# MONEY, CAPITAL FLOWS AND PROTECTIONISM:

# THE INDUSTRIAL REVOLUTION REVISITED

by

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Submitted to the Department of
Economics in Partial Fulfillment of
the Requirements for the Degree of

DOCTOR OF PHILOSOPHY

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## ABSTRACT

This thesis touches on many of the puzzles linked to the Industrial Revolution, but its main focus is an area which has been largely neglected: the role of money and foreign flows of capital in the Industrial Revolution. The purpose of this thesis is twofold: (i) to fill this lacuna by underlining the importance of money and foreign capital in the Industrial Revolution, and (ii) to show that theories prevalent during the 18th century can be given solid theoretical foundations despite all that has been written to the contrary.

One purpose of the first chapter is therefore to highlight the fact that England was an open economy not only for trade in goods but also for movements of capital. Foreign capital flows, mainly from Holland, financed a sizeable portion of investment: that part of the capital accumulation controversy which is linked to the relation between saving and investment is therefore largely irrelevant. In order to demonstrate the existence of capital inflows and to clarify their relationship to investment, I build the Balance of Payments and the National Income Accounts of the UK for the 18th and 19th centuries. The statistical evidence on these flows is corroborated by a large body of historical and literary evidence which shows that Holland lending to Britain fits the broader historical perspective.

The topic of Chapters II and III is to find theoretical underpinnings for Mercantilist theories, the models we develop being grounded in assumptions we believe to be appropriate to the period of the Industrial Revolution.

The model in Chapter II can be described as "Keynesian economics in the 18th century." The model shows how, in a developing country context, money can have permanent effects on output. The last decade has seen a resurgence of models explaining the effect of money on output --those of the New-Keynesians being the prime example. What all the models in this genre have in common is a desire to lay solid micro foundations. However, they are built within a closed economy framework and are thus not well suited to the study of developing countries. The model presented in Chapter II is an attempt to lay microfoundations in a model which draws its inspiration from developing country experience and more particularly from England during the Industrial Revolution.

The model of Chapter II is Mercantilist in spirit because specie matters. Some Mercantilist might even have agreed with the explicitly Keynesian causality of the model. But a closer look at Mercantilist authors reveals that these were not the main lines of their thought. As numerous Mercantilist authors stressed, an increase in the stock of bullion was the aim of protectionism. Chapter III presents a justification for such an accumulation of precious metal, a justification we believe to be particularly relevant to the international political system prevalent during the 17th, 18th and 19th centuries. I show in chapter III that indeed a stock of bullion is a way to deter attack by other nations. I also show that protectionist policy is associated with the absence of an hegemonic power in the international system, while free trade is inextricably linked to the presence of such a power. Thus mercantilist theory is not meaningless.

While Chapters II and III each show in their way that specie was an important variable in the development of England, Chapter I underlines the importance of foreign flows of capital and their relation to the Industrial Revolution. Indeed money and foreign capital flows were needed, both from the economic development and international politics perspectives, took place, and paved the way for the Industrial Revolution.

Thesis Supervisors: Paul Krugman, Professor of Economics
Peter Temin, Professor of Economics

## Acknowledgments

> "Economists do not grow bitter gracefully. Many of them came to the subject hoping to do good and to be useful and find that they can do far less than they had expected" (F. H. Hahn, "The Winter of our Discontent," *Economica* 1973, p. 322).

I have been fortunate in that my advisors Paul Krugman and Peter Temin showed me that I could do more than I expected: write a thesis. It is thanks to their wide knowledge of and interest in macroeconomics as well as history that I could write a thesis on the border of both fields. To them I owe the ability to formulate and shape coherent economic models. I am grateful for them being constantly available and their enthusiastic support of my research.

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Finally, I thank my parents, my husband David and my children Michal and Noam for their support and advice. I hope the children will forgive me for not being a Jewish mother while preparing this thesis. It is therefore to them and to my parents --who *are* the perfect Jewish parents-- that I dedicate this thesis.

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# Introduction

For most economists, interest in the Industrial Revolution stems from a wish to understand the first case of successful economic growth in modern times in a free enterprise context. There is also the desire to compare the Industrial Revolution with more recent development experiences in an effort to identidy any common traits that might exist.

The list of controversies surrounding the Industrial Revolution is inexhaustible. Corresponding to every hypothesis or point of view is an opposing one. The debate begins with the definition itself: was it a revolution, a "take-off", or an evolutionary process? What is meant by "revolution": growth in output or structural change? Was the Industrial Revolution due to an increase in capital or to innovations? Was it an economy-wide phenomenon or was it confined to a restricted number of sectors (i.e., a case of unbalanced growth)? Did capital increase gradually or did it rapidly double during one crucial spurt? Is the composition of capital itself important? Was domestic saving sufficient or did it constrain growth? Was investment demand or supply determined?

In the *mêlée* of claims and counter-claims attempting to answer these and other questions, two subjects have been ignored: money and flows of foreign capital. While attention has been paid to some historical details of foreign

investment in British bonds and a debate has arisen about the importance of the banking system during the Industrial Revolution, there has been no attempt to investigate the role of money and foreign capital. This lack of interest is all the more puzzlesome when account is taken of the interest expressed by 18th century economists on these two subjects. The purpose of this thesis is twofold: (i) to fill this lacuna by underlining the importance of money and foreign capital in the Industrial Revolution, and (ii) to show that theories prevalent during the 18th century can be given solid theoretical foundations despite all that has been written to the contrary.

Before delving deeper into the subject of this thesis, it is worthwhile to examine in greater detail a number of the controversies noted above which are most pertinent to my thesis. Perhaps the best-known of all these questions is whether the change in the British economy took place gradually or occurred in one heroic effort, stemming from a sudden increase in capital. Traditionally, authors have favored the discontinuous view: Kuznets stated that "at some phase. . . there must have been a substantial rise in the capital formation proportions."[1] Lewis wrote that "the central problem in the theory of economic development is to understand the process by which a community. . . converts itself into an economy where voluntary saving is running at

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[1] Kuznets (1955), pp.26-28.

about 12 to 15 per cent of national income or more."[1] Rostow's celebrated "take-off" involved "the ability of the society to sustain an annual rate of net investment of the order of, at last, ten per cent."[2] These traditional views were challenged by the appearance of Feinstein's data which seemed to show that the gradualism of Cairncross and Deane was right. As Cairncross (1963) wrote: there was a "slow and relatively steady rather than a sudden and rapid acceleration in investment ratios."[3]

It has been known since the publication of Kuznets' seminal work that productivity and innovation, as opposed to capital deepening, are by far the more important factors in the growth of output. This was confirmed for 18th century Britain by the appearance of Feinstein's data. Given the importance of productivity gains, the question one logically poses next is whether these gains took place evenly across all sectors? For Kuznets and Denison the increase in productivity was caused by the release of labour from low productivity sectors and their reallocation to those sectors with high productivity, in other words, from agriculture to industry. Crafts showed that labour did indeed migrate from agriculture to industry during the early stages of British development. Similarly, for Mathias the Industrial Revolution is the "fundamental redeployment of resources away from

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[1] Lewis (1954), p.155.
[2] Rostow (1959), p.7.
[3] Cairncross (1963), p.240.

agriculture".[1] However this movement is entirely discounted by Williamson who writes that "the early release of labor was simply not important enough to matter to overall British growth."[2]

The question that is currently the subject of fierce debate is why the rate of capital accumulation was not as high as was thought by Lewis and Rostow. Some authors (Postan and Crafts) believe that there was no shortage of capital and that demand for capital was simply slack; others theories, from Hamilton's forced-saving theory to Williamson's crowding-out, argue for the existence of a shortage of capital. Given the relatively low rate of capital accumulation, it is perhaps inevitable that this controversy be linked to that regarding the nature of capital itself. For example, Ashton underlines the importance of the transition from circulating to fixed capital, a factor also stressed in the Hicks-Ranis-Fei model. On the other hand, Pollard has shown that this shift had not yet occurred at the time of the Industrial Revolution.

The persistence of so many controversies is in large part attributable to the paucity of good data. Though Economic History has made considerable progress in the last decade, and has greatly heightened our understanding of the factors shaping the Industrial Revolution, the large margins of error which will undoubtedly continue to plague the data

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[1] Mathias (1983), p.2.
[2] Williamson (1987), p.271.

ensure that it will be difficult if not impossible to keep controversy at bay. Thus, effort must be expended not only in the quest for better data, but also in the search for greater historical perspective and a deeper understanding of the writings of economists of the period.

This thesis touches on many of the puzzles described above, but its main focus is an area which has been largely neglected: the role of money and foreign flows of capital in the Industrial Revolution.

There exists a broad consensus in the literature as to a direct link between saving and investment. ("Rostow and Lewis both thought the doubling in the investment rate could be traced to a rise in the domestic saving rate and Lewis thought the rise in the saving rate was induced in large part by the mechanism of the classical labor surplus model."[1]) This consensus rests on economic historians having carefully avoided the potential importance of foreign investment. From the ideological standpoint, it stems from an inability to accept that what is perceived as having been the most economically developed country of the day was receiving foreign aid. As will be shown in Chapter I, this hypothesis is wrong both from the perspective of the data on trade (there were indeed capital inflows into Britain), and as an interpretation of history. It will be shown that there

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[1] Williamson (1987), p.285.

existed a country --Holland-- developed enough to give aid to England. It will also be shown that the distorted view of the economic importance of England during the period stems from a case of transplanting a later historical picture back several decades: after the Napoleonic wars Britain was undisputedly the most developed country in Europe and extended credit to other countries --it has therefore become difficult to accept that it could have been otherwise earlier. A closer look at the historical record would have shown that the transition from debtor to creditor status for a (subsequently hegemonic) country like England is not at all inconceivable. Indeed history repeats itself. The same happened to the US: from being an important debtor while developing, the US became an hegemonic power and concomitantly a creditor; and in both cases the transition from debtor to creditor was marked by a major war.

One purpose of the first chapter is therefore to highlight the fact that England was an open economy not only for trade in goods but also for movements of capital. Foreign capital flows, mainly from Holland, financed a sizeable portion of investment: that part of the capital accumulation controversy which is linked to the relation between saving and investment is therefore largely irrelevant.

In order to demonstrate the existence of capital inflows and to clarify their relationship to investment, I build the Balance of Payments and the National Income Accounts of the UK for the 18th and 19th centuries. The statistical evidence

on these flows is corroborated by a large body of historical and literary evidence which shows that Holland lending to Britain fits the broader historical perspective.

A result which emerges in the wake of the construction of the Balance of Payments in Chapter I is that the inflow of foreign capital led to an increase in the stock of bullion. The importance of an increase in the quantity of specie in a country was the cornerstone of one of the most pervasive economic doctrines of the period: Mercantilism. From the Classical economists onwards, however, this theory has been vilified, though Keynes did allow that "the early pioneers of economic thinking may have hit upon their maxims of practical wisdom without having had much cognisance of the underlying theoretical grounds."[1] The topic of Chapters II and III is to find theoretical underpinnings for Mercantilist theories, the models we develop being grounded in assumptions we believe to be appropriate to the period of the Industrial Revolution.

The model in Chapter II can be described as "Keynesian economics in the 18th century." The model shows how, in a developing country context, money can have permanent effects on output. The last decade has seen a resurgence of models explaining the effect of money on output --those of the New-Keynesians being the prime example. What all the models in this genre have in common is a desire to lay solid micro

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[1] Keynes (1936), p.340.

foundations. However, they are built within a closed economy framework and are thus not well suited to the study of developing countries. The model presented in Chapter II is an attempt to lay microfoundations in a model which draws its inspiration from developing country experience and more particularly from England during the Industrial Revolution. The principal features of the model are drawn from a close reading of 17th and 18th century economists (Defoe, Child, Mun, Petty, I. de Pinto, A. de Serionne).

The economy in our model comprises an agricultural and an industrial sector. A distortion in the agricultural labour market is responsible for the existence of disguised unemployment because of a discrepancy in marginal productivities.

The industrial sector, for its part, is faced with a liquidity constraint which increases its marginal cost. An increase in money therefore reduces marginal cost and leads industrial firms to employ more workers, to build up larger stocks and to shift factors of production from agriculture to industry. Output therefore expands.

In the open economy setting of our model, Hume's specie-flow mechanism would usually entail that monetary flows have no real effects because they always find their way back to the originating country through the channel of the trade deficit. This mechanism, which operates through its effect on net imports, is a purely demand-side construct. If money has effects on the supply-side, on the other hand (by

affecting costs of production), the Classical specie-flow mechanism is not operative, and the economy is not driven back to its initial state. The effect of money can therefore be permanent.

The model of Chapter II is Mercantilist in spirit because specie matters. Some Mercantilist might even have agreed with the explicitly Keynesian causality of the model. But a closer look at Mercantilist authors reveals that these were not the main lines of their thought. As one author has put it: "By trying to isolate the purely economic element in Mercantilist thought and policy, Keynes was perpetrating an anachronism."[1]

Mercantilist doctrine is related to the concept of national sovereignty and power. Their commercial policy was intended as the hand-maiden of their political goal of national sovereignty. As numerous Mercantilist authors stressed, an increase in the stock of bullion was the aim of protectionism. Chapter III presents a justification for such an accumulation of precious metal, a justification we believe to be particularly relevant to the international political system prevalent during the 17th, 18th and 19th centuries. The Classics had a tendency to ridiculize the Mercantilists by accusing them of mistakenly equating the accumulation of gold with the accumulation of national wealth. The Classics,

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[1] Wilson (1957), p.188.

however, also had a tendency to view the world through rosy spectacles, and what they chose to see was a world devoid of complicating distortions, strategic behavior and, more importantly for our model, devoid of war and international power struggles. Herein lay their misunderstanding of the Mercantilists position, for as one historian writing on the period has put it: "control of an adequate bullion stock was. . . a crucial variable in the struggle between core powers."[1] I show in chapter III that indeed a stock of bullion is a way to deter attack by other nations. I also show that protectionist policy is associated with the absence of an hegemonic power in the international system, while free trade is inextricably linked to the presence of such a power. Thus mercantilist theory is not meaningless.

While Chapters II and III each show in their way that specie was an important variable in the development of England, Chapter I underlines the importance of foreign flows of capital and their relation to the Industrial Revolution. Indeed money and foreign capital flows were needed, both from the economic development and international politics perspectives, took place, and paved the way for the Industrial Revolution.

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[1] Wallerstein (1980), p.277.

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# Chapter I

# International Capital Flows During the 18th Century: Did Holland Finance the British Industrial Revolution?

## Introduction

Development economists have long pointed out the importance of foreign capital in the industrialization and development process. This is perhaps best seen in the extensive "two-gap" literature, which emerged in the wake of seminal contributions by Chenery.[1]

Chenery and Syrquin (1975), for example, argued that "external borrowing is a normal feature of the development strategies of many countries." Drawing heavily on this literature, Crafts (1985) points out that "countries with the same per capita income as Britain in the 18th century were experiencing a considerable inflow of capital."[2]

In contrast, when economic historians have discussed those factors that contributed to the development of Great Britain, inflows of foreign capital have seldom been included. Instead, they have chosen to underline the uniqueness of the evolution of the first country to industrialize and develop --England in the 18th century. From Rostow's "take off" to Crafts and Williamson, the portrayal of the British Industrial Revolution has revolved around domestic saving.[3] Williamson, for example, favors "the view that saving significantly constrained British

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[1] See, e.g., Chenery and Bruno (1962) and Chenery (1969).
[2] Crafts (1985), p.52.
[3] See, e.g., Williamson (1987) and Crafts (1985).

accumulation."[1] In essence, one is confronted with a plethora of pseudo-economic and sociological theories attempting to persuade one that the saving of "poor hard-working" British Protestants constituted the motor driving investment and thus the Industrial Revolution itself.

In this paper it will be shown that in fact the inflow of capital from Holland, and not only domestic saving, paved the way to the Industrial Revolution. In the economic history literature, the flow of capital from Holland to England that occured mainly in the second half of the 18th century is well documented.[2] However, the treatment has remained confined to the descriptive level. There has been little analytical effort geared towards relating these flows to the economic development of England and the Industrial Revolution.

The analytical device which will allow us to link international capital flows to saving and investment is the balance of payments (BOP). The BOP for 18th century Great Britain has not been constructed for a number of reasons, including the poor availability of the relevant data. Despite these problems, I will devote a considerable portion of this paper to its construction for two reasons:

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[1] Williamson (1987), p.273.

[2] See Wilson (1966), Carter (1953), Sinclair (1791) and Hargreaves (1966).

(i) the issue of whether British industrialization in 18th century stemmed from domestic saving or from inflows of foreign capital is a crucial one;

(ii) a number of 18th century British series have been constructed with large margins of errors; these series are severely flawed either because of inadequate knowledge of national income accounting practices or because they omit mention of the surprisingly large margins of error involved.[1] Many scholarly salvos have been fired with these irreparably contaminated series acting as ammunition. Of course, the 18th century BOP series I build in this paper are also subject to substantial margins of error: for this reason, I have buttressed them with additional historical evidence.

The aim of this paper is to highlight the crucial role played by foreign capital in the determination of British investment, by establishing the BOP, and, having done so, the National Income Accounts (NIA) from 1740 to 1900. This procedure demonstrates (i) that England was running a current account deficit during the entire 18th century, and (ii) that this current account deficit was financed through capital flows and not through the depletion of reserves. This current account deficit is a non-negligible component of the NIA. Thus, inflow of foreign capital, at least as much as domestic thrift, financed the investment which accompanied the Industrial Revolution of the 18th century.

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[1] See Appendix 1.

The paper is divided into four parts. In Part (I), I present the BOP for the period 1710-1900; I construct the BOP for the years 1710-1800.[1] The years 1816-1900 are drawn from the series constructed by Imlah (1958). In Part (II), I discuss the capital inflow series derived in Part (I). I also sketch the wider historical context which underlies these developments. In Part (III), I construct the NIA, which allows one to relate the inflow of capital to the trade deficit and to investments. Part (IV) concludes.

[1] The years 1800-1815, years of war and major restructuring of the world system unfortunately entails that the data for this period are subject to large errors. I therefore abstain from calculating the BOP for this period.

## (I)

## The Balance of Payments and the Foreign Debt

Estimation of the BOP for the 18th and 19th centuries is crucial to the study of the British economy during the Industrial Revolution. The openess of Western economies during this period (as opposed to the middle of the 20th century, for example) implies that confining one's attention to domestic factors distorts one's view of the economy as a whole. However, estimation of the BOP is an exercise frought with uncertainty. The BOP should be seen as indicative of the direction of flows and of orders of magnitude: it should not be interpreted as a precise estimate. For the 19th century one has the seminal work of Imlah (1958), who constructs the BOP and derives the credit balance of the UK. He shows that the UK was an exporter of capital during the 19th century. In this paper, I construct the BOP for the 18th century: I show that Great Britain was a net importer of capital during this period.

The BOP is divided into three parts: the current account, the change in reserves and the capital account. The first two elements of the BOP are to be estimated; the third is obtained from the first two by the usual identities.

## 1. The Current Account.

The current account comprises three parts: the trade balance, the service account and transfers. Though we will be dealing with each of these items in turn, our division will not be entirely watertight and certain elements which belong under the trade balance heading will be dealt with in the service account discussion. Sales of ships should be placed in the trade balance category. However, we will consider them while dealing with shipping services. This distinction is essentially of no consequence, since the allocation of items to either the trade or the service account also depends on whether the trade balance data are presented c.i.f. or f.o.b.

### 1.1. The Trade Balance.

The trade balance data (i.e., imports and exports of goods) are the least problematic aspect in the balance of payments. Yet even here problems remain. The raw data on imports, exports and re-exports originate in the customs authorities' *Ledgers*.[1] As explained by Clark (1938), Schumpeter (1960) and others, a major problem exists with the *Ledgers'* official values: the value of certain imported goods was calculated at fixed prices. Moreover, the re-export series includes freight-insurance and profits. For the 19th century, Imlah (1958) has constructed a series which takes

[1] See Schumpeter (1960) or Deane and Cole (1967).

care of the problem.[1] For the 18th century, Deane and Cole (1967) have attempted the same exercise using the data compiled by Schumpeter (1960). Both Deane and Cole (1967) and Imlah (1958) compute imports c.i.f. and exports f.o.b. This consistency in the construction of the series allows one to obtain a net import series for the years 1710-1900 by splicing the two together.[2] This is presented in Table 1, column 1.

This series, were it to include sales of ships and smuggling, would be the trade balance.[3] These two items are not particularly significant for the 19th century, as shown by Imlah (1958). For the 18th century, on the other hand, they are of considerable import. We will deal with sales of ships later; we now turn to smuggling.

*1.1.1. Smuggling.*[4] Illicit trade was a persistent feature of 18th century commerce and varied along with the severity of duties imposed. As noted by Imlah in the context

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[1] There is also a series constructed by Davis (1979), the difference between his and Imlah's estimates being on the order of 5%.

