

**Debt Inflation :
Theory and Evidence**

BY

Mervyn King

DISCUSSION PAPER NO. 175

FINANCIAL MARKETS GROUP
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THEORY AND EVIDENCE**

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DEBT DEFLATION: THEORY AND EVIDENCE

Abstract

In the early 1990s the most severe recessions occurred in those countries which had experienced the largest increases in private debt burdens. Was this an accident of history or did it reflect deeper forces affecting market economies? The paper comprises three parts. First, it presents three "stylised facts" about debt and its impact on consumption growth in the 1930s and the 1990s. Second, it discusses the reception of Irving Fisher's work on debt deflation by his contemporaries, and argues that it is helpful to think of debt deflation as a real business cycle phenomenon. Third, there is a theoretical discussion of the reaction of debt and consumption to shocks in the context of a model of precautionary saving. Central to the model is the role of distributional shocks which implies that aggregate demand may be a nonmonotonic function of the price of assets in terms of the consumption good. Multiple equilibria may exist, leading to the possibility of financial instability. The analysis of debt deflation requires the construction of real business cycle models without a representative consumer.

DEBT DEFLATION : THEORY AND EVIDENCE¹

Mervyn King

"Be not made a beggar by banqueting upon borrowing"

Ecclesiasticus 18 : 33

1. Introduction

Over the past three years many of the major industrialised countries have experienced protracted periods of below trend growth, and some the longest recession since the 1930s. And the most severe recessions occurred in those countries which had experienced the largest increases in private debt burdens. Figure 1 illustrates this correlation for ten major countries, the G7 countries together with Australia, Norway and Sweden. It plots the *difference* between the actual annual growth rate between 1989 and 1992 and the trend growth rate (measured by the average growth rate of GDP between 1974 and 1989), against the *change* in the ratio of household debt to GDP from 1984 to the end of 1988.² The larger the increase in debt over the preceding five years, the greater the shortfall in output relative to its trend level. It is not surprising, therefore, that the phrase "debt deflation", coined by Irving Fisher some sixty years ago, has been rediscovered by the economics profession. Is the coincidence of a rise in debt burdens and the prolonged nature of the recent recession an accident of history, or does it reflect deeper forces affecting the behaviour of market economies?

In this lecture I shall assess the relevance of debt deflation to aggregate economic fluctuations. Let me start by posing four questions about the phenomenon of debt deflation:

(1) First, why should an increase in purely inside, or internal, debt affect the behaviour of the economy? Does not the Modigliani-Miller theorem tell us that real variables such as output and employment are invariant to the debt-equity ratio of the corporate sector? I shall argue that debt deflation is not necessarily inconsistent with the Modigliani-Miller theorem, and can result from behaviour in the household sector.

(2) Second, what was Fisher's model of debt deflation, and why was it largely ignored by our profession both at the time and subsequently? Why did Keynes, in particular, pay virtually no attention to Fisher's contribution? I shall suggest that the principal reason for this neglect is that debt deflation is best thought of as a real business cycle, and not a monetary, phenomenon.

(3) Third, is it possible to construct a simple model of debt deflation that captures at least some of its main features? I shall show that recent contributions to the literature on consumption provide components of a formal analysis of Fisher's mechanism. The key is to examine debt deflation in a model of purely distributional shocks with no aggregate uncertainty at all. Although I have described debt deflation as a real business cycle phenomenon, it cannot be analysed within the conventional RBC framework with a representative consumer. Distributional shocks are the essence of the model.

(4) Fourth, what is the evidence for the proposition that debt deflation contributed to the length and depth of the recent recession? I shall present some preliminary results on the importance of debt ratios in explaining the pattern of consumption growth during the recent recession in ten major countries and on the link between the distribution of indebtedness and aggregate consumption growth using household data for the UK.

Irving Fisher put forward his thesis in his book *Booms and Depressions* in 1932. Comparisons with the 1930s have a perennial fascination for economists. During the summer of 1992, those with a sense of history were very conscious that the date of the French referendum on the Maastricht treaty, Sunday 20 September, was not only a key time for the ERM but was also the very date in 1931 when Britain left the gold standard. And the last major country to abandon the gold standard was, of course, France, in 1936. The similarities with recent events are self-evident. More relevant to my concern here is a comparison of the behaviour of consumption in the 1930s and the 1990s. I shall return to this later. But I want, first, to discuss the link between the theory of business cycles and the concept of debt deflation. A theory of business cycles has three elements. First, a model of the initial shock hitting the economy. Second, a propagation mechanism which magnifies the initial shock and describes its impact (both magnitude and duration) on aggregate demand. Third, an explanation of why changes in aggregate demand affect output rather than prices. Debt deflation is not a complete theory of the business cycle in two respects. First, it is concerned only with the way in which an initial shock is transmitted through the economy and not how that shock itself comes about. Debt

deflation concerns the propagation mechanism which determines the depth and duration of the recession. Fisher's story is relevant because it explains why aggregate demand responds to an initial shock by more than would be predicted by a representative consumer model. Distributional effects are an important part of the transmission mechanism of both monetary and real shocks.

Second, Fisher's theory does not provide a convincing explanation of why changes in aggregate demand should lead to changes in output rather than prices. With flexible prices, and especially interest rates, short-run changes in output reflect supply shocks and equilibrium responses of factors, such as labour supply, to changes in prices. Much of the debate on the causes of the Great Depression - among Friedman and Schwartz (1963), Temin (1976, 1993), and, more recently, Eichengreen (1992) - has focused on the responsibility of domestic monetary policy, the gold standard, or other shocks for the contraction in prices and output. But, as Ben Bernanke (1993) points out in his review article of Eichengreen's (1992) book, one of the important puzzles of that period is "why did the declines in *nominal* income of the early 1930s lead to such deep and protracted falls in *real* variables such as output and employment?". The magnitude and duration of the monetary non-neutrality remains to be explained. This is a question about the supply-side of the economy, and I shall return to it at the end of my lecture. But for the most part I shall concentrate on the role of debt deflation as a propagation mechanism from an initial shock to aggregate demand.

Before turning to a discussion of debt deflation in the 1930s and the 1990s, I want to mention two aspects which have been the focus of

discussion of debt deflation in the post-war literature, but on which I shall not dwell. The first concerns the role of the aggregate price level. In the 1930s the absolute price level fell - from 1929 to 1933 the average fall in producer prices in the ten countries shown in figure 1 was 27%. In the 1990s the price level rose - by an average of 6% from 1989 to 1992 in the ten countries. But a falling absolute price level is not a necessary condition for debt deflation. What matters is the fluctuation of asset values relative to the unit of account in which debts are denominated. A falling price level exacerbates the problem, in part because it is often associated with a rise in the real interest rate. But this reinforces the point that in essence debt deflation is a real not a monetary phenomenon, and is concerned with changes in relative prices. It is the change in the distribution of net worth from debtors to creditors which leads to a fall in demand and output.

A second line of enquiry which I shall not pursue in this lecture is the rise in the effective, or "virtual", cost of capital resulting from the impact of a downturn in activity on the cost of financial intermediation. This argument - based on the role of asymmetric information - stresses the distinction between "insiders" and "outsiders" in the supply of finance to the corporate sector. Banks or other financial intermediaries with a continuing relationship with a firm can supply funds at a lower cost than "outsiders" because of their superior information about the firm's management and prospects. The unobservable cost of financial intermediation drives a wedge between the cost of capital and the observable rate of interest. Moreover, this unobservable component of the cost of capital varies both across countries and over time as result of differences and changes in the distribution of wealth between insiders

and outsiders. As a dimension of the process of economic development the story is convincing, but whether such changes in the technology of providing credit can explain business cycle fluctuations in output is still open to question, not least because of the difficulty in measuring the unobservable marginal cost of financial intermediation. In using this approach to explain the depth of the Great Depression in the US in terms of a loss of informational capital following the collapse of an unprecedentedly large number of banks, Bernanke (1983) used changes in the net worth of firms and banks as an explanatory variable for future changes in output. Since news about the future is rapidly assimilated by financial markets, correlations between changes in net worth and subsequent changes in output are open to a number of interpretations of which an adverse shift in the technology of supplying credit is only one. Nevertheless, this line of enquiry has been a fruitful source of ideas on financial intermediation.³

In the remainder of this lecture I shall discuss, first, some common patterns in the experience of the major industrial countries during the recent recession; second, Fisher's model of debt deflation and its reception by his contemporaries; third, a model of certain aspects of debt deflation that seem to me most germane to our recent experience and finally, some fragments of empirical evidence relevant to the ideas I shall be discussing.

