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IDE DISCUSSION PAPER No. 450

Did Japanese Direct Investment in Korea Suppress Indigenous Industrialization in the 1930s?

Evidence from county-level factory entry patterns

Yutaka Arimoto* and Changmin Lee**

March 2014

Abstract

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Keywords: foreign direct investment; entry spillovers; Korean industrialization

JEL classification: F21, F23, M13, N65, O14

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Abstract

Foreign direct investment (FDI) can deliver both positive and negative spillovers to the local economy. Negative effects such as crowding-out or entry-barrier effects might outweigh the positive ones when the technological gap between foreign and local firms is significant. In this regard, there is an ongoing debate about whether the advance of Japanese firms into Korea under colonization in the 1930s suppressed or facilitated indigenous development. This paper examines the impact of Japanese direct investment on the entry of Korean-owned factories. By using the census of manufacturing factories in Korea, we exploit variations in the share of Japanese factories and their entry rates across counties within the same subsectors. We find that within a subsector, gross entry rates of Korean factories were higher in counties with higher presence and entry of Japanese factories. Positive correlations are also found between subsectors. Anecdotal evidence suggests that technology transfer and spin-offs were the possible channels of positive entry spillovers. The results imply that Japanese direct investment did not suppress the entry of Korean factories and that FDI and foreign firms could exert positive entry spillovers on indigenous firms, even at a very early stage of industrialization. (193 words)

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Keywords: foreign direct investment; entry spillovers; Korean industrialization

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1. Introduction

It is undisputed that colonial Korea experienced rapid industrialization during the 1930s. The reason researchers worldwide began focusing on the industrialization of colonial Korea is closely related to the emergence of the newly industrialized economies (NIEs) of Asia during the 1980s. Unlike the newly industrializing regions in Central and South America and Europe, the economies of the Asian states of Korea, Taiwan, Hong Kong, and Singapore survived two oil crises and achieved considerable growth during the 1980s.

A series of studies has attempted to trace the source of these countries' success to the legacy of the colonial era. In the case of Korea in particular, considerable attention has been given to the claim that the state-led growth under the Chung-Hee Park regime (1963-1979), which has been dubbed a developmental dictatorship, originated in Korea's colonial administration under Japanese rule. Proponents of this view assert that Korea's industrialization during the 1930s resulted from the industrial policy of the Governor-General of Korea (Eckert, 1991; Woo, 1991; Kohli, 1994). However, subsequent research has revealed that industrial policy of the Governor-General of Korea during the 1930s is a catchphrase with little substance (Kim, 2002).

In light of the debate over the origins of Korean industrialization, interest has grown in case studies focusing on private capital such as companies and factories during the colonial era. These case studies have variously emphasized the positive and negative effects of the advance of Japanese firms into Korea. However, opinions are divided regarding whether industrialization during the colonial era included Korean-owned firms. One strand advocates that industrialization in the 1930s only benefited large-scale Japanese factories that advanced into Korea and delivered scant developmental benefits or even negative crowding-out effects to Korean-owned firms. This view is based on the fact that industrialization was driven by production to meet the Japanese military's demand and lacked organic linkages with Korea's industries and economy. The other strand asserts that industrialization in the 1930s was accompanied by the development of Korean factories, and in fact, the growth and number of Korean factories overtook those of Japanese factories owing to the creation and expansion of the industrial product market in Korea, led by the successful increase of agricultural exports.

The debate is closely related to the literature on the spillover of foreign direct investment (FDI) to indigenous firms. FDI is expected to increase productivity of indigenous firms and promote growth through externalities in the form of technology transfers. Foreign firms can also exert positive spillovers by stimulating demand through purchases and sales of intermediate goods (vertical linkages) and by creating new demand through exports (Markusen and Venables, 1999). FDI may also act as an incubator for indigenous firms by enabling local employees to gain experience they can use to start their own businesses. On the other hand, foreign firms can negatively affect indigenous firms by crowding out inefficient firms or serving as an entry barrier by stealing the market with their advantages over technology, capital, and marketing abilities. Indigenous firms in developing countries face higher risks of being driven out by foreign firms as the technology gap is greater (Caves, 1996; Blomstrom, Kokko, and Zejen, 2000).

Empirical examinations of FDI's entry or exit spillovers are scarce compared with the sizeable literature on productivity spillovers[1]. The limited quantitative evidence indicates a positive correlation between FDI, represented by presence or entry of foreign firms, and domestic entry. Görg and Strobl (2002), De Backer and Sleuwaegen (2003), and Ayyagari and Kosová (2010) find positive entry spillovers in Ireland, Belgium, and the Czech Republic, respectively. On the other hand, Anwar and Sun (2012) find no overall entry spillover from foreign presence on domestic entry in China, but FDI from all countries except Hong Kong, Macau, and Taiwan are positively correlated with the domestic entry rate. Evidence for the static (instantaneous) effect of foreign entry is mixed; Görg and Strobl (2002) find a positive effect in Ireland, while De Backer and Sleuwaegen (2003) find a negative correlation in Belgium. In addition, Kosová (2010) finds a static crowding-out effect where foreign entry increases the exit rates of domestic firms.

In this paper, we integrate these two distinct strands of the literature to answer the following question: Did Japanese direct investment during Korea's colonial era suppress industrialization by Korean-owned firms? In particular, did the presence and penetration of Japanese factories discourage the entry of Korean factories? To answer this question, we investigate entry patterns of Korean factories by utilizing subsector–county-level panel data aggregated from the census of factories for 1932, 1936, and 1940. We exploit variations in the share of Japanese factories and their entry rates across counties within the same subsector to determine if the entry of Korean factories was suppressed in counties with higher presence and entry of Japanese factories. To deal with concerns of omitted variable bias (i.e., unobserved subsector- or county-level factors that affect both Japanese presence or entry and Korean entry), we control for subsector and characteristics or include fixed effects for subsector–county, year, and subsector- and county-specific trends.

We find that Korean entry rates were, in fact, higher in counties with a higher presence of Japanese factories: a 10 percentage point increase in the lagged share of Japanese factories increases entry rates of Korean factories by 9.1 percentage points on average, roughly doubling the figure from 0.116 to 0.207. As another measures, a 10 percentage point increase in the lagged share of Japanese factories increases the probability of Korean entry by 2.9 percentage points, an 11.6% increase from 24.9%. These results counter the view that the advance of Japanese factories had little benefit to or crowded out Korean factories. Instead, it suggests possible entry spillovers by the Japanese factories. Our intensive review of the case studies of some sectors indicates that there was

[1] See Hanousek et al. (2011), Havranek and Irsova (2011), Irsova and Havranek (2013), and references therein for empirical studies on productivity spillovers of FDI. These papers provide recent meta-analyses of the empirical studies and conclude that horizontal spillovers (spillovers within a sector) are on average zero while spillover to suppliers is economically significant, whereas spillover to buyers is small.

considerable technology transfer from the Japanese factories and spin-offs by their Korean employees.

This paper makes two main contributions. First, we contribute to the debate on indigenous industrialization in 1930s Korea and, more generally, on the role of FDI in indigenous development. Although previous literature asserts the case for indigenous industrialization by showing that the number of Korean factories increased in the 1930s, it does not comprehensively investigate the effect of the advance of Japanese factories on Korean factories (Huh, 1993; Kim, 2002). We take a step further to examine more direct evidence regarding the relationship between Japanese direct investment and Korean industrialization and show that entry of Korean factories was more likely in counties with a higher number of Japanese incumbents.

Our second contribution is an extension of the literature on entry spillovers from FDI. The current understanding relies on evidence from developed or transition countries such as Ireland, the Czech Republic, Belgium, and China, where the technological gap between foreign and indigenous firms seems to be moderate (Görg and Strobl, 2002; De Backer and Sleuwaegen, 2003; Ayyagari and Kosová, 2010; Anwar and Sun, 2012). However, crowding-out or entry-barrier effects of FDI are expected to be larger in circumstances with substantial technological gaps. This paper studies an ideal case, wherein Korea was at a very early stage of industrialization and agriculture was its predominant industry; therefore, the Japanese factories that advanced into Korea enjoyed advantages of technology and scale accrued during the World War I boom. This case shows that FDI can serve as a catalyst for indigenous development, as Markusen and Venables (1999) suggest, even at a very early stage of economic development.

We also differ from previous studies that examine the effects of FDI on local entry by considering regionally "local" spillovers. As these studies use industries as a unit of observation, they implicitly assume that the spillover would be exhibited over the entire country. However, competitions or spillovers may only affect factories locally, as Aitken and Harrison (1999) suggest, especially in developing economies with limited transportation and information infrastructures. Thus, we take local spillovers into account by examining entry patterns at the city–county level.

This paper is structured as follows: Section 2 provides the historical background of industrialization and Japanese direct investments in Korea during the 1930s. Section 3 discusses the benefits and drawbacks of the advance of Japanese capital into Korean factories. Section 4 describes the specification and data. Section 5 presents the empirical results. Section 6 discusses and interprets the empirical findings with historical anecdotes focusing on certain sectors. Section 7 concludes.

2. Industrialization in Korea in the 1930s

2.1. Trend of Korean industrialization

It is clear that colonial Korea achieved rapid industrialization in the 1930s. Under Japanese rule, colonial Korea experienced remarkable expansion in manufacturing. As Figure 1 shows, manufacturing accounted for 15% of total output in 1918, 26% in 1930, 30% in 1935, and 41% by 1940. Even though the Korean economy remained predominantly agricultural in the 1940s, manufacturing had become comparable with the agricultural sector (Kim, 2002: 128). The number of factories continually increased from the time Korea was annexed by Japan in 1910 until 1940, and the number of Korean-owned factories surpassed that of Japanese-owned factories by the mid-1920s, with the gap increasing in the 1930s (Figure 2)[2]. However, due care should be taken when interpreting this data. It is important to note that most large factories were owned by Japanese, and most Korean factories were small to medium sized.

== Figure 1. Share of sectors in total output ==

== Figure 2. Number of factories ==

Korea's industrialization in the 1930s had certain specific features. The proportion of primary industries gradually declined in the 1930s, whereas manufacturing and mining became significant sectors. In particular, heavy and chemical industries grew rapidly, and their total output overtook that of light industries by around 1940. Many domestic industries were transformed into modern factories, which used mechanized equipment, electric power, and a relatively large labor force. The output of traditional industries, which was 40.5% of total output until 1933, sharply dropped to 21.9% in 1939. Moreover, as commerce and trade were boosted in the 1930s, the gap in commodity prices, interest rates, and wages decreased throughout the country, and business cycles developed in near perfect unison between Japan and colonial Korea (Huh, 1996: 181-182).

