出國報告(出國類別：短期研究)

# 出國報告：至德國漢堡大學短期研究

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# 摘要

本次為期一個月的短期研究地點是德國漢堡大學經濟學系。目的如下。首先，邀請對象漢堡大學經濟系 Michael Funke 教授同樣是從事國際金融與總體經濟的實證研究。透過短期訪問本人得以獲知當前重要的研究題材與成果，同時就論文草稿與執行中的構想進行討論，對於本人的論文寫作與後續期刊投稿幫助頗大。其次，漢堡大學圖書館具有豐富的德文與英文藏書與期刊訂閱，對於本人目前進行的研究相當有助益。本人目前的研究議題，是關於德國經濟在兩次世界大戰之間的表現，特別是凡爾賽合約對於第一次世界大戰之後德國經濟的負面影響，如何導致 1931 年的債務違約與金融風暴。第三，本人也同時在德國當地收集與購買相關的德文書籍文獻，帶回台灣以利後續的研究需要。

# 目次

# 壹、目的

本次為期一個月的短期研究地點是德國漢堡大學經濟學系。短期研究有幾下幾項目的。首先，漢堡大學經濟系系主任 Michael Funke 教授是本人多年好友。他過去到香港貨幣管理局進行研究時，也數次在本人邀請下順道到台灣訪問。他本身的研究領域同樣屬於實證國際金融與總體經濟。他與其博士班學生組成的研究團隊成果豐富，一直在進行最新的研究。透過短期訪問本人得以獲知當前重要的研究題材與成果，同時我們經常就論文草稿與執行中的構想進行討論，對於本人的論文寫作與後續期刊投稿幫助頗大。其次，本人的研究涉及德國在兩次世界大戰之間的經濟表現，特別是 1931 年的銀行與貨幣危機，以及凡爾賽合約對於德國債務危機與一次戰後經濟的負面作用。漢堡大學圖書館具有豐富的德文與英文藏書與期刊訂閱，特別是出版年代較為久遠的書籍，可以提供本人需要的研究文獻支援。第三，本人也趁著這趟機會，在當地收集與購買相關的德文書籍，帶回台灣以利後續的研究需要。

# 貳、過程

這次的國外研究是利用學校暑假的假期，到德國漢堡大學經濟系進行短期研究。這次我到漢堡的訪問是由 Michael Funke 教授接待。我在抵達漢堡之後，隨即每日到 Michael Funke 教授安排給我的研究室進行研究工作。每天的作息時間，是上午八點抵達研究室，開始一天的工作。中午將近十一點三十分的時候，Michael Funke 教授、他的辦公室、與他的博士班研究生，會一起到學校餐廳用餐，我則

是加入他們一起前往。用完午餐之後，就回到研究室繼續工作到下午六點。下午的時候，偶爾會跟 Michael Funke 教授前往教學大樓一樓的咖啡屋，談一些研究的議題與論文。同時，本人也參與該系在星期二舉行的定期學術研討會。Michael Funke 夫婦也在 7 月 13 日邀請本人至他們家中晚餐。

由於沒有教學的負擔，在訪問期間的工作頗有效率。我在這段期間完成被接受在 Oxford Economic Papers 的論文的最終校訂工作：「Money doctors and their reform proposals for China reconsidered, 1903-29」。該論文的 Advance Access 版本已經在 7 月 4 日發布在該期刊網站。與此同時，本人也修改並且校訂完成被接受刊登在 Australian Economic History Review 的文章：「Exchange Rates and Economic Recovery in the 1930s: An Extension to Asia」。除此之外，本人也撰寫完成進行中論文(重新詮釋德國 1931 年金融危機)的理論部分(Incomplete monetary union and sovereign default)，以及第一個歷史對比案例(The Russia financial crisis of 1998)。同時，本人也於 7 月 21 日搭乘火車至波昂大學拜訪博士論文指導教授 Jürgen von Hagen 博士。並且洽談他來台灣訪問事項。

除了上述的工作之外，我在研究期間還完成以下的事項：

（一）完成「科技部經濟學門學術研習營」講題規劃。講題是：Trilemma: monetary policy, capital mobility and exchange rate, past and present。

（二）協助教育部高教司完成國立臺中科技大學教師升等案審查。

（三）撰寫完成中央銀行經濟研究處課程的上課講義：SVAR 與反事實模擬。

（四）協助「應用經濟論叢」審查論文。

# 參、心得與建議

## 一、 心得：

我很謝謝學校給予的補助，讓我到漢堡大學進行一個月多的短期研究。訪問期間由於沒有其他雜務，同時因為研究時間密集，步調緩慢然而又不至於鬆散，因此往往會有好的研究構想出現，在論文寫作上也具有效率。

## 二、 建議：

一、漢堡大學圖書館提供讀者一個先進的大型掃瞄機器，讓讀者在不損害書籍的情況之下，可以輕易地將圖書資料掃瞄成為電子檔案。對於較為老舊的圖書，也都由館方掃描成為電子檔案，讓擁有大學帳號的讀者可以使用。建議清華大學圖書館引進相關的作法。清華圖書館，尤其是人文社會學院圖書館，也許多絕版、老舊、卻是會用到的圖書，像是台灣經濟研究室早期翻譯的作品。這些珍貴的圖書資料，也應該加以電子化，讓清大的讀者可以使用。

二、漢堡大學的圖書館都設有類似星巴克的咖啡屋，以平價販賣咖啡與糕點，可以讓學生與讀者在閱讀中間稍微休息，或是討論問題。清大的圖書館一樓附設的餐廳價格過於昂貴，無法發揮上述效果。建議校方參考漢堡大學做法。

# 肆、附錄

## 一、附件 1

論文：「Money doctors and their reform proposals for China reconsidered, 1903-29」。Oxford Economic Papers。

## 二、附件 2

論文:「Exchange Rates and Economic Recovery in the 1930s: An Extension to Asia」。Australian Economic History Review。

(如為國外攜回之重要文件相關資料，不涉著作權的部分，得影印掃描成 pdf 檔，附加於正文之後成為完整之電子文書，同時上載至資訊網。)

## 三、活動照片

無

(為避免出國報告內容因相片檔案過大，致影響上傳速度，相片解析度以低解析度處理為原則。)

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OXFORD

# Money doctors and their reform proposals for China reconsidered, 1903–29

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## Abstract

In this paper we provide a quantitative evaluation of foreign financial advising, taking China's currency reform proposals as an example. Between 1903 and 1929, three Western financial experts proposed a gold (-exchange) standard to China, which at that time was on a silver standard. Using counterfactual simulation, we find that: (1) a gold (-exchange) standard would not have brought price stability to China; (2) and it could have even worsened global deflation during the beginning years of the Great Depression.

**JEL classifications**: C32, E32, N15.

## 1. Introduction

The act of money doctoring started well before the twentieth century and occurred in less developed countries that suffered from economic and political instability and which were receivers of foreign loans (Drake, 1994). By the mid-1920s, international economic advice was a fully recognized professional activity (Flandreau, 2003), and it has persisted into the current IMF conditionality.

The current literature has enriched our understanding of money doctoring. Regarding the activities of the money doctors, Rosenberg (1999) describes US money doctoring in new U.S. colonies, protectorates, and other strategic areas between 1900 and 1930. Seidel (1972) and Drake (1989) focus on the reform work of Edwin W. Kemmerer in the South America between 1923 and 1931. Mouré (2003) reviews French money doctors to Romania between 1928 and 1932, while Avramov (2003) examines money doctoring in Bulgaria over the past one hundred years. Clavin (2003) documents the contribution made by the League of Nations to money doctoring during the Great Depression. Helleiner (2009) analyses the series of financial missions launched by the US Federal Reserve during the 1940s. Schiltz (2012) discusses the foreign financial advising activities of Japanese government officials in Formosa, Chosen, and Manchuria between 1895 and 1937. For a more recent period, Ivanova and Wyplosz (2003) assess the money doctors at work in Russia over the period 1992–98.

Regarding the political economy of money doctoring, the literature shows that money doctors are part of the process of brokering money against reforms. Where and how money doctors were sought were determined not by their expertise, but by access to foreign capital (Mouré, 2003). Money doctors were sought for their flawless scientific credentials and impartiality that promised much success in resisting inflationary pressure and political intervention (Glaser, 2003). In some cases, the purely technical contribution of the foreign financial expert was minimal. Their contribution was to cement the new political coalition that made reform possible (Hirschman, 1965). In other cases, the advice could be contradictory from one adviser to another, raising suspicions that there was no good advice as such (Ivanova and Wyplosz, 2003).

While providing technical assistance, economic advisers could not escape the political entanglements surrounding their work. Often they had to work with strongmen or dictators to carry through the proposed reforms that were intended to free economic institutions from political interventions (Seidel, 1972). Concerns for political influence and institutional prestige could be the chief motivation behind the money doctoring, such as the money doctors from the Bank of France to Romania who were there to increase French influence in the Balkans and to establish Bank of France's equality with the Bank of England (Mouré, 2003); or the dollar diplomacy from Presidents Roosevelt, Taft to Wilson which sought to extend US influence by using bankers rather than Marines (Rosenberg, 1999, p. 61). In the Persian case, US money doctors were called by the host country to counter the preponderant influence of Britain and Russia (Rosenberg, 1999, p. 183). Nowadays, IMF loan conditionality is a continuation of the old practice of private bank loan controls (Rosenberg, 1999, p. 255).

This paper complements the existing studies by examining a case that has received scant attention in the literature: financial missions to China between 1903 and 1929. A series of war indemnities since the 1840s had caused an extraordinary financial burden upon the nation, which became especially serious during the 1890s and the early 1900s. Exacerbating this whole situation was a slump in the international price of silver from the 1880s onwards. By the early 1900s, the Chinese government was aware of the necessity to join the gold club and started to examine this possibility. Between 1903 and 1929, three money doctors from the West were called to China to offer reform proposals to China's currency: Jeremiah W. Jenks (Professor of Cornell University), Gerald Vissering (President of the Netherlands Bank), and Edwin W. Kemmerer (Professor of Princeton University). All three money doctors proposed a gold-exchange standard (GES) for China and differed only in the steps to carry it out. Even historians on modern Chinese history, such as Jonathan D. Spence who examines western advisers in China between 1620 and 1960 (Spence, 1969), ignore these financial missions to China.

The Chinese case reflects two features of money doctoring worth noting. First, the patient was usually not fully informed about the possible side effect of the prescription. The reform proposals made no hint of possible deflationary effects by putting China on a gold standard, even though contemporary sources indicate that it was widely understood that exchange rate stabilization programs slowed down domestic activity and increased unemployment. Mexico's transition from silver to the gold standard in 1905 had ushered in several years of a currency shortage. Agricultural and industrial labor was severely affected, and this fed the economic grievances that culminated in the 1910 revolution (Rosenberg, 1999, p. 21). This is exactly the same gold-exchange standard that Jenks proposed to China. Jenks, with Charles A. Conant and Hugh H. Hanna, was actively involved in the

Mexican currency reform. Vissering, taking efforts to introduce his Chinese audience to the practice of the gold-exchange standard in British India, was silent about the economic contraction India suffered between 1893 and 1899 to establish a gold-exchange standard (Robertson, 1903). In 1925–26 Kemmerer enacted a similar currency reform in Chile that fixed the peso exchange rate and established a gold-exchange standard. As a result of the change in the monetary unit and the reduction of currency in circulation, the inception of the currency reform caused a downturn in business activity (Glaser, 2003). Kemmerer's reform project submitted to the Chinese government made no mention of the Chilean experience.

Second, the potential negative impact of the advised policy on the rest of the world was overlooked. The majority of the countries that money doctors visited were small, and the repercussion of their policy on the world economy could be safely ignored. However, for a country like China, this ignorance could be detrimental. Actually, Rosenberg (1999, pp. 240–7) suggests that financial missions of the 1920s to stabilize and integrate the troubled regions into the world financial system stimulated unsound loans that led to overproduction of primary products and contributed to the weakness of the financial system that set the stage for the spread of the Great Depression. China's case corroborates the suggestion of Rosenberg (1999) that foreign financial advice could have negative worldwide effects that were not foreseen by the money doctors.

In the end, none of the proposals were actually implemented. To make causal statements, we depend on counterfactual analysis. Complementing the existing narrative literature on money doctoring, we evaluate the reform proposals quantitatively through simulation and by generating counterfactuals. Our analysis is also a general equilibrium approach, which is necessary, because the results of China's monetary reform depend on the actions of other countries, and China's reform also has a repercussion effect on the rest of the world.

For the period 1900 to 1913, we simulate whether a gold-silver bimetallic standard was feasible for China and simulate the counterfactual price level if China were on a gold (-exchange) standard. The model we use for the simulation is adapted from the bimetallic model contributed by François Velde. It was argued that an important advantage of the gold standard was the stability of prices for commodities at home. We find that a gold (-exchange) standard would not have brought the promised price stability to China. Even worse, a China on a gold (-exchange) standard would have caused world deflation in the beginning years. For the interwar period from 1928 to 1932, using a simple price decomposition method borrowed from Friedman and Schwartz (1963) and Bernanke and Mihov (2000), we simulate the world price and show that changes in China's preferences for foreign assets would have worsened the world price level in the initial years of the Great Depression.

There are some caveats to our analysis, however. For the designers of the reform projects, a promised advantage of a gold-exchange standard is an increase in international trade and foreign investment in China. A related issue is whether relief would come for China's foreign debt payment. Our analytical framework, which is a pure exchange economy, does not allow us to evaluate these aspects of the reform proposals involving the dynamics of balance of payments. In this sense, we caution readers that our empirical results do not give an all-sided analysis of the reform proposals.

The rest of the paper is structured as follows. Section 2 provides a brief description of the three reform projects. Section 3 presents the structural model and the method for counterfactual simulation. Section 4 explains the data sources. Section 5 reports the

counterfactual simulations for the pre-1913 period, while Section 6 reports the results for the interwar period. The final section concludes.