2. Debts and Consumption: The Recent Experience

I want to start by presenting three "stylised facts" from the impact on the major industrialised countries.

(1) The first "stylised fact" concerns the increase in internal debt burdens which have, in recent years, grown enormously in both the US and UK. In his book Fisher (1932) presented a table showing the estimated change in total debts in the United States from 1929 to 1932, both at nominal prices and deflated by a price index of wholesale commodities, or, as Fisher termed it, the "businessman's dollar". Table 1 shows Fisher's numbers and the equivalent figures for the US and UK over the period 1989 to 1992. In nominal terms debt - both private and total - rose more rapidly between 1989 and 1992 than between 1929 and 1932, but the fall in the price level led to a much sharper proportionate (though a similar absolute) increase in the real burden of debt in the earlier period. Nevertheless, the disinflationary policies of the early 1990s meant that by 1992 inflation was no longer the means by which the real burden of debt could be steadily reduced.

(2) The second "stylised fact" concerns the character of the recent recession which has been rather different from earlier postwar recessions. In both the UK and US output peaked in 1990 Q2 and recovery has been abnormally slow since output reached its trough - in 1991 Q1 in the US and 1992 Q1 in the UK.⁴ Can we identify the causes of the recession in the early 1990s? Recent studies by Olivier Blanchard, Robert Hall, and George Perry and Charles Schultze, throw light on the US experience. Blanchard (1993) concludes that, "By far, the main proximate cause of the recession was a consumption shock"; Hall (1993) argues that, "changes in consumption not associated with changes in disposable income may be an important part of a bigger story about the late 1980s and early 1990s"; and Perry and Schultze (1993) conclude that "spending by consumers has not only been weak during this

recovery, ... but [was] substantially overpredicted relative to earlier recessions" by equations estimated on post-war data. In the UK too, falls in consumption were larger than in previous recessions - aggregate consumption fell for seven consecutive quarters and by 3.5% from peak to trough, a period in which real disposable income rose by 1.1%.⁵ An illuminating way to illustrate the different nature of the recent recession is shown in figure 2. It shows the behaviour of consumption relative to an estimated trend level of GDP over the eight quarters both preceding and following the trough in output. Figure 2 shows the profile of consumption over the cycle for an average of 21 recessions in the G7 countries since 1970, and for the most recent recessions in the US and UK (consumption eight quarters before the trough in output is normalised to 100). In an "average" recession consumption relative to trend output follows a shallow saucer-shaped profile. But in the recent recession consumption has fallen much more sharply and been slower to recover, especially in the UK. But why were there large negative shocks to consumption? And were there similar shocks in other countries? I shall return to these questions later.

(3) The first two "stylised facts" concerned debt and consumption separately. Are they connected? So far I have referred only to aggregate data. But the effect of a given debt ratio depends critically upon its **distribution** among the population of households and companies. Indeed, such variation provides another opportunity to identify the impact of debt burdens on spending. Variations in spending and debt among groups of households can throw light on the relevance of debt because they effectively control for unobservable national shocks, especially monetary policy shocks. Household expenditure

surveys rarely contain detailed information on the total indebtedness and net worth of individual households. But it is possible to compare groups of households with very different levels of debt. Given the importance of mortgages in total household debt, it is instructive to examine the behaviour of consumption in the recent recession for two groups of home-owners - those with a mortgage and those who own their house outright. Table 2 shows the levels of average real weekly expenditure (both total and non-housing expenditure) for the two types of home-owner in the UK from 1989 to 1991. The estimates are derived from the Family Expenditure Survey (FES) which each year contains responses from around 3,000 home-owners with a mortgage and just under 2,000 without a mortgage. These time series of cross-sections are subject to sampling error and care must be exercised when drawing inferences about changes over time. Nevertheless, between 1989 and 1991 total real consumption expenditure of households with a mortgage fell by about 2%, whereas for those without a mortgage it rose by almost 4%. Non-housing expenditure in real terms fell by over 4% between 1989 and 1991 for home-owners with a mortgage and rose by 1% for those with no mortgage debt (see figure 3).⁶

Given these "stylised facts" about the relationship between increases in debt and a subsequent fall in consumption, there is, therefore, a *prima facie* case for thinking that high debt burdens, especially the increase during the 1980s, led to a deeper and longer recession than might otherwise have occurred. What is the mechanism by which this came about? It is time to turn to Irving Fisher.

3. Debt Deflation, Fisher and Keynes

Irving Fisher developed his debt-deflation theory of depressions in his 1932 book **Booms and Depressions**. The book grew out of an invitation to address the American Association for the Advancement of Science. His talk was delivered in New Orleans on 1 January 1932, and the book was published in November of that year.⁷ Fisher repeated, and to some extent developed, his ideas in his 1933 article in the very first issue of *Econometrica*.

Fisher identified **nine** factors as characterising the cyclical tendencies associated with the expansion and contraction of debts, and which can lead to a depression:

1. debts - an exogenous shock (to expectations of future incomes, for example) produces a desire to reduce debts;
2. falls in asset prices - change in expectations capitalised in asset prices;
3. real interest rates rise - a negative shock to asset values raises the conditional volatility of returns and leads to a higher risk premium;
4. reductions in net worth of businesses and households - follows from the above and also leads to;
 5. fall in business and consumer confidence;
 6. lower profitability;
 7. fall in output;
 8. contraction in broad money supply and *credit*;
 9. slower velocity of circulation;

These factors reinforce the initial shock and produce a downward spiral. The process stops when the actions of debtors in cutting back on consumption and investment in order to reduce debt are offset by the actions of creditors who are able to increase spending.

Before turning to the analytics of the matter, it is interesting to ask what was the reaction of contemporary economists to these ideas. It has to be said that **Booms and Depressions** was not well received by the critics. It was reviewed in three academic journals and none was favourable. Among the reactions of the reviewers were the following:

"From the pen of Professor Fisher this book cannot but be a disappointment. What little theory it contains is in no way novel" (**Economic Journal**, December 1933).

"In the reviewer's opinion, this book is of little use to the lay reader and of even smaller value to the technical investigator of business cycle phenomena" (**American Economic Review**, March 1933).

And even the clarity of the writing was described as "a factor which would in itself be a recommendation, were the reasoning as penetrating as the lucidity of the style" (**Economica**, November 1933).

The economics profession showed little propensity to disagree with the reviewers. There are remarkably few references to the debt-deflation theory of depressions in subsequent literature. Even Keynes, who was an admirer of much of Fisher's work on monetary economics, ignored the book and article. There are no references to Fisher's work on debt

deflation in the Collected Writings of Keynes. And the private correspondence between Keynes and Fisher, amounting to 12 letters from Fisher to Keynes and 2 letters from Keynes to Fisher, contain no mention of debt deflation.⁸ Minsky (1977, 1982) kept the flame alive, although, ironically, his hero was Keynes. In recent years, however, there has been renewed interest in Fisher's ideas, especially in the literature on the cost of financial intermediation.

