Financial Deregulation and Household Saving

Tamim Bayoumi (1)

(1) Bank of England and International Monetary Fund.

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Abstract

An overlapping generation model of the effects of financial deregulation is developed. The results indicate that deregulation will produce an exogenous short-run fall in saving, some of which will be recouped over time, while increasing the sensitivity of saving to wealth, current income, real interest rates and demographic factors. Empirical tests using regional saving data for the United Kingdom are reported, and found to generally accord with the theoretical model. It is estimated that deregulation caused an autonomous fall of 2¼ % in the personal saving rate of the United Kingdom over the 1980s.

1. Introduction

The last decade has seen widespread domestic financial deregulation in the industrial countries. (1) At the same time household consumption behaviour has also changed, the most dramatic illustration being the fall in the household saving ratio over the 1980s in both the United States and the United Kingdom, two of the countries where the process of deregulation has gone furthest. This paper develops a model of the effect of deregulation on the household sector.

Deregulation of domestic financial markets in the 1980s, resulted in an increase in competition both between banks and saving institutions (thrifts or building societies) as they moved into each others services, and within each sector. (2) The result was to open up new finacial options, particularly for households, the sector that was probably most affected by government regulation. These changes are investigated by developing an overlapping generations model of the effects of financial liberalisation. (3) This model is initially used to examine the effect of deregulation on the relationship between household saving and factors such as income, real interest rates and demographics. Next, the dynamic implications of the transition from a financially repressed state to a deregulated regime are examined.

The results from the model are then used as the basis for an empirical investigation of household saving behaviour in the United Kingdom. Pooled data, comprising regional data on household saving rates, are used to look at the effect of deregulation. It is concluded that deregulation lowered the equilibrium level of saving over the 1980s, probably by 2¼% per annum, as well as making saving significantly more dependent on changes in wealth, income and real interest rates. All these results are in accord with the predictions of the underlying model. (4)

2. Financial liberalisation and saving

This section develops a model of the effects of financial deregulation on saving based on an overlapping generations framework. Financial repression is assumed to limit the degree to which consumers could borrow in order to finance consumption. Specifically, the regime prior to financial liberalisation is modelled by assuming that while consumers are able to lend, they are unable to go into debt. Deregulation is

(1) General summaries of this process can be found in Mathieson and Rojas-Suarez (1990) and OECD (1987).

(2) In the United Kingdom the differences between various types of financial intermediaries were sharply reduced. See Bank of England (1984) page 42 and Bayoumi (1990) for further discussion of these changes.

(3) The overlapping generations framework was originally developed by Samuelson (1958). For a discussion on the properties of such models see Blanchard and Fischer (1989). Jappelli and Pagano (1991) use a similar overall approach in looking at the effect of financial liberalisation on growth rates in different economies.

(4) Earlier work on the effects of financial deregulation on the economy include Muellbauer and Murphy (1989) and Bayoumi (1990) on the United Kingdom, and Bayoumi and Koujianou (1989) and Blundell-Wignal *et al* (1991) in the international context.

assumed to lift this borrowing constraint, allowing people to smooth their consumption path more fully. The implications of the change in regime for the relationship between saving and other factors such as income and wealth are analysed, followed by an examination of the effects of the transition from one regime to another.

Consider an overlapping generations model in which consumers live for three periods; youth, middle age, and old age. It is assumed that they have identical logarithmic utility functions with a fixed discount rate ß. The consumer has an endowment path for the three periods defined by $(e_{yt}, e_{mt+1}, e_{ot+2})$, where the letters *y, m, o* stand for the age of the consumer and *t* is the time period. The endowment is assumed to be non-storable, and there is no uncertainty.

It will be assumed that, in addition to any financial transactions between consumers, an external market exists in which the consumer can buy and sell financial instruments for endowment an interest rate r_t. In the exposition, this external market will assumed to be a foreign country, however it could equally well be another sector within the economy (such as a government).