2.2. Japanese direct investment in Korea

Much of Korea's industrialization during the 1930s was sparked by the influx of Japanese capital, which rose sharply during the late 1910s, a period of entrepreneurial boom. Since the *Company Law*, which restricted company start-ups, was incrementally eased after World War I, direct investment from Japan was considerable, and many Japanese-owned firms were established in Korea (Kobayashi, 1994: 207-213.) However, this investment boom was only temporary, and from the 1920s onward, direct investment from Japanese firms stagnated considerably (Kaneko, 1986: 59).

[2] The increase in factories was most striking during the 1930s. From 1930 to 1933, the number of Korean factories increased by 77%, and Japanese factories also increased by 31%. The proportion of Korean to Japanese factories significantly increased, with the former being as much as 63% more in 1938 (Joo, 1996: 135.)

Direct investment of Japanese capital rose again during the late 1920s, after a handful of pioneering Japanese firms moved into Korea. In 1926, the Japan Nitrogenous Fertilizer Company set up the Korea Nitrogenous Fertilizer Company, and in 1927, it established the Korea Hydroelectric Power Company[3]. The advance of the Japan Nitrogenous Fertilizer Company encouraged other Japanese firms to increase direct investment in Korea. Consequently, a diverse range of Japanese capital investment began entering Korea in the late 1920s, such as the Mitsui Group (the Nanboku Cotton Company, Gunze Textiles, Toyo Textiles, and Onoda Cement Corporation), the Mitsubishi Group (Chosun Heavy Industries), the Nichimen Group (Chosun Cotton, Jeollanam-do Textiles), the Kanebo Group (Kanegafuchi Spinning), the Katakura Group (Katakura Textiles), and the Asano Group (Asano Cement).

The advance of Japanese firms into Korea gathered momentum during the 1930s. According to the Long-term Economic Statistics (LTES) estimates shown in Figure 3, the total annual Japanese investment into Korea prior to 1927 (excluding 1920 and 1923) never rose above 100 million yen[4]. However, the value surpassed the 100 million yen mark in 1928, and continued rising to 200 million in 1933 and 300 million in 1937. The rise in investment into Korea was particularly striking during 1934-1940 (Mizoguchi, 1988: 298), and the nature of investments also changed. Much of the Japanese capital that flowed into Korea until the 1920s was state capital and large-scale capital, but the balance shifted considerably toward industrial capital from the 1930s onward, including small- to medium-scale private capital (Ahn, 1990: 102).

== Figure 3. Total annual Japanese investment into Korea ==

There are two probable reasons for the substantial increase in the inflow of Japanese capital into Korea in the 1930s[5]. First, as a result of the consecutive depressions of the late 1920s and early 1930s, the liberal policy regime of the 1920s became discredited and state interventionism gained momentum in Japan (Cha, 2003: 131). In response to the financial crisis of 1927 and the Showa Depression of 1930-1931, the Japanese government introduced the *Major Industry Control Act* in 1931, which resulted in many Japanese firms building their factories in colonial Korea to avoid

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[3] The sum of these two companies' capital was the third largest in Korea, behind the Bank of Korea and the Korea Railway Company. In 1927, both companies began building factories and power plants, and in 1929, the Korea Nitrogenous Fertilizer Factory was founded in Hŭngnam, and a hydropower plant was completed on the Bujeon River. In the 1930s, following in the footsteps of these companies, other large Japanese companies successively built modern textile, chemical, and cement factories in the Korean Peninsula (Lee and Park, 1998: 28).

[4] Japanese scholars at Hitotsubashi University engaged in LTES between 1967 and 1989. In this project, Yuzo Yamamoto estimated the amounts of Japanese annual investments in Korea.

[5] On the other hand, we can highlight three traditional explanations of the inflow of Japanese capital into Korea. The first is that the Great Depression caused a dramatic drop in profits across all industries and led to the accumulation of surplus capital that sought outlets of investment, and some of this capital found an outlet in Korea. The second explanation is that in Korea, the factors of production were low compared with those in Japan. The third explanation is that Korea had fewer economic restrictions than Japan and thus served as a haven for capital (Ahn, 1990: 103-104.)

Japan's rigid government controls on production and sales[6]. Second, colonial Korea was becoming an attractive marketplace for Japanese entrepreneurs during the 1930s owing to factors including inexpensive power supply, cheap labor force, and the Governor-General's provision of financing and tax-based support.

Examining the details of Japanese capital investments during this period, heavy and chemical industries are predominant with 90% of the market share, largely comprising electronics, chemicals, iron, and light metals. On the other hand, the proportion of machinery-equipment manufacturing was relatively low. With regard to total assets, large-scale capital represented a high proportion of total assets, and the development of middle-scale chemical industries in the 1930s was led by large-scale direct investment by a few Japanese large-scale businesses. With the exception of certain industries such as the spinning industry, many Japanese-owned factories that engaged in light industry were based on small to medium-scale capital; therefore, they engaged in close competition with Korean-owned factories (Huh, 1996: 195-197).

2.3. Start-ups and growth of Korean factories

The direct investments by these Japanese firms into Korea spurred the industrialization of the country and resulted in many Korean start-ups. Whereas Japanese capital followed an increasing trend from the end of the 1920s onward, Korean capital began to rise rapidly only in the 1930s. As Figure 2 shows, the number of Korean-owned factories surpassed and greatly superseded that of Japanese-owned factories from the 1930s onward.

Despite this increase, such activity was disproportionately weighted toward certain categories of industry, including rice-milling, liquor, and oil production industries. These three major industries accounted for 60% of all Korean-owned factories. Furthermore, a development gap existed between the modern and traditional sectors. As evidenced by machinery manufacturing, the knitting industry, and the flour-milling industry, the industries that developed successfully were modernized industries introduced from Japan. However, as evidenced by the ceramics, salt, and wadding industries, more deeply traditional categories of industry experienced a relatively striking decline[7]. In addition, the degree of development differed depending on the factory's scale: the growth of medium-sized factories with a regular workforce of 50-200 people was remarkable, compared with that of larger factories with a workforce of more than 200 people (Huh, 1993: 134).

Korean capital not only grew in factories with five or more regular employees but also saw

[6] The industrial policy implemented by Kazusige Ugaki, the Governor-General of colonial Korea from June 1931 to August 1936, focused on encouraging Japanese entrepreneurs to invest in colonial Korea and granting a favorable environment for capital movement (Kim, 2003: 34-35). Takeo Suzuki (1942: 93-95) described Ugaki's policies as "Ugaki Liberalism" and presented the industrialization of colonial Korea, as initiated by Japanese capital, as the Korean industrial revolution.

[7] However, a handful of these business categories, such as the silk fabrics industry, which involved small-scale factories based on a foundation of handicraft manufacturing, were late in upgrading to new technologies. Therefore, their number continued to rise into the 1930s.

considerable growth among cottage industries, which were not included in the statistics if they had fewer than five workers. The output of cottage industries represented more than 60% of the total industrial output in 1923, but this proportion fell steadily to 23% in 1938. However, this does not imply that the scale of production contracted. In fact, real production levels increased, and cottage industries continued to hold an important position in Korean industrial output until the Sino-Japanese War (Kim, 2002: 130). The main products produced in household businesses were soybean paste, soy source, straw products, cotton fabrics, and hemp fabrics. While these products were initially intended for domestic consumption, many cottage industries successfully upgraded to factory industries by expanding their scale. During the 1930s, from all small-size Korean factories with a regular workforce of 5-50 people, between 30 and 50% were former cottage industries (Huh, 1993: 147).

3. Pros and cons of Japanese direct investment in Korea

3.1. Entry spillovers of foreign firms

FDI can be expected to have both positive and negative effects on entry and exit of indigenous firms (Markusen and Venables, 1999; Görg and Strobl, 2002; Ayyagari and Kosová, 2010; Anwar and Sun, 2012). On the positive side, first, foreign firms can generate technology spillovers that transfer advanced knowledge and technology to indigenous firms. This would ease the catch-up of indigenous firms, foster entry, and raise existing firms' chances of survival. Second, foreign firms can act as incubators of indigenous firms and facilitate spin-offs by enabling local employees to gain experience before starting their own businesses. Third, foreign firms can create and expand demand: they might create new demand through exports of final products or generate additional demand for intermediate goods. Expansion of demand for intermediate goods would induce entry and survival of indigenous firms in upstream sectors. It can also facilitate entry in the downstream (final goods) sector by enabling access to cheap and high-quality inputs. Finally, although foreign firms might have strong competitive advantages over indigenous firms in the home-country or export market, indigenous firms are in a significantly better position to market locally. Therefore, in places where local markets are expanding, indigenous firms might outperform foreign firms after catching up technically.

On the negative side, foreign firms might serve as an entry barrier for indigenous firms. In general, in comparison with indigenous firms, foreign firms have advanced skills and technology, abundant capital, and strong networks of suppliers and buyers in the home country. These characteristics enable foreign firms to enjoy higher productivity, better product quality, and easier access to the export market. Hence, foreign firms may have a competitive advantage over indigenous firms and may crowd them out through increased competition. Acknowledging the competitiveness of foreign firms, indigenous entrepreneurs might abandon their own business start-ups. Moreover, if production by foreign firms lacks organic linkages with upstream or downstream sectors, then the demand creation effect through vertical spillovers will be limited.

3.2. Military-demand-oriented vs. market-oriented industrialization

Two main viewpoints have emerged regarding the effects of the influx of Japanese firms into Korea. The first sees Korea's industrialization in the 1930s as a part of "military-demand-oriented industrialization" (hereafter "military industrialization theory"). This theory asserts that Korea's industrialization during the 1930s focused on producing military supplies against the backdrop of Japan's invasion of China after the 1931 Mukden Incident ,Second Sino-Japanese War and Pacific War (known as the "Fifteen-Year War") (Kobayashi, 1967, 1975, 2012). Since Korean industrialization was deemed to serve military demand, the military industrialization theory considers that Korean industrialization had a "dual structure" and lacked an organic connection with the country's internal situation. It only benefited the Japanese-owned firms that had advanced into Korea and only developed as an enclave economy, delivering little developmental benefit to Korean-owned firms.

