The Dynamics of Consumption and Investment in the Victorian Economy

Nicholas H. Dimsdale, Oxford University.

Abstract

In the late 19th century Britain accumulated substantial overseas assets. It has been generally accepted that overseas investment displaced domestic investment. This paper questions this assumption by pointing to the rise in the savings ratio, which enabled high capital exports to be combined without reducing the rate of domestic investment. The determinants of consumption and savings are examined and it is argued that the rise in savings can be attributed to the fall in the dependency ratio. This phenomenon is familiar from modern studies of economic development and also from US experience in the 19th century. The determinants of business investment are analysed and the results indicate the importance of both real profits and accelerator effects for investment, but there is no evidence of crowding out of home investment by overseas issues. House building then is examined and demographic factors are found to be important. Crowding out effects may have been present ,but this is not the only hypothesis, which is consistent with the data.The collapse in house building could also be attributed to the massive boom and bust in the property market in the period 1890-1914.

The Dynamics of Consumption and Investment in the Victorian Economy

Nicholas H.Dimsdale , Oxford University

Introduction

Britain accumulated overseas assets at a rapid rate from the third quarter of the nineteenth century until the outbreak of the First World War. According to Matthews, Feinstein and Odling Smee (1982), British overseas assets rose by 390 per cent from 1873 to 1913 at constant prices , while domestic assets increased by only 120 % [1]. However, they also show that the rate of growth of the domestic capital stock was at 2.0 percent per annum from 1873-1914, which was the same rate achieved in the previous phase from 1956-1873.[2] Thus the growth rate of the domestic capital stock after 1870 does not appear to have been reduced by the high level of capital exports. Contrary to this ,it has been argued by Cairncross (1953) that overseas investment was at the expense of home investment The inverse pattern of home versus foreign investment has been emphasized by Ford (1962), who pointed to an inverse cycle with a periodicity longer than the 7 year trade cycle. As imilar point was made by Matthews (1959).

A further element in the debate has been the argument that distortions in the capital market may have led to an excessive concentration of investment on overseas issues with adverse effects on domestic capital formation. This argument has been contested by McCloskey (1971)[3] and Edelstein (1982).

A feature of the controversy over home versus foreign investment has been the lack of attention given to the determinants of home savings. If the savings ratio were constant the rapid growth of overseas assets would have to take place at the expense of home investment, but this need not apply if the savings ratio were rising. It is the aim of the paper to examine the factors explaining the course of domestic savings. This is important in itself but it is also motivated by the long running controversy over foreign investment. The question of the determinants of domestic savings has been raised most recently by Edelstein (2004).He observes that demographic change may have contributed to the rise in domestic savings, but does not go further than this. In his empirical work he estimates savings functions which include no demographic variable, Edelstein (1982). These equations do not test the hypothesis which is of interest to him.[4]

This paper explores the hypothesis that demographic change , namely a fall in the average size of families, contributed to a rise in the savings ratio in the period 1870-1913. The approach can be viewed

[1] Matthews et al. (1982) p129.

[2] Matthews et al. p133.

[3] The main papers in this controversy are reprinted in McCloskey (1981)

[4] Edelstein(1977),(1982).

as an attempt to evaluate the plausible hypothesis which Edelstein has proposed .Studies of the US economy in the nineteenth century , such as Davis and Gallman (1977) and Lewes(1983) ,suggest that falling fertility was associated with a rising savings ratio. There is also evidence from development economics that a fall in the dependency ratio due to a decline in the proportion of young people in the population is associated with a rise in the savings ratio. For the UK this issue is of wider significance than macroeconomic history. It is relevant to assessing the social and economic effects of demographic trends. While the reasons for the decline in fertility has been closely examined by demographic historians, as discussed in Woods (1996), less attention has been given to its economic effects.

A consumption function is estimated based on the consumption to income ratio, the complement of the savings ratio. The estimation is carried out using the error correction approach, first proposed by Davidson et al (1978), with a view to examining the impact on consumption of a reduction in the proportion of young people in the population. This reduction in the dependency ratio was a consequence of the steep the decline in fertility after 1870.The proportion of the population aged 14 or less declined from 36% in 1871 to 31% in 1911, while Baines and Woods(2004) show that the total fertility rate fell from 5 children per family in 1871 to less than 3 by 1911.

The rise in the British savings ratio during the late nineteenth century may have been sufficient to finance the capital outflow, which took place in this period ,without impeding home investment. In the second part of the paper we explore the determinants of home investment, while recognizing the difficulties of estimating a satisfactory investment function. The aim is to test whether there is evidence that overseas issues displaced home investment . Alternatively, home investment may have been driven largely by its own dynamic as suggested by Habbakuk (1962) in relation to domestic house building.

Our investigation of investment starts with a review of previous work in this area. The main recent contribution has been Eichengreen (1984), which emphasizes the influence of stock market prices on investment. We are sympathetic to Eichengreen's general approach ,but have reservations about some aspects of the methodology which he uses. He sets out to test a particular model and imposes restrictions to bring the model into reasonable accord with the data. By contrast we use a data based approach which is more in accord with modern time series analysis. Eichengreen estimates a single equation which aggregates investment in plant and machinery with investment in buildings and works. This is not likely to be satisfactory, since inspection of the data suggests that the course of investment in plant and machinery differs substantially from that for building and works during the sample period. Consequently it is preferable to estimate separate equations for these two major components of fixed industrial investment. Having estimated equations for the two major components of industrial investment, the hypothesis that overseas capital issues displaced domestic investment can be tested.

This paper does not undertake a full analysis of building activity in the Victorian economy , but it includes an equation for investment in house building. This is necessary because foreign investment may have displaced house building rather than investment in industry. Any attempt to explain investment in house building necessarily involves testing the empirical validity of the views of a number of economic historians who have written on this topic. These include contributors, such as Cairncross (1953), BrinleyThomas (1954), Parry Lewis (1965), Saul (1962) and Habbakuk (1962).[5] We have made use of an insight in Feinstein, cited by Parry Lewis [6]. This suggests the use of a demographic variable to explain house building, but the insight has yet to be tested empirically. It turns out that ,as Feinstein suggested, the quinquennial increase in the family forming group aged 20-44 is a powerful variable for explaining house building. The presence of a demographic variable in the housing equation means that we are in a position to be able to assess the impact of emigration on housing, a relationship which has been emphasized by both Cairncross and Brinley Thomas, while being questioned by Habbakuk and Saul.

There was a major boom in house building in the 1890s, which was followed by a severe contraction in the Edwardian period. Higher emigration may have reduced the demand for housing, while the buoyancy of capital exports at this time may have diverted funding away from housing. An additional factor was the excessive stock of houses ,due to previous overbuilding, which discouraged investment in the housing sector.

Table 1 The Equations to be estimated:

1. Consumption Function

   C/Y =f1 (KIDR, PERUN, CBR)

   C ,consumption, Y ,GNP net of taxes, KIDR ,Proportion of the population aged 14 or less, PERUN, Unemployment %, CBR, Commercial bill rate%.

2. Fixed Investment in Plant and Machinery

   PINV=f2 (GDPO, DGDPO, RSP, CBR , LR)

   PINV, Investment in plant and machinery, GDPO, GDP Output, RSP, Industrial share price index/GDP deflator, CBR ,Commercial bill rate %, LR, Long term interest rate%.

3. Investment in Buildings and Works

   WINV=f3 (RSP, CBR, LR)

   WINV, Investment in buildings and works, RSP,Industrial Share Price Index/GDP Deflator, CBR, Commercial bill rate %. LR, Long term Interest rate %.

[5] For a concise summary of this debate among economic historians, see Richardson and Aldcroft (1968)pp27-32.

[6] Parry Lewis(1965) p169.

