

# How Taiwan Won World War One and Became a Model Colony

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## Introduction

The amount of capital flowing from poor to rich countries is clearly much less than a naïve economic model would suggest (Lucas 1990). This discrepancy, known as the Lucas paradox, was already evident during the first era of globalization in the late nineteenth and early twentieth centuries (Clemens and Williamson 2004 and Shularick 2006). The massive amounts of British capital flowing abroad in that period were disproportionately directed toward the relatively rich settler economies, including the U.S. The capital-scarce Indian subcontinent accounted for roughly two-thirds of the British Empire's population but in 1913 had only received 10.1% of British foreign investment compared with Canada, which had received 13.8% (Goetzmann and Ukhov 2006, 270). Lenin (2010) and Hobson (1938) both speculated that imperialism was a means of siphoning capital out of increasingly-low-interest-rate capitalist economies into underdeveloped high-interest-rate areas, but if this was the object of imperialism, its success was modest. The capital that did flow to poor colonies such as India generally went to economic enclaves, such as plantation agriculture, or to the government-supported infrastructure projects that serviced them. Both in the colonies and in later post-colonial nations, the results of such investment were often dual economies with low rates of economic growth.

The most common explanation for the Lucas Paradox is poor institutions which limit capital flows within the capital-scarce economies (for example, Tornell and Velasco 1992 and Alfaro, et. al. 2008). Intercultural transaction costs may also play a role (Hanson 1999). Railroads float bonds in low-interest-rate international markets while village moneylenders lend at high interest rates to peasants. The enclave economy gets the limited amount of capital it requires at prevailing international interest rates, but high transaction costs keep the capital from flowing out of the enclave into the hands of the capital-strapped producers in the indigenous economy. These high transaction costs were occasionally overcome. Chettiar moneylenders funneled capital to lowland Burmese farmers keeping interest rates relatively low and creating—at least temporarily—a profitable rice-export economy (Turnell and Vicary 2008). But such instances

were rare. One of the few examples of a colony that overcame such problems and gained long-run economic success was the Japanese colony of Taiwan.

In 1895, the Japanese government obtained Taiwan after its victory in the first Sino-Japanese War. During the early years, the Japanese had to overcome fierce resistance to their rule. Thus, their colonial policy focused on law and order, the basic infrastructure needed for military control and health and sanitation improvements necessary to keep their personnel alive. This period produced much basic infrastructure that served as a foundation for economic development. A strictly enforced legal system was instituted, roads, railways and harbors were greatly improved and the life expectancy of the Taiwan population began to increase.

Private investment from Japan, however, was hard to attract and the public investment is sometimes exaggerated. From 1896 to 1905, only an average of 2.6 million yen of government subsidy and 3.3 million yen of long-term investment entered Taiwan each year. Gross domestic fixed capital formation averaged less than 5% of GDE from 1901-1907. In comparison, at the height of the post-World-War-One boom in 1920, long-term investment coming into Taiwan exceeded 60 million yen and from 1918-1938 gross domestic fixed capital formation averaged over 12% (溝口敏行與梅村又次 1988, 295 and 溝口敏行 2008, 393). The dearth in investment had a clear effect. Before World War One, the Taiwan economy did not appear very successful. Figure one shows real consumption per person, an often-used indicator of economic well-being, showed no clear increase in Taiwan until the 1920s.

As the data in the second section of this paper will show, before World War One, the Taiwanese economy resembled many Western colonies in that its financial markets were not integrated. Relatively cheap capital was available to Japanese corporations investing in Taiwan and this allowed them to expand, but very little of this capital left the corporate sector and interest rates faced by Taiwanese borrowers actually rose. To the extent there was any increase in the supply of capital faced by Taiwanese entrepreneurs, it was more than offset by increases in demand.

Most Japanese capital in Taiwan was in the sugar industry enclave. A heavily subsidized sugar mill went into operation in 1900, but the real boom began in 1907. By World War One, Japanese-controlled sugar corporations owned almost 5% of Taiwan's farmland (台灣新聞社

1917, 77). However, the sugar industry was an artificial creation: a cartel relying first on subsidy and later on a protected Japanese market. Sugar peaked as a share of Taiwan's exports in the early 1920s, and then began to decline. The cheap capital to which Japanese corporations had access gave them an advantage over Taiwanese entrepreneurs, but in practice it was difficult for Japanese corporations to profitably diversify and expand into the local Taiwan economy, which was dominated by small-scale production units.

Japan's World-War-One economic boom (1915-1920) greatly changed the Taiwan economy. The price of Taiwan's imports from Japan rose precipitous. The terms of trade turned against Taiwan (溝口敏行 2008, 401) and there was import-substitution investment. During the first couple years of the war, banks began collecting more deposits from Taiwanese but the value of loans to Taiwanese showed little increase and Taiwanese access to finance remained limited.

After 1916, bank lending to Taiwanese increased greatly and both interest rates facing Taiwanese and the rate of return to land ownership began to fall (reflecting the rise in land prices). Inflation in Taiwan followed Japan upward, peaking at 29.5% in 1918—measured by the GDP deflator (溝口敏行 2008, 403). Real interest rates, at least in the formal sector, were negative during the 1916-1919 period. In Taiwan, inflation increased largely through an expansion in bank loans. Bank loans in Taiwan were primarily short-term loans to provide trade credit and usually involved discounting promissory notes and bills of exchange. Since real interest rates were negative, holders of money-denominated assets were being forced to subsidize commercial transactions. By 1921, almost half of the bank loans in Taiwan went to Taiwanese. Japanese-run banks were probably willing to lend so much to Taiwanese outsiders because notes and bills were legally guaranteed by both parties in the transaction (沼田照義與犀川長作 1921, 52-4, 133). Trade credit loans benefitted both the buyer and seller and in many cases loans to Taiwanese were being “guaranteed” by a Japanese counterparty. Taiwanese entrepreneurs now gained connections and credit histories. Japanese capital—no longer stuck in the enclave economy—could find profit in the hands of Taiwanese entrepreneurs, investors and speculators.

The short-term working capital to which Taiwanese businessmen were gaining access was crucial to industries such as rice milling,<sup>1</sup> but it could not easily be converted into long-term capital for investment in land: Taiwan's most important productive natural resource. Japan, had better-developed capital markets and the price of Japanese farmland rose quickly. Then throughout the deflationary 1920s, the price of Japanese farmland fell. The falling price and farmland's low rate of return discouraged bank lending to landowners. In Taiwan, the price of land jumped after 1918, but lack of capital for land purchase kept the increase in land prices below the increase in the general price level. After the 1921-1922 postwar recession, Taiwan's land prices again began to rise, slowly catching up with the rise in agricultural prices. The rate of return to holding farmland fell but stayed well above the rate of return in Japan and above the interest rate for bank loans. The Japan Hypotec Bank (日本勸業銀行) shifted an increasing portion of its lending to Taiwan through the 1920s and 1930s. This was not only a reaction to rising prices and high rates of return in Taiwan's land market, but also a factor driving up farmland prices creating for the bank a virtuous cycle.

Turn-of-the-century observers of Taiwan, such as Davidson (1903) and Takekoshi (1907), praised the colonial government the Japanese set up in Taiwan and, given the colony's eventual success, many later researchers, such as Chang and Myers (1963) tended to emphasize the good results of Japan's early economic development policies. For Taiwanese, however, success was delayed until after World War One, and came in tandem with the rise of the largely Taiwanese rice industry. Ho (1978) has argued that the rice industry benefited the Taiwanese much more than the sugar industry since rice was key to Taiwan's subsistence economy. However, Ka (1995) has pointed out that the increase in rice production was largely due to an increase in exported ponlai rice and improvements in ponlai rice cultivation did not have any obvious impact on the production of subsistence zailai rice. Ka argues that the increase in rice production benefited the Taiwanese because unlike the sugar cartel, rice was produced by many small competitive units.

