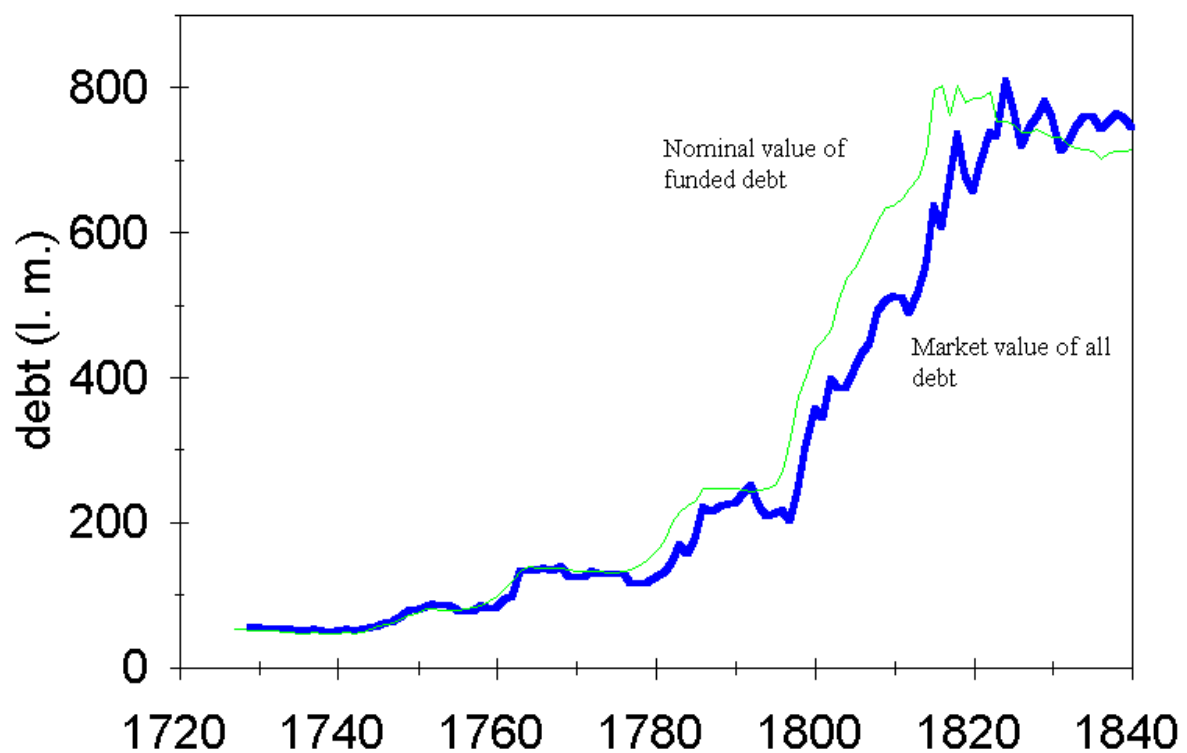Prof. Gregory Clark
Economics 110B
Spring 1999

7. GOVERNMENT DEBT, WAR, AND CROWDING OUT: ENGLAND, 1727-1840

7.1 INTRODUCTION

From 1692 to 1815 the British government was engaged in a protracted struggle with the French for military predominance that is sometimes called the "Second Hundred Years War." The wars that Britain was involved in after 1720 included the War of the Austrian Succession (1740-48), the Seven Years War (1756-63), the American War of Independence (1775-83), and the Revolutionary and Napoleonic Wars (1793-1815). War expenditures were a heavy burden on the government, typically accounting for over 90% of government expenditure before 1799. Most of the war expenditures were not immediately covered by taxes, but were instead largely financed by government borrowing. Thus the government greatly increased the nominal stock of government debt over time. The market value of government debt is, however, a more meaningful economic quantum. This is the amount the government would have had to pay at any time to buy out its debt obligations. The market value is calculated by dividing up government debt into its various constituent elements - 3%, 3.5%, 4%, and 5% perpetuities, short term debt, term loans, life annuities, and redeemed land taxes - and calculating the value of each from quotes of the trading price of various obligations. Figure 7.1 shows this market value.

FIGURE 7.1: THE MARKET VALUE OF GOVERNMENT DEBT COMPARED TO THE NOMINAL VALUE OF FUNDED DEBT, 1727-1840

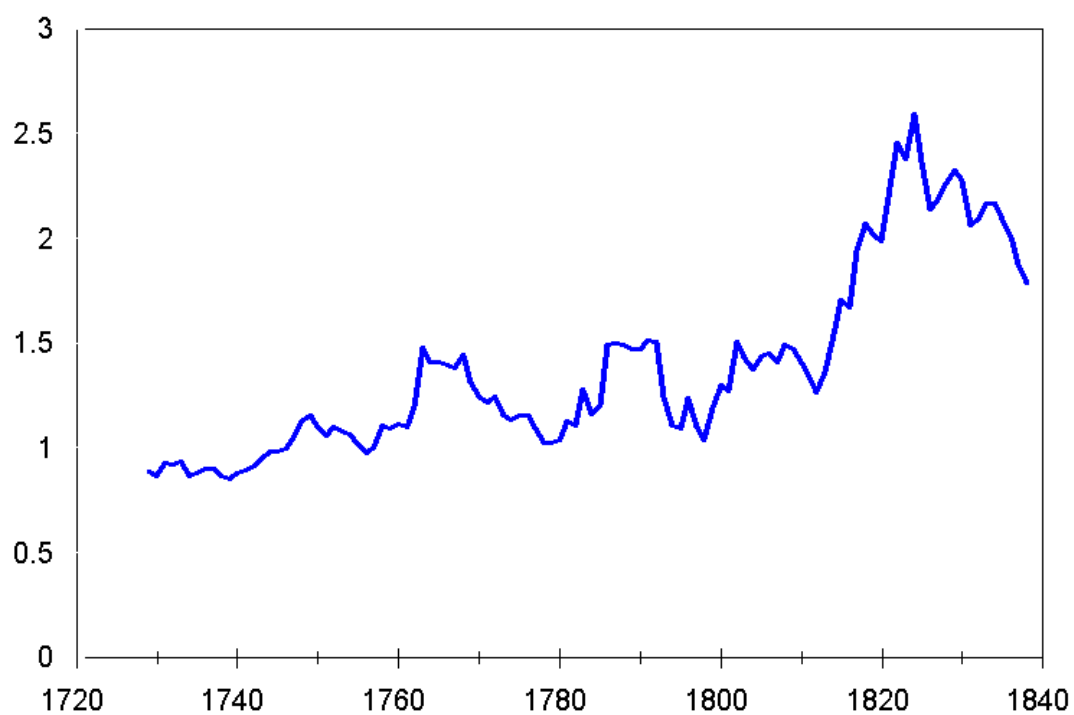Notes: Values are given in £ million at current prices.

Source: See the appendix.

The market value of the debt got very large over this period compared to the net reproducible wealth of Britain. Thus by 1830 government debt was worth 78% of the net value of reproducible assets in the economy, compared to 36% in 1760. Indeed if we look at the estimates of the value of all assets in the economy in this period we see that government debt was much larger than the value of all structures in the economy (valued at £518 m.). Government debt in 1830 would represent 25% of the private non-human wealth of individuals (land was the major component at 44%).

The debt to GNP ratio was correspondingly large. At its maximum in the 1820s the market value of government debt was 2.3 times GNP. This can be compared to the US debt burden of about .70 times GNP in 1992, and the debt burden in 1946 of 1.3 times GNP. Figure 7.2 shows the ratio of GNP to government debt from 1727 to 1840.