4. Inventory Investment

INV=f4(GDPO,DGDPO, CBR,RSP)

INV, Investment in inventories, GDPO, GDP output , RSP, Industrial share price index/ GDP deflator, CBR, Commercial bill rate %

5. Housing Investment

HINV=f5(DPOPQ,HR,CBR,RCAPEX,HCAP,GDPO)

HINV, Investment in housing, DPOPQ, Average change in size of population aged 20-40 in 5 year period, HR, Return on investment in housing ,RCAPEX, Overseas capital Issues/GDP deflator, HCAP, Housing capital stock, GDPO, GDP output.

The Determinants of Consumption

There has been little research on the factors governing consumption in the late nineteenth century[7]. The most recent discussion is in Edelstein (2004). He notes the possibility that the rise in the savings ratio may have been related to the reduction in the fertility which occurred after 1870. This is a hypothesis which can be tested. In this paper we estimate an error correction consumption function for the post 1870 period. Our basic equation relates the average propensity to consume to the proportion of the population aged 14 or less, which is interpolated from Census data [8]. It is suggested that as the proportion of young people in the population declined, there was more scope for families to invest in education of their children and to build up their savings for retirement. This argument applies more readily to the middle class rather than to the working class, whose savings behaviour had more short term objectives as shown in Johnson (1985). The hypothesis proposed is that the reduction in fertility caused the propensity to consume to decline and the savings ratio to rise from 1870 to 1913 The average propensity to consume (CER) and the proportion of the population aged 14 or less (KIDR) are shown in Chart 2. It will be seen that there was a declining trend in the proportion of young people in the population,or dependency ratio, and also a decline in the propensity to consume(APC), particularly after 1875. The average propensity consume falls from 0.88 in 1871 to 0.83 in 1911. The APC is defined

[7] Consumption/savings functions are estimated in Tinbergen (1956), Edelstein (1977) (1982) and Blake(1992).

[8] Feinstein (1972).

here as the ratio of consumer spending to GNP excluding direct and indirect taxes and its complement is one measure of the savings ratio. The association between APC and the dependency ratio could be spurious, since collinear trending variables may not be causally related. We guard against possibility by testing the consumption function for cointegration [9]and also by testing for Granger Causality running from the proportion of young people to the propensity to consume. The equation also includes the unemployment rate, since unemployment might be expected to raise precautionary saving. We also test whether the interest rate ,measured by the commercial Bill rate, had an effect on savings decisions as postulated in Classical economic theory.

The result of estimating the consumption function are shown in Table 2. Equation 1 shows that the average propensity to consume is positively relative to the proportion of the population aged 16 or less. The error correction term is statistically significant and its coefficient of -0.24 is relatively large, indicating that the speed of adjustment is rapid. As expected ,the percentage of unemployment and the change in unemployment enter with negative signs, confirming that rising unemployment dampened consumer spending. The short term interest rate enters with a negative sign as might be expected , although the size of the impact on consumer spending is relatively small. The long run solution for the consumption to income ratio shows that the impact of the demographic variable on consumption is substantial. It can be confirmed that the main variables of the model are cointegrated with one cointegrating vector. In addition there is Granger Causality[10] between the average propensity to consume and the demographic variable with causation running from the dependency ratio to the average propensity to consume.

These results point to the decline in the proportion of young people having a major effect on the savings ratio as suggested by Edelstein (2004). It would appear that demographic change had important economic effects via the decline in fertility. The reasons for that decline have long been debated by economic historians. A balanced assessment of the issues involved has been given by Woods (1987), (1996) and Anderson (1990). Three general hypotheses have been advanced[11]. The first explanation is demographic. Families reduced the number of children conceived as the probability of a child surviving to adulthood improved. The hypothesis links the decline in fertility to the declining trend in child mortality and the later fall in infant mortality. The second explanation is economic. It focuses on the increasing costs of raising children. The costs of providing private education were rising which led the middle classes to opt for a smaller number of higher quality children. For the working class, larger families became more costly as the age at which children could enter the labour force was raised by the introduction of compulsory state education. This argument supposes that the substitution effect due to the increasing cost of having children was stronger than the income effect . The third explanation is sociological. It suggests that the growth of secularization and decline in religion made decisions to

[9] Granger(1987),Johansen(1988)(1995) develop cointegration analysis.

[10] Granger(1969).

[11] These explanations are examined in Woods (1987).

control family size more acceptable. The growing influence of women in family decision taking may also have strengthened the pressure for limiting family size. This effect has been observed in developing countries and may well have been relevant to Victorian Britain. It is generally agreed that the introduction of contraceptives was not an important factor in explaining the fall in fertility. Contraceptives were expensive before 1914 and only became affordable for the majority of families in the interwar period. It should also be emphasized that this trend in fertility was a European phenomenon and was not confined to Great Britain. In their concise survey Woods and Baines (2004) conclude that we do not know which of the three hypotheses is correct. The results reported in this paper suggest that the consequences of the fertility decline need to be examined, even though the cause of the demographic change is not known.

The relationship between fertility and the savings behaviour has been widely discussed in the literature on economic development.[12] The view that high fertility is associated with a low savings ratio was advanced by Leff (1969) and has been subject to intense scrutiny. This literature is reviewed and evaluated in Mason(1998), who supports the basic hypothesis with qualifications about growth rate effects. In particular, it has been observed that in modern Asian economies the savings ratio has risen rapidly as fertility has declined.

In the United States during the nineteenth century, Gallman and Davis (1978) argue that the reduction in the proportion of young people in the population or dependency ratio contributed to a rise in the savings ratio. A formal model based on the life cycle theory of consumption of Ando and Modigliani (1963) , which includes the cost of raising children, has been presented by Lewes(1983). In Lewes' model investing in children is treated as an alternative to saving. He shows that a rise in fertility in the United States would have resulted in a substantial fall in the savings ratio in 1900.

A more general approach to this issue has been adopted by Taylor and Williamson (1994).They provide evidence that in the period 1870-1914 capital importing countries, such as Argentina, Australia and Canada ,had high dependency ratios. They argue that capital exporting countries, such as the UK and other European economies , had older populations and higher savings ratios, which enabled them to export capital. In their empirical work Taylor and Williamson concentrates on the capital importing countries and emphasize the intergenerational transfer involved in the pattern of foreign investment before 1914. The implications for UK savings resulting from the consumption function estimated here are highly relevant for their analysis. Their thesis can only be sustained if the reduced dependency ratio in the UK resulted in a rise in the savings ratio, so facilitating capital exports. The consumption function which has been estimated here is consistent with their hypothesis as well as the insights of Edelstein.

The rise in the UK savings ratio is relevant to the debate about the effects of British overseas investment on domestic investment. If there was a sufficient increase in the savings ratio, this could provide funding for higher capital exports without reducing the pace of domestic investment. Chart 1 shows the ratio of domestic capital formation to GDP expenditure at factor cost as well as the ratio of the real volume of

[12] This is discussed in detail by Taylor and Williamson (1994).

overseas investment to GDP. Real overseas investment is derived from the surplus on the current account of the balance of payments deflated by the GDP deflator. Inspection of Chart 1 suggests that the ratio of home investment to GDP was fairly stable over the full period 1855-1913, while the ratio of real overseas investment to GDP shows signs of a rising trend. The series are tested for stationarity using the Augmented Dickey Fuller (ADF) test.[13] The test indicates that the home investment ratio is stationary with an ADF statistic of -2.27. By contrast the ratio of the real current account surplus to GDP is not stationary .It has an ADF statistic of -1.14 , which rejects stationarity. The sum of ratio of home investment to GDP and the ratio of the real current account surplus gives the amount savings required to finance home and foreign investment. It therefore provides an alternative measure of the savings ratio to that previously discussed in relation to the consumption function. This overall ratio of savings to GDP follows a fluctuating path rising from about 10% in 1855-60 to about 15% in 1913-13. The rise in the ratio is interrupted by a massive spike in the savings ratio in the early 1870s after which there is a relapse. An ADF test confirms that the combined series for overall savings is non stationary.