## 2. Proposals for China's currency reform

Both the Jenks and Vissering missions were before World War I. Jenks' mission was in 1903, the same year that the US War Department established a gold-exchange standard in the Philippine Islands. Jenks' reform proposal for China was largely inspired by that experiment there. Vissering's mission was in 1912. In many places, Vissering used his many years of practical experience in the Dutch Archipelago as the model for China's reform. A gold-exchange standard was successfully introduced to Netherlands East Indies in 1877. Only the Kemmerer mission was after World War I, in 1929. Like his Cornell teacher Jenks, Kemmerer relied on the introduction of the gold-exchange standard into the Philippines in 1903 as a model for China. All three reform proposals were supposed to be implemented at the time of the missions even though it was understood that given the immense territory of China and the different conditions in various provinces it would take many years to complete the whole reform.[1]

The proposed GES has the following features.

1. The adoption of a standard unit of value. The unit shall consist of a fixed number of grains of gold.
2. The main currency in circulation is silver coins, which have a fixed parity with the standard gold unit. Subsidiary coins, made of silver, nickel, and copper, are to be provided, too.
3. The coinage of silver coins is entirely under the government control. A gold reserve kept abroad will maintain the parity of silver coins with gold.
4. The main source of the gold reserve is the profits of coinage. In the beginning, a modest foreign loan may be necessary.

Although there would be no gold coins in circulation, the proposed GES was expected to work like a strict gold standard. Through the depletion (sale of bills of exchange on the gold reserve) and replenishment (gold paid in exchange for silver coins) of the gold reserve and the accompanying withdrawal from or release into circulation of silver coins, the circulation would be decreased or increased as if China's gold coins were exported or imported.

As far as China was concerned, the proposals were not aware of the potential conflict between stable exchange rates and stable internal prices, as first highlighted by John Maynard Keynes (1923) and later exemplified by Robert Mundell's trilemma. The experts expected that 'Roughly speaking, the great advantage of the gold standard is the stability of prices, which it brings along for commodities and home trade as well as for exchanges on foreign

1 Jenks' proposal is contained in two pamphlets: *Memoranda on a New Monetary System for China* and *Considerations on A New Monetary System for China*. Vissering's proposal is contained in two volumes, *On Chinese Currency: Preliminary Remarks about the Monetary Reforms in China*, Volume I (1912) and Volume II (1914). Kemmerer's proposal is contained in *Project of Law for the Gradual Introduction of a Gold-Standard Currency System in China, together with a Report in Support Thereof*. The readers may refer to Ho (2015) for the detailed historical background, reform design, potential difficulties, reactions, and criticism of the three reform proposals. Lai et al. (2009) discuss Jenks' mission to China and his reform project.

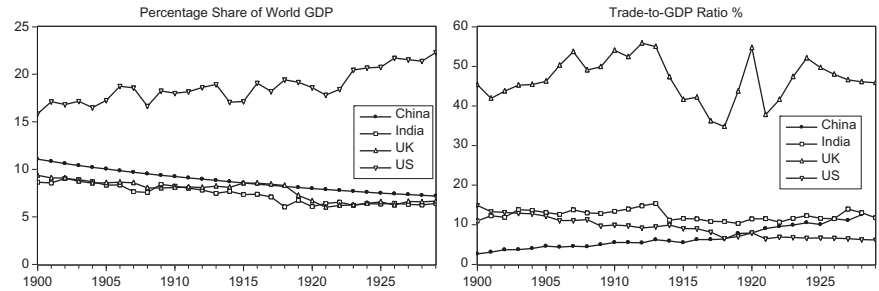


**Fig. 1.** Share of world GDP and trade-to-GDP Ratio for China, India, UK, and USA.
The left panel plots the share of world GDP while the right panel plots the trade-to-GDP ratio. The unit in both panels is percentage. Data source for the left panel is *Statistics on World Population, GDP and Per Capita GDP, 1-2008 AD* provided by Angus Maddison homepage. Data sources for the right panel are Yang et al. (1931) [China]; Chaudhuri (1983), Heston (1983), and McAlpin (1983) [India]; Mitchell (2007a) [UK]; Mitchell (2007b) [USA]

countries' (Vissering, 1912, p. 15). However, under free capital mobility, the proposed gold-exchange standard would bring exchange rate stability at the cost of price stability. By focusing their policy on the sole object of fixing the exchange rate, these financial experts ignored the domestic policy implication of such an adherence to a fixed exchange rate.

As far as the rest of the world was concerned, by taking China as a small- and semi-open economy, the proposals did not take into account the potential impacts on the world from China's reform. Figure 1 plots the share of world GDP and trade-to-GDP ratio for China, India, the UK, and the US. In terms of economic size China was comparable to India and UK, while in terms of openness it was comparable to India and the US by 1918, such that the effects of China's monetary decisions on the rest of the world could not be neglected.

The first ignored issue was the danger of world deflation. Examples abound from monetary history that a restoration of a gold standard would introduce deflationary tendencies (Mundell, 2000). Kemmerer was aware of the concern that China's adoption of the gold standard might bring about a world shortage of gold and thus cause a fall in the general price level in all gold-standard countries. The discussion of Gustav Cassel and Ralph Hawtrey about the gold scarcity and the 1922 Genoa conference to economize the use of gold could not have been foreign to him. Even aware of the problem, Kemmerer stuck to the gold-standard doctrine: 'She (China) should not be expected to sacrifice that advantage because her adoption of the gold standard might make the use of gold as the world's standard of value somewhat less desirable than it otherwise would have been' (Commission of Financial Experts, 1929, p. 65).

Once in operation, a gold-exchange standard makes the gold centers excessively dependent on those countries that have adopted the gold-exchange standard, because the gold centers may incur the risk of great disturbances in their credit structure if such countries suddenly withdraw their foreign exchange reserves (Mlynarski, 1929, p. 89). As described in Eichengreen (2004, pp. 13–4), 'Money supplies were a multiple of the international reserve backing of central banks and governments. This backing contracted as central banks, fearful for the stability of the gold standard, liquidated their foreign exchange reserves. Central banks whose obligations were reserve currencies, suffering corresponding reserve losses, raised their discount rates to stem capital outflows'. Under these circumstances, the

gold standard became an engine of deflation. With one more player, China, the situation was looking to become worse. This was the second ignored issue.

## 3. Methodology

### 3.1 Model

We use a model of bimetallism pioneered by Velde and Weber (2000) and Velde (2002a,b) for counterfactual simulation. Gold and silver standards are two special cases of the model. The model endogenously determines the split between monetary (coined) and non-monetary (un-coined) stocks of gold and silver in response to price changes. It is a general equilibrium model that allows us to model the interaction between domestic and foreign monetary regimes.[2]

The model contains three types of goods: a consumption good $\xi_t$ and the respective stocks of gold and silver metal $Q_{1,t}$ and $Q_{2,t}$. The consumption good is non-durable while gold and silver are durable and non-depreciating. Total quantities of all goods are given exogenously. A gold (silver) coin is defined by $b_1(b_2)$ ounces of metal gold (silver) per coin. Let $m_{1,t}(m_{2,t})$ denote the number of existing gold (silver) coins and $d_{1,t}(d_{2,t})$ denote the quantity of un-coined gold (silver). Un-coined gold and silver are considered as jewelry. The metal stocks, coined and un-coined, must add up to the existing supply:

$$Q_{1,t} = b_1 m_{1,t} + d_{1,t} \tag{1}$$

$$Q_{2,t} = b_2 m_{2,t} + d_{2,t} \tag{2}$$

The representative household's lifetime utility depends on consumption and stocks of jewelry (un-coined metals), described by:

$$E_0 \sum_{t=0}^{\infty} \beta^t [u(c_t) + v(d_{1,t+1}, d_{2,t+1})], \tag{3}$$

where $c_t$ denotes consumption and $d_{1,t+1}(d_{2,t+1})$ denotes the end-of-period stock of un-coined gold (silver). In each period, the household receives an endowment $\xi_t$, which is sold to the firm, and the household purchases the consumption good from the firm, in exchange for the firm's end-of-period profits. The household needs coins to meet a cash-in-advance constraint for the purchase of the consumption good. Gold and silver coins are perfect substitutes in the cash-in-advance constraint at an exchange rate $e_t$, in gold coins per silver coin. With its coin balances, the household buys the consumption good from the firm at a price $p_t$ and $h_{1,t}(h_{2,t})$ ounces of new un-coined gold (silver) at the price $q_{1,t}(q_{2,t})$. All prices are denominated in gold coins. Let $\Pi_t$ denote the firm's profits, which are paid to the

2 Like the current bimetallic literature, the model assumes that world gold (and silver) supplies are exogenous to price movements that may be caused by the adoption of a silver (or bimetallic) standard in the counterfactual scenario. Most silver is produced as a by-product of copper, gold, lead, and zinc refining. This makes it difficult to model the price elasticity of world silver supply. Even for gold, existing studies find that gold supplies appear to be exogenous to price movements, and the actual linkages between gold and prices were rather weak (Rockoff, 1984; Eichengreen and McLean, 1994). In fact, allowing world gold (and silver) supplies to respond strongly to price movement would strengthen the argument for bimetallism, because it makes a bimetallic standard more viable (Oppers, 1995).

household in the form of coins. Equation (4) presents the household's cash-in-advance constraint while eq. (5) presents the household's budget constraint.

$$p_t c_t + q_{1,t} h_{1,t} + q_{2,t} h_{2,t} \leq m_{1,t} + e_t m_{2,t} \tag{4}$$

$$m_{1,t+1} + e_t m_{2,t+1} \leq \Pi_t + (m_{1,t} + e_t m_{2,t} - p_t c_t - q_{1,t} h_{1,t} - q_{2,t} h_{2,t}) \tag{5}$$

The household's stocks of un-coined gold and silver evolve according to:

$$d_{1,t+1} = d_{1,t} + h_{1,t} + (Q_{1,t+1} - Q_{1,t}) \tag{6}$$

$$d_{2,t+1} = d_{2,t} + h_{2,t} + (Q_{2,t+1} - Q_{2,t}) \tag{7}$$

The model assumes the existence of separate gold and silver blocs. Let $\alpha_{1,t}(\alpha_{2,t})$ denote the share of the gold (silver) bloc in the world. The numbers $\alpha_{1,t}$ and $\alpha_{2,t}$ are exogenous to the model and satisfy $0 < \alpha_{1,t} + \alpha_{2,t} \leq 1$. Since the gold (silver) bloc uses solely gold (silver) coins for transactions, two cash-in-advance constraints, eqs (8) and (9) below, must hold. The household maximize utility (3), subject to the constraints (4), (5), (6), (7), (8), and (9).

$$m_{1,t} \geq p_t \alpha_{1,t} \xi_t \tag{8}$$

$$e_t m_{2,t} \geq p_t \alpha_{2,t} \xi_t \tag{9}$$

The firm decides the quantity $n_{1,t}(n_{2,t})$ of gold (silver) coins to mint and the quantity $\mu_{1,t}$ $(\mu_{2,t})$ of gold (silver) coins to melt. The firm maximizes profits:

$$\Pi_t = p_t \xi_t + n_{1,t} - \mu_{1,t} + q_{1,t} h_{1,t} + e_t n_{2,t} - e_t \mu_{2,t} + q_{2,t} h_{2,t}, \tag{10}$$

subject to $n_{1,t} \geq 0$, $n_{2,t} \geq 0$, $m_{1,t} \geq \mu_{1,t} \geq 0$, $m_{2,t} \geq \mu_{2,t} \geq 0$, and the conditions:

$$h_{1,t} = b_1(\mu_{1,t} - n_{1,t}) \tag{11}$$

$$h_{2,t} = b_2(\mu_{2,t} - n_{2,t}) \tag{12}$$

An equilibrium is defined as a set of prices and quantities such that the household maximizes its utility, the firm maximizes its profits, and the market-clearing conditions hold:

$$\xi_t = c_t \tag{13}$$

$$m_{1,t+1} = m_{1,t} + n_{1,t} - \mu_{1,t} \tag{14}$$

$$m_{2,t+1} = m_{2,t} + n_{2,t} - \mu_{2,t} \tag{15}$$

### 3.2 Equilibrium conditions and the steady state

The equilibrium conditions of the model, obtained by combining the household's and the firm's first-order conditions and the cash-in-advance constraints, are expressed as:[3]

$$v_1(d_{1,t+1}, d_{2,t+1}) = \frac{1}{b_1}\frac{u'(\xi_t)}{p_t} - \beta E_t\left[\frac{1}{b_1}\frac{u'(\xi_{t+1})}{p_{t+1}}\right] \tag{16}$$

3 A technical appendix, which contains a complete setting of the model and a detailed derivation of the equilibrium conditions, is available online.

$$v_2(d_{1,t+1}, d_{2,t+1}) = \frac{e_t}{b_2}\frac{u'(\xi_t)}{p_t} - \beta E_t\left[\frac{e_{t+1}}{b_2}\frac{u'(\xi_{t+1})}{p_{t+1}}\right] \tag{17}$$

$$p_t\xi_t = \left(\frac{Q_{1,t+1} - d_{1,t+1}}{b_1}\right) + e_t\left(\frac{Q_{2,t+1} - d_{2,t+1}}{b_2}\right), \tag{18}$$

$$\left(\frac{Q_{1,t+1} - d_{1,t+1}}{b_1}\right) \geq \alpha_1 p_t\xi_t, \quad e_t\left(\frac{Q_{2,t+1} - d_{2,t+1}}{b_2}\right) \geq \alpha_2 p_t\xi_t \tag{19}$$

Equation (16) is the asset pricing equation for gold that determines the optimal holding of un-coined gold. This is analogous for eq. (17), which is the asset pricing equation for silver. Equation (18) means that in equilibrium, money supply (right-hand side) must be equal to money demand (left-hand side). Equation (19) ensures that the supply of gold (silver) coins be sufficient for the transaction purpose of the gold (silver) bloc. Bimetallism is defined as an equilibrium in which $e_t = e$, $m_{1,t+1} > 0$, and $m_{2,t+1} > 0$.

In the model, the gold-silver legal ratio (in ounces of silver per one ounce of gold) is equal to $\frac{b_2}{b_1 e}$. In the steady state, eqs (16) and (17) are rearranged as:

$$\frac{b_2}{b_1 e} = \frac{v_1(d_1, d_2)}{v_2(d_1, d_2)}, \tag{20}$$

implying that the gold-silver legal ratio is equal to the market ratio. Equation (18) can be rearranged as:

$$X \equiv (1-\beta)u'(\xi)\xi = v_1(d_1, d_2)(Q_1 - d_1) + v_2(d_1, d_2)(Q_2 - d_2), \tag{21}$$

which is the quantity theory equation stated in terms of the weights of gold and silver coins, with each valued at its marginal utility as jewelry.