We can also construct a series on the net receipts from borrowing of the government in each year relative to GNP, which shows the net cash flow into the government from sales of new debt minus payoff of old debt. Net receipts from debt sales, which measures the amount of resources the government commanded by trading them for debt has been assumed to be the measure of the likely extent of crowding out in some of the previous discussion of this period. I will argue below, however, that the market value of the debt (or changes in this) is a more appropriate measure, since rational consumers will not be indifferent to revaluations of their current holdings of government debt. In the estimate of net receipts from borrowing I include sums that were borrowed in Britain for the government of Ireland in the years 1797 to 1816. Though this borrowing was to be serviced by Irish taxes, it represented to the British lender an equivalent asset to British government debt.

FIGURE 7.2: THE MARKET VALUE OF GOVERNMENT DEBT RELATIVE TO GNP
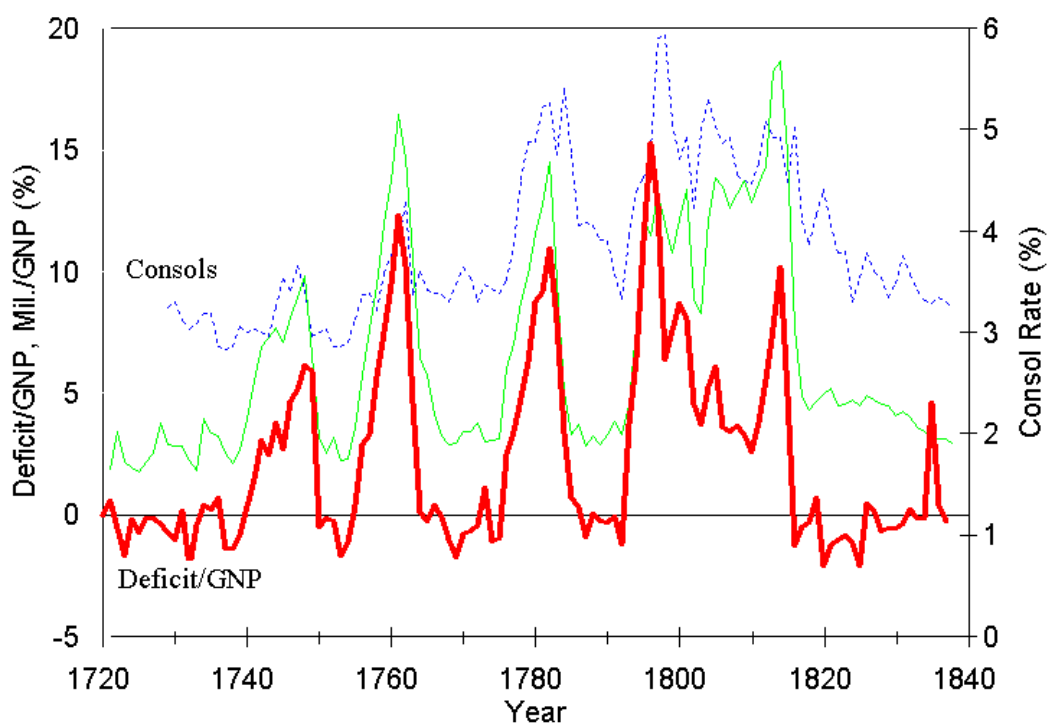
1727-1839

<u>Source</u>: See Appendix 1.

Figure 7.3 shows net receipts from borrowing as a percentage of GNP. In 1761 the government net receipts from borrowing reached 12% of GNP, and in 1796 a remarkable 15%. There were net receipts from borrowing above 10% of GNP also in 1762, 1782, 1795, 1797, and 1814. Figure 3 shows also military expenditures as a percentage of GNP. We can compare this to a measured government deficit relative to GNP which reached a maximum of 3.8% in the USA in 1983 at a time when the deficit was regarded as extraordinarily large and was the cause of much public concern.

As can be seen the extraordinary military expenditures of the war years were largely met by free market means through the sale of debt until the Napoleonic War period when extra taxes financed much of the war from 1799 until 1815. The correlation coefficient between debt sales and the level of military expenditure from 1727 to 1840 is thus 0.83. Notice that the deficit position of the government as measured by net receipts from borrowing will be very different from the position as measured by changes in the market value of government debt. Net receipts from borrowing were high during the wars. But the market value of government debt typically rose only when the wars ended. This was because the interest rates on government debt rose during the wars, and in the 1793-1815 wars general prices also rose with the abandonment of gold convertibility. Thus in some years of the largest debt sales the "real" government deficit, measured as the change in the market value of government obligations, actually fell.

Figure 7.3 also shows the rate of return on 3% annuities and consols from 1727 to 1840. As can be seen the consol rate typically is high in the years of large borrowing, which are also generally the years of large military expenditures. This suggests to some that government borrowing to finance wars in Britain in this period crowded out private capital. However the consol rate depended not just on private market rates but also on the level of investor confidence in the governments ability to honor its obligations. Thus to measure crowding out effects we need to condsider private market rates of return.

FIGURE 3: NET RECEIPTS FROM DEBT ISSUE AND MILITARY EXPENDITURES

AS A PERCENTAGE OF GNP, 1727-1840

Notes: Military expenditures are the faint dotted line which moves in generally close relationship to the government deficit.
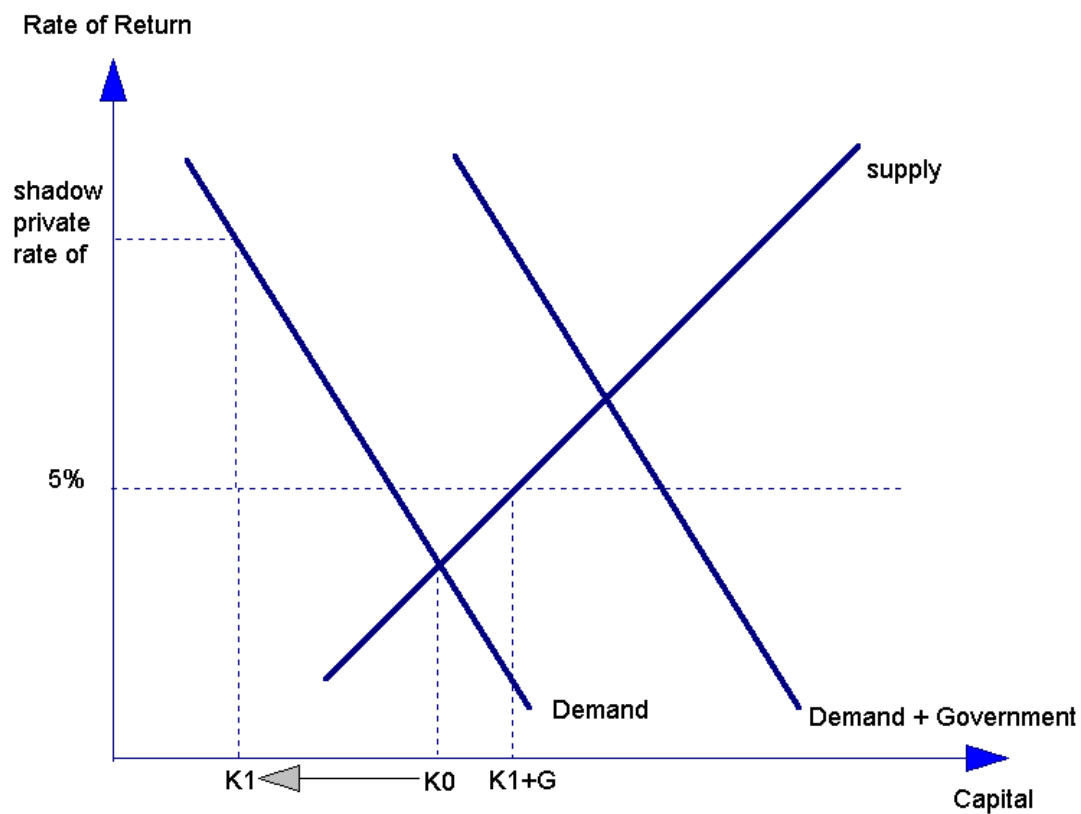
7.2 THE EFFECTS OF THE WARS AND GOVERNMENT DEBT: THE DEBATE

