number of Products)

VARIABLES	(1) Total Extensive	(2) Total Intensive	(3) Extensive HS	(4) Extensive LS	(5) Intensive HS	(6) Intensive LS
GDP	0.325***	1.428***	0.245**	0.164	0.534*	0.958***
	(0.120)	(0.341)	(0.110)	(0.116)	(0.292)	(0.322)
RELPRODUCTIVITY	-0.0880	0.146				
	(0.290)	(0.320)				
REL PRODUCTIVITY HS			0.189		0.623***	
			(0.141)		(0.183)	
REL PRODUCTIVITY LS				-0.239		0.612***
				(0.324)		(0.173)
RELWAGES	0.180	0.697**				
	(0.215)	(0.285)				
RELWAGES HS			-0.287		0.381	
			(0.199)		(0.354)	
RELWAGES LS				0.474**		0.459
				(0.202)		(0.374)
POPDENSITYDIFF	0.0325	0.346*	0.0262	0.0829	0.240*	0.170
	(0.0666)	(0.206)	(0.0805)	(0.0824)	(0.133)	(0.152)
GDPCAPABSDIFF	0.0668	1.016**	0.153	0.0975	1.139**	0.0419
	(0.260)	(0.397)	(0.262)	(0.252)	(0.474)	(0.329)
FREIGHTS	-0.287**	0.0842				
	(0.140)	(0.308)				
FF HIGH SKILL			-0.458***		0.0980	
			(0.121)		(0.192)	
FF LOW SKILL				-0.414***		-0.382
				(0.141)		(0.270)
EXCHCONTROL	-0.295	-1.173	-0.623**	-0.413*	-1.258*	-0.726
	(0.239)	(0.875)	(0.270)	(0.233)	(0.660)	(0.530)
EXCHRATE	-0.168***	-0.316***	-0.176***	-0.162***	-0.337*	-0.340***
	(0.0531)	(0.105)	(0.0606)	(0.0493)	(0.175)	(0.0826)
TARIFF	-0.177*	-0.528***				
	(0.0963)	(0.181)				
TARIFFS HS			0.0171		-0.0319	
			(0.0746)		(0.0861)	
TARIFFS LS				0.00926		-0.526***
				(0.0786)		(0.120)
COLONY	0.835*	1.782**	0.762**	0.458	4.091***	3.270***
	(0.442)	(0.875)	(0.342)	(0.433)	(0.436)	(0.502)
FUTURE CONQUESTS	0.855***	0.533*	0.571	0.541	1.438***	3.413***
	(0.246)	(0.285)	(0.397)	(0.395)	(0.397)	(0.660)
DIPLOMATS	0.141*	0.0177	0.173**	0.153**	-0.168	-0.0727
	(0.0737)	(0.131)	(0.0741)	(0.0758)	(0.154)	(0.235)
IMPORTS	0.0291	0.0999	0.0175	0.0293	0.530***	0.167***
	(0.0402)	(0.0757)	(0.0378)	(0.0352)	(0.181)	(0.0396)
Constant	0.506	-10.21**	-0.466	-0.833	-10.87***	-5.229*
	(1.712)	(4.316)	(1.535)	(1.515)	(2.726)	(3.053)
Observations	674	674	676	676	676	676
R-squared	0.596	0.639	0.590	0.521	0.713	0.636

*Robust standard errors in parentheses: *** p<0.01, ** p<0.05, * p<0.1*

APPENDIX C

Manufacturing products by skill intensity and the dynamics of textiles

1. General division of total exports by skill intensity

We have adapted the 3 digit SITC categorization to a contemporaneous group of 16 manufacturing sectors following the British Board of Trade (1905) classification of British manufacturing exports. We have ranked these according to skill intensity following Tena-Junguito (2010). Table 1 shows these manufacture sectors ranked from high to low median earning workers at the turn of the century (High skilled (skill intensity between 11 and 13, ranked 1-6), Medium skilled (skill intensity between 9 and 10, which are ranked from 7 to 9) and Low skilled manufactures (between 5 and 8 skill intensity, ranked from 10 to 16). This strategy, suggested by Num and Trefler (2009), consists of differentiating high and low cut-offs inside the ranking to categorise in a more effective way high skills and low skill sectors. This strategy is hopefully less vulnerable to technological change during the first third of the twentieth century.