Under these assumptions the problem for the consumer who faces no borrowing constraints can be defined as,

$$Max\ U(c_{yt},c_{mt+1},c_{ot+2}) = ln(c_{yt}) + \beta ln(c_{mt+1}) + \beta^2 ln(c_{ot+2})$$

$$st.\ r_t r_{t+1} c_{yt} + r_{t+1} c_{mt+1} + c_{ot+2} \leq r_t r_{t+1} e_{yt} + r_{t+1} e_{mt+1} + e_{ot+2} \qquad (1)$$

The solution to this problem gives a consumption path,

$$c_{yt} = \lambda \qquad (2.1)$$

$$c_{mt+1} = \lambda \beta r_t \qquad (2.2)$$

$$c_{ot+2} = \lambda \beta^2 r_t r_{t+1}, \qquad (2.3)$$

$$\text{where } \lambda = (e_{yt} + e_{mt+1}/r_t + e_{ot+2}/r_t r_{t+1})/(1+\beta+\beta^2) \qquad (2.4)$$

Financial regulation is assumed to imply that consumers are unable to use more resources than the endowment available to them up to that point. This involves two further constraints:

$$c_{yt} \leq e_{yt} \qquad (3.1)$$

$$c_{yt} + c_{mt+1}/r_t \leq e_{yt} + e_{yt+1}/r_t \qquad (3.2)$$

The solution now depends upon whether the constraints defined by (3) bite or not.

For example, in the case that (3.1) bites but not (3.2) the solution is,

$$c_{yt} = e_{yt} \tag{4.1}$$

$$c_{mt+1} = \lambda' \tag{4.2}$$

$$c_{ot+2} = \lambda' \beta r_{t+1} \tag{4.3}$$

where $\lambda' = (e_{mt+1}+e_{ot+2}/r_{t+1})/(1+\beta)$. (4.4)

In the case when both (3.1) and (3.2) bind, consumers simply consume their endowment each period.

These results can be used to develop a saving function for the economy, and hence to look at how the response of saving to changes in income, wealth, demographics, and interest rates is affected by the change in regime. In order to do this it is useful to summarise the formula for aggregate demand ($c_{yt}+c_{mt}+c_{ot}$) both in the unconstrained equilibrium and in the face of financial repression. For simplicity it will be assumed that all consumers in a particular generation face the same path of endowments and that in the finaicially regulated case young consumers are constrained while middle-aged consumers are not (equation 3.1 binds, but 3.2 does not). The model can easily be extended to more complex cases, however since the basic results are similar we will focus on this simplified example.

Letting n_y, n_m *and* n_o represent the numbers of young, middle-aged and old in the population, from equations (2) and (4) it follows that prior to deregulation aggregate demand is,

$$AD_t = n_y e_{yt} + n_m \lambda'_{t-1} + n_o \beta r_{t-1} \lambda'_{t-2}, \tag{5}$$

where λ'_t is $(e_{mt+1}+e_{ot+2}/r_{t+1})/(1+\beta)$, the present value of endowment in middle and old age for somebody who is young in time t. After financial deregulation the level of aggregate demand becomes,

$$AD_t = n_y \lambda_t + n_m \beta r_{t-1} \lambda_{t-1} + n_o \beta^2 r_{t-1} r_{t-2} \lambda_{t-2}, \tag{6}$$

where λ_t is $(e_{yt}+e_{mt+1}/r_t+e_{ot+2}/r_t r_{t+1})/(1+\beta+\beta^2)$, the present value of the full endowment stream for somebody who is young at time t. Note that, since the consumer is constrained in youth λ'_t is greater than λ_t, since e_{yt} must be relative small compared to the other two endowments.

Net lending from the rest of the world can be calculated by subtracting demand from the total endowment for the economy ($n_y e_{yt}+n_m e_{mt}+n_m e_{mt}$). This gives the following formulae for saving (S_t) in the regulated and deregulated cases, respectively,

$$S_t = n_m (e_{mt} - \lambda'_{t-1}) + n_o (e_{ot} - \beta r_{t-1} \lambda'_{t-2}), \quad (7.1)$$

$$S_t = n_y (e_{yt} - \lambda_t) + n_m (e_{mt} - \beta r_{t-1} \lambda_{t-1}) + n_o (e_{ot} - \beta^2 r_{t-1} r_{t-2} \lambda_{t-2}), \quad (7.2)$$

In equation (**7.1**), which is the financially repressed case, the behaviour of the young has no effect on saving, since they are assumed to be constrained by equation (**3.1**). Saving depends upon the level of endowment of the middle-aged and old, the wealth of these individuals, defined as the present value of the endowment when middle-aged and old, and interest rates, which enter as a separate term in the behaviour of the old. By contrast, in the unconstrained case given by equation (**7.2**), all generations affect the behaviour of saving, which depends upon current endowments, wealth (defined as the discounted value of the full endowment stream over time) and interest rates. The two case imply different responses to changes in income, wealth, demographics and real interest rates.