Jeffrey Williamson and others have argued that the large government debt of the French war years must have "crowded out" a very large amount of private investment thus slowing British growth in the early Industrial Revolution. Suppose we conceive consumers as holding a stock of capital in order to smooth their lifetime consumption. The wars were largely financed by borrowing. If consumers did not recognize the future tax obligations stemming from this borrowing they would not desire to hold any larger total stock of capital than they were currently holding when the government issued debt. Thus the government debt would displace private capital in peoples' portfolios, and the wars would be financed by this displacement. Investment would fall as a result, not consumption. The reduction in the private capital stock would lead to an increase in all rates of return which would reduces private demands for capital, and also increase private savings. Thus the crowding out of private investment by government debt would not be one for one. This situation is shown in figure 7.4. As the government sells more bonds the demand for capital at any interest rate moves out by the amount of the government debt.

The situation in Britain at this time was complicated by the usury laws which limited the rate of return on mortgages and bonds to 5%, but did not limit the rates of return on government debt, on rent charges, or on real assets such as land. Williamson argued that this will make the crowding out effect of government debt even stronger. Government debt had a lower rate of return than private debt in Britain in the mid and late eighteenth century because it was safer and more liquid. As the stock of government debt was increased it would drive up all rates of return. But bonds and mortgages would soon hit the usury ceiling. At this point, argues Williamson, any further issue of government debt would crowd out private lending one for one. Thus the issue of large amounts of government debt might have quite modest effects on government interest rates once private rates were driven up to the usury ceiling. The effect of the usury ceiling is also shown in figure 7.4.

An example of this rationing effect is found in a letter in 1759 from Hoare's, a bank which lent much money on mortgage, to a customer,

FIGURE 7.4: CROWDING OUT WITH USURY LAWS

Notes: The usury limit is assumed to be 5%. The demand schedule on the right is the demand when the government has issued debt.

Source: See the text.

At present we do not advance Money to anyone on any security....The uncommon supply of millions and millions granted and now raised [to pay for the Seven Years War] obliges all of our Profession to be prepared for the Payments [to customers moving their money from the bank into government stock] coming on, so that instead of lending out money, we have called it in on this occasion (Brewer(1989), pp. 202-3).

If the crowding out was approximately one for one as Williamson argues then at the maximum of the debt relative to GNP in the 1820s, when government debt averaged a value of 2.3 times GNP, output would have been depressed by up to 23% as a result of crowding out.[1] Williamson notes in particular that, "Crowding out seems to have seriously constrained residential housing investment in the cities...rents and/or urban disamenities rise" (Williamson (1987), p. 287).

An implication of Williamson's argument that usury ceilings would produce almost one for one crowding out is that the shadow rate of return on capital in the private economy would rise sharply. The usury ceiling limits severely any inducement for new saving. Thus most of the accommodation to the government debt demands has to come through displacement of private capital. There is thus rationing at the usury rate. But the rationing means that the capital stock will yield a high rate of return to the owners. Thus rates of return not limited by usury laws have to rise strongly in this period.

Consider, for example, the housing market. Williamson's idea is that the supply of capital to this market through private mortgages would dry up since that capital would be diverted to government debt. The reduced supply of housing would have to be rationed among housing demanders by rents increasing.[2] But housing prices would not increase proportionally with the rise in rents. If the price of old homes rose significantly above the cost of supplying new ones then there would be nothing to stop existing owners from selling their housing stock to finance the construction of new houses, and hence reaping great profits. They would keep selling till the price of the old housing was driven down to its replacement cost. Thus crowding out in the

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[1]Assuming that returns to capital were 30% of GNP, and that the marginal return to capital was the same as the average return.

[2] If the war expenditures were financed completely by a reduction in investment so that consumption was unaffected then the demand for housing would be unaffected by the government debt.

housing market has to take the form of an increase in the rate of return on owning housing. This in turn will change the incentives of investors. Those who would previously have lent on mortgage will now have an inducement to become direct property owners and act as landlords, or form equity partnerships with those who built and managed rental housing.

The upward movement of rates of return in the housing market means that rates of return on land ownership have to move up also. Land owners have an inducement to sell land to buy houses, or to build housing themselves, while no new mortgages will be available to buy agricultural land. Thus the price of farm land should fall and rates of return on land ownership rise. Similarly the price of rent charges should fall as capital becomes scarce, driving up rates of return on rent charges as well. The upward movement of rates of return on owning land will induce those who lent land to agricultural property owners on mortgage to become land owners, taking on the direct management of the asset. Thus the existence of the usury laws probably had less distortionary effect on the capital market than Williamson imagines. They should mainly have distorted the form of asset holding, rather than changing greatly the outcome from the free market one.

This has an important implication. We would expect the government's interest rate to be driven up substantially if it was to compete away private capital, despite the existence of usury laws. If changing the forms of asset holding was relatively costless then we would expect that normal premium that existed on holding land, houses, or rent charges compared to holding government debt in the mid seventeenth century would also hold in the period of high debt. If changing the forms of asset holding was costly then the premium on holding real assets or rent charges should increase as government debt increased. Either way the 'crowding out' argument implies that the rate of return on land, houses, and rent charges should all be increased by increases in government debt.

Williamson's conclusion that economic growth in the Industrial Revolution was slowed by "crowding out" has been criticized on a number of different grounds. Mokyr (1987) and Neal (1990) argue that Williamson overstated the size of the government debt in many years by using its face value and not its market value, and that the market value was typically much less than the face value because of higher interest rates in the years of highest debt. This paper uses the calculated market value of debt for each year. But as can be seen from figure 1 while the market

value of the debt is generally below the face value, in the years of the highest debt to GNP ratio in the 1820s this effect is largely absent. The reason there is not more divergence between the market value and face value of the debt is that the market value used here includes a number of elements normally excluded in measuring the face value of the debt - the market value of the term annuities and life annuities the government had contracted, the market value of the land tax obligations the government had sold in the years after 1799, and the short term "unfunded" borrowing of the government.

Mokyr and Neal also argue that much of the government debt was owned by foreigners and by Irish investors which would have again reduced the magnitude of crowding out. If the British government was borrowing in an international capital market, then the ratio of government debt to the world capital stock would be small even in the 1820s when the value of the debt was at its greatest. This argument that government debt would have little impact on domestic capital markets in an integrated world capital market has as a corollary the implication that in the years of the greatest increases in debt there should be corresponding increases in capital imports. These capital imports would show up as a deficit in the merchandise balance of trade.

Barro has more generally rejected the crowding out argument in general on the grounds that if people were rational and well informed they would regard government debt as presaging a heavier tax burden in future and would consequently save an extra amount equal to the debt to generate an increase in income in future to meet the anticipated tax burden. In this case the debt itself would have no impact on the level of investment or the rate of return in the private capital market.[3] This situation is called **Ricardian Equivalence** after Ricardo who first realized (and also first dismissed) this possibility. The increased military expenditures themselves, however, might drive up interest rates and reduce investment. If the war is expected to be temporary it is like bad weather hitting the economy. Available output falls, but since people expect to be richer again in future they try to borrow to smooth consumption, hence driving up interest rates. The higher interest rate will be associated with lower levels of private investment, though the size of the effect on interest rates and the capital stock is indeterminate.[4] One implication of Ricardian

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[3]The military expenditures which caused the debt would imply lower private incomes, and hence lower levels of private saving.