Academic research stressing the dual structure of Korean industrialization emphasizes the negative effects of the advance of Japanese firms into Korea. Kajimura (1977) argued that capital and technology gaps existed between Japanese and Korean firms and that Korean-owned factories existed only in peripheral areas which Japanese-owned factories had not penetrated. Similarly, Suh (1978) argued that Korea's industrialization simply represented the injection of Japanese capital into the peninsula and that there was no link between Korean capital and industries. Accordingly, the advance of Japanese firms into Korea led to the decline of many Korean cottage industries and small businesses and further reduced employment opportunities in the industrial sector. Haggard, Kang, and Moon (1997) also pointed out that scarcely any connection existed between the modern sector, represented by Japanese-owned factories, and the traditional sector, represented by Korean-owned factories. They concluded that industrialization in Korea during the 1930s was not related to Korea's economic growth or the improvement of Korean living standards. Most recently, Huh (2005) argues that the industrial growth process in Korea was simply that of large-scale capital that had advanced into the country from Japan. According to Huh, 80% of the industrial output during the 1930s came from factory manufacturing industries, and only 20% originated in cottage industries. Furthermore, one-third of the output of factory manufacturing industries came from factories based on large-scale capital from Japan. Many Korean-owned factories were cottage industries, and many factory-led manufacturing industries were small to medium sized. The Japanese-owned factories overwhelmed Korean-owned ones in terms of production scale and technology, and as there was little prospect of building up human capital, the ethnicity-based economic disparity grew increasingly wider.

The second view regards Korea's industrialization during the 1930s as being market led rather than state led. Hori (1995) argues that during the 1930s, Korean consumption of mass-produced goods was increasing, and the Korean market for industrial products was gradually expanding. In the case of cotton spinning and ammonium sulfate, demand expanded as a result of direct investment by Japanese firms, and for the rayon industry, demand was created by Japanese imports. Direct investment by Japanese firms and imports of Japanese goods not only substituted Korea's self-sufficient consumption economy but also created new demand. This continuous market expansion attracted further Japanese capital and goods, and many Korean firms were also stimulated by this phenomenon. A conspicuous number of Korean firms appeared in industries such as rayon textiles, liquor production, and fishmeal production.

On the other hand, Kim (2002), another researcher emphasizing the role of the market, argued that expansion of the industrial products market in Korea during the 1930s resulted from Korean agriculture becoming an export industry, which had in turn occurred as a result of the successful *Plan for Increased Rice Production* in the 1920s[8]. The large volumes of rice exports to mainland Japan increased farmers' incomes and led to an expansion of the consumer market for industrial goods. The expansion of the domestic market led to an increase in imports of industrial goods from Japan as well as stimulated the development of import-substitution industrialization by both Japanese- and Korean-owned factories in Korea. Thus, while the rise in demand was dependent on imports of consumer goods during the early stages of industrialization, demand continued to grow owing to direct investment by Japanese capital and the establishment of new Korean firms.

According to this market-oriented view, direct investment by Japanese firms in Korea had both positive and negative effects on the growth of Korean firms. It led to the decline of some indigenous capital that lacked competitiveness; however, amid this upheaval, other Korean firms prevailed against the severe competition, and some even developed to the extent that they overwhelmed the Japanese firms.

3.3. Heterogeneity of spillovers between industries

How should we understand the two-sided impact brought about by the direct investment of Japanese capital? Joo (1996) classifies this direct investment into three categories. The first comprises firms that exported intermediate goods to the Japanese market, including those involved in deseeded cotton production, the paper manufacturing industry, and the iron industry. The second category consists of firms that supplied consumer goods to the Korean market, including those involved in the spinning and weaving, sugar manufacturing, flour-milling, and cement industries. The third category includes firms that exported consumer goods to the Japanese market, such as the

[8] These plans aimed at the expansion of rice production by introducing improved seed types, increasing fertilizer input, and securing a stable water supply (Cha, 1998: 732).

silk industry (Joo, 1996: 123).

Of these industries, the negative effects were most strongly felt in industries that required large-scale capital investment, such as the iron, paper manufacturing, sugar manufacturing, and cement industries. Korean-owned factories faced high entry barriers created by capital and technology gaps between Japanese- and Korean-owned factories, and as a result, barely any Korean-owned factories made any headway. In other words, the influx of large-scale Japanese capital was accompanied by a powerful entry-barrier effect. However, the advance of Japanese capital into these industries was not necessarily the only factor that drove the Korean firms away. As a result of having insufficient levels of capital and technology, few Korean-owned factories appeared in these sectors prior to the influx of Japanese capital; thus, any crowding-out effect on Korean-owned factories was limited. In the case of the textile industry, however, because it originally existed in Korea as a traditional industry, traditional Korean-owned factories were driven out by Japanese-owned factories. Thus, the textile industry suffered from an obvious crowding-out effect as well as an entry-barrier effect[9].

On the other hand, in cases of small- to medium-scale Japanese capital investment, negative effects were frequently outweighed by positive effects such as market expansion, technology spillovers, spin-offs, and vertical linkages. The liquor, knitting, and rubber industries developed against the backdrop of an expanding domestic market, while the silk and rice-milling industries developed in the context of the emergence of new export markets. All these industries were based on sectors that had traditionally existed in Korea but had undergone modernization, and innovation brought about by technology introduced from Japan played a crucial role in this modernization. The number of spin-offs, which involved Korean workers employed in Japanese-owned factories becoming independent and setting up their own factories, was particularly striking in the rice-milling, knitting, and rubber industries. There were also many cases of vertical linkages, in which Japanese-owned factories collaborated with Korean-owned factories and developed together[10].

Historical documents confirm the concurrent existence of industries that reflected both the positive and negative effects of Japanese capital in Korea. Generally, studies that consider the influence of Japanese capital in Korea as having a dual structure use industries that are conspicuously negative examples as case studies, whereas studies that focus on the role of the market use industries that highlight the positive effects. Regardless, a limit exists as to the extent to which case studies can show the true nature of industrialization in Korea during the 1930s. Thus, a quantitative analysis is needed, to which we turn in the following sections.

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[9] Direct investment by Japanese textile firms in Korea stimulated the establishment of new Korean-owned factories. However, as the scale of textile capital increased, this positive effect was outweighed by the fact that many Korean capitalists were effectively driven out of the market (Joo, 1996: 123).

[10] More specifically, Korean-owned factories produced intermediate goods and supplied them to Japanese-owned factories that produced the end products, or vice versa. Examples of this include the hulling industry, which supplied the rice-milling industry; the silk industry, which supplied the silk fabrics industry; and the sardine oil manufacturing industry, which supplied the machine oil manufacturing industry.

4. Estimation strategy and data

4.1. Specifications and methodology

To examine the effect of Japanese presence on Korean entry, we follow the estimation strategies of earlier literature by regressing the entry rate of Korean factories on the variables that capture the presence and entry of Japanese factories in the same subsector. However, we extend the analysis by exploiting variations in the presence and entry of Japanese factories across counties within the subsector rather than variation between subsectors. By employing subsectors as a unit of observation, previous studies implicitly assume that any spillovers of foreign presence affect all factories throughout the country. However, as Aitken and Harrison (1999) discuss, spillovers might only affect nearby factories. Our approach captures these local spillovers.

Empirically, we regress variations of the following equation:

$$\text{EntryRateKR}_{sct} = \beta_0 + \beta_1 \%\text{Japanese}_{sct-1} + \beta_2 \text{EntryRateJP}_{sct} + X_{sct-1}\gamma_1 + X_{st}\gamma_2 + X_{ct}\gamma_3 + \delta_{sc} + \upsilon_t + \varepsilon_{sct}. \quad (1)$$

The gross entry rate of Korean factories (EntryRateKR_{sct}), measured by the number of factories in subsector s in county c during period $t-1$ and t, is regressed on the following two variables that represent the presence and entry of Japanese factories in the same subsector–county. The lagged share of Japanese factories measured by the number of factories in the same subsector–county ($\%\text{Japanese}_{sct-1}$) represents presence, whereas the synchronous gross entry rate of Japanese factories in the same subsector–county (EntryRateJP_{sct}) captures the static or instantaneous impact of the entry of Japanese factories on Korean entry. The coefficients of these variables, β_1 and β_2, should be negative if the presence or entry of Japanese factories discourages the entry of Korean factories.

As for controls, we include fixed effects for subsector–county δ_{sc} and year υ_t. The subsector–county fixed effects eliminate time-invariant subsector–county effects that might influence both Korean entry and Japanese presence or entry. For example, factories might intensively enter rapidly growing subsectors; urban counties might nurture entry owing to agglomeration effects; and counties with more Japanese factories might be equipped with better infrastructure, thus facilitating entry of even more firms. The year fixed effects υ_t control for external macroeconomic shocks that are common across all subsector–counties, such as inflation or changes in exchange rates.

While these fixed effects control for many possible unobserved confounders, certain time-variant effects might still bias β_1 and β_2. To reduce such biases, we control for subsector–county-wide covariates X_{sct}, subsector-wide covariates X_{st}, and county-wide covariates X_{ct}, which change over time. For subsector–county-wide covariate X_{sct}, we control for factory density, defined as the number of factories in subsector s per 10,000 residents in county c. This variable captures the level of agglomeration or congestion of factories in a subsector–county–year. For subsector-wide covariates Y_{st}, we include the share of Japanese factories, gross entry rate, and number of factories in a subsector. These variables capture the stage of development and the degree of entry barriers for Korean factories in each subsector. Alternatively, we can control for subsector-specific time trends (which are common across counties) by including the interactions of subsector dummies and year dummies. This deals with all temporal shocks common across factories within subsectors, such as increases in demand. Finally, county-wide covariates Z_{ct} include the population growth rate, which addresses changes in local demand. Alternatively, we can include county–year dummies that control for county-specific trends (common across subsectors) driven by other county–year specific shocks such as connection to a railway.

4.2. Data

The data on factories are obtained from the *Chosen Kojo Meibo (Register of Korean Factories)* edited by the Governor-General of Korea (1934, 1938, 1941). We use the 1934, 1938, and 1941 editions, which provide information for 1932, 1936, and 1940, respectively. The data cover all manufacturing factories in Korea that hold equipment requiring five or more workers or that employ five or more workers. For each factory, the data provide the address, factory name, owner name, and main product. Data for 1934 and 1936 also include the date of establishment and number of employees in intervals. Population data are obtained from the Annual Statistics published by the Governor-General of Korea (1934, 1938, 1942).

Provinces (*do*) were the primary administrative unit in Korea under Japanese colonial rule, with each province divided into cities (*fu*) or counties (*gun*). We use city–counties (hereafter, “counties” for short) as a primary regional unit of observation. In 1932, there were 234 counties in 13 provinces. We fix the county borders in 1932 to construct consistent boundaries throughout the period of study[11]. On the basis of the owner’s name, we categorize the nationality of factories as Japanese, Korean, and other or unknown nationality. Most names belonged to individuals, but some were those of corporations. We categorize factories with corporate owners as unknown nationality as we were unable to identify the nationality from the corporate name. We classify each factory into one of 77 subsectors on the basis of the factory’s main product. We also attach a sector code that aggregates subsectors into 10 sectors. The sector categories are the same as in the original data, but given the inconsistencies of sectors and main products across years in the original data, we use our sector coding for uniformity.