We have extended this strategy to primary products as a residual (assuming less skill intensity than in manufactures). Thus, we work with a simple division between high skill sectors that were more influenced by the second industrial revolution technologies and those that were less influenced. We recognize that, on one hand, this division represents a very rudimentary of capturing skill improvements inside sectors, especially productivity increases in Japanese textile industries in the 1920s and 1930s (See Wolcott (1994)), but on the other hand, this strategy captures better Japan's manufacturing dual aggregate sectoral advance in the second industrial revolution technologies as an indicator of industrial modernization in the inter-war years, which is the main objective of the paper.

Table 8 Skill intensity ranking

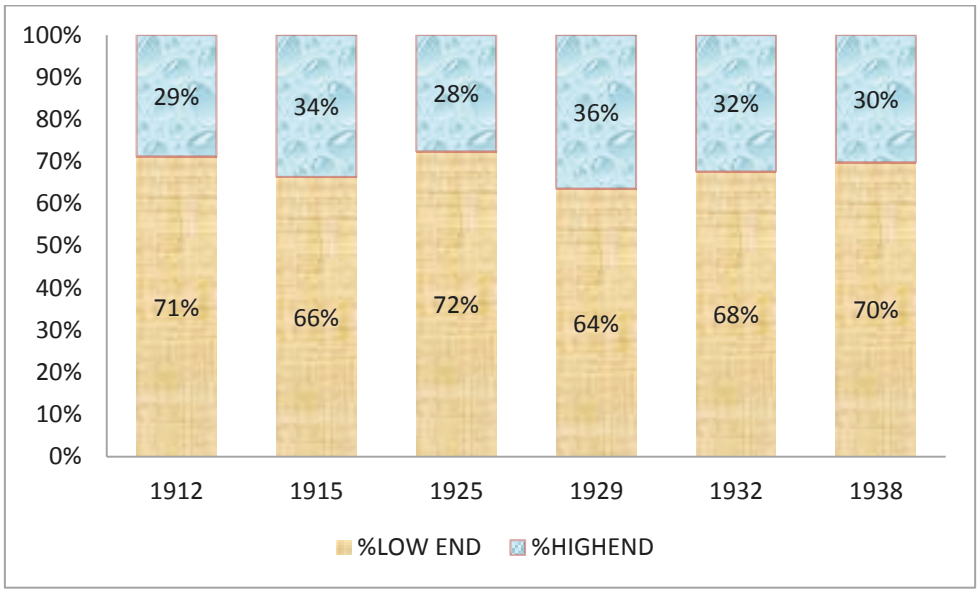
Ranking	Description	skill intensity	
1	Ships	13,01	
2	Machinery hardware&c	12,65	
3	Paper Manufactures	11,65	
4	Silk thrown	11,58	
5	Iron Steel Manufactures	11,29	
6	Leather and Manufactures	11,00	high cut-off
7	Copper lingots, Cakes, Slabs	10,01	
8	Alkali Chemical products	9,64	
9	Apparel	9,27	
10	Woollen & Worsted Manufactures	7,9	low cut off
11	Linen Manufactures	7,8	
12	Cotton Manufactures	7,74	
13	Jute Canvas and Sacking	7,04	
14	Woollen yarns(stuffs all wool)	6,2	
15	Linen Yarn	5,9	
16	Cotton yarns undyed	5,8	

Sources: See Tena-Junguito (2010)

2. Dynamics of Japanese high- and low-end textiles exports

In order to ascertain how the destination of Japanese exports varied across time, and which dynamics they followed according to economic and political circumstances, it is pertinent to exploit the possibilities offered by the granular database employed in the paper. For example, it has permitted us to further divide Japanese textile exports between high-end or highly sophisticated textiles and low-end ones. The first category includes apparel or finished clothing, the skill intensity of which is higher than 8, whereas the second category includes piece goods, yarns and other unfinished textiles with a skill intensity lower than 8.