Why was Fisher's work not well received at the time, and virtually ignored for sixty years? There are three reasons, I think, one personal, one theoretical, and the other empirical. First, Fisher was not well-liked by many of his peers. His self-promoting style grated with some - his *Econometrica* article gratuitously stated that two of the best-read authorities in the field had said that the conclusions of his book were "both new and important" - and he championed some controversial causes, among them prohibition and eugenics. His stock among both professional economists and the general public, whom he liked to lecture at every opportunity, fell after his optimism on the economy and stock prices was undermined by the Great Crash in 1929, and the subsequent depression. Fisher was consistently optimistic. In 1931 he praised Herbert Hoover for "his calm reassurances to business and Andrew Mellon, Secretary of the Treasury, for asserting that prosperity was 'just around the corner'" (Allen, 1993, p.235). It is reassuring that arguably the greatest economist America has produced could not forecast the business cycle. And there was worse. His own finances took a tumble. Fisher had massive debts of his own, many of them to his sister-in-law who bailed him out. And in the end Yale had to buy his house in New Haven and rent it back to him to save him from eviction⁹

The second, and important, reason for the lack of attention paid to Fisher's theory of cycles and depressions is, I believe, that it is not a monetary explanation of economic fluctuations but a real business cycle model. This is because Fisher's model is one in which initial shocks to the economy - and Fisher listed many possible types of shock - are magnified by the debt-deflation transmission mechanism. And Fisher proposed his thesis at a time when the attention of Keynes and others was on the incorporation of monetary factors into a theory of the business cycle. Possibly Keynes felt that he himself had anticipated Fisher, because in 1931 he had written an essay entitled "The Consequences to the Banks of the Collapse of Money Values". In this he emphasised the losses to the banks from a fall in asset values and the impact on their willingness to extend further loans to business - a credit crunch in fact. He described the problems of the time as having their "roots in the slow and steady sapping of the real resources of the banks as a result of the progressive collapse of money values over the past two years" (Keynes, 1931). Keynes was primarily interested in the consequences of a collapse of asset values for the process of financial intermediation by the banking system. In this respect it was Keynes not Fisher who led the way in stressing the role of the cost of financial intermediation in business cycles. In choosing, as I said earlier, to leave this issue to one side, it is because I believe there are other aspects of Fisher's story which merit analysis.

Schumpeter was one of the very few to recognise that Fisher's debt-deflation theory was a real business cycle model rather than a monetary model. Describing the evolution of Fisher's thought on cycles, Schumpeter (1954) wrote:

"But, though he continued to emphasize the monetary aspects of the phenomenon, he so broadened the basis of his analysis so as to end up with the Debt-Deflation Theory, which, contrary to his unduly restricted claim, applies to all recorded business cycles and is in essence not monetary at all" (1954, p.1122).¹⁰

The third reason for the lack of attention paid by Keynes to Fisher's concept of debt deflation is the very different nature of the depressions in the UK and US in the early 1930s. I have already drawn attention to the large negative consumption shock which both the US and UK experienced in the 1990s. Was the same true in the 1930s? The answer is, yes in the US but no for the UK. Following Temin (1976) and Hall (1986), Romer (1993) has pointed out that in the US, "consumption accounted for a much larger fraction of the decline in real GNP in 1930 than in most previous or subsequent recessions". But the experience of Britain was very different. Table 3 shows the fall in GDP and consumption (in real terms) during the Great Depression in our group of ten countries. It is striking that in the UK consumption fell only in 1932 - and then only by about % - whereas in the US consumption fell for four successive years and by 20% in total. Indeed, consumption in the UK fell by over five times as much during the recent recession as in the 1930s. Changes in the terms of trade account for much of the variation shown in Table 3. In the US the terms of trade fell by 16% between 1929 and 1932, in Canada by 13% and in Australia by 30%; in the UK by contrast the terms of trade improved by 24% over the same period (Liesner, 1989). But another important difference between the US and UK was the rapid increase in household debt in the US during the 1920s. Consumer debt more than doubled during the 1920s in the US.

and in the Great Depression repossession of consumer durables bought on credit was common. In 1932 alone over 10% of cars bought on credit were repossessed (Olney, 1992). The experience of the 1930s as well as the 1990s seems to give support to the notion that the interaction between prior increases in household debt and negative demand or supply shocks can lead to prolonged downturns in demand and output.

The basic argument is not new. In his 1978 Yrjö Jahnsson Lectures delivered, of course, in Helsinki, James Tobin described Fisher's debt deflation as a reverse Pigou real balance effect, and pointed to the dangers of ignoring distributional effects: "Aggregation would not matter if we could be sure that the marginal propensities to spend from wealth were the same for creditors and debtors. But if the spending propensity were systematically greater for debtors, even by a small amount, the Pigou effect would be swamped by this Fisher effect" (Tobin, 1980, p.10).

4. A Model of debt deflation

I turn now to the question of how to model debt deflation. The key insight is that provided by Tobin (op.cit.), namely that the marginal propensity to spend from wealth differs between debtors and creditors. The microeconomic analysis of debt deflation, therefore, concerns optimal consumption behaviour under uncertainty. The emphasis will be on the role of precautionary saving. I focus on household consumption rather than corporate investment for two reasons. First, the theory

of household behaviour under uncertainty is on a surer footing than that of firms, and I wish to avoid the problems of modelling corporate finance when the Modigliani-Miller theorem does not hold. Second, it was a fall in consumption which characterised both the Great Depression in the United States and the 1990s recession in the Anglo-Saxon world.

The macroeconomic analysis is based on the idea that aggregate demand may be a non-monotonic function of the relative price of assets in terms of the numeraire consumption good. Distributional shocks associated with changes in the relative asset price produce a non-monotonic aggregate demand function. Given appropriate assumptions about aggregate supply this leads to multiple equilibria, and, to the possibility of cyclical behaviour of the kind described by Fisher. Models of credit cycles can, I believe, be described as belonging to a family of this type.

The key features of the model are:

- (i) two types of agent;
- (ii) two goods, a consumption good and a capital asset;
- (iii) stochastic and uninsurable endowments.

Central to the model is the impact of **distributional shocks** on the aggregate level of consumption. Agents who had borrowed on the expectation of future returns suffer adverse shocks that lead them to consume less and repay debt. Other agents experience **offsetting shocks** but do not increase consumption by enough to **compensate** for the reduction of consumption by the first type. In other words, **the marginal**

propensity to consume out of wealth is higher for debtors than for creditors.¹¹

Consumption responses of this kind reflect precautionary saving. In the late 1960s Hayne Leland (1968) and, a former President of the EEA, Agnar Sandmo (1970), showed how an increase in uncertainty would reduce consumption if preferences exhibited the property of "prudence". For this to be the case the third derivative of the utility function defined over instantaneous consumption must be positive. The papers by Leland and Sandmo inspired a number of problem sets which were given to graduate students of my generation, the answers to which always depended upon the third derivative of the utility function. We can now go one better. For, as Kimball (1990 a,b) has shown, the marginal propensity to consume out of wealth in a world of uncertainty depends upon the fourth derivative of utility.¹² What matters is how the degree of prudence changes as net worth changes.

The precautionary saving motive means that an increase in uncertainty about future endowments leads households to save more in order to provide for a rainy day. One of the consequences of precautionary saving is that it explains why, in typical life-cycle models, households may choose not to borrow, and hence why consumption may track income. Christopher Carroll (1992) and Angus Deaton (1992) have explored this approach as an alternative to the assumption of exogenous borrowing constraints. But a model in which households do not borrow is hardly a useful basis for an analysis of debt deflation!

I shall construct a model in which households choose to borrow and in which risk is not fully insurable. For some households, at least, I assume that their endowments come toward the end of life. This is similar to modifying a standard overlapping generations model so that endowments are received in the second rather than the first period of life.¹³ The effect of introducing this consideration is that households are now required to borrow to finance consumption, at least in the early part of life. In fact, I shall use a many-period finite lifetime model, but with concurrent rather than overlapping generations. It is now possible to analyse the interaction between prudence and the response of borrowing to shocks to future income and asset values.

The motivation for recognising the importance of deferred endowments is the existence of **illiquid** assets for which use or control is not easy to separate from ownership, and the returns on which are not verifiable. Households will not be able to issue equity in such assets, and the risks will be uninsurable. Such assets may provide consumption services directly (housing, for example), or generate an investment return which cannot be easily realised until late in life (a private business or anticipated inheritance, for example). The illiquid nature of the assets is crucial, because it means that asset price risk is uninsurable. For example, if there is no rental market (because of government intervention to impose rent controls), housing services can be obtained only by buying an asset on which outside equity cannot easily be issued and which must be financed by debt.¹⁴ This means that the risk of the entire asset return falls on the home owner. If the only source of uncertainty were returns on a tradable asset, then households would face a standard optimal consumption-portfolio decision problem. They could

sell part of their claim on these future returns and switch to a diversified portfolio. This would generally imply holding positive quantities of all financial assets, and households would lend not borrow. With isoelastic utility, for example, consumption would be proportional to current wealth where the constant of proportionality would reflect time preference and the distribution of returns (Samuelson, 1969). Agents with identical preferences and equal access to trading opportunities would consume equal proportions of current wealth. Hence redistributions of wealth would have no effect on aggregate consumption. When assets cannot be traded analytical solutions are generally not to be had, but prudence comes into its own.