[4] See Barro (1987).

Equivalence, however, is that once we include measures of military expenditure the size of the government debt itself should have no effect on interest rates or on the balance of trade. The financing decision itself is unimportant.

Heim and Mirowski (1987) have argued against crowding out in this period in part on the very different grounds that capital markets were segmented so that investment and rates of return in many markets would be unaffected by the size of government debt in the financial capital markets.

7.3 RETURNS IN THE PRIVATE CAPITAL MARKET

The evidence Williamson adduces for crowding out is the rate of return offered by 3% consols, which typically rose significantly in the war periods. But the rate of return on government debt may not show the rate of return on private assets. To get better measures of private asset returns I look below at the returns from owning land and houses, the returns on private perpetuities (rent charges), and the return on bonds and mortgages (including mortgages on turnpike tolls) from 1725 to 1839 drawn principally from transactions recorded in the Charity Commission reports. The Charity Commission examined the asset holdings of charities in all parishes in England and Wales in the course of its investigation which lasted from 1818 to 1840. Often the commissioners gave details on the purchases and sales of assets such as land, tithes, houses, rent charges, mortgages, and private bonds. A rent charge was a fixed perpetual nominal obligation secured by a house or a piece of land. It could only be redeemed if the owner of the rent charge agreed to accept a capital sum for it. In the later period the most numerous observations are on private bonds and mortgage lending. Money lent on bond was generally secured only by the bond of the borrower, and was recallable at will. Money lent on mortgage was secured by land or housing, and was recallable or repayable at 6 months notice.

The bulk of charities were run by local landowners and churchwardens. Their purchases and sales of assets should consequently have reflected local capital market conditions, even if they themselves were not adjusting their portfolios in response to the sale of government debt. Further in at least some cases we can see charities adjusting their investment portfolios as the rate of return on government debt changes. Thus Sir Thomas Heathcote, Baronet and trustee of John Nowes charity in Yeovil, Somerset noted that "In January 1818, there being a considerable

balance in hand, we wished to lay it out on mortgage, in consequence of the funds being very high" (4th Report, p. 605). Similarly in 1823 the Charity School in the township of Warton in Kirkham parish in Lancashire had Charity had £400 in cash, lent out at 4.5% interest, and it is noted "It was in the funds but it was sold out to an advantage" (11th Report, p. 283). When part of the church land in Cold Ashby, Northampton was sold in 1819 the money was invested in 3% consols. But "the stock was sold in 1822, in order that the money might be laid out on mortgage, and a profit made from the then advanced price of stock" (13th Report, p. 29).

Rent charges, bonds, and mortgages are nominal assets. Their real return is thus the nominal return minus the rate of inflation. i.e. if P is the price of the asset and R its current annual rent, then the real rate of return r_n for such a nominal asset is given by,

$$r_n \quad = \quad (R/P) \ - \ \pi$$

where π is the rate of inflation. For assets such as land and houses, the real rate of return is

$$r_r \ = \ (R/P) \ - \ \pi \ + \ \rho$$
$$= \ (R/P) \ + \ (\rho \ - \ \pi)$$

where ρ is the rate of growth of the assets nominal value, and $(\rho \ - \ \pi)$ is the rate of growth of the real value of the asset. The long run rate of growth of real asset values, $(\rho \ - \ \pi)$, will be close to zero. Nominal farmland rents in England increased by about 200% between 1760 and 1814, in part as a consequence of the inflation of the Napoleonic war period. But real rents increased by only about 28% which implies an average rate of growth of land values of only 0.45% per year in this interval. Thus the current rate of return on holding land is generally a good proxy for the real rate of return in the economy.

The usury restrictions in the period 1727 to 1840 applied to only bond lending and mortgages, but not to rent charges. The reported rates of return on rent charges sometimes exceed the usury limits, while those for bonds and mortgages almost never do. Thus rent charges have another attraction for looking at interest rates, in that they were not legally constrained.

Table 7.1 shows the calculated return on land and houses by quinquennia for the years 1725-1839 using this data, as well as the 5% confidence intervals around the estimates. The return on holding land and houses is derived as a weighted average of two series. The first is the gross return on land or houses derived from cases where we have both the price and the rent of a piece of land or a house. The second is the rate of return derived from estimating the ratio of
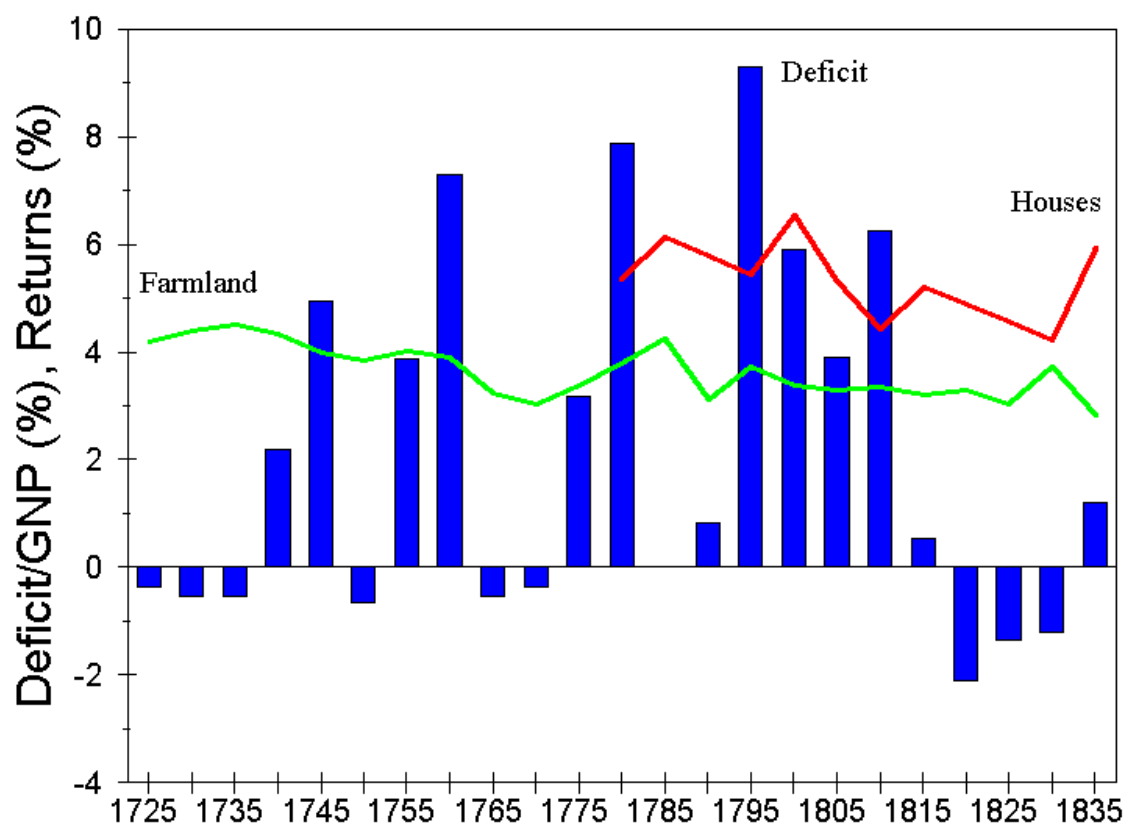
TABLE 7.1: INFORMATION ON THE RETURN ON LAND AND HOUSES 1725-1839