Income. It is clear from equation (**7.2**) that in the unconstrained case that a transient increase in income (modelled as an increase in the current endowment) in any one period will always raise the saving rate. This is because while the increase in the endowment raises income, the effect on demand is muted since consumption only increases by the change in the present value of the endowment (λ). On the other hand, when there is financial repression, as in equation (**7.1**), the effect on saving depends upon the timing of the change in endowment within the consumers life. If the rise occurs in youth, then (because consumers are constrained by the inability to borrow) saving will be unaffected since the whole of the rise in income will be channelled into consumption. In addition, if the rise in endowment occurs in middle or old age, while saving will be affected the size of the effect will be smaller than in the unconstrained case. This is because λ'_t will change more than λ_t since it does not include the endowment when young. This means that financial liberalisation will result in an increase in the sensitivity of saving to changes in income.

Wealth. In the unconstrained case the saving rate depends upon the wealth of all generations, where wealth is defined as the present value of all future endowments, λ_t. This reflects the assumption that consumers wish to smooth their consumption path. In the case where there is financial repression the saving rate is independent of the behaviour of the young generation. For those consumers who are middle-aged and old wealth, defined as the present value of the endowment when middle-aged and old, does matter, however the exclusion of the endowment when young from the variable λ'_t makes the connection between wealth and consumption less strong. As in the case of income, the model implies that saving will become more sensitive to changes in wealth in the liberalised financial environment.

Demographics. Changes in demographics can be represented as changes in the n_i coefficients, hence the effect of changes in demographics on saving depends upon the

coefficients associated with these variables. Comparing equation **(7.1)** (the regulated regime) with **(7.2)** (the liberalised regime) it is clear that the position with respect to demographics is similar to that associated with income or wealth, and that demographics would be expected to have larger effects in the liberalised regime than the constrained case.

Interest rates. Interest rates have both an income effect (through the effect on wealth, λ or λ', which in turn depends upon the path of the endowment), and a substitution effect, represented by the inclusion of terms in r_t directly in equations **(7.1)** and **(7.2)**. The implications of financial deregulation on wealth was discussed above. Turning to the substitution effect, it is clear that saving is more sensitive to substitution effects in the unconstrained case, when changes in interest rates effect the saving of both the old and the middle aged, than in the financially repressed case when only the old are effected.

The transition to a deregulated environment. In addition to comparing the two steady state solutions, the model can also be used to analyse the effects of the transaction from one regime to another on saving. This is best illustrated by reference to a specific example; consider an endowment path $(e_{yt},e_{mt+1},e_{ot+2})$ of (0,6,0) for all t, and assume that the rate of population increase is zero. In addition, it will be assumed that the economy has access to foreign endowments, but faces an upward sloping demand curve. Specifically, it is assumed that the supply of foreign endowment (e_{Ft}) is defined by,

$$e_{Ft} = (c_{yt}+c_{mt}+c_{ot}) - (e_{yt}+e_{mt}+e_{ot}) = \xi - \xi / r_t, \qquad (8)$$

hence excess consumption can be borrowed from the rest of the world at steadily increasing interest rates.(1) The functional form of **(8)** is chosen so that when the economy is neither borrowing or lending then the interest rate is zero. In addition, it will be assumed that the discount rate is also zero. The somewhat unusual assumption of a zero discount rate is made purely for numerical convenience in the simulations and has no material effect on the analysis.

In this case, the unconstrained steady state consumption path $(c_{yt},c_{mt+1},c_{ot+2})$ is (2,2,2) for all t, while in the case of financial repression the path is (0,3,3).

Consider first the case of a small open economy where consumers are able to borrow and lend as much as they like at the initial rate of interest of zero (this can be thought of as the limit of the model as ξ goes to infinity). The transition path in this case is shown in Table 1. The rows show the consumption pattern, and average net financial position, for each generation of consumers, while the columns show the behaviour in

(1) The functional form was chosen for analytical convenience, and is not derived from any well specified maximisation problem.