The primary unit of observation is subsector–county–year. There are 77 subsectors and 234

[11] Six counties were split into a city and a county during the years of observation (1932-1940).

counties. We dropped seven subsectors, which are bundles of factories that we are unable to code as belonging to a specific subsector because the main product registered is vague, as well as the gas and electricity subsector (which comprises one sector). Next, we dropped six counties that do not have factories, leaving us with 66 subsectors (nine sectors) and 228 counties. We also dropped subsector–county pairs without factories throughout our observations, leaving us with 1,805 pairs. As we take differences over time to construct entry rates, we can only utilize observations for two out of three periods. The final number of observations is therefore $1{,}805 \times 2 = 3{,}610$ subsector–county–years.

To construct the entry rates, we employ the following definition of percentage changes:

$$\text{EntryRate}_{sct} = \frac{n_{sct} - n_{sct-1}}{\frac{1}{2}(n_{sct} + n_{sct-1})},$$

where n_{sct} is the number of factories in subsector s in county c in period t. This measure is frequently used when dealing with discrete changes that can be very large (see, for example, Kosová, 2010; Roberts and Key, 2008). Using this measure rather than the “standard” one (i.e., $(n_{ict} - n_{ict-1})/n_{ict-1}$) allows us to avoid an infinite growth rate when $n_{ict-1} = 0$. When no factories existed in both the previous and present periods, we define the entry rate as zero. Note that this is the gross entry rate, which also deducts the number of exits. Thus, an increase in the entry rate is affected by a rise in net entry rate and a decline in net exit rate.

The share of Japanese factories is defined as the number of Japanese factories over the total number of factories in each subsector–county–year. For subsector–county–years with no Japanese factories, we set the variable to zero.

Table 1 reports summary statistics of the variables used in the regression as well as additional variables for reference at the subsector–county–year. Table 2 reports the profile of each subsector with certain key indicators. Some observations concerning variations between subsectors are worth noting with respect to the analysis. First, a substantial variation was found in the total number of factories. While some subsectors, such as those manufacturing other liquors (mostly traditional Korean liquor), flour and grain mills (mostly rice milling), apparel, animal fat and oils (mostly sardine oil), and product machinery had more than 400 factories, other subsectors, such as those manufacturing malt liquor (beer), sugar, tea, livestock products, cotton spinning, petroleum and coal, and aircraft and parts had fewer than five factories.

== Table 1. Summary statistics (subsector–county–year level) ==

== Table 2. Profile of subsectors ==

Second, variations in regional dispersion of factories were also observed. Factories were localized in a small number of counties. In 1940, each subsector had a factory in 22 counties on average (9.3% of all 234 counties). Korean factories were less dispersed and were found in only 12 counties (5.3%). Table 2 suggests that equipment industries or high-tech industries such as the subsectors of malt liquors, sugar, tea, cotton spinning, miscellaneous spinning and woven products, chemical fertilizers, drugs and medicines, petroleum and coal products, abrasive products, miscellaneous chemical products, electrical machinery, equipment and supplies, electric bulbs and lighting fixtures, railroad equipment and parts, and aircraft and parts were localized in a maximum of four counties in 1940. On the other hand, factories in subsectors such as other liquors and flour and grain mills were observed in more than half the counties. Factories manufacturing Japanese sake, seasoning, woven fabric, lumber and wood products, printing, pottery and related products, structural clay products, fabricated metal products, and production machinery were also dispersed over more than 20% of the counties. This list suggests that subsectors producing daily and universal products were relatively ubiquitous across regions.

Third, the share of Japanese factories also exhibited a wide variation. Some subsectors such as malt liquors, sugar, tea, cotton spinning, chemical fertilizers, petroleum and coal products, and aircraft and parts were dominated by Japanese factories in 1940, while more than 60% of the factories in subsectors of other liquors, flour and grain mills, woven fabric, knit fabric, drugs and medicines, pulp, paper and paper products, rubber products, and pottery and related products were Korean owned.

Subsector-level variations over total number of factories, regional dispersion, and share of Japanese factories are inter-related: oligopolistic subsectors (subsectors with a small number of factories) tend to be highly localized and predominantly occupied by Japanese factories[12]. Since oligopolistic subsectors are more likely to be localized in limited counties, new entry is highly likely in these counties. To take such tendencies into account, we control for the subsector-wide total number of factories in the regression as well as omit oligopolistic or highly localized subsectors for our robustness check.

5. Results

5.1. Main results: Entry patterns within subsectors

== Table 3. Japanese presence and Korean entry: Subsector–county level ==

[12] Subsector–year-level correlation coefficient of total number of factories and the percentage of counties with any factories is 0.7638 ($p < 0.001, N = 198$), suggesting that oligopolistic subsectors tend to localize in few counties. Also, the correlation coefficient of total number of factories and the share of Japanese factories is −0.3633 ($p < 0.001, N = 198$), suggesting that oligopolistic subsectors are predominantly occupied by Japanese factories.

In this section, we present our main results. We employ observations by subsector–county to exploit variations across counties within subsectors. Table 3 reports the fixed effects estimates of equation (1). All estimates include a subsector–county fixed effect, and we cluster standard errors by subsector–county. Column (1) reports the result without controls. We sequentially add subsector–county-wide, subsector-wide, and county-wide covariates that change over time from columns (2) to (6). Column (2) controls for the subsector–county-year covariate of factory density. Columns (3) and (4) control for subsector-wide covariates; we add share of Japanese factories, gross entry rate of all factories, and total number of factories in the same subsector in column (3) and subsector-specific time trends (subsector–year dummies) in column (4). We add county-wide covariates (population growth rate) in column (5) and county-specific time trends (county–year dummies) in column (6). As the number of entries by Korean factories in each subsector–county–year is small, we also report the estimate of a linear probability model, regressing a dummy indicating the gross entry of Korean factories in column (7).

We consistently find a positive and significant coefficient of the lagged share of Japanese factories for all specifications. The result in column (6), with all controls, shows that an increase in the lagged share of Japanese factories from 0 to 10% leads to a 9.1 percentage point higher entry rate of Korean factories. The magnitude is large, roughly doubling the average gross entry rate from 0.116 to 0.207. The linear probability estimate in column (7) shows that this change increases the probability of Korean entry by 2.9 percentage points, an 11.6% increase from 24.9%. The coefficients of the synchronous gross entry rate of Japanese factories are also all significantly positive, but their magnitude is considerably smaller than that of the lagged share: a 10 percentage point increase leads to a 1.5 percentage point higher gross entry rate.

For other controls, we find that entry rates are lower when factory density is higher, suggesting that negative spillovers appear in congested situations. On the other hand, Korean entry rates are higher in subsectors that have higher increases in Japanese presence and that are rapidly growing as well as in counties with higher population growth.

In column (8), we examine whether the presence of large-scale factories serves as entry barriers. Large-scale factories are likely to be more productive due to scale economies and advanced technology; therefore, they are likely to discourage entry of small-scale indigenous factories. We add a dummy variable indicating if a subsector–county–year has a large-scale factory of any nationality with more than 100 workers in the same subsector. The coefficient of the large-scale dummy is negative but statistically insignificant.

We briefly discuss the results that investigate entry patterns by using subsector–year, which has been conventionally analyzed in previous entry spillover studies, as the unit of observations. This analysis provides useful insights from variations between subsectors, implicitly assuming that entry spillovers occur at the subsector level over the entire Korean Peninsula. Table 4 reports the estimates of the subsector-level version of equation (1). We report robust standard errors clustered by subsector.

== Table 4. Japanese presence and Korean entry: Subsector level ==

A simple pooled-OLS estimate in column (1) indicates that the gross entry rate of Korean factories is higher in subsectors with higher lagged shares and higher gross entry rates of Japanese factories. Both coefficients are statistically significant at the 1% level. Considering the difficulty of entry, we expect that subsectors requiring large investments are harder to enter. In column (2), we add the lagged share of large factories with more than 100 workers, expecting a negative coefficient; the coefficient is negative but not statistically significant. In column (3), we include a subsector fixed effect to eliminate subsector-specific differences that affect Korean entry. For example, rapidly growing subsectors may induce intensive entries of factories irrespective of factory nationality. The fixed-effect estimates of Japanese presence and entry in column (3) are both positive, but the coefficients of the lagged share of Japanese factories are now marginally significant ($p = 0.07$).

To summarize, we find that within the same subsector, Korean factories were likely to enter counties with higher presence or entry of Japanese factories. Subsector-level analyses also indicate that Korean entries were more active in subsectors with higher presence or entry of Japanese factories. These results imply that the advance of Japanese factories did not suppress Korean entry. In fact, Japanese factories probably acted as a catalyst for Korean industrialization.

5.2. Robustness checks

In this subsection, we conduct robustness checks of our main results. The results are reported in Table 5, with column (1) reporting the “base” result of column (8) in Table 3 as reference.

== Table 5. Robustness checks ==

First, we use the standard entry rate to calculate the gross entry rate of Korean factories as discussed in section 4.2. To avoid infinite entry rates, we set the number of factories in $t-1$ to one when the entry rate is zero; thus, even if the number of Korean factories increased from zero to one, we regard the entry rate as zero. The result reported in column (2) shows that the main results are qualitatively similar.

Second, in column (3), we control for presence and entry of “Other” factories, including corporate-owned factories. While we are unable to identify the nationality of these corporate-owned factories, they could be owned by Japanese corporates, and omitting these factories might bias our estimates. The result indicates that our results on Japanese presence and entry are robust to the inclusion of “Other” factories. The estimates also suggest that the presence of “Other” factories is positive and significantly correlated with Korean entry.

Third, we test the robustness of the samples’ limitations. In column (4), we drop Keijo-fu (now Seoul), which has been the center of economic activity, to check whether the results are driven by observations from this region. In column (5), we drop subsectors without any Korean factories throughout our observations, as Korean factories might have been prohibited from entry in some subsectors for political or military reasons. In cases wherein such prohibition occurred locally, we drop subsector–counties without any Korean factories throughout our observations in column (6). Column (7) omits oligopolistic subsectors with the total number of factories lower than the first quartile in 1940 (59 factories), and column (8) drops localized subsectors whose number of counties with any factory is lower than the first quartile in 1940 (19 counties). The results are robust to these limitations of the samples.