| Period | Land | | | Houses | | |
	Lower Bound	Estimated Return	Upper Bound	Lower Bound	Estimated Return	Upper Bound
1725-9	3.79	**4.20**	4.66	-	-	-
1730-4	4.03	**4.40**	4.82	-	-	-
1735-9	4.11	**4.51**	4.94	-	-	-
1740-4	3.90	**4.34**	4.83	-	-	-
1745-9	3.59	**4.00**	4.45	-	-	-
1750-4	3.44	**3.84**	4.28	-	-	-
1755-9	3.58	**4.01**	4.49	-	-	-
1760-4	3.42	**3.90**	4.45	-	-	-
1765-9	2.77	**3.24**	3.78	-	-	-
1770-4	2.63	**3.03**	3.49	-	-	-
1775-9	2.88	**3.36**	3.91	-	-	-
1780-4	3.32	**3.77**	4.29	3.90	**5.34**	7.32
1785-9	3.72	**4.23**	4.80	4.87	**6.12**	7.70
1790-4	2.69	**3.13**	3.63	4.40	**5.78**	7.59
1795-9	3.25	**3.71**	4.23	4.21	**5.44**	7.03
1800-4	3.08	**3.39**	3.73	5.46	**6.55**	7.87
1805-9	2.98	**3.29**	3.63	4.52	**5.31**	6.24
1810-4	3.04	**3.34**	3.68	3.53	**4.43**	5.56
1815-9	2.96	**3.21**	3.48	4.37	**5.20**	6.17
1820-4	2.99	**3.30**	3.63	4.06	**4.89**	5.88
1825-9	2.74	**3.02**	3.32	3.68	**4.55**	5.64
1830-4	3.33	**3.72**	4.15	3.35	**4.22**	5.32
1835-9	2.25	**2.82**	3.54	4.35	**5.94**	8.12

average rents to average prices in each quinquennia, controlling for land or house characteristics, and dividing the one by the other. The best estimate of returns is the weighted average of these two estimates weighting based on the standard errors of each estimate. This means that for the years before 1720 the directly estimated returns have the predominant weight in the combined series, while for the years after 1840 the indirectly estimated returns predominate. This average estimate is shown in figure 7.5. Also shown in figure 7.5 is the government deficit as a share of GNP. As can be seen there is no sign that the years of high deficits when consol rates would move up saw any increase in the rate of return on land or on houses. The failure of returns on housing to rise in line with debt or deficits is particularly interesting because the years 1800 to 1840 were ones of rapid population growth in Britain, and consequently ones where there had to be a steady expansion of the housing stock to house the additions to the population. The resources the government commanded for the wars by borrowing seemingly did not constrict the housing supply by driving down house prices relative to house rents as Williamson anticipated.

FIGURE 7.5: THE RETURN ON LAND AND HOUSES COMPARED TO THE DEFICIT, 1727-1840

Source: See the text.

7.4 NOMINAL RATES OF RETURN

We can also look at the link between debt, war expenditures and nominal rates of return, though the interpretation of any such link for real interest rates is difficult. The first set of nominal returns we have is the returns on rent charges, which were as noted above perpetuities, not limited by usury laws, secured by land or houses. Figure 7.6 shows the average return on rent charges by 5 year periods compared to the average government deficit in the same 5 year period. As with the return on land there is no perceptible effect of the size of the deficit on the rate of return on rent charges. The blip upwards in rent charge returns in 1830-4 it should be noted is based on only 2 observations.

In the case of bonds and mortgages, comparing their returns with the size of the deficit or the debt is more complicated because of the usury limit of 5% on such loans in this period. If the government borrowing crowded out such lending, then it would show up as loans mostly being made at the usury interest rate limit. To measure the effects of government borrowing in these markets I estimate the 5 year averages of returns assuming that the data is censored at the 5% upper limit. The assumption here is that there is a normal distribution of rates on bond and mortgage lending, and all the rates which would be above the usury limit are truncated to that limit. This would in part occur through the usury laws being circumvented by borrowers paying additional unrecorded considerations to secure the loan at the usury limit. To maximize the data availability I pool bond, mortgage and turnpike mortgage returns assuming they all move in the same direction but can be at different levels. The regression estimates suggest that on average returns on mortgages were .16% higher than for bonds, and returns on turnpike mortgages .54% higher than for bonds.
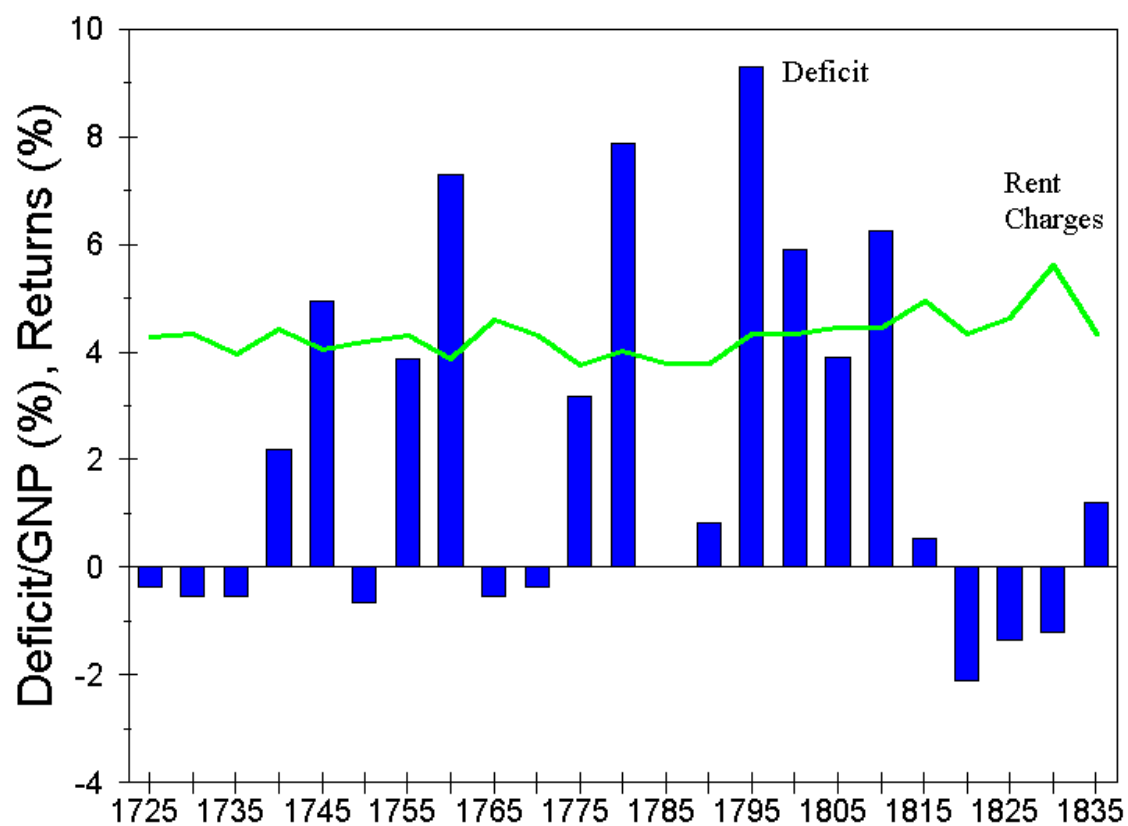
Figure 7.7 shows the movement of the average returns on these nominal assets. As can be seen the average implied rates on bonds exceeds the usury limit in many years. The rate clearly moves up in the years of substantial deficits. It also clearly is associated with the rate of return on consols, which is shown in the same figure. It also seems that the gap between the consol rate and the rate on bonds or mortgages narrows when the consol rate rises. A 1% rise in the consol rate is associated with only a .4% increase in private rates. Thus the estimated relation between the "shadow" private bond rate and the consol rate was:
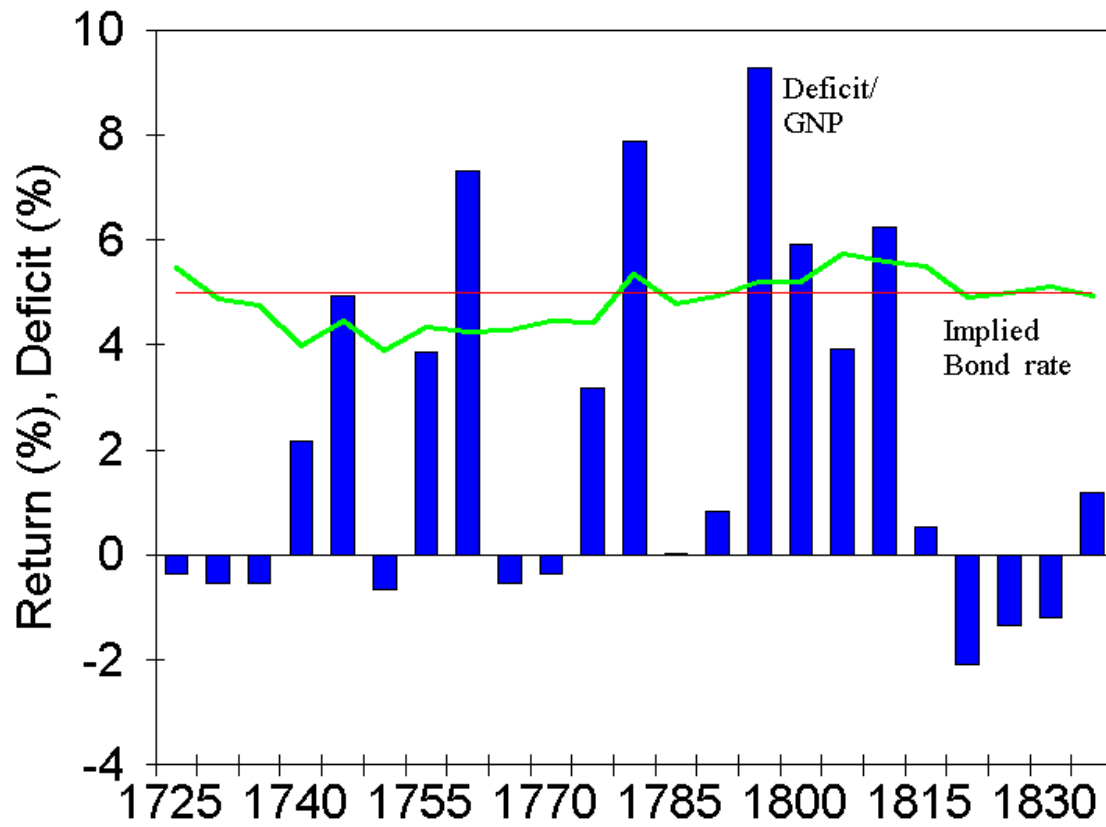
$$RET_{it} \quad = \quad -12.86 + \quad 0.0090t + \quad 0.407RET_C$$
$$(.0012) \qquad (.050)$$