Table 1
The transition from financial repression to an unconstrained equilibrium for a small open economy with perfect capital mobility

	Time period										
Generation	-3	-2	-1	0	1	2	3	4	5	6	Average borrowing position
1	0	3	3								1
2		0	3	3							1
3			0	3	3						1
4				2	2	2					0
5					2	2	2				0
6						2	2	2			0
7							2	2	2		0
8								2	2	2	0
Interest rate	1	1	1	1	1	1	1	1	1	1	1
Total consumption	6	6	6	8	7	6	6	6	6	6	
Current account	0	0	0	-2	-1	0	0	0	0	0	

Notes: The endowment path is (0,6,0) in youth, middle and old age respectively.

each time period. It is assumed that the financial system is liberalised in period 0, and hence from this point on consumers are allowed to go into debt to finance consumption. Prior to this date, each generation follows the constrained consumption path, given the interest rate, of (0,3,3) over their life span. The economy is in balance, with a current account deficit of zero, and hence a zero saving rate.

In period 0, with the interest rate still at 0, the young switch to the unconstrained consumption path (2,2,2). However, for the middle-aged and old consumers the liberalisation has no effect on behaviour, because they have already been constrained from consuming as much as they wished to when they were young. Given that they have already been unable to consume when young, the optimal consumption path over their lifespan remains (0,3,3). As a result, in period 0 the economy consumes 8 units (3 units of consumption each for the old and middle-aged and 2 units for the young), compared to an endowment of 6 units, implying a trade deficit with the rest of the world of 2 units. In period 1 the proportion of consumers following the constrained consumption path falls, as the previous old generation are replaced by the new young generation, and hence the trade deficit falls to 1 unit. By period 2 the economy is back in steady state equilibrium, with all consumers following an unconstrained consumption path, and the saving rate has returned to its initial level of zero.(1) The transversality condition is not violated since the country only accumulates a finite amount of debt (3 units).(2)

(1) The fact that the saving rate is exactly the same before and after deregulation is a function of this particular example. Different assumptions about the initial level of interest rates and about the discount factor can imply either an upward or a downward shift in the long-run saving rate, however these effects are small relative to the short-run change implied by the transition itself.

(2) If the steady state level of the interest rate was positive, the economy would have to run a small surplus to pay the interest payments each period.

Table 2
The transition from financial repression to an unconstrained equilibrium with an upward-sloping supply of foreign endowment

	Time period										
Generation	-3	-2	-1	0	1	2	3	4	5	6	Average borrowing position
1	0.00	3.00	3.00								1
2		0.00	3.00	3.00							1
3			0.00	3.00	4.00						1
4				1.50	2.00	2.67					0
5					1.50	2.00	2.18				0
6						1.83	2.00	2.05			0
7							1.96	2.00	2.01		0
8								1.98	2.00	2.00	0
Interest rate	1.00	1.00	1.00	1.33	1.33	1.09	1.02	1.01	1.00	1.00	
Total consumption	6.00	6.00	6.00	7.50	7.50	6.50	6.14	6.03	6.01	6.00	
Current account	0.00	0.00	0.00	-1.5	-1.5	-.50	-.14	-.04	-.01	0.00	

Notes: The endowment path is (0,6,0) in youth, middle and old age respectively. The coefficient, ξ on the supply for foreign endowment is set at 6.

A similar pattern emerges when the demand for foreign endowment is made upward sloping. Table 2 shows the results for the endowment path (0,6,0) when the parameter ξ is set equal to 6. In this case financial deregulation, by raising the demand for resources, raises the real interest rate. The main rise in demand and interest rates occurs in periods 0 and 1, which are the periods of the liberalised regime when there are still consumers who were originally liquidity constrained in youth (experiments indicate that the relative importance of the boost in the two periods depends upon the coefficient ξ). From period 2 onwards there is then a gradual fall in interest rates and a move towards the new equilibrium steady state path for consumption. Hence, unlike the case with perfect capital mobility, where the economy moves immediately to the new steady state consumption path, in this case the move to the new consumption path is more gradual. However, the overall pattern of a temporary fall in saving which then returns to its new long-run value, observed in the perfect capital mobility case, is also present in this case.