[2] There remains a minor problem with the 18th century re-export series. Deane and Cole (1967) present the official values, which are c.i.f. (i.e., include freight-insurance and profits). We will have to take account of this in the service account.

[3] Imports and exports of gold and silver are seen as changes in foreign reserves, and thus do not fall under the trade balance.

[4] Imlah (1958) combines smuggling with *tourist expenditures* and *unrecorded imports*. For the 18th century, it is not possible to be as categorical as Imlah was about the 19th century (namely, that the English travelled much more abroad than other Europeans), and we therefore set this category to zero. Therefore, we confine our attention to smuggling.

of the 19th century data, "translating these impressions into a series of annual values is a more troublesome matter."[1]

Table 1.
Trade and Service Accounts
(Annual flows, £m)

| Year | Net Exports (1) | Sales of Ships (2) | Smuggling (3) | Balance of Trade (4) | Net Credit from Shipping (5) | Insurance, etc (6) | Profits on Trade (7) | Service Account Net of Interest Payments (8) |
|---|---|---|---|---|---|---|---|---|
| 1710 | 0.90 | -0.04 | 0.3 | 0.56 | -0.20 | 0.0 | 0.7 | 0.51 |
| 20 | -1.25 | -0.04 | 0.5 | -1.79 | 0.00 | 0.0 | 0.7 | 0.69 |
| 30 | -2.22 | -0.05 | 0.7 | -2.97 | 0.20 | 0.0 | 0.8 | 1.00 |
| 40 | -0.95 | -0.07 | 1.0 | -2.02 | 0.30 | 0.0 | 0.8 | 1.07 |
| 50 | 1.87 | -0.08 | 0.9 | 0.89 | 1.05 | 0.0 | 1.4 | 2.47 |
| 60 | 0.04 | -0.1 | 2.0 | -2.06 | 1.37 | 0.0 | 1.6 | 3.02 |
| 70 | -2.90 | -0.11 | 2.8 | -5.81 | 2.77 | 0.0 | 1.4 | 4.20 |
| 80 | -2.17 | -0.11 | 1.2 | -3.48 | 3.15 | 0.0 | 1.3 | 4.47 |
| 90 | -5.90 | 0.0 | 1.1 | -7.00 | 4.15 | 0.0 | 2.2 | 6.39 |
| 1800 | 0.81 | 0.0 | 1.1 | -0.30 | 5.15 | 0.0 | 3.6 | 8.80 |
| 16 | 4.10 | 0.0 | 2.5 | 1.60 | 9.00 | 2.9 | 5.7 | 17.60 |
| 20 | -7.40 | 0.0 | 2.2 | -9.60 | 8.40 | 2.5 | 5.1 | 16.00 |
| 30 | -12.00 | 0.0 | 2.3 | -14.30 | 7.90 | 2.5 | 5.0 | 15.40 |
| 40 | -29.80 | 0.0 | 3.1 | -32.90 | 12.60 | 3.8 | 7.6 | 24.00 |
| 50 | -19.60 | 0.0 | 3.6 | -23.20 | 14.20 | 4.7 | 9.3 | 28.20 |
| 60 | -46.00 | 0.5 | 6.9 | -52.40 | 27.70 | 9.4 | 18.8 | 55.90 |
| 70 | -59.20 | 1.7 | 8.0 | -65.50 | 45.70 | 13.7 | 27.4 | 86.80 |
| 80 | -124.80 | 3.7 | 8.9 | -130.00 | 60.00 | 15.7 | 31.4 | 107.10 |
| 90 | -92.40 | 6.1 | 10.5 | -96.80 | 60.60 | 16.9 | 33.7 | 111.20 |
| 1900 | -168.70 | 1.7 | 11.6 | -178.60 | 68.50 | 17.5 | 35.1 | 121.10 |

Sources: see text.

For the 18th century, and despite these difficulties, Cole (1958) arrived at an estimate which showed that the magnitude of smuggling was equivalent to up to 25 percent of recorded imports: "It seems possible that £2 or £3 million worth of

[1] p.59.

goods may have been smuggled into Britain each year."[1] He also suggests that from 1724 to 1745 there was a general increase in smuggling, a resurgence again in the 1770s, and a decline after 1780 corresponding to the introduction of Pitt's reform. For the 19th century, the data are Imlah's. His "arbitrary treatment"[2] was the following: £1.5 million was taken as the starting point for 1816, a constant percentage of exports being assumed subsequently. The series is presented in Table 1, Column 3. We now turn to the service account.

1.2. The Service Account.

Given that the trade balance has been calculated taking imports c.i.f. and exports f.o.b., export and import services (freight, insurance and profits) rendered by Britons must be credited to the current account surplus, while services rendered by foreigners for British exports must be subtracted from the current account.[3]

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[1] Cole (1958), p.142.

[2] His own words.

[3] Measuring both imports and exports f.o.b. yields the following accounting balance:

| Balance of Payments | |
|---|---|
| • Exports (f.o.b)<br>• services for exports by British companies | • Imports (f.o.b)<br>• services for exports and imports by foreign companies |

This is equivalent to the following balance when imports are c.i.f. and exports f.o.b.:

It is well-known that the UK ran a large service account (i.e., invisible exports) surplus in the 19th century. The UK possessed the largest merchant fleet in the world. Seventy percent of all entries and clearances in British ports were accounted for by British ships.[1]

In the 17th century, the Dutch merchant marine held sway over the world's oceans. Most British exports and imports were carried on foreign vessels: and most of these were Dutch. Sir George Downing lamented about "so much money carried out of the Kingdome as is yearely for freight and wages".[2] Others were more succinct: "What we want is more of the trade the Dutch now have."[3] Arguments such as these inevitably led to the various Navigation Acts, beginning in 1651.

The purpose of the Navigation Acts may have been to exclude foreigners from the import trade and to forcibly develop British shipping, but their immediate impact was negligible. Davis (1962) writes that "the masters of Trinity House representing the ship owners declined to agree that the 'Act or pretended Act' was of benefit to English shipping unless it had been more exactly performed." There was no manner of ascertaining the nationality of a ship (given that

| Balance of Payments | |
|---|---|
| • Exports (f.o.b)<br>• services for exports and imports by British companies. | • Imports (c.i.f)<br>• services for exports by foreign companies |

[1] See Davis (1962), Imlah (1958).
[2] State papers, Foreign, Holland,168, pp.219-20, 1663.
[3] Cited in Barbour (1930).

almost all ships were Dutch-built), and if a captain of a foreign ship swore that his ship was English, very little could be done. Davis writes that there were "many fraudulent sales of Dutch ships to temporary English owners" and that "admiralty passes were obtained for foreigners."[1] Wilson (1966) argues that "[t]he Acts may possibly have done some little temporary damage [to Dutch shipping], but it was negligible, and even this was counterbalanced by its effects in the Baltic, where its secondary results were to give the Dutch a monopoly of shipping until late in the eighteenth century."[2]

It is clear therefore that despite the Navigation Acts, the Dutch maintained their supremacy in the field of merchant shipping well into the 18th century. More details are needed, however, for one to able to determine the party to which shipping revenues accrued. We turn to Davis (1962) and Barbour (1930) for those details.

In the trade of commodities in which a relatively large proportion of the final price was attributable to shipping costs, namely bulky cargoes, the Dutch were near to holding a monopoly position. These cargoes accounted for much of the Baltic trade and exchanges between the UK and northern Europe, "the lost trade" as one English observer noted[3]. The extent of Dutch dominance is attested to by the fact that "of

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[1] p.224.
[2] p.20.
[3] See Roger Coke, *A discourse of Trade* (1670).

a total of 1,035 ships which passed the Sound between June 19 and November 16, 1645, all but 49 were Dutch."[1] Barbour (1930) writes that the "Dutch by cheap purchasing, low freights and low duties were able to reduce [their costs]. . . . Dutch rates would be 1/3 to 1/2 lower than English for the same voyage."[2] Moreover, merchants recognized the advantages of shipping Dutch: they "often stipulated carriage in Dutch vessels. It was always easy to find a ship bound for Amsterdam and from thence to ship goods to any part of the world."[3]

For commodities "of small size and weight in proportion to their value," where shipping costs were unimportant, the British were capable of carrying their imports and exports themselves.[4] The Mediterranean and East Indian trade routes, also known as the "rich trade," fell under this category.[5] In the aggregate, however, the British had a large deficit in the balance on invisible trade; and the Dutch pressed home their advantage not only in freight, but in shipbuilding as well. The supremacy of the Dutch rested on the English merchant not being able to build cheaply "because he could not import timber and other materials cheaply and he could not import cheaply because he could not build cheaply."[6]

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[1] G. W. Kernkamp, *De Sleutels van de Sont* (1890) Bijlage, i, pp.279-80.
[2] pp.274-85.
[3] Barbour (1930), p.286.
[4] Barbour (1930), p.265.
[5] The "rich trade" was a term coined by Downing.
[6] Barbour (1930), p.267.

Barbour writes that even the "English Postmaster General preferred a Dutch packet-boat to any English craft for carrying the mails."[1] Indeed, despite the Acts, acquisition of foreign ships continued, and "one may guess without pretending accuracy that there may have been some 1,200 foreign bottoms in the English merchant marine just prior to the Peace of Nymwegen [1678]. . . . Of those foreign ships the great majority had been built in the Netherlands."[2]

For the 17th century, invisible trade (i.e., payment to foreigners for entrepot and freight, etc.) undoubtedly registered a deficit for England. For the 19th century, British supremacy in merchant shipping entailed that 70 percent of world freight travelled on British vessels. But what of the 18th century?

There is no doubt that the second half of the 18th century witnessed the decline of Holland, and that it is during this period that England's deficit on the service account became a surplus. In what follows, I estimate the different components of the service account.[3]

*1.2.1. Net Credit from shipping.* Davis (1962) has collected data for the years 1686, 1715 and 1771 on entries and clearance of shipping engaged in foreign trade, as well

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[1] p.276.
[2] Barbour, p.289.
[3] Here, I will rely heavily on Davis'(1962) work.

as revenue per ton of freight, according to the trade route involved. This allows one to compute shipping revenue. For BOP purposes, however, one needs to know how much of this revenue accrued to Britain. Davis also presents data on entries and clearances of foreign-registered vessels. However, these data are suspect because it is known that the Navigation Acts caused many captains to falsely register their vessels as being British.[1] However, Davis' discussion (which is strangely divorced from his data) of British foreign trade, as well as Wilson's (1957) work does shed some (more convincing) light on the relative importance of British and foreign carriers in British trade.

The Baltic and Northern Europe. In 1700, the share of foreign-shipping, according to Davis and Wilson, was 90%, declining to 60% in 1750, 50% in 1760, 40% in 1770 and 30% in 1780. I am confident that, if anything, these figures are biased *downwards*: as quoted above,[2] 90% of the Baltic trade was carried on foreign ships in 1698; in 1721 "the bulk of British trade with France went in Dutch boats;"[3] and in 1780 "there were 2,075 Dutch against 1,651 British ships

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[1] The weakness of Davis' data is crystallized in the following inconsistency: for the years 1686 and 1715, when, as I have shown, the Navigation Acts had little effect and the importance of foreign shipping is well-documented, Davis claims that only 15% of shipping (in tons) was carried on foreign-registered vessels --much too low a figure. What is more damning for his case, however, is that for 1779, by which time British preeminence was well-established, Davis gives a figure of 30%: this *decrease* in the share of shipping accounted for by British carriers is completely out of line with what one knows to be a large *increase* in the importance of British shipping during the period.

[2] p.30, f.n.1.

[3] Wilson (1966), p.20.

trading."[1] The 30% figure for 1780 is thus clearly an underestimate.

Southern Europe and the Mediterranean. Refered to as the "Rich Trade," in the hands mainly of Englishmen, it is estimated that only 30% of this lucrative route was handled by foreigners.

The East Indies. This route was dominated by the British: a rough guess of the British share is 75%.

The West Indies and North America. For the Dutch, "trade with the Americas and the colonies was, by 1750 proving more difficult, though here again there was no obvious or startling decline. . . . and in spite of the Asiento Treaty, the Dutch remained the most important slavers in West Africa."[2] Davis confirmed this view, and I have therefore chosen a figure of 50% for the British share.

My estimates of foreign shipping are summarized in Table 2. Column 3 gives my estimate of total revenues from shipping (English and foreign). It is derived by multiplying freight rates (column 2) by the tonnage carried (entries and clearance: column 1). For my estimate of British revenues

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[1] Macpherson (1805), p.649.
[2] Wilson (1954), pp.258-9.

Table 2
Net Credit from Shipping.

| | Trade Route | Trade (000s tons) | Freight Cost (£ per ton) | Total Revenues (000s £) | British Share of Route | British Revenues (000s £) | Foreign Revenues (000s £) | Net Credit from Shipping |
|---|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
| 1700 | | | | | | | | |
| | North Europe | 565 | 4 | 2260 | 0.1 | 226 | 1017 | |
| | South Europe | 102 | 3 | 306 | 0.7 | 214.2 | 45.9 | |
| | East India | 14 | 20 | 280 | 0.75 | 210 | 35 | |
| | West-Ind. &N.-Am. | 147 | 5 | 735 | 0.5 | 367.5 | 183.75 | |
| | Total | | | 3581 | | 1017.7 | 1281.65 | -263.95 |
| 1720 | | | | | | | | |
| | North Europe | 551 | 4 | 2204 | 0.15 | 330.6 | 936.7 | |
| | South Europe | 89 | 3 | 267 | 0.7 | 186.9 | 40.05 | |
| | East India | 13.8 | 20 | 276 | 0.75 | 207 | 34.5 | |
| | West-Ind. &N.-Am. | 156 | 5 | 780 | 0.5 | 390 | 195 | |
| | Total | | | 3527 | | 1114.5 | 1206.25 | -91.75 |
| 1750 | | | | | | | | |
| | North Europe | 798 | 4 | 3192 | 0.4 | 1276.8 | 957.6 | |
| | South Europe | 106 | 3 | 318 | 0.7 | 222.6 | 47.7 | |
| | East India | 19.9 | 20 | 398 | 0.75 | 298.5 | 49.75 | |
| | West-Ind. &N.-Am. | 250 | 5 | 1250 | 0.5 | 625 | 312.5 | |
| | Total | | | 5158 | | 2422.9 | 1367.55 | 1055.35 |
| 1760 | | | | | | | | |
| | North Europe | 698 | 4 | 2792 | 0.5 | 1396 | 698 | |
| | South Europe | 87.1 | 3 | 261.3 | 0.7 | 182.91 | 39.195 | |
| | East India | 17.8 | 20 | 356 | 0.75 | 267 | 44.5 | |
| | West-Ind. &N.-Am. | 246.7 | 5 | 1233.5 | 0.5 | 616.75 | 308.375 | |
| | Total | | | 4642.8 | | 2462.66 | 1090.07 | 1372.59 |
| 1770 | | | | | | | | |
| | North Europe | 1075 | 4 | 4300 | 0.6 | 2580 | 860 | |
| | South Europe | 126 | 3 | 378 | 0.7 | 264.6 | 56.7 | |
| | East India | 28 | 20 | 560 | 0.75 | 420 | 70 | |
| | West-Ind. &N.-Am. | 396 | 5 | 1980 | 0.5 | 990 | 495 | |
| | Total | | | 7218 | | 4254.6 | 1481.7 | 2772.9 |
| 1780 | | | | | | | | |
| | North Europe | 1108 | 4 | 4432 | 0.7 | 3102.4 | 664.8 | |
| | South Europe | 100 | 3 | 300 | 0.7 | 210 | 45 | |
| | East India | 24.3 | 20 | 486 | 0.75 | 364.5 | 60.75 | |
| | West-Ind. &N.-Am. | 197 | 5 | 985 | 0.5 | 492.5 | 246.25 | |
| | Total | | | 6203 | | 4169.4 | 1016.8 | 3152.6 |

Sources: columns 1 and 2, Davis (1962); col.3 = col.1 x col.2; col.4: see text; col.5 = col.4 x col.3; col.6 = 0.5 x col.3 x (1 - col.4); col.7= col.5 - col.6.

(column 5), I multiply total revenues by the weights (the British share of the various routes) described above (column 4). Of course, only those foreign revenues stemming from the carriage of exports should be included in the imported services side of the BOP:[1] these estimates are given in column 6. They are obtained by multiplying export tonnage by the weights (the foreign share of the various routes) also described above. Net credit from shipping is given in column 7. This last series confirms that Britain emerged as a more important shipping power than the United Provinces in 1750.

*1.2.2. Ship Sales.* In the 18th century, British shipbuilding did not meet the demands of the British merchant marine. The necessary vessels were obtained from the Netherlands, the Baltic and America: "before 1786 a considerable number of very large merchantmen were built in the Baltic for British owners."[2] "America became an active supplier of new tonnage early in the 18th century."[3] After 1786 and until 1849, because of the Registration Act, no foreign vessels were officially acquired. After 1849, the British were able to supply the needed vessel themselves: "any accession of vessels from [abroad] was by far outstripped by the number of British vessels which were sold

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[1] See footnote 3, p.27.
[2] Craig (1971), p.138.
[3] Craig, op. cit., p.138.

to foreigners."[1] Feinstein (1978) estimated the total investment in new ships in 1760 to be £0.27m. Given the discussion above, I assume that 40% of this total was bought abroad. My estimate of purchases of foreign ships is presented in column 2 of Table 1.

*1.2.3. Insurance, Brokerage and Shipping Commissions.* In the 18th century, the insurance industry was not highly developed: "a large part of coastal and foreign bound shipping proceeded without cover. It is not until the beginning of the 19th century that the first reasonable, accurate account of the volume of business is available."[2] Moreover, Amsterdam remained an important insurance center: there is therefore no reason to suppose that there existed a positive balance in Britain's favour in this service.

If the 18th century saw the decline of Amsterdam as the hub of the staple market, it is still true that English trade with Russia and the Baltic was handled on commission by houses based in Holland and Hamburg. A 2% percent commission fee was usual. In contrast, commissions were not commonplace in the East India trade (in which, as was noted above, the British dominated). In northern and southern Europe, commissions were more common and the majority of traffic was handled on commission by the Dutch and other foreigners. In

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[1] Craig, op. cit., p.139.
[2] John (1958), p.132.

the belief that this item was a debit item to Britain, and at that a small one, I omit it altogether.[1]

*1.2.4. Profits on foreign trade and services.* This series should include profits made by British firms for export and import trade, net of the profits of foreign firms on export trade. Under this heading, one should also include banking and technical services rendered to foreigners. For the 18th century, the average rates of profit assumed by Deane and Cole (1967), based on Irving's computation, are 15%. For the 19th century, Imlah (1958) takes 5% of the sum of imports, exports and reexports. In my series for the 18th century, reexports already include profits. As is the case with freight costs, profits on the import and export trade were divided between British and foreigner. I assume that profits on exports flowed into British coffers, and that those on imports were split evenly with the foreigners. I take the same average rate of profit as Deane and Cole (1967); the series is presented in Table 1, in the fourth column.

*1.2.5. Summary of the Goods and Services Account.* The balance of trade (Table 1, column 4) is negative for most of the years of both the 18th and the 19th century. The service account (Table 1, column 8), though positive, is not of

[1] If it was a debit item, it is already included under imports c.i.f.

sufficient magnitude to offset the trade deficit during the 18th century. During the 19th century, on the other hand, the goods and services account is positive, except for the last decade.

1.3. Transfers.

Emigrant funds, as well as government and private transfers fall under this heading. It is always extremely problematic to assemble a comprehensive view of transfers, all the more so for the 18th century. Some transfers are known and we will confine our attention to them.

During the Seven Years War, Britain sent subsidies to Frederick the Great. It is assumed that £.6m were sent every year between 1757 and 1760, financed chiefly by loans from the Dutch.[1] Moreover, British troops and mercenaries stationed in Europe, were not only living on pillage. Those defence expenditures were not included in the figures. On the other hand, it is known that prizes (the most important being ships) were taken during most battles. Davis has gathered data on the number of ships taken as prizes of war: 2,203 during 1702-13, 1499 during 1739-48, and 1855 during 1756-63. However many of these ships changed hands several times, thus entailing much double counting.

Concerning emigrant funds, we know that there was Dutch and Huguenots immigration to Britain, as well as emigration

[1] See Kennedy (1987), p.98.

toward the American colonies. Since I have no hard data readily available on these flows, I assume that they are offsetting. After the French Revolution, on the other hand, there is evidence of a large inflow of French immigrants, along with their accompanying funds.

It is argued by some authors (Davis (1979) and Philips (1961)) that there were substantial remittances (amounting to up to £15 million per annum on average) from the East Indies during the course of the last decade of the 18th century. Since we are unable to give precise figures, we display our results under the two cases: the first scenario assumes zero remittances, the second, a full £15 million. This series is presented in Table 3, column 2.