The rise of the rice industry has usually been attributed to an increase in Japanese demand that caused Japanese colonial policy to begin favoring rice production. Concretely, the most obvious

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<sup>1</sup> Teranishi (2007, 55 and 59) shows that among major Japanese industries, rice milling was by far the most dependent on trade credit.

boost to rice production due to colonial policy was the construction of two large irrigation systems, the Chia-Nan and Taoyuan irrigation systems. Although Japanese colonial policy played a part in determining Taiwan's productivity and economic welfare, this paper argues that the World-War-One inflationary shock that broke down the wall around the enclave economy also played a central role. The World War boosted loans outstanding to Taiwanese borrowers by over 90 million yen and from mid-1919 to the end of 1926, the value of long-term loans outstanding from the Hypotec Bank quintupled with almost 20 million yen of loans outstanding to Taiwan landowners at the end of 1926 (臺灣銀行 1922, 28 and 豐甜久核保 1927, appendix, 28-31). This is considerably more than the 26.7 million yen and 7.5 million yen of taxpayer money the Government-General of Taiwan used to support the Chia-Nan and Taoyuan irrigation projects (川野重任 1969, 19).

The next section of this paper will present evidence for the existence of dual financial markets in Taiwan and show the rise and fall of interest rates and the rate of return to land faced by the Taiwanese. The third section of the paper describes what happened during the WWI boom and how this immediately affected Taiwanese borrowing. The fourth section shows what happened to long-term borrowing and land prices after the boom. The last section concludes, suggesting that an improved understanding of colonial economic development in Taiwan, and elsewhere, could be obtained by moving beyond disputes on the effects of imperial economic policies and looking more closely at the international economic environment and the reaction among the colonized to changes in this environment.

## Taiwan's Dual Financial Markets

Dual financial markets can arise when high transaction costs keep capital from flowing out of the "formal" sector of the economy into the "informal" sector. Bank data show reasonably low interest rates being offered to borrowers, but most borrowers are in the informal sector and have no access to this capital. These borrowers must pay significantly higher rates to borrow from informal-sector lenders.

Taiwan's statistical yearbooks report interest rates in both Taiwan's formal and informal markets, but only the minimum and maximum interest rates were recorded. The range between the maximum and minimum interest rate largely reflects the difference in the risk premium between the least and most risky borrowers. This paper uses the minimum interest rate since the focus is in the cost of capital abstracted from the problem of risk.

Figure two shows three types of interest rates. The Bank of Taiwan was by far the dominant bank supplying over two-thirds of all bank loans on the island. Like most Japanese banks, it specialized in offering short-term working capital. The large majority of its loans in Taiwan were either in the form of discounted commercial bills or overdrafts. The interest rate shown in figure two as a proxy for interest in the formal financial sector is the average of the minimum interest rate offered by the Bank of Taiwan on discounted bills and overdrafts at its Taipei and Tainan branches.

A second interest rate shown is the minimum interest rate reported for collateralized loans among the Taiwanese population. This informal-market interest rate was published in the Taiwan Government-General statistical yearbooks. The interest rate per month is reported from various commercial centers on the island so this is probably the interest rate on local short-term trade credit, but exactly how the information was gathered is never explained.

Finally, the figure shows two measures of the interest rate in a second informal market. The on-line Taiwan Colonial Court Records Archives contains numerous notarized loan contracts between Taiwanese individuals. Some small loan contracts have high interest rates probably due to the relatively high per-yen transaction costs of small loans. Once loans under one thousand yen in value are removed along with illegible loans, interest-free loans, loans with interest payments made in rice and loans attached to sales contracts (for which there may be hidden implicit interest payments), 1207 loan contracts covering the period 1904-1942 remain. The figure shows the interest rate for the relatively low-interest loan in the 25<sup>th</sup> percentile of each year's sample (sorted by interest rate) along with the median interest rate. Again the low-interest rate loan is emphasized because, we wish to examine the costs of capital abstracted from risk. The 25<sup>th</sup> percentile is used to eliminate outliers.

The figure makes clear that the formal interest rate fell during the early years of Japanese rule. There were two troughs. The first trough was in 1910-1911 and coincided with the peak of the first big sugar boom. The second trough coincided with the wartime bubble. During the latter half of this boom, interest rates were gradually increased. The bubble popped in 1920 but interest remained high through 1926 after which a downward trend becomes obvious.

In spite of the early fall in formal interest rates in Taiwan, the informal rates did not decline. The local short-term trade credit rate reached a peak in 1909 and then began falling but in 1916 it was still as high as it had been in 1901. The interest rate on the safer notarized loan contracts between Taiwanese rose to a plateau over the period 1908-1916 before it began to fall.<sup>2</sup> After 1919, the informal interest rates rose along with the formal interest rate and then began falling, as did the formal interest rate. In other words, before 1916, the falling formal interest rate had no apparent effect on the informal interest rates that were faced by Taiwanese. After this time, however, informal interest rates fell and began to approach the formal rate. Since, more Taiwanese gained access to formal loan markets after 1916, the actually rates at which the average Taiwanese borrowed fell even more than the informal rate itself.

For Taiwanese investors, the land market was probably more important than the money market. Before World War One, over 90% of privately held land was in Taiwanese hands. Beginning in October 1905, all land transactions in Taiwan had to be registered and taxed. Tables showing the number of plots of land registered and taxed each year can be found in 臺灣總督府(民政局) (1906-1942), 臺灣總督官房法務課 (1918-1919, 1923-1924, 1927-1938) and 臺灣總督府法務部 (1915). These tables all show the number of land plots and taxes paid within each registration category. Before 1923, when land was sold, it was taxed at 3% of its market price. From 1923 to April 1927 land sales were taxed at 2.5%. Then until mid-1937, the tax was 3.3-3.5% after which it dropped to 3% (臺灣總督府財務局 1936, 西澤基一 1939 and 臺北商工會 1937).

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<sup>2</sup> The rise in Taiwanese interest rates may have been due in an increase in demand for funds. The volume of notarized loans increased suggesting that Japanese investment may have opened up opportunities for new Taiwanese investment. This seems to have been the case when the Japanese constructed Taiwan's first modern sugar mill (Liu 2005).



The number of land plots was reported but not the land area. Land plots on the tax rolls were becoming somewhat smaller over time, which in itself would push down the value of each plot. This paper corrects for this problem by dividing the yen-per-plot figure by the average size of all existing private plots in that year. The number of plots, both taxed and untaxed are found in 臺灣總督府財務局(1909-1943). In 1916, the land records add new land that was found in the forest survey. These were usually small dry fields or else undeveloped plots and the result is a fall in the average plot size of 6%. This paper assumes that prior to the forest survey change of ownership of these fields was not recorded. The data thus shows that in 1906 the average plot size was 0.504 *jia*.<sup>3</sup> This gradually fell to 0.471 *jia* in 1915, then in 1916 abruptly fell to 0.443 *jia*. After 1916, the size of the average plot shrunk slowly until it was only 0.405 *jia* in 1940. Undeveloped plots and farm plots were roughly the same average size, but there is much variance within the undeveloped category. Furthermore, residential plots were on average only a little over 20% the size of other plots. Thus if transactions occurred more in some categories of land than in other categories, the price-per-*jia* estimates will be somewhat distorted.<sup>4</sup>

An average value of a *jia* of farmland in any given year is derived from the annual average value of all land, the proportion of land in each category in each year and two additional assumptions. First, undeveloped land is taken to be worth 0.0833 times the value of farmland per *jia*. Second, the average value of residential land was 2.75 times the per-*jia* average value of farmland at the beginning of 1904 and its relative value grew at a constant rate of 1.45% until in 1942, its relative value was 4.81 times the per-*jia* average value of farmland. These two assumptions are based on the rates at which residential and non-developed land were taxed.<sup>5</sup>

To calculate the returns per *jia* of farmland, one estimates average rent and subtracts costs to the landowner (taxes, irrigation fees and fertilizer). To estimate the return on farmland, this paper

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<sup>3</sup> A *jia* is roughly equivalent to 0.97 hectares.