Fourth, since our classification by subsectors based on the main product might include classification errors, we re-estimate equation (1) using a larger classification: sectors. We control for sector–year dummies instead of subsector–years for this specification. The result reported in column (9) is qualitatively similar, but the magnitudes of the coefficients of Japanese presence and entry are larger compared to the results using classification by subsectors. Since the classification by sectors includes factories in neighboring subsectors, this is likely caused by capturing vertical spillovers.

Finally, in columns (10) and (11), we test if the lagged presence of Japanese factories has diverse effects on entry between Korean and Japanese factories. While we include fixed effects for subsector–county–year and control for subsector- and county-specific trends, there might still be omitted variables that affect both Korean entry and Japanese presence or entry. However, if the lagged Japanese presence affects only Korean factories, then we can rule out the possibility of spurious correlation. Interestingly, the results indicate that while the lagged Japanese presence is positively correlated with entry of Korean factories, its effect on Japanese entry is negative. This suggests that even if omitted variables exist, such effects tend to underestimate our results.

5.3. Heterogeneity of the effects of Japanese presence and entry

In this subsection, we examine the heterogeneity of the effects of Japanese presence and entry on Korean factories.

== Table 6. Heterogeneity of the entry spillovers ==

We begin by examining the prediction that subsectors requiring large capital investments are more difficult to enter; therefore, entry spillovers, if any, would be smaller. We define 39 subsectors that have at least one factory employing more than 100 workers in 1936 as “large-scale” subsectors. The remaining 27 subsectors without such large factories are considered as "small-scale" subsectors[13]. Columns (2) and (3) in Table 6 report estimates for large- and small-scale subsectors, respectively. While the coefficient of the lagged Japanese presence is slightly smaller for large-scale subsectors than for small-scale subsectors, the coefficient of the synchronous Japanese entry is larger. Thus, we do not find clear tendencies of factories in large-scale subsectors facing stronger entry barriers.

Next, we compare the coefficients between urban and rural counties. Urban counties might be easier for factories to enter for various reasons such as larger demand; better access to credit; and possible technology spillovers generated from economies of urbanization, i.e., positive spillovers from the diversity of subsectors. We define counties as "urban" if a county was a city (*fu*) in 1940 and as "rural" otherwise. Columns (4) and (5) in Table 6 show that entry spillovers are larger in urban than in rural counties.

In Table 7, we report results by sector. While differences exist in the coefficients' magnitude and significance, we do not find negatively significant coefficients of Japanese presence and entry. We also find positively significant effects of Japanese presence in certain modern sectors such as chemicals, iron and steel, and machinery. This implies that even though Korean factories had difficulty entering these sectors, when they did enter, they were likely to enter counties with Japanese incumbents.

== Table 7. Japanese presence and Korean entry by sector ==

6. Discussion: Channels of positive entry spillovers

Why were Korean factories more likely to enter counties with higher presence of Japanese factories? In this section, we interpret the results and discuss the channels of positive entry spillovers with historical anecdotes drawn from particular industries.

6.1. Spinning and weaving industry

The spinning and weaving industry, which is a modern industry, did not exist in pre-colonial Korea. The concept of producing cotton products in a mechanized factory was instituted by Japanese firms during the colonial period (Ahn, 2004: 95). While the indigenous cotton industry was reorganized as a side business for farmers, the spinning and weaving industry as a modern factory system saw significant direct investment from Japanese corporations. Since 1934, there has been a

[13] Small-scale subsectors include other liquors; sugar; tea; soft drinks; livestock products; seafood products; miscellaneous foods; salt; other spinning; knit fabrics; furniture and fixtures; bookbinding; industrial organic chemicals; vegetable fat and oil; drugs and medicines; abrasive products; glass and products; non-ferrous metals and products; electrical machinery; equipment and supplies, primary batteries; electric bulbs and lighting fixtures; miscellaneous transportation equipment; shipbuilding and repairing; marine engines; hats; sundry goods such as tatami mats; bones, horns, hoofs, turtle shell, ivory, and shell products; and paper products.

four-corporation regime comprising Japanese-owned Chobang, Kanebo, and Toyobo and Korean-owned Kyŏngbang[14]. These four corporations produced most of the cotton yarn and cotton textiles for the Korean domestic market and successfully displaced the imported versions produced by Japan (Fukuoka, 2008: 190). In this context, Korean-owned Kyŏngbang became a successful new entrant into the spinning and weaving industry, in which Japanese capital was dominant.

Joo (2002) explains how industry latecomers, Japanese-owned Chobang and Korean-owned Kyŏngbang, achieved growth using the advantage of backwardness. According to him, Chobang, one of the first entrants into the Korean market, was an industry latecomer in Japan compared with other major spinning and weaving corporations, and its objective was to catch up with these corporations. Kyŏngbang, created in response to Japanese entry into Korea, was a further latecomer, entering after Chobang, and its aim was to catch up first with Chobang and then with other big Japanese spinning and weaving corporations (Joo, 2002: 96).Technology transfer from Japanese corporations played an important role in Kyŏngbang's development. The company installed its first power looms, purchased from Toyoda in 1922, and imported 224 automatic looms, the newest and best equipment available at the time, from Nogami in 1933 (Eckert, 1991: 146). Kyŏngbang actively pursued the use of cutting-edge technology not only in the form of machinery but also in the form of knowledge by inviting Japanese engineers to its factories and sending its engineers to Japanese corporations for training[15].

6.2. Rice-milling industry

The rice-milling industry in 1930, with Korean-owned factories comprising 34% of the total industry, led the growth of Korean capital through the mid-1930s[16]. The Korean traditional rice-milling industry was created by farmers who processed rice directly for domestic consumption. When the mass export of rice to Japan began, however, the process of turning rice kernels to white or brown rice by removing the husks was separated from rice cultivation, and the rice-milling industry became a factory-based industry. The number of Korean-owned factories in the rice-milling industry had already surpassed that of Japanese-owned factories in the 1920s, and it was consistently more than double that of Japanese-owned factories through the 1930s[17].

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[14] The official names of these companies are Chosun Spinning and Weaving Company, Kanegafuchi Spinning and Weaving Company, Tōyō Spinning and Weaving Company, and Kyŏgsŏng Spinning and Weaving Company, respectively.

[15] The factors that brought about Kyŏngbang's success include the active introduction of technology from Japanese spinning and weaving corporations, development of low-end markets, and highly developed managerial ability of the Kim family (Kyŏngbang's management). In particular, the management of Kyŏngbang became the new Korean elite, receiving their university education in Japan, learning to capture business opportunities, and gaining the ability to organize and run the corporation (Joo, 2008: 352).

[16] Although the number of Korean rice-milling factories increased throughout the 1930s, their market share fell below 20% in 1940, implying that in colonial Korea, the speed of growth of other industries significantly exceeded that of the rice-milling industry.

[17] The Japanese-owned factories were larger in terms of capital, engines, and production, but the gap gradually narrowed throughout the 1930s.

Japanese rice merchants were the first entrants in Korea's rice-milling industry. They used equipment brought from Japan at the end of the nineteenth century to process brown rice and then export it to Japan[18]. In the 1900s and early 1910s, they introduced rice-milling machinery from Japan and established the mechanized rice-milling industry in Korea. The industry was a large-scale mechanized factory-based operation, with oil-based generators and steam engines—and later electric motors and gas engines—used as power sources. This mechanized rice-milling industry killed off the indigenous milling industry in Korea, but Korean rice merchants started to emerge; they actively introduced milling technology and machinery from Japanese-owned factories and established numerous milling factories. There were also many instances wherein Korean employees of Japanese-owned rice-milling factories became independent and set up new rice-milling factories[19]. In both Japanese- and Korean-owned factories, a common method of market entry was for an employee of a milling factory to become independent and set up a new factory (Lee, 2010: 47-49).

6.3. Knitting industry

The knitting industry is a representative industry with no major Japanese capital and in which medium and small Korean-owned factories have outperformed Japanese businesses[20]. The growth of the Korean knitting industry resulted from the expansion of the domestic market and was deeply rooted in lifestyle changes. As Western lifestyle started to spread rapidly from the 1920s onward, the demand for rubber shoes, and socks as a complementary good, increased exponentially. The high demand for socks was first met by imports from Japan and then gradually by domestic production. Early sock factories were established with loaned Japanese merchant machinery, yarn, and technology. As the demand for socks grew, however, direct investment from Japan as well as the number of new Korean corporations entering the market increased. As a result, imported knitted material was completely displaced by domestically produced material in the mid-1920s (Joo, 1996: 147-148).

The knitting industry saw the most visible effects of technological spillover and spin-off from Japanese entry into the Korean market. The technology to produce knits spread from domestic factories organized by Japanese merchants even after the development of modern factories. Korean entrepreneurs invited engineers from Japanese-owned factories and sent their skilled workers to Japanese-owned factories to learn the technology. The development of the sock industry led to the development of related industries such as sock needles and dyeing. At the time, the production of

[18] For example, Sadajiro Okuda, a typical rice merchant, brought 30 brown rice mills from Sakai, Japan and started a mechanical rice-milling business in the fall of 1890 (Lee, 2010: 47).

[19] Sun-Gyun Kim, a Korean rice merchant, worked at Okuda Rice Milling factory as an interpreter for the Japanese rice merchant Sadajiro Okuda. He later left the factory to set up his own rice-milling factory.

[20] The knitting industry includes knitted materials, knitted fabrics, and other products that use such fabric. Knitted material stretches well and is therefore used for several everyday clothing items such as socks, underwear, gloves, and hats.

sock needles was dominated by a Japanese-owned factory called Toyo Senshin Kojo and a Korean entrepreneur, Sung-Yo Kim, who had learned the technology at the Japanese factory before setting up his own needle factory. As in this case, Korean entrepreneurs who started spin-offs occasionally achieved even greater technological innovation. Another Korean entrepreneur, Chang-Yoon Son, who also learned the technology in a Japanese-owned factory, almost monopolized domestic demand for sock dyeing using a technology that he developed (Joo, 1994: 110-111).

6.4. Rubber industry

The rubber industry was another industry in which Korean entrepreneurs were very active. In particular, Korean-owned rubber shoe factories experienced such rapid growth that they were competing with Japanese-owned factories by the 1930s. As with the knitting industry, the rubber industry developed as a result of the expansion of the domestic market, which was caused by lifestyle changes. The demand for rubber shoes grew more than 60-fold over 16 years, from 600,000 pairs sold in 1921 to 37,000,000 pairs sold in 1937. This rapid expansion of demand led to an increase in imported rubber shoes from Japan as well as stimulation of the domestic manufacturing sector. As a result, several rubber shoe factories, both Japanese- and Korean- owned, were set up. The self-sufficiency rate of rubber shoe production in 1921 was below 20%, with most of the domestic demand met by imports; however, with the rapid growth of domestic production, the self-sufficiency rate reached almost 100% in 1933, implying that imports were successfully displaced by domestic production (Joo, 1997: 85-87).