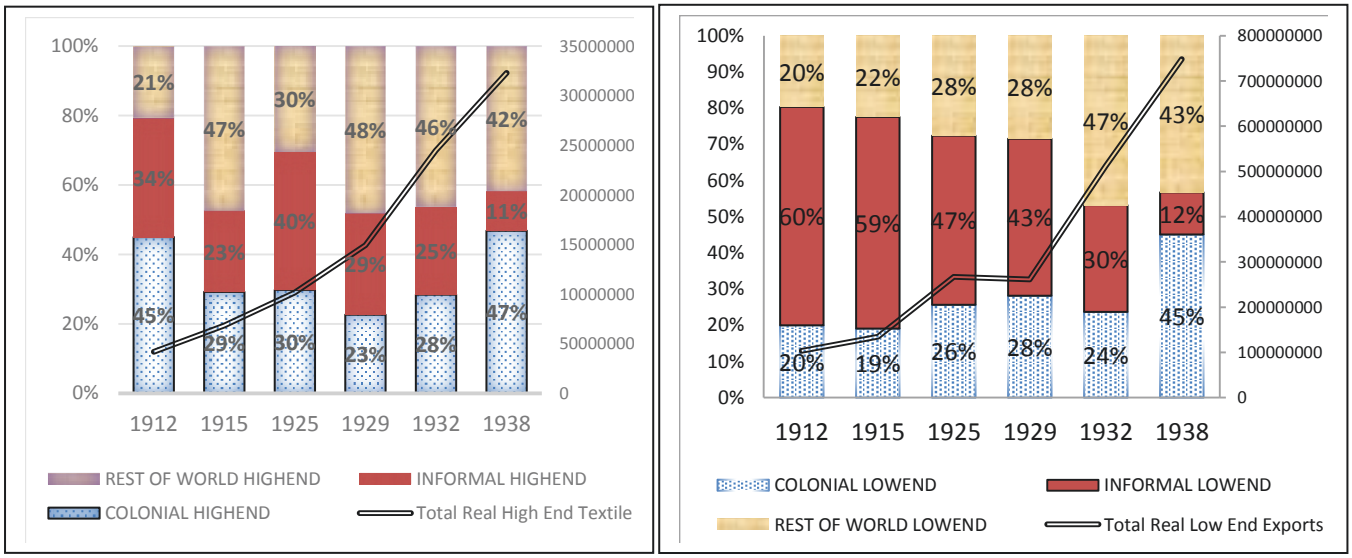
Figure 4: Share of low- and high-end textiles over total Japanese textile exports.



Source: Annual Return of trade for the Empire of Japan (various years).

We note that most textile exports were low-end; that is, cotton yarns, threads and other kinds of piece goods represented around 65-70% of the total, in contrast to clothing and apparel, which represented between 25% and 30% of textile exports.

Figure 5: Distribution of low- and high-end textiles by regions (1912-1938)



Source: Annual Return of trade for the Empire of Japan (various years).

Furthermore, it is interesting to observe the market behaviour of both kinds of exports. In both cases we can appreciate a transition from a focus on controlled territories to a distribution outside the Japanese sphere of influence, which ends after 1932, the year in which Great Britain and other powers diverted trade to their Empires and in which Japan, as a consequence of this and of its invasion of Manchuria, decided to launch an Empire-based development strategy.