<sup>4</sup> An additional problem was that land was sometimes held in several and shares of severally held land were bought and used as collateral. From the contracts I have seen, I judge the proportion of land held in several to be small: certainly less than ten percent. Jointly held land was bought and sold and used as collateral but transactions had to be done jointly by all owners. An individual could not sell or mortgage his joint ownership rights.

<sup>5</sup> Undeveloped land was not taxed until 1935. We assume that its value changed in proportion to the value of farmland. Residential land began to be taxed in 1915. It then showed a quicker rise in value than farmland. Pre-1914 values are an extrapolation of the post-1914 trend.

uses estimates from 吳聰敏 (2001) for crop harvest and then estimates the proportion of the harvest that goes to rent. Taxes and major expenses incurred are then subtracted from the rent.

In the original land survey, the Japanese estimated that the landlord received on average 39.2% of the crop. In the revision of the land survey, they estimated this share had risen to 41.0%. This paper assumes that these figures correctly describes the situation in 1904 and 1919 and then geometrically extrapolates percentages for all other years. By 1940, 44.7% of the harvest is assumed to go to the landowner. This increase was primarily due to the increase in irrigation.

Data on the land taxes (island-wide, district/prefectural and local) are taken from 臺灣總督府財務局(1909-1943). A land tax was taken by both the Government-General of the island and the district/prefectural governments. After 1919, a land tax was also taken by the local governments.<sup>6</sup> In the revision to the land survey, irrigation and fertilizer expenses were calculated so that they could be deducted before land taxes were calculated. The estimated total cost of irrigation was 798,000 yen or 2.5% of rent and the estimated fertilizer expense was 17.5% of rent. 臺灣總督府民政部土木局 (1916, 52 and 183) reports that excluding the smaller unofficial systems, irrigation fees had already grown to 926,000 yen in 1914, so the survey revision figure seems to be an underestimate. To estimate the cost of irrigation this paper uses the fees charged by official irrigation organizations and government-run irrigation projects. This data is found in 臺灣總督府民政部土木局 (1911 and 1916) for the years before 1915. Later data is available for government-run irrigation projects from 1915 to 1921 in 臺灣總督府財務局 (1922, 92) and after 1924 and for irrigation organizations after 1922 in 臺灣總督府內務局土木課 (1931-1942). When data is not available, linear extrapolation has been used. To estimate fertilizer usage, this paper uses total fertilizer and lime imports found in 臺灣總督府財務局稅務

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<sup>6</sup> When the Japanese estimated returns on investment in land, they deducted several other taxes. I am not deducting these taxes because they fell on all types of wealth, not just land.

課 (1936) before 1936 and 臺灣總督府民政部文書課 (1938-1942) afterwards along with fertilizer and lime produced in Taiwan also from 臺灣總督府民政部文書課(1915-1942).

A person invests in land to gain a future stream of returns. Unfortunately, one cannot directly observe the expectations of investors. Dividing the previous year's return on land investment by the average sales price of farmland gives one a simple naïve estimate of the expected rate of return on investment in land in percentage terms. The previous year's harvest was used because this minimized the variance of the rate of return. One must then keep in mind that this naïve rate may mislead if investors are expecting capital gains or losses.

The naïve rate of return on investment in land, found by dividing the previous year's return with the present year's land price, is shown in figure three along with this series' five-year moving average. The moving average rises prior to 1914, peaks from 1914 to 1920 and then slowly falls over the next twenty years.

The rate of return for the land market in Taiwan tells a story similar to the informal credit market data. The only important difference is that the fall in returns to Taiwanese investment in land was somewhat delayed. Given the much lower rates of return facing Japanese investors, unified financial markets would have led to capital flowing into the hands of Taiwanese investors or Japanese investors would have themselves started buying up Taiwanese land. In fact, during WWI landholdings of Japanese sugar mills did almost double (臺灣總督府殖產局糖務課 1921). But this was not enough to immediately drive down rates of return. The post-1920 falling rates of return to Taiwanese land investment supports the interest rate data, indicating that by the 1920s the capital available to Taiwanese investors was increasing.

## A Sketch of the Market-Integrating Wartime Bubble

The start of World War One did not lead to immediate advantage for Japan. Some of Japan's export industries and its shipping industry gained from the decrease in European competition, but many of Japan's imports also rose in price. The higher prices in foreign markets caused Japan's trade deficit to turn to a large surplus (Metzler 2006, 91-95). Foreign money flowed into Japan. The Japanese sent some of this money back abroad again in the form of loans to foreign governments and trade credit to foreign buyers. Real gross domestic fixed capital investment actually fell through 1916 and overall prices declined slightly in 1915 (溝口敏行與梅村又次 1988). But by 1916 a large inflation had begun.

Japan's GDE deflator rose 13.7% in 1916, 28.1% in 1917, 26.9% in 1918 and 24.2% in 1919. During this period, due partly to the glut of money flowing into the country and partly to lack of competition among cartelized banks, interest rates on deposits remained low. Savers who kept their wealth in yen-denominated form were losing about 20% of their savings each year from 1917 to 1919. This inflation tax went to subsidize borrowers who could borrow at negative real interest rates. People with access to such credit (the nouveau-riche *narikin*) made great profits while real wages slumped and in 1918 the inflated price of rice brought about the Rice Riots.

The WWI bubble continued after the Armistice in November 1918, but in somewhat altered form. Credit remained easy and both the stock market and public investment boomed. The U.S. lifted its gold embargo which allowed more gold to flow into Japan and the price of silver doubled leading to a large rise in demand in Chinese markets (Metzler 2006, 118). However, as Japanese prices continued to rise, a trade deficit reappeared (Metzler 2006, 120-1). The Japanese government worried that inflation would make Japan's exports uncompetitive and interest rates were gradually increased. The U.S. went into recession at the beginning of 1920 and in March of 1920, the Tokyo stock market crashed and Japan also went into recession.

The effect of the wartime boom on Taiwan was somewhat different than in Japan. In real terms, consumption per person in Taiwan did not rise except for a small uptick in 1919-1920. Although Japan was investing abroad in this period, figure four shows that Taiwan was neglected. Two estimates of net capital inflow into Taiwan are shown in the figure. One is the unadjusted current account balance of payments (溝口敏行與梅村又次 1988, 295). The other adjusts the balance of payments by using the cost in Taiwan of producing sugar instead of the value of sugar

given in the trade statistics(台灣總督府殖產局特產科 1935, 106).<sup>7</sup> The price of exported sugar in the trade statistics is somewhat arbitrary since the corporations running the sugar mills generally took the sugar out of the country without a market transaction. The Japanese sugar cartel sold sugar at prices well over cost and the profits accrued may have never entered Taiwan. However, both estimates tell a roughly similar story. Investment came into Taiwan before the war when the sugar industry was being expanded and then perhaps later during the postwar period of the boom. But during the war years, 1915-1918, investment was not on net coming in. By 1915, subsidies to Taiwan's Government-General had ceased and from 1913 to 1916 long-term capital investment was at a low (溝口敏行與梅村又次 1988, 295).

Although not much capital, on net, was coming into Taiwan, investment increased. Observers noted a rise in import substitution industries, transportation and land development (高北四郎 1927, 62). Coal mining and electrification also took off during this period (臺灣總督府官房調查課 1921, 544-552). Figure five shows that private gross domestic fixed capital formation rose from 5.1% of GDP in 1915 to 19.7% of GDP in 1920. This increase was much greater than that observed in Japan and was due to the increase in domestic saving. There had been a surge of domestic saving in the 1909-1911 period, but this was virtually all due to retained earnings on the part of the Japanese sugar cartel. If one sets the cartel earnings aside, there was very little saving during this period on the part of Taiwanese. After 1915, however, savings jumps to 10% of GDP and remains at this level.

