Estimating price elasticities of financial services: the case of UK personal pensions

Preliminary version

First version: September 2001

This version: July 2002

This paper is not for distribution

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ABSTRACT

The present study estimates demand and supply functions of the UK market for 25-year maturity unit-linked (UL) personal pensions for the years 1998 to 2000. It exploits the unique information contained in the PIA disclosure surveys on reduction in yields and new business. The results suggest the popular view about the business of life offices - "insurance products are sold, not bought" - does not mean that demand is price independent. From the 25 years perspective adopted here, the new stakeholder regime in the UK does not appear to have had a significant impact on new UL personal pensions business written in 1999 or 2000. Recent restructuring seems to have a negative impact on the quantities sold. The results are obtained by using several parametric and recently introduced semiparametric estimators.

JEL Code: D12, D23, G22, G23, C140, C300

Key words: price elasticity, personal pensions, insurance industry, demand function, supply function, simultaneous equations estimation, semiparametric estimation

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1. Introduction

Descriptions and empirical analyses of equilibrium forces in life insurance markets are rare. Usually studies of these markets confine themselves to investigating the demand side and eliminate the supply-demand identification problem by more or less strong assumptions (Fortune, 1973; Babbel, 1985). It is also rare that the studies consider income/wealth and costs and try to explain life insurance demand also by prices (Babbel, 1985). In addition, all these studies use data at the most aggregate level, i.e. business in force, new business, price indexes, etc. at the national level of the industry. This is not surprising because data for more detailed studies, e.g. price and quantity data at firm and consumer level, either do simply not exist, are not readily available or are protected from outside scrutiny.

The existing studies have already brought out several interesting results, particularly concerning the role of the costs of insurance which are an important determinant of demand from a theoretical point of view (Mossin, 1968; Fortune, 1973; Campbell, 1980; see Villeneuve, 2000, for a modern presentation from a life-cycle perspective). According to Babbel, his results suggest that, in contrast to a popular view held in the insurance industry - "life insurance is sold, not bought" - demand for whole life insurance depends on prices indeed. This result is also interesting from the perspective of a financial regulator because of the widespread belief that consumers are price insensitive and do not "shop around" (e.g. FSA, 2000; Sandler Review, 2001).

This paper aims at investigating the equilibrium forces of the UK market for 25-year unit linked personal pensions by using price and quantity data for several distribution channels at firm level. The unique database comes from the PIA (Personal Investment Authority) disclosure survey which, for regulatory reasons, summarises the data on costs and charges collected since new rules on commission payments have been introduced in 1995. From 1998 to 2000, the survey also contains confidential data on new business. A particularly interesting feature of the survey is the distinction between different channels of distribution, roughly: tied agents, independent financial advisors and sales without advice. This allows us to investigate simultaneously the supply and the demand side of the market in some detail for these three years and to see to what extent the supply-demand identification problem impacts on the estimated elasticities.

Several questions naturally arise with respect to these data: Is consumer demand independent of prices, as the existing price dispersion for personal pensions (Burkart, 2001) and the popular view about life insurance buying/selling seem to suggest? Did the stakeholder regime, i.e. the introduction of minimum standards, have an impact on the writing of new 25-year unit linked personal pension business? Did consumer demand change as a result of the announcement of the stakeholder regime? What is the consequence of industry restructuring on the market? The present study will investigate these issues in some detail whereby the main focus is on the price-elasticity of demand. However, before, it might be useful to replace the market for unit-linked personal pensions in a broader context.

From an economic point of view, personal pensions are savings not insurance contracts whereby a monthly premium is paid during a fixed time span. However, the overwhelming majority of personal pensions are sold by life insurance providers either directly (tied agents) or through intermediaries (independent financial advisers). Personal pensions share one important feature with life insurance contracts: they are credence goods, i.e. it is difficult to assess some essential characteristics of the product in advance or even by experience[2]. This might be one of the reasons for the popular view quoted above that is also widely thought to apply to personal pension products.

[2] Dulleck and Kerschbamer (2001) have proposed a simple unifying framework within which it is possible to analyse many aspects of credence goods.

The regular unit-linked[3] personal pension business studied here is part of the ordinary[4] individual regular long-term business of insurance companies which contains mainly life insurance contracts (around 60% of the business in force and around 50% of new business) and personal pensions (around 30% and 45% of the premiums of business in force and of new business respectively)[5]. Other products - collective life insurance , deferred annuities, purchased life annuities, pension annuities, free-standing AVCs, income protection insurance – sum up to less than 10% of the total (in terms of numbers and in terms of premiums). Unit-linked (UL) personal pensions are an increasing part of the total ordinary individual long-term business in force. This is true when one looks at the number of policies or at the amount of premiums. In 1999, it represents approximately 20% of the premiums of the total business in force. When examining new business, UL personal pensions are again an increasing part of the total of ordinary individual long-term new business (in terms of numbers as well as in terms of premiums). Inside the personal pension sector, UL personal pensions are dominant in terms of business in force since 1995, whereas the non-linked personal pension business stagnates and even declines as a part of total ordinary long-term business[6]. In terms of new business, linked personal pensions today largely outsell non-linked business, whereas these two branches were still very similar in 1992/93 - both when looking at the number of contracts and premiums.