### 3.3 Counterfactual simulation for bimetallism

We use tilde to denote the counterfactual value of a variable. The counterfactual simulation goes as follows. For each year, we take the exogenous values of $\{\xi_t, Q_{1,t}, Q_{2,t}, \alpha_{1,t}, \alpha_{2,t}\}$ as given. Let $\alpha_{CN,t}$ denote the share of China in the world. We remove China from the silver bloc, which changes $\{\alpha_{2,t}, Q_{1,t}, Q_{2,t}\}$ to the counterfactual $\{\tilde{\alpha}_{2,t}, \tilde{Q}_{1,t}, \tilde{Q}_{2,t}\}$, where $\tilde{\alpha}_{2,t} = \alpha_{2,t} - \alpha_{CN,t}$. We find $(\tilde{d}_1, \tilde{d}_2)$ that solves eqs (22) and (23):

$$\frac{b_2}{b_1 e} = \frac{v_1(\tilde{d}_1, \tilde{d}_2)}{v_2(\tilde{d}_1, \tilde{d}_2)} \tag{22}$$

$$v_1(\tilde{d}_1, \tilde{d}_2)(\tilde{Q}_1 - \tilde{d}_1) + v_2(\tilde{d}_1, \tilde{d}_2)(\tilde{Q}_2 - \tilde{d}_2) = X \tag{23}$$

If, in addition, the money demand of both gold and silver blocs is satisfied, as the following two conditions depict, then we have a bimetallic equilibrium:

$$\frac{\tilde{Q}_1 - \tilde{d}_1}{b_1} \geq \alpha_1\left(\frac{\tilde{Q}_1 - \tilde{d}_1}{b_1} + e\frac{\tilde{Q}_2 - \tilde{d}_2}{b_2}\right) \tag{24}$$

$$e\frac{\tilde{Q}_2 - \tilde{d}_2}{b_2} \geq (\alpha_2 - \alpha_{CN})\left(\frac{\tilde{Q}_1 - \tilde{d}_1}{b_1} + e\frac{\tilde{Q}_2 - \tilde{d}_2}{b_2}\right) \tag{25}$$

If eq. (24) is violated, meaning that the amount of gold coins is not sufficient to support a bimetallic equilibrium, then China is effectively on the silver standard and the equations that determine $(\tilde{d}_1, \tilde{d}_2)$ are:

$$v_1(\tilde{d}_1, \tilde{d}_2)(\tilde{Q}_1 - \tilde{d}_1) = \alpha_1 X \tag{26}$$

$$v_2(\tilde{d}_1, \tilde{d}_2)(\tilde{Q}_2 - \tilde{d}_2) = \alpha_2 X \tag{27}$$

If eq. (25) is violated, meaning that the amount of silver coins is not sufficient to support a bimetallic equilibrium, then China is effectively on the gold standard and the equations that determine $(\tilde{d}_1, \tilde{d}_2)$ are:

$$v_1(\tilde{d}_1, \tilde{d}_2)(\tilde{Q}_1 - \tilde{d}_1) = (\alpha_1 + \alpha_{CN})X \tag{28}$$

$$v_2(\tilde{d}_1, \tilde{d}_2)(\tilde{Q}_2 - \tilde{d}_2) = (\alpha_2 - \alpha_{CN})X \tag{29}$$

We use China's price level to represent the price level of the silver standard bloc. As the price level is the inverse of the price of silver, a counterfactual price of silver thus determines a counterfactual price level. Let $p_S$ denote the actual price level in the silver bloc and $\tilde{p}_S$ denote the counterfactual price level. It follows that the counterfactual price level in the silver bloc is:

$$\tilde{p}_S = \frac{v_2(d_1, d_2)}{v_2(\tilde{d}_1, \tilde{d}_2)} \cdot p_S \tag{30}$$

The price level of the gold bloc and that of the silver bloc are linked by the gold-silver ratio. The counterfactual price level in the gold bloc is:

$$\tilde{p}_G = \tilde{p}_S \cdot \frac{\tilde{e}}{e}, \quad \tilde{e} = \frac{b_2}{b_1} \frac{v_2(\tilde{d}_1, \tilde{d}_2)}{v_1(\tilde{d}_1, \tilde{d}_2)} \tag{31}$$

For simulation, one needs to specify the function form for $v(d_1, d_2)$. Following Velde and Weber (2000), we assume that:

$$v(d_1, d_2) = \theta_1 \log(d_1) + \theta_2 \log(d_2) \tag{32}$$

### 3.4 Range of gold-silver ratios

In addition to the counterfactual price level, the theoretical range of gold-silver ratios that are compatible with a bimetallic equilibrium provides us another way to look at the problem. The lower bound, at which there is no gold coin and corresponds to the silver standard, is computed as $\frac{\alpha_1(\tilde{Q}_2 - \tilde{d}_2)}{\alpha_2(\tilde{Q}_1 - \tilde{d}_1)}$ using eqs (26) and (27). The upper bound, at which there is no silver coin and corresponds to the gold standard, is computed as $\frac{(\alpha_1 + \alpha_{CN})(\tilde{Q}_2 - \tilde{d}_2)}{(\alpha_2 - \alpha_{CN})(\tilde{Q}_1 - \tilde{d}_1)}$ using eqs (28) and (29).

### 3.5 Counterfactual simulation for the gold standard

To simulate the case that China adopts a gold standard, we simply use eqs (28) and (29) to solve for $(\tilde{d}_1, \tilde{d}_2)$. The counterfactual price level in the silver bloc is the same as eq. (30). The counterfactual price level in the gold bloc is:

$$\tilde{p}_G = \tilde{p}_S \cdot \frac{\tilde{e}}{e_t}, \tag{33}$$

where $e_t$ is the actual gold-silver market ratio.

## 4. Data sources

To conduct the counterfactual simulation, we make use of the following annual data: (a) the gold-silver market ratio, (b) the total stocks of gold and silver in the world, (c) the monetary stocks of gold and silver in the world, and (d) the actual price level in China, which represents the silver bloc.

The gold-silver market ratio data are taken from *Annual Report of the Director of the Mint for the Fiscal Year Ended June 30 1935*, downloadable from HATHI TRUST Digital Library. The sources for the volumes of the production of gold and silver from 1493 to 1927 are Soetbeer's studies (US Senate, 1887) and the papers by Ridgway (1929) and Merrill (1930). The source for the period 1928 to 1934 is from the *Annual Report of the Director of the Mint for the Fiscal Year Ended June 30 1935*. Following Velde and Weber (2000), the stock of gold in 1492 is 297 tons, and the stock of silver in 1492 is 3,600 tons. For both gold and silver we use a 1% depreciation rate, and we add to the initial stocks for 1492 the annual production to obtain the annual stocks of gold and silver. One ton is equal to 32,000 ounces.

We follow Velde (2002a) closely to estimate the monetary stocks of gold and silver. The US *Annual Report of the Director of the Mint* provides estimates of the monetary stocks of gold and silver for a growing list of countries in 1878 to 1883, 1893 to 1907, and 1909 to 1913. The estimates are given in US dollars. The monetary stock of gold is converted to troy ounce at \$20.69 per troy ounce. Similarly, the monetary stock of silver is converted to troy ounce at \$20.69/ $N$ per troy ounce, where $N$ is the legal ratio for silver currencies provided by the *Annual Report*, and the legal ratio can be different for full legal-tender silver and limited-tender silver. The *Annual Report* provides estimates of China's monetary stock from 1893 to 1907. Given the lack of a better alternative, we assume that China's monetary stock from 1909 to 1913 remains the same as in 1907. The robustness of this assumption will be discussed later. The non-monetary stock of gold is computed as the difference between the total stock and the monetary stock of gold. The non-monetary stock of silver is computed analogously.[4] The actual price level of China is taken from Kong (1988). The Chinese price level is normalized to 100 in year 1913.

We use the data for 1900, the year before the world silver price witnessed a further decline and the first reform proposal was presented, to calibrate the parameters $(\theta_1, \theta_2)$. The calibrated parameters are used in the simulation for the subsequent years.

## 5. Counterfactual simulation for price

### 5.1 Was bimetallism a feasible choice for China?

In this section, we use the formal model outlined above to examine what China's price level would be if the reform proposals were adopted before World War I.

None of the three reform proposals suggest a bimetallic standard for China. After several years of political debate about bimetallism, the Gold Standard Act of 1900 just placed the United States de jure on a gold standard. In seeking the support of the US Congress for approval of Jenks' mission, both the Chinese government and the US Department of State

4 As a check to the collected data, we plot the ratio of total silver to total gold stock and the ratio of non-monetary silver to non-monetary gold stock. We also plot the gold-silver market price ratio against the ratio of non-monetary gold to non-monetary silver stock. These figures, reported in the online appendix, are broadly consistent with those reported in Velde (2002a).

could not have reiterated more that 'It is not asked that the United States modify its monetary system, and it is distinctly disavowed that any movement is contemplated for the restoration of international bimetallism' (Hanna *et al.*, 1903, p. 38). For Vissering, 'Bimetallism in the old scientific sense is out of the question for China' (Vissering, 1912, p. 30). For Kemmerer, a devout practitioner of the gold standard and its variants, it was taken for granted that the gold standard was the only feasible choice for a country like China, which intended to advance its monetary system.

Even though none of the three reform proposals consider bimetallism, it is interesting to ask whether bimetallism was feasible to China, and whether it was right for the proposals to ignore this possibility. In what follows, we simulate whether bimetallism was feasible for China, using a gold-silver legal ratio of 36. Throughout the text, the gold-silver ratio refers to the price ratio - namely, how many ounces of silver it takes to purchase one ounce of gold. Table 1 provides the gold-silver market ratio between 1878 and 1913. The legal ratio of 36 to 1 does not depart widely from the gold-silver market ratio during the study period.

The left panel of Fig. 2 reports the counterfactual simulation for bimetallism, using 32 to 1 as the legal ratio. This is also the coinage ratio proposed by Jenks. The upper subplot reports the actual and counterfactual price levels for China. In the figure, we use '*B*', '*G*', and '*S*' to denote bimetallism and the gold and silver standards, respectively. Using this ratio in the simulation, gold coins would be melted, leaving only silver coins in circulation. China would be de facto on a silver standard, and the counterfactual price is almost identical to the actual price. The lower subplot reports the gold-silver legal ratio, the simulated market ratio, and the theoretical range of gold-silver ratios that are compatible with a bimetallic equilibrium. The simulated market ratio is higher than the legal ratio. In the case of bimetallism, the two ratios would be identical. As no more gold circulates as coins, one cannot increase the stock of gold jewelry to drive down the price of gold and thus the gold-silver market ratio. The legal ratio is outside the limits of the gold-silver ratio, where the lower bound is identical to the simulated market ratio. Restoring bimetallism requires raising the legal ratio.

The middle panel of Fig. 2 plots the results of simulation, using a legal ratio of 36 to 1. Now bimetallism has a chance to succeed. About one half of the time China would be on a silver standard while the other half of the time on a bimetallic standard: on a bimetallic standard during 1900–1901, switching to a silver standard during 1902–1905, on a bimetallic standard during 1906–1907, switching to a silver standard during 1908–1910, and again on bimetallism during 1911–1913. The standard deviation of China's price level

**Table 1.** Average commercial ratio of silver to gold for each calendar year between 1878 and 1913

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | 1878 | 1879 | 1880 | 1881 | 1882 | 1883 | 1884 | 1885 | 1886 | 1887 | 1888 | 1889 |
| Ratio | 17.92 | 18.39 | 18.05 | 18.25 | 18.20 | 18.64 | 18.61 | 19.41 | 20.78 | 21.10 | 22.00 | 22.10 |
| Year | 1890 | 1891 | 1892 | 1893 | 1894 | 1895 | 1896 | 1897 | 1898 | 1899 | 1900 | 1901 |
| Ratio | 19.75 | 20.92 | 23.72 | 26.49 | 32.56 | 31.60 | 30.59 | 34.20 | 35.03 | 34.36 | 33.33 | 34.68 |
| Year | 1902 | 1903 | 1904 | 1905 | 1906 | 1907 | 1908 | 1909 | 1910 | 1911 | 1912 | 1913 |
| Ratio | 39.15 | 38.10 | 35.70 | 33.87 | 30.54 | 31.24 | 38.64 | 39.74 | 38.22 | 38.33 | 33.62 | 34.19 |

*Note:* Ratio of silver to gold refers to the price ratio, or namely, how many ounces of silver it takes to purchase one ounce of gold.

*Sources: Annual Report of the Director of the Mint for the Fiscal Year Ended June 30 1935*, p. 91.

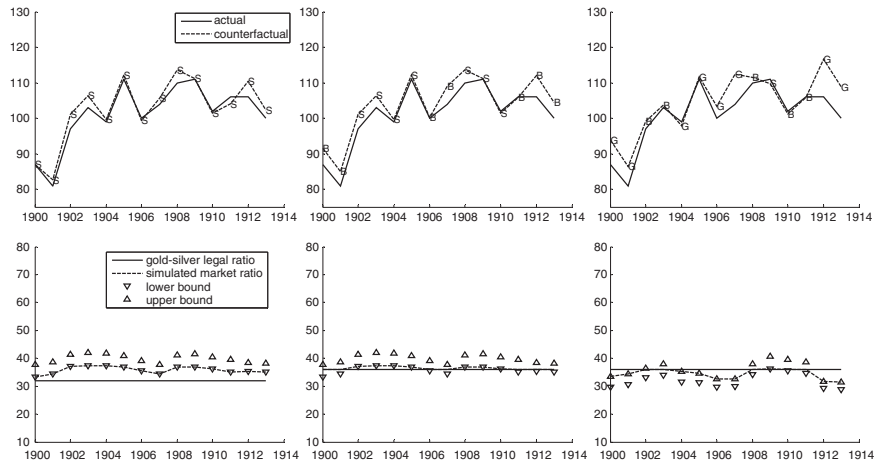


**Fig. 2.** Counterfactual simulation for bimetallism.
The left panel assumes a gold-silver ratio of 32 to 1; the middle panel assumes a gold-silver ratio of 36 to 1; the right panel assumes India is on a silver standard. Each panel contains two subplots. The upper subplot reports the actual and counterfactual price levels for China; the lower subplot reports the gold-silver legal ratio, the simulated market ratio, and the theoretical range of gold-silver ratios that are compatible with bimetallic equilibrium

would decrease from 8.60 to 8.20, or a reduction of about 5%. The greatest advantage of a bimetallic standard comes from the stabilization of the gold-silver market ratio during the years of bimetallism and thus the stabilization of price level in both gold and silver blocs.