The model presented in this section implies that the move from a financial regulated to a deregulated regime will have several effects on the behaviour of saving. It will make saving more sensitive to changes in income, wealth, demographics and real interest rates. In addition, there will be a transitional decline in saving, caused by the fact that the young are able to raise their consumption immediately by borrowing, while older consumers do not lower their consumption in the short run since their behaviour continues to be affected by earlier financial repression, which will be financed by a current account deficit. This effect, while transitional, may last for a

considerable period since it depends upon the length of the generations in the overlapping generations model. (1)

3. The estimating equation

The model properties discussed above imply an empirical saving function of the form,

$$S = S(FD,\ R(FD),\ W(FD),\ \Delta Y(FD),\ DEM(FD),\ INFL) \qquad (9)$$
$$\quad -\quad +(>)\quad -(>)\quad +(>)\quad -(>)\quad +$$

where S is saving, FD is a measure of the degree of financial deregulation, R is the real interest rate, W is wealth, Y is real disposable income and DEM represents demographic factors assumed to be the ratio of the young and old in the population and $INFL$ is the inflation rate. Inflation is included in the specification because nominal rather than real interest rate payments are considered to be income in the national accounts, hence in inflationary times consumers are forced to increase saving simply to keep their debt position stable. The coefficients below the variables are the expected sign of the effect, while the figures in parentheses indicate the expected influence of financial deregulation on the coefficient.

A panel data set of the factors in equation (9) were collected for the regions of the United Kingdom from *Regional Trends* (more details are available from the author). Annual regional household saving rates from 1971–88 were calculated for the eleven standard economic regions.(2) Movements in wealth are proxied by two variables; regional real house prices and real national share prices. Housing comprises over half of the net wealth of the personal sector, and is one of the more volatile and regionally differentiated elements. Shares also make up a substantial, and variable, part of personal wealth, and one which is unlikely to be regionally differentiated.(3) Together, these variables probably represent reasonable proxies for year-to-year movements in personal wealth, in the absence of direct data on regional wealth holdings.

Two variables were used to measure rates of return; the national real interest rate and regional rates of return on housing. The real interest rate was measured as national short-term nominal interest rates (on Treasury bills) adjusted for national inflation over the following year, measured by the implicit consumption deflator. Due to the highly integrated nature of the UK financial markets (all the major banks have branches nationwide), there is no reason to expect there to be regional differences in

(1) Ermisch and Westaway (1990) find that these types of responses last for very long periods in an extended overlapping generations model with a fifty-year time horizon per generation.

(2) The regions are the North, Yorkshire and Humberside, the East Midlands, the North West, Wales, Scotland, and Northern Ireland.

(3) Atkeson and Bayoumi (1991) find little regional specific element in receipts of dividends, interest and rent across US sates. Given the much higher financial integration of the United Kingdom it would seem reasonable to assume that this pattern also holds for the United Kingdom.

nominal interest rates. (1) The rate of return on housing was measured using the regional inflation rate for real house prices. Since house prices make up half of UK personal sector assets, the rate of return on this specific asset might be expected to be important in personal behaviour.

Changes in real income were calculated using regional personal disposable income deflated by the national price level, again measured by the implicit consumption deflator. Two regional demographic variables were calculated, namely the proportion of the population the below 15, and over retirement age (defined as 60 for women and 65 for men).(2) Inflation was measured as the increase in the consumption deflation.

Financial deregulation was proxied by the ratio of total outstanding consumer credit to GDP, transformed to equal 0 in the mid-1970s and 1 in 1988. Since consumer credit is used to finance deviations of consumption from income, this ratio is a useful measure of the extent to which consumers are using credit markets to smooth consumption. The series is stable in the late 1970s and early 1980s, before then rising steadily from 1983 onwards.(3) For share prices, however, the chronology of deregulation is more precise; the main deregulation of the market occurred at the time of the "Big Bang" in the city of London in 1986, hence a dummy variable equal to 0 before 1986, ½ in 1986, and 1 afterwards was used for the real share price variable.

Putting all of these factors together the following equation was estimated.

$$
\begin{aligned}
S_{i,t} = {} & (\alpha_1+\alpha_2 FD_t) \\
& + (\beta_1+\beta_2 FD_t)\,(HP_{i,t}/P_t) + (\psi_1+\psi_2 FD^*_t)\,(SP_t/P_t) \\
& + (\delta_1+\delta_2 FD_t)\,R_t + (\phi_1+\phi_2 FD_t)\,\Delta \log(HP_{i,t}/P_t) \\
& + (\eta_1+\eta_2 FD_t)\,(P{<}15)_{i,t} + (\kappa_1+\kappa_2 FD_t)\,(P{>}RT)_{i,t} \\
& + (\lambda_1+\lambda_2 FD_t)\,\Delta \log(Y_{i,t}/P_t) + \mu\,\Delta \log (P_t) \\
& + \varepsilon_{i,t}, \qquad\qquad (10)
\end{aligned}
$$

where S represents the saving ratio, FD and FD^* are proxies for general financial deregulation and the 'Big Bang' respectively, HP house prices, P is the price level, SP is the share price, R is the real interest rate, $P{<}15$ is the ratio of people under 15, $P{>}RT$ is the ratio of people over retirement age, Y disposable income, and Δ is the first difference operator. Estimated coefficients are represented by Greek letters,

(1) National price data were used because no regional data are available. Since the United Kingdom has a very integrated goods market, it appears likely that for many items there is relatively little variation across the country.