Korean-owned rubber shoe factories were concentrated in large cities such as Seoul, Pyongyang, and Pusan. Pyongyang’s rubber industry originated from the Toa Rubber Company, set up by a Japanese entrepreneur who brought equipment from Japan. Later, Japanese-owned corporations educated skilled Korean workers about the technology of rubber compounding and rubber production, and these workers later established separate rubber shoe manufacturing in Pyongyang. For example, Byoung-Doo Lee, who learned the technology used at a Japanese-owned rubber shoe factory, established the Jŏngchang Rubber Company and taught the technology to other skilled workers. Thus, rubber shoe manufacturing technology gradually spread throughout Pyongyang (Joo, 1996: 158). Many examples of technological spillovers and spin-offs can be observed in the rubber industry in Pusan. Young-Joon Kim, a Korean entrepreneur, was originally a skilled worker at the Watanabe Rubber Factory in Kobe, Japan who returned to Pusan, Korea to set up a rubber factory. In the 1930s, he also established several rubber shoe factories outside Pusan and became a representative capitalist in the rubber industry in the Southern region (Lee, 1990: 226-227).

7. Conclusion

In light of the debates on the origin of Korean industrialization and on the effects of direct investment by the Japanese during the colonial period, we examined whether the advance of Japanese factories into Korea suppressed the entry of Korean-owned factories during the period of rapid industrialization in the 1930s. To quantitatively investigate this, we exploited variations of the share of Japanese factories and their entry rates across counties within same subsectors by using the census of factories in Korea.

After controlling for potential unobservable factors that might affect both Japanese presence or entry and Korean entry by fixed effects for subsector, year, and subsector- and county-specific time trends, we found that on average, within a subsector, gross entry rates of Korean factories were higher in counties with higher presence and entry of Japanese factories. This positive relationship was also found between subsectors. Our findings clearly counter the view that the advance of Japanese factories suppressed indigenous industrialization by Korean factories in the 1930s. Instead, the result suggests possible positive entry spillovers from Japanese factories. As concrete evidence of such spillovers, we identified cases of technology transfer and spin-offs from Japanese factories in several sectors, which acted as a catalyst for Korean entry. Our results indicate that FDI can exert positive spillovers on the entry of indigenous firms, even at a very early stage of industrialization.

While our results suggest that on average, the advance of Japanese factories did not suppress the entry of Korean factories, it should be noted that negative spillovers did exist. For instance, some subsectors were dominated by Japanese factories, suggesting crowding-out or entry-barrier effects. Huh (1993) also notes that large factories were predominantly Japanese owned and Korean factories were likely to remain small. It is important to notice the variations between subsectors and to consider the limitations faced by Korean factories after entry, such as growth in scale or improvement in productivity.

Another important issue that remains is distinguishing between horizontal and vertical spillovers, as the views that emphasize the negative effects of Japanese direct investment rest on the argument that such investment lacked organic linkages with the Korean economy. In column (9) of Table 5, we found larger spillovers when observations were aggregated at a wider sector level compared with those at a subsector level. We interpreted this as indicative evidence of vertical spillovers from neighboring subsectors. Further analysis is needed to more clearly disentangle horizontal and vertical spillovers, which requires the construction of an input–output table for the time. Such an exercise will further our understanding of the relationships between the advance of Japanese factories and Korean industrialization, which we leave for future research.

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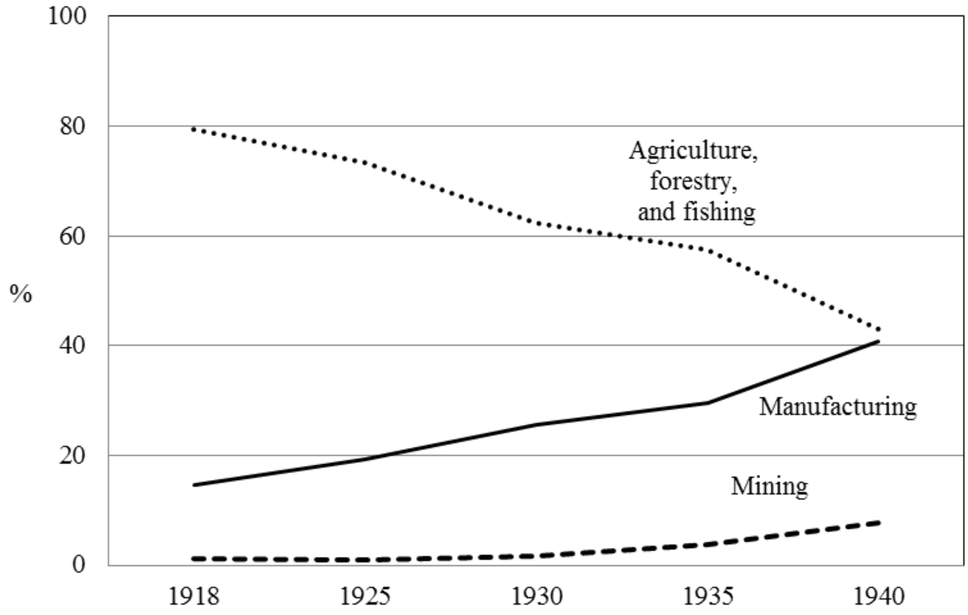
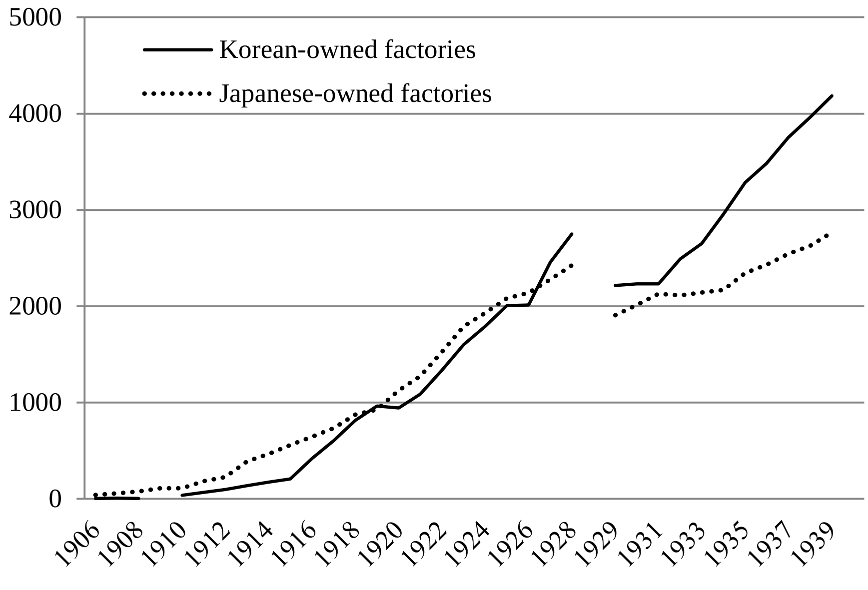
Figures

Figure 1. Total output by sector



Source: Kim (2002:128)

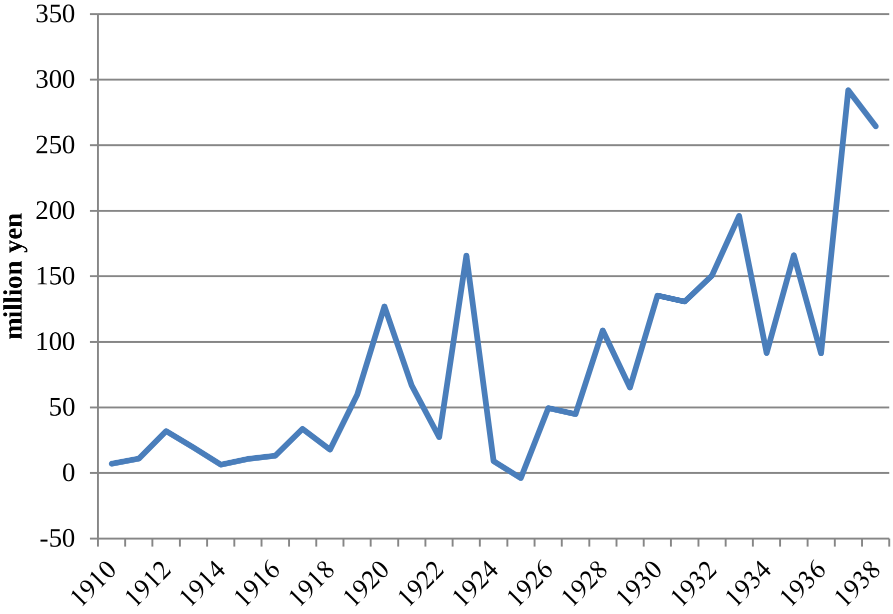
Figure 2. Number of factories



Source: Huh (1993:125)

Note: There is a break between 1928 and 1929 owing to a change in statistical standards. Prior to 1928, to qualify as factories, sites needed to have five or more regular employees, a motor, or an annual output of at least 5,000 yen. From 1929 onward, sites only needed to have five or more regular employees to count as factories.