A bimetallic standard would be less viable if a country of comparable size (such as India) or a big country (such as the US) changes to a silver standard. To satisfy the new demand for silver coins from the silver bloc, silver coins would be minted and stock of silver jewelry would be decreased, driving up the price of silver and thus driving down the gold-silver market ratio. The gold-silver ratio can be restored by melting China's silver coins to compensate for the reduction in stock of silver jewelry, thus cheapening silver and pushing up the gold-silver market ratio to make it in line with the legal ratio. However, once no more silver circulates as coins in China and China is de facto on a gold standard, the market ratio can no longer be stabilized. The right panel of Fig. 2 simulates the case of India on a silver standard. Now it is more difficult for China to maintain a bimetallic standard: 8 years on a gold standard, 5 years on a bimetallic standard, and 1 year on a silver standard. The left panel of Fig. 3 simulates the case of US on a silver standard. The price of silver would be driven up and the gold-silver market ratio would be driven down to the point that makes China *de facto* on a gold standard. In the top left panel of Fig. 3, the counterfactual price is significantly higher than the actual price, because the simulated market ratio is substantially lower than the legal ratio ($\tilde{e} > e$).

A bimetallic standard would be more viable if either India or the US were also on the bimetallic standard. The middle panel of Fig. 3 simulates the case of both India and China on a bimetallic standard. A bimetallic standard would be maintained except for the year 1909. With more stocks of gold and silver coins as buffers against shocks to gold and silver supplies, the ability of bimetallism to influence the market ratio increases, reflected in the widening range of the legal ratio compatible with a bimetallic equilibrium. The right panel of Fig. 3 considers the case of both China and the US on the bimetallic standard. Now the

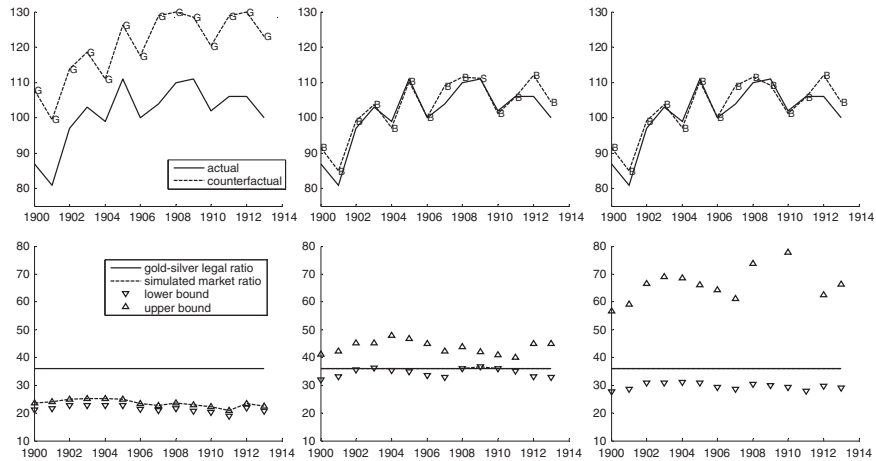


**Fig. 3.** Counterfactual simulation for bimetallism continued.
The left panel assumes the US is on the silver standard; the middle panel assumes India is on the bimetallic standard; the right panel assumes the US is on the bimetallic standard. Each panel contains two subplots. The upper subplot reports the actual and counterfactual price levels for China; the lower subplot reports the gold-silver legal ratio, the simulated market ratio, and the theoretical range of gold-silver ratios that are compatible with bimetallic equilibrium

bimetallic standard would be viable for all years, and the market ratio is fully stabilized and equal to the legal ratio. Using a partial equilibrium analysis, Friedman (1990) concludes that 'the US could have played the same role after 1873 in stabilizing the gold-silver price ratio that France did before 1873', thus resulting in a stabler price level in the gold standard countries. Our simulation results are consistent with Friedman's analysis.

The above simulations make clear that the viability of bimetallism depends on two factors: a proper legal ratio and the action of other countries. For China alone to remain safely under a bimetallic equilibrium, the legal ratio must be set between 37.4 and 37.7 - namely, between the highest value of the lower bound and the lowest value of the upper bound depicted in the middle panel of Fig. 2. This is quite a narrow range. United States support would increase the chance of bimetallism. However, US policy was unlikely to return to a bimetallic standard and policy coordination between China and other major countries was non-existent at best. Bimetallism did not have a chance to succeed and it was wise for the three reform proposals not to take bimetallism into consideration. Our analysis supports the argument of Srinivas Wagel that 'as bimetallism is only possible through negotiation it is needless to consider it for the present' (Wagel, 1915, p. 273).

## 5.2 What if China were on the gold standard

We now turn to the question: what would happen if China were on the gold standard? The left panel of Fig. 4 shows that if China were on the gold standard, it (and the gold bloc) would experience a general decline in price level that lasts until 1907. Taking the year 1906 as an example, the price index would fall from 100 to 83. The general decline in the price index stops first in year 1908. The reason for the decline in the price level is explained in the lower subplot of the same panel, which presents the actual and simulated gold-silver market ratios. Gold coins would be minted and silver coins would be melted to satisfy

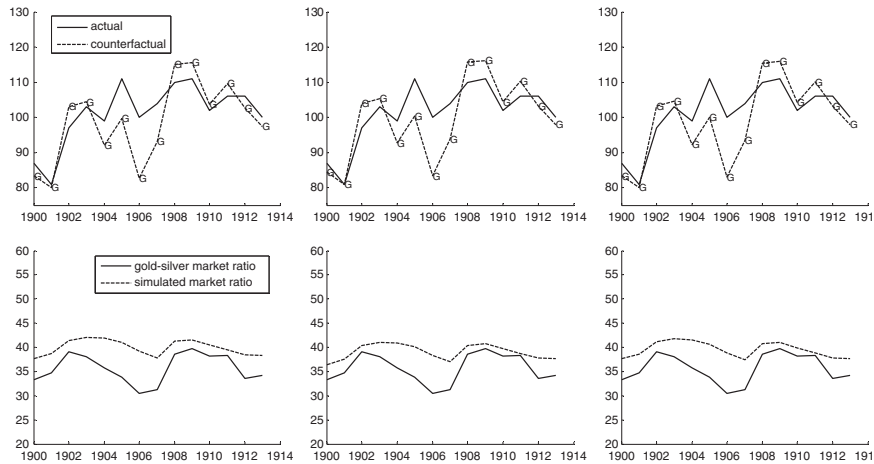


**Fig. 4.** Counterfactual simulation for a gold standard.
The left panel assumes China is on the gold standard; the middle panel assumes China is on the gold-exchange standard; the right panel assumes a transition period. Each panel contains two subplots. The upper subplot reports the actual and counterfactual price levels for China; the lower subplot reports the actual and simulated gold-silver market ratio

China's new demand for gold coins. The stock of gold jewelry decreases while the stock of silver jewelry increases, driving up the price of gold and thus the gold-silver ratio. The standard deviation of the price level also increases from 8.60 to 11.37, an increase of 32%.

A gold-standard proposal obviously does not benefit China, as it causes greater price volatility and a general decline in price level in the first few years. The proposal also does not benefit the gold bloc, since such a proposal introduces deflationary tendencies for the gold bloc, just like when countries shifted from silver to gold after the breakdown of bimetallism in the early 1870s (Mundell, 2000).

So far we have made no distinction between a gold standard and a gold-exchange standard. To model a gold-exchange standard, we assume that China continued the use of its silver coins that had a fixed parity with the standard gold unit. The middle panel of Fig. 4 reports the simulation results. By economizing the use of gold and mitigating the reduction in the stock of gold jewelry and the increase in the stock of silver jewelry, the gold-silver market ratio rises less than that under the gold standard. However, a gold-exchange standard cannot prevent the deflation tendencies in the first few years of the reform as well as the increase in price volatility.

The Vissering plan suggested a transition period. As an approximation, we assume that China's transition to a gold standard, and therefore its demand for gold coins, would take place gradually between 1900 and 1913. As the right panel of Fig. 4 shows, the deflation tendencies would be further mitigated, but not eliminated, with a period of transition.

So far it is assumed that China's monetary stock from 1909 to 1913 remains the same as in 1907. This assumption is consistent with Thomas Rawski's estimates of China's money supply between 1910 and 1913 (Rawski, 1989, Tables C.16, C.17). However, the period between 1909 and 1913 was one of political turmoil for China and a revolution broke out in 1911–12. It is likely that China's monetary stock did decline during this period, because

of silver outflows. To check for robustness, we gauge the possible reduction in monetary stock between 1909 and 1913, using a similar episode in Chinese history. Between 1933 and 1935, China experienced serious silver outflows that finally forced the Chinese government to abandon the silver standard in November 1935. Between January 1933 and October 1935, notes issued by the Bank of China, Shanghai Branch, then the largest note-issuing bank, declined from 182.8 to 119.5 million Chinese dollars. This translates into an annual reduction of about 12% (*Statistics Monthly*). Between December 1932 and September 1935, total silver stock in Shanghai banks declined from 438 to 336.1 million Chinese dollars, about an annual reduction of 8% (Burdekin, 2008, p. 100). Taking the average of 12% and 8%, we assume an alternative scenario in which China's monetary stock fell by 10% for the period 1908–13. We have redone the simulations by using this alternative scenario for monetary stock and find that the results thus obtained are almost identical to the previous ones.[5]

## 6. The tail that wags the dog

Our previous simulation stops at 1913, after which the classical gold standard was interrupted by World War I. Starting from 1924, major European countries returned to an interwar gold standard, but it did not last long. The time span when the interwar gold standard was in operation was only from 1927 to 1931. The extremely short time span and the financial instability associated with the interwar period make it difficult to calibrate the above model properly. Moreover, except for a few strict supporters for a gold standard, governments no longer subordinated domestic policy goals to the maintenance of a fixed exchange rate. Actions of the central banks to offset the monetary impact of international gold flows make the current model, which assumes that a redistribution of gold and silver has an immediate effect on the supply of money, no longer proper to describe the interwar gold standard. To examine what would happen if the reform proposals were adopted in the interwar period, we therefore use an approach of price decomposition that is non-structural, but flexible enough, to accommodate the empirical data and also for the purpose of simulation.

It is not our purpose to explore the nature of the interwar gold standard, but it suffices to say that the interwar gold standard was actually a gold-exchange standard, in which the reserves held by the central banks were part gold and part foreign exchange (Bernanke, 1993). Except for the core countries such as the UK and the US, most central banks met their statutory requirements to hold gold by holding foreign exchange (of the core countries) that could be exchanged for gold at a fixed rate. The endorsement of the 1922 Genoa Conference encouraged the use of foreign exchange as part of the reserves.

How could China, supposedly on a GES, endanger the interwar gold standard? In the initial phase of the Great Depression, many periphery gold standard countries, fearing the depreciation of the reserve currencies, replaced their foreign reserves with gold stocks and drained the gold stocks of the core gold standard countries. These general drains for gold destabilized the interwar gold standard, as clearly depicted by the following IMF document: 'At the same time, the loss of confidence in the exchange rates of the currencies of the reserve holding countries, especially the United Kingdom (due in part to inadequacies in their reserves), caused runs on these countries which induced them to contract their own credits,

5 To save space, the results are reported in the online appendix.

and so reduced the total amount of reserves available to other countries. A shortage of reserves was certainly not the principal cause of the depression of the thirties, but it did contribute to the scope, intensity, and duration of the depression because of the severe restrictions on trade and even because of the general deflationary policies that were instituted to protect reserves' (IMF, 1953, p. 209). A China on a gold standard could have intensified the drains on gold and worsened the situation.

To evaluate the instability that China might have brought to the interwar gold standard, we follow Bernanke and Mihov (2000) and decompose the price level at a given time into an exhaustive set of determinants. The tautological expression for the price level in country $i$ at time $t$ is:

$$P_{it} = \frac{P_{it}}{M_{it}} \cdot \frac{M_{it}}{BASE_{it}} \cdot \frac{BASE_{it}}{RES_{it}} \cdot \frac{RES_{it}}{GOLD_{it}} \cdot (QGOLD_{it} \cdot PGOLD_{it}), \tag{34}$$

where $P_{it}$ is the price level, $M_{it}$ is the nominal money supply, $BASE_{it}$ is the monetary base, defined as notes in circulation plus bank reserves, $RES_{it}$ is international reserves of the central bank, defined as foreign assets plus gold reserves, $GOLD_{it}$ is gold reserves of the central bank valued in domestic currency, $QGOLD_{it}$ is gold reserves of the central bank in ounces, and $PGOLD_{it}$ is the official domestic-currency price of gold.

Equation (34) provides a heuristic method for decomposing price changes in a given country into components due to (1) the inverse of real money balances $\left(\frac{P_{it}}{M_{it}}\right)$, (2) the money multiplier $\left(\frac{M_{it}}{BASE_{it}}\right)$, (3) the inverse of the cover ratio $\left(\frac{BASE_{it}}{RES_{it}}\right)$, (4) the ratio of international reserves to gold stocks $\left(\frac{RES_{it}}{GOLD_{it}}\right)$, and (5) the quantity and price of gold, $QGOLD_{it}$ and $PGOLD_{it}$. Our focus here is the fourth term, the ratio of international reserves to gold stocks. Below we give a brief description of factors causing a variation in each term. Readers may refer to Bernanke (1993) and Bernanke and Mihov (2000) for further details.