Such a drastic increase in investment caused a corresponding rise in the prices of investment goods. In fact, a good part of the initial growth in fixed capital formation as a percentage of GDE was due to the fact that fixed capital prices had risen much faster than other prices. In Taiwan the price index for gross domestic fixed capital formation rose considerably more than it rose in Japan while consumer prices rose less in Taiwan than those in Japan (calculated using 溝口敏行與梅村又次 1988). Japan's boom was driven by demand for exports and Japanese were

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<sup>7</sup> To calculate the per unit cost in Taiwan, the cost of selling the sugar and half the business cost is deducted from the total unit cost.

cautious about investment since the wartime boom was by nature temporary. Taiwan's boom seems to have been a bubble driven by a sudden capital glut—a glut of forced savings.

Banks in Taiwan specialized in granting short-term loans for working capital. In 1914 the banks lent 259,685,627 yen in Taiwan but at the end of the year only 44,091,650 yen worth of loans were outstanding. Thus the average loan was for a period of between two and three months and the average loan period dropped below two months from 1918 to 1921. Most bank loans in Taiwan came in the form of discounting commercial bills and, after 1915, accepting commercial bills as collateral. 78% of all loans outstanding at the end of 1914 were due to discounting bills; and from 1919 to 1921, over 90% of outstanding loans were either due to discounting bills or accepting them as collateral (臺灣總督府財務局金融課 1930, 46-9).

When the wartime boom began, lending by Taiwan banks greatly increased but most of the lending did not occur in Taiwan. In particular, the Bank of Taiwan lent large amounts through the many new branches it opened in China and elsewhere in the world. Then in 1917-1918, it participated in the Nishihara loan to the Chinese government (Tamaki 1995, 123-124). Table one shows the deposits and loans outstanding of Taiwanese banks. From 1914 to 1916 lending to Japanese in Taiwan increased 60% but only in 1917 did loans to Taiwanese begin increasing. By 1919 the post-1914 growth in loans to Taiwanese had surpassed the growth in loans to the Japanese in Taiwan and by 1921 virtually as many loans were going to Taiwanese as were going to Japanese. After 1921, the amount of bank loans granted in Taiwan remained at the new higher level.

The rise in Taiwan's GDE deflator indicates that inflation was averaging 18% from 1916 to 1920. As figure one showed, this was far above interest rates in the formal market and even above interest rates on loans between Taiwanese found in the notarized contracts. Commercial transactions by businessmen who had access to trade credit were thus being subsidized by those holding cash and yen-denominated assets. Those paying this subsidy were primarily Japanese. The inflation tax was non-neutral. It created forced savings, funneling money to investors and speculators. Overall from the end of 1915 to the end of 1918, outstanding bank loans rose 50 million yen (20 million to Taiwanese, 30 million to Japanese in Taiwan) and the three-year total for gross fixed capital formation was 90 million yen in excess of what would have been expected

given average gross fixed capital formation during the 1911-1915 period. In the 1919-1920 period, when significant investment from Japan started flowing into Taiwan, outstanding bank loans rose 122 million yen (64 million to Taiwanese and 58 million to Japanese) and this two-year period saw 236 million yen in excess gross fixed capital formation. Thus in both periods, the rise in bank loans accounts for a little over half of the increase in gross fixed capital formation. Much of the rest may be attributed to “piling on.” Since the rise in bank loans was driving up the price of land and capital goods, many people would have found saving attractive since they also wanted to gain from the increase in land and capital prices.<sup>8</sup>

Bubbles can be disastrous when they pop, but the recession following the Taiwan bubble was relatively mild. Banks had accumulated piles of bad debts (高北四郎 1927, 64), but even though interest rates rose in the formal markets they were still lower than what Taiwanese had faced before the bubble in the informal markets. During the bubble, many Taiwanese *nouveaux-riche narikin* had established relationships with banks and now had credit histories. They would have come out of the bubble with better access to credit than when the bubble first began. The year after the bubble, Taiwanese were borrowing more than they did during the bubble and by 1924 Taiwanese deposits had recovered and in real terms exceeded the peak they had reached during the bubble.

Japan’s other colony, Korea, showed some resemblance to Taiwan, but its financial sector was much less developed. Figure six shows the real bank deposits and bank loans per person for native Taiwanese and Koreans. Unfortunately, there is no data on loans to Taiwanese after 1921. The percentage growth in deposits and loans was actually somewhat greater in Korea than in Taiwan, but since Korea began from a very low base, the loan expansion had much less effect on

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<sup>8</sup> Over the whole 1916-1918 period, Taiwan’s balance of payment (current transactions) had a 98 million yen surplus with 154 million yen of short-term capital leaving the island on net and 56 million yen of long-term capital entering the island on net. If one adjusts this by using the on-island cost instead of the recorded value of exported sugar there is a small 7 million yen deficit in the balance of payments. In effect, this lowers the estimate of short-term capital leaving the island to 49 million since it is assumed that 105 million yen of short-term capital supposedly leaving the island never reached Taiwan. During the two-year 1919-120 period, there was a total surplus of 17 million yen with 116 million yen of long-term capital entering the island and 133 million yen of short-term capital leaving the island. But if one adjusts the sugar exports, there is now a 99 million yen deficit. This could explain almost half of the rise in gross fixed capital formation.

Koreans. In 1921, native Taiwanese had five times more bank deposits, per capita, than native Koreans and received six times more money in loans. As a result, not only were Koreans less likely to have access to bank loans than Taiwanese but interest rates on loans between Koreans were also much higher. One estimate is that for a 1000-yen collateralized loan between individuals in 1934, a Japanese in Japan would have had to pay on average 10.4% in annual interest, a Taiwanese would have paid 13.8% and a Korean would have paid 18.5% (臺灣總督府財務局稅務課 1936, 70-77). The increase in investment in Korea was less than in either Japan or Taiwan. One reason may be that much of the capital was flowing to Manchuria. From 1917 to 1919, the Manchurian boom had increased land prices in Dairen (Dalian) by a factor of six (Meltzer 2006, 135).

One obvious immediate effect of the increase in capital available to Taiwanese can be seen in the stock market. From 1916 to 1919, Taiwan's statistical yearbooks show how much of each corporation's stock was held by (a) Taiwanese, (b) Japanese in Taiwan and (c) Japanese in Japan. The figures for the whole market are shown in table two. The largest amount of capital was in the sugar mills and the Bank of Taiwan. Stock in these corporations was mainly held by Japanese in Japan. After 1916, however, there was an increase in the creation of smaller local corporations in Taiwan and stock in these corporations were most often held by Taiwanese and local Japanese. Taiwanese stockholdings rose steadily from 1916 to 1918 and then surged in 1919. 涂照彥 (1992, 408-426) gives a more detailed look at how this investment boom affected some of Taiwan's richest families. Of course, the stock market crash came in early 1920, so the accumulation of stock on the part of Taiwanese may not have been to their long-term advantage.

## The Bubble and Long-Term Investment

In the long run, the most important Taiwanese investment was land. Holders of money-denominated assets (who were predominantly Japanese) suffered from the inflation while land held its value much better. As prices rose, the market value of land also rose, but without easy access to capital, adjustment took time. Taiwanese landowners came out of the World War One with their land devalued less than money-denominated assets and with the value of the land still



generally adjusting upward. The boom thus left Taiwanese with better collateral vis-à-vis the Japanese in Taiwan.

Figure seven shows this paper's estimates of the market value per *jia* of Taiwan's privately held land from 1905 to 1942 along with the rural CPI and Japanese land value and the Tokyo Stock Market index for comparison. In the 1906-1910 period, the price of Taiwanese farmland was only 22% the price of Japanese both because it was less productive and because of the higher interest rates and rates of return in Taiwan. To make comparison easier, in figure seven, the Japan farmland price has been multiplied by 0.22. The stock market index has also been adjusted.