1.4. Debt Service.

Data on interest rates and debt service are available from various sources.[1] The debt service series is obtained by multiplying outstanding debt by the interest rate. As explained below in part (II), small changes in the outstanding debt can have large effects on debt service (see Table 4). Primary sources which deal with interest payments on the debt give one a range within which it should lie. The interest rates appropriate to the public debt are available in Grenville (1828): the interest rate in the first half of

[1] For instance, Grenville writes that interest payments on the public debt to foreigners in 1767 should be £1.6m. Cited by Carter (1953) and Wilson (1966).

the 18th century was approximately 5 percent, 4 percent in the second half. On private debt, the relevant interest rate is slightly higher. Turning to British foreign investment,

Table 3
The British Balance of Payments: 1711-1900.
(Decade Averages, £million)

| | Trade and Services | Transfers | Current Account, Net of Debt Service | Debt Service | Current Account | Increase in Foreign Reserves | Outflow of Capital | Balance of Foreign Credit |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| 1711-20 | -0.02 | 0.11 | 0.09 | 0.11 | 0.21 | 0.41 | -0.20 | 0.52 |
| 1721-30 | -1.53 | | -1.53 | 0.02 | -1.51 | 0.43 | -1.94 | -18.91 |
| 1731-40 | -1.46 | 0.02 | -1.44 | -0.85 | -2.29 | 0.13 | -2.42 | -43.14 |
| 1741-50 | 1.20 | 0.14 | 1.34 | -1.94 | -0.60 | 0.06 | -0.66 | -49.72 |
| 1751-60 | 2.16 | | 2.16 | -2.24 | -0.08 | 0.07 | -0.15 | -51.17 |
| 1761-70 | -0.33 | -1.00 | -1.33 | -2.30 | -3.63 | 0.06 | -3.69 | -88.06 |
| 1771-80 | -0.31 | | -0.31 | -3.96 | -4.27 | 1.02 | -5.29 | -140.95 |
| 1781-90 | 0.19 | 2.00 | 2.19 | -3.52 | -1.33 | 1.71 | -3.04 | -171.34 |
| 1791-1800(a) | 3.95 | 0.00 | 3.95 | -4.28 | -0.34 | 1.34 | -1.68 | -188.11 |
| 1791-1800(b) | 3.95 | 15.00 | 18.95 | -4.28 | 14.66 | 1.34 | 13.32 | -38.11 |
| 1801-15 | | | | | | | | 10.00 |
| 1816-20 | 7.44 | -0.36 | 7.08 | 1.74 | 8.82 | 1.60 | 7.22 | 46.10 |
| 1821-30 | 3.52 | -0.37 | 3.15 | 4.43 | 7.58 | 1.11 | 6.47 | 110.76 |
| 1831-40 | -1.92 | -1.04 | -2.96 | 6.65 | 3.69 | -0.78 | 4.47 | 155.41 |
| 1841-50 | -1.70 | -2.15 | -3.85 | 8.49 | 4.64 | -0.66 | 5.30 | 208.36 |
| 1851-60 | 8.30 | -2.21 | 6.09 | 14.11 | 20.20 | 3.11 | 17.09 | 379.23 |
| 1861-70 | 12.15 | -1.58 | 10.57 | 26.17 | 36.74 | 5.61 | 31.13 | 690.49 |
| 1871-80 | 0.58 | -1.41 | -0.83 | 53.17 | 52.34 | 2.62 | 49.72 | 1187.67 |
| 1881-90 | 2.50 | -1.73 | 0.77 | 74.47 | 75.24 | 0.66 | 74.58 | 1933.44 |
| 1891-1900 | -44.11 | -0.74 | -44.85 | 96.48 | 51.63 | 5.15 | 46.48 | 2398.22 |

Note: column 8 (Balance of Foreign Credit) is an end-of-period figure.

on the other hand, one finds much higher rates of return than on British debt.[1] This implies that, although Britain was a net debtor during much of the 18th century, the average rate

[1] See Wilson (1966) p.183.

of interest applicable to debt service on the *net* foreign debt approximately the same as the rate on the public debt. For the 19th century, one has Imlah's data on debt service. The series for debt service is given in Table 3, column 4.

1.5. The Current Account.

The current account, excluding debt service, is presented in column 3 of Table 3. Including debt service, it is presented in column 5. Excluding debt service, the current account is variable in both the 18th and the 19th century. Including debt service, however, it is negative for the entire 18th century and positive for the entire 19th century. Debt service is very sensitive to accumulated foreign debt outstanding at the beginning of the period under consideration (this will be dealt with in greater depth when we consider foreign debt). Therefore, it is the *sign* of the current account, rather than its magnitude, which is of importance.

**2. Change in Foreign Reserves.**

I did not find data on the quantity of gold (and silver) in circulation in England during the 18th century, and there are no records of gold and silver imports in the trade statistics (The records are only for exports).[1] We do have

[1] This fact escaped notice until D. Macpherson published his *Annals of Commerce* in 1805.

data on gold coined at the Royal Mint.[1] Exporting coins was forbidden, and we can therefore safely assume that new coins were minted from net gold (and silver) imports. On the other hand, illicit trade was known to be paid in part (25%) by illegal exports of gold. Therefore, for the 18th century, the series I use was computed by taking Craig's (1953) "import of precious metal to the mint" series and subtracting 25 percent of total illicit trade. For the 19th century, we have Imlah's series.[2] The complete series is presented in column 6 of Table 3. From other sources we know that the quantity of gold increased. Our data seem consistent with the conventional wisdom on the quantity of gold.[3]

### 3. Capital flows and the Balance of Payments.

Table 3, which summarizes the balance of payments for 1711-1900, reveals that the 18th century was a period during which England was a net borrower. To Britain's great benefit, she was able to borrow at more favorable rates of interest than continental nations. From Table 3, we can see that this net capital inflow financed an increase in gold reserves and a current account deficit. As we will show in Section (III), this current account deficit is essential in understanding the evolution of investment. Contrary to the

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[1] See Craig (1953).

[2] As pointed out by Feinstein (1978), p. 645, fn.182, it is not at all clear how Imlah arrived at his series on the change in foreign reserves. Feinstein thinks that Imlah "understated the imports in the period before 1858."

[3] See Soetbeer (1879).

18th century, the 19th was a period during which the UK was lending to the world. It is these foreign flows of capital, positive in 18th and negative in the 19th century that we are going to investigate in what follows.

## (II)

## The Balance of Foreign Credit

The balance of foreign credit series is presented in Table 3, column 8. These data are derived from the BOP. I will now analyze them, and corroborate the picture they paint with additional historical evidence.

Because the capital flows in the 18th and 19th centuries are so different, we will divide our discussion of them into two parts. The 19th century has been the subject of a considerable amount of research.[1] The 18th century, on the other hand, has hardly been touched. While much has been written on the British public debt owed to Holland, little effort has been expended in trying to build a more comprehensive picture of debt and credit in the 18th century. I will therefore devote the bulk of this section to the 18th century. My remarks pertaining to the 19th century will be more concise.

The years 1780-1810 mark the transition in the British BOP: they mark the change in the British position, from being a debtor to being a creditor nation. These years also mark a time of revolutions --in the realms of ideas, politics, and international relations, and also a time of war. Given the

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[1] See, e.g., Cairncross (1975), Jenks (1938).

inevitable data problems arising from such a period of upheaval, I treat it in a separate section of its own.

## 1. The 18th Century.

Primary sources are replete with references to foreign countries lending to England. Unfortunately this wealth of anecdotal evidence is accompanied by a dirth of hard macro-economic data on lending. Holland was by far the most important international lender (around 90% of the total) and therefore we will concentrate our discussion on Dutch financing.[1]

### 1.1. Dutch Investment in England.[2]

The various sources of data on investment in the British debt leave one with an impression of the relative importance of the Dutch: "As early as the 1740s some investors recognized that both Britain and the United Provinces drew in part on a common pool of capital"[3]. Dutch investment was concentrated in private assets and in British government debt.

a) *Investment in government securities.* It has already been established that a large portion of the foreign capital

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[1] Carter (1953) writes that "there was about £600 of Dutch money for every £100 of other foreign money in the English funds" (p.331).
[2] The sources for our data are: Wilson (1966), Grenville (1828), Sinclair (1791) and A de Serionne (1771).
[3] Riley (1980), p.120.

available to the British government was Dutch.[1] London's Dutch financiers were instrumental in tapping that capital. In 1737, Dutch investment in British public debt stood at £10m (27.7% of the total debt), in 1762, at £30m (25% of the total debt), in 1774, at £46.6m (25 % of the total debt), it soared in 1776 to £59m (41 % of the debt). Around 1780, Dutch investment in England fell in response to the American revolt, the French war, and the Anglo-Dutch war. The French invasion of 1795 and the proclamation of the Batavic Republic under the supervision of Napoleon's brother, Louis, weakened Dutch links with England. At this time, Holland switched international investments towards the US and French economies.[2]

b) *Investments in private funds.* There are already traces of small-scale lending by the Dutch in England in the 17th century.[3] In the 18th century, their investments were divided into three types:

(1) direct investments and credit;

(2) portfolio investment in stocks (known as "safe speculation);

(3) portfolio investment in options (known as "gambling").

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[1] For example: "Dutch holdings of British securities were probably large" (Hargreaves (1966), p.86) and "the Dutch as well as other foreign nations, having a very considerable share in our public funds". (Adam Smith (1776), p.879)

[2] In 1796, the US borrowed $12m from Holland (see Wilson (1966)).

[3] In 1669, it was revealed that several London merchants were acting as recipients for Dutch lenders, the loans being of the order of £30,000 to 200,000, at interest rates of 5 to 7%.

As regards direct investment and credit, they were perhaps as significant as investments in government securities, and were safe either by virtue of ownership or through mortgaging the property of the borrower.[1] The Dutch were lending working capital to private investors against mortgages on their fixed assets: "Contemporaries believed that much larger sums were normally advanced to British merchants and gentry upon the mortgage of consols and real property."[2] Regarding credit to private companies, we know that there were connections between merchant-bankers in London and bankers in Amsterdam. For example, we know that Baring and Hope, noted London bankers, were in fact Dutch (as was Ricardo), and maintained close financial relations with Amsterdam. It seems reasonable to infer that, deprived of good local investment opportunities, Holland invested her wealth in England, primarily through the merchant-bankers and traders of London, usually of Dutch descent themselves. Jenks (1938) writes that "the profits of an immense carrying trade and the positive of Amsterdam in Europe brought surpluses to Holland which her merchants did not hesitate to lend to political and commercial rivals."[3]

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[1] In letters between English and Dutch, the safety of the Public Debt was an important topic of discussion. The English claimed that the "sinking fund" allowed those investments to be as safe as private investments. This shows that private investments was as popular as public debt. In fact it was rumored that landed property was mortgaged to the Dutch .

[2] Jenks (1938), p.7.

[3] Jenks (1938), p.6.

The second type of investment was securities. Popular investments included bank shares, East India and South Sea shares, lotteries and bank annuities. It is known that in 1770, Dutch investments in the English East India Company alone stood at around £10m. In 1791, one sixth of Bank of England stocks were held by the Dutch. In 1773, the British government borrowed one million pound sterling from Holland to assist sugar plantations in the British West Indies (paying 8% interest, versus 2-3% in Holland).

Concerning the third type of investment (risky speculations), we have no data. We know that the South Sea "bubble" of 1720 originated mainly in speculation. We also know that some Dutch were linked to it.[1]

The instances we have cited lead us to believe that inflows of capital from Holland to England were not insignificant. A. de Serionne estimated the total inflow to be £100m in 1770.[2]

The estimate of the foreign debt derived from the balance of payments (Table 3) is consistent therefore with the partial data gathered from other sources. The figure for the overall debt in 1770 is reassuringly close to A. de Serionne's estimate of £100m which we refered to earlier.

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[1] Dutch Calvinism was on this point less exacting than the Quakerism of Sir John Barnard. This could explain why Quakers were found in industrial innovations while other groups (including jews), were found in financial institutions.

[2] A. de Serionne (1771), p.87.

Because the figures on foreign debt are subject to severe errors of measurement, their precise size is not crucial. What is crucial is the *direction* of the flows, and establishing that *having the Dutch lending to British fits the broader historical perspective*. I will therefore first explain the link between Holland and Britain, and then explain how and why Holland could become as important as it did in the British capital market.

1.2. Anglo-Dutch Relations.

The English had aided the Dutch revolt against Spain in 1570, and until 1650 the links between these two Protestant countries were strong. But British jealousy of Dutch wealth increased. As one British observer noted: "The trade of the world is too little for us two, therefore one must down."[1]

England, traditionally a seller of raw materials and an importer of manufactured goods, tried by the Navigation Acts of 1651 and 1660 to reduce the commercial power of Holland and started building her own ships. Nevertheless, the economic rivalry that had led to four wars between 1650 and 1800, was put aside when fighting against the Catholic countries. In 1688 (the Glorious Revolution), William III was called to England to become King. At that time important flows of factors of production took place. These took two forms: (i) foreign investments from Holland; and (ii) an

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[1] Pepys (1664).

inflow of Dutch immigrants to London (some of whom became permanent agents of the Amsterdam investors).[1]

The Dutch community in England, though not large, quickly grew very influential. They became part of the financial and political élite.[2] The twin links of religion and ties between families are also important in understanding why the Dutch prefered to invest in England rather than in France when it was not profitable to invest in Holland.

Political relations were not the only reasons for those ties. Economic factors were important too: England's financial system raised public debt in a manner resembling that of the Dutch Republic[3]. Moreover, the British had a good reputation for paying back their debts. In fact, political and economic factors were inextricably entwined: it is because of the strong bonds linking the two protestants communities that "the financial links necessary for direct investment in loans issued in London were available in long standing contacts between the two states in commerce and commercial finance."[4] There remains the question of how a country as small as the Netherlands (with a population of two

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1 "In the long run, most of the community of lenders became English - Van Necks, van Sittarts, Van Mierop.....and their companion to immigration to England, the Portuguese Sepharadic jews - Pereira, Da Costa, Heriguez, Medina." Clapham (1966) p.2.

2 For example: Van Notten's daughter married Bosanquet the banker; Van neck's daughter married Thomas Walpole; Samson Gideon and Joseph Salvadore were the main financiers of the king.

3 See Riley (1980), p119.

4 Riley (1980), p.119.

million in 1715) could be powerful enough to be a major international lender. It is to this question that we now turn.

## 1.3. Holland and its Power in the World.[1]

In the 16th century Holland had been part of the Spanish Empire. In 1572, the Protestants rebelled, demanding autonomy. In 1581, they declared independence under the authority of William of Orange. From then on, the power and wealth of Holland rose, while that of Spain fell. Holland remained the wealthiest state in Europe until at least 1713.

Holland's income and power stemmed from its role as the merchant of the world, providing trade-related services (warehouse, shipping, insurance and banking services), as well as producing and exporting manufactured goods.[2] The Dutch shipped grain from Northern Europe (the Baltic) to Italy and Portugal, and wool from England to the Continent. They also had an important share of the trade with the West and East Indies. They imported spices, tobacco and silk from their colonies, in return for manufactured goods and gold.

It is remarkable how Amsterdam was able to steadily increase its power in the 17th century, despite an almost continuous state of war. In the first half of the century,

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[1] This section relies on the work of Charles Wilson (1966,1957) and Geyl (1961).

[2] "The Dutch were the carryers of the world, the middle persons in trade, the factors and Brokers of Europe....The greatest part of their vast commerce consists in being supply'd from all parts of the world, that they may supply all the world again" (Defoe (1728), p.192.)

the Dutch (with English support) fought the Spanish for religious freedom. The second half of the 17th century (Holland became a Republic in 1648) saw a succession of wars between Holland, England and France in various permutations.[1] Dutch commercial and manufacturing power only began to decline after the war for the succession in Spain (1713).

The demise of Dutch commercial power has been attributed to the disappearance of the need for a staple market, once trade became direct. Buying merchants were making direct contacts with selling merchants.[2] Concomitantly, Dutch manufacturing was supplanted by its English rival because of protectionism and lower wages.[3]

Leiden's wool and Haarlem's dyeing industries, for example, suffered when Dutch immigrants transplanted their techniques of production to English soil (i.e., dyeing cloth, shipbuilding, etc). As a result, from 1713, Holland was left with three important sectors in its economy: (1) the insurance and financial sector; (2) agriculture and fishing; and (3) trade with the colonies. These remaining activities allowed the Dutch to maintain a high standard of living.[4]

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[1] See Appendix 2.

[2] For example: English business houses were setting up their own agencies in Hamburg, cloth was being sent directly from Exeter to Spain, Bordeaux displaced the Dutch in the wine trade (see Wilson (1966)).

[3] "The wages of labour are said to be higher in Holland than in England" (Adam Smith (1776), p.91). See also A. de Serionne (1763).

[4] "The province of Holland, on the other hand, in proportion to the extent of its territory and the number of its people, is a richer country than England" (Adam Smith (1776), p.91)

a) *Insurance and financial sector.* The Dutch commission-trader, who in the 17th century was advancing cash and stocking the goods in Amsterdam until sold, turned into a banker-lender in the 18th century. Although the goods were no longer transiting via Holland, financing was still Dutch, and Amsterdam remained a major financial clearing-house.

b) *Agriculture and fishing.* These activities abandoned their export-orientation and turned primarily to serving the home market. Because of superior productivity, wages remained high.

c) *Trade with the colonies.* Despite losing a portion of her colonies under the treaty of Utrecht (1713), 18th century Holland continued to trade with those it retained. In 1751, the Dutch government, concerned with declining production, contemplated various countermeasures (the "Propositions") which aimed at solving the problems by lowering taxes. In practice, however, little was done.

It is not surprising therefore, that the Dutch, who could not find opportunities at home, and who were offered an interest rate of 6-8% in the world as against 2-3% domestically, lent to the world and invested in foreign countries.[1] They lent to many European countries, including Sweden, Denmark, Germany and Russia.

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[1] See Acarias de Serionne (1771).

> The great sums which they lend to private people in countries where the rate of interest is higher than in their own, are circumstances which no doubt demonstrate the redundancy of their stock, or that it has increased beyond what they can employ with tolerable profit in the proper business of their own country.[1]

In conclusion, those foreign flows, in great majority Dutch, financed budget deficits, domestic investments and investment in the colonies, this last item being in fact an ouflow of capital. In the 19th century, investment was concentrated in foreign bonds, railroads and direct investment.[2] In contrast, the 18th century saw no investment in foreign bonds and none in the railroads(!). Investment was in the great majority directed towards the West Indies for investment in infrastructure (i.e., direct investment in housing, ports and plantations). Moreover, a portion of this development was Dutch-financed: "from the beginning of the sugar colonies in the 17th century, London and Liverpool merchants supplied the plantation with capital and borrowed funds at lower rates in Amsterdam."[3] The East Indies, for their part, were self-financing through indigenous taxes. Therefore it is not surprising to find that net flows of capital display a negative sign for the 18th century. During

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[1] Adam Smith (1776), p.92.
[2] See section 3 below.
[3] Pitman, *The Development of the British West Indies*, in Jenks (1938), p.7.

the 19th century, net flows become positive, though capital continued to move in both directions. The critical time of change is of course the period 1780-1815, to which I now turn.

## 2. The period 1780-1815.

From 1780 to 1810, Britain passed from being a debtor to being a creditor nation. This momentous realignment, coupled with a major restructuring of the international system --a restructuring bringing war and upheaval in its wake-- unfortunately entails that data for this period is subject to a severe *caveat*. These limitations in the data in mind, I will first explain why Dutch funds abruptly ceased to flow to the UK. I will then analyze the consequence of the curtailment of Dutch financing on the British debt and BOP.

The Dutch, in the second half of the 18th century, were divided over the choice of an ally: some favoured the French, others the British. Until 1780, as was noted above, the Dutch favored their relationship with the British. By about 1780, however, the Francophile faction had gained the upper hand. Not only had the 1780 Anglo-Duch war severely shaken the confidence of Dutch holders of British securities, but French credit seemed good after Necker's reform of the annuities market. Wilson (1966) writes that "Dutch confidence in British credit. . . expired simultaneously in 1780, under the

pressure of American revolt and the French war."[1] Thus the Dutch chose not to invest in Britain but rather in France and the US.

What were the effects of these withdrawals of funds on the UK? The BOP for this period are rather nebulous, but it is generally accepted that Dutch loans were no longer essential to the British at the beginning of the war (1793). A number of factors contributed to this new-found financial independence: the British raised taxes to finance the war (when in previous years, they had gone further into debt); concomitantly Dutch financing was no longer needed for the recruitment of mercenaries. Indeed, this period witnessed a revolution in warfare and military organization: "total war involving all the people with conscription for military duty and labour services took the place of the wars of the cabinets and mercenaries".[2]

Davis considers another hypothesis which seeks to explain the ease with which the British were able to do without Dutch financing: "It is altogether more probable that Indian wealth supplied the funds that bought national debt back from the Dutch and others. . . leaving Britain nearly free from overseas indebtedness when it came to face the great French wars from 1793"[3]. On the other hand, doing without Dutch funds may not have been as painless as it has

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[1] Wilson (1966), p.189
[2] See Kinder and Hilgermann (1974), vol.II, p.23.
[3] See Davis(1979) p.55.

been made out to be. The period also saw a deterioration in Sterling's exchange rate, a sign of BOP weakness: Sterling's exchange rate depreciated, reaching 30 percent below par in 1811 on the Hamburg exchange.[1]

**3. The 19th Century.**

The outflow of funds from Britain in the 19th century has been the subject of much research. Cairncross (1975) gives abundant details of portfolio investment in foreign bonds in the US, the Indian colonies, Russia, Turkey, Egypt, Peru, as well as in the financing of railways in India, South America, Canada and the US; he also discusses direct investment. He estimates the BOP between 1870 and 1914. Imlah's estimates are used more often nowadays and I present them in Table 3.