These results suggests that the consequences of a rising savings ratio need to be taken into account in assessing the debate over home versus overseas investment. The existing literature concentrates on the pronounced inverse relationship between home and overseas investment , which is feature of Chart 1, but ignores the rise in the savings ratio. The increased savings ratio raises doubts about home investment being displaced by overseas investment . It explains the stability in the rate of growth of the domestic capital stock reported by Matthews et al. (1982), despite the rapid rate of accumulation of overseas assets. The stationarity of the home investment ratio is consistent with their findings. The rapid growth of foreign assets, which they report ,is consistent with the ratio of the real current account surplus to GDP being non stationary. In the next part of the paper the impact of foreign investment on domestic investment is tested. The issue is explored by estimating equations for the main components of investment and then testing whether home investment was being displaced by overseas capital issues.

Industrial Investment

The impact of overseas investment is tested by first estimating equations for domestic investment. We then test whether investment was affected by the level of new overseas issues. [14] This requires that a satisfactory equation is estimated for each of the main components of investment. There are few recent studies in this area but an exception is Eichengreen (1982)(1984).[15] He seeks to explain British home investment relying upon a capital market approach. He uses a rational expectations version of the Tobin q model of investment , Tobin(1979),as extended by Abel (1980)[16] . The estimation procedure used by

[13] See Enders (2004) for a discussion of the ADF test.

[14] Investment data are from Feinstein (1988).

[15] For early studies of investment, see Tinbergen (1939)(1956), Pezmazoglu, (1951).

[16] The rational expectations model of investment is discussed in Begg (1982).

Eichengreen requires the imposition of a restrictions on the estimated statistical model to bring it into line with the requirements of the Tobin's model of investment. The estimated equations exhibit serial correlation which indicates mis-specification. This is 'remedied 'by using a Cochrane Orcutt transformation. The approach used here is quite different .We start with an Auto Regressive Distributed Lag (ADL) model. This is simplified to obtain a parsimonious equation ,which is consistent with the data set. The approach used here is similar to that used by Bean(1981). It has also been influenced by more recent work on investment, such as Ellis and Price (2001). The starting point is the plot of the data which is shown in Chart 4. This shows the different course of investment in plant and machinery (PINVF) compared with investment in buildings and works (WINVF). The former was influenced by both movements in GDP and in the real value of the industrial share price index, whereas the latter was more strongly affected by the behaviour of real industrial share prices. This suggests that it would be useful to estimate separate equations for these two components of fixed investment rather than to combine them into a single aggregate, which is the procedure followed by Eichengreen (1982), (1983).

The basic hypothesis is that investment depends on the level of output, the level of real share prices and the cost of capital. The indicator of output is (GDPO) . Real share prices (RSP) are a measure of the expected profitability of investment. The share price series used is the Smith and Horne Index of Industrial Share Prices (1934),which is deflated by the GDP deflator. While it is not a good representation of shares quoted on the London Stock Exchange, it provides a good indication of the prices of industrial securities , which are most relevant to industrial investment. Grossman (2001) has provided a general index of shares quoted on the London Stock exchange(RSPG), which is much wider than the Smith and Horne Index ,but it is less suitable for explaining the prices of British industrial securities with which we are concerned.[17] The two series for real share prices shown in Chart 5.If the Grossman index replaces the Smith and Horne index in the investment equations the ability of real share prices to explain the course of investment is greatly reduced as an comparison of the series shown in Chart 5 suggests. There are problems with the Smith and Horne index, such as an inadequate weighting procedure and a restricted sample size, which could be improved by further work. At present, it is the most suitable index for our purposes, even though it suffers from shortcomings. Investment also depended on the cost of capital, which is measured by the commercial bill rate or the yield on Consols.

The results of the estimation of the equations for fixed industrial investment are shown in Tables 3 and 4. It will be seen from Equations 2and 3 that investment in plant and machinery (PINV) is strongly influenced by both the change in output and the level of output. This points to the importance of accelerator effects in this component of investment. In addition real industrial share prices, that is the share price index deflated by the GDP deflator, had a powerful effect on investment with a lag of two years. The importance of the two year lag comes out strongly. The lag of investment behind the rapid movement of share prices is feature of rational expectations models of investment , such as Begg

[17] Home companies were about 19% of the total value of securities quoted on the London market in 1913,Edelstein (1982) p48.

(1982)[18]. In these models share prices jump to the equilibrium path, whereas investment moves only slowly in response to economic incentives. Rate of interest variables are present , but the short term and long term rates are not included in the same equation, because of the high degree of collinearity between them. Equation 3 shows that the change in the Consol rate makes a useful contribution to explaining the buoyancy of investment in the 1890s. The major factor explaining the strength of investment in this decade was the high level of real industrial shares prices, indicating a high degree of investor confidence in the prospects for the British economy.

The equations for investment in buildings and works (WINV) are reported in Table 4. Both Equations 4 and 5 are dominated by the strength of real shares prices in the 1890s.This was followed by their relapse after 1900, when share prices weakened after 1900, By contrast with investment in plant and machinery there are no signs of strong accelerator effects. A small contribution is made by interest rates with stronger effects coming out for the change in the Consol rate than for the commercial bill rate.

For completeness an equation has been estimated for investment in inventories in Table 5. The variables included in the equation are shown in Chart 6. The quality of the data is not as good as for fixed investment, which should be borne in mind when assessing the results. The estimates in Table 5 of Equations 6 and 7 show that reasonably satisfactory results can be obtained for investment in stocks. Stock building is shown to depend on the change in GDP, pointing to accelerator effects. In addition it is affected by real share prices and interest rates. The equations perform well in the statistical tests. This is a surprising result in view of the relatively limited data which is available on this component of investment. The equations indicate that there was a major boom in stock building in the 1890s.The strength of investment was largely in response to the vigour of industrial share prices rather than to changes in output. A similar pattern was found for both components of fixed industrial investment. The upsurge in the prices of British industrial stocks had an impact which emerges in all types of business investment. It must be emphasized that this effect appears to have been confined to a relatively small part of the British equity market, since there is no comparable boom in the general market for shares quoted on the London market, Grossman (2001).

Overseas capital issues are taken from the revised series of Stone (1999). This is deflated by the GDP deflator to give a measure of real capital issues. When this variable is included in the equations for each of the three components of industrial investment, it is found to be insignificant. In all cases the t-ratio is less than 0.850 in absolute value. The commercial bill rate can be excluded from the equation on the grounds that the crowding -out effect may work through the interest rate as well through direct displacement in the capital market. The omission of the interest rate made little difference to the lack of significance of real capital exports. These results suggest that displacement of home industrial investment by overseas issues did not take place. There is, however, evidence that investment in all three component of industrial investment was sensitive to the rate of interest rate, whether represented by the commercial bill rate or the change in the yield on Consols.

---

[18] This model is set out in Begg (1982) pp185-200.

Investment in House Building

It is necessary to estimate an equation for investment in house building, since this is a component of investment which may have been sensitive to both migration and capital exports. This was the view advanced by Cairncross (1953) and Brinley Thomas (1954), which needs to be tested. The building blocks for our equation for house building are drawn from Parry Lewis (1965)[19]. He draws attention to an insight of Feinstein on the possible effects of demographic factors on house building in this period. Feinstein noticed that housing building activity was related to increases in the family forming group aged 20-44 years.[20] He compared the estimated quinquennial increase in population in this age range with the level of house construction. Parry Lewis points out that the fit is closer if a one period lag, that is a lag of 5 years, is introduced . We make use of this suggestion in constructing a demographic variable, which is the average annual increase in the 20-44 year old age grouping in each quinquennium with a 5 year lag. This variable DPOPQ(-5) is shown in Chart 7 together with investment in house building (HINV). Increases in the 20-44 age group were high immediately before the marked rise in building in the 1890s.There was then a falling away of growth in the age group, which was reduced by emigration after 1900 as well as the effects of declining fertility. A reduction in the annual increase in the size of the age group was associated with a slowdown in the rate of house construction after 1900. An advantage in using this variable is that it allows the impact of emigration on house building to be assessed.