where RET_{it} is the individual return on investments in bonds, mortgages and turnpike mortgages, t is the year, and RET_C is the return on 3% consols (or annuities).
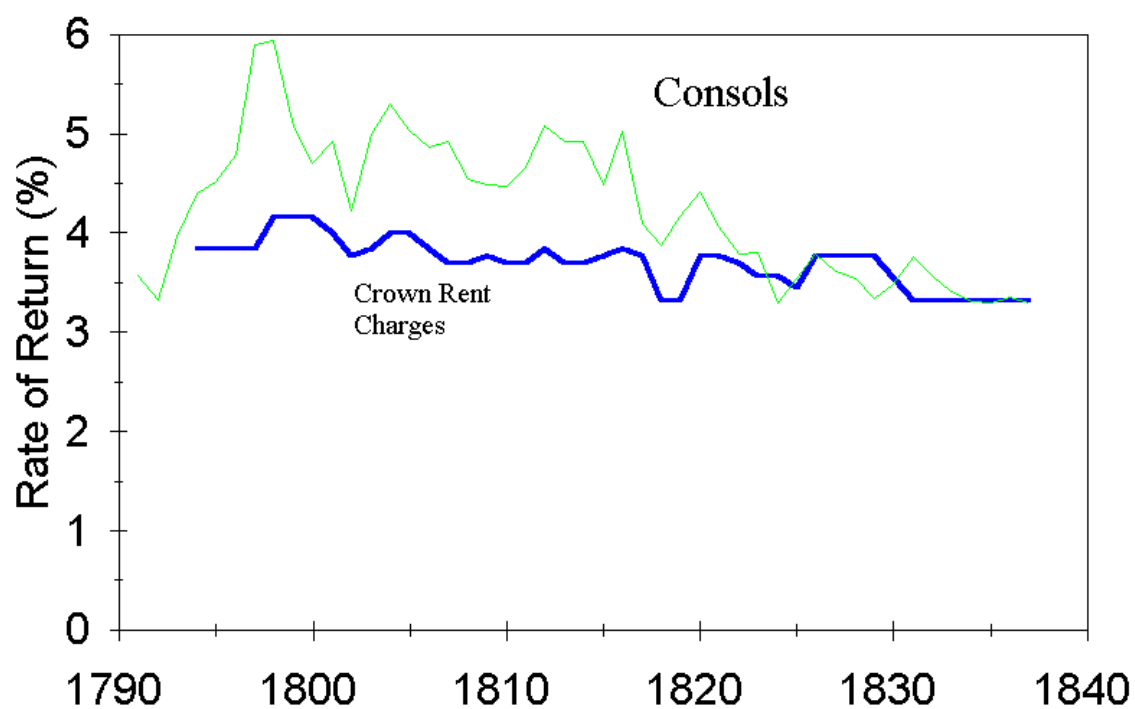
Overall when we look at the private interest rates in the economy we find no evidence that the huge increase in the stock of debt from 1727 to 1824 crowded out any private investment. In the war years when government debt sales were high the only rates to seemingly rise were the implied rates on private bonds and mortgages. But these implied rates rose less than the consol rate, and would be associated with modest reductions in the capital stock. It is, however, puzzling that these rates were linked with the consol rate while the return on land, houses and rent charges showed no connection. For the rate of return on mortgages should be related to the rate of return on land, for example. Perhaps it was the case that these investments were those most easily substituted for consols, and land, houses and rent charges were more distinct?

FIGURE 7.7: BOND AND MORTGAGE RETURNS AND THE DEFICIT

There is one other nominal rate series that we can get for the period 1794-1840. This is the rate of interest charged by the Crown Commissioners to those who bought back rent charges that were owned by the crown. The crown commissioners in valuing these rent charges for sale would establish a ratio between the annual charge and the purchase price (the number of years purchase in the parlance of the time), whose inverse tells us the rate of return the purchasers received on their investment. This unlike consols was an absolutely safe asset, which was not subject to any potential renegotiation or default by the crown. Figure 7.8 shows these interest rates compared to consol interest rates. As can be seen while these rates broadly follow the consol rates, for the war period 1794-1815 the consol rate is generally 1-2% higher, but this premium disappears by the 1820s when the two rates are very similar. Why would people who could invest a sum of money in consols accept a much lower rate by investing it to repurchase a rent charge, but only in the years before 1820? Part of the reason may be a perception of greater security in the case of the redeemed rent charge. Thus again the rise in consol rates in the war years may owe as much to default risks on government debt as to any general upward movement of returns in the private capital market.