Until the World War One boom got underway, the nominal value of Taiwan farmland did not increase. Given the upward drift in the price level, the real price of land fell. Then the price of Taiwanese farmland began rising after 1916, but only in 1919 did the price of farmland begin to increase faster than the CPI. Compared to Japanese land prices, the jump in Taiwan prices was delayed. From 1915 to their peak in 1919, Japanese land prices increased 294%. When Taiwanese farmland prices reached their peak in 1920, they were only 216% above their 1915 value. Taiwanese land prices rose less than the CPI, while Japanese prices overshoot the Japanese CPI. This is probably attributable to the better capital markets in Japan. In Japan, it was easier to borrow money to make land purchases and if one expected inflation in the future, one would certainly wish to convert one's money into physical assets. In Taiwan, short-term borrowing had become much easier, but there were limits to how long one could plan to roll over short-term loans. After a short downturn in 1922, land prices continued to rise.

When one wanted to borrow funds for long-term investments in either Japan or Taiwan, the main source of funds in the formal market was the Japan Hypotec Bank. While most Japanese banks limited risk by lending short-term, the Hypotec bank was largely funded through the issue of long-term bonds and this allowed it to make matching long-term loans. In Taiwan, previous to 1923, these long-term (usually ten-year) loans were sold through the Bank of Taiwan, which acted as the Hypotec Bank's agent. Table three shows the number of loans issued by the Hypotec Bank each year and the number (and percentage) of these loans issued in Taiwan.

The Hypotec Bank began issuing loans in Taiwan in 1905. Before WWI, there was an increase in the proportion of loans issued in Taiwan so one could argue that the growth in lending in Taiwan would have increased even without the war. However, a boom did occur during the war. Overall, there was a large decrease in Hypotec Bank loans, probably because of the difficulty of selling long-term bonds during the wartime bubble. However lending to Taiwan increased substantially. Loans continued to be issued at the new higher level during the 1920s and in the late 1920s and early 1930s a new burst of lending occurred on the island. In 1926, loans worth approximately 20 million yen were outstanding to Taiwan farmland owners and over 7% of Taiwan's farmland was held by the Hypotec Bank as collateral (calculated using 豐甜久 核保 1927, appendix 32). By 1936, 16% of Taiwan's farmland was held by the Hypotec Bank as collateral (後藤辛雄 1937, 42) and the price of Taiwanese land had risen to 36% of the price of Japanese land.

Nanjo (2002, 138) argues that the decline in farmland values in Japan during the 1920s and early 1930s constrained bank lending there. The price of Japanese farmland rose too high in 1919 and then had to gradually come down. In Taiwan, the wartime improvement in capital markets lowered the rate of return on investment so that land prices kept rising. The Hypotec Bank found this environment very attractive and greatly increased lending in Taiwan. The increase in lending, in turn, helped push up land prices.

It is not possible at this point to determine how much the postwar growth in Taiwan was due to the improvement in capital markets and how much was due to other factors. The key changes to occur in Taiwanese agriculture beginning in the 1920s were the increase in rice production and the increase in the capital intensity of agriculture. The Japanese developed a new strain of rice, ponlai, which was more acceptable to Japanese consumers, but required more fertilizer and better paddy (臺灣總督府殖產局 1931, 2-3). Increased exports of this rice is often linked to the rising welfare among the Taiwanese population, but the changes in the capital markets described in this paper precede the widespread cultivation of ponlai rice. Ponlai rice had been under development in Taiwan since 1912 but not until 1924 was it grown on more than an experimental basis.

Certainly one reason Taiwanese were willing to grow this rice was that access to lower interest rates allowed the additional investment required.

Before the war, commercial fertilizers were seldom used on rice paddies, and were largely limited to sugar cane. Until 1916, the sugar mills supplied fertilizer at subsidized prices since they could borrow at lower interest rates. When real interest rates tumbled in 1916, the subsidy was ended (川野重任 1969, 30-31). Yet in spite of the end of the subsidy, during the WWI boom, fertilizer imports rose over 250% (at 1919 prices) suggesting that the use of fertilizer was closely tied to interest rates (calculated from 臺灣總督府財務局稅務課 1936).

The other important investment for rice farmers is irrigation. The Japanese Government-General did subsidize some large irrigation projects, but as noted in the introduction, the subsidy was not as large as the increase in lending associated with the wartime boom. In fact, the war was a turning point in fixed capital investment. Before the war, virtually half the fixed capital investment in Taiwan came from the government. But after 1914, private investment quickly rose so that during the 1915-1920 period, 80% of fixed capital investment came from the private sector and this public-private ratio continued after the war (溝口敏行 2008, 365). Overall, it was the increase in private investment that seems to have driven the post-WWI Taiwan economy.

## Conclusions

Narrowly stated, the point of this paper is that World War One was a turning point for Taiwan's economy—a turning point that has been largely overlooked. Inflationary bubbles do not usually benefit economies, and this bubble did not benefit the economy of the Japanese empire in general, but the flood of new money did burst the financial dike around the Japanese economic enclave in Taiwan. This unpredictable event helped put the Taiwan economy on a new growth path. One might see this as simply a fortuitous accident, but historically the ability to take advantage of the twists of fortune has been a noted Taiwanese trait. Absent the World-War-One inflation, it is not clear Taiwan would have ever become a successful “model” colony.

More broadly, the point of this paper is to suggest that Taiwan's economic development was not merely the result of Japanese economic policy. Understandably, the main question that has motivated most studies of colonial economic history is to what extent imperialist rule was exploitive and to what extent it was developmental. This is certainly the main focus of economic studies of Japanese-era Taiwan, and many studies of the post-colonial KMT period adopt a parallel approach. Such questions are extremely important, but if one is not careful, they can lead one to view a colony's economy—for better or worse—as something that has been carved by imperial policy makers. The colonized seem to play a passive role. In fact, economic policies in a colony were not only to a significant extent endogenously determined, but were constantly buffeted about by international economic forces beyond imperial control. These forces, and how the colonized reacted to these forces, played an important role in colonial development.

Taiwan's success was not simply due to luck in obtaining good imperial masters. Successful reaction by Taiwanese to changes in the international economy was an important factor in Taiwan's growing economic success.<sup>9</sup> To understand why the colonial Taiwan economy performed as well as it did, studies need to focus on such issues as how Taiwanese investors obtained the support of Japanese capital and how they were able to increase their own capital. The World-War-One inflation played an important role, but many other colonies went through similar inflations without advantage. Why inflation in other colonies did not more often lead to capital flows similar to those in Taiwan is another topic begging for research.

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<sup>9</sup> Olds (2011) presents one small, but significant, example of this.

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Table One. Deposits in and Loans Granted by Taiwanese Banks (1000 yen)

Year	Taiwanese		Japanese in Taiwan		Off-Island	
	Deposits	Loans	Deposits	Loans	Deposits	Loans
1909	3193 (106.6)	6911 (38.6)	15,096 (51.9)	10,744 (41.0)	3086 (10.3)	12,235 (48.6)
1910	2808 (93.8)	8226 (46.0)	17,235 (59.3)	11,875 (45.3)	4335 (14.5)	12,362 (49.1)
1911	3664 (122.4)	8905 (49.8)	19,639 (67.6)	16,059 (61.3)	7518 (25.2)	15,512 (61.6)
1912	4238 (141.5)	12,017 (67.2)	22,059 (75.9)	19,312 (73.7)	15,772 (52.9)	20,082 (79.7)
1913	3741 (124.9)	15,699 (87.8)	24,405 (84.0)	24,983 (95.3)	22,559 (75.6)	23,410 (92.9)
1914	2994 (100.0)	17,886 (100.0)	29,059 (100.0)	26,206 (100.0)	29,822 (100.0)	25,197 (100.0)
1915	5637 (188.3)	19,025 (106.4)	24,352 (83.8)	32,993 (125.9)	53,592 (179.7)	71,023 (281.9)
1916	9506 (317.5)	18,935 (105.9)	27,223 (93.7)	41,799 (159.5)	87,047 (291.9)	122,028 (484.3)
1917	13,027 (435.1)	30,419 (170.1)	32,456 (108.2)	55,386 (211.3)	214,057 (717.8)	288,418 (1144.7)
1918	20,126 (672.2)	39,639 (221.6)	40,048 (137.8)	64,894 (247.6)	354,906 (1190.1)	375,396 (1489.8)
1919	25,174 (840.8)	88,192 (493.1)	60,665 (208.8)	102,814 (392.3)	246,831 (827.7)	396,077 (1571.9)
1920	19,490 (651.0)	103,341 (577.8)	64,582 (222.2)	123,035 (469.5)	142,729 (478.6)	307,082 (1218.7)
1921	18,984 (634.1)	111,573 (623.8)	56,930 (195.9)	115,869 (442.1)	132,923 (445.7)	354,941 (1408.7)

From 臺灣銀行 (1922, 105-107), 臺灣銀行 (1917, 151-168). Numbers in parenthesis are index numbers: 1914 = 100.