A further variable , which is included ,is a measure of the return on investment in new housing (HR). This is calculated as the present value of current house rents divided by an index of the cost of house construction. The Consol rate is used in this calculation as the long term rate is appropriate for computing returns on a long lived asset. This is only a crude indicator of the profitability of building new houses for rent, which ignores regional variations. Measures of rent tend to be sticky in the face of changing market conditions, but the Webber index of house rents, which is used here , is the most flexible measure of house rents.[21] The short term interest rate(CBR) is included in the equation as a measure of short term credit conditions. The presence of crowding out effects is tested by including the real value of overseas new issues (RCAPEX).

The results of the estimation shown in Equations 8 and 9 in Table 6a indicate that the quinquennial average annual change in the 20-44 age group was a powerful explanatory variable. The computed return on investment in housing has a positive effect on house building. It enters the equation in difference form, while the short term rate of interest has an expected negative effect . There is evidence of crowding -out effects as real capital exports tend to reduce housing investment. This effect

---

[19] Parry Lewis (1965)Chapter 7.

[20] Feinstein, Home and Foreign Investment ,1870-1939, DPhil Thesis,1959.

[21] Parry Lewis, Chapter 6.

is strengthened if the short term interest rate is omitted. This allows a more general form of crowding-out to occur, since the impact of capital issues can include effects through changes in short term interest rates as well as direct displacement in the capital market. The equations in Table 6a support the view that overseas investment displaced investment in housing. This would have applied particularly to the period after 1900, when overseas issues were buoyant and house building was depressed.

There is an additional factor which needs to be considered, which Offer (1981) [22]and Daunton (1990)[23] have noted. It is based on data from the property market and contemporary comment. The slump in the housing market and fall in house building in the Edwardian decade could be attributed to the massive boom ,which preceded it. There was overbuilding of houses in the boom of the 1890s, which was followed by a severe setback with rising numbers of vacant properties. According to this view, what deterred house building after 1900 was the rise in the number of empty properties rather than a shortage of finance for new housing because of the attractions of foreign investment. This hypothesis can be tested by including the lagged housing stock in the equation, where it is entered as a ratio of the housing stock to GDP (HCAP/GDPO).This variable is found to be statistically significant in Equation10 in Table 6B.When it is included with the real capital exports variable (RCAPEX), the latter ceases to be significant, as shown in Equation 11 .

The conclusion which emerges from this estimation is that house building responded chiefly to demographic factors .While crowding -out due to the high level of overseas investment after 1900 may have been present , these effects cannot be firmly established. By contract, explaining the property downturn by invoking over building of houses before 1900 looks more promising. Housing is the only component of investment where it has been possible to find evidence of displacement of home investment by overseas capital issues, but even this is not fully convincing.

Conclusion

The rise in the savings ratio, it is argued, can be attributed to the decline in fertility in Britain after 1870.There is evidence for this view based on an error- correction consumption function in which the proportion of young people in the population is important. This conclusion accords with the results observed in the US in the nineteenth century and also in modern studies of economic development. It is also consistent with the results of Taylor and Williamson on the intergenerational transfers involved in nineteenth century capital movements.

The growth in savings enabled Britain to accumulate foreign assets without impeding the rate of growth of the domestic capital stock. When examining the factors determining industrial

[22] Offer(1981) pp280-2.

[23] Daunton (1990) p226.

investment, no evidence was found of domestic investment being displaced by overseas capital issues. For housing the situation is less clear. Demographic factors are found to be important in explaining the rate of house building. There may have been a role for crowding- out effects in this sector due to foreign investment, but this cannot be established in a convincing way.

Table 2	Consumption Function	Ref/ EQCE3
Sample 1873-1913 41 Obs	OLS Estimation	
Dependent Variable DLCE	EQ 1	
Variable	Coefficient	t-ratio
Constant	0.0956	3.49
DLGNPNT	0.3526	6.91
L [CE/GNPNT](-1)	-0.2419	-2.74
LKIDR	0.0874	2.70
PERUN(-2)	-0.0024	-3.36
DPERUN	-0.0026	-2.95
CBR(-1)	-0.0052	-3.04
RSQ(Adj)	0.768	
SE	0.0074	
DW	2.27	
LM(1) F	0.795	
LM(2)	0.726	
Chow Break 1900 F	1.398	

Definition of Variables: CE ,Consumers Expenditure at Constant Prices, L ,Variable in logs.

GNPNT, GNP Expenditure at constant prices, excluding direct and indirect taxes

KIDR ,Proportion of the population aged 16 or less.

PERUN, Unemployment %, CBR Commercial Bill Rate%

Table 3	Fixed Investment:	Plant and Machinery	Equations 2 & 3	Ref/PINVF 59,62
Sample 1873-1913	Obs 41	OLS Estimation		
Dependent Variable	DLPINV EQ2		DLPINV EQ3	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
Constant	-4.278	-4.83	-5.013	-5.83
LPINV(-1)	-0.469	-4.90	-0.506	-5.62
DLPINV(-2)	0.331	2.58	0.333	2.77
DLGDPO	1.693	4.09	1.554	3.97
DLGDPO(-2)	-0.656	-1.40	-0.931	-2.12
LGDPO(-1)	0.489	3.76	0.564	4.67
LRSP(-2)	0.555	4.33	0.614	4.98
CBR(-1)	-0.022	-1.76		
DLR(-1)			-0.388	-2.85
RSQ (adj)	0.544		0.560	
SE	0.058		0.054	
DW	1.69		1.61	
LM (1)	1.022		1.452	
LM(2)	0.522		0.746	
Chow 1900 F	1.213		1.024	

Definition of Variables: PINV, Investment in Plant , RSP, Real Price Industrial Shares ,CBR, Commercial Bill Rate %,Consol Yield %, GDP Output, L Variable in logs.

Table 4	Fixed Investment	Buildings and Works	Equations 4& 5	Ref/WINVF 18,20
Sample 1872-1913	OBS 42	OLS Estimation		
Dependent Variable	DLWINV EQ4		DLWINV EQ5	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
Constant	-0.198	-0.96	-0.354	-1.52
LWINV(-2)	-0.341	-5.43	-0.355	-5.61
LRSP(-2)	0.343	4.83	0.377	4.93
CBR(-1)	-0.018	-1.89		
DLR(-1)			-0.233	-2.03
RSQ(adj)	0.411		0.461	
SE	0.048		0.048	
DW	2.095		2.060	
LM(1)	0.250		0.188	
LM(2)	0.153		0.357	
Chow B 1895	1.440		0.097	
1900	1.926		0.774	

Definition of Variables: As for Table 3, plus WINV Investment in Buildings and Works,

Table 5	Investment in	Inventories		
Sample 1872-1913	Obs 42	Estimation OLS	Equations 6 &7	REF/INV06,07
Dependent Variable	DLINV EQ6		DLINV EQ7	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
Constant	-0.684	-3.70	-0.856	-4.09
LINV(-2)	-0.312	-6.68	-0.311	-6.66
DLGDPO	0.822	2.88	0.812	2.83
LRSP(-2)	0.497	6.52	0.502	6.57
CBR(-1)	-0.023	-2.79		
DLR(-1)			-0.274	-2.76
RSQ(adj)	0.642		0.602	
SE	0.0401		0.0402	
DW	2.23		1.98	
LM(1)	0.763		0.0113	
LM(2)	0.664		0.0502	
Chow B 1895 F	1.249		0.662	
1900	1.253		1.160	

Definition of Variables: As for Table 3, plus INV Investment in Inventories.