To investigate the relationship between shocks to future endowments, borrowing and consumption, I turn now to a simple formal model. There are equal numbers of two types of agents, $i = 1, 2$. Both types have finite lives and live for T periods. Preferences are defined over consumption in each period and in period t are given by the additively separable form

$$V_t = E_t \sum_{\tau=0}^{T-t} U(c_{t+\tau}) (1+\rho)^{-\tau} \quad (4.1)$$

where c denotes consumption, ρ the rate of pure time preference, and E_t the expectations operator conditional upon information available in period t .

The two types of agent differ with respect to their endowments. Type 1 agents are endowed with a fixed quantity of an illiquid capital good

which does not depreciate and pays off only in period T when the asset can be redeemed as q units of consumption. The value of q is stochastic and "news" about its expected value in period T arrives each period. The revision in the expected terminal value of the asset, $(E_t - E_{t-1})q$, constitutes the "news" in period t about wealth. I shall assume that the risk to q is uninsurable, for example because the return in period T is costly or impossible to verify. Type 1 agents, must therefore, borrow to finance consumption before period T. They are the debtors. The time structure of their endowments is shown in Table 4. Access to the capital market is limited to the ability to lend or borrow at a fixed nonstochastic interest rate which, for ease of exposition, is assumed to be zero. Optimal consumption behaviour of type 1 agents in period t is derived by maximising (4.1) subject to the distribution of "news" about q and the following budget constraint

$$\sum_{\tau=0}^{T-t} c_{t+\tau}^1 + b_{t-1}^1 = q \quad (4.2)$$

where b_{t-1}^1 is the stock of debt brought forward from the previous period and is equal to cumulated past consumption. The simple dynamics of debt for type 1 agents are:

$$b_t^1 = b_{t-1}^1 + c_t^1 \quad (4.3)$$

At the beginning of each period "news" arrives about the value of q in period T. By the law of iterated expectations these revisions to the expected value of q are stochastic shocks with zero mean. The unconditional expectation of q - before the arrival of first period "news" - is normalised to unity.

Type 2 agents receive a different structure of endowments from type 1 agents. But they receive the same unconditional expected value of lifetime wealth (see table 4). At the beginning of life they receive one unit of the consumption good which may be consumed or invested at a (zero) nonstochastic interest rate. Access to the capital market is limited to this opportunity to lend or borrow at the safe real rate set on the world capital market. In each period type 2 agents receive a stochastic labour income, denoted by s_t , which is nondiversifiable and has a zero mean.¹⁵ Type 2 agents will typically save part of their initial endowment ($b_t^2 < 0$). They are the creditors. Their consumption in period t is determined by maximising (4.1) subject to the budget constraint:

$$\sum_{\tau=0}^{T-t} c_{t+\tau}^2 + b_{t-1}^2 = \sum_{\tau=0}^{T-t} s_{t+\tau} \quad (4.4)$$

with debts (assets) evolving according to

$$b_t^2 = b_{t-1}^2 + c_t^2 - s_t \quad (4.5)$$

In order to focus on the impact of distributional shocks, I shall assume that the "news" for the two types of agent is perfectly negatively correlated, that is

$$s_t = -(E_t - E_{t-1})q \quad \forall t \quad (4.6)$$

With this assumption **aggregate** lifetime wealth per head, denoted by w , is nonstochastic and constant over time. To see this note that the expected lifetime wealth of a type 1 agent in period t is $w_t^1 = E_t q$, and of a type 2 agent is

$$\begin{aligned}
 w_t^2 &= 1 + \sum_{\tau=1}^t s_\tau \\
 &= 1 - \sum_{\tau=1}^t (E_\tau - E_{\tau-1})q \\
 &= 2 - E_t q
 \end{aligned}
 \tag{4.7}$$

Total lifetime wealth per head, $(w_t^1 + w_t^2)/2$, is, therefore, equal to unity in all periods. The distribution of q is assumed to lie within the interval $[0,2]$.

In order to generate interesting differences in the consumption patterns of debtors and creditors, I shall assume that the distribution of q is **skewed**, with a higher probability of very low realisations for q than of high values. Skewness captures the notion that nontradable assets can turn out to be almost worthless, and even stock market returns are negatively skewed. This means that the risk of very low consumption is greater for debtors than for creditors, even though expected lifetime wealth is the same for the two groups.

The difference in the timing and distribution of endowments means that the consumption functions of creditors and debtors differ. Hence shocks to the distribution of wealth, which follow from "news" about the value of the asset, will lead to changes in aggregate consumption.¹⁶ To examine this we need to solve explicitly for the consumption function - the level of consumption in period t expressed as a function of the state variable, the level of debt or assets inherited from period $t-1$, and the

stochastic shock in period t . The solution to the model can be found by dynamic programming techniques. In the last period

$$\begin{aligned} c_T^1 &= q - b_{T-1}^1 \\ c_T^2 &= s_T - b_{T-1}^2 \end{aligned} \quad (4.8)$$

Similarly backward induction gives

$$c_t^i = f_t^i(b_{t-1}^i, s_t) \quad i=1,2, t=1..T \quad (4.9)$$

The consumption function $f(\cdot)$ reflects not only preferences but also the distribution function of endowments. In general there are no analytical solutions, and numerical grid-search techniques must be used either by iterating to find the function $f(\cdot)$ for each t (see King and Robson, 1993) or by evaluating the value function (Deaton, 1992 p.186). Typical consumption profiles for the two types of agent are shown in Figure 4. Precautionary saving means that debtors will typically consume less than creditors before the final period. The greater risk faced by debtors means that, provided preferences exhibit a sufficient degree of decreasing absolute prudence, they have a higher marginal propensity to consume out of expected wealth. The location of the curves also depends upon the past history of shocks and consumption.

The expected wealth of an agent in period t is equal to his expected lifetime endowment less his cumulative consumption to date. Using this relationship we may map the consumption functions shown in figure 4 into functions expressing consumption in terms of the expected value of the asset, $E_t q$. These are shown in Figure 5, together with aggregate consumption per head, which is the average of the two curves. For

debtors consumption is an increasing and for creditors a decreasing function of $E_t q$. At both low and high values for the asset price one or other of the agents has a high marginal propensity to consume out of wealth, and the result is that aggregate consumption is first an increasing and then a decreasing function of the expected asset value.¹⁷

This non-monotonic relationship provides the basis for some interesting dynamics. In the model described above there was no supply side. Consider now the introduction of a supply response to expected returns.¹⁸ Figure 6 plots the aggregate demand function - total consumption as a function of $E_t q$. Aggregate supply is assumed to be (slightly) increasing in the expected asset price to reflect the relative inelasticity of labour supply and the greater responsiveness of entrepreneurial effort to expected returns. It is possible, though by no means either necessary or likely, that there are multiple equilibria, as shown in figure 6. Of the three equilibria shown in figure 6 two are stable and one unstable. Financial instability is clearly possible. Even without any further demand shocks resulting from news about future endowments, cyclical fluctuations in demand and output can arise as the economy moves over time from one equilibrium to another. Fisher went on to analyse the impact of attempts to reduce debt on the level of asset prices, which in turn exacerbated the initial shock. To analyse this requires an extension of the above model to allow for endogenous asset prices. In a stochastic setting this is by no means straightforward. Kiyotaki and Moore (1993) have produced a very interesting deterministic model of this chain reaction in which falls in asset prices reduce the collateral available to support borrowing. Given the (crucial) assumption that borrowing is necessary not only to finance investment but also some

part of current expenditure, they show that falls in asset prices reduce the ability to borrow and hence investment, a process which comes to an end when creditors find assets cheap enough to buy.¹⁹

5. Empirical Evidence

Distributional effects were at the heart of the model that I presented. I want, therefore, to conclude with two pieces of empirical evidence on debt and consumption based on cross-section data.