This transition is more evident in the case of textiles, located on the bottom part of the skill intensity distribution. Beginning in 1912, it is evident that they are mainly exported towards countries composing the Japanese informal Empire in Southeast Asia (60%). According to the dynamics followed by other sectors in the Japanese economy, low-end textiles were first directed towards Japanese colonies which were politically and economically controlled by Japan. Once they achieved a certain degree of competitiveness, they were exported towards countries in the informal empire. After that, we can clearly appreciate a diversification of low-end textile exports towards the rest of the world, suggesting that Japan had reached a certain competitive threshold both regionally and internationally. This phase started in 1929, coinciding with the period in which Japanese low-end textile exports experienced their largest increase. The transition of high-end textiles is less gradual but also appreciable and in both cases the biggest increase in exports coincides with the opening towards new markets. Furthermore, it seems that high-end textiles were introduced sooner to international markets than low-end ones, suggesting that they were more responsive to market factors.

All in all, according to the literature and the data we have presented, both low- and high-end textile exports followed a similar tendency, in which they seem to have followed productive and international market characteristics, at least to a much higher degree than high skilled manufactures, which were extremely concentrated inside the Empire. Both kinds of exports experienced a strong Imperial bias after 1932, even though their final distribution was more evenly shared across regions than that of high skilled industrial exports.

This intuition can be verified following our gravity model for analysing the determinants of both high- and low-end textile exports. The variables employed have been the same as the ones used in the main paper since we haven't been able to obtain reliable variables presenting a higher degree of disaggregation. For example, productivity reflects GDP per hour worked in the overall textile sector related to total GDP per worker in partner countries.

Table 7: Determinants of high- and low-end textile exports

VARIABLES	(1) High-End Textiles	(2) Low-End Textiles
GDP	0.909***	0.588***
	(0.220)	(0.213)
REL PRODUCTIVITY TEXTILES	1.395***	1.246***
	(0.205)	(0.167)
RELWAGES TEXTILES	0.939***	0.503
	(0.304)	(0.330)
POPDENSITYDIFF	0.530**	0.554***
	(0.230)	(0.127)
GDPCAPABSDIFF	0.395	0.335
	(0.462)	(0.380)
FFLOWSKILL	-0.378*	-0.284*
	(0.210)	(0.171)
EXCHCONTROL	-0.626	-0.468
	(0.401)	(0.414)
EXCHRATE	-0.544***	-0.567***
	(0.0981)	(0.100)
TARIFF LS	-0.324***	-0.273***
	(0.109)	(0.0959)
COLONY	2.955***	3.004***
	(0.424)	(0.364)
FUTURE CONQUESTS	2.448***	2.461***
	(0.490)	(0.437)
DIPLOMATS	0.107	0.303**
	(0.0843)	(0.125)
IMPORTS	0.182***	0.140***
	(0.0492)	(0.0313)
Constant	-4.496	0.488
	(2.975)	(2.352)
Observations	676	676
R-squared	0.791	0.779

The results show that productivity played a role in determining these kinds of exports, which is larger than the one it played in other sectors. This suggests that Japanese comparative advantage played a relevant role in the expansion of textile exports and its strength was similar at both ends of the skill classification. Contrary to high skill manufactures, textiles were driven by productivity with the difference that a relevant share of their exports were directed towards colonies and future conquered territories, although both kinds of textiles were more biased towards the first than to the second. Interestingly, we can also appreciate that high-end textiles were slightly more responsive to changes in comparative advantage variables and less sensitive to imperial controls.

Both low- and high-end textiles were first introduced in the colonies, then in the Japanese future conquests territories, and once they became internationally competitive, they were distributed all over the world. What's more, they demonstrated significant expansion in the world market in spite of the backlash bias towards its colonies experienced after the reaction of the British Commonwealth trade bloc to the Manchuria invasion that partially excluded Japanese textiles from India and other markets. In addition, the comparison with second industrial revolution exports and the fact that productivity played a bigger role in determining textile exports, along with the dynamics presented above, suggest that textile exports responded more to productivity determined comparative advantage than high skilled manufactures, which were more strongly affected by Japanese imperial aims.