Imlah's debt series, computed in the same manner as my own, reveals a debt towards the UK of £2.4 billion (see Table 4) in 1900. This figure seems excessive, as does the entire series for the period 1820-1900, as noted by Platt (1986). Recall that in my discussion of the British current account in the 19th century, I took Imlah's computations at face value and did not investigate the possibility of the series being over- or under-estimated. The element of suspicion in the data comes from doubts surrounding the amount of foreign

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[1] See Gayer, Schwartz and Rostow (1953), p.306.

debt outstanding at the beginning of the period, in 1816. Imlah writes that "the great difficulty in beginning this series is the lack of clear light on Britain's creditor or debtor status at the close of the Napoleonic Wars."[1] Imlah's approach was simply to assume "as a *guess*, that the net balance at the close of the year 1815 was about £10 millions."[2] My discussion about the 18th century highlights the arbitrary nature of this figure and suggests that it might even be negative. In Table 4, I show how changing the net balance in 1815 from 10 to 0 or -10 instead has a very considerable effect on Britain's balance of credit abroad in subsequent years. Instead of £2.4 billion in 1900 one obtains £0.179 billion.

These remarks are not meant in any way to discredit Imlah's very significant contributions to scholarship. Rather, my intention is to underline that data on the British balance of credit abroad are subject to very large errors. The inference to be drawn is that examination of the BOP cannot stand alone, but must be backed up with richer historical evidence. Hopefully, the evidence garnered from primary sources is sufficiently clear and unambiguous on Britain's role as a debtor in the 18th century and creditor in the 19th. In the belief that the weight of this historical material is on my side, I feel reasonably confident in

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[1] Imlah (1958), p.64.
[2] Imlah (1958), p.67 (my italics).

concluding that, despite the fragility of the data, the broad lines of my argument are robust: the UK was a net debtor in the 18th century; it only became a net creditor in the 19th century.

Table 4
Balance of Credit Abroad: Three Scenarios.
(£million)

| | | Case A | | Case B | | Case C | |
|---|---|---|---|---|---|---|---|
| | Outflow of Capital Net of Debt Service (1) | Balance of Foreign Credit (2) | Debt Service (3) | Balance of Foreign Credit (4) | Debt Service (5) | Balance of Foreign Credit (6) | Debt Service (7) |
| 1801-15 | | 10 | | 0 | | -10 | |
| 1816-20 | 5.48 | 46.10 | 1.74 | 27.40 | 0.00 | 8.70 | -1.74 |
| 1821-30 | 2.04 | 110.76 | 4.43 | 74.10 | 2.63 | 37.45 | 0.84 |
| 1831-40 | -2.18 | 155.41 | 6.65 | 96.77 | 4.45 | 38.12 | 2.25 |
| 1841-50 | -3.19 | 208.36 | 8.49 | 117.70 | 5.28 | 27.04 | 2.08 |
| 1851-60 | 2.98 | 379.23 | 14.11 | 227.18 | 7.97 | 75.14 | 1.83 |
| 1861-70 | 4.96 | 690.49 | 26.17 | 433.54 | 15.68 | 176.59 | 5.18 |
| 1871-80 | -3.45 | 1187.67 | 53.17 | 732.87 | 33.38 | 278.07 | 13.60 |
| 1881-90 | 0.11 | 1933.44 | 74.47 | 1193.48 | 45.95 | 453.52 | 17.43 |
| 1891-1900 | -50 | 2398.22 | 96.48 | 1289.02 | 59.55 | 179.82 | 22.63 |

My next task is to examine the influence of these flows of capital on British domestic investment.

## (III)

## The Impact of the Inflow of Capital on Investment

### 1. The Saving-Investment Relationship.

In an open economy, net flows of capital and domestic saving finance the government deficit and investment. This saving-investment relationship originates in the national income accounts (NIA), and is given by

$$[1] \quad S \equiv I + (X - M) + (G - T);$$

$$[2] \quad NS \equiv I + (X - M);$$

where $(X - M)$ is the current account surplus;
S is private saving;
NS national saving;
I is investment;
and $(G - T)$ is the government deficit.[1]

The NIA displayed in Table 5 (with the obvious *caveat* that the data are subject to measurement error) is the correct methodology to follow when comparing investment and saving.

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[1] For more details, see Appendix 1.

Table 5
The National Income Accounts: The S-I Relation.

| | (£ million) | | | | | | (%) | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Year | Nominal Output Y | Nominal Investment I | Current Account Surplus X-M | Budget Deficit G-T | Private Saving S | National Saving NS | S/Y | NS/Y | I/Y | (M-X)/Y |
| | (1) | (2) | (3) | (4) | (5)=2+3+4 | (6)=2+3 | (7) | (8) | (9) | (10) |
| 1740 | 50.3 | 2.3 | -0.8 | 0 | 1.5 | 1.5 | 3.0 | 3.0 | 4.6 | 1.6 |
| 1761-70 | 78.0 | 4.7 | -3.63 | 3.95 | 5.02 | 1.07 | 6.4 | 1.4 | 6.0 | 4.7 |
| 1771-80 | 92.7 | 6.0 | -4.27 | 4.65 | 6.38 | 1.73 | 6.9 | 1.9 | 6.5 | 4.6 |
| 1781-90 | 112.5 | 8.8 | -1.33 | 4.95 | 12.42 | 7.47 | 11.0 | 6.6 | 7.8 | 1.2 |
| 1791-00 | 176.0 | 14.9 | -0.34 | 8.35 | 22.91 | 14.56 | 13.0 | 8.3 | 8.5 | 0.2 |
| 1801-10 | 266.5 | 21.9 | 0.00 | 19.35 | 41.25 | 21.90 | 15.5 | 8.2 | 8.2 | 0.0 |
| 1811-20 | 296.0 | 29.5 | 7.58 | 5.85 | 42.93 | 37.08 | 14.5 | 12.5 | 10.0 | -2.6 |
| 1821-30 | 315.5 | 35.8 | 6.64 | -1.10 | 41.34 | 42.44 | 13.1 | 13.5 | 11.3 | -2.1 |
| 1831-40 | 396.1 | 44.0 | 3.30 | 0.00 | 47.30 | 47.30 | 11.9 | 11.9 | 11.1 | -0.8 |
| 1841-50 | 487.8 | 55.0 | 4.44 | 0.00 | 59.44 | 59.44 | 12.2 | 12.2 | 11.3 | -0.9 |
| 1851-60 | 595.6 | 61.5 | 18.02 | -1.05 | 78.47 | 79.52 | 13.2 | 13.4 | 10.3 | -3.0 |
| 1861-70 | 827.5 | 52.0 | 31.80 | -3.55 | 80.25 | 83.80 | 9.7 | 10.1 | 6.3 | -3.8 |
| 1871-80 | 1027.0 | 80.5 | 35.58 | 0.80 | 116.88 | 116.08 | 11.4 | 11.3 | 7.8 | -3.5 |
| 1881-90 | 1247.0 | 93.0 | 56.30 | 2.10 | 151.40 | 149.30 | 12.1 | 12.0 | 7.5 | -4.5 |
| 1891-00 | 1588.0 | 144.0 | 42.95 | 4.90 | 191.85 | 186.95 | 12.1 | 11.8 | 9.1 | -2.7 |

Sources: See Appendix 1.

Table 5 elucidates the following points:

• The investment-output ratio series increases from 6.0% in the 1760s to 8.5% in the 1790s.

• National saving in the 18th century was not sufficient to finance investment. There was a particular need for flows of foreign capital in the middle years of the century.

The NIA identity tells us that both saving and foreign investment were needed to finance investment and government expenditures (i.e., purchases of government bonds). It does

*not* allow one to infer a one-to-one relationship linking specific investments to a particular form of saving (domestic or foreign). This information cannot be extracted from Table 5, which only displays foreign flows (column 10), national saving (column 8), and investment (column 9).[1] In part (II), I examined the division of foreign flows of capital between private investment and government bonds. Historical evidence on the link between domestic saving and investment allows one to infer a potential path along which foreign capital flows were channelled toward domestic investment. It is to these channels that I now turn.

## 2. Evidence on Investments and Saving in the 18th Century.

There exists an argument in the historical literature which purports to explain why investment ratios during the Industrial Revolution remained low --from 5.4 to 7.8 percent-- only reaching 11 percent in the 19th century.[2] Some authors (Pollard (1964), Postan (1972), Chapman (1967)) have

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[1] For example, in the years 1771-80, the capital inflow to nominal output ratio was 4.6% and the investment ratio was 6.5%, while national saving was only 1.9%. Two completely different stories could fit these figures: on the one hand, all capital flows could have been directed toward investment, including a portion of domestic saving (the other portion going toward financing the budget deficit); on the other hand, foreign capital could very well have been financing the budget deficit, with domestic saving being directed into investment. With the data at hand, there is no way of distinguishing between these two (or many other) explanations.

[2] It has recently emerged (Crafts (1985), Williamson (1984)) that earlier works (Rostow (1956), Feinstein (1978)) seriously overestimated the magnitude of the investment-output ratio.

argued that it need not have been high because investments in fixed capital did not need to be large. They note that the costs of construction and machinery were relatively low; that setting up a factory in the cotton industry required a few thousand pounds, in the iron industry about ten thousand and in the paper industry around sixty thousand. These authors argue that investment in fixed capital could thus be achieved by the saving of a few individuals and that firms could be self-financing. Indeed, entrepreneurs in manufacturing ploughed back most of their profits into their firms. Very few workers, of course, could afford to invest, their annual average wage being circa £23.[1] We also know that landlords invested in agriculture (i.e., enclosures), as well as in canals and iron extraction. Their share in canal financing was around 18.9%, and they accounted for 20% of total investment in the non agricultural sector. O'Brien claims that the profits from trade being reinvested in industry could explain 15% of total fixed investments. The general impression one is left with is that fixed capital was mostly financed by own saving. This line of reasoning does not end here, however.

In the 17th century and at the beginning of the 18th, when manufacturing was not mechanized (i.e., low fixed investment), saving was sufficient to finance working capital. In the 18th century, along with improvements in

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[1] See Gilboy (1934), p.204.

technology came the necessity of investing in fixed assets, and saving was no longer sufficient to finance both working and fixed capital. Working capital was still one and a half times greater than fixed capital.[1] This can be explained by stocks having to be kept for long periods of time. Companies purchased for cash and sold for credit, implying that the financing of working capital was crucial to the operation of the enterprise. Usually working capital was provided by a merchant banker and did not come from the entrepreneur's own saving.

Merchant bankers and banks played an increasingly vital role, and their numbers did not cease to grow during the whole century. The link between the merchant bankers, bankers, and the Dutch community was dealt with in part (II); indeed, Boulton, one of the inventors of the steam engine, sought Dutch financing for his project. More generally, Riley (1980) writes that "non-goverment foreign lending from the [Dutch] Republic financed commercial flows and was sometimes used in the private sector to expand production in mining, industry and plantation agriculture."[2]

### 3. Conclusion.

The foreign-saving/investment behavior displayed by England during this period is typical of countries in the

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[1] See Feinstein (1978).
[2] Riley (1980), p.219.

initial phases of their development. From an intertemporal perspective, they borrow in order to invest (without reducing their consumption). England borrowed from a more advanced country, Holland, that did not have opportunities to invest at home.

## (IV)

## Conclusion

"French, Dutch and British observers were all agreed that Dutch money was important and even indispensable to a British government during the period which lasted ... until 1780 and perhaps later."[1] In the literature [Crouzet (1967), Crafts (1984), Kindleberger (1984)], the comparison between England and France has been overplayed at the expense of the relationship between the English and the Dutch. This paper has attempted to fill this void by explaining how "Dutch" money had an impact on output and investments in England.

Of course, the question of why France did not industrialize before England is still open. It could be that the lack of liquidity in the French economy, caused by scanty reserves and credit, was a factor which obstructed its path to industrialization. Indeed, this is the way De Pinto, a Dutch Jewish Portuguese economist depicts it: "Le crédit est assurément l'une des principales causes des autres avantages que l'Angleterre a eus sur la France car il a fait valoir tous les autres, en les mettant en activité."[2]

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[1] Wilson (1966) p.78.
[2] p.172.

Therefore my argument is that England in the 18th century was in fact an under-developed country with low wages and high rates of returns relative to Holland. England imported capital that was needed for the Industrial Revolution.

## Appendix 1

The saving-investment relationship that is dealt with in Table 5 has already been the subject of many papers. Williamson (1984), while attempting to answer the question of why British growth was so slow during the Industrial Revolution, finds that debt crowded out investment. The main problems with his procedure are that he neglects flows of foreign capital and uses inappropriate government deficit series (this last point indicated by Heim and Mirowski (1987).

Crafts (1985,1987), for his part, is aware of the effects of capital inflows on saving and investment (although in Chapter VI on sectoral savings and industrial capital accumulation he writes S = I). Despite his awareness, however, he uses series that are improper from the national income identity perspective. His basic error lies in that the relation between saving and investment is not only a financial identity but also a real one, each side being the mirror image of the other. Data from the financial side is often fraught with problems and it is thus usual to obtain the desired series from the real side instead. In order to clarify the exact items which should be included in the saving-investment identity, we will show how it is derived. After deriving the identity, the sources of the various series used will be discussed.

1. The Saving-Investment Identity.

The national income identity is given by

$$(1) \quad Y \equiv C + I + G_r + TS$$

where

- $Y \equiv$ gross domestic product,
- $C \equiv$ consumption,
- $I \equiv$ investment,
- $G_r \equiv$ government expenditure excluding debt service,
- $TS \equiv$ the trade and services surplus, excluding foreign debt service.

In order to derive saving from the GDP series, we first have to obtain personal income by adding interest income, transfers from the government and from abroad and then subtracting consumption and taxes: this yields personal saving. Therefore, adding net interest income from internal and external debt, as well as transfers to both sides of equation (1) and subtracting taxes and consumption (also from both sides equation (1)) yields equation (2):

$$(2) \quad S \equiv I + (G_r + TR + rB - T) + (TS + UTR + rF)$$

where

- $S \equiv$ saving,
- $TR \equiv$ transfers from the government,

- rB ≡ internal debt service,
- T ≡ taxes,
- UTR ≡ unilateral tranfers to foreign countries (which include remittances,prizes of war and foreign aid)
- rF ≡ external debt service.[1]

The three components of the right-hand-side are investment, the government deficit and the current account surplus (as defined in Table 3, column 5). Thus we can rewrite equation (2) in the form

$$(3) \quad S \equiv I + (G - T) + (X - M)$$

where (G - T) is the government deficit and (X - M) is the current account surplus.

It is equation 3 that is used in Table 5. We also define national saving as the sum of private and government saving, that is

$$(4) \quad NS \equiv S + (T - G) \equiv I + (X - M)$$

When Williamson (1984) considers investment during the Napoleonic Wars, he equates national saving and investment: he completely omits the current account deficit, or as seen from the financial side, net foreign investment (including

[1] For more details see Dornbusch and Fischer(1987), Chapter 2.

changes in foreign reserves). We will now describe the sources of the series used in Table 5.

2. Sources of the Series.

*2.1 Output.* The nominal output series (Table 5, column 1) is GNP at current prices. Deane and Cole (1967, p.282) present data for 1801-1901. Feinstein (1972, p.T4) presents data for 1855 onwards. For the 18th century we use Crafts' (1987, p.248) series which is very similar to the one in Cole (1981, p.64).[1] For 1801 to 1860 we use Deane and Cole (1967) and from 1861 onward Feinstein. The Feinstein and Deane and Cole series are similar for the period during which they overlap, and therefore the choice of which of the two to use is not critical.[2]

*2.2 Investment.* Feinstein (1972) is the source of this series, but we have some minor reservations about his definitions. Feinstein (1978) defines total investment as investment in fixed capital plus stockbuilding plus overseas

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[1] The debate is not about the nominal but rather about the real output series, and stems from a disagreement about which price index one should divide nominal output by.

[2] Using nominal data allows one to avoid the price index issue. Given that Feinstein (1972, p.21) has found that pre-1870 series display margins of error in excess of 25%, it seems peculiar that Crafts (1985) expends so much energy in developing a new price index which he then uses to calculate a new 18th century output growth series: taking the 25% margin of error into account, Crafts' findings are well within the confidence interval around Deane and Cole's (1967) series. To reiterate: in dealing with 18th century data, one must remain keenly aware of the limitations inherent in the data. One simply does not have the means to distinguish between output growth rates of 1.32% increase on the one hand and 2.06% on the other (as Crafts (1985, p.45) attempts to do).

investment. This last item should not be included in what is called investment (I) as defined in the NIA. Overseas investment is part of the capital account in the BOP, not part of investment. In the same way, accumulation of gold and silver should not be included under stockbuilding (and also should not be included under investment because it belongs to the category of changes in foreign reserves). Therefore column 2 in Table 5 includes only investment in fixed capital and in stockbuilding. For the whole 18th century and for the 19th until 1860 the series we use is that reported in Feinstein (1978), Table 7, p.41 and Table 16, p.69. From 1860 onwards the series is drawn from Feinstein (1972) p.T85.

*2.3. Other series.* The current account surplus (Table 5, column 3) is the same as the one reported in Table 3, column 5. The budget deficit comes from Deane and Cole (1967) p391-9. The other series are derived through simple manipulations.

## Appendix 2
A Brief Historical Survey of the 18th Century.

| General History | | Economic History | |
|---|---|---|---|
| European | English | Dutch | English |
| | 1558-1603: Queen Elizabeth I | | |
| 1572: St. Barthélémy | | | |
| 1567-1648: 80 years of war between Spain and the Netherlands | | | |
| 1581: Proclamation of Dutch independence from Spain | | | |
| 1588: Spain occupies Antwerp | 1603-1625: James 1 | 1602: Foundation of Dutch East India co. | 1600: foundation of English East India co. |
| | | 1609: Foundation of the Bank of Amsterdam | |
| 1618-1648: 30 years war (Spain, Hapsburgs -vs- Protestants) | 1625-1649: Charles I Stuart | 1621: Dutch West India co. | |
| | 1629-1640: 11 years of tyranny | | |
| 1645-1659: war France -vs- Spain | 1642-1646: 1st civil war | | |
| 1648: treaty of Munster, Peace of Westphalia. Recognition of Dutch independence | 1649: Charles I beheaded | | 1651: Navigation Act against Dutch trade, excise taxes. |
| 1652-54: 1st Anglo-Dutch war | 1653-58: Protectorate under Cromwell | | |
| 1660-1715: Reign of Louis XIV. | 1660-85: Restauration of Charles II Stuart, Catholic, pro-French. | 1660-80: Recession | 1660: New act of Navigation. |
| 1665-1667: 2nd Anglo-Dutch war. | | | |
| 1665-68: Franco-Dutch war | | | |

| General History | | Economic History | |
|---|---|---|---|
| European | English | Dutch | English |
| 1668: Triple Alliance: Holland, England, Sweden. | | | |
| 1670: Treaty of Dover (Charles II and Louis XIV) | | 1670: France imposes tariffs against Holland. | |
| 1670-72: Franco-Dutch war | | | |
| 1672-78: 3rd war: France and England against Holland and Germany. | | | |
| 1678: Treaty of Nijmegen | | | |
| | 1685-88: James II, the Catholic. | | |
| 1688-97: France against Holland &England | | | |
| | 1688-89: The Glorious Revolution. James II dethroned. William brought from the Netherlands. | | 1694: Creation of the Bank of England. |
| | 1689: Bill of rights. | | |
| 1701-13: War of Spanish Succession. France against Holland, England and Germany. | 1702-14: Queen Anne. | | |
| | 1707: Union of England and Scotland. | | |
| 1713: peace of Utrecht. | 1714- : Georges I. | | |
| | | | 1720: South Sea crisis. |
| 1715: Death of Louis 14. | 1721-42: Sir W. Walpole. | | |
| 1733-48: War: France and Spain against Austria. | | | |
| 1740-48: War: Holland and England against France and Prussia. | | 1751: Proposities | |
| 1756-63: 7 Years War. England against Hapsburg | | 1763: Crisis | |
| | | 1773: Crisis. | |
| 1773: Tea party. | | | |
| 1776: Independence of Us | | | |
| 1780-84: 4th war Anglo-Dutch | | | |
| 1795-1815: Holland becomes the Batavic Republic. | | | |

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# Chapter II

## Non Transitory Effects of Money in a Developing Country: The Case of the Industrial Revolution.

## Introduction

The last decade has seen a resurgence of models explaining the effects of money on output.[1] The common thread of the "New-Keynesian" school is the desire to lay solid micro-foundations.[2] The models used in this literature avoid *ad hoc* assumptions and, insert imperfections that allow money to have effects on output. They focus on the effects of imperfect competition and information, and price rigidities (introduced, for example, through menu costs). They confine themselves mainly to the closed economy and to the implications of liquidity constraints on the demand side. In such contexts, the effects of money have not been found to be permanent.