Table 6A	Investment in	House Building		
Sample 1876-1913	Obs 38	OLS Estimation	Equations 8& 9	Ref/HINVF 39,40
Dependent Variable	DLHINV EQ8		DLHINV EQ9	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
Constant	1.441	4.63	1.644	5.18
LHINV(-2)	-0.310	-5.06	-0.367	-6.15
DPOPQ(-5)	0.0038	6.20	0.0041	6.62
DLHR	0.390	1.98	0.408	1.95
LRCAPEX	-0.065	-3.19	0.076	-3.65
CBR(-1)	-0.030	-2.30		
RSQ (adj)	0.643		0.596	
SE	0.058		0.062	
DW	1.66		1.78	
LM(1)	0.271		0.0428	
LM(2)	0.166		0.0955	
Chow B 1895 F	1.467		1.467	
1900	1.128		1.918	

Definition of Variables: HINV, Investment in Housing, DPOPQ (-5), Average annual change in population aged 20-44 in each quinquennium lagged one period of 5 years, HR, Return on Housing Investment, RCAPEX, Overseas Capital Issues/GDP Deflator, L, Variable in logs.

Table 6 B	Investment in	House Building		
Sample 1876-1913	OBS 38	OLS Estimation	Equations 10&11	Ref/HINVF 35,51
Dependent Variable	DLHINV EQ10		DLHINV EQ11	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
Constant	0.303	2.01	0.604	1.29
LHINV(-2)	-0.214	-4.06	-0.240	-3.67
DPOPQ(-5)	0.0032	6.25	0.0034	5.81
DLHR	0.463	2.64	0.424	2.28
L(HCAP/GDPO)-1	-0.969	-4.07	-0.797	-2.29
CBR(-1)	-0.044	-3.66	0.040	-3.06
LRCAPEX			-0.019	0.68
RSQ(adj)	0.690		0.684	
SE	0.054		0.055	
DW	1.964		1.93	
LM(1)	0.031		0.009	
LM(2)	0.078		0.054	
Chow B 1895 F	1.299		1.274	
1900	1.124		0.009	

Definition of Variables: As for Table 6a,plus HCAP, Housing Stock.

List of Variables used in Charts:

Chart 1 Investment Ratios

GINVMPFMR=Domestic Investment/GDP

CBFCPR=Real Current Balance/GDP

Chart 2 Consumption

CER=Consumer Spending/GNP less taxes

KIDR=Proportion of Population aged 14 or less

PERUN=Unemployment %

CBR=Short Term Interest Rate

Chart 3 Industrial Fixed Investment

PINVF= Investment in Plant and Machinery

WINVF=Investment in Buildings and Works

RSP=Real Industrial Share Prices

CBR=Short Term Interest Rate , LR=Consol Yield

Chart 4 Real Share Prices

RSP=Real Industrial Share Prices , RSPG=Real Price UK Equities.

Chart 5 Stock Building

INVF=Investment in Inventories . Other variables :as for Chart 4.