The first takes us back to the group of ten countries with which I started this lecture. The correlation between the rise in household debt in the 1980s and the subsequent shortfall in GDP growth between 1989 and 1992 shown in Figure 1 is not particularly strong. But the theory relates to the impact of debt on consumption growth. I have repeated the exercise this time plotting the shortfall in consumption growth (defined as before as the difference between the growth of consumption in 1989-92 and its average growth in 1974-1989) against the change in the ratio of household debt to GDP. The results for ten countries are shown in Figure 7 (the solid line denotes the OLS regression). The correlation is much closer than in Figure 1 and the significance of the relationship does not depend upon any individual observation. Similar conclusions can be drawn from VAR estimates of consumption and output.

The second piece of evidence exploits regional differences within a country. As before, looking at variations within a country helps to control for differences in national fiscal and monetary policy shocks. Of course if the transmission mechanism of such policies operates via

distributional effects then such effects will appear in cross-sectional data within a country. In the UK the recent recession exhibited an unusual regional pattern, with the normally prosperous south-east region more adversely affected than the manufacturing regions of the north. Unemployment differentials among the regions narrowed very significantly. And house prices fell sharply, even in nominal terms, in the south. The result was that many households found that the nominal value of their mortgage exceeded the market value of their house - a position of "negative equity". Of the eleven standard regions in the UK, only seven generate sufficiently large annual samples of households in the FES for estimated changes over time to be reliable. For these seven regions Figure 8 shows the relationship between the increase in average real weekly non-housing expenditure from 1988 to 1990 and the new debt acquired by households relative to their income over the same period. The regions fall into two groups, those with low ratios of new debt to income and high consumption growth and those with high new debt ratios and low consumption growth.

These results can be no more than suggestive of the importance of precautionary saving in the face of high debt levels. But they illustrate the potential value of microeconomic data for the analysis of those macroeconomic issues where the assumption of a representative agent conceals the essence of the phenomenon of interest. I believe debt deflation to be a good example of such an issue.

6. Conclusions

Debt deflation has many facets, as shown by Fisher's nine factors. I have examined only one - the impact of distributional shocks between debtors and creditors on aggregate demand. I do not mean to play down the significance of the other aspects of the story, but rather to play up an aspect that is at the heart of Fisher's analysis, namely the real business cycle nature of his model of debt deflation. To do this I have focussed on purely distributional shocks. The observation that distributional shocks can cause changes in aggregate demand which are significant from the macroeconomic perspective may seem a statement of the obvious. As Robert Louis Stevenson put it in his diary of *Travels with a Donkey* after a night in the open air, "I thought I had rediscovered one of those truths which are revealed to savages and hid from political economists" (Stevenson, 1897). Yet it is worth making the point that the assumption of a representative consumer can sometimes conceal more than it reveals in macroeconomic behaviour.²⁰

I have argued that debt deflation should be seen as a real business cycle rather than a monetary phenomenon. The model I presented was a real model. It is true that unanticipated monetary shocks can exacerbate the problems caused by debt deflation because they lead to instability in the price level and to macroeconomic instability more generally. And it was macroeconomic instability against which both Fisher and Keynes fought so hard. As Keynes wrote in 1937, "I find, looking back, that it was Professor Irving Fisher who was the great-grandparent who first influenced me strongly towards regarding money as a 'real' factor" (Keynes, 1937b). And Keynes and Fisher were united in their advocacy of price stability.²¹ But it is the real structure of the economy which

is crucial. A housing market in which many families with low net worth can only obtain housing services by purchasing 100% of an asset worth a multiple of their wealth, exposes such households to great risk.

Debt deflation is a propagation mechanism which multiplies small shocks into potentially large changes in aggregate demand and output. The existence of multiple equilibria produces the possibility of instability. To understand this requires a real business cycle model, but one in which the representative consumer is replaced by at least two types of agent, debtors and creditors. There is a lesson here for the use of macroeconomic models in policy analysis. There is no single model that can possibly hope to capture all the features of the world that may be relevant in the future. It is the pretence that one model can hope *ex ante* to incorporate all relevant features of the world which is the undoing of large econometric forecasting models. Our aim should be to identify important issues of the day and construct a model which casts light on the problem in question.

Fisher's work on debt deflation was launched - first in his lecture and subsequently in his book - in 1932. Later that year Fisher also gave a presidential address - to the American Statistical Association. In it Fisher discussed economics and forecasting. He compared economic forecasting with both astronomy - where accurate predictions of, say, eclipses were possible, and meteorology, where predictions of whether the weather would permit an observation of an eclipse were impossible. He continued,

"Contrast this with our economic predictions. We are now going through an economic eclipse which began in September, 1929. But few if any economists predicted it, or, if so,

they failed to make their predictions public. It is well that we face these failures and that, when we fail, we confess it with due humility. [Fisher continued] I confess it. .. in September 1929 I publicly stated my belief that .. there would be a recession. .. Unfortunately I also stated my belief that the recession would be slight and short; and this proved untrue. .. I can now see that my failure was due to insufficient knowledge of both kinds, scientific and historical. .. As to the laws governing depressions, I did not then know .. the important role of over-indebtedness" (Fisher, 1933b).

Fisher was a poor forecaster but a great economist. We should learn from his experience. Economists should not play the role of fairground fortune tellers. If Oscar Wilde were alive today he would surely describe economic forecasters as the unfathomable in pursuit of the unpredictable. Fisher was sceptical of a purely statistical approach to the discovery of economic relationships - an approach he described as "the grinding out of correlation coefficients between statistical series whose inner relationships are unknown or possibly non-existent" (op.cit.). A theoretical framework was essential to the advancement of understanding:

"Theory and fact must go hand in hand. Otherwise the world of observation and statistical data will be almost meaningless for lack of any rational framework to fit into; and conversely our theory will be almost meaningless for lack of any statistical expression or verification." (Fisher, 1933b).

That clarion call of Fisher's could serve as the motto for a research programme into the construction of real business cycle models without a representative consumer, and the use of microeconomic data to throw light on macroeconomic phenomena. There is much to do.

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END NOTES

1. I am grateful to Alex Bowen, John Campbell, Andrew Crockett, Oliver Hart, Don Moggridge, John Moore, James Poterba, Agnar Sandmo and Roland Wales for helpful discussions and suggestions, and to the Bank of England for research support.

2. Similar results hold for total private sector debt but there are difficulties in obtaining consistent time series for corporate sector debt in all countries. The model presented in this lecture relates primarily to the behaviour of household consumption.

3. Among the authors who have contributed to this literature are Bernanke, Gertler, Greenwald and Stiglitz. A survey of the relevance of these papers to the causes of the Great Depression may be found in Calomiris (1993).

4. In the US output fell from peak to trough by 2.2% over three quarters, whereas in the UK non-oil output fell by 3.9% to its trough in 1992 Q1.

5. In the US consumption fell for two consecutive quarters and by 1.5% from peak to trough.

6. Expenditure on housing during this period was affected by the switch from rates to the Community Charge. It is, therefore, preferable to look at non-housing expenditure when making comparisons over time. In addition to the effect of the stock of debt relative to expected future incomes, the cash flow burden of servicing debt might also have lowered consumption.

7. The copy in the Bank of England library has a personal inscription from Irving Fisher to, the then Governor, Montagu Norman.

8. Keynes also contributed to a *Festschrift* for Fisher in 1936 which made no reference to debt deflation (Keynes, 1937a). And, in line with the absence of references in the Collected Writings of Keynes, there is no reference to Fisher's work on debt deflation in the two recent biographies of Keynes (Moggridge 1992, Skidelsky 1992).

The correspondence between Keynes and Fisher is in the Keynes Papers in the library of King's College, Cambridge. The most interesting item is a letter from Fisher to Keynes dated 5 May 1916:

"I remember your telling me when I was in England a number of years ago, that you had at one time made a study of the records of the dinner hour in England for several centuries and that you had discovered that the hour of that function had become gradually later, at about a certain rate per century. Can you let me have any definite figures on this point, as to rate of change per century or the times at different century markers? I am gathering material for a book on progress which I hope to write some day".

Sadly, no record remains of the research results.