In contrast, the development literature has stressed the role of money as a constraint on the supply side: this constraint has been shown to be a crucial parameter of the development process. In contrast to the Neoclassical view (as in Levhari-Patinkin), the McKinnon-Shaw supply-constrained models make money a complement to investment. This development literature has been divorced from the mainstream for being too ad-hoc.

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[1] See Blanchard (1987), for a thourough survey of this subject.
[2] See Rotemberg (1987).

This paper presents a model where money can have permanent effect on output, and where, as in McKinnon-Shaw, the effects come from the liquidity constraint being placed on the supply side of the economy. This model differs from McKinnon-Shaw in that it adheres to the Neoclassical framework of the recent literature and starts from micro equations: the unemployment that can be reduced by an increase in money stems from a distortion existing in the economy. In this too the model follows the lead of the development literature and is thus well-adapted to developing country contexts. It includes a distortion in the labor market which yields a "productivity gap" (i.e., a difference in the marginal product of labor in the traditional and in the modern sector).

The framework of this model is therefore suited to developing countries, and in particular, to our focus on the first country in Europe to develop: 18th century Britain during the Industrial Revolution. The framework of the model we present here comprises three elements:

i) the model incorporates a liquidity constraint embeded in the supply side of the economy in the McKinnon-Shaw tradition, but also in the spirit of a theme familiar to 18th century economists: the "scarcity of money."[1]

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[1] We tend to forget that there existed economic theories well before the Classics such as Hume and Ricardo. The ideas of these "pre-Classic" economists reflected the problems of the moment. Thus, even though many of these theories have been revealed to be wrong in light of current economic knowledge, they do preserve an indelible imprint of the facts they were designed to interpret.

Eighteenth century economists were very much aware of the consequences of the liquidity constraint (or as they called it, the "scarcity of money") on the development of new sectors in the economy. In 1805, Ferrier, a neo-mercantilist, wrote that

> When the need for money increases, money has to increase because if it increases only in its real value, industry will feel compressed. We can view the wealth of a nation as being similar to a young tree full of sap on which a tight ligature is applied, and which suffocates if you do not remove the discomfort caused by the shortage of money. The nation will grow ill and will wither. Sufficient repetition of the false idea that the real value of money will go up leads to its acceptance as received theory. Nothing is further from the truth than wide divergence from established habits. [sic]

Adam Smith did not disagree. He emphasized that scarcity of money did not only mean a lack of specie but also a lack of credit.

> No complaint, however is more common than that of scarcity of money. . . . Over trading is the common cause of it. . . . When the profits of trade happen to be greater than ordinary, over-trading becomes a general error. . . . The demand comes before the returns, and they have nothing at hand, with wich [sic] they can either purchase money, or give solid security for borrowing. It is not any scarcity of gold and silver, but the difficulty which such people find in borrowing, and which their creditor find in getting payment, that occasions the general complaint of the scarcity of money.[1]

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[1] p.406.

Smith even pointed out that industry was growing in regions where people did not have any money constraint:

> That the trade and industry of Scotland, however, have increased very considerably during this period, and that the banks have contributed a good deal to this increase, cannot be doubted. . . They contributed by inventing cash accounts and issuing credit.[1]

This line of reasoning appears also in development theory. McKinnon writes that "a contraction in money supply. . . forces firms dependent on bank finance to reduce working capital: inventories of goods in process, trade credit, and advances to workers prior to the actual sales."[2] Following this line of reasoning, our model incorporates the "scarcity of money" phenomenon and captures the effect of money on output.

ii) The supply side comprises two sectors, each with two factors of production; moreover there exists a distortion between marginal products in the traditional and modern sectors: "the productivity gap." This is a feature not only of developing countries nowadays, but also of England in the 18th century. It is well-known that an increase in productivity was one of the principal causes behind the spurt in output which heralded the Industrial Revolution.[3]

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[1] p.281.
[2] McKInnon (1973), p.87.
[3] See Crafts (1985).

Moreover, it has been established that this increase in productivity was in part based on a shift of factors of production from low productivity sectors (such as agriculture) to high productivity sectors (such as industry).[1]

iii) The model depicts an open economy. This assumption is as important for England in the 18th century as it is for developing countries today, although most of the models which consider the influence of money on output confine themselves to a closed economy framework. In an open economy setting, the Classical specie-flow mechanism posits that monetary flows have no real effects because they always return to the country of origin by way of the trade deficit.[2] This is purely a demand-side mechanism which operates through the effect on net imports. However, if money influences the supply-side by affecting entrepreneurs' costs of production, the specie-flow mechanism does not necessarily bring the economy back to its initial state. In such a model, the effects of money can be permanent.

The attraction of such a model is that its framework captures essential elements of a developing economy. The interrelations among the different elements of the model is summarized in what follows.

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[1] Williamson (1987) shows that the deadweight loss due to inequality in marginal product is 12% as a share of national income.
[2] See Hume and Dornbusch-Fischer-Samuelson (1977).

The economy has two sectors: agriculture and industry. There is disguised unemployment in the agricultural sector in that the marginal product of labour is higher in the industrial sector than in the agricultural sector. Shifting factors of production from agriculture to industry therefore effectively decreases unemployment and increases output.

On the other hand, the industrial sector suffers from a scarcity of money. This liquidity constraint increases the marginal cost of production. An increase in money therefore reduces marginal cost and leads industrial firms to employ more workers, to build up larger stocks and to shift factors of production from agriculture to industry. Output therefore expands. This result is obtained because prices do not change: they are fixed internationally. We are therefore in a partial equilibrium setting. We show in general equilibrium that prices do not necessarily have to change. Therefore, the increase in money is translated into a permanent increase in real money, which in turn leads to an increase in output. We close our argument by showing that the trade deficit is not necessarily worsened by the increase in money, and that money does not flow back out.[1] The effect of money can therefore be permanent.

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[1] This model assumes imperfect capital mobility. Thus monetary flows stem from changes to the current account. This assumption, which fits our developing country context very well, allows one to compare the effects of money in this model with its effects in the Hume and Dornbusch-Fischer-Samuelson models where capital mobility is not allowed.

The paper is organized in the following manner: part I sketches the effects of money on output during the 18th century and shows that a number of business cycles were correlated with shocks in financial markets during this period. The importance of liquidity on the long run growth of output is the subject of section II. Section III concludes.

Examples of the impact of money on output in developing countries are numerous (McKinnon (1973) points to countries ranging from Japan to Germany including Chile, Argentina, and Brazil). The relationship between money and output during the Industrial Revolution, on the other hand, has not been the subject of detailed scrutiny; and as we mentioned above, we want to emphasize the relevance of this model to the particular case of 18th century Britain. We begin therefore by rapidly sketching the effects of money on output during the Industrial Revolution.

# (I)

## Money and Output Fluctuations in 18th Century England

The Industrial Revolution in England was not characterized by a steady increase in output. The 18th century economy experienced business cycles, though they were probably shorter than those of the 19th century. Ashton's (1959) analysis of the different cycles is presented in Table 1.

Table 1.
Business Cycles in the 18th Century.

| Depression | Turning-point | Peak |
|---|---|---|
| 1702 | 1702 | 1704 |
| 1705 | 1706 | 1708 |
| 1711-12 | 1712 | 1714 |
| 1715-16 | 1716 | 1717-8 |
| 1718-21 | 1722 | 1724-5 |
| 1726-7 | 1727 | 1728 |
| 1729 | 1730 | 1733 |
| 1734 | 1734 | 1738 |
| 1739-41 | 1742 | 1743 |
| 1744-5 | 1746 | 1726 |
| 1747 | 1748 | 1751 |
| 1752-5 | 1755 | 1761 |
| 1762 | 1763 | 1764 |
| 1765-9 | 1769 | 1771-2 |
| 1773-4 | 1775 | 1777 |
| 1778-81 | 1781 | 1783 |
| 1784 | 1784 | 1787 |
| 1788-9 | 1789 | 1792 |
| 1793 | 1794 | 1796 |
| 1797 | 1798 | 1799 |

Source: Ashton (1959).

The main factors influencing business cycles during this period were fiscal, monetary, and agricultural shocks. Given the importance of the agricultural sector, it is easy to accept the influence of harvests on business cycles. Concerning fiscal shocks, Barro (1986) has shown that bursts of military expenditure associated with a succession of wars intermitently drove up interest rates and slowed the pace of output growth. We will show that monetary and financial crises also had a non-negligible impact on the British economy in the 18$^{th}$ century. There is no research on the effects of money during the 18th century, the reason being the lack of data on money and output.[1] By a brief narrative, however, we can still give a flavor of the correlation that seems to have existed between money and output.

A string of episodes in which money seems to have affected the real sector dot the 18$^{th}$ century record:

• the bad harvest of 1710 put a strain on Bank of England reserves and in the autumn of that year, the financial crisis developed into a generalized panic;

[1] Unfortunately, there exist no data on M1 in the 18th century. Barro (1986) uses the quantity of banknotes issued by the Bank of England as a proxy for money. Unfortunately, this is an inadequate proxy because it fails to take account of the change bullion stocks and bills of exchange issued by other private banks. There is no yearly data on output which was estimated on a decade by decade basis.

• in much the same way, the financial crisis and the run on the Bank of England of 1715 can be held responsible for the general depression which followed;

• in 1720, when the South Sea Bubble burst, the ensuing reduction in liquidity brought about a sharp contraction in industry and trade;

• in 1727, "cheap" money was associated with the opening of new mines, and a recovery in the building sector;

• the 1751 cyclical peak coincides with a monetary expansion, probably caused by Pelham's conversion of the public debt. Important infrastructure development and employment growth followed in its wake;

• in 1761, large government expenditures overseas and restrictions on domestic credit rendered money scarce. The ensuing decline in production began in the woolen industry and spread later on to the rest of the economy;

• the crisis of 1763 had its origins in a financial crisis in Holland which drained English reserves;

• the upswing of 1771 is linked to the creation of private banks and the expansion in the issuance of notes and bills;

• the collapse of 1776 corresponded to a shortage of currency. Manufacturers lacked the currency to pay wages, and employment was reduced;

• between 1789 and 1791, the expansion in money brought about by the inflow of refugees from France led to boom which was brought to a halt by a shortage of hard money;

• in 1796, money was scarce: a crisis followed soon after in 1797. In 1797, convertibility of bank notes to specie was suspended.

This description strongly suggests that a correlation exists between monetary disturbances and business cycles, and that this correlation should be the topic of further research.[1] We now turn to the permanent effects of the accumulation of money on the development of British industry.

[1] Much has been written on the effects of "crowding out" which caused a slowdown in output growth during the Napoleonic Wars. It is equally plausible that the slowdown is attributable to a financial crisis and a lack of specie.

# (II)

# Money and Permanent Effects

## 1. Partial Equilibrium

### 1.1. The set up of the model.

First, we introduce the agricultural sector with its labor market distortion, then we consider the industrial sector which faces a liquidity constraint.

1.1.1. *The agricultural sector.* Most of the increase in output experienced by developing country economies during their transition from traditional to industrializing status can be attributed to a rise in productivity. This enhancement in productivity comes about through factors of production being shifted from sectors with low to those with high marginal productivity. This is the Kuznets view of development, which was proven to be accurate for numerous countries. David (1967) shows that part of US growth in the 19th century is explained by the reduction in this "productivity gap;" Feinstein (1978) has shown that the increase in English output during the Industrial Revolution was due mainly to an increase in total factor productivity; Crafts (1985) and Williamson (1987) have shown that the

increase in factor productivity could have come from shifting resources.[1]

What arguments can one appeal to in order to explain the gap in labour productivity between the traditional and the modern sector? There are numerous models built around this gap which yield disguised unemployment, such as Harris-Todaro (1970) or Hagen (1958). However the effect posited by Lewis (1954), and also present in Cohen and Weitzman (1975) and Denison (1967) is more in line with England in the 18th century: these models posit that agents in the agricultural sector in the 18th century did not think in marginal product terms. They assume that the decision to release workers to the industrial sector hinged on a comparison of their average product while on the farm to the wage that could be earned working in industry. This behavior leads to disguised unemployment, when a yeoman's remuneration includes both the return to his labour and the rent on his land. This characterization is accurate for the 18th century because the overwhelming majority of 18th century farmers were yeomen who owned their own land.[2]

In order to formalize the model, we write the production function in the agricultural sector as

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[1]Crafts, however, emphasizes the labour side, while Williamson believes that the reallocation of capital is more important.

[2] In fact there are differences of opinion as to whether their land belonged small yeomen or was already occupied by tenant farmers. For the 18th, though, it seems that: "no really serious breach had yet been made in the ranks of the yeomanry, if indeed their strength had not positively risen." (Rae, *Contemporary Review* (October 1883), p.551.

$$(1) \quad Y_a = K_a^{\sigma} L_a^{\alpha} T_a^{1-\sigma-\alpha} \qquad 1-\sigma-\alpha > 0,$$

where $Y_a$, $K_a$, $L_a$, $T_a$ are output, capital, labour and land in agriculture. The production function displays constant returns to scale for convenience.

For the reasons explained above, we assume that the farmer's remuneration is equal to the average product of labour and that it includes not only the return to labour but also the rent on land. We also assume that the cost of capital is the same in both sectors and that the farmer incurs the cost of capital.[1] Therefore we have:

$$(2) \quad w_a = (P_a Y_a - rK_a)/L_a$$

$$(3) \quad rK_a = P_a f_k^a K_a = \sigma P_a Y_a$$

where $w_a$ is the wage (or remuneration) in agriculture, r is the rental cost of capital and where $P_a$ denotes the price of the agricultural good. It follows that:

$$(4) \quad w_a = (1-\sigma) P_a Y_a / L_a.$$

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[1] Probably rents were not equalized across sectors. Williamson shows that even the distortion in the capital market is important. Nevertheless, this will only add another distortion to our model, and for convenience we restrict ourselves to the one in the labour market.

Equalizing the wage in industry ($w_m$) to earnings in agriculture ($w_a$) implies that the marginal product ($\omega_a$) of labour in the agricultural sector is lower than the marginal product of labour in the industrial sector ($w_m$):

$$(5) \qquad \omega_a = f_1{}^a P_a = \delta w_a = \delta w_m \qquad \text{where } \delta = \alpha/(1-\sigma) < 1.$$

This distortion is tantamount to a form of disguised unemployment. When labour is released toward industry (which happens, as we will show, when the money supply is increased), unemployment is reduced and productivity as well as output increase.

We arrived at equation (5) by positing a decisionmaking process by which agricultural yeomen determine whether or not to migrate to the industrial sector. There is some disagreement as to the validity of this theoretical construct *à la Lewis*, a construct which yielded equation [5], especially in the context of 18th century England.[1] On other hand, there exists a broad consensus as to the plausibility of equation [5] as a specification for the labour market:[2] this equation represents a distortion in the labor market.[3]

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[1] Davies (1954) claims that tenant farmers were already widespread at the end of the 18th century.

[2] See, e.g., Bhagwati (1981).

[3] This model is therefore in the line with the "balanced growth" view of the Industrial Revolution.

1.1.2. *The industrial sector.* The industrial sector is assumed to be competitive, with a production function of the form:

$$(6) \quad Y_m = K_m^{\beta} L_m^{1-\beta}$$

where $Y_m$, $K_m$, $L_m$ are output, capital, and labour in the industrial sector.

As opposed to the agricultural sector which has no need of liquidity to pay for wages, operations in the industrial sector involve paying cash for factors of production, actions which require money to facilitate transactions.[1] Money was needed to pay for stocks of raw materials, as well as for wages which had to be paid for in cash whereas collection of payment for goods and services took time:[2] Adam Smith (1776) wrote that "the returns of the foreign trade of consumption seldom come in before the end of the year, and sometimes not till after two or three years."[3] The "scarcity of money" has been emphasized not only by 18th century economists, but also

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[1] This assumption is by no means equivalent to the agricultural sector being a subsistence sector. Money has two "liquidity roles." The first, modelled as a Clower constraint on the demand side, implies that money is used as a medium of exchange between sectors, and in this sense the agricultural sector uses money to buy and sell goods. Under its second role, money is used to pay for factors of production. This is the role played by money in our model. We assume as said before that in the agricultural sector, yeomen were working with their families (Hartwell, p.128) and did not pay their workers with money but with food and lodging. In the industrial sector, money was required.

[2] Money in this context is the usual definition of M1: it includes specie and credit.

[3] Smith (1776), p.349.

by adherents to the supply-constrained model of development: McKinnon writes that "for lack of financing for key inputs -- replacement parts, various semi-finished materials, labor services-- entire factories may be shut down".[1]

This discussion suggests that the industrial sector --in developing countries as well as in England during the Industrial Revolution-- can be characterized as having a cash in advance constraint.

We can formalize this scarcity of money by writing that the industrial sector was producing under a constraint; that is, it solves:

$$(7) \qquad \begin{aligned} \text{Max} \quad & P_m Y_m - w_m L_m - r K_m \\ \text{s.t} \quad & w_m L_m + r K_m \leq H \\ & Y_m = K_m^{\beta} L_m^{1-\beta} \end{aligned}$$

where H is the money supply.

The FOC are:

$$(8) \qquad \begin{aligned} P_m f_1^m &= w_m [1+\mu] \\ P_m f_k^m &= r[1+\mu] \end{aligned}$$

where $\mu$ is the Lagrange multiplier, the shadow value of the constraint.[2] Substituting into (6), we obtain:

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[1] McKinnon (1973) p.87.

[2] As seen from equation (8), this constraint is a cost added to the usual cost of production. In particular it distorts the interest rates between countries. When we speak about the general equilibrium, we will explain how this happens.

(9) $Y_m = AHr^{-\beta} w_m^{\beta-1}$ where $A = (1-\beta)^{\beta}\beta^{1-\beta}$

Output is homogeneous of degree zero; we can therefore write

(10) $Y_m = g(w_m/P_m,\ r/P_m,\ H/P_m)$

and because of the money constraint we have the distortion in (8) where

$$P_m\ f_1^m > w_m$$

$$P_m\ f_k^m > r$$

1.2 Equilibrium in the economy.

Equilibrium in this economy is determined by the contract curve and prices. Prices are set from abroad and we will see in the general equilibrium model how they are determined. The set of equations determining the contract curve is given by the conditions on marginal products:

(11) $w_m = P_m\ f_1^m[1+\mu\ ]^{-1}$

$w_a = \delta w_m$

(12) $r = P_m\ f_k^m[1+\mu\ ]^{-1}$

$r = f_k^a P_a$

(13) $L_m + L_a = L = 1$

$K_m + K_a = K = 1$

Without loss of generality, we normalize the amount of labour and capital in the economy to be equal to 1. Due to the distortion in the labor market, we will not be on the contract curve. This can be seen by substituting (13) into (11) and (12), whence we obtain:

$$(14) \qquad K_a = \delta\sigma(1-\beta)L_a / [\delta\sigma(1-\beta)L_a + \beta\alpha(1-L_a)]$$

while in the Pareto Optimum, we find that the contract curve has the equation:

$$(15) \qquad K_a = \sigma(1-\beta)L_a / [\sigma(1-\beta)L_a + \alpha\beta(1-L_a)$$

This implies that we are off the contract curve. Figure 1 depicts the contract curve (with no distortion), as well as the ABM curve faced by the economy. We assume that industry is capital intensive. At point B, we have $f_l^a / f_k^a > f_l^m / f_k^a$.