Except for the first term, all the terms in eq. (34) are determinants of the nominal supply of money. The second term, the money multiplier, exceeds one under a fractional-reserve banking system. It depends inversely on the ratio of currency to deposits and the ratio of bank reserves to deposits. The money multiplier would decrease sharply if banking crises induce depositors to switch into currency or induce banks to increase their reserves holdings. The second term therefore reflects conditions in the commercial banking system.

The third term, the inverse of the cover ratio, is greater than one, because the monetary base is typically only partially backed by international reserves. A country that loses reserves has to contract its monetary base to prevent the cover ratio from falling below the statutory cover ratio. A country that gains reserves may in practice sterilize the reserve flows and prevent the monetary base from rising, therefore raising the cover ratio, which in principal has no upper bound. The changes in the third term are thus indicative of sterilization by the central banks.

The fourth term, the ratio of international reserves to gold stocks, exceeds one, because of the substitution of foreign exchange for gold as part of a central bank's reserves. The reserve currencies held by the central banks in many countries included British pounds and U.S. dollars. Fear of an exchange rate devaluation by the reserve currencies may lead a central bank to convert its foreign exchange reserves into gold, therefore lowering the ratio of international reserves to gold stocks. The fourth term therefore reflects the effects of the

liquidation of foreign exchange reserves on the money supply. The fifth term, the quantity and price of gold, affects the money supply by changes in the physical quantity of gold stocks or by changes in the gold parity.

Let $\omega_i$ denote a time-invariant weighting factor that reflects the relative importance of country $i$ in the world economy and $\sum_{i=1}^{n} \omega_i = 1$. The world price level at time $t$ is computed as:

$$P_t = \sum_{i=1}^{n} \omega_i P_{it} \tag{35}$$

In the following counterfactual simulation, we follow Bernanke and Mihov (2000) in the choice of variables and set the study period from 1928 to 1936. We include a total of 22 countries that adhered to the interwar gold standard: Austria, Belgium, Bulgaria, Chile, Czechoslovakia, Denmark, Finland, France, Germany, Hungary, Japan, Netherlands, Norway, Peru, Poland, Portugal, South Africa, Sweden, Switzerland, United Kingdom, United States, and Yugoslavia.

Price level is the wholesale price index numbers taken from the League of Nations, *Statistical Yearbook*, with a base year of 1929. Deposits in commercial banks, circulations of notes, and international reserves of the central bank (gold and foreign assets) are also taken from the League of Nations, *Statistical Yearbook*. Bank reserves are taken from various issues of *Federal Reserve Bulletin*, using the end of year (December) data. Real GDP is taken from Maddison Historical GDP Data provided by the World Economics website.[6] We use weights based on relative real GDP in 1928.[7]

We add China to the above 22 countries. China's wholesale price index is also taken from the League of Nations, *Statistical Yearbook*. Deposits in commercial banks, notes in circulation, bank reserves, and silver reserves of the central bank are taken from Young (1971). Real GDP is taken from Maddison Historical GDP Data.[8] China's financial statistics during the interwar period do not have as good a quality as those for the Western countries. We caution readers over the quality of the Chinese statistics we use. The counterfactual exercise reported below is heuristic, and the quality of the data should not affect the main implications of the exercise.

We treat France, the United Kingdom, and the United States as the core gold standard countries and treat the other sample countries as the periphery gold standard countries. Figure 5 plots the simple average of the ratio of international reserves to gold stocks for the two groups of countries. The ratio is quite stable for the core countries at about 1.3 in 1928 and about 1.0 in 1932. The ratio becomes 1 if France is excluded from the core countries, because both the Bank of England and the Federal Reserve held only gold reserves. For the periphery countries, the ratio declines steadily from 2.4 in 1928 to 1.4 in 1932 and then remains roughly at that level until 1936. The decline between 1928 and 1932 reflects the scrabble for gold before the gold standard was abandoned.

6 http://www.worldeconomics.com/Data/MadisonHistoricalGDP/Madison%20Historical%20GDP%20Data.efp. Date last assessed 27-April-2016.

7 For Poland we use 1929 real GDP data. South Africa's real GDP data are obtained from interpolation.

8 For China we use 1929 real GDP data.

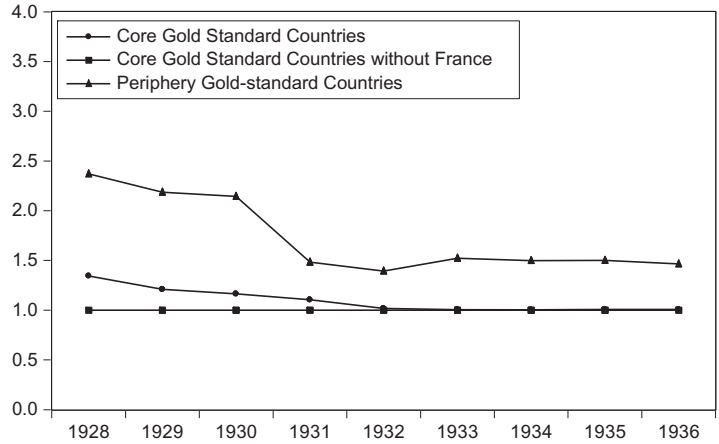


**Fig. 5.** World ratio of international reserves to gold stocks.
The core gold standard countries include France, United Kingdom, and the United States; the periphery gold standard countries include Austria, Belgium, Bulgaria, Chile, Czechoslovakia, Denmark, Finland, Germany, Hungary, Japan, Netherlands, Norway, Peru, Poland, Portugal, South Africa, Sweden, Switzerland, and Yugoslavia. The figure plots the simple average of the ratio of international reserves to gold stocks for the two groups of countries

Our simulation starts from 1929 and ends in 1932, during which the gold standard countries experienced massive price deflation. The counterfactual simulation consists of two steps. In the first step, we place China on the gold standard as the reform proposals suggest and do so for the period from 1928 to 1932. For that purpose, we assume that China's silver reserves were replaced by gold reserves, and that China's ratio of international reserves to gold reserves during 1928–1932 is identical to that of the average periphery gold standard countries in 1928.

According to Kemmerer's proposal, the unit of China's new gold currency shall consist of 60.1866 centigrams of pure gold. This unit was selected, because it was of the same value, in terms of gold, as the silver dollars then in most parts of China. Therefore, the shift from the silver unit to the gold unit of equivalent value shall bring little disturbance to prices, wages, and debt contracts. One Chinese silver dollar at that time contained 23.493448 grams of silver. Given that the gold-silver market ratio was 38.78 in 1929, the conversion from silver to gold reserves would make China's total reserves roughly the same in terms of domestic currency. [9] However, with an increasing gold-silver market ratio between 1930 and 1932, China's total reserves in terms of the new gold currency would decline. Once China abandoned the silver standard and demonetized silver, the gold-silver market could only increase further and the terms with which China exchanged its silver for gold could only become worse. Therefore, once China were on a gold standard, its price level would not remain the same. In fact, it would be lower than it actual was according to eq. (34),

9 Namely, the official domestic-currency price of silver was $PSILVER = \frac{31.1034768}{23.493448} = 1.3239$, and the official price of gold shall be $PGOLD = \frac{31.1034768}{0.601866} = 51.678$. Let $GSRATIO$ denote the gold-silver market ratio; the conversion rate from silver to gold reserves for the year 1929 is $\frac{1}{GSRATIO} \cdot \frac{PGOLD}{PSILVER} = \frac{1}{38.78} \cdot \frac{51.678}{1.3239} \approx 1$.

because the new total reserves, represented by the product of the fourth and fifth terms, decline. In addition, we assume that China's gold stocks were to be acquired from the gold centers, say the Bank of England.

In the second step, we assume that with the onset of the Great Depression, China, like other periphery gold standard countries, changes its preference for foreign assets. In other words, we assume that China's ratio of international reserves to gold stocks between 1929 and 1932 follows the same path as the average periphery gold standard countries, as depicted in Fig. 5. A decrease in China's ratio of international reserves to gold stocks means that China exchanges foreign assets for gold, creating an excess demand for gold in the world market. In the computation, we assume that a change in China's preference for foreign assets must be accompanied by a change in either the UK or the US gold stocks, because the world gold stock is constant in each year and a redistribution of gold stock between China and the core countries is necessary to accommodate China's new preference. The description above also makes clear that China's policy affects the world price level through two channels: firstly by affecting China's price level and secondly by affecting the price level of the core countries via the redistribution of gold stocks.

Having obtained the counterfactual series, we recalculate the world price level using eqs (34) and (35). Figure 6 plots the actual world price level, which witnesses an abrupt decline between 1929 and 1932. The figure also plots the counterfactual world price level for two scenarios. In one scenario it is assumed that China liquidates its holding of British pounds for gold and causes gold drains on the UK. In the other scenario, China liquidates its holding of US dollars and causes gold drains on the US. The results of the two scenarios are almost the same. The change in China's preference for foreign assets would worsen the world deflation during the initial years of the Great Depression. The effects are mild between 1929 and 1930, but become strong between 1931 and 1932. To be more concrete, the world price level would become 75 instead of 82 in 1931 and become 68 instead of 74 in 1932. Using the relationship between inflation and output growth identified by Atkeson

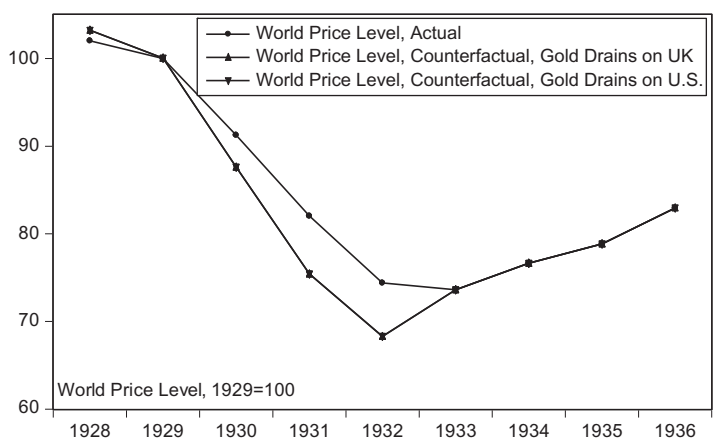


**Fig. 6.** Actual and counterfactual world price levels.
The figure plots the actual world price level and the counterfactual world price level for two scenarios. In one scenario it is assumed that under a gold standard China liquidates its British pounds for gold and causes gold drains on the UK. In the other scenario, China liquidates its US dollars and causes gold drains on the US.

and Kehoe (2004) for the Great Depression episode, this corresponds to a further drop in world growth of 2.4% for 1931 and 1932.[10]

By using real GDP instead of nominal GDP, our simulation is likely to overestimate China's impact on the world prices. A poor country like China usually has higher real GDP than nominal GDP, because its non-traded goods and services tend to be cheaper, but non-traded goods only have a small effect on world prices. Keeping this caveat in mind, our simulation indicates that China, if it had followed the proposals of the money doctors and adopted a gold standard, would have had significant leverage on the interwar world economy, at least in terms of making the Great Depression even worse. This unwanted feedback from East (China) to West (gold standard countries) was totally unforeseen by the money doctors who enthusiastically urged China to follow the West. China would become the tail that wags the dog.

## 7. Conclusion

Jenks departed from Peking in August 1904, realizing that his proposal had failed, 'for experience teaches that between Chinese expression for approval of a reform and its actual introduction the distance often is considerable' (Words of Dr. Morrison, London Times correspondent in Peking, Commission on International Exchange, 1904, p. 9). Vissering's plan was overturned when the 1911 revolution broke out. Kemmerer left China in December 1929 and was not pleased with what his mission had accomplished. Our counterfactual analysis shows that the consistent efforts to put China on the gold (-exchange) standard, from Jenks to Kemmerer, might have exposed China and the gold standard bloc to deflation. It is probably fortunate that the gold standard proposal was not followed.[11]

Even though the proposals were not followed, the influence of the money doctors persisted. Jenks' proposal and the debates it provoked were a learning opportunity for the Chinese officials who had very little knowledge about the fundamental principles of monetary science and who misunderstood the proposal (Wei, 1914, pp. 102–103). It also stimulated subsequent currency reform proposals made by the Chinese. Several members of the Kemmerer mission stayed and served as advisers to the Chinese government, among them, Arthur Young, Oliver Lockhart, and Fenimore Lynch. Instead of offering advice from outside, they participated in daily operations and played a significant role in policy-making and execution (Trescott, 2010). They also helped with the adoption of the customs gold unit (which was fixed in terms of gold) as the standard for customs payments, the 1935 currency reform, and even China's wartime finances. This is a reminder that the act of money doctoring is multifaceted and its full consequences become visible only after the lapse of considerable time.

10 Atkeson and Kehoe (2004) find that a one-percentage-point lower inflation rate is associated with a drop in growth of 0.4 of a percentage point. In 1932, the simulated world price level declines from 74 to 68, implying a drop in growth of $(74 - 68) \times 0.4 = 2.4\%$. This is analogous for the year 1931.

11 In his discussion about the Kemmerer mission, Trescott (2010, p. 13) suggests that 'China was probably fortunate that the gold-standard and central-banking recommendations were not followed, because of their deflationary tendencies'.

## Supplementary material

Supplementary material is available online at the OUP website.

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# Exchange Rates and Economic Recovery in the 1930s: An Extension to Asia

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**Abstract**

Scholars have found a positive relationship between the magnitude of currency depreciation and the extent of recovery from the Great Depression for Europe and Latin America. The relationship between currency depreciation and economic activity during the Great Depression for Asian economies has not yet been explored. This paper examines this topic using data from 13 Asian economies: China, India, Indonesia, Iran, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan, Thailand, Turkey, and Vietnam. We find that Asian economies responded in a similar way to currency depreciation during the Great Depression as did European and Latin American countries.

**JEL Codes:** E42, F33, N25

**Key Words:** exchange rates, economic recovery from the Great Depression, Asian economies, gold standard, silver standard

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# 1 Introduction

In the midst of the Great Depression, Asian economies were split into several currency zones: the yen bloc (Japan, Korea, and Taiwan), the sterling bloc (India, Malaysia, Singapore, Thailand, and to some extent Turkey), the dollar bloc (Philippines), the gold bloc (Indonesia and Vietnam), and the silver bloc (China and Iran).[1] In this paper we address a question concerning the economic performance of Asia during the Great Depression: was there a link between the currency arrangement and the extent of recession? The variety of Asian currency arrangements, ranging from the most rigid to the most flexible exchange rate regimes, offers a good chance to answer this unexplored question.