9. Tobin (1987, p.371) and Allen (1993, chapter 9). There are two biographies of Fisher, one by his son (Fisher, 1956), and the other by Robert Loring Allen (1993) published earlier this year after the first draft of this lecture was completed.

10. It is worth quoting Schumpeter in full on the contribution of these ideas:

"Ostensibly, the burden is chiefly laid upon the fact that in the atmosphere of prosperity debts are accumulated, the inevitable liquidation of which, with the attendant breaks in the price structure, constitutes the core of depression. Behind this surface mechanism there are the really operative factors - new technological and commercial possibilities chiefly - which Fisher does not fail to see but which he banishes to the apparently secondary place of "debt starters".... so that... the true dimensions of what is really a great performance are so completely hidden from the reader's view that they have to be dug out laboriously and in fact never impressed the profession as they should have done" (op. cit. p.1122).

11. If shocks were diversifiable through either insurance or asset markets, then they would have no impact on consumption. But the empirical relevance of incomplete consumption insurance has been demonstrated by Acemoglu and Scott (1993), Cochrane (1993), Mace (1993) and Miles (1993). Mace (op.cit.) finds that full insurance cannot be rejected for exponential utility (constant absolute risk aversion) but is rejected for isoelastic utility (constant relative risk aversion).

12. In a two-period model with additively separable preferences, an increase in uncertainty, holding expected wealth constant, will raise the marginal propensity to consume out of wealth, provided that preferences display decreasing absolute prudence, where the degree of prudence may be defined analogously to the degree of risk aversion but in terms of the marginal utility rather than the utility function. Kimball (1990a) has proposed an index of the (absolute) degree of prudence defined as $p(c) = - [u'''(c)/u''(c)]$. This index measures the intensity of the desire for precautionary saving, and reflects the propensity to anticipate future risks by cutting back current consumption. Strictly decreasing absolute prudence is satisfied by isoelastic utility functions (constant relative risk aversion); exponential utility (constant absolute risk aversion) implies a constant degree of absolute prudence. In a multi-period setting with isoelastic utility a sufficient condition for the result to hold is that the degree of risk aversion exceed unity.

13. In an unpublished paper delivered some years ago in Edinburgh, Ragnar Bentzel discussed such a model.

14. I shall assume that marginal utility at zero consumption is infinite. Hence agents will never borrow more than they can repay in period T with certainty. Any claim that there are inadequate resources to repay debt will be known to be false, and can be deterred by a sufficiently large legal penalty on a refusal to repay debt. With no default risk agents are able to borrow at an interest rate free of any default premium - the safe "world" interest rate.

15. This assumption - that the mean value of labour income is received at the beginning of life - is made for convenience.

16. Differences in the marginal propensity to consume are not imposed exogenously, as in the Cambridge theory of distribution for example, but reflect endogenous optimal behaviour. Hassler (1993) argues that the influence of precautionary saving may be small relative to the impact of income shocks on the demand for goods such as durables for which there are significant transaction costs.

17. Mishkin (1976, 1978) emphasised the role played household balance sheets as a structural transmission mechanism through which shocks led to a fall in aggregate demand.

18. I am assuming here that nonmonotonic aggregate demand functions are generic to precautionary saving in a world without a representative consumer.

19. O'Connell (1987) analyses the investment decision when macroeconomic shocks interfere with the ability of agents to build a reputation with the suppliers of finance. Optimal behaviour then leads to greater fluctuations than would occur if the signals could be disentangled.

20. The importance of heterogeneity has been stressed by Hildenbrand (1983, 1989) Grandmont (1992) and Kirman (1992).

21. See Bank of England (1992).

TABLE 1: DEBTS: THEN AND NOW

	1929-32 US			1989-92 US		1989-92 UK	
	\$ bn current	\$bn 1989	%	\$ billion	%	£ billion	%
<i>Nominal</i>							
Private	-41	-278	-21.1	876	12.7	284	23.8
Total	-37	-251	-15.7	1,799	18.4	339	24.6
<i>Real*</i>							
Private	40	271	20.7	265	3.8	81	6.8
Total	68	461	29.1	893	9.2	102	7.4

* Deflated by the 'businessman's dollar' (index of wholesale commodity prices).

Source: Fisher (1932), Table 2, page 109 and OECD (1992).

**TABLE 2: AVERAGE REAL WEEKLY
HOUSEHOLD EXPENDITURE
OF OWNER-OCCUPIERS IN UK, 1989-91
(1989=100)**

	Total expenditure		Expenditure excluding housing	
	No mortgage	With a mortgage	No mortgage	With a mortgage
1989	100.0	100.0	100.0	100.0
1990	99.1	99.2	98.5	99.6
1991	103.9	98.2	100.9	95.9

Source: Family Spending, Table 14, issues of 1989-91, CSO

The real figures are obtained by deflating weekly expenditure by RPI and RPI excluding housing respectively.

TABLE 3: THE GREAT DEPRESSION

		Percentage change in	
		GDP/GNP	Consumption
US	1929-33	-29.7	-19.7
UK	1929-31	-5.5	-0.6
Australia	1929-31	-7.9	-19.2
Canada	1929-33	-30.1	-18.1
France	1929-32	-8.8	na
Germany	1929-32	-23.5	-9.5
Italy	1929-31	-7.0	-4.8
Japan	1930-32	+4.5	-0.9
Norway	1930-31	-8.0	-2.5
Sweden	1930-32	-11.9	-9.1

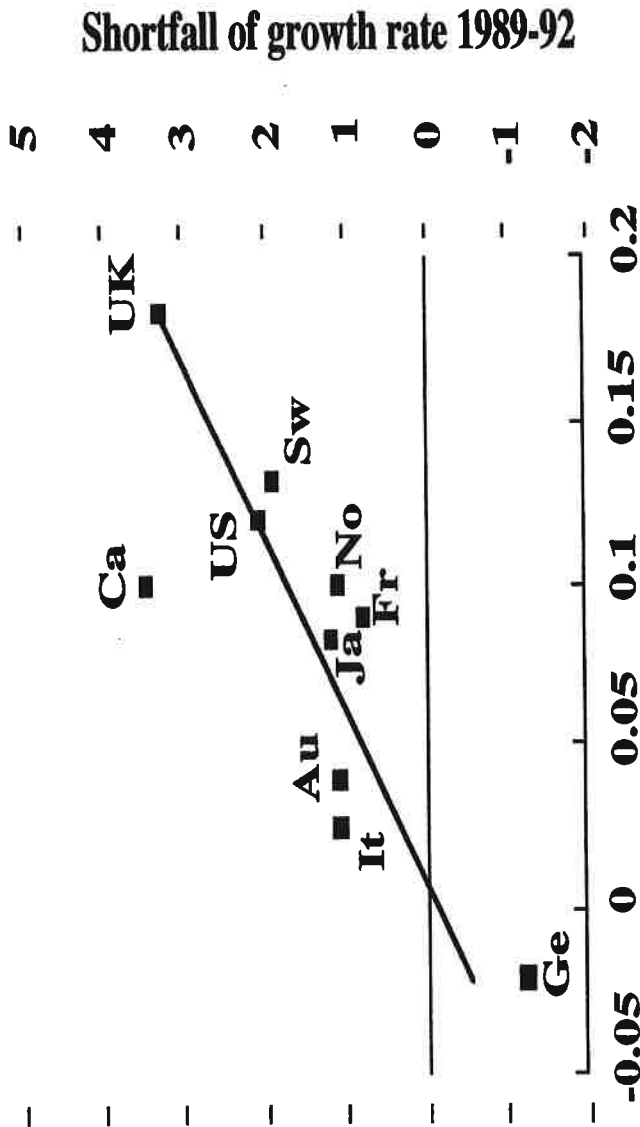
Source: Liesner (1989), Mitchell (1981), Central Bureau of Statistics (1965).