**Figure 1.**

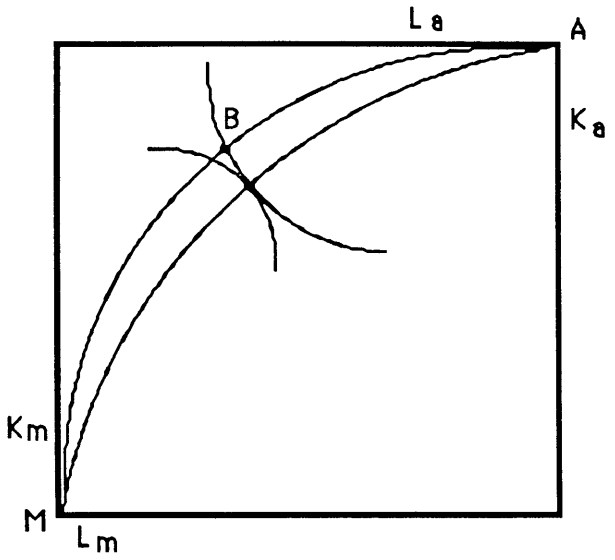
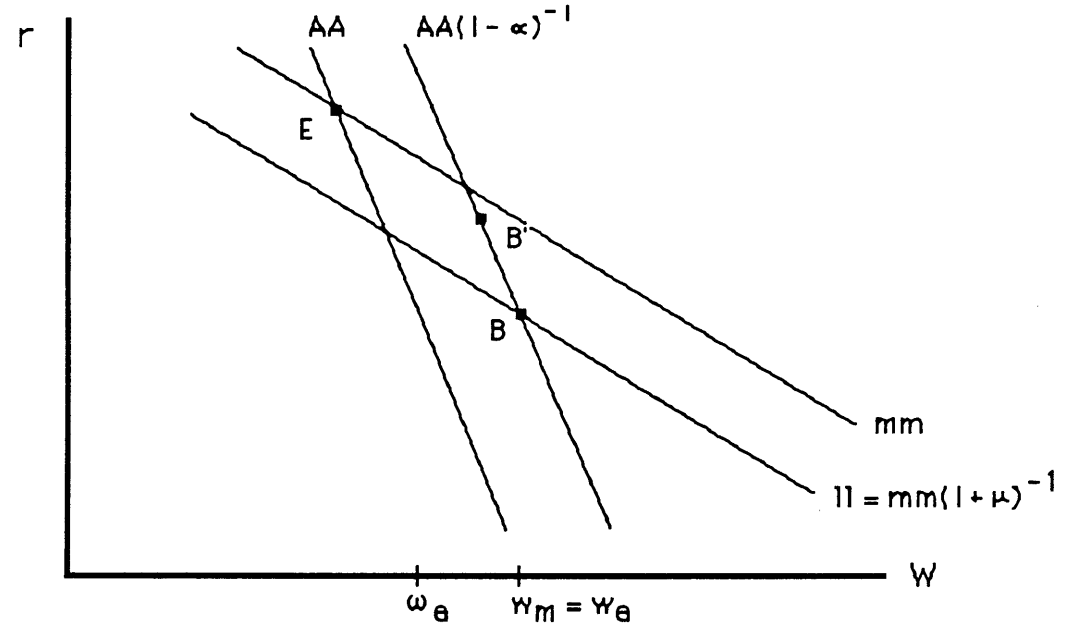



**Figure 2.**



In order to analyze the effect of an increase in money, we make use of a Woodland diagram (see Figure 2). We depict agriculture as being the labour-intensive sector.

The mm and AA lines are the isocost curves for the industrial sector and the manufacturing sector respectively. They indicate the combinations of the wage rate and the rental rate of capital which are consistent with minimization of costs. The point of intersection, E, determines the wage rate and the rental rate.

The existence of a cash in advance constraint, and the distortion in the labour market are given by equations (16) and (17):

$$(16) \quad P_a f_k^a = r_a = P_m f_k^m [1+\mu]^{-1}$$

$$(17) \quad P_a f_l^a = w_a = (1-\alpha) P_m f_l^m [1+\mu]^{-1}$$

The cash in advance constraint results in the mm curve shifting left by $[1+\mu]^{-1}$. The wage differential leads to the AA curve shifting to the left by $(1-\alpha)^{-1}$. Therefore the economy is not at the Pareto optimum point E, where the marginal costs are equal.

1.3. The effect of an increase in money.

We now show that an increase in money will reduce production costs and therefore lead to an expansion in industrial output, a contraction in agricultural output, and a reduction in disguised unemployment. We start at equilibrium point B in Figure 2. We increase the money supply. Prices of goods are set internationally, and for a given country will not change (we will discuss this assumption in the next paragraph). From equation (6), we have that

$$\partial L/\partial H = \mu \text{ and } L_{hh} < 0$$

(where L is the Lagrangian function). Therefore, the shadow price of the constraint, $\mu$, decreases. This is depicted in the graph by a shift of the ll curve to the right. The new equilibrium is at point B'. Labour and capital move from agriculture to industry. The increase in money therefore leads to a restructuring of the economy away from the agricultural sector and towards the industrial sector. Because of the distortion in the economy, this shift increases output.[1] To summarize the effect of an increase in money: the liquidity constraint entails higher production

[1] Because of the capital intensity of industry and the mobility of factor of production, the labor capital ratio increases, wages decrease and the rental cost of capital increases.

costs in the industrial sector; increasing money decreases factor costs in the industrial sector, thus drawing factors into industrial production. This shift, from a sector with relatively low marginal productivity to one where marginal productivity is relatively high, increases total output.

This result is perfectly consistent with existing evidence which indicates that the increase in output during the first Industrial Revolution was due more to changes in "factor productivity" than to an increase in capital (see Williamson (1987) and Crafts (1985)). This increase in factor productivity can be explained by an increase in money which led to a reallocation of the factors of production from agriculture to industry. Is this increase a long term phenomenon?

In macro-economic models in which money has an effect on output, prices adjust in the long run and real effects vanish. These are closed-economy models. In an open economy, the adjustment mechanism is the specie flow: an increase in money leads to greater demand for goods and therefore to an increase in net imports. Foreign reserves flow out which cuts back the money supply. In our model, where money influences the supply side, neither of these two mechanisms necessarily take effect: prices do not invariably increase after a shift of money from one country to the other. What is more, we will show that the specie flow does

not necessarily take place. In order to do so, we must consider the general equilibrium.

## 2. General Equilibrium: a Two-Country Model.

There are two countries which both have a supply side as described above. $Y_m$ and $Y_a$ are the domestic supply of industrial and agricultural goods, respectively, while $Y^*_m$ and $Y^*_a$ are the foreign supply. We assume that domestic and foreign production functions are identical, and that both goods are tradable. Aggregate supply, defined as PY in the domestic economy is:

$$(18) \quad PY = P_m Y_m + P_a Y_a$$

while aggregate demand in the domestic economy, E, is:

$$(19) \quad E = P_m D_m + P_a D_a$$

where $D_m$ and $D_a$ are domestic demand for industrial and agricultural output. We define the foreign demand functions $D^*_m$ and $D^*_a$ and we assume that the domestic and foreign demand functions are identical.

The distribution of money in the world is given. The equilibrium is determined by seven equations (and we have seven unknowns: $Y_a$, $Y_m$, $Y^*_a$, $Y^*_m$, $P_a$, $P_m$, $\Delta H$ ). Four of these equations are the supply equations for $Y_m$ $Y_a$ $Y^*_m$ $Y^*_a$. The

supply functions were derived in section 1. They depend on the cost of production and on money. The three other equations are the goods market equilibrium conditions given by:

$$(20) \quad P_m(Y_m + Y^*_m) = P_m (D_m + D^*_m)$$

$$(21) \quad P_a(Y_a + Y^*_a) = P_a (D_a + D^*_a)$$

and

$$(22) \quad \Delta H = (P_m Y_m + P_a Y_a) - (P_m D_m + P_a D_a) = PY - E$$

The first and second equations represent the goods market equilibrium. Given the simple Gold Standard in effect, prices are the same in both countries. The third equation is the trade balance equation. The discrepancy between income and spending is associated with monetary flows.

Equation (22) ignores the capital account. In the case of perfect capital mobility, a difference in effective interest rates between countries would lead to flows of capital and to an increase in money in the country with the "most binding" constraint.[1] In our model this does not happen

[1] The "effective interest" rate in a country is of course equal to the interest rate multiplied by one plus the Lagrange multiplier $\mu$, $\mu$ being interpreted as the shadow value of the constraint. The country with the "most binding" constraint is the country in which $\mu$ is the highest.

because we assume a degree of imperfect capital mobility. Such an assumption is quite plausible for developing countries as well as for the 18th century: "Capital markets remained imperfect and capital supply did not move freely".[1] We can therefore ignore the capital account and confine our attention to the effect of the redistribution of money on the current account.

2.1. The effect of an increase in money.

We start at an equilibrium. There is no trade deficit, $\Delta H=0$. We increase money in one country and decrease it in the other, such that $dH = -dH^*$. We have assumed that the two countries are identical, with the same supply and demand functions. Therefore money will influence the countries in the same way, i.e.,

$$(23)\quad dY_a = -dY_a^* \quad \text{and} \quad dY_m = -dY_m^*$$

and

$$(24)\quad dD_a = -dD_a^* \quad \text{and} \quad dD_m = -dD_m^*$$

World supply and world demand for both goods do not change. Therefore the prices $P_a$ and $P_m$ do not move. A redistribution

[1] Crouzet (1972), p.53. In chapter I we show that indeed there existed interest rate differentials among countries. Of course, it remains that there was capital mobility, though that mobility was not perfect.

of money does not necessarily imply a change in prices. This fact was underlined in Dornbusch-Fischer-Samuelson (1977). In the particular case where there is no change in aggregate supply and demand, the redistribution of money does not affect prices. In our model this implies that the increase in money in the domestic country is an increase in real money. The effects on output we have described in the first section of the model will therefore obtain.

The question remains as to whether the increase in money will reverse itself through the trade deficit. In the conventional model, where money influences only the demand side, an increase in money leads to an increase in spending and therefore to a trade deficit. This trade imbalance causes money to flow back until the initial equilibrium is reached. In our model, this mechanism may not work. Earlier, we showed that the supply is an increasing function of money. Of course, so is domestic demand, E. Therefore equation (22) can be rewritten in the form:

$$(25) \qquad \Delta H = PY - E = S(H) - D(H)$$

where the supply S() and the demand D() are increasing functions of money. The direction of the influence of money on $\Delta H$ therefore depends on whether $\partial S/\partial H$ is greater or smaller than $\partial D/\partial H$. The sign of $\Delta H$ depends upon the specific functional form we adopt. The price-specie flow mechanism is

thus not necessarily operative when money influences the supply side. If the effect of money on the supply side is more powerful than its effect on the demand side, an initial increase in money has no reason to die out through a trade deficit; on the contrary the effect on output will be permanent.

## (III)

## Conclusion

The recent literature on the effect of money on output has restricted its attention to closed economy models. On the other hand open economy models usually include Hume's specie flow mechanism. This paper shows that allowing the "scarcity of money" effect to work on the supply side instead of confining oneself to a "liquidity constraint" on the demand side makes a difference in an open economy setting: the specie flow mechanism does not operate.

The implications of the model seem to correspond to what happened in the 18th century. England experienced an increase in specie and credit, at a time when other countries faced a shortage. This easy money led the English to switch from agriculture to industry, and to increase their productivity and thus their output. As was noted in Chapter I, the money and credit markets in England were more developed than those in France. This rendered the "scarcity of money" less binding in England and therefore eased the restructuring of the British economy.

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# Chapter III

## Power and Protectionism: A Strategic Reconsideration of Mercantilist Theory

## Introduction

To many economists, "brought up to believe that [mercantilism] was little better than nonsense,"[1] the persistence of mercantilist doctrines on the public policy agenda of many nations is difficult to fathom. If one believes Keynes' assertion that "madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back,"[2] the resilience of Mercantilism is puzzling indeed, given the caliber of the academic opposition --from Adam Smith through Taussig and beyond-- mustered against it. Why, when the purely economic case for mercantilism is dead and buried, does the doctrine insist on reappearing? And why are these periodic appearances linked to the state of the international political system --Protectionism being associated with the absence of an hegemonic power in the international system, free trade with the presence of such a power?

The purpose of this paper is to develop a model that will answer these two questions. We will show that the outcome of a Mercantilist view of the world is either protectionism or free trade, depending on the state of the international political system (i.e., the existence of an

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[1] Keynes (1936), p.335.
[2] Keynes (1936), p.383.

hegemonic power). Before proceding, however, one must clarify the content of the mercantilist doctrine itself.

Mercantilist doctrine has its clearest expression in the advocacy of trade restrictions, the purpose being to increase net exports and obtain a balance of payments surplus. Many scholars have pondered the value of such a surplus. As numerous mercantilist authors have stressed, the accumulation of bullion was the main operational goal of trade restrictions. Keynes had advocated an increase in gold as a way to increase employment (through a reduction in interest rates and an increase in investment), but for mercantilists "employment was seen as a means for increasing bullion supplies rather than vice-versa."[1] The Mercantilists' insistence on the intrinsic merit of accumulating bullion has led some authors (wrongly) to think that mercantilists saw precious metal as wealth and that they were therefore interested in its accumulation. Such an interpretation understandably leaves most economists uneasy about the intellectual content of Mercantilism. The goal of accumulating bullion becomes less disturbing however, once one sets aside the pure theory of international trade and enters the area which can be broadly refered to as national security.[2] Adam Smith himself did not deny that political

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[1] Wilson (1949 ), p.152.

[2] Wolf (1982) writes that: "Regretably, governments do not generally behave with respect to trade as liberal economists would wish. *In each country, there is a political imperative toward mercantilism.*"

reasons, and not a misunderstanding of economics, lay at the roots of mercantilism:

> The real wealth or poverty of the country, they [the Mercantilists] allow, would depend altogether upon the abundance or scarcity of those consumable goods. But it is otherwise, they think, with countries which have connections with foreign nations, and which are obliged to carry on foreign wars, and to maintain fleets and armies in distant countries. This, they say, cannot be done, but by sending abroad money to pay them with; and a nation cannot send much money abroad, unless it has a good deal at home, Every such nation, therefore, must endeavour in time of peace to accumulate gold and silver, that when occasion requires, it may have wherewithal to carry on foreign wars.[1]

Wallerstein (1980) writes that in the 18th century, "control of an adequate bullion stock was. . . a crucial variable in the struggle between core powers."[2] This is the essence of mercantilism: a commercial policy which serves the political goal of national sovereignty. It is not surprising therefore that interpretations of Mercantilism have often mistakenly reduced it to that political goal, and have depicted it primarily as a system of state-building.[3]

There remains the question of how protectionist policy and the ensuing accumulation of bullion can affect the

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[1] Smith (1937), p.399.
[2] Wallerstein (1980), p.277.
[3] See Schmoller(1895) p.69.

ability of the nation to wage war. The answer was provided by Colbert: "trade is the source of public finance and public finance is the vital nerve of war." With more bullion available in the economy, the state could increase its receipts through increased taxation. In a similar vein, James Whinston (1693) argued that

> war is become rather an expense of money than men, and success attends those that can most and longest spend money: whence it is that princes' armies in Europe are become more proportionable to their purses than to the number of their people; so that *it uncontrollably follows that a foreign trade managed to the best advantage will make our nation so strong and rich, that we may command trade of the world, the riches of it, and consequently the world itself.*"[1]

The practice of war during the 17th century was also a factor which increased the importance of a stock of bullion: Kinder and Hilgemann (1964) note that "the duration of campaigns depended on finances. Mercenaries were freed of their obligations if their pay was in arrears. They allowed themselves to be hired by others."[2]

Though Adam Smith seems to have understood the political motivation for mercantilism, he was far more worried about the welfare costs of giving up free trade. Smith proclaimed

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[1] James Whinston (1693).
[2] Kinder and Hilgemann (1964), p.253.

that "consumption is the sole end and purpose of all production" and that to increase welfare every nation should therefore engage in free trade. Smith was not aware that (despite the desire to achieve maximum consumption) it can be optimal, for strategic reasons, to pursue a protectionist policy and to hoard reserves. Mercantilist doctrine does not deny the importance of economic wealth but it is acutely aware of the importance of national sovereignty; and given the anarchy of the international political system, power (by one definition, "the ability to prevail in conflict") is of the utmost importance in preserving that sovereignty.[1]

Some have condemned Mercantilism as being predicated on the misguided belief that there exists a fundamental tradeoff between power and plenty.[2] We prefer to subscribe to Viner's (1948) view that "there is long-run harmony between these

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[1] Viotti-Kauppi (1987), p.44. Some theories of politics see power as an aim in itself rather than the means of attaining an aim. Smith, and all contemporary economists' models start from the premise that "consumption is the sole end and purpose of all production." This is the stance we adopt in this paper. However a number of writers on Mercantilism have taken the alternative view: "The mercantile system is concerned with man solely as a being who pursues power, and who is capable of judging of the comparative efficacy of means to that end. It makes entire abstraction of every other human passion of motive, except those which may be regarded as perpetually antagonizing principles of the pursuit of national power-viz., neglect of shipping and aversion to a fish diet" (Cunningham (1895), p.53); "The essence of the system lies not in some doctrine of money, or of the balance of trade: not in tariff barriers, protective duties, or navigation laws; but in something far greater: namely in the total transformation of society and its organization, as well as of the state and its institutions, in the replacing of a local and territorial economic policy by that of the national state" (Schmoller (1903), p.95); "English mercantilism is a system of power, that is, that "power" was for mercantilists the sole or overwhelmingly preponderant end of foreign policy, and that wealth or "plenty", was valued solely or mainly as a necessary means to attaining or retaining or exercising power." (Viner (1930), p.61).

[2] For example, Hecksher (1965).

ends [wealth and power], although in particular circumstances it may be necessary for a time to make economic sacrifices in the interest of military security and therefore also of long-run prosperity."[1] The model we develop revolves around this relationship between power and plenty. Under certain circumstances, countries will choose to accumulate gold in order to increase their power. However they do so not only to be able to attack more effectively, but as a strategic move designed to discourage the other country from invading. To obtain this necessary strategic deterrent, countries will reduce their own consumption in order to increase net exports, and thus their reserves of bullion. We show that this holds true in a "balance of power" situation, in which no single actor on the international scene possesses hegemonic status. In the hegemonic case, on the other hand, the equilibrium will be not to accumulate foreign reserves.

In Part I of the paper, we present evidence on the link between commercial policy and the international political system. We also present existing theories in political science which attempt to account for this link. Part II fleshes out our own strategic model, which we offer as an alternative explanation for the stylized facts discussed in part I. Part III considers the model under uncertainty. Part IV concludes.

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[1] Viner (1948), reprinted in Coleman (1969), p.71.

## (I)

## The Facts

The historical record of the past 330 years shows cycles in which waves of protectionism alternate with periods of free trade. The association of these cycles with the shifting balance of international power is also well documented. The Navigation Act of 1651 is widely held to have represented the end of effective Dutch commercial hegemony in Europe and to have marked the beginning of the British challenge. By the end of the second decade of the 19th century, Britain had set about dismantling its own protectionist apparatus and had initiated an era of free trade which lasted as long as the *Pax Britannica* endured.[1] The rise in German power in the 1870s went hand in hand with protectionism driven by nationalistic fervor.[2] The rise of American power in the pre-World War II years was associated with a succession of protectionist measures, whereas the establishment of American hegemony after the war led to the pursuit of free-trade.[3]

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[1] Gilpin (1975) writes that: "Britain's interest lay in universal free trade and the removal of all barriers to the exchange of goods."(pp.84-5)

[2] Lawson (1983) summarizes the views of Gilpin and Krasner on this issues as follows: "Gilpin and Stephen Krasner suggest that after the 1870s Britain was no longer in a position to prevent Germany, France, and Italy from adopting protective tariffs and destroying an international order in which free trade had been the rule."(p.317-339)

[3] See, for example Calleo and Rowland (1973). Cline (1980), argues that tendencies toward what he calls "neomercantilism" were visible at the

The relationships between protectionist commercial policy, power, nationalism and hegemony have been explored at some length in the works of a number of contemporary political scientists. One of the most widely accepted paradigms linking the structure of the international political system with protectionism is the theory of hegemonic stability.[1] Kindleberger (1973), following in the footsteps of Frohlich, Oppenheimer and Young (1971), argues that international security is a collective good. Since free trade can arise only in a climate of international security, it is only when some power is dominant enough to enforcet security that a régime of free trade will arise. Given the inevitable tendency of weaker states to free-ride on the provision of the collective good by a hegemonistic power, the absence of a hegemonic state leads to the errosion of free trade and to the growth of protectionism. Gilpin (1975) writes that "a liberal international economy cannot come into existence and be maintained unless it has behind it the most powerful state(s) in the system. . . . A liberal economic system is not self-sustaining, but is maintained only through the actions --initiatives, bargaining, and sanctions of the dominant power(s)."[2]

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end of the seventies, which corresponds to the end of American hegemony in the world system; also see Cline (1970-71).

[1] A precursor is Hirschman (1945); also see Kindleberger (1975), Whitman (1975), Krasner (1976), Keohane and Nye (1977), Gilpin (1977), MacEwan (1978), Keohane(1980), Wallerstein (1980), Gilpin (1981).

[2] Gilpin (1975), p.85.

A related literature, typified by Gallagher and Robinson (1953-54), considers the "imperialism of free trade."[1] This process, which purports to explain the development of the world trading system in the presence of a hegemonic power, argues that "the hegemonic power is expected to extend its control --and the open international trading order-- over local economies by informal or indirect means whenever possible, since this constitutes the cheapest way to create and maintain its predominant position in the world."

Although these political science models provide an explanation for the relationship between protectionism and the structure of the international political system, they do not provide a rationale or a justification for mercantilism itself, which was built around the balance of trade doctrine (i.e., the desirability of running a trade surplus). In the model presented below, we will show that mercantilism is an integral part of an overall policy of national secutity.