FIGURE 7.8: THE RETURN ON CONSOLS AND CROWN RENT CHARGES, 1790-1840
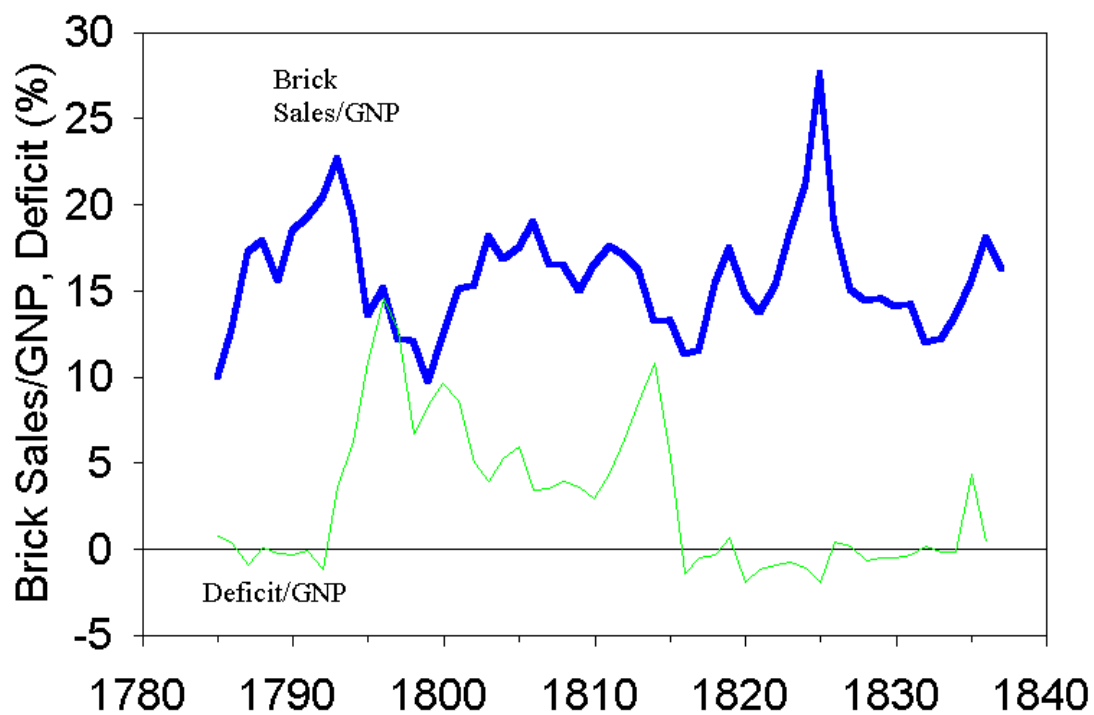
Source: See the text.

7.5 BRICK SALES

Did changes in the value of the stock of government debt or sales of government debt have any discernible effect on investment activity in the economy? The modest effects, if any, of government debt and military spending on real rates of return suggests that there should be no connection between debt and investment.

We have a relative good index of investment in structures in Britain from 1785 on, in the form of statistics on brick production. I thus construct an index of brick production relative to real GNP. This index of bricks produced per unit of real GNP is set at 10 in 1785. Did the size of the government debt have any effect on the pace of housing construction?

Figure 7.9 shows the ratio of brick output to GNP stays roughly constant from 1785 to 1840, with seemingly random fluctuations around the given mean, despite the much greater public debt in the period after 1820. The figure also shows net sales of debt as a percentage of GNP in this period. The graph suggests some possible link between brick output and debt sales, but a very modest one. Regression analysis suggests that an issue of debt equal to 10% of GNP in any year would reduce brick production by 9%, though the effect is not statistically significant. But since normal investment activity is estimated to be not much more than 10% of GNP at this time these estimates imply that debt crowded out very little private construction activity.

FIGURE 7.9: BRICK PRODUCTION AND DEBT SALES, 1785-1840

Notes: Brick production is measured as an index of production relative to GNP set at 10 in 1785.

Source: See text.

7.6 THE OPERATION OF THE CAPITAL MARKET

The general finding of the empirical estimation above is that the level of government debt in the years 1727 to 1840 had little perceptible effect on real rates of return in the British economy, and war expenditures had significant effects only on some nominal rates of return. Neither debt nor war expenditures had any impact on brick production. Another illustration of the small impact of government debt comes if we consider the net receipts of the government from borrowing in each year - that is, the sales of debt minus the buying back of government debt. The finding of little evidence of crowding out in response either to the size of the debt or sales of government debt implies that consumption had to drop by close to 15% of GNP in some years such as 1796 through the sale of debt. The percentage drop in private consumption would be even greater because of the normal burdens of investment and taxation.

There seem to be three possible explanations of these findings.

1. The issuance of government debt brought forth an equivalent amount of private saving in anticipation of future taxes, through Ricardian Equivalence, as Barro would argue.

2. The British government debt was substantially financed from abroad. This is the argument of Mokyr (1987) and Neal (1990, 1991).

3. The capital markets of the period before 1840 were segmented so that crowding out did take place but not in the capital markets for which we have rates of return. Heim and Mirowski (1987, 1991) argue strongly that in this period there was a segmented capital market, and Buchinsky and Polak (1993) provide evidence for regional segmentation of the capital market.

4. The capital markets were segmented so that many people were constrained to save less than they desired from a lack of investment opportunities. The creation of a large body of government debt brought forth this saving by providing an appropriate vehicle.

The first argument, that of Barro, imposes a very strong knowledge requirement on consumers, as well as various requirements on intergenerational altruism. How would a person in Britain in the period 1727-1840 know how much to save in anticipation of their share of the tax burden? The first population census was only in 1801, so the debt burden per capita would not even be very well known before this date. The size of the government debt would itself be known

only by the most financially sophisticated, since it was composed of many elements which would have to be valued in different ways to arrive at its real value. There were books and pamphlets written from the late eighteenth century on discussing and debating the issue of the debt, such as J. J. Grellier, The History of the National Debt from the Revolution in 1688 to the Beginning of 1800, published in 1810. But even this 420 page volume gives only the nominal value of the debt, and has no mention of the size of debt relative to GNP. It is intended to alert the reader to the alarming size of the national debt, but what the reader is supposed to do with the knowledge contained therein is very unclear. Suppose you have an income of £1000 in 1810, and learn that the debt in 1800 (the last date given in the book) was £491 million. What does that imply about the extra saving you should undertake to cover the anticipated tax payments this debt implies?

Neal argues that the debt, particularly in the years of the Revolutionary and Napoleonic Wars, was financed in part by capital from France, the Netherlands, and Germany fleeing the confiscatory appetites of the French Army and administration. The amount of foreign debt holding he identifies from the Bank of England Accounts is however, pitiably small in relation to the overall debt in the years 1801-1816: £14-18 million in nominal terms compared to a total debt of around £600 million, or less than 3% (Neal(1991), pp. 68-72). Also Neal focuses on the War Years, while we see above that the market value of government debt relative to GNP did not rise to its highest levels till the deflation and decline of the rate of return on consols after the end of the war in 1815. If government debt was to have little influence on rates of return on capital there had to be massive imports of capital in the years 1816 to 1824, years Neal identifies with the repatriation of Continental capital.