Charts 6 and 7

HINVF=Investment in Housing

POPQ=Change in Population Aged 20-44, HRWR =Return on Housing Investment,

RSTONECAL= Real Capital Exports, LR=Yield on Consols , HCAPR=Housing Stock/GDP

Chart 1: Investment ratios   Ratio of Domestic Investment /GDP GINVMPFMR

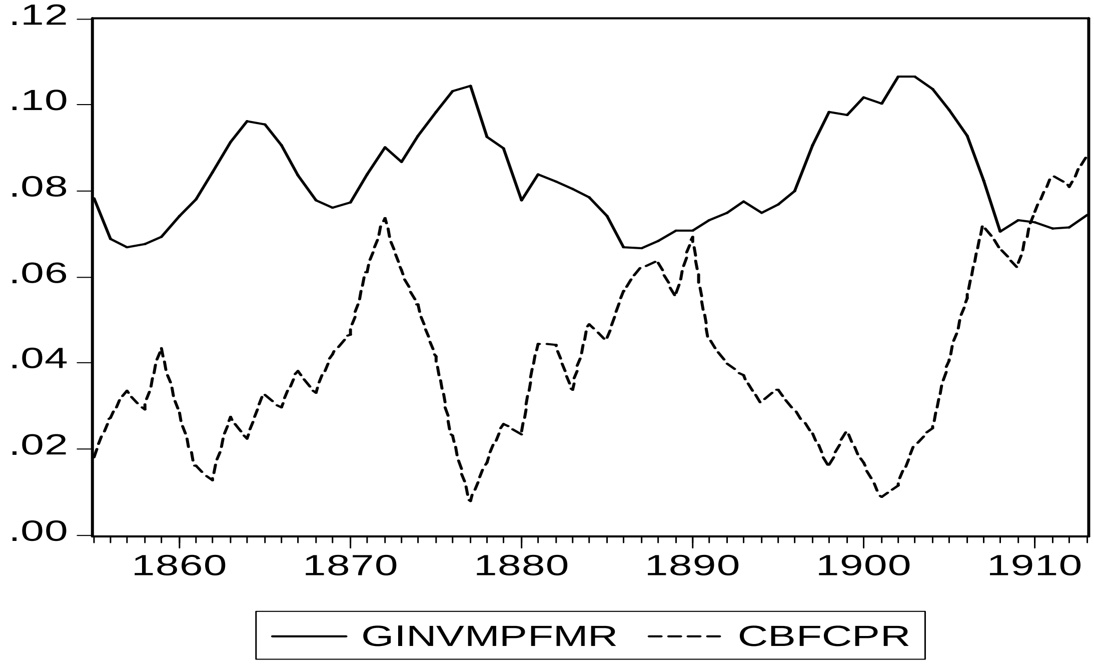


Chart 2: Consumption

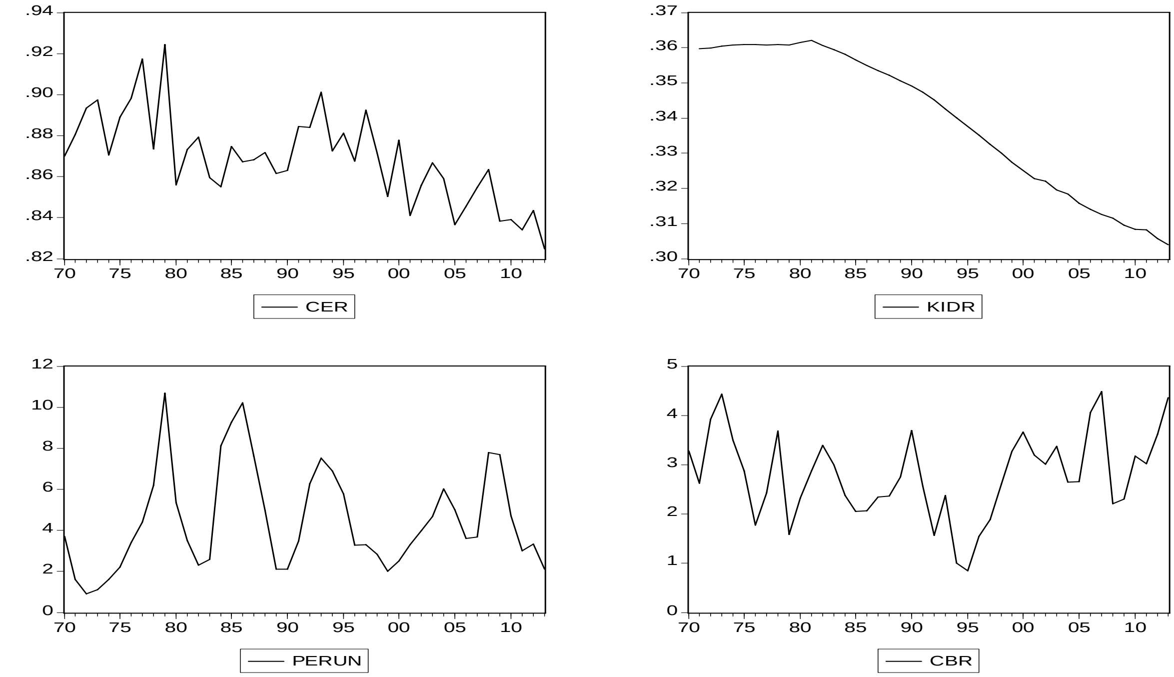


Chart 3: Industrial Fixed Investment

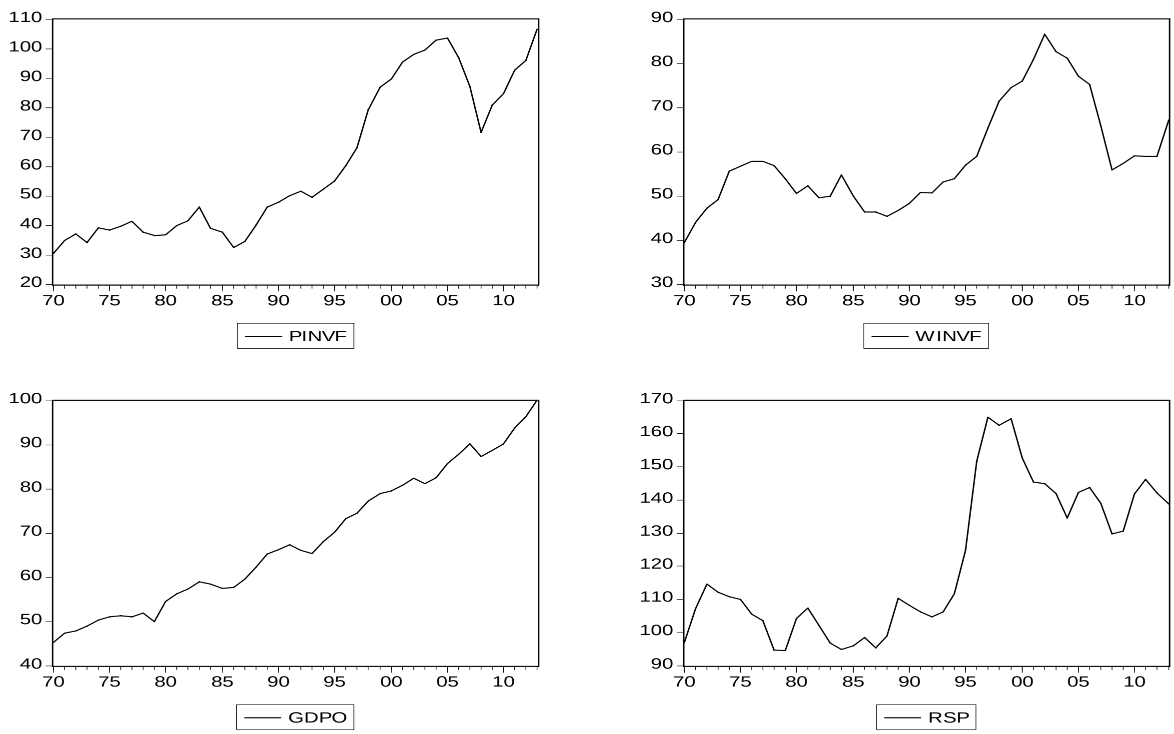
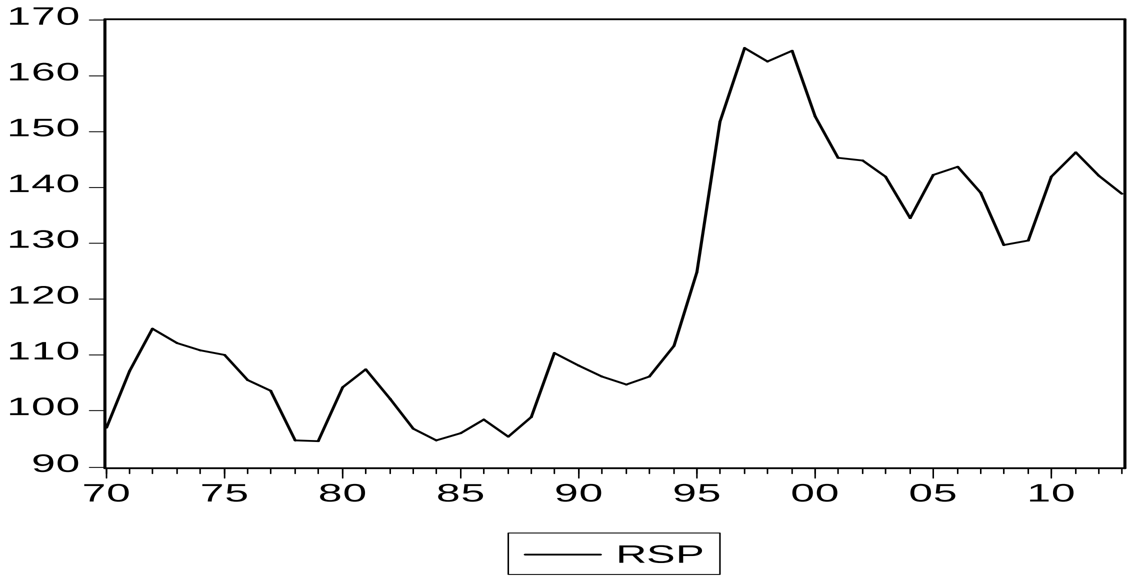