na = not available

TABLE 4: STRUCTURE OF FINITE HORIZON MODEL

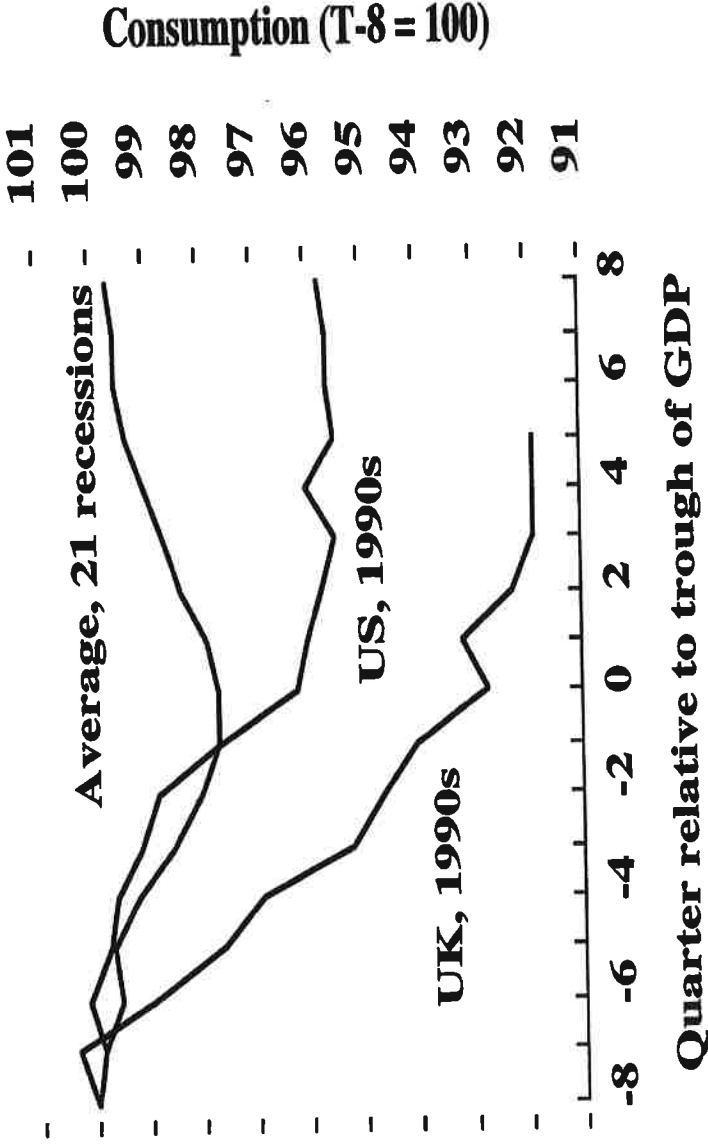
	Period 1	Period t	Period T
<u>Type 1: Debtors</u>			
Endowments	0	0	q
Expected Lifetime Wealth	$E_1 q$	$E_t q$	q
"News"	$E_1 q - 1$	$(E_t - E_{t-1}) q$	$q - E_{T-1} q$
<u>Type 2: Creditors</u>			
Endowments	$1 + s_1$	s_t	s_T
Expected Lifetime Wealth	$1 + s_1$	$1 + \sum_{\tau=1}^t s_\tau$	$1 + \sum_{\tau=1}^T s_\tau$
"News"	s_1	s_t	s_T

Figure 1: Debt and the 1990s recession
Ten major countries



Source: OECD (1992) and own calculations.

**Figure 2: Consumption over the cycle
(relative to trend GDP)**



Source: OECD (1992) and own calculations.