To search for the answer, we survey how the 1930s unfolded for the Asian economies, focusing on what policy instruments were used to combat the impact of the Great Depression. We gather relevant information from a diverse set of studies, compiling an annual dataset for 13 Asian economies over the period 1929-35. The data are collected from a variety of publications, including the *League of Nations Statistical Yearbook*, national statistics, and reconstructed Asian regional data constructed by numerous economic historians in recent decades. The data set, which contains annual information regarding monetary standards, exchange rates, wholesale price indexes, industrial production indexes, and export volumes, is used for quantitative analysis.

The empirical contributions of this paper are twofold. First, in the Asian context we show that there was also a positive relationship between the magnitude of currency depreciation and the extent of recovery from the Great Depression. The economic performance of the Asian economies depended crucially on currency blocs. Second, given that existing studies on the impact of the Great Depression on Asia are less developed, this paper fills the gap in the literature.

Beginning with Choudhri and Kochin (1980), many empirical studies find that there is a positive relationship between the magnitude of currency depreciation and the extent of recovery from the Great Depression. Eichengreen and Sachs (1985) identify this relationship using a sample of 10 European countries, with the sample broadened to 24 European countries by Bernanke and James (1991). Campa (1990) extends the analysis to 10 Latin American countries and confirms the same relationship. As Peter Temin (1993, p. 92) concludes, 'The single best predictor of how severe the Depression was in different countries is how long they stayed on gold.'

[1] Here, currency bloc refers to a group of countries that have the same exchange rate regime. It does not necessarily imply that countries in the same currency bloc have formal monetary cooperation or agreements. However, monetary (interest rate) policies within the same currency bloc were linked by the need to maintain a fixed exchange rate.

In this paper we extend the analysis to a sample of 13 Asian economies.

Why should we expect the same relationship to hold for the Asian economies? The majority of the Asian economies were exporters of agricultural products and raw materials in the early-1930s. Many of them were either European or Japanese colonies in Asia, where policies were formulated by the metropolitan state and were not necessarily consistent with the interests of the colonies. They suffered from the impact of the Great Depression, firstly because of the collapse of primary commodity prices and secondly because of the tight monetary regime imposed on them by the metropolitan states in order to stay with the gold-exchange standard.[2] The fact that currency devaluation was initiated by the metropolitan states underscores the close relation between colonial and metropolitan economic activity. Currency deprecation helped the economies rise out of the depression through two mechanisms. First, currency depreciation raised the prices of imports relative to domestic goods, switching expenditures toward domestic goods. Second, currency depreciation (and control over foreign exchange) stimulated domestic demand by allowing monetary expansion and lower interest rates.

In addition to exchange rate policy, Asian economies also responded to the depression by adopting other policies, which were equally important for their recovery from the depression. With the exception of Japan and probably Vietnam, fiscal expansion was not a policy choice. Trade protection and tariff preference between colonies and their respective metropolitan states were two common policies in the 1930s. Our goal is to show that the exchange rate stood out as being among the most important factors even when other factors were also at work. In fact, our review of the Asian experience indicates that the more rigid a currency was, no matter what caused that rigidity, the more crucial trade protection and tariff preferences became.

The rest of the paper is structured as follows. Section 2 describes the relevant historical context in which Asian countries made decisions about their exchange rate policy. Section 3 presents quantitative analyses concerning the effects of exchange rate depreciation. The final section concludes.

# 2 Policy responses to the Great Depression in Asia

Table 1 summarizes the monetary standards of our sample economies, the principal measures that affected these standards around the Great Depression, and the policy

[2] A gold standard refers to a monetary system that is based on coinage containing a specific quantity of gold. In the gold-exchange standard, the silver token currency, currency notes, and banknotes are based on a gold standard maintained at par by gold reserves. Although there may not be any gold coins in circulation under a gold-exchange standard, it basically functions like a strict gold standard. Colonies in Asia were on a gold-exchange standard. Throughout the text, gold and gold-exchange standards are used interchangeable, because this distinction is of little importance to our purpose.

responses. The impact of the Great Depression was transmitted to the Asian economies through two channels: firstly by a sharp fall in export commodity prices and secondly by the decline in world demand for exports. Table 1 shows that Asian economies, except Iran and two Japanese colonies (Korea and Taiwan), experienced a sharp fall in export commodity prices that ranged from 26 to 64 per cent.

Exports in current prices also declined substantially in most countries except Iran, Japan, and its colonies Korea and Taiwan - the countries which aggressively depreciated their currencies at the beginning of the depression. Export volume also declined, but was less dramatic than export value. Export volume for Thailand, Turkey, and Vietnam also increased, while it remained almost unchanged in the Philippines.

Trade policy explains the increase in export volume for those countries whose exchange rate remained rigid or devalued only later in the depression. There was free trade between the United States and the Philippines. The privileged position enjoyed by the latter's sugar exports to the American market explained why its exports remained buoyant during the Great Depression (Brown, 1989). Vietnam had a similar relationship with France (Booth, 2000). The aggressive protectionism by the French government permitted the rapid expansion of Vietnam's exports to France and the French Empire, even though Vietnam's piastre was overvalued. In Turkey, the government moved quickly towards protectionism and greater control over foreign trade. The government also shifted to a policy of import-substitution based industrialization and also started a new strategy, called étatism, which used state capital to foster industrialization (Pamuk, 2000).

The exchange rate policy of the European and Japanese colonies was determined by the metropolitan state (Booth, 2000). Even after going off the gold standard, their currencies remained fixed to that of the metropolitan state, but their ability to undertake devaluation to counter the depression varied. The sterling bloc (India, Malaysia, and Singapore) devalued by 24 per cent in September 1931; the yen bloc (Japan, Korea, and Taiwan) devalued by 40 per cent in December 1931; the Philippines peso followed the United States dollar and devalued in June 1933; Indonesia and Vietnam, followed the Netherlands and the France, and remained on gold until 1936.

Independent countries had some autonomy to formulate their own policy. China's silver currency appreciated after the pound sterling and the Japanese yen went off the gold standard. To gain control over the money supply, China abandoned the silver standard and adopted a managed currency in November 1935 (Ho and Lai, 2016). Both Iran and Turkey introduced foreign exchange controls that saved them from a contractionary monetary policy, although Iran's currency devalued by 54 per cent while Turkey's currency revalued against the pound sterling (Pesaran, 1997;

Rothermund, 1996, p. 77).

Devaluation might not have aided recovery from the Depression if the degree to which Asian economies were dependent on foreign trade was low. The degree of openness, defined as the ratio of foreign trade (or exports) to GDP, for the Asian economies around 1929 was: China, 3-7 per cent, based on exports (Myers, 1989); India, 12 per cent, based on trade (Ho, 2016); Indonesia, 29 per cent, based on exports (Maddison, 1990); Iran, 40 per cent, based on trade (Esfabani and Pesaran, 2009); Japan, 39 per cent, based on trade (Mizoguchi and Umemura, 1988); Korea, 43 per cent, based on trade (Mizoguchi and Umemura, 1988); Malaysia, 135 per cent of trade (Nazrin, 2000); Philippines, 36.5 per cent, based on trade (Hooley, 1996); Singapore, 522 per cent, based on trade (Sugimoto, 2011; Huff, 1994); Taiwan, 61 per cent, based on trade (Mizoguchi and Umemura, 1988); Turkey, 19 per cent, based on trade (Özel, 2000); and Vietnam, 25 per cent, based on exports (Booth, 2003). As a benchmark, the ratios of exports to GDP for France, Germany, Japan, Netherlands, and U.K. in 1929 were about 14 per cent, 15 per cent, 16 per cent, 29 per cent, and 16 per cent, respectively (Maddison, 1990). Therefore, by this measure, Asian economies, with the exception of China and Thailand, were highly dependent on foreign trade. Despite China's low exports to GDP ratio, it was substantially integrated into the world economy because its domestic grain prices were closely linked to international prices (Brandt, 1985). Thailand's share of trade to GDP is not available, but it seems that a low level of direct dependence on export commodities for the majority of the population mitigated the impact of the recession (Dixon, 1999, p. 59).

Was foreign public debt a factor that affected the decision of exchange rate policy? Colonies were expected to be self-supporting and usually followed a strictly balanced budget. Foreign debt was limited and was floated in the metropolitan capital market. For examples, debt services as a percentage of gross national expenditure between 1926 and 1930 were only 1.70 per cent for Korea and 1.23 per cent for Taiwan (Kimura, 1989). In the Philippines, funds obtained from bond sales, which were subject to a ceiling of ten per cent of annual fiscal revenues, peaked in the 1920s and the outstanding bonds were redeemed in the 1930s (Hooley, 2005). To maintain parity between the Straits dollar and pound sterling, both the Straits Settlements and the Federated Malay States held large balances in England. These balances earned extremely low interest rates, and were effectively extended loans from the colony to Great Britain (Booth, 2007). Foreign debt of the independent Asian countries was similarly limited. Iran under the Reza Shah regime avoided foreign debt by means of a large increase in indirect taxes (Keddie, 2006, p. 95). To maintain independence from imperialist occupation, the Thai government borrowed very little abroad in the pre-1940 era (Booth, 1990). For the above-mentioned economies, foreign public debt

was not a factor that affected exchange rate policy, because devaluation would not increase the cost of servicing debt or disqualify them from foreign loans.

Things were different for India, Indonesia, and Vietnam, which held much larger foreign debts. India's so-called home charges, to be paid in sterling and about half of which consisted of interest payments on debt, amounted to 27 per cent of public expenditure in 1933 (Kumar, 1983, p. 937). Indonesia made substantial use of foreign loans in the early-1920s and again in the 1930s. By the late-1930s, total foreign public debt was about 47 per cent of national income, a figure substantially higher than for India (Booth, 1990). Vietnam's public debt increased sharply during the Great Depression. The proportion of debt service in government expenditures increased from 3.5 per cent in 1931 to 26.7 per cent in 1935 (Robequain, 1944, pp. 152-3). The need to make payments in sterling made India reluctant to lower the rupee exchange rate, because a depreciation of the rupee would have caused a rise in government expenditures (Kumar, 1983, p. 937). The pegging of Vietnam's piastre to the franc allowed Vietnam to borrow capital in France to finance its budget deficits during the depression (Brocheux, 2000, p. 257).

India, Indonesia, and Vietnam did not have an autonomous exchange rate policy, as policy was dictated by their metropolitan power. India's proposal for a devaluation of the rupee, even knowing this would increase expenditures for home charges, was refused by the British government, because London was afraid that in case India was unable to meet its sterling obligations, the British government might be forced to assume these obligations (Kumar, 1983, p. 941). Both India and Indonesia could have followed China, Turkey, and several Latin American countries and resorted to debt default, but such a solution was excluded by the metropolitan powers (Maddison, 1990). That the exchange rate policy was dictated by the metropolitan rather than colonial interests is clearly summarized by van Laanen: ‘In this respect the interests of the Netherlands, as typical highly-developed creditor nation, did not coincide with those of the Netherlands India, a debtor nation that depended heavily on an annual surplus on the commodity account of its balance of payments’ (van Laanen, 1980, pp. 29-30).

Even as foreign debt increased the cost of devaluation, a policy of non-devaluation was not necessarily better. The overvalued exchange rate imposed deflationary hardships on Indonesia, which could have been mitigated by simultaneous devaluation along with sterling (Maddison, 1990). Citing the Indian case, Rothermund (1996, p. 90) suggests that non-devaluation only postponed debt payments. If the gold standard had been maintained and the currency therefore overvalued, then there would have been no immediate danger of increased debt payments. However, if this had endangered the export surplus and reduced receipts of foreign reserves, then the

problem of debt service would eventually emerge. Furthermore, after Britain abandoned the gold standard countries no longer had easy access to international financial markets. The potential improvements in access to capital from core western countries derived from adherence to the gold standard, along the lines proposed by Bordo and Rockoff (1996), were in doubt. In fact, one reason why Japan went off gold was that adherence to the gold standard only worsened economic conditions without bringing the promised benefits (Shizume, 2011).

Finally, to what extent had quantitative restrictions in importing countries reduced the export-stimulating effects of devaluation? This issue is beyond the scope of the current study and deserves a separate treatment. Sporadic evidence from Japan, the country that was the main target of tariffs and quotas imposed by other countries, seems to suggest that the effects should not be overestimated. Sugihara (2010) argues that the formation of the British preferential tariff bloc actually facilitated trade between sterling bloc countries and other areas, rather than making them more exclusionary. For example, the share of the bloc's imports from Japan rose from 2.8 per cent in 1928 to 7.1 per cent in 1935, and the share of the bloc's exports to Japan did not follow a steady downward trend. Japan undertook trade negotiations with India in 1933 and Indonesia in 1934. However, as Kagotani (2010, p. 199) shows, Japan's textile exports remained at the same level even after the trade negotiations. In the case of Indonesia, cheap Japanese goods were continuously imported, firstly to satisfy the needs of native consumers at a time when their purchasing power was weak, and secondly to protect the interests of the Dutch importers. The Philippines and Japan reached an agreement in 1935. The Japanese yarn and textile producers agreed to restrict their exports to the Philippine market voluntary (Booth, 2000). However, the Philippines was only a small market for Japanese exports. The price advantage resulting from yen devaluation made Japanese cotton goods continue to flow into Asia, Africa, and Latin America (Sugihara, 1989). We caution that Japan's case may be specific and may not represent the experience of other Asian economies.

# 3 Quantitative analyses

## 3.1 Sample countries

In this section we provide quantitative evidence regarding the association between exchange rate depreciation and recovery from the Great Depression. The data for the analysis, as well as an appendix that describes in detail the sources of data, are downloadable from the internet.[3] The construction of the variables follows closely

[3] http://mx.nthu.edu.tw/~tkho/research/data.html.

that of Eichengreen and Sachs (1985).