[1] Also see MacDonagh (1962), Moore (1964-5), Mathew (1968), Platt (1968), Platt (1973).

## (II)

## The model

The essence of the model lies in the strategic interaction among countries. If war did not exist, no country could gain an advantage by accumulating foreign reserves, and therefore free trade would emerge as the optimal policy. War does have a place in our model; moreover, and in Clausewitzian fashion, it arises as the outcome of a rational exercise in cost-benefit analysis. A stock of bullion (with which to purchase ammunition and mercenaries at short notice) is thus a way to deter attack by other nations. The strategic behavior induced by this construct is similar to that of an arms race where the stockpiles of nuclear warheads are replaced by hoards of bullion.

In what follows, we will assume that the world is divided into a multitude of states. We will confine our attention to two of them. Apart from the usual advantages in terms of interpretative and notational simplicity, this restriction will allow for the possibility of both nations running a trade surplus, which would be impossible were we to consider the entire world trading system.

First we will analyze the case where decisions are taken only once and are not repeated; we call this the one-period

model: it will be presented in section 1. In section 2 we analyze the case where the one-period model is repeated an infinite number of times: we call this the infinite horizon model.

## 1. The One-Period Model.

### 1.1. The set up.

Each nation behaves in its own self-interest and we adopt Nash equilibrium as our basic solution concept. We begin with two definitions.

*1.1.1. Definition of Power.* Power is a means of maintaining one's sovereignty, of winning at war, or of deterring attack. The debates over the definition and measurement of power are endless. Despite the lack of consensus on precise definitions, most scholars of the "realist" school agree that economic and military factors are crucial.

We thus begin with the premise that the power of a nation depends both on its economic and on its military power. Mathematically, we express this assumption as:

$$PW_i = F(EPW_i, MPW_i)$$

where $PW_i$, $EPW_i$, $MPW_i$ are total, economic and military power respectively. In this paper, we pick

$$(1) \quad PW_i = \text{Min}(EPW_i, MPW_i).$$

Any functional form in the class of the CES function yields our results. We choose this discontinuous functional form for convenience and in order to ensure transparency of the results.

All suggested measures of economic power are intrinsically *ad hoc*. The proxy we choose for economic power is consumption. *A priori*, a more natural choice might be output.[1] This choice has the inconvenience that in the case where a country decides to allocate all of its output to the arms race and leave very little for consumption, this country would be said to have economic power. Consumption is therefore a more appropriate proxy in the context of our model. Thus, we write

$$(2) \quad EPW_i = C_i,$$

where $C_i$ is the output allocated to consumption.

Military power is a function of the stock of military equipment and infrastructure of war owned by the country (ships, canon, fortresses, etc.), but also of the possibility

[1] This measure has been suggested by Organsky (1972), Gilpin (1975), Krasner (1976), and many others.

of immediately purchasing ammunition and raising mercenaries. The stock of military equipment, $M_i$, is given exogenously at the start of the period and there is no depreciation of materials during periods of peace. Ammunition and mercenaries may have to be bought at short notice with foreign reserves or gold, and therefore the increase in foreign reserves, denoted by $O_i$, is a factor influencing the military power of a country.

We therefore have the specification

$$(3) \quad MPW_i = f(O_i, M_i) = O_i + M_i.$$

For simplicity we choose a function with perfect substitution between guns and mercenaries. Although this perfect substitution is not realistic, it is not important for the proof. Equations (1) through (3) yield our definition of $PW_i$, the power of a nation

$$(4) \quad PW_i = Min(C_i, O_i + M_i)$$

It could be argued that foreign credit is just as effective a means of financing war as is bullion, and indeed, many wars of the 17th and 18th centuries were financed in this way. But in our model, accumulated bullion finances war only if war breaks out. As long as war does not break out, bullion only represents *potential* expenditures on war, and thus constitutes a *strategic threat,* as does a stockpile of

nuclear missiles in the Intriligator-Brito (1976) model of the arms race. It is this strategic aspect of the accumulation of bullion that we wish to emphasize in our model, and in what follows we therefore abstract from foreign credit.[1] The stock of bullion and the trade balance are therefore linked by the simple expression

$$(5) \quad O_i = NX_i,$$

where $O_i$ is the increase in foreign reserves, and $NX_i$ is the current account surplus. This establishes the link between military power and commercial policy.

*1.1.2. Military victory.* In the simplest case with perfect information and no uncertainty, a country is said to have won a war against another if its power, PW, is greater than that of its adversary. If a country wins the war, it appropriates for itself the output of the other country. If a country loses at war, it loses everything. In part 3, we will allow for uncertainty: in this context, there will exist a positive probability of winning a war even if one's power is less than one's adversary's.

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[1] For the same reason, building up a trade surplus in wheat or in another commodity does not constitute a threat, because it takes time to convert these assets into liquid cash: the liquidity of foreign reserves is important as an element of deterrence.

*1.1.3. Decisions and timing.* In our one-period model two sequential decisions are taken. At the beginning of the period, each country has a given output, $Y_i$, and a given stock of military equipment, $M_i$.[1] Countries 1 and 2 then simultaneously decide how to allocate output between consumption, $C_i$, and accumulation of foreign reserves, $O_i$.[2] We call this "decision-node one". When each player knows the allocation made by the other, each country decides whether or not to engage in war: this is "decision-node two". The decision to start a war depends on (i) one's ability to win it and (ii) whether it is worth fighting even if it results in victory.

*1.1.4. Objectives.* The objective of a country is to maximize its utility function. A country's utility function depends on (i) its consumption, (ii) its sovereignty and (iii) on its being in a state of war or not. *National sovereignty* enters the utility function in such a way that the loss of one's autonomy results in a zero utility level. This can be interpreted as the loser's output being seized by the victorious country. *Being in a state of war* enters the utility function directly because we assume that the act of waging war yields a country negative utility. This disutility

---

[1] A more sophisticated model will endogenize $Y_i$ and $M_i$, but for our reasoning we do not need further complications.

[2] We assume that decisions are taken before people consume. This is equivalent to saying that one consumes last period's output while this period's output will be consumed next period. These tricks are necessary because we are in a discrete time framework.

is an increasing function of the relative level of development of the two belligerents, as measured by the ratio of their "military-economic sizes". We define the "military-economic size" of a country to be the sum of its income and its military infrastructure. By this we mean that the greater the "military-economic size" of country 1 relative to that of country 2, the greater the disutility country 1 suffers from making war.[1] A classical illustration of this assumption springs to mind: the disutility of waging war was undoubtedly far greater for the relatively rich and cultured Athenians than for the much more ascetic Spartans. In essence, the assumption attempts to capture the proposition that rich nations are seldom warlike by nature, whereas less comfortable peoples tend to view war with less abhorence.[2] We express the disutility to country i by writing

$$D(y_i/y_j), \text{ with } D'(.) \geq 0, \text{ where } y_i = Y_i + M_i.$$

We normalize D(.) so that D(X) = 0 for $X \leq 1$, and we note that the disutility of being at war appears in the utility

---

[1] We can interpret this disutility as concavity of the utility function: the richer one is, the less one values marginal consumption.

[2] Again, a classical illustration seems appropriate. The Romans under the Republic undertook continuous wars of conquest. By the later Empire, however, and as living standards improved, the will to wage wars of expansion had largely vanished and the Empire confined its efforts to protecting its frontiers from Barbarian incursions. A more recent example is the United States: popular rejoicing over territorial conquests at the expense of the Spaniards during the late 19th and early 20th centuries, for example, versus horror at the war in Vietnam during the 1960s.

function only during periods of war.[1] Thus, we can express country i's utility as

$$U_i = U_i(C, D(y_i/y_j)).$$

For simplicity, we choose a utility function which is linear in its arguments

$$U_i = C - D(y_i/y_j).^2$$

*1.1.5. Budget constraint.* The national income identity is given by

$$(6) \quad Y_i = C_i + G_i + NX_i,$$

where Y is output, C is consumption and G is government expenditures.[3] From equation (5), this becomes

$$(7) \quad Y_i = C_i + G_i + 0_i$$

---

[1] The actual cost of waging war, as opposed to the psychological disutility, it could be argued, should also be included in our specification, and would presumably be a function of the relative power of the two countries. The inclusion of this possibility changes little of any substance in the results that follow.

[2] This expression will take different forms, depending on whether a country is at war or not, and on whether it wins or loses. This will become clearer in section 1.1.6.

[3] Note that we do not consider investment in this model and it is therefore excluded from the national income identity.

where government expenditures, which we assume can only be on mercenaries and ammunition, occur solely during wartime (because we assume that $M_i$ is constant).

When the decision as to how to allocate output between consumption and net exports is taken, there is no war and therefore $G_i = 0$. Therefore:

$$(8) \quad Y_i = C_i + 0_i$$

If war then errupts, government will undertake military expenditures equal in value to the amount of gold accumulated (i.e., the government spends all its gold on the war). Therefore

$$G_i = -0_i.$$

If country i wins the war it seizes that part of the output of the other country allocated to consumption (because the output that was allocated to foreign reserves was eaten up during the war). Having defined the budget constraint and the utility function we can now write the payoffs to the countries.

*1.1.6. Payoffs.* The first decision taken at the beginning of the period is the allocation of output between foreign reserves and consumption. This allocation determines the relative power of the two countries. Then, depending on their relative power, countries decide whether or not to

fight, and the payoffs for country 1 at the end of the period are:

$$
(9)\quad V_1 = \begin{cases} C_1 & \text{if there is no war;} \\ C_1 + C_2 - D(y_1/y_2) & \text{if there is war and it results in victory (i.e., if } PW_1 > PW_2\text{);} \\ 0 & \text{if there is war and it results in defeat (i.e., if } PW_1 \leq PW_2\text{),} \end{cases}
$$

where $C_i$ is that part of output allocated to consumption by country i at the beginning of the period (i.e., $C_i = Y_i - O_i$, $i = 1,2$).

1.2. Equilibrium.

Equilibrium is defined to be the set of actions performed sequentially during the period (i.e., the allocation of resources, "decision-node one", and 'war' or 'nowar', "decision-node two") that

$$
(10)\quad \underset{\{C_i\}}{\text{maximize}}\ V_i[(C_i, O_i),(C_j, O_j),\text{'war' or 'nowar'}]
$$

for $i = 1, 2$, $j \neq i$, and $O_i = Y_i - C_i$.

In other words, the equilibrium is a perfect Nash equilibrium of this one period, sequential decision game. Having defined the structure of our model and our equilibrium concept, we are now equipped to present our main results.

**Proposition 1**

When countries are equal in size, that is, when $y_1 = y_2$, then

(i) in the unique equilibrium, countries will choose to increase their national power by hoarding foreign reserves until they attain maximum power.

(ii) The countries will choose not to fight, the balance of power is sustained, and every country remains sovereign.[1]

Proof

Claim 1

The strategy $[C_1^*, C_2^*, \text{'nowar'}]$ is a perfect Nash equilibrium, where $C_1^*$ and $C_2^*$ are the allocations to consumption at the point of maximum power.

Proof

Recall equation (4) which gives us the expression for a country's power

$$(4) \quad PW_i = \text{Min}(C_i,\ O_i + M_i) = \text{Min}(C_i,\ y_i - C_i)$$

[1] By balance of power, we mean that there is no hegemonic state, and peace is preserved.

There exists a consumption allocation which maximizes this expression. Let $C_i^*$ be that allocation

$$(11)\quad C_i^* = y_i/2,$$

to which there corresponds the power-maximizing accumulation of bullion $O_i^* = (y_i/2) - M_i$. The value of the power function at the maximum is

$$PW_i^* = C_i^* = O_i^* + M_i.$$

In order to show that $[C_1^*, C_2^*,$ no war$]$ is a perfect equilibrium we will show that a nation i is worse off if it deviates to any $C_i$ where $C_i \neq C_i^*$.

Suppose country 1 increases its consumption to $C_1$, where $C_1 = C_1^* + \varepsilon$; then $PW_1 < PW_1^* = PW_2^*$.[1] This implies that in period 2, $PW_1 < PW_2$. Therefore, the payoff to country 2 will be given by

$$(12)\quad V_2 = \begin{cases} C_2^* & \text{if there is no war;} \\ C_2^* + (C_1^* + \varepsilon) - D(y_1/y_2) = C_2^* + (C_1^* + \varepsilon) & \text{otherwise.}[2] \end{cases}$$

Given these payoffs, "decision-node two" for country 2 will be to choose war, since it will be the victor. The payoff to

---

[1] To decrease consumption below $C_1^*$ is always a dominated strategy because power and consumption decrease.

[2] Because $D(1)=0$.

country 1 is then

$$V_1(C_1 + \varepsilon) = 0 < V_1(C_1^*).$$

Thus $C_1^*$ is the optimal strategy for country 1. The proof is similar for country 2 and this is enough to show that these strategies form a perfect Nash equilibrium.

Claim 2

This equilibrium is unique.

Proof

Suppose there exists another equilibrium $(\underline{C}_1, \underline{C}_2)$, different from $(C_1^*, C_2^*)$. We have two cases to consider:

(i) Case 1. Suppose $(\underline{C}_1, \underline{C}_2)$ is an equilibrium and $\underline{C}_1$ and $\underline{C}_2$ are such that $PW_1 < PW_2$. We then have that

$$(13)\quad V_2(\underline{C}_2, \text{war}) > V_2(\underline{C}_2, \text{no war})$$

therefore $V_1(\underline{C}_1, \text{war}) = 0$. Country 1 can improve its payoff by decreasing consumption to $C_1$ such that $PW_1 = PW_2$, because

$$(14)\quad V_1(C_1, \text{nowar}) = C_1 > 0.$$

Therefore $(\underline{C}_1, \underline{C}_2)$ is not an equilibrium.

(ii) Case 2. Suppose $(\underline{C}_1, \underline{C}_2)$ is an equilibrium and $\underline{C}_1$ and $\underline{C}_2$ are such that

$$PW_1 = PW_2 < PW_1^* = PW_2^*$$

Upon consideration of the alternatives, both countries will choose 'nowar' as "decision-node two", therefore

$$V_1(\underline{C}_1, \text{nowar}) = \underline{C}_1$$

and we have that $\underline{C}_1 > C_1^*$. If country 1 moves to $C_1' = \underline{C}_1 - \varepsilon$, then $PW_1 > PW_2$, and

$$(15)\quad V_1(C_1', \text{war}) > V_1(C_1', \text{nowar}).$$

Therefore

$$(16)\quad V_1 = V_1(C_1', \text{war}) = C_1' + C_2 - D(1) = \underline{C}_1 - \varepsilon + C_2 > \underline{C}_1$$

Country 1 has an incentive to deviate and therefore ($\underline{C}_1$, $\underline{C}_2$) is not an equilibrium. We have therefore proved that, in equilibrium, countries will choose to have maximum power. They do so not in order to attack, but as a strategic move designed to prevent the other country from invading. To obtain this necessary strategic deterrent, countries will reduce their own consumption in order to increase net exports, that is, their foreign reserves. This holds true when countries are similar or almost similar (as will be proved in proposition 3.), which we refer to as a "balance of power" situation. Next, we will prove that when a country is

much stronger than the other, the equilibrium will be not to accumulate foreign reserves.

**Proposition 2**

When one of the countries has an hegemony, the perfect Nash equilibrium is to choose sequentially $O_1^* = O_2^* = 0$, and then 'nowar'.

Proof

We begin by formulating our definition of an hegemony.

Definition: Country 1 is an hegemony if

(i) $y_1 > y_2$ and the difference is so great that $D(y_1/y_2) > Y_2$ and

(ii) $PW_1(O_1 = 0) > PW_2^*$.

Condition (i) means that country 1 is so big that its abhorence of war is greater than what it can win by invading the other country. Condition (ii) means that the hegemonic country, even if it does not accumulate foreign reserves, has enough power to defeat the smaller country whatever the smaller country does.

Claim 1

For every choice of $PW_1$ and $PW_2$ at "decision-node one", the ensuing Nash equilibrium choice is 'nowar' at "decision-node two".

Proof

We know that whatever the choice of $O_2$, we have that $PW_1 > PW_2$. Therefore whatever country 2 does, it can be defeated.

In order to prove that it will not be attacked, we have to prove that:

(17) $V_1(C_1,C_2,\text{nowar}) > V_1(C_1,C_2,\text{war})$ for every $C_1$ and $C_2$.

(18) $V_1(C_1, C_2, \text{nowar}) = C_1$

(19) $V_1(C_1, C_2, \text{war}) = C_1 + C_2 - D(y_1/y_2)$.

For (17) to be true we have to show that $C_2 - D(y_1/y_2) < 0$. But by assumption, $D(.) > Y_2 > C_2$.

Claim 2

Having proved that the best strategy is 'nowar' at "decision-node two", it follows that the best strategy at "decision-node one" is to have maximum consumption and $O_1 = O_2 = 0$.[1]

Proof

The proof is immediate. If we know that there will never be a war, then the payoff is always:

$V_i(C_i, \text{nowar}) = C_i$ and $V_i(Y_i) > V_i(Y_i - O_i)$ for $O_i \geq 0$;

and therefore countries choose $O_i = 0$.

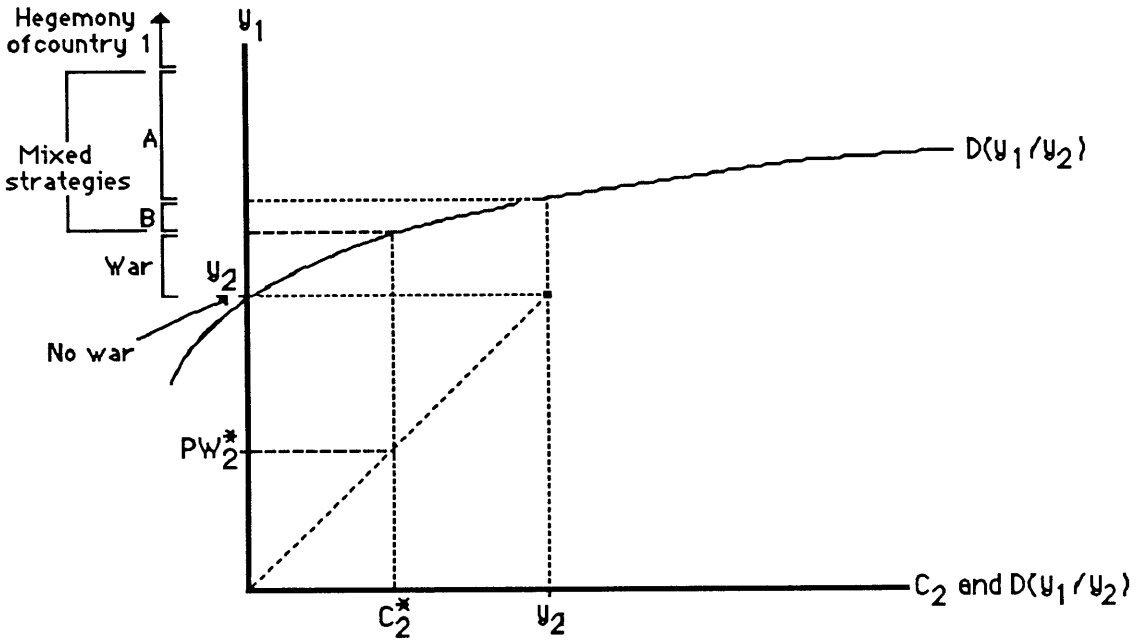
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[1] In fact if we allow reserves to be negative the equilibrium is to increase consumption as much as possible.But this equilibrium will be ruled out by the intertemporal budget constraint and by the stationarity of the perfect equilibrium set. Therefore we are searching for the perfect Nash equilibrium under the condition that $O_i \geq 0$.

Proposition 2 states that in a world system dominated by an hegemonic power, countries will not allocate output to foreign reserves in order to increase their power. Trade will be free, yielding the usual efficiency gains from the unfettered operation of comparative advantage. Moreover, countries will not squander resources in an attempt to increase their reserves of bullion.

In proposition 1, we showed that in a world characterized by a balance of power, the possibility of being invaded leads countries to give up free trade in order to accumulate foreign reserves, so as to bolster their power. We will now analyze the cases in which the countries are not perfectly similar, but no one country possesses an hegemony. These cases run from complete equality to complete hegemony. Propositions 3 and 4 deal with those cases near perfect similarity, in which $y_1$ is relatively close to $y_2$. In Figure 1 this corresponds to the interval "war" on the $y_1$ axis (Prop.3), and the point separating the interval "war" and the interval "mixed strategy B" (Prop.4). Propositions 5, cases 1 and 2, deal with those cases in which the sizes of the countries diverge progressively more from equality. In Figure 1, this corresponds to the interval "mixed strategy B" (Prop.5,c.2), and the interval "mixed strategy A" (Prop.5,c.1). Of course, Proposition 2 simply represents the case in which the size of country 1 is vastly superior to that of country 2, and corresponds, in Figure 1, to the interval "Hegemony of country 1".