APPENDIX D

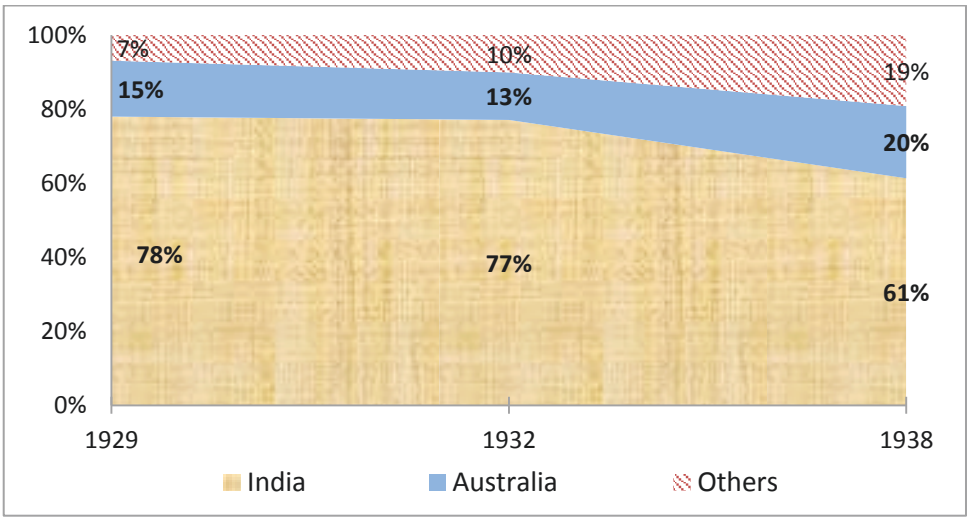
The Great Depression, Imperial policies and manufactured exports

1. The Great Depression, Ottawa agreement and Japanese Empire

The reasons behind Japan's considerable commercial concentration in its colonies and neighbouring countries inside the region are varied and not fully reviewed in the paper. Many authors view the Japanese invasion of Manchuria in 1931 as a turning point in the sense that after this great victory, the military gained important political power that permitted them to continue lobbying the government for a continued pursuit of Imperial expansion. Of course, this historical event was of relevance to the subsequent commercial, economic and political decisions adopted by the Japanese government during the 1930s, as were the needs of the Japanese Zaibatsu for gaining access to bigger markets and achieving economies of scale in a context of a protected market with monopolistic privileges. Nevertheless, there are other factors that might have also facilitated Japan's strong focus on its empire as a source of exports. In that sense, the international landscape might have played a significant role.

First of all, after the 1929 crash, GDPs declined rapidly and the collapse of international demand was reinforced by a generalized increase of *beggar my neighbour* policies with increased tariffs, competitive devaluations, and the creation of new trade blocs. Differences in international and domestic demand declines are captured in our regressions. In that sense, the immediate Japanese response was to focus on exerting its comparative advantage on closer markets, especially in India, which was by far the largest accessible market for Japan apart from its colonies at that time. This can be appreciated in Figure 3 of the paper (Other Asia and Pacific share raise from 18% to 24% after 1929) and also in Figure 6 in the present appendix in which we can see how the vast majority of manufacturing exports towards this region are concentrated on India.