(2) From 1974 to 1981 the only data available were for all people over 65. These were used to interpolate the retirement data over this period.

(3) This path corresponds to the chronology of financial deregulation, as detailed in Bayoumi (1990), in a paper which also uses this ratio as a measure of financial innovation. Unfortunately the data are only available back to 1975; the ratio was assumed to be equal to the 1975 value for earlier years.

while $\varepsilon_{i,t}$ is an error term assumed to have standard properties. All coefficients (including the constant term) are assumed to take the same value across all regions, which amounts to assuming that all consumers have the same utility functions.

Initially, an attempt was made to make the autonomous effect of financial deregulation on saving (represented by α_2) to follow a V shaped path, as in the theoretical model, by allowing the effects of increments to deregulation to decay over time. However, the resulting coefficients were so badly determined that the simpler specification of equation **(10)** was adopted, in which the change in the constant follows the proxy variable for deregulation. This amounts to assuming that over the period covered by the data the recovery from the initial negative effect on saving has not started. Since this recovery in saving represents an effect of overlapping generations, it is not unreasonable to assume that the recovery is not yet underway.(1)

4. Results

The system of equations defined by equation **(9)** were estimated using three stage least squares. Instrumental variable techniques were used since the right hand side variables such as wealth and income may be correlated with the errors; the instruments were a constant, the proxy for financial deregulation, and first lags of the national values of the dependent variables. While the number of coefficients (17) may appear large, it should be recalled that the data set has 176 observations (11 regions for 16 years each). Indeed, by using a panel data set it is possible to get a relatively small ratio of coefficients to observations, and hence greater precision in coefficient estimates.

The results are shown in Table 3. The first column of the table shows the coefficient estimate prior to deregulation, while the second column shows the shift in the coefficient associated with the proxy for deregulation; hence the sum of the two values shows the implied coefficient in 1988, the year in which the proxy for deregulation is equal to one. Looking first at the estimates prior to deregulation, all but one of the estimated coefficients have the correct sign (although several are not significantly different from zero at conventional levels). Both measures of wealth (real house prices and real share prices) have the expected negative effect, but only house prices are significant at conventional levels. Similarly, both rates of return (the real rate of interest and the change in real house prices) attract the expected positive coefficients, however neither is significant. Of the two demographic variables, the ratio of those below 15 has the correct sign and is significant; the coefficient on the ratio of those over retirement, on the other hand, is incorrectly signed but not

(1) An interesting issue is the time scale over which such overlapping generation effects might occur. Taken literally, the implication of the model is that this fall would continue for about 20 years. However some, notably Carroll and Summers (1991), have argued that individuals may smooth consumption over rather shorter periods than this.

Table 3
The results from estimating the regional saving model

	Coefficient before deregulation		Shift associated with deregulation	
Constant	1.360**	(0.290)	0.972**	(0.300)
Wealth effects				
Real house prices	-0.084**	(0.006)	-0.094**	(0.019)
Real share prices	-0.050	(0.040)	-0.001	(0.010)
Substitution effects				
Real interest rate	0.035	(0.441)	4.534*	(1.769)
Real return on housing	0.013	(0.028)	0.236**	(0.069)
Demographic effects				
Population below 14	-0.483**	(0.150)	-0.276	(0.336)
Population over retirement	0.217	(0.181)	-1.562**	(0.405)
Other effects				
Change in income	0.031	(0.074)	1.826**	(0.318)
Inflation	0.429	(0.339)		

Results for the individual equations

	NT	YH	EM	EA	SE	SW	WM	NW	WA	SC	NI
R^2	.24	.52	.51	.61	.63	.63	.30	.70	.43	.22	.23
DW	1.7	1.5	1.4	1.6	2.0	1.3	1.2	1.4	2.0	1.7	1.6

Notes: The dependent variable is the level of household saving in each region of the United Kingdom. The time period is 1973 to 1988. Standard errors for the coefficients are reported in parentheses. One or two asterisks indicate the coefficient is significant at the 5 or 1% level respectively. The instruments were a constant, a dummy variable equal to 0 before 1983 a 1 thereafter, and the first lags of the explanatory variables.

significant. The change in income has the correct sign, but the coefficient is small and insignificant. This implies that prior to deregulation, most (predictable) transient income was used for immediate consumption, rather than being used to smooth the consumption path. Finally, inflation has the expected positive sign.