Figure 3. Total annual Japanese investment into Korea



Source: LTES estimate by Yuzo Yamamoto in Mizoguchi (1988)

Tables

Table 1. Summary statistics (subsector–county–year level)

Variable	Obs	Mean	Std. Dev.	Min	Max
Subsector-county characteristics					
Gross entry rate of Korean factories	3610	0.116	1.113	-2	2
Lagged share of Japanese factories	3610	0.272	0.406	0	1
Gross entry rate of Japanese factories	3610	0.223	1.033	-2	2
Lagged factory density (number of factories per 10,000 residents)	3610	0.276	0.770	0	14.6
(Variables for reference)					
Number of Japanese factories (1936 and 1940)	3610	1.6	5.0	0	122
Number of Korean factories (1936 and 1940)	3610	1.9	6.4	0	121
Number of Other factories (1936 and 1940)	3610	0.1	0.4	0	8
Total number of factories (1936 and 1940)	3610	3.5	10.2	0	244
Gross entry rate of all factories	3610	0.250	1.230	-2	2
Gross number of Korean factories entered	3610	0.232	6.195	-101	112
Dummy if gross entry of Korean factories	3610	0.249	dummy	0	1
Dummy if lagged presence of Japanese factories with 200+ workers	3610	0.020	dummy	0	1
Dummy if lagged presence of Japanese factories with 100+ workers	3610	0.022	dummy	0	1
Dummy if lagged presence of any factories with 200+ workers	3610	0.027	dummy	0	1
Dummy if lagged presence of any factories with 100+ workers	3610	0.048	dummy	0	1
Characteristics common across subsector–years					
Lagged share of Japanese factories	3610	0.497	0.267	0	1
Gross entry rate of all factories	3610	0.220	0.444	-2	2
Lagged factory density (number of factories per 10,000 residents)	3610	225.4	306.6	0	1167
Characteristics common across county–years					
Population growth rate	3610	0.145	0.274	-0.620	2.413
Dummy if urban (="city"(*fu*)) in 1940	3610	0.306	0.461	0	1

Table 2. Subsector Profiles

		Gross entry rate of Korean factories		Total number of factories			Share of Japanese factories			Number of counties with any factories			Number of counties with Korean factories		
Sector	**Subsector**	1936	1940	1932	1936	1940	1932	1936	1940	1932	1936	1940	1932	1936	1940
Food	Japanese sake	1.813	-0.085	94	164	174	84%	59%	63%	30	42	50	2	9	17
Food	Malt liquors	0.000	0.000	0	2	2	0%	100%	100%	0	1	1	0	0	0
Food	Other liquors	0.108	-0.368	462	500	463	16%	16%	31%	125	141	150	113	133	119
Food	Seasonings	0.000	-0.091	116	104	107	69%	70%	73%	54	51	56	18	22	20
Food	Sugar	0.000	0.000	1	1	1	100%	100%	100%	1	1	1	0	0	0
Food	Tea	0.000	0.000	3	3	3	100%	100%	100%	2	2	2	0	0	0
Food	Soft drinks	-2.000	2.000	19	21	22	84%	100%	77%	9	10	18	1	0	3
Food	Manufactured ice	0.000	0.000	18	23	25	61%	96%	92%	15	18	19	0	0	0
Food	Flour and grain mills	0.046	-0.458	1167	1141	828	32%	31%	35%	121	131	123	110	120	106
Food	Bakery and confectionery	-0.105	0.909	72	78	132	82%	86%	80%	7	9	15	2	3	9
Food	Canned food	0.444	-0.316	39	59	52	74%	78%	81%	20	27	26	3	5	3
Food	Livestock products	0.000	0.000	2	1	3	50%	100%	67%	2	1	3	0	0	0
Food	Seafood products	0.069	1.400	66	72	152	71%	79%	43%	10	13	19	2	4	8
Food	Miscellaneous foods	0.667	-0.514	30	45	41	50%	47%	59%	21	22	21	10	15	8
Food	Salt	-0.341	-0.061	55	44	42	53%	61%	62%	14	10	11	4	4	3
Textile and apparel	Silk reeling	0.471	-1.294	106	108	86	65%	55%	83%	45	45	46	5	11	8
Textile and apparel	Spinning, cotton	0.000	0.000	1	3	3	100%	100%	100%	1	2	2	0	0	0
Textile and apparel	Spinning, other	0.000	2.000	1	2	6	100%	100%	50%	1	2	6	0	0	2
Textile and apparel	Woven fabric	1.371	0.530	40	145	285	25%	16%	21%	18	61	59	10	50	31
Textile and apparel	Dyed and finished textiles	0.000	-0.667	14	16	29	71%	75%	90%	6	6	7	1	3	1
Textile and apparel	Knit fabrics	1.077	1.298	7	12	64	57%	17%	27%	3	4	7	2	4	7
Textile and apparel	Rope, nets, and lace	0.667	0.545	8	14	16	75%	71%	56%	6	7	11	2	4	6
Textile and apparel	Cotton wadding	-0.625	0.308	54	37	63	54%	62%	59%	19	22	31	10	6	6
Textile and apparel	Miscellaneous spinning and woven products	2.000	0.667	1	5	6	100%	80%	67%	1	3	3	0	1	2
Textile and apparel	Apparel	0.612	0.939	116	179	501	51%	46%	47%	18	22	33	11	18	25
Lumber and wood products	Lumber and wood products	0.727	0.960	98	163	346	77%	71%	59%	23	33	68	13	16	46
Lumber and wood products	Furniture and fixtures	0.754	0.213	79	118	137	75%	64%	59%	12	14	21	6	7	14
Printing	Printing	0.527	-0.054	230	276	318	59%	57%	64%	55	55	57	38	47	46
Printing	Bookbinding	0.222	-0.857	11	10	8	64%	50%	75%	2	1	2	1	1	1
Chemical	Chemical fertilizers	0.000	0.000	3	3	7	100%	100%	100%	3	3	4	0	0	0
Chemical	Feed and organic fertilizers	0.510	-0.623	261	475	336	17%	24%	40%	13	11	17	11	8	13
Chemical	Industrial inorganic chemicals	0.000	2.000	14	13	47	93%	100%	87%	6	7	17	0	0	4
Chemical	Industrial organic chemicals	-0.667	0.000	10	11	14	50%	91%	93%	4	4	7	1	1	1
Chemical	Vegetable fat and oil	-2.000	2.000	4	9	36	50%	89%	44%	3	6	13	1	0	7
Chemical	Animal fat and oil	0.747	-0.046	264	615	820	14%	19%	40%	11	18	24	9	15	19
Chemical	Oil and fat products*	-0.182	-0.222	23	20	20	70%	75%	80%	8	8	10	3	2	3
Chemical	Drugs and medicines	0.800	0.963	11	17	31	18%	47%	35%	2	2	3	1	1	3
Chemical	Pulp and paper	0.636	-0.173	92	185	170	3%	3%	9%	23	36	38	19	34	28
Chemical	Petroleum and coal products	0.000	0.000	1	4	2	100%	100%	100%	1	3	2	0	0	0
Chemical	Rubber products	-0.057	0.000	58	46	50	29%	24%	32%	15	10	12	11	10	9
Chemical	Leather tanning, leather products, and fur skins	-0.235	0.378	45	32	57	56%	50%	58%	13	5	15	8	3	8
Chemical	Abrasive products	0.000	2.000	5	4	8	100%	100%	88%	4	3	4	0	0	1
Chemical	Miscellaneous chemical products	2.000	-0.667	0	9	11	0%	78%	91%	0	3	8	0	1	1
Ceramic, stone and clay products	Pottery and related products	-0.070	-0.432	178	163	121	8%	6%	18%	66	60	51	61	55	41
Ceramic, stone and clay products	Glass and products	0.545	0.880	15	21	36	73%	67%	50%	5	7	10	3	4	7
Ceramic, stone and clay products	Cement and products	1.000	1.294	37	32	56	84%	91%	68%	12	12	25	1	2	10
Ceramic, stone and clay products	Miscellaneous ceramic, stone, and clay products	0.000	2.000	2	11	8	100%	100%	88%	2	4	2	0	0	1
Ceramic, stone and clay products	Structural clay products	0.293	0.306	90	112	167	58%	56%	57%	35	35	57	19	21	38
Iron and steel	Iron and steel	-1.389	0.842	84	20	67	23%	45%	55%	41	4	20	37	3	13
Iron and steel	Non-ferrous metals and products	2.000	0.000	2	3	10	100%	67%	90%	1	1	6	0	1	1
Iron and steel	Fabricated metal products	0.783	-0.496	133	237	214	48%	35%	55%	32	69	64	25	61	46
Machinery	General-purpose machinery	1.200	0.222	13	19	45	92%	74%	87%	5	7	14	1	4	5
Machinery	Electrical machinery, equipment, and supplies	0.000	2.000	2	3	10	100%	100%	90%	1	1	3	0	0	1
Machinery	Primary batteries	0.000	0.000	0	1	0	0%	100%	0%	0	1	0	0	0	0
Machinery	Electric bulbs and lighting fixtures	2.000	0.435	0	18	27	0%	50%	48%	0	2	2	0	2	2
Machinery	Production machinery	0.330	0.723	129	171	408	65%	64%	66%	31	32	55	19	21	36
Machinery	Railroad equipment and parts	0.000	2.000	5	3	10	60%	100%	90%	3	1	3	0	0	1
Machinery	Motor vehicles, parts, and accessories	0.824	0.154	17	33	59	59%	64%	75%	3	9	12	3	4	4
Machinery	Miscellaneous transportation equipment	0.364	0.074	29	29	34	69%	55%	59%	12	11	17	6	7	10
Machinery	Shipbuilding and repairing, and marine engines	2.000	1.000	50	58	75	96%	98%	91%	11	16	17	0	1	2
Machinery	Business oriented machinery	0.667	0.000	6	8	17	67%	75%	76%	1	1	5	1	1	1
Machinery	Aircraft and parts	0.000	0.000	0	0	1	0%	0%	100%	0	0	1	0	0	0
Other manufacturing	Hats	-0.286	0.800	7	6	14	43%	50%	50%	2	1	3	1	1	2
Other manufacturing	Sundry goods such as tatami mats.	2.000	0.364	15	29	41	93%	69%	63%	6	10	14	0	5	8
Other manufacturing	Bones, horns, hoofs, turtle shell, ivory, and shell products	-0.462	0.333	10	9	14	20%	44%	50%	3	4	4	2	2	2
Other manufacturing	Paper products	1.556	-0.133	20	27	39	95%	70%	79%	5	4	7	1	2	5

Note: *Oil and fat products include soaps, synthetic detergents, surface active agents, and paints.