Table Two. Paid-in Capital in Taiwan Corporations (Million Yen).

<b>Year</b>	<b>Held in Japan</b>	<b>Japanese in Taiwan</b>	<b>Taiwanese</b>
1916	70.3 (83.1%)	8.0 (9.5%)	6.3 (7.4%)
1917	82.8 (82.5%)	8.9 (8.9%)	8.6 (8.6%)
1918	103.4 (79.3%)	12.3 (9.5%)	14.6 (11.2%)
1919	131.5 (63.4%)	38.5 (18.6%)	37.3 (18.0%)

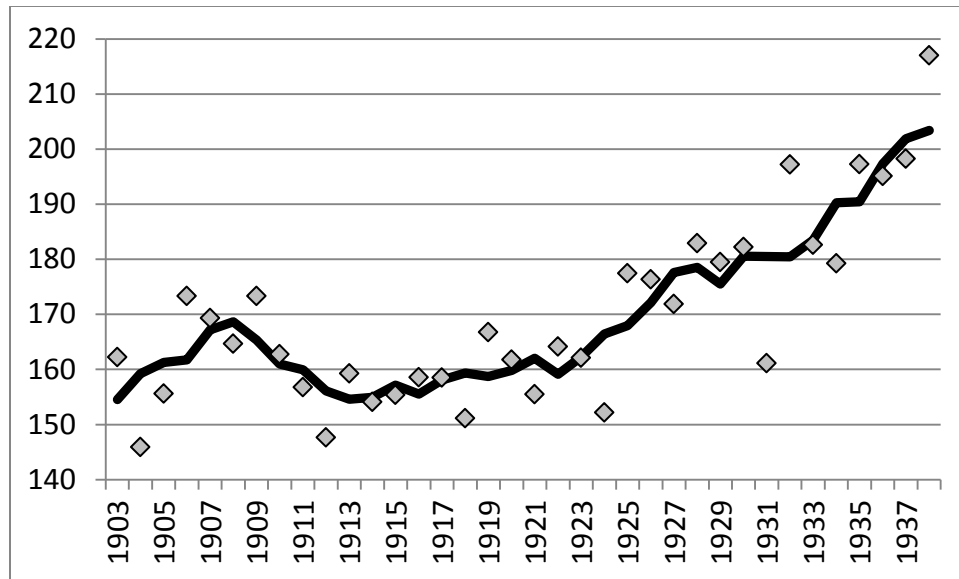
Calculated from 臺灣總督府官房統計課 (1918, 544-549), 臺灣總督府官房調查課 (1919, 558-563), 臺灣總督府官房調查課 (1920, 534-541) and 臺灣總督府官房調查課 (1921, 544-553).

Table Three. The Number of Japan Hypotec Bank Loans

Year(s)	Total Loans	Taiwan Loans	Taiwan Loan Percentage	Year(s)	Total Loans	Taiwan Loans	Taiwan Loan Percentage
1905	1302	4	0.3	1921	10522	922	8.8
1906	1972	13	0.7	1922	15003	338	2.3
1907	1827	36	2.0	1923	19653	1166	5.9
1908	2183	27	1.2	1924	20958	948	4.5
1909	4083	29	0.7	1925	21697	652	3.0
1910	10588	45	0.4	1926	21753	729	3.4
1911	20453	141	0.7	1927	30018	1290	4.3
1912	12829	171	1.3	1928	44539	2001	4.5
1913	11607	388	3.3	1929	38450	3695	9.6
1914	15444	307	2.0	<b>1921-29</b>	<b>24733</b>	<b>1305</b>	<b>5.3</b>
<b>1905-14</b>	<b>8229</b>	<b>116</b>	<b>1.4</b>	1930	48525	4947	10.2
1915	20802	714	3.4	1931	55123	8264	15.0
1916	11520	817	7.1	1932	50366	6089	12.1
1917	6489	780	12.0	1933	38846	6671	17.2
1918	4971	765	15.4	1934	45572	7485	16.4
1919	5826	946	16.2	1935	45149	6021	13.3
1920	5413	690	12.7	1936	50198	9467	18.9
<b>1915-20</b>	<b>9170</b>	<b>785</b>	<b>8.6</b>	<b>1930-36</b>	<b>47683</b>	<b>6992</b>	<b>14.7</b>

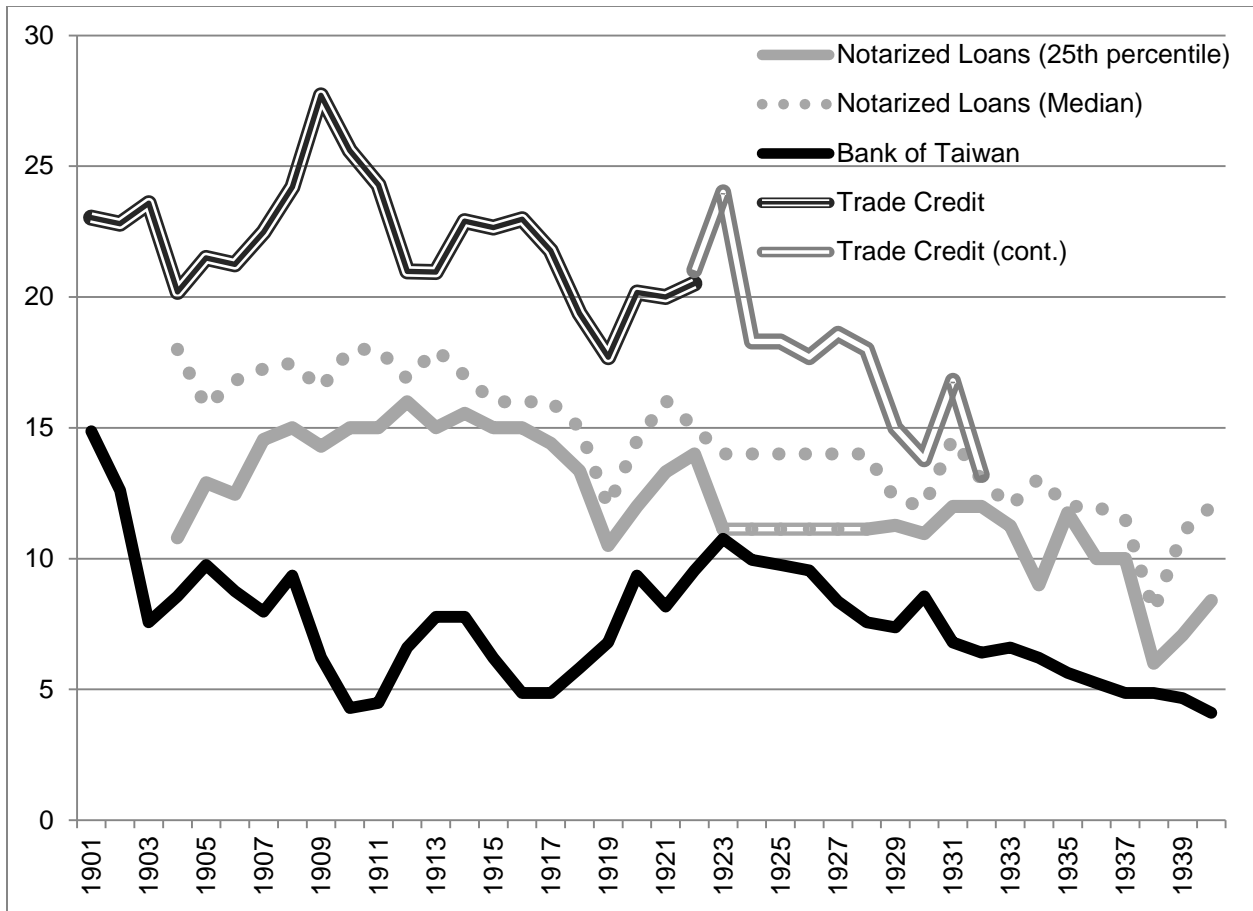
From 後藤辛雄 (1937, appendix 12-17) and 豐甜久核保 (1927, appendix 12-17). The number of loans is used rather than the value of loans because there were a small number of big non-collateralized loans to corporations, irrigation organizations, etc., that distort the statistics.