The effects of deregulation, shown in the second column of the table, also broadly conform to expectations. Saving becomes more sensitive to wealth and to rates of return, the effect on returns being particularly striking. Deregulation has an insignificant effect on the coefficient associated with the ratio of population below 15, but a large negative effect on the ratio of the population over retirement.(1) Finally, saving is also estimated to have become more sensitive to (predicted) changes in real disposable income, with an implied total coefficient on this variable of 1.8 in 1988.

(1) This indicates that the influence of those over retirement age has risen with financial innovation, whereas in the overlapping generations model on page 9 (equation 8.1), the old influence saving even before deregulation as they run down their assets. One explanation for the empirical result of a large shift in this effect associated with deregulation is that prior to the reforms many of the assets held by the elderly were relatively illiquid, in particular housing, whose value they were unable to realise. The recent increase in such instruments as equity loans may have made it easier for the old to use such assets for consumption smoothing purposes, making saving more sensitive to this variable.

This is rather larger than the coefficient of unity which would be associated with transient income if all consumers smoothed consumption perfectly (this is simply the inverse of the random walk theory of consumption). One possible explanation for this large value is that if increases in income are associated with subsequent falls as the system returns to long-run equilibrium the coefficient could be above 1.(1)

The summary statistics for each equation are also reported in Table 3. The R^2 statistics indicate that the model explains over one fifth of the variance in saving in every equation, and in six of the eleven equations over half of the variance is explained. The Durbin Watson statistics vary between 1.15 and 2.04, indicating no clear and systematic autocorrelation across equations, despite the fact that only contemporaneous variables were used in the estimation and that the contract term is equal across all regions.

Table 4 reports a simplified version of the model, in which the insignificant coefficients have been eliminated from the model. Prior to deregulation saving depends upon wealth (both real house prices and share prices), demographics and

Table 4
The preferred regional saving model

	Coefficient before deregulation		Shift associated with deregulation	
Constant	1.360**	(0.136)	0.864**	(0.141)
Wealth effects				
Real house prices	-0.081**	(0.006)	-0.096**	(0.013)
Real share prices	-0.044*	(0.020)		
Substitution effects				
Real interest rate			4.245**	(1.396)
Real return on housing			0.245**	(0.053)
Demographic effects				
Population below 14	-0.610**	(0.051)		
Population over retirement			-1.145**	(0.160)
Other effects				
Change in income			1.822**	(0.254)
Inflation	0.379*	(0.147)		

Results for the individual equations

	NT	YH	EM	EA	SE	SW	WM	NW	WA	SC	NI
R^2	.24	.50	.52	.60	.64	.60	.35	.69	.41	.23	.24
DW	1.73	1.43	1.40	1.59	1.95	1.30	1.19	1.25	1.94	1.75	1.67

Notes: The dependent variable is the level of household saving in each region of the United Kingdom. The time period is 1973 to 1988. Standard errors for the coefficients are reported in parentheses. One or two asterisks indicate the coefficient is significant at the 5 or 1% level respectively. The instruments were a constant, a dummy variable equal to 0 before 1983 a 1 thereafter, and the first lags of the explanatory variables.

(1) For example, assume $y_t = -\beta y_{t-1} + (\beta - 1)y_{t-2} + \varepsilon_t$. In this case the coefficient on the change in (undiscounted) income $(1 + \beta)$.

inflation, but with no effect from rates of return or changes in real disposable income. Deregulation makes saving more sensitive to both of these influences, while also increasing its sensitivity to real house prices and the ratio of the elderly. The summary statistics for this model are very similar to those from the original model, indicating that the simplification of the model has not had a large effect on overall properties.

Overall, these results suggest that deregulation had a significant effect on the behaviour of consumption during the 1980s, but that other forces, such as the rise in asset values and demographic trends, may also have had important effects. Of course, these explanations are not necessarily exclusive; for example, by increasing real interest rates and making assets more liquid, financial deregulation may have contributed to the rise in real asset values.