Chart 4: Real share prices



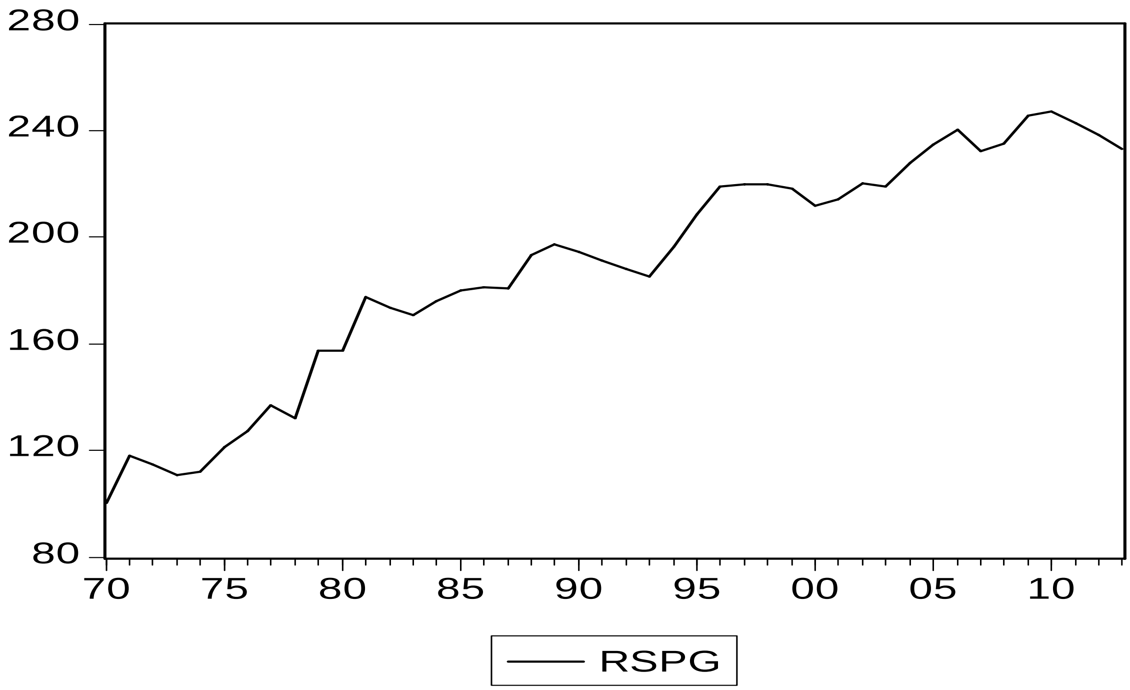


Chart 5: Stock building

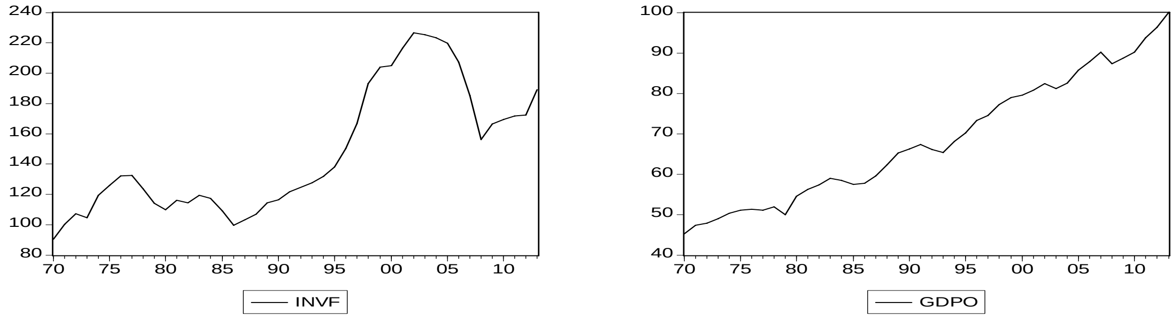


Chart 6: Housing investment I

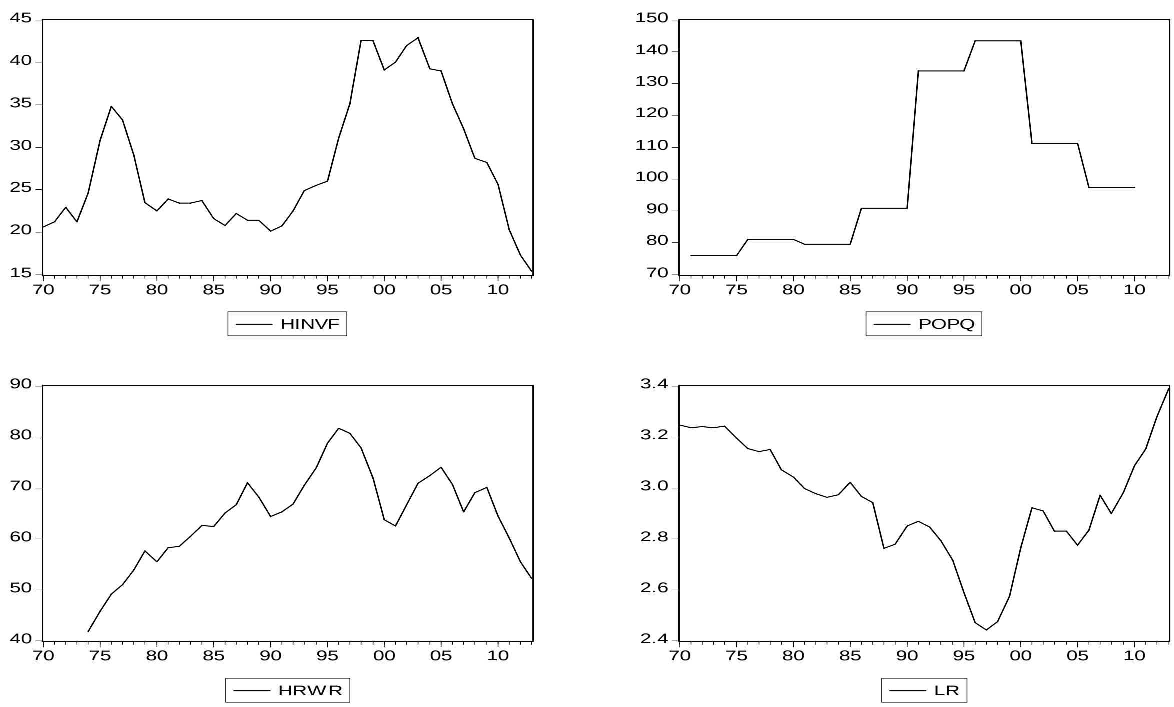
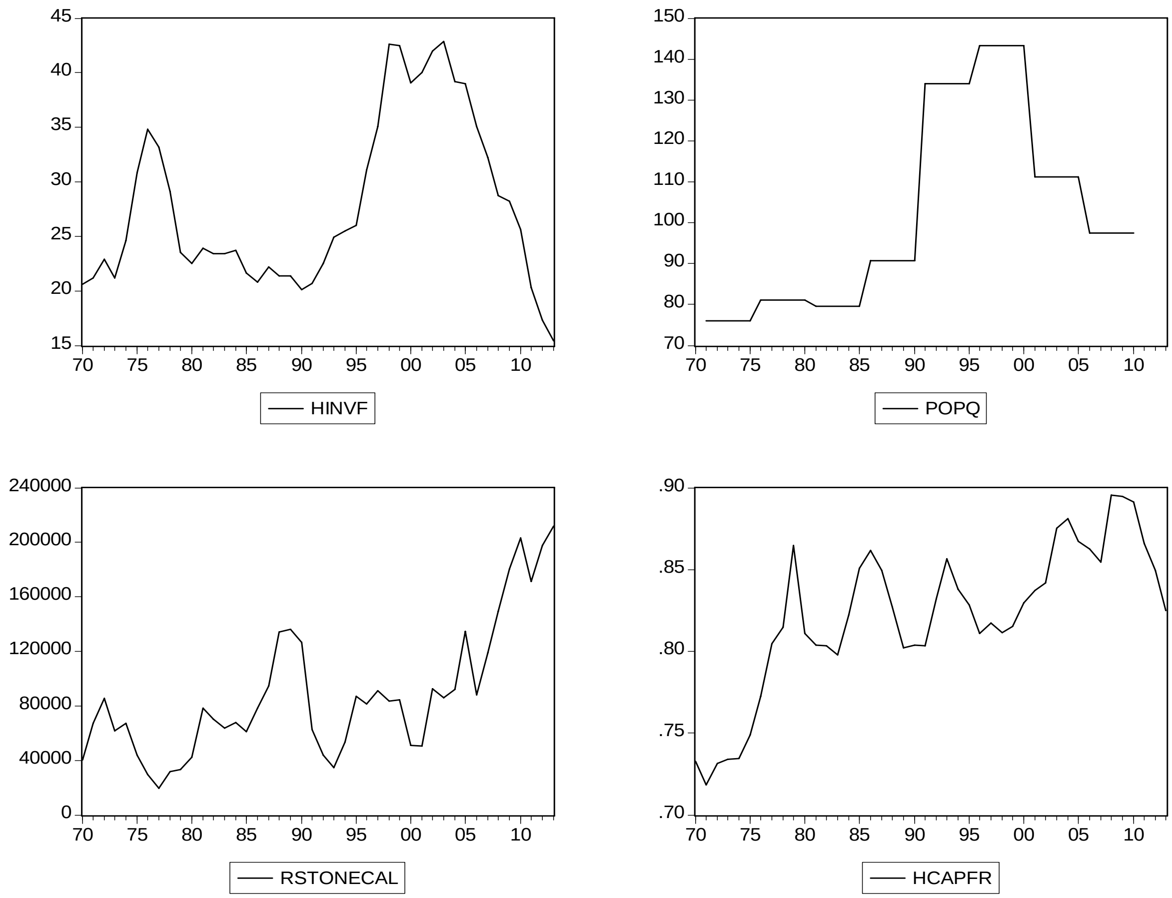


Chart 7: Housing investment II



References:

Abel, A. B. (1980), Investment and the Value of Capital, New York, Garland.

Anderson, M. (1990), The Social Implications of Demographic Change in The Cambridge Social History of Britain 1750-1950, Cambridge: Cambridge University Press.

Baines, D and Woods, R.I.(2004), Population and Regional Development in The Cambridge Economic History of Modern Britain Vol II Economic Maturity 1860-1939 ,ed. R.Floud and P.Johnson, Cambridge: Cambridge University Press.

Banks, J.(1954), Prosperity and Parenthood: A Study of Family Planning among the Victorian Middle Classes, London: Routledge Kegan and Paul.

Barrell,R, C. Guillermineau and D.Holland,(2007), Decomposing Growth in France, Germany and the United Kingdom using Growth Accounting and Production Function Approaches, National Institute Economic Review, 199, 99-113.