Figure One. Real Consumption per Person in Taiwan (1914 yen per person)



Calculated from 溝口敏行與梅村又次 (1988). The line represents a five-year moving average.

Figure Two. Interest Rates in Taiwan (Percent per Year)



Calculated from 臺灣總督府民政部文書課(1901-1940) and the online Taiwan Colonial Court Records Archives. During the period 1923-1928, notarized loans averaged less than 10 per year, so these six years were combined as one observation. The trade credit data is based on two samples. From 1901 to 1922, the average minimum interest rate for Taipei, Keelung, Hsinchu, Taichung, Chiayi, Tainan, Kaohsiung (Fengshan), Pingtung (Hengchun), Ilan and Taitung are averaged. For the period 1923 to 1932, the yearbooks present less data and only Taipei, Hsinchu, Chiayi and Tainan are used.

Figure Three. Estimated Returns to Landholding (Percent per Year)

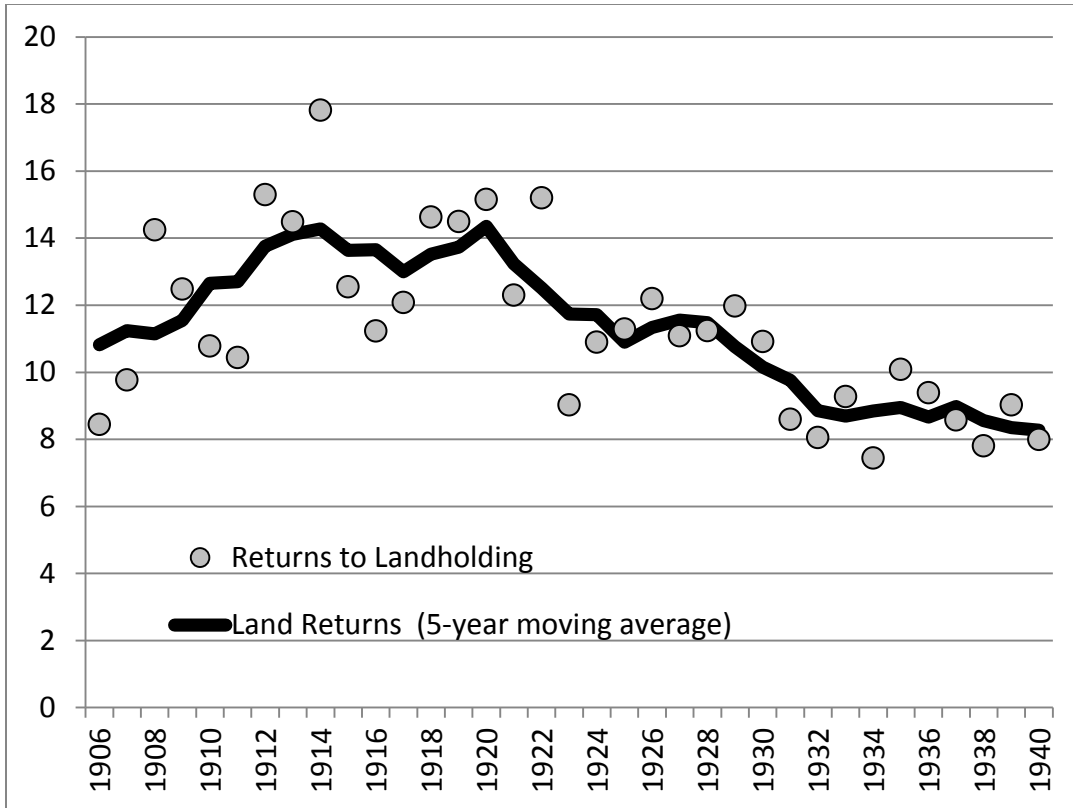
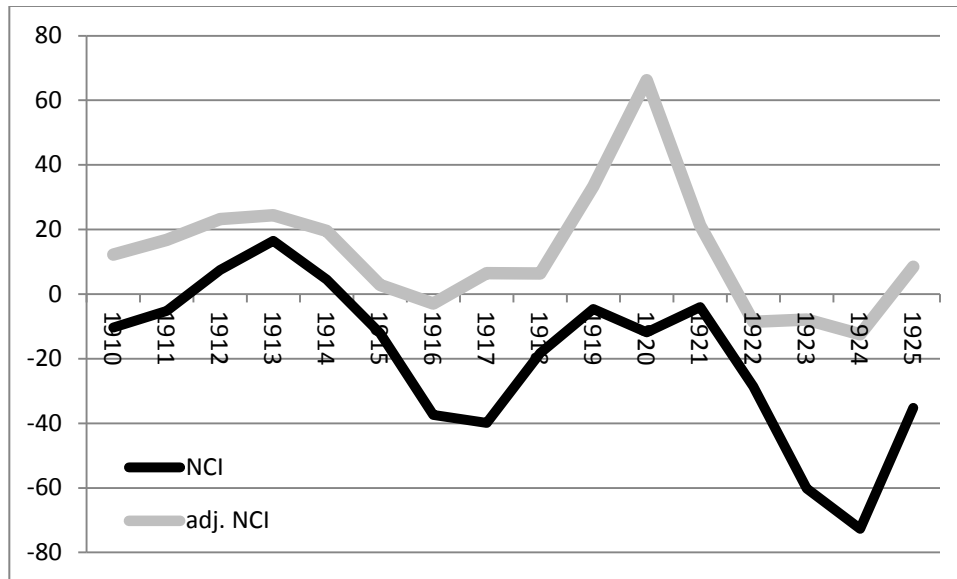


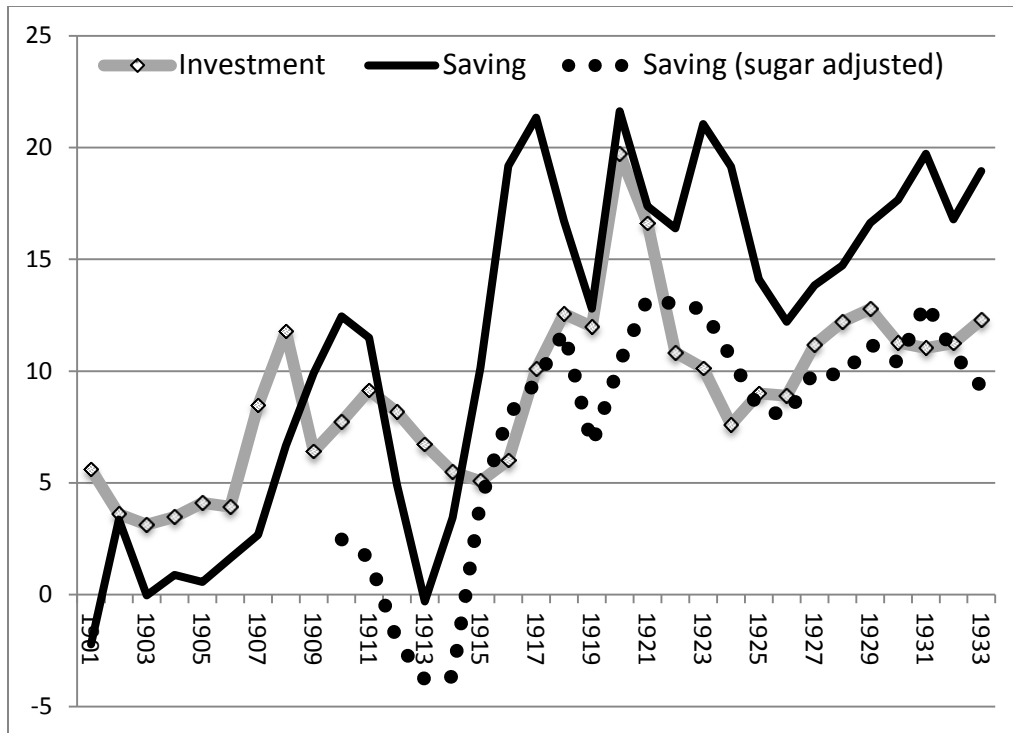


Figure Four. Taiwan's Net Capital Inflow (in Millions of Yen)