**Figure 1.**




**Proposition 3**

For countries similar enough that $C_2^* > D(y_1/y_2) + 1$, the equilibrium $(\underline{C}_1, \underline{C}_2)$ is such that at "decision-node two" countries will fight, and their strategies at "decision-node one" are:[1]

- country 2 chooses $O_2 = O_2^*$ (i.e., $C_2 = \underline{C}_2 = C_2^*$ and $PW_2 = \underline{PW}_2 = PW_2^*$);
- country 1 chooses $O_1$ such that $PW_1 = \underline{PW}_1 = PW_2^* + 1$,

[1] Until now, we have considered continuous actions. In the proof which follows, we assume that gold is available only in discrete quantities, down to some minimum, indivisible weight. This assumption is perfectly compatible with reality, perhaps even more so than the assumption of continuity of the previous two propositions.

where an asterisk '*' denotes the value of the variable in question which maximizes the power function PW.

Proof

Consider country 1. When the strategy of country 2 is $PW_2^*$, we look for an $O_1$ that maximizes $V_1$ where

$$(9) \quad V_1 = \begin{cases} C_1 & \text{if there is no war;} \\ C_1 + C_2^* - D(y_1/y_2) & \text{if there is war and it results in victory (i.e., } PW_1 > PW_2^*\text{).} \end{cases}$$

If $O_1$ is such that $PW_1 < PW_2^*$, then country 2 invades and $V_1 = 0$.

If $O_1$ is such that $PW_1 = PW_1'' = PW_2^*$ then $V_1 = C_1''$.[1]

If $O_1$ is such that $PW_1 = \underline{PW}_1 = PW_2^* + 1$ then

$$V_1 = \underline{C}_1 + C_2^* - D(y_1/y_2) > \underline{C}_1 + 1 = C_1''.$$

Country 1 therefore chooses a level of power just sufficient to invade country 2: $PW_1 = \underline{PW}_1 = PW_2^* + 1$. Country 2, whatever its choice, will then lose the war and its payoff will be zero.

One might be led to believe that these strategies do not constitute an equilibrium, since country 2 has no reason to choose such a high level of reserves. However, if country 2 chooses a lower level of reserves (or no reserves at all), then country 1 will not accumulate as much bullion, and country 2 will be tempted to invade. Therefore, it is clear

---

[1] Where C" is the consumption associated with $O_1$ such that $PW_1 = PW_2^*$ (and is not to be confused with C' of the previous section).

that the only equilibrium consists in accumulating a reserve of gold. The unique equilibrium is where

$$PW_1 = \underline{PW}_1 = PW_2^* + 1 \text{ and } PW_2 = \underline{PW}_2 = PW_2^*.$$

**Proposition 4**

In the case where $C_2^* = D(y_1/y_2) + 1$, the equilibrium is

$$(\underline{C}_1, \underline{C}_2, \text{nowar}),$$

where $\underline{C}_1 = \underline{C}_2 = C_2^*$ and $\underline{PW}_1 = \underline{PW}_2 = PW_2^*$.

Proof

The proof is similar to that of proposition 3.

**Proposition 5**

In those cases where $C_2^* < D(y_1/y_2) + 1$, there exist mixed strategy equilibria which are combinations of the cases presented in propositions 1 to 3. In the case where $PW_1(O_1 = 0) > PW_2^*$, one is back to the case of an hegemony.

Proof.

We have two cases to consider which satisfy

$$C_2^* < D(y_1/y_2) + 1.$$

Case 1: $C_2^* < Y_2 < D(y_1/y_2) + 1$. From Nash's Theorem, we know there exist a number of mixed strategy equilibria.[1] We shall

[1] A mixed strategy equilibrium is an equilibrium in probability over the set of strategies, while the equilibrium we dealt before was an equilibrium in strategies. For more details see for example Luce and Raiffa (1957).

construct one such equilibrium. We notice that the following strategies constitute an equilibrium: country 1 mixes between ($\underline{O}_1 = 0$) and ($\underline{O}_1 = O_1'$) with probability p on the first and (1-p) on the second, while country 2 mixes between ($\underline{O}_2 = 0$) and ($\underline{O}_2 = O_2^*$) with probability q on the first and (1-q) on the second, where

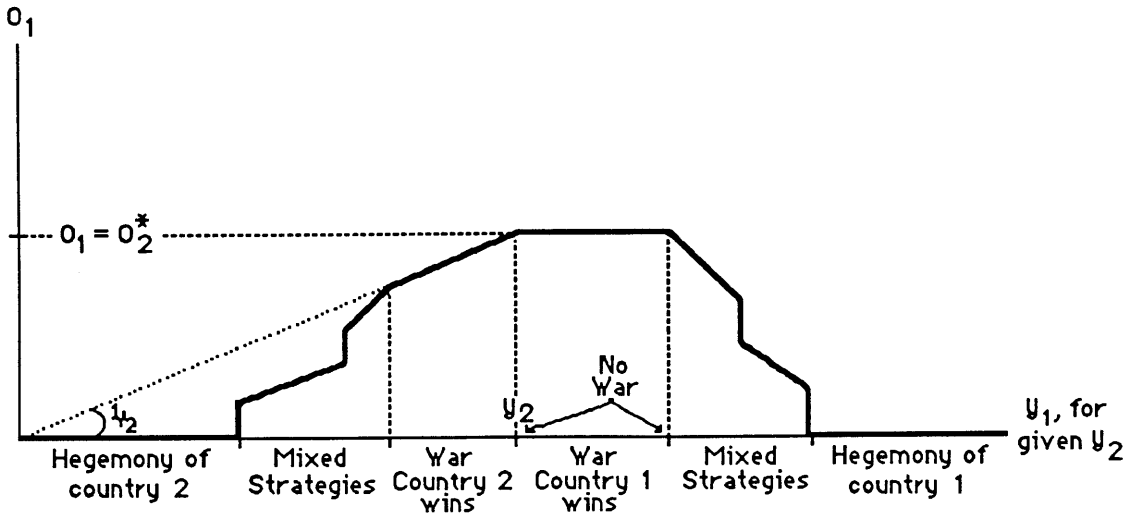
$O_1'$ is such that $PW_1 = PW_2^*$, i.e., $O_1' = O_2^* + M_2 - M_1$ and

$p = (O_2^*/Y_1)$ and $q = (Y_1 - O_1')/Y_1$.

Case 2: $C_2^* < D(y_1/y_2) + 1 < Y_2$ . In a similar manner, we can construct an equilibrium in mixed strategies.

Propositions 1 through 5 are different cases of relative size $(y_1/y_2)$. We can summarize these cases with the help of Figure 2.

**Figure 2.**



In Figure 2, Proposition 1 corresponds to the point where $y_2 = y_1$. At this point, both countries will hoard gold so as to maximize power, setting $O_1 = O_2 = O_1^* = O_2^*$. If we move to the right of $y_2$ along the horizontal axis, the size of country 1 relative to that of country 2 increases. The interval "War: Country 1 wins" corresponds to Proposition 3. Proposition 4 corresponds to the point separating the intervals "War: Country 1 wins" and "Mixed Strategies". The interval "Mixed Strategies" is studied in the two cases of Proposition 5. Beyond the interval "Mixed Strategies", the size of country 1 is so big, and its military power so overwhelming, that it no longer needs to hoard bullion: it becomes an hegemony. To the left of $y_1 = y_2$, $y_1$ becomes the smaller country, yielding the same result as in Proposition 3. In this interval ("War: Country 2 wins") country 1 hoards bullion such that $O_1 = O_1^* = y_1/2$. Beyond this interval, the same discussion as above is valid, substituting $y_1$ for $y_2$ and vice versa.

In each of the cases we have considered, except for hegemony, we have found a positive accumulation of bullion. As has been demonstrated, hoarding of bullion is motivated by strategic concerns of deterrence. It is only in the case where one country is so dominant that it possesses an hegemony that these strategic concerns lose their relevance, and that free trade emerges. We have also shown that war can

arise as part of a country's optimal strategy.[1] These results have all been derived in a static context. In order to see how behavior is affected by intertemporal concerns we will now consider the infinite horizon model.

## 2. The infinite horizon model.

### 2.1. Objectives and payoffs.

In the usual Ramsey infinite horizon model, countries maximize the discounted sum of their utility subject to the intertemporal budget constraint:

$$(20) \quad \underset{\{C_{it}\}}{\text{Max}} \quad \sum_{t=1}^{\infty} \delta^t U(C_{it})$$

$$\text{s.t. } O_{it} = Y_{it} - C_{it}$$

$$\sum_{t=1}^{\infty} R^t Y_{it} \geq \sum_{t=1}^{\infty} R^t C_{it}$$

where R is the interest rate and $\delta$ is the discount rate. The strategic elements introduced by our model yield results different from those of the usual Ramsey case. In order to study the behavior of our model, as opposed to the Ramsey case, we assume that

---

[1] It is worth pointing out that in the perfect information case we have consider so far, the transition from "nowar" to "war" is made in a discontinuous jump. The abruptness of this transition is slightly troubling, but disappears as soon as uncertainty is brought to bear.

(21) $Y_{it} = Y_i$ = constant, and $R = \delta$.

This implies that the solution to equation (20) is

$C_{it}$ = constant for every t.

In our model the payoff is $\sum_{t=1}^{\infty} \delta^t V_{it}$.

2.2. The case of the balance of power.

Claim

The actions $[C_1^*, C_2^*, \text{nowar}]$ in each period, where $C_1^*$ and $C_2^*$ maximize the power functions of countries 1 and 2, respectively, constitute a perfect Nash equilibrium.[1] This equilibrium is unique.

Proof

The first part of the proof is immediate:

$(C_1^*, C_2^*)$ is feasible because $\sum_{t=1}^{\infty} R^t Y_i > \sum_{t=1}^{\infty} R^t C_i^*$ for i=1,2.

Moreover, since the repetition of Nash strategies constitutes a perfect equilibrium, the strategies chosen themselves form a perfect equilibrium. The proof of the second part of the proposition is less obvious. An informal proof follows.

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[1] Note that $[C_1^*, C_2^*, \text{nowar}]$ is simply the perfect Nash equilibrium of the one period game.

The uniqueness of our equilibrium may seem puzzling since Friedman's Folk Theorem states that "grim" strategies yield a perfect equilibrium. For the Friedman Folk Theorem to hold, however, all stage games must be identical and independent of the history of the game. In our model, this is not the case. For instance, grim strategies of choosing $O_{1t} = O_{2t} = 0$, and threatening that when a country j deviates, all other countries return to the Nash outcome of the stage game, is not an equilibrium and is not feasible. To prove this, note that at time t of this strategy, where $O_{1t} = O_{2t} = 0$, if country j deviates and invades country i, then at time t+1, country i starts with no output and no army and cannot pursue the strategy described above. Moreover, the history of this game is not stationary. Therefore $(C_1^*, C_2^*)$ is the unique perfect equilibrium.

2.3. The case of hegemony.

Claim

In a perfect Nash equilibrium, each country chooses $O_{1t} = O_{2t} = 0$ in each period. This equilibrium is unique.

Proof

So far, we have proved that in a hegemonic equilibrium there is no need for a balance of trade surplus. In the one stage game, we imposed the condition that $O_1$ and $O_2$ be nonegative. This no longer needs to be so in the infinite horizon case, where all that is required is that the intertemporal budget

constraint hold. This means that the country is free, in each stage game, to maximize consumption, even if this entails a temporary balance of payments deficit (or surplus). By now it should be clear that we are back in the usual open economy Ramsey model, where free trade is optimal and countries merely solve

$$(20)' \qquad \underset{\{C_{it}\}}{\text{Max}} \sum_{t=1}^{\infty} \delta^t U(C_{it})$$

$$\text{s.t.} \sum_{t=1}^{\infty} R^t Y_{it} = \sum_{t=1}^{\infty} R^t C_{it}.$$

2.4. The case in between.

For cases where the solution is 'nowar', the infinite horizon strategy is to repeat the one stage equilibrium for the reasons explained in the "balance of power" case (2.2).

For cases where the solution is 'war', then in period 2 one of the countries will be an hegemony and in equilibrium there will be no accumulation of reserves.

2.5. Conclusion.

We have shown that commercial policy is strategically motivated by a country's desire for sovereignty, and that, in association with the relative size of the countries, such behavior determines whether free trade or protectionism

obtains. This general proposition holds true both in the stage and in the infinite horizon models.

Our model yields very specific results and we should check their robustness to the introduction of uncertainty.

## (III)

## The Case of Uncertainty

With the introduction of uncertainty, the payoffs themselves remain unchanged. However, winning or losing at war is no longer determined solely by a comparison of national powers, but also depends on chance factors. Thus, if country 1 is more powerful than country 2, we can no longer simply state that country 1 will win at war with probability 1. Rather, despite its power advantage, there is some non-zero probability that country 1 can lose. This probability of losing, decreases when the power of country 1 relative to that of country 2 increases.[1] In other words, the probability of winning at war is an increasing function of a country's relative power. We write the payoffs as

$$(9') \quad V_1 = \begin{cases} C_1 & \text{if there is no war;} \\ C_1 + C_2 - D(y_1/y_2) & \text{if there is war and it results in victory;} \\ 0 & \text{if there is war and it results in defeat,} \end{cases}$$

[1] Note that in the previous models, if country 1 was more powerful than country 2, then it could win at war with probability one. Once uncertainty is introduced, this is no longer the case.

Consider country 1, which is contemplating declaring war. Country 1 will declare war if its expected payoff from declaring war is greater than its payoff under peace. We write this as

$$(21)\quad \text{Prob}_1.(C_1 + C_2) + (1 - \text{Prob}_1).0 > C_1 \quad (\text{since } D(y_1/y_2)=0).$$

where $\text{Prob}_1$ is the conditional probability of country 1 winning the war, given the relative power of the two countries. For any country i, we write this conditional probability as

$$\text{Prob}_i = \text{Prob}_i(\text{country i winning the war} / (PW_i/PW_j)) = p_i(PW_i, PW_j).$$

Definition: probabilities $(p_1, p_2)$ are said to be consistent when

$$p_1(PW_1, PW_2) = 1 - p_2(PW_1, PW_2).$$

An example of a consistent probability is

$$p_1(PW_1, PW_2) = \text{Prob}(\text{country 1 winning the war}) = PW_1/(PW_1 + PW_2)$$

Claim

The only consistent probability when $PW_1 = PW_2$ is:

$$p_1(PW_1 = PW_2) = p_2(PW_1 = PW_2) = .5$$

Proof. Immediate.

We are now equipped to consider the case of countries similar in size.

## 1. The Case of Similar Countries

**Proposition 6**

The only symmetric equilibrium under the condition of consistent beliefs is : $\underline{C}_1 = \underline{C}_2 = C_1^* = C_2^*$ and 'nowar'.

Proof

Consider country 1; given that country 2 plays $PW_2^*$, we will show that choosing $PW_1 = PW_2^*$ is optimal.

In this case, where country 1 chooses $C_1 = C_2^*$, both countries are indifferent between "war" and "nowar" since the following equality holds

$$(22)\quad Prob_1.(C_1 + C_2) = C_1 = C_2$$

and because: $Prob_1 = p_1(PW_1 = PW_2) = .5$ and $C_1 = C_2$.

Now let us show that deviating from $C_1 = C_2^*$ is not an optimal strategy. If country 1 chooses $C_1'$ such that $PW_1' < PW_2^*$ then country 2 has $Prob_2 > .5$, therefore

$$(23)\quad Prob_2.(C_1 + C_2) > C_2.$$

This means that the expected payoff from waging war is greater than that of remaining at peace. Country 2 will invade and the payoff to country 1 is

$$(24)\quad V_1 = Prob_1.(C_1 + C_2) < C_1.$$

Therefore choosing $C_1 = C_2^*$ is a best response to $C_2 = C_2^*$. The proof for country 2 is symmetric to this one and therefore: $(C_1^*, C_2^*, \text{nowar})$ is an equilibrium.

We will now prove that this symmetric equilibrium is unique.

Let us assume that

$\underline{PW}_1 = \underline{PW}_2 < PW_1^* = PW_2^*$ is an equilibrium.

Recall that the only consistent beliefs when $PW_1 = PW_2$ are: $Prob_1 = Prob_2 = .5$. If country 1 increases its reserves of bullion and decreases its consumption to $C_1$, then $Prob_1 > .5$ and therefore

$$(25) \quad Prob_1 . (C_1 + \underline{C}_2) > \underline{C}_1 .$$

which implies that $(\underline{C}_1, \text{nowar})$ is dominated by $(C_1, \text{war})$, and could thus not be an optimal strategy in the first place. Therefore our symmetric equilibrium is unique. Let us now examine the case of an hegemonic country.

## 2. The Hegemonic Case.

The proof of Proposition 7 will be similar to that of Proposition 2, except that our definition of hegemony must be adapted to the complications arising from the introduction of

uncertainty. Recall that in our definition of country 1 being an hegemony (see Prop. 2), the two conditions were given by:

(i) $D(y_1/y_2) > Y_2$ and

(ii) $PW_1(O_1 = 0) > PW_2^*$.

Condition (ii) means that country 2 will always be defeated at war, regardless of what it does. With the introduction of uncertainty, this condition is modified to

(ii') $\text{Prob}_2.(C_1 + C_2) < C_2$, for all $C_1$ and $C_2$.

**Proposition 7**

In the case where a country is an hegemony, the equilibrium under imperfect information is no different from that under perfect information, that is, ($O_1 = 0$, $O_2 = 0$, nowar) is the equilibrium.

Proof

We will show that at "decision-node two", 'war' is a dominated strategy for both countries. Condition (ii') states that

$$\text{Prob}_2.(C_1 + C_2) < C_2.$$

Thus, country 2 has no reason to initiate hostilities. Country 1 is not interested in fighting because

$$\text{Prob}_1.(C_1 + C_2 - D(y_1/y_2)) < C_1.$$

Having proved that the best strategy is 'nowar' at "decision-node two", then the best strategy at "decision-node 1" is to have maximum consumption and $O_1 = O_2 = 0$. This is proved in exactly the same manner as was claim 2 in the proof of Proposition 2.

Thus, we see that the introduction of uncertainty into our model does not change our main result. Rather, uncertainty "smooths the transition" from one case to the next. Instead of immediately jumping from 'nowar' to 'war', we now have situations in which countries are indifferent between the two. This explains why, even in the context of a balance of power, both war and peace may be observed.

# (IV)

## Conclusion

From the rise of the concept of the nation-state, the locus of hegemonic power has shifted periodically, going from Spain, to the Netherlands, then to England and finally to the United States. In each case, the attainment of hegemonic status has entailed the adoption of a free-trade policy. In each case however, the *interregnum* during which no single state exercized hegemony over the international system was accompanied by a period in which nationalism and mercantilism were the primary determinants of each country's political and economic stance. Why does the *sine qua non* of free trade appear to be hegemony, while an anarchic international system gives rise to Mercantilism?

In this paper, we have provided answers to this question. We have sought to clarify the link tying the international distribution of power to commercial policy. While we do not pretend that our model is faithful to Mercantilistic *justifications*, we do claim that it revolves around the central tenet of their paradigm: the balance of trade doctrine. We have shown, contrary to Hecksher's belief and in support of Jacob Viner's, that there is no fundamental tradeoff, in the long run, betweem power and plenty. Rather,

as the political scientists would have it, the two goals are linked by a complex dialectic, which we have attempted to shed some light on. Our model has shown that the pursuit of a balance of payments surplus is not necessarily the result of misguided policymaking, and that free trade obtains as the optimal policy only under extremely specific circumstances. We have also shown, in the context of our model, that war can be the optimal outcome of the interraction of rational players. Moreover, our model has shown that the pursuit of a balance of payments surplus need not arise from a misunderstanding of the concept of wealth, as many critics of the Mercantilists have argued, but rather is the rational response to strategic concerns. Finally, and at the risk of adding to the already long list of poor paraphrases of Von Clausewitz's celebrated *dictum*, we have shown that "commercial policy is the pursuit of political aims by other means."

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# Conclusion

This thesis has shown that money, capital flows and protectionism were an important part of the environment that led Britain to become the leading country in the world after the Napoleonic wars. Capital flows were needed to finance investment and budget deficits. Money facilitated the process of English industrialization. Protectionism was the outcome of a rational response to strategic concerns.

These issues were raised by a school of 18th century economists: the mercantilists. I have attempted in this thesis to show how well-adapted their arguments were to the problems of the 18th century. I have also tried to show how they can be explained and rationalized in more contemporary terms.

Finally, I hope that I have not committed a sin which Schumpeter saw as being common to economists:

"We know, of course, that history incessantly repeats itself. But it is amazing and perhaps a little sad to observe that economists, swayed by the prevailing humors of the hour, also repeat themselves and that, blissfully ignorant of their predecessors, they believe in each case that they are making unheard-of discoveries and building up

a brand-new monetary science. However, there are some things to be gleaned from a history of analysis".[1]

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[1] Schumpeter (1954), p.712.