Table 3. Japanese presence and Korean entry: Subsector–county level

	Fixed effect	Fixed effect	Fixed effect	Fixed effect	Fixed effect	Fixed effect	Linear probability	Fixed effect
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Share of Japanese factories (t − 1)	1.014***	0.862***	0.839***	0.796***	0.777***	0.914***	0.294***	0.922***
	(0.121)	(0.116)	(0.119)	(0.124)	(0.124)	(0.131)	(0.0467)	(0.131)
Gross entry rate of Japanese factories	0.279***	0.187***	0.155***	0.153***	0.145***	0.152***	0.0477***	0.151***
	(0.0343)	(0.0332)	(0.0330)	(0.0333)	(0.0331)	(0.0344)	(0.0122)	(0.0343)
Factory density (number of factories per 10,000 residents) (t − 1)		-0.632***	-0.607***	-0.658***	-0.660***	-0.678***	-0.292*	-0.676***
		(0.132)	(0.134)	(0.107)	(0.108)	(0.0852)	(0.125)	(0.0847)
Dummy if factories with 100+ workers present (t − 1)								-0.160
								(0.189)
Subsector-wide covariates								
Share of Japanese factories (t − 1)			0.771**					
			(0.268)					
Gross entry rate of all factories			0.666***					
			(0.0630)					
Total number of factories (t − 1)			0.000892					
			(0.000782)					
County characteristics								
Population growth rate					0.451***			
					(0.133)			
Year = 1940	-0.244***	-0.196***	-0.211***	-0.0642	-0.0874	-0.713*	-0.196***	-0.676*
	(0.0434)	(0.0418)	(0.0441)	(0.193)	(0.195)	(0.328)	(0.0277)	(0.332)
Constant	-0.100*	0.112*	-0.604**	0.0655	0.0185	0.291	0.322***	0.254
	(0.0392)	(0.0550)	(0.225)	(0.154)	(0.153)	(0.176)	(0.0665)	(0.162)
Subsector-county FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subsector × 1940 dummy	No	No	No	Yes	Yes	Yes	Yes	Yes
County × 1940 dummy	No	No	No	No	No	Yes	Yes	Yes
N	3610	3610	3610	3610	3610	3610	3610	3610
R-sq	0.044	0.107	0.162	0.234	0.239	0.369	0.319	0.369

Note: Unit of observation is subsector–county–year. The dependent variable is gross entry rate (percentage change in the number of factories during t − 1 to t). Share of Japanese factories is set to zero if no Japanese factories were present in period t − 1. Robust standard errors clustered by subsector–county in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4. Japanese presence and Korean entry: Subsector-level

	(1)	(2)	(3)
Share of Japanese factories (t − 1)	0.866**	0.864**	1.538
	(0.255)	(0.257)	(0.868)
Gross entry rate of Japanese factories	0.408**	0.406**	0.361*
	(0.141)	(0.142)	(0.155)
Share of factories with 100+ workers (t − 1)		-0.0301	0.712
		(0.142)	(0.616)
Total number of factories (t − 1)	-0.0000906	-0.0000658	-0.00695**
	(0.000193)	(0.000231)	(0.00247)
Year = 1940	-0.0475	-0.0422	-0.0891
	(0.159)	(0.158)	(0.175)
Constant	-0.303	-0.299	-0.310
	(0.199)	(0.201)	(0.614)
Subsector FE	No	No	Yes
N	132	132	132
R-sq	0.129	0.129	0.168

Note: Unit of observation is subsector-year. The dependent variable is gross entry rate (percentage change in the number of factories during t-1 to t). Share of Japanese factories are set to zero if there were no Japanese factories in period t-1. Robust standard errors clustered by subsector in parentheses. * p<0.05, ** p<0.01, *** p<0.001

Table 5. Robustness check.

					Subsectors	Subsector-				Dependent variable:	
			With presence			counties	Without	Without	Aggregation	Gross entry rate of	
		"Standard"	and entry of	Without	with Korean factories		"oligopolistic"	"localized"	by	Korean	Japanese
	Base	entry rate	Other factories	Keijo	only	only	subsectors	subsectors	sector	factories	factories
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Share of Japanese factories (t − 1)	0.922***	1.054**	0.994***	0.863***	0.957***	1.712***	0.967***	0.970***	1.089***	0.508***	-2.752***
	(0.131)	(0.340)	(0.133)	(0.132)	(0.137)	(0.283)	(0.160)	(0.162)	(0.214)	(0.0961)	(0.0847)
Gross entry rate of Japanese factories	0.151***	0.220*	0.148***	0.125***	0.153***	0.217***	0.133***	0.108**	0.219***		
	(0.0343)	(0.101)	(0.0343)	(0.0345)	(0.0349)	(0.0526)	(0.0396)	(0.0395)	(0.0485)		
Share of Other factories (t − 1)			0.731***								
			(0.198)								
Gross entry rate of Other factories			0.00421								
			(0.0464)								
Factory density (number of factories per 10,000 residents) (t − 1)	-0.676***	-4.686***	-0.682***	-0.686***	-0.678***	-0.688***	-0.685***	-1.251***	-0.353***	-0.747***	-0.471***
	(0.0847)	(0.883)	(0.0861)	(0.0814)	(0.0849)	(0.0824)	(0.0750)	(0.198)	(0.0822)	(0.0864)	(0.0420)
Dummy if factories with 100+ workers present (t − 1)	-0.160	-1.134	-0.175	-0.239	-0.131	-0.155	0.0517	0.235	-0.536**	-0.204	-0.290*
	(0.189)	(0.984)	(0.188)	(0.207)	(0.200)	(0.346)	(0.239)	(0.240)	(0.200)	(0.192)	(0.134)
Year = 1940	-0.676*	-2.104	-0.612	0.616	-0.714*	-1.005	-0.921	-0.822	-0.838**	-0.746*	-0.469*
	(0.332)	(1.192)	(0.338)	(0.321)	(0.345)	(0.600)	(0.483)	(0.421)	(0.272)	(0.338)	(0.220)
Constant	0.254	2.290***	0.242	-0.350	0.163	0.611*	0.601*	0.651*	0.583**	0.601**	1.335***
	(0.162)	(0.588)	(0.186)	(0.186)	(0.223)	(0.256)	(0.304)	(0.295)	(0.215)	(0.193)	(0.140)
Subsector-county FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subsector × 1940 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County × 1940 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3610	3610	3610	3500	3522	2390	2714	2728	1820	3610	3610
R-sq	0.369	0.448	0.374	0.379	0.371	0.465	0.418	0.413	0.420	0.362	0.610

Note: Unit of observation is subsector–county–year (sector–year for column (9)). The dependent variable is gross entry rate (percentage change in the number of factories during t − 1 to t). Share of Japanese factories is set to zero if no Japanese factories were present in period t − 1. Base result in column (1) replicates the result in column (8) in Table 3. “Oligopolistic” subsectors are those with a total number of factories lower than the first quartile in 1940 (59 factories). “Localized” subsectors are those whose number of counties with any factory is lower than the first quartile in 1940 (19 counties). Robust standard errors clustered by subsector–county in parentheses (sector–county for column (9)). * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6. Heterogeneity of the effects of Japanese presence and entry

	Base	"Large-scale" subsectors	"Small-scale" subsectors	Urban counties	Rural counties
	(1)	(2)	(3)	(4)	(5)
Share of Japanese factories (t − 1)	0.922***	0.912***	0.977**	1.527***	0.562**
	(0.131)	(0.144)	(0.361)	(0.217)	(0.171)
Gross entry rate of Japanese factories	0.151***	0.149***	0.112	0.274***	0.0670
	(0.0343)	(0.0388)	(0.0893)	(0.0565)	(0.0445)
Factory density (number of factories per 10,000 residents) (t −	-0.676***	-0.644***	-2.756***	-1.102***	-0.668***
	(0.0847)	(0.0669)	(0.746)	(0.223)	(0.0783)
Dummy if factories with 100+ workers present (t − 1)	-0.160	-0.121		0.0856	-0.401
	(0.189)	(0.189)		(0.224)	(0.298)
Year = 1940	-0.676*	-0.827*	-0.0188	-1.013**	0.782*
	(0.332)	(0.372)	(0.950)	(0.385)	(0.391)
Constant	0.254	0.198*	0.250	0.520	-0.461
	(0.162)	(0.0865)	(0.821)	(0.330)	(0.287)
Subsector-county FE	Yes	Yes	Yes	Yes	Yes
Subsector × 1940 dummy	Yes	Yes	Yes	Yes	Yes
County × 1940 dummy	Yes	Yes	Yes	Yes	Yes
N	3610	2732	878	1106	2504
R-sq	0.369	0.418	0.628	0.346	0.421

Note: Unit of observation is subsector–year. The dependent variable is gross entry rate (percentage change in the number of factories during t − 1 to t). Share of Japanese factories are set to zero if no Japanese factories were present in period t − 1. Base result in column (1) replicates the result in column (8) in Table 3. “Large-scale” subsectors are those with at least one factory employing more than 100 workers in 1936 (39 subsectors). “Small-scale” subsectors are those without any factories employing more than 100 workers in 1937 (27 subsectors). “Urban” counties are those categorized as a city (*fu*) in 1940. Robust standard errors clustered by subsector–county in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7. Japanese presence and Korean entry by sector

	Base	Food	Textile and apparel	Lumber and wood products	Printing	Chemical	Ceramic, stone, and clay products	Iron and steel	Machinery	Other manufacturing
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Share of Japanese factories (t − 1)	0.922***	0.857***	0.265	0.770	1.998*	1.166**	0.490	2.916**	2.254***	1.197
	(0.131)	(0.254)	(0.382)	(1.221)	(0.777)	(0.374)	(0.451)	(0.935)	(0.646)	(1.548)
Gross entry rate of Japanese factories	0.151***	0.118	0.0225	-0.343	-0.00730	0.359**	-0.105	0.266	0.223	-0.00377
	(0.0343)	(0.0650)	(0.106)	(0.272)	(0.197)	(0.118)	(0.153)	(0.165)	(0.153)	(0.161)
Factory density (number of factories per 10,000 residents) (t − 1)	-0.676***	-1.569***	-1.681***	-2.939	-2.522***	-0.458***	-3.237***	-3.894***	-3.088***	-13.41***
	(0.0847)	(0.337)	(0.395)	(1.935)	(0.643)	(0.0695)	(0.791)	(0.786)	(0.667)	(2.225)
Dummy if factories with 100+ workers present (t − 1)	-0.160	-0.195	0.926*			-0.540	0.204	-0.343	0.0541	
	(0.189)	(0.487)	(0.360)			(0.369)	(0.678)	(0.845)	(0.578)	
Year = 1940	-0.676*	-0.262	-0.873	-1.194	-0.325	0.329	-0.610	0.0121	-1.316*	-0.537
	(0.332)	(0.667)	(1.054)	(0.634)	(0.224)	(0.496)	(0.866)	(0.808)	(0.527)	(1.151)
Constant	0.254	0.298	0.747	2.549*	0.497	0.0155	1.178	0.0177	1.209*	1.787
	(0.162)	(0.430)	(0.924)	(1.016)	(0.498)	(0.521)	(0.905)	(0.928)	(0.586)	(1.618)
Subsector-county FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Subsector × 1940 dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
County × 1940 dummy	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
N	3610	1270	520	200	128	438	386	292	314	62
R-sq	0.369	0.463	0.670	0.896	0.310	0.742	0.713	0.827	0.687	0.844

Note: Unit of observation is subsector–county–year. The dependent variable is gross entry rate (percentage change in the number of factories during t − 1 to t). Share of Japanese factories are set to zero if no Japanese factories were present in period t − 1. Base result in column (1) replicates the result in column (8) in Table 3. County × year dummies are omitted for column (5) owing to insufficient observations. Robust standard errors clustered by subsector–county in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.