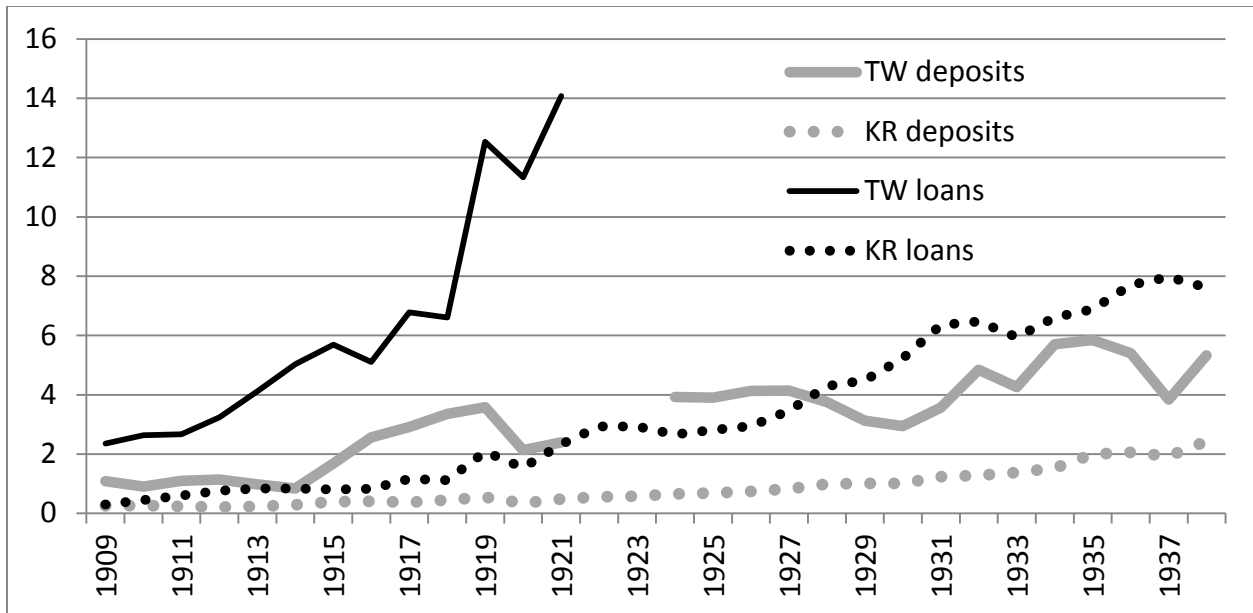
Calculated from 溝口敏行 (2008) and 臺灣總督府殖產局特産科 (1935, 106). The adjusted NCI, uses the cost of sugar instead of the export price reported. Cartel profits are thus assumed never to have left Japan.

Figure Five. Fixed Capital Formation and Private Domestic Savings as Percent of GDE



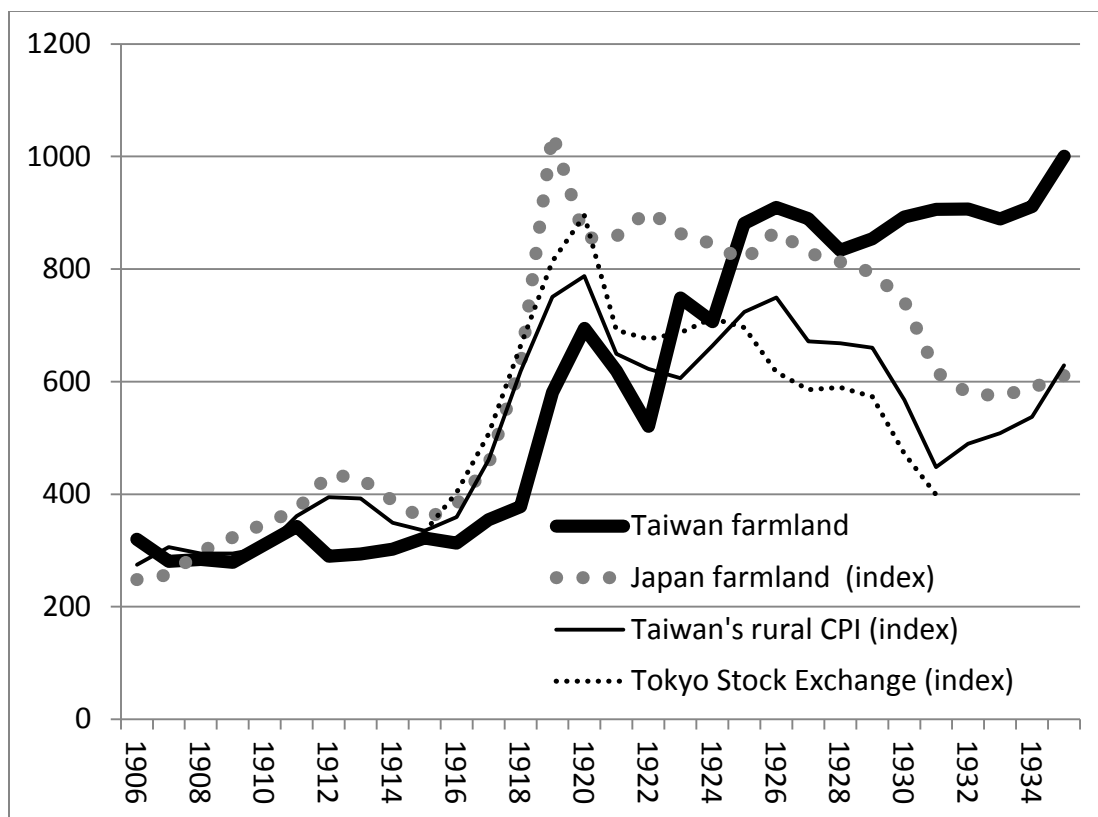
Calculated from 溝口敏行 (2008) and 臺灣總督府殖產局特產科 (1935).

Figure Six. Real Deposits and Loans per person: Native Taiwanese and Koreans



In 1914 yen per person. Calculated from 溝口敏行與梅村又次 (1988, 256), 臺灣銀行調查課 (1941, 36-7) 臺灣銀行 (1922, 105-107), 臺灣銀行 (1917, 151-168) and 朝鮮總督府財務局 (1940, 93-94)

Figure Seven. Nominal Land Prices in Taiwan



The CPI is from 吳聰敏 (2004) and Japanese farmland prices have been calculated from 梅村又次、山田三郎、速水佑次郎、高松信清與能崎実, (1966, 230-231). Both have been calibrated so that their average value and the average Taiwan farmland value for the period 1906-1910 are the same. The Tokyo Stock Data is from 大藏省理才局 (1932, 323-325). It has been calibrated so that its average value equals the average value of Japanese farmland during the two year period, 1915-1916. Taiwan farmland values have been estimated as explained in the text.