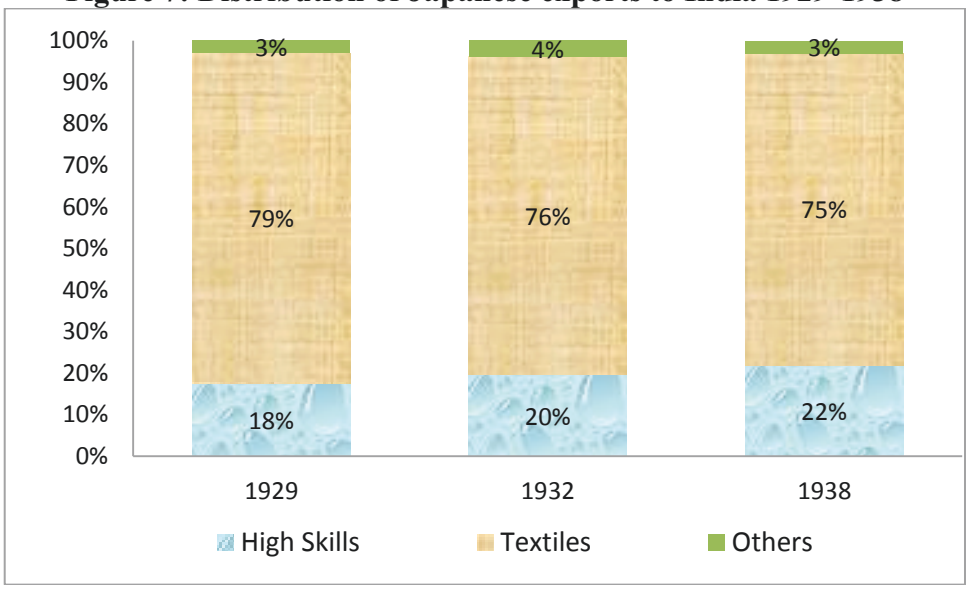
Figure 6: Japanese Manufacturing exports by regions



Source: Annual Return of trade for the Empire of Japan (various years).

Regarding the kinds of products and the competition faced by Japan in its territory, it is remarkable how Japan concentrated its manufacturing exports to India on textiles as shown in Figure 6:

Figure 7: Distribution of Japanese exports to India 1929-1938



Source: Annual Return of trade for the Empire of Japan (various years).

As show Table 1 of the text, Japan enjoyed comparative advantage in the production of textiles. This is also confirmed by Robertson (1990) and Wolcott (1994), who mention that during the interwar years, especially the 1930s, Japan became the world's main exporter of cotton textiles. According to the former author, the main competitor of Japan on the Indian market was Great Britain, which also enjoyed political privileged access to the territory.

Competition grew in intensity during the 1920s, but Great Britain didn't give much importance to the growth of Japanese cotton textile exports to India since they attributed them to the 1924 Yen devaluation. Indeed, time proved the British correct because, after the Japanese financial crisis in 1927 and subsequent increase in the price of Yen, Japanese exports to India decreased.

Nevertheless, Japanese cotton textile production enjoyed other advantages over the British than lower labour costs or exchange rate depreciation. The large scale of Japanese textile producers, the high level of integration between firms, the tendency to concentrate on a reduced set of product varieties and the closer links between producers, suppliers and merchants, provided a cost advantage that the British producers couldn't match. This advantage also allowed the Japanese to surpass the British in cotton textile exports not just to India, but also in other markets traditionally dominated by the British, like China or East Africa. All in all, it seems that the commercial performance of the Japanese outside its Empire was dominated by textile exports, in which it was the leading exporter, and this performance was possible thanks to factors awarding the sector comparative advantage.

The largest increase of exports to India during the Great Depression might be also related with the Yen's devaluation after 1931, which was larger than that of the sterling pound. Between 1929 and 1932, Japanese exports towards its Empire experienced a reduction due to the Chinese boycott in retaliation of Japanese military campaigns over Manchuria in 1931. This fact could have also forced Japan to diversify its exports towards territories like Australia, Africa or Ceylon. In each of these territories, Japanese cotton textiles enjoyed a comparative advantage over British ones.