**Figure 3: Consumption of home owners
(with and without a mortgage)**

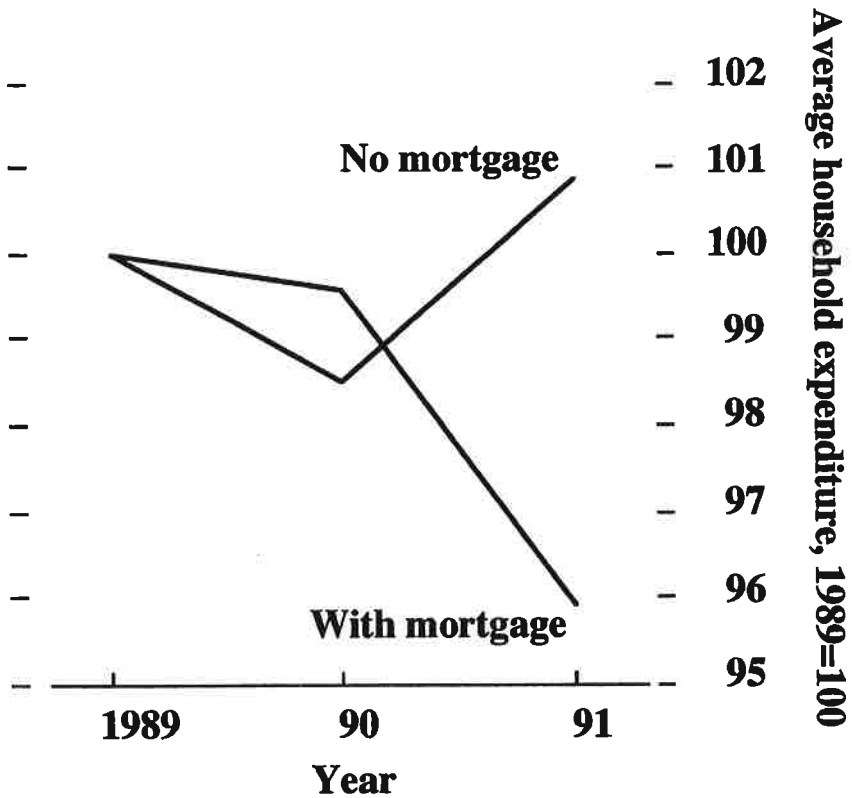


Figure 4: Consumption functions

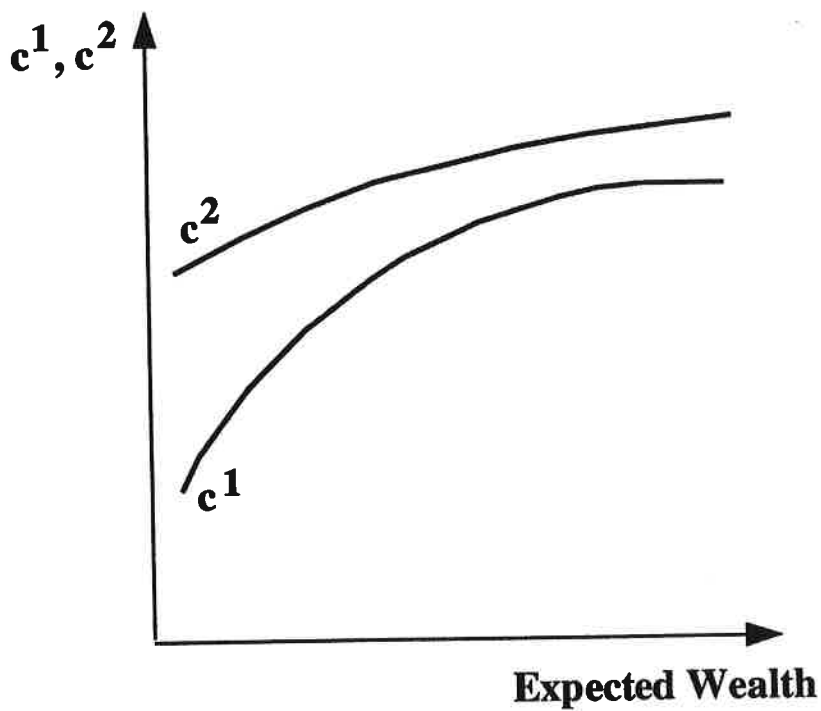


Figure 5: Consumption and expected asset values

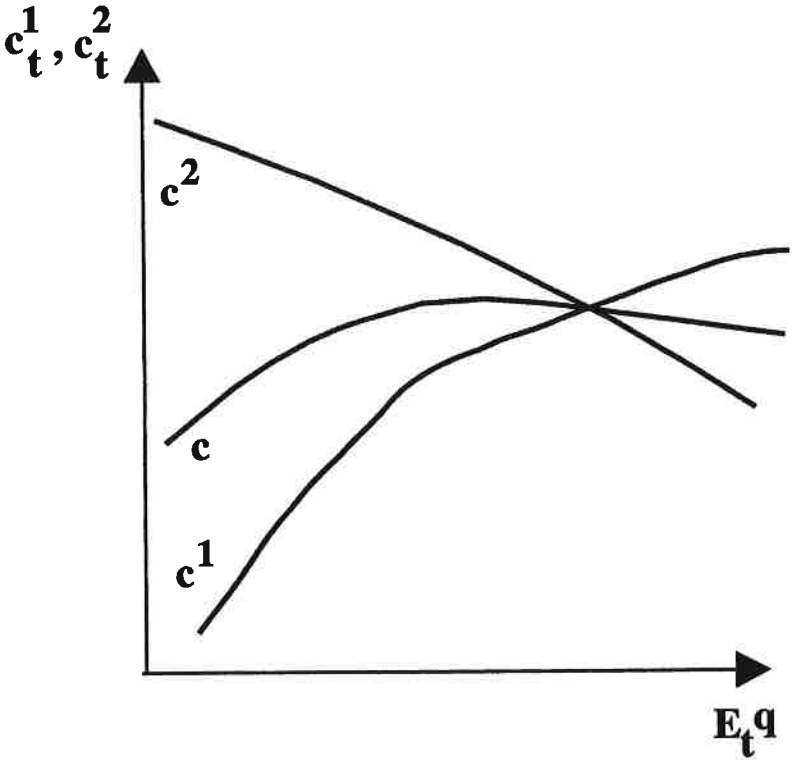
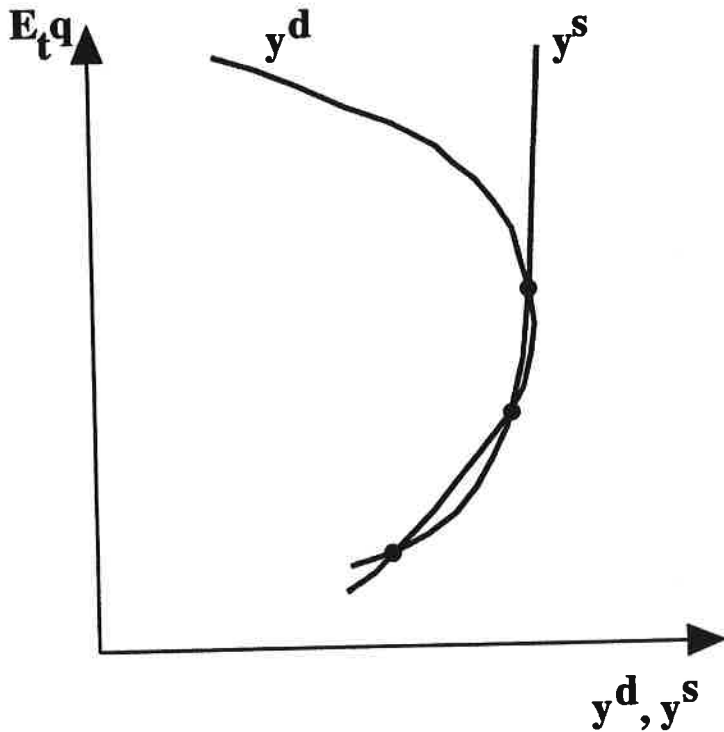


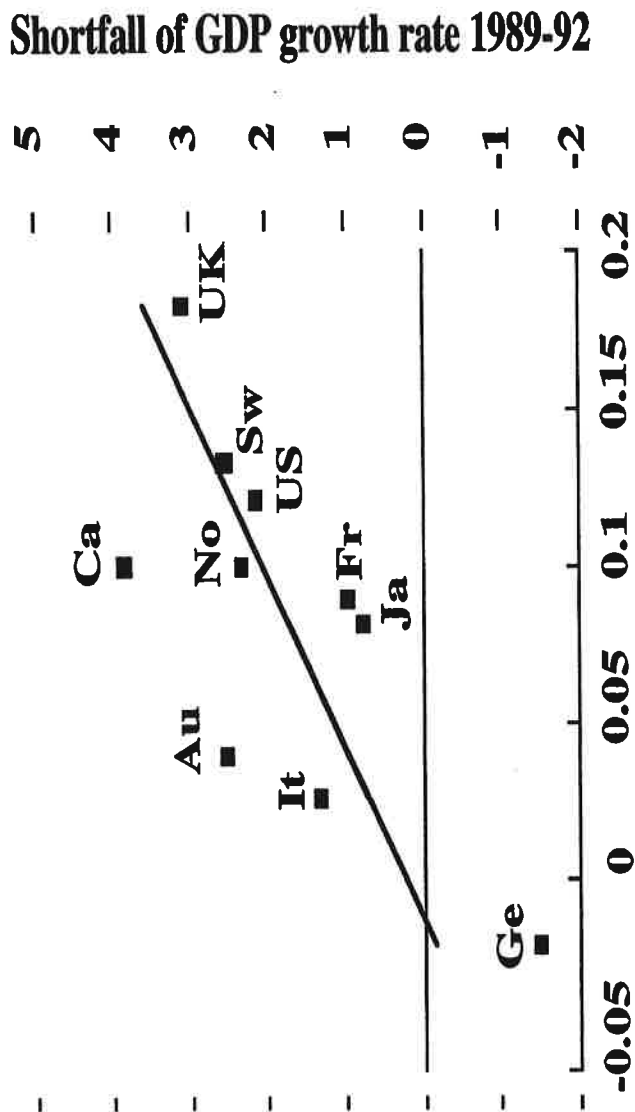
Figure 6: Multiple equilibria



y^d , Aggregate demand

y^s , Aggregate supply

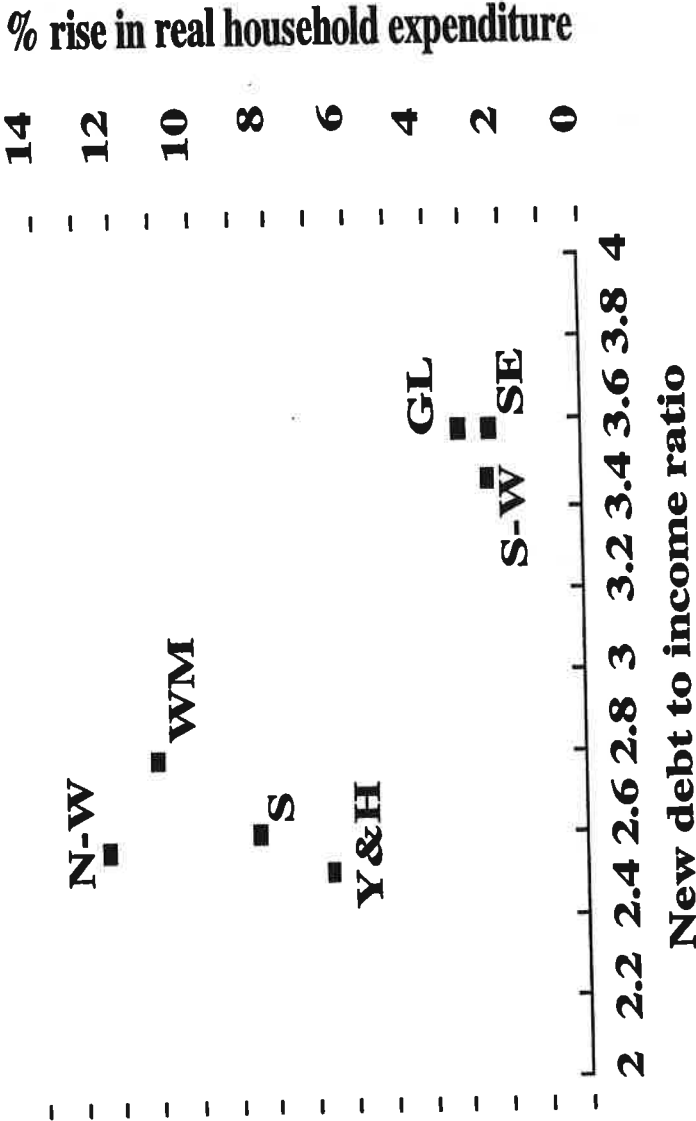
Figure 7: Consumption and debt—the 1990s
Ten major countries



Change in household debt ratio 1984-88

Source: OECD (1992) and own calculations.

Figure 8: Regional consumption and debt UK households, 1988-90



Source: Bank of England.

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