Neal could argue that the foreign capital was invested in other areas of the British economy. But what other asset would foreigners invest in? Land and houses, the two major assets both required supervision, and so should be more attractive to local investors than to foreigners. An investor in Amsterdam could easily know at any date the value of his holdings of British government debt, and could easily trade these holdings to another investor in Amsterdam. But the situation was much more difficult with respect to land. An agent would have to be hired both to purchase it and to rent it. Liquidation of the holding would typically require a sale in England, since an investor in Amersterdam would have no means of reliably ascertaining the value of the land. Charities who invested in land overwhelmingly preferred to invest in local land. When they

were left land at a distance the costs of journeys to inspect the property were large, so that only large estates could practically be held at a distance. If foreigners were investing in Britain they should be investing in government debt.
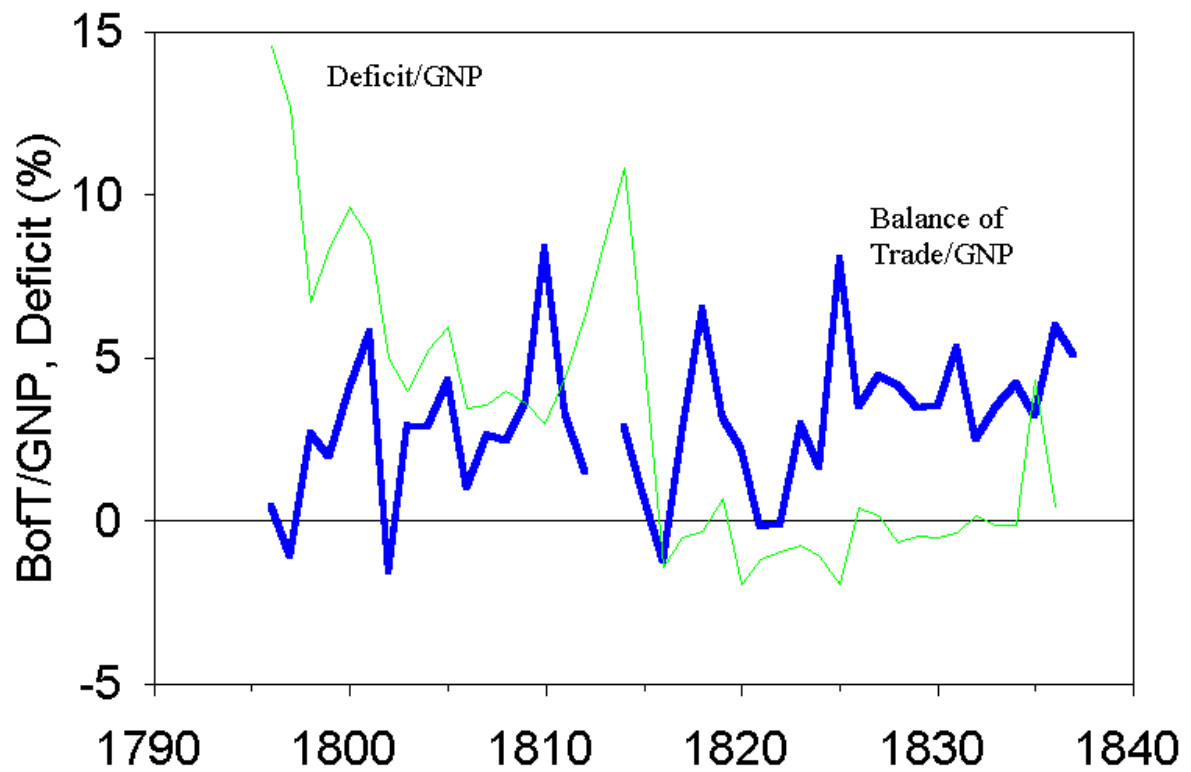
If capital was flowing in to finance the British government deficit, then it should show up as a deficit in the merchandise balance of trade. Figure 7.10 shows the merchandise balance of trade for the United Kingdom for the years 1796 to 1840 relative to GNP. As can be seen there was a persistent merchandise trade deficit between 1796 and 1840. The figure also shows net sales of debt relative to GNP in the same years. But we can find no sign that this deficit was responsive to either changes in the real value of the government debt relative to GNP or sales of debt by the government. Thus, for example a regression of BOFT, the merchandise balance of trade as a percentage of GNP on CASH, the receipts from borrowing, yields the estimate,

$$BOFT \quad = \quad -3.3 \quad + \quad .121 CASH$$
$$(0.4) \qquad (.08)$$

$$R^2 \ = \ .053$$
$$n \ = \ 40$$

In years where there were large sales of debt there was if anything a smaller merchandise trade deficit, which is the opposite of what we would expect if foreigners were buying much of the debt. If the deficit was being largely financed from abroad the balance of trade should move one to one in line with changes in the debt. Thus there is little evidence of foreign financing of the deficit.

FIGURE 7.10: THE MERCHANDISE BALANCE OF TRADE AND DEBT SALES, 1796-1840

Source: See text.

Could it be that the capital market was segmented so that the rates of return I observe cover only a part of the capital market, a part which was isolated from the market in government debt? Heim and Mirowski (1991) argue, for example, that "a rise in the London consol rate would not have a major impact on industrial investment" because firms mainly used retained earnings and credit from suppliers and workers as a source of capital. This seems quite plausible. Could crowding out have occurred in the other elements of the capital market which my rates of return do not cover? The problem is that there are no other sectors of the capital market which are plausibly linked to the government debt market which are at all large. As noted in 1820 government debt would be 23% of private wealth. My data covers the land, farms, housing, and road transport sectors which together would constitute another 57% of private wealth. This leaves only about 20% of private wealth where returns are not observed. But Feinstein estimates that 14% of the remaining wealth would be stocks and work in progress, which we would think is the type of capital least likely to be integrated with the government debt market. Another 2% would be manufacturing and mining fixed capital, again unlikely to be integrated with government debt. This leaves about 4% of private wealth in 1820 as the unobserved sector that might be experiencing crowding out from government debt. Clearly the huge stock of government debt was not financed by crowding out in a segment of the capital market I did not observe.

So it has to be the case that the sale of government debt brought forth more domestic saving, though by a mechanism other than the anticipation of future taxes. We do see in the records of the Charity Commission that in the period before the wide diffusion of government debt finding a safe investment vehicle for funds was difficult. In country parishes there might be a lapse of 10, 20 or even more years before money left to be invested in land would be so invested, presumably because of the difficulty of finding a seller of the appropriate sized parcel in the vicinity of the parish. In the interim it would be lent to the parish, to the vicar, or to local farmers, merchants, or gentry. But by the 1730s or 1740s government debt was widely available, at least in the large population concentrations around London, so any further issues of government debt thereafter should not have been able to induce a mobilization of savings. A reflection of this is the fact that in the period 1727 to 1840 the bulk of reports of mortgage and bond contracts coming from the charity commission reports are drawn from those counties remote from London where

government debt was issued. 21% of the pages of the Reports are devoted to London and the 6 counties adjacent to it or Middlesex, yet these counties produce only 7% of the bond and mortgage reports in this period.

If government debt was in large part bought using idle stores of cash which could find no productive investment then the sale of government debt would effectively
induce inflation by issuing debt by increasing the velocity of money. There is little evidence in the Charity Commission reports, however, of idle cash balances being kept on any large scale, even though we would expect charities to be more lax on this score than private individuals. Money that could not find any safe long term investment was generally lent out to one of the trustees of the charity at interest or to the local vicar or a local farmer.

One force that could induce more saving would be the calling in of money lent on bond and on mortgage when the government floated new debt. Those who had borrowed using these instruments to finance the purchase of houses and land, and to provide working capital for trade and manufacture could in principle have sold the assets that secured the mortgage or bond in response to the credit rationing created by the usury laws. But if they had a strong aversion to selling assets (perhaps because liquidation at short notice is costly) their response instead might be to sharply curtail consumption in order to pay back their bonds or mortgages. In this case the credit crunch created by the sale of government debt might lead to induced saving as a response. Even this argument should produce only a temporary boost in savings, not the long run effects we find above. It is also not clear if the amounts of bond and mortgage lending would be large enough, and the credit rationing effect anywhere near strong enough, even with such an effect, to allow the amount saved from year to year to increase by over 10% of GNP.

The failure of private interest rates to increase in line with government debt in years 1727-1840 is profoundly puzzling. In particular in a number of periods the government was able to borrow between 5 and 10% of GNP for five years or more while having little effect on real private rates of return. This implies that the capital market in this period operated in a way of which we have little comprehension.

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