Bean, C.R.(1981), An Econometric Model of Manufacturing Investment in the UK, Economic Journal, 91.

Begg,D.K.(1982), The Rational Expectations Revolution in Economics, Oxford, Philip Allan.

Boyer, G.R. and T.J. Hatton, (2002), New Estimates of British Unemployment, 1870-1913,Journal of Economic History, 62,643-75.

Capie , F. and A. Webber, (1985), A Monetary History of the United Kingdom 1870-1982 Vol I , London: Allen and Unwin .

Cairncross, A.K. (1953) , Home and Foreign Investment 1870-1914, Cambridge: Cambridge University Press.

Daunton, M.J. (1990), Housing in The Cambridge Social History of Britain 1750-1950 Vol II, ed. F.M.L.Thompson. Cambridge : Cambridge University Press.

Davis, L. E. and Gallman, R.E. (1978), Capital Formation in the United States in the Nineteenth Century in The Cambridge Modern History of Europe VII The Industrial Economies Part2, ed. P. Mathias and M.M.Postan, Cambridge: Cambridge University Press.

Ellis and Price (2004), UK Business Investment and the User Cost of Capital, Manchester School, 72, 72-93.

Edelstein, M. (1977), UK Savings in the Age of High Imperialism and After, American Economic Review, Papers and Proceedings,67, 288-294.

Edelstein, M. (1984), Overseas Investment in the Age of High Imperialism: The United Kingdom 1850-1914, London : Methuen.

Edelstein, M. (2004), Foreign Investment Accumulation and Empire 1860-1914 in The Cambridge Economic History of Modern Britain ed. R. Floud and P. Johnson ,Cambridge : Cambridge University Press.

Eichengreen , B. J.(1982), The Proximate Determinants of Domestic Investment In Victorian Britain Journal of Economic History, 42, 87-95.

Eichengreen , B. J.(1983), Asset Markets and Investment Fluctuations in Late Victorian Britain, Research in Economic History, 145-179.

Enders,W.(2004),Applied Econometric Time Series Analysis,2nd Edition, New York,Wiley.

Feinstein, C.H. (1972), National Income, Output and Expenditure of the United Kingdom 1855-1965,Cambridge: Cambridge University Press.

Feinstein, C.H. and S. Pollard, (1988), Studies in Capital Formation in the United Kingdom, 1750-1920,Oxford: Oxford University Press.

Ford, A. G.(1962), The Gold Standard, 1880-1914: Britain and Argentina, Oxford :Oxford University Press.

Granger,C.W.J.(1969),Investigating Causal Relations by Econometric Models and Cross-Spectral Methods, Econometrica,37,423-38.

Granger,C.W.J .(1986), Developments in the Study of Cointegrated Economic Variables, Oxford Bulletin of Economics and Statistics, 48, 424-38.

Gross man, R.S. (2002), New Indices of British Equity Prices,1870-1913,Journal of Economic History,62,121-146.

Habbakuk, H.J.(1962), Fluctuations in Housebuilding in Britain and the United States, Journal of Economic History, 22, 239-79.

Johansen,S. (1988), Statistical Analysis of Cointegrated Vectors, Journal of Economic Dynamics and Control,12,231-54.

Johansen,S.(1995), Likelihood -Based Inference in Cointegrated Vector Autoregressive Models, Oxford: Oxford University Press.

Johnson ,P .(1985), Saving and Spending: The Working Class Economy in Britain 1870-1914, Oxford: Oxford University Press.

Leff , N.(1969), Dependency Rates and Savings Rates, American Economic Review, 59, 886-96.

Lewis, F. (1983), Fertility and Savings in the United States, 1830-1900, Journal of Political Economy, 91, 825-40.

Lewis, W.A. (1978), Growth and Fluctuations 1870-1913,London: Allen and Unwin .

Mason, A. (1988), Saving, Economic Growth and Demographic Change, Population and Development Review, 14,133-44.

McCloskey, D.N.(1971), Did Victorian Britain Fail? Economic History Review, 2nd Series,23, 446-459.

Mitchison , R. (1977), British Population Change since 1860,London: Macmillan.

Modigliani, F. (1966), The Life Cycle Hypothesis of Savings, the Demand for Wealth and the Supply of Capital, Social Research,33,160-217.

Modigliani, F.and A. Ando (1957), Tests of the Life Cycle Hypothesis of Savings: Comments and Suggestions, Bulletin of the Oxford University Institute of Economics and Statistics,19,99-124.

Modigliani ,F . and Brumberg , R. (1954),Utility Analysis and the Consumption Function: An Interpretation of Cross-section Data in Post Keynesian Economics ,ed. K. K. Kurihara , New Brunswick, N.J.: Rutgers University Press.

Matthews, R.C.O. (1957), The Trade Cycle, Cambridge: Cambridge University Press.

Matthews, R.C.O., C. H. Feinstein and J. Odling-Smee , (1982),British Economic Growth 1856-1873,Oxford:Oxford University Press.

Mitchell., B.R. (1962) ,Abstract of British Historical Statistics, Cambridge : Cambridge University Press. Ca

Mitchell, B. R. (1988), British Historical Statistics, Cambridge : Cambridge University Press.

Offer, A . (1981) ,Property and Politics 1870-1914,Cambridge:Cambridge University Press.

Parry Lewis, J. (1965), Building Cycles and Britain's Growth, London : Macmillan.

Pezmazoglu,J. (1951), A Note on the Cyclical Fluctuations of British Home Investment 1870-1913, Oxford Economic Papers.

Richardson, H.W. and D.H. Aldcroft (1968), Building in the British Economy between the Wars, London : Allen and Unwin.

Robertson, D.H. (1915) ,A Study of Industrial Fluctuations, London : P.S. King.

Rowthorn , R.E. and Solomou, S.N.(1991), The Macroeconomic Effects of Overseas Investment on the British Balance of Trade 1870-1913. Economic History Review , 44,654-64.

Saul ,S.B.(1962), Housebuilding in England, 1890-1914, Economic History Review, 15,119-37.

Smith, K.C . and G.W. Horne , (1934), An Index Number of Securities, 1867-1914,London and Cambridge Economic Service , Special Memorandum 37.

Spensley , J.C. (1918), Urban Housing Problems, Journal of the Royal Statistical Society 81, 162-71.

Stevenson ,T. H. C. (1920) The Fertility of the Various Social Classes from the Middle of the Nineteenth Century to 1911., Journal of the Royal Statistical Society,83, 401-32.

Stone, I (1999) ,The Global Export of Capital from Britain 1865-1914, London : Macmillan.

Thomas, B .(1954), Migration and Economic Growth, Cambridge : Cambridge University Press.

Thomas, B.(1972), Migration and Urban Development, Cambridge : Cambridge University Press.

Tobin,J.(1978), A General Equilibrium Approach to Monetary Theory, Journal of Money Credit and Banking, 1, 26-37.

Taylor, A.M. and J.G. Williamson (1994),Capital Flows to the New World as an Intergenerational Transfer, Journal of Political Economy,102, 348-71.

Tinbergen, J. (1938), Statistical Evidence on the Acceleration Principle, Economica ,5, 164-76.

Tinbergen,J.(1939) ,A Method and its Application to Investment Activity, Geneva, League of Nations.

Tinbergen,J.(1956), Business Cycles in The United Kingdom 1870-1914, Amsterdam, North –Holland.

Tranter, N . (1973), Population and the Industrial Revolution, London : Croome Helm.

Webber, J.B. (1955), A New Index of Residential Construction 1838-1950, Scottish Journal of Political Economy, 2.

Woods, R.I, (1996), The Population of Britain in the Nineteenth Century in British Population History: From the Black Death to the Present Day ,ed. M. Anderson , Cambridge: Cambridge University Press.

Woods, R.I.(1987) ,The Fertility Transition in Victorian England , Population Studies, 41,283-311.

Wrigley, E. A. (1969), Population and History, McGraw Hill, New York.