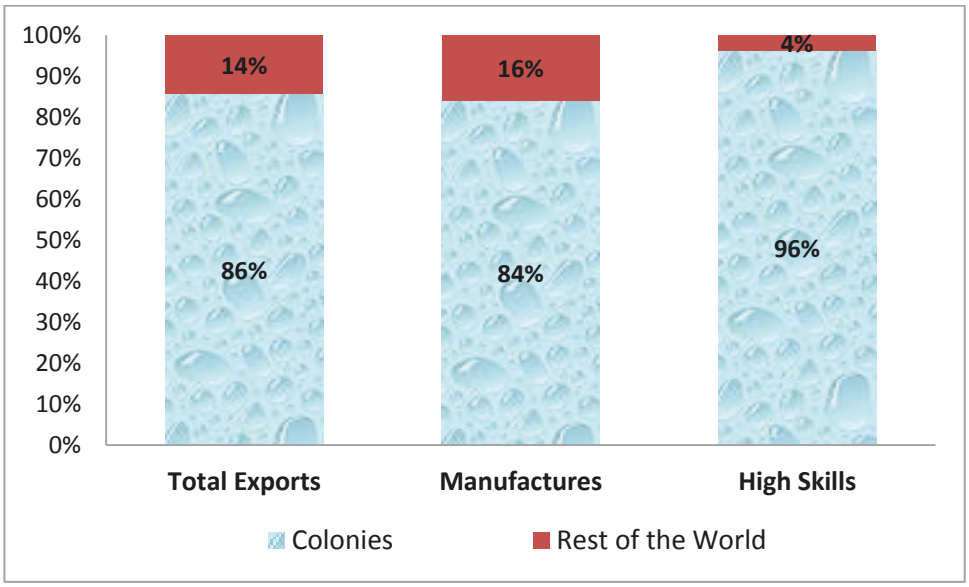
For this reason, the British response to Japanese competition in cotton textiles in India and other colonial territories came in the form of imposing higher tariffs and quotas after 1932 and forcing them to negotiate to raise their prices. This would have provoked the retreat of Japanese exports from British dominions appreciable in previous graphs, and may explain the strong Japanese focus on its empire which is observed in 1938 exports. Those exports were, as shown in the paper, not dominated by comparative advantage, but rather by other political motives and focused on high skilled manufactures.

2. Great Depression colonial bias on high skilled manufacturing exports

We deal here with a potential bias of the effect of the colonial increase on total Japanese exports despite their low initial levels. It is pertinent to offer evidence that proves that the colonial effect is much bigger for high skilled exports.

In order to do, we have calculated increases in total, manufacturing and high skilled exports for the period in which they rose the most (1932-1938) and have computed the colonial share of these increases. The results clearly show a colonial bias, as colonies represent 86% of the increase in total exports. This proportion is slightly reduced when we examine the increase in total manufactures (84%). But the evidence is conclusive, showing that Japanese colonies were by far the main destination market of high skill manufactured exports after 1932, representing 96% of the total increase. In other words, figure 8 shows the colonial bias of Japanese total and manufacturing exports and that this bias was much higher for high skilled manufactures.

Figure 8: Japanese exports increase 1932-38 (%) by groups of products and region.



Source: Annual Return of trade for the Empire of Japan (various years).

APPENDIX E

The endogeneity of exports on productivity and transaction costs.

Another important concern related with this article and with papers in general dealing with export determinants and productivity is precisely the possible endogeneity between the key variables. For example, productivity increases may be affected by export expansion. The mechanisms are related with the fact that exogenous changes in trade costs might also generate improvements in productivity through economies of scale (the market expands and unit costs reduce) or experience (increasing production might lead to learning by doing and reduced costs). For that reason, the first test we are going to run in this section is to check whether increases of exports generated improvements in productivity in Japan.