Accounting for the fall in personal saving in the 1980s. These empirical results can be used to decompose the fall in the saving rate over the 1980s into its component parts. To so this, the fall in saving between 1988 and 1980–82 predicted by the model were divided into three parts:[1] that which would have occurred in the absence of deregulation, caused by changes in wealth, etc; the part caused by the interaction between deregulation and changes in factors such as wealth; and the autonomous change in saving resulting from deregulation. The tabulation below quantifies these effects; it divides the change in saving into these categories, and for the first two categories further subdivides the change into that caused by changes in wealth, rate of return, demographics and other factors. The data are based on the general specification; the results using the simplified version of the model were similar.

Accounting for the fall in saving over the 1980s
In per cent (1988 versus 1980–82)

Independent variables	-5.3
of which:	
Wealth	-6.8
Rate of return	0.7
Demographics	0.1
Other	0.7
Deregulation and independent variables	-1.6
of which:	
Wealth	-2.8
Rate of return	1.6
Demographics	-0.4
Autonomous fall in saving	-2.3
Total estimated fall in saving	-9.4
Memorandum:	
Actual fall in saving	-7.7

Notes: The effect of the change in the co-efficient on growth of disposable income due to deregulation was incorporated into the autonomous fall in saving.

(1) Averages were used for the earlier years in order to reduce the influence of behaviour in any one particular year.

The results indicate that, even in the absence of deregulation, the personal saving rate would have fallen by 5.3% over the 1980s. The main cause of this fall being the rise in wealth caused by the rise in the real value of houses and shares over the 1980s. Deregulation itself lowered the saving rate in two ways. The increased sensitivity to wealth and other factors lowered the rate of saving by 1.6%. This overall figure reflects a relatively large fall in saving implied by the rise in a wealth, partially offset by the boost to saving given by the high rate of return on housing. Finally, deregulation is also estimated to have resulted in an autonomous 2.3% decline in the personal saving ratio. This implies that even if all of the independent variables returned to their early 1980 values, the personal saving rate would still be 2¼% lower in 1988 than before deregulation (recall, however, that the theoretical model implies that this fall will be clawed back at some point in the future).(1)

Three broad conclusions come out of this analysis of the factors behind the fall in saving in the United Kingdom in the 1980s. First, much of the fall in saving was a result of the rise in personal wealth in the 1980s rather than being a direct response to financial deregulation.(2) Second, the main impact of deregulation came through the autonomous fall in the saving rate rather than through the interaction of deregulation with factors such as wealth and the rate of return. Third, demographic effects appear to have had a relatively small effect on saving.(3)

5. Conclusions

This paper has looked at the effects of financial deregulation on personal saving. In the first section, an overlapping generations model of the process of financial deregulation was analysed. The results imply that financial deregulation should produce an exogenous short-run fall in saving, some of which will be recouped over time, while increasing the sensitivity of saving to wealth, current income, real interest rates and demographic factors. These propositions were then tested using data on aggregate regional saving for the eleven standard regions of the United Kingdom; using a panel data set makes it possible to produce more accurate estimates of the key parameters of the model.

The regression results generally support the analysis of the theoretical section. It was found that household saving did indeed show an exogenous decline associated with financial innovation, as well as becoming more sensitive to wealth, real interest rates and current income. The empirical results imply that much of the decline in the personal saving rate in the 1980s was caused by the rise in wealth, however

(1) Jappelli and Pagano (1991), using a very different econometric approach, find that financial deregulation explains one third of the fall in saving over the same period, similar to the proportion estimated here.

(2) It is also possible that deregulation was partially responsible for the rise in wealth, for example by raising real interest rates and increasing the liquidity of financial instruments.

(3) For earlier work on the interaction between demographics and personal sector behaviour in the United Kingdom see Currie *et al* (1989) and Lee and Robinson (1989).

deregulation also played a significant part. In particular, it is estimated that deregulation may resulted in an autonomous fall in the personal saving rate of 2¼%, although some of this will be recouped over time.

The ability to link the empirical results to a well specified theoretical model allows the various effects of financial deregulation to be studied in a systematic manner. In addition, putting empirical estimates on the different effects of deregulation in the United Kingdom may give an idea of the orders of magnitude involved from other countries considering deregulation. Finally, the increased importance of wealth and changes in income in personal saving implies that with deregulation consumption is going to become less dependent on the generally path of the economy, implying an increased role for consumption in the generation of business cycles.

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