Thirteen Asian economies are included in our sample: China, India (formerly British India), Indonesia (formerly Dutch East Indies), Iran (formerly Persia), Japan, Korea, Malaysia (formerly Malaya), Philippines, Singapore, Taiwan, Thailand (formerly Siam), Turkey, and Vietnam (formerly part of French Indo-China).[4][5]

The selection of sample economies is dictated by data availability. In 1928, the 13 economies accounted for 93 per cent of total Asia trade and about 14 per cent of world trade, and these numbers remained roughly the same in 1935. With the exception of Japan, they were all exporters of agricultural products and raw materials in the early-1930s.

Despite this common feature, these economies differ in their trade relationships. As shown in Table 2 (and Figure 4 below), China, Indonesia, Japan, and Malaysia traded extensively with other Asian economies. Korea, Philippines, and Taiwan traded overwhelmingly with their respective metropolitan states. India, Thailand, and Vietnam traded extensively with non-Asian economies, but not solely with their metropolitan states. India and Thailand also had important trade partners in Asia: Japan for India and Malaysia for Thailand. The trade of both Iran and Turkey with Asian economies was tiny. The diverse trade relationships in the sample reduce the effect of possible sample selection bias on our conclusions.

## 3.2 Country-specific effects of depreciation

Figure 1 plots the relationship between exchange rate depreciation and changes in the wholesale price index. The variable on the x-axis is the exchange rate to the American dollar in 1935 relative to that in 1929. The variable on the y-axis is wholesale prices in 1935 relative to that in 1929. The export price index is used as a substitute in cases where the wholesale price index is not available (Philippines and Thailand). The two variables are negatively correlated, implying countries that depreciated their currencies tended to suffer less from deflation. The contrast between Indonesia and Iran is particularly striking. By adhering to the gold parity, the price level in Indonesia fell by over 50 per cent between 1929 and 1935, while Iran, which depreciated its currency, saw its price level increase by over 40 per cent during the same period. Vietnam, which joined the gold standard in 1930, experienced exchange rate appreciation similar to Indonesia. Both Vietnam and Indonesia also suffered from

[4] For consistency, we refer to our sample countries by their modern day names.

[5] In this paper Malaysia refers to Malaya. Following Nazrin (2006), Malaya comprises the Straits Settlements territories of Penang, Malacca, and Dinding; the Federated Malay States of Perak, Selangor, Negeri Sembilan, and Pahang; and finally, the Unfederated Malay States of Johore, Kedah, Perlis, Kelantan, and Trengganu.

serious deflation.

Countries belonging to the same currency bloc experienced almost identical changes in their price levels. This is true for the yen bloc, consisting of Japan and its colonies Korea and Taiwan, and the sterling bloc in Asia, consisting of India, Malaysia, Singapore, and Thailand.[7] The yen bloc depreciated more than the Asian sterling bloc, and deflation in the yen bloc was less severe than that in the Asian sterling bloc.

We have regressed the price level on the exchange rate, and the results are reported in column I of Table 3. The estimates indicate that changes in the exchange rate and changes in the price level are negatively and significantly correlated, as expected. The slope coefficient is significant at the 1 per cent significance level. The $R^2$ is 0.60, which is remarkably high for a cross-sectional regression with 13 observations.

Figure 2 shows the relationship between exchange rate depreciation and economic activity. We use the industrial production index as an indicator for economic activity. In cases where this index is not available, national income data are substituted (Indonesia, Iran, Malaysia, Philippines, Singapore, Taiwan, Thailand, and Vietnam). Figure 2 shows that currency depreciation and economic activity are negatively correlated; countries that depreciated their currencies tended to suffer less from the depression. The estimated coefficient on industrial production is significant at the 10 per cent significance level. However, because we were forced to use national income rather than industrial production for over half of the sample, our regressions may underestimate the impact of the Great Depression on the manufacturing sector. Column II indicates that the $R^2$ value for this regression is 0.27, substantially lower than the regression on the wholesale price level.

Figure 2 shows that Korea stands out as an outlier, as its actual industrial production is much higher than what the regression predicts. Because of Korea's ideal location to launch an invasion into China, from 1931 the Japanese colonial rulers attempted to transform the country into a military supply base by offering tax breaks and subsidies to large Japanese industrial groups to set up heavy industry (Cha, 1998). This politically motivated industrialization after 1931 explains why Korea experienced an extraordinary expansion of industrial production at that time.

Figure 3 plots the relationship between exchange rate depreciation and export performance. Note that of the three economic indicators used in this study, export volume is probably the most reliable. It can be seen that currency depreciation and export performance are strongly and positively correlated. The relationship between the two is stronger than the relationship between exchange rates and industrial

[7] Thailand was an independent country rather than a British dominion or colony. However, like the Scandinavian countries, Thailand linked the value of its currency to sterling. Its exchange rate against sterling was almost constant between 1929 and 1938. It therefore is treated as part of the sterling bloc.

production shown in Figures 2. The $R^2$ value in column III of Table 3 shows that currency depreciation explains about 35 per cent of the variation in export volume.

To understand the association between colonial and metropolitan export performances, we also add four colonial powers to Figure 3: France, the Netherlands, United Kingdom, and the United States. Figure 3 shows that Philippine export performance was better than its metropolitan state (the United States). Vietnam likewise had a better export performance than France. As already mentioned above, both the Philippines and Vietnam enjoyed a protected metropolitan market, which allowed their exports to remain vigorous during the depression. Therefore, even if the Philippines had followed the same exchange rate policy, its export performance would have been different from the United States. The same was also true for Vietnam.

The other Asian colonies, which followed the exchange rate policies of their metropolitan states, experienced export performances similar to their metropolitan states. The export performances of the colonies are also regressed on that of the metropolitan states, and the results are reported in column IV of Table 3. The $R^2$ for the regression is 0.56, and the coefficient on metropolitan state is significant, although not statistically equal to one.

Putting aside the Philippines, Turkey, and Vietnam, Figure 3 clearly delineates the Asian countries into three groups. The first group includes the yen bloc and Iran, which allowed their currencies to depreciate substantially and experienced good export performance. The second group includes the sterling bloc plus China, whose currencies depreciated little relative to the dollar. The third group includes Indonesia, whose currency appreciated strongly and which suffered the largest decline in exports.

The fact that changes in colonial exports were closely correlated with changes in the corresponding metropolitan state may reflect either that: (a) a similar monetary-exchange rate policy caused changes in economic activity, (b) the economic activity of the metropolitan state determined colonial economic activity, or (c) a combination of the two. To disentangle these effects, we examine the weight of exports to the metropolitan state for the years 1928 and 1935 in Figure 4.

Notice that the trade weights presented here records only direct exports from the colony to the metropolitan state. It does not give a complete account of the total exports from the colony to the metropolitan state, because transit trade via third countries was not included. However, as long as the depression did not substantially change the trade routes between the colony and the metropolitan state, the trade weights presented in Figure 4, although admittedly deficient, still capture the changing importance of metropolitan trade to the colony.

Keeping the above caveats in mind, Figure 4 shows that, with the exception of Korea, all colonies experienced an increase in their weight of exports to the

metropolitan state. The cases of Indonesia (from 17 per cent to 22 per cent) and Vietnam (from 21 per cent to 34 per cent) are noteworthy. By adhering to the gold standard and being deprived of the exchange rate instrument, these two colonies had to depend on trade restrictions and a preferential trade system to protect their balance of payments. The same was also true for the late-devaluer, the Philippines, which experienced an increase in its export weight to the metropolitan state from 75 per cent to 80 per cent. While commenting on the Philippine exchange rate policy, Hooley concluded that: 'Whereas the pre-independence policy was to compensate for the export-depression effects of an overvalued peso by use of abnormally low (United States) tariffs on Philippine exports, the independence period strategy attempted to compensate for the import-stimulating effects of peso overvaluation by quantitative controls and abnormally high tariffs on imports. Both strategies share a common element: the reliance on interventionist policies to compensate for a disequilibrium exchange rate' (Hooley, 1996). The same observation is made by Irwin (2011) for the European countries during the Great Depression. In such a case, an increased trade weight with the metropolitan state was not a sign of strength, but rather a sign of defects in the adjustment mechanism. The other economies experienced only a slight increase in their export weight to the metropolitan state.

Following the above discussion, we construct a dummy variable that represents the metropolitan tariff preference. The dummy variable takes a value of one for the Philippines and Vietnam and zero for the other economies. Next, we rerun the regression for export volume and also include the dummy variable. Here, column V of Table 3 shows that the coefficient of the dummy is positive, but not significant. Using a dummy variable to capture metropolitan tariff preference does not perfectly capture the factors described above, and thus we interpret the insignificant result with caution.[9] The coefficient of the exchange rate variable remains significant even after controlling for the metropolitan tariff preference.

The above dummy variable may not be able to capture the full effect of the metropolitan tariff preference. On the other hand, the changes in export weight to the metropolitan state may contain both outcomes of the metropolitan state and tariff preference. The export performance is regressed on the exchange rate and export weight to the metropolitan state. A two-stage regression is used to purge out the potential effects of the exchange rate on the export weight. We see that column VI of Table 3 shows that the coefficient of the exchange rate remains negative and significant. The coefficient on the export weight to the metropolitan state is negative, but insignificant. This suggests that once the effects of the exchange rate on the export weight are controlled for, changes in the export weight to the metropolitan state do not

[9] We thank the referee for mentioning this caveat to us.

have additional effects on export performance in addition to the exchange rate.

Using dominance analysis, a technique to gauge the contribution of each factor in a multiple regression proposed by Azen and Budescu (2003), we find that the contribution of the exchange rate to the $R^2$ value is 0.4332, while that of the export weight to the metropolitan state is 0.0016 (with total $R^2$=0.4348). The regression suggests that the effects of the metropolitan states are negligible. It was mainly a similar monetary-exchange rate policy that closely linked the changes in colonial and metropolitan exports.

# 4 Conclusions

This paper provides an overview of the impact of exchange rate policy on Asian economies during the Great Depression. Our study reconfirms the relationship between currency depreciation and economic recovery from the Great Depression as identified by previous studies in the literature.

There are some caveats to our analysis, however. Even though a link between currency depreciation and extent of recovery is established herein, we have not explored the mechanisms through which currency depreciation helped the Asian economies to recover from the impact of the Great Depression. In addition to exchange rate policy, a more thorough analysis should also take into account simultaneously the impact of fiscal, trade, and industrial policies. This needs to be done on a country by country basis and with the help of long-term time series data. For example, Ho and Lai (2016), use counterfactual simulations based on a general equilibrium model to show that being on a silver standard insulated China from the Great Depression by saving the country both from a tightening of monetary conditions and from detrimental internal deflation. Cha (2003) and Shibamoto & Shizume (2014) use structural VAR models to evaluate the contribution of exchange rate depreciation to Japan's recovery from the Great Depression. We hope that data availability in the future will enable us to explore this issue.

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Table 1: Principle measures affecting exchange rates and policy responses to counter the Great Depression

| Country | Monetary Standard | Official Suspension of Gold Standard | Exchange Control | Active Fiscal or Monetary Policy | Change in Export Price Index (%) | Per centage Change in Export Volume (Value) | Customs Tariff or Protection |
|---|---|---|---|---|---|---|---|
| China | Silver (until 11/ 1935) | | Oct. 1934 | No active fiscal policy; expansionary monetary policy after 11/1935 | -26 | -19 (-46) | Increased import tariff after 5/1933 |
| India | Gold (1927-1931) | 1931 | | No active fiscal or monetary policy | -39 | -16 (-51) | Import tariff and Imperial tariff preference |
| Indonesia | Gold (1925-1936) | 1936 | | No active monetary policy | -58 | -28 (-67) | Import quotas after 9/1933 |
| Iran | Silver (until 1933) | | May 1932 | No active fiscal policy; foreign exchange controls enabled an expansion of money supply | -4 | 29 (21) | Effective tariff autonomy first in 1936;<br>state monopoly of trade after 2/1930 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Japan | Gold (1930-1931) | 1931 | May 1933 | Expansionary fiscal and monetary policy after Japan went off the gold standard in 12/1931 | -32 | 97 (17) | Tariff protection encouraged import substitution |
| Korea | Gold (1930-1931) | 1931 | | No active fiscal and monetary policy; benefited from yen devaluation in 12/1931 | 0 | 59 (59) | Protected Japanese market |
| Malaysia | Gold (1925-1931) | 1931 | | No active fiscal or monetary policies | -41 | -20 (-41) | Imperial tariff preference; international agreements to control the world supply of rubber and tin |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Philippines | Gold (1919-1933) | 1933 | | No active fiscal or monetary policy | -41 | -3 (-43) | Protected U.S. market; initial tariff restriction and then quota against Japanese cotton textiles |
| Singapore | Gold (1925-1931) | 1931 | | No active fiscal or monetary policy | -41 | -27 (-48) | Imperial tariff preference |
| Taiwan | Gold (1930-1931) | 1931 | | No active fiscal and monetary policy; benefited from yen devaluation in 12/1931 | -8 | 40 (29) | Protected Japanese market |
| Thailand | Gold (1928-1932) | 1932 | | No active monetary policy; fiscal policy was even contractionary | -42 | 18 (-31) | Increased tariff for protection purposes only after late 1930s |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Turkey | Fiat money (1915-1944) | | 1929 | No active fiscal and monetary policy; shift to a policy of import-substitution industrialization and state capital to foster industrialization | -50 | 25 (-38) | Increased import tariff after 10/1929 |
| Vietnam | Gold (1930-1936) | 1936 | | Expansionary fiscal policy between 1930 and 1934 | -64 | 21 (-52) | Subsidies for tea and sisal exports and reduction of export tax on rice; protected French market |

Sources: See online data appendix.