Table 9: Effect of export increase on productivity

VARIABLES	(1) Rel productivity	(2) Rel productivity	(3) Rel productivity	(4) Rel productivity	(5) IV
logrelativeopen	-0.0721				
	(0.0795)				
logexports		0.0418			
		(0.0261)			
logexportsHS			0.0572**		
			(0.0257)		
logexportsLS				0.0949***	
				(0.0344)	
ivexports					-0.0251
					(0.0429)
Constant	-0.381***	-0.877**	-0.367	-1.293***	0.177
	(0.0482)	(0.368)	(0.315)	(0.443)	(0.673)
Observations	123	140	131	133	149
R-squared	0.012	0.034	0.068	0.135	0.003

In order to do so we follow an approach similar to that of Huberman et al. (2017): first, we check whether improvements in openness (increases of Japanese exports as a percentage of GDP) generated increases of Japanese productivity (measured as non-agrarian GDP per hour worked). The same has been done using nominal exports or high and low skill manufacturing exports. Finally, an instrument has been created which is called ivexports and is constructed by the predicted value of exports regressed on the usual variables with the exception of productivity measures.

$$\text{IVEXPORTS}=\beta_0 + \beta_1 lnGDP_{it} + \beta_2 CA_{it} + \beta_3 TC_{it} + \beta_4 COLONY_{it} + \beta_5 FUTURE\ CONQUESTS_{it} + \beta_6 IMPORTS_{it} + \beta_t + \varepsilon_{it}$$

The results show that in general increments of exports didn't increase Japanese productivity. However, there is a perceivable effect at the skill level, although the effect of increases of high and low skilled exports on productivity is very weak. In other words, the results in table 10 permit us to reject the possibility that productivity growth was endogenous to export growth for the case of 1912-1938 Japan.

Another possible source of endogeneity could be present in trade costs in the sense that their causality relation with exports might be bidirectional. The clearest example is that of diplomats, since increases in the number of Japanese diplomats in a country might increase Japanese exports to that country, but the fact that Japan is trading with the country might also attract a larger number of Japanese consuls there. This possibility is real, as is demonstrated in table 11, in which the value of Japanese exports affected in a positive and significant way the number of Japanese Diplomats abroad, the number of foreign diplomats in Japan and total Diplomatic representation (the sum of diplomats abroad and foreign diplomats in Japan). Furthermore this phenomenon could also appear in the rest of trade costs or even in productivity measures.

Table 10: Effect of Changes in Exports on the Number of Japanese Diplomats Abroad

	(1)	(2)	(3)
VARIABLES	Japan Diplomats abroad	Diplomats in Japan	TOTAL DIPLOMATS
logexports	0.271***	0.232***	0.232***
	(0.0433)	(0.0221)	(0.0395)
Constant	-2.731***	-1.622***	-1.537**
	(0.669)	(0.362)	(0.609)
Observations	327	165	327
R-squared	0.170	0.541	0.165

For that reason, it is important to ascertain whether the dependent variable (exports) is not affecting the independent variables, because it would lead to distorted and biased effects of trade costs on export growth. In order to do this, we take lags of every independent variable so as to avoid them being affected by changes in exports, as current exports can't affect past trade costs.

Table 11: Japanese Exports Determinants (Lagged Independent Variables)

VARIABLES	(1) EXP
GDP	0.977***
	(0.300)
RELPRODUCTIVITY	0.544*
	(0.292)
RELWAGES	0.125
	(0.140)
GDPCAPABSDIFF	1.035**
	(0.408)
POPDENSITYDIFF	0.601***
	(0.125)
FREIGHTS	-0.219
	(0.177)
TARIFFS	-0.338**
	(0.140)
EXCHCONTROL	-1.757
	(1.097)
EXCHRATE	-0.457***
	(0.109)
COLONY	2.638***
	(0.706)
FUTURE CONQUESTS	0.832***
	(0.305)
DIPLOMATS	0.375***
	(0.109)
IMPORTS	0.156*
	(0.0861)
Constant	-4.937
	(3.044)
Observations	673
R-squared	0.741

Table 12 shows export determinants lagged by one period, and we can see that the main results still hold when we account for the effect of trade determinants on exports one period ahead. By doing this, we avoid bias conclusions generated by the hypothetical effect of export growth on trade determinants, and we also find that the employed trade determinants were persistent since changes in productivity and trade costs affected Japanese exports in the future period.

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