Table 2: Mutual trade weights in 1928 and 1935 (per cent)

| | China | India | Indonesia | Iran | Japan | Malaysia | Philippines | Thailand | Turkey | Vietnam | Others |
|---|---|---|---|---|---|---|---|---|---|---|---|
| China | --- | 2.9 | 2.4 | 0.1 | 29.0 | 1.5 | 0.6 | 0.5 | 0.0 | 0.9 | 62.1 |
| India | 2.8 | --- | 3.8 | 1.3 | 8.0 | 2.5 | 0.1 | 0.3 | 0.1 | 0.5 | 80.5 |
| Indonesia | 2.2 | 1.4 | --- | 0.0 | 7.5 | 19.5 | 0.3 | 1.0 | 0.1 | 1.2 | 64.2 |
| Iran | 0.1 | 1.0 | 0.2 | --- | 1.0 | 0.0 | 0.0 | 0.0 | 1.8 | 0.0 | 95.8 |
| Japan | 37.3 | 13.3 | 14.0 | 2.8 | --- | 1.4 | 1.0 | 0.4 | 0.1 | 0.6 | 50.9 |
| Malaysia | 1.5 | 2.6 | 18.7 | 1.1 | 2.8 | --- | 0.2 | 7.7 | 0.0 | 1.7 | 65.5 |
| Philippines | 0.5 | 0.1 | 0.4 | 0.0 | 1.3 | 0.3 | --- | 0.0 | 0.0 | 0.8 | 97.0 |
| Thailand | 0.9 | 0.7 | 0.7 | 0.0 | 0.9 | 7.7 | 0.0 | --- | 0.0 | 0.6 | 89.4 |
| Turkey | 0.0 | 0.1 | 0.0 | 0.6 | 0.1 | 0.0 | 0.0 | 0.0 | --- | 0.0 | 98.0 |
| Vietnam | 2.7 | 0.4 | 0.9 | 0.0 | 0.4 | 1.5 | 0.3 | 0.9 | 0.0 | --- | 93.7 |
| Others | 52.1 | 77.6 | 61.6 | 94.1 | 27.1 | 63.9 | 97.2 | 88.3 | 99.3 | 93.0 | --- |

Source: *The Network of World Trade*, League of Nations, 1942.

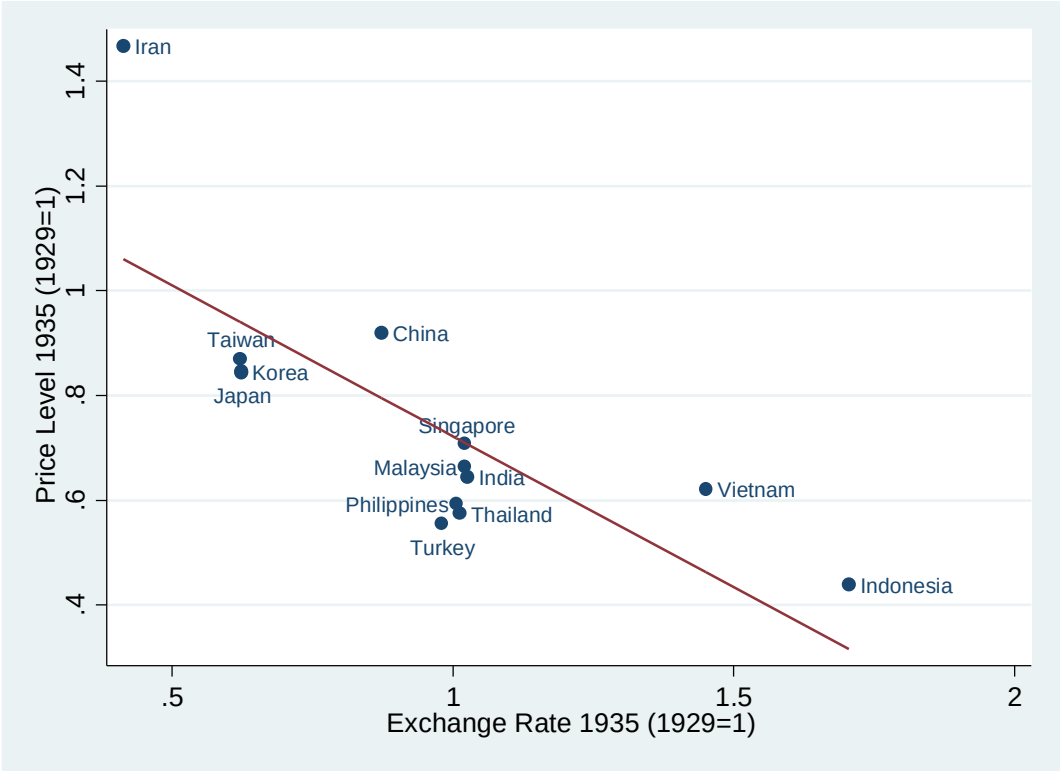
Note: The triangular above the diagonal reports the mutual trade weights in 1928 while the triangular below the diagonal reports the mutual trade weights for 1935. Japan includes Korea and Taiwan. Malaysia includes Singapore.

Table 3: Regression results, 1929-35

| Dependent Variable | Constant Term | Exchange-Rate Term | | $R^2$ | N | Sum of Square Residuals |
|---|---|---|---|---|---|---|
| I. Wholesale Price Index | 1.30*** | -0.58*** | | 0.60 | 13 | 0.32 |
| | (0.14) | (0.14) | | | | |
| II. Industrial Production | 1.63*** | -0.49* | | 0.27 | 13 | 0.95 |
| | (0.25) | (0.24) | | | | |
| III. Export Volume | 1.73*** | -0.63** | | 0.35 | 13 | 1.10 |
| | (0.26) | (0.26) | | | | |
| IV. Export Volume | Constant Term | Metropolitan Export | | | | |
| | 0.63*** | 0.42** | | 0.56 | 9 | 0.34 |
| | (0.16) | (0.14) | | | | |
| V. Export Volume | Constant Term | Metropolitan Tariff Preference | Exchange-Rate Term | | | |
| | 1.77*** | 0.17 | -0.69** | 0.37 | 13 | 1.06 |
| | (0.28) | (0.27) | (0.29) | | | |
| VI. Export Volume | Constant Term | Export Weight to Metropolitan | Exchange-Rate Term | | | |
| | 1.67*** | -0.32 | -0.55* | 0.43 | 8 | 0.38 |
| | (0.31) | (2.73) | (0.28) | | | |

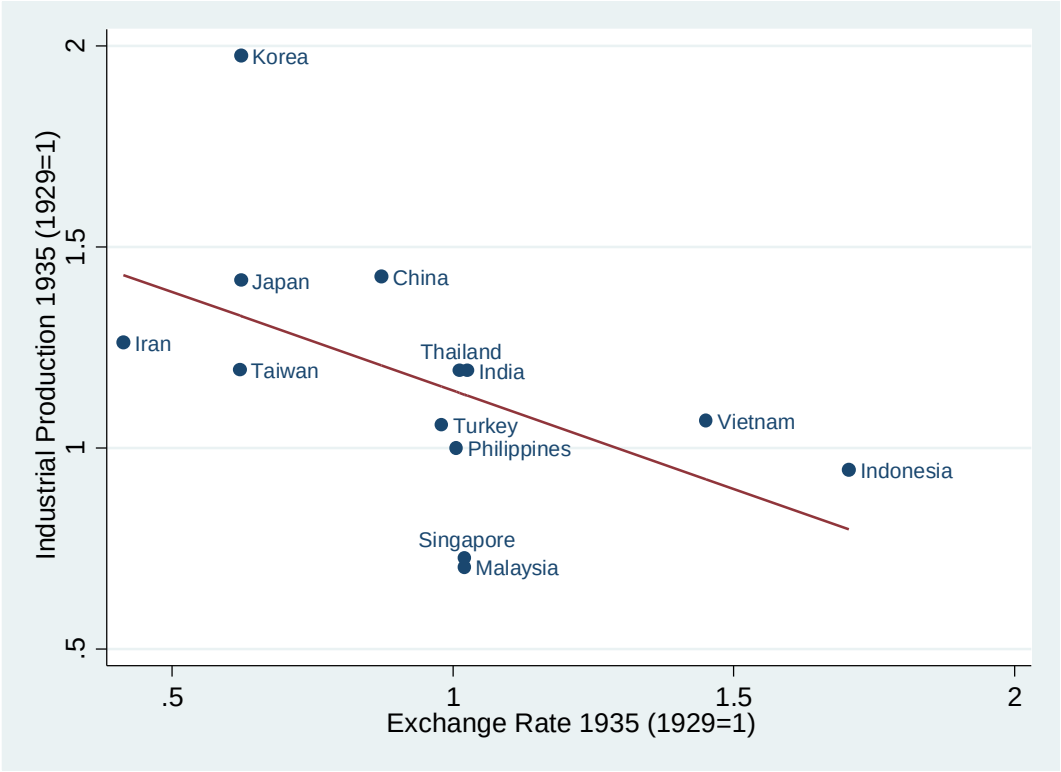
Note: Standard errors in parentheses. ***, **, * indicate significance at the 1, 5, 10 percent levels, respectively.

Figure 1: Changes in exchange rates and wholesale price index, 1929-35



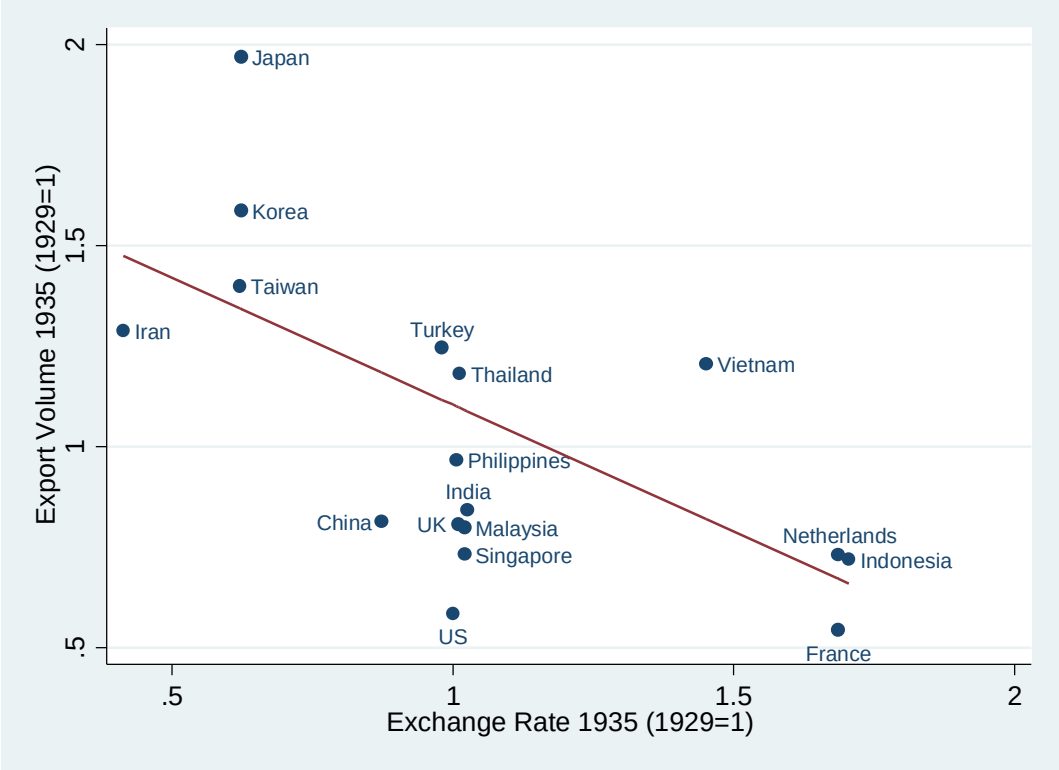

Note: The line in the graph is the fitted regression line.

Figure 2: Changes in exchange rates and industrial production, 1929-35



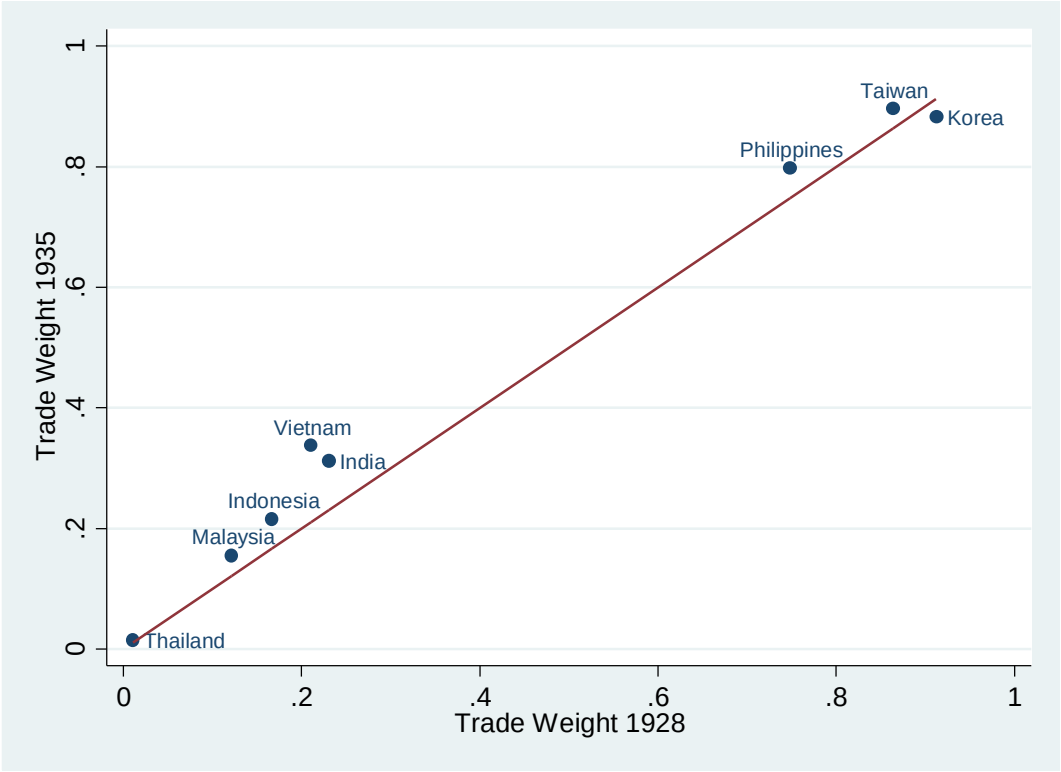

Note: The line in the graph is the fitted regression line.

Figure 3: Changes in exchange rates and export volume, 1929-35




Note: The line in the graph is the fitted regression line (without France, Netherlands, United Kingdom, or the United States).

Figure 4: Weight of export trade with Metropolitan States in 1928 and 1935




Note: The line in the graph is the 45 degree line.

Sources: *The Network of World Trade*, League of Nations, 1942; For Korea and Taiwan, *Statistical Yearbook*, 1936-37, League of Nations.