Section 2 discusses the related literature. Section 3 presents the empirical model of demand for and supply of UL personal pensions. Section 4 gives details on the data and section 5 presents the results. Section 6 concludes. The appendix contains the first stage regression and an alternative model and its estimation.

2. Related literature

There are only few papers that are concerned with estimating market forces of life office products. Fortune (1973) is an early study who focuses on the demand of total life insurance in force without however considering the cost of these products for the investor. The study of Babbel (1985) is closer to our approach in that he uses also information on prices. The construction and the use of a suitable price index for whole life insurance sold in the U.S. from 1953 to 1979 constitutes the originality of his work. New purchases are shown to be negatively related to changes in this cost index (with elasticities between –0.32 and –0.92). Both studies eliminate the supply-demand identification problem by assuming a flat supply curve and are based on data that are aggregated at the national level.

Another related strand of the literature looks at price dispersion which often characterises markets of insurance products. This is of concern to our study because price dispersion might be negatively linked to price elasticity. The aim of this literature is to show that dispersed prices can arise as an equilibrium outcome – and therefore so could price inelasticity. Mainly two types of explanations have been advanced for price dispersion and their implications have been analysed in different settings: search costs of consumers (see e.g. Carlson, McAfee, 1983) and product differentiation (e.g. Salop and Stiglitz, 1977). Only few papers try to discriminate empirically between these arguments

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[3] There also exists single premium personal pension business. Here we deal only with contracts with regular premiums (and we will drop the term "regular" in what follows). The term "unit-linked" refers to the value of a defined pool of investments, whereby units in the fund are allocated to the policy from each premium paid, after charges.

[4] The term "ordinary" refers to the non industrial branches of insurance contracts.

[5] The following figures have been calculated from Association of British Insurers (2000).

[6] This is so despite the fact that the hybrid and increasingly important unitised with-profit personal pensions are mostly counted in the non-linked part (those which are in the linked part are negligible).

which, in a given market, are not necessarily exclusive (Van Hoomissen, 1988, and Sorensen, 2000). The theoretical literature suggests that price dispersion is not equivalent to demand inelasticity with respect to prices – and that an elastic demand may even be an essential ingredient for generating price dispersion (see e.g. Reinganum, 1979, for a parsimonious model). This point is important for our study which does not focus on price dispersion.

3. An empirical model of demand and supply

3.1. A demand function for personal pensions

There is a population of M firms where each firm m (m=1,..., M) can distribute its product simultaneously through different distribution channels denoted by $DC_{d,m}$ with $d = \{1,...,D_m\}$, where D_m is the total number of channels of firm m. We assume that each firm's distribution channel constitutes a separate supplier i, with $i = \{1,..,\sum_{m=1}^{M}\sum_{d=1}^{D_m} DC_{d,m}\}$. On the demand side we hypothesise a "virtual utility-maximising consumer" with a standard logarithmic "demand function" (see e.g. Deaton and Muellbauer, 1980) that deals with each of the i suppliers, i.e. each firm's different distribution channels:

$$\log q_i^d = \gamma + \delta_p \log p_i + \delta_r \log r + \sum_n \eta_n cd_{n,i} + \vartheta_i, \qquad (1)$$

where q_i^d denotes the value of new personal pensions demanded from supplier i as measured by the total of premiums paid, γ is a constant, p_i denotes the price of a standardised contract (details are given later), r stands for income/wealth, $cd_{n,i}$ are the n control variables of the demand function, and η_n are the associated coefficients. ϑ_i represents the error term which is assumed to be iid and to follow a normal distribution. This latter assumption will be relaxed in some of the estimations. The coefficients δ_p and δ_r are the elasticities of demand with respect to price and income/wealth. All variables refer to one single period.

This study aims at investigating interesting properties – in particular price elasticities - of the demand for (and the supply of) personal pensions[7]. The "virtual consumer" model might seem far away from reality where each of the firms' distribution channels is dealing with a multitude of different consumers. However several arguments support this simplifying assumption. Ideally, one might want to work with a time series-cross section database which links together distribution channels and individual consumers. There is an econometric tradition (Stone, 1954) which suggests to identify the price elasticity of demand through the time series dimension and the income elasticity through the cross-section dimension of a database. However, in the case of credence long-term financial services, like personal pensions, this type of analysis is made difficult. Indeed, we expect that, in general, an investor will buy only one personal pension (and certainly not sign more than a handful of contracts) within a given, possibly long period. This means that the time series dimension of the "ideal" dataset would not be helpful in recovering individual price elasticities[8]. The assumption of a single "virtual

[7] It does not intend to test properties of utility theory. For an account of the difficulties of such an attempt see Kirman and Phlips (1993). A good survey of demand and supply aggregation for econometric analysis is given by Russel, Breunig and Chiu (1998).

[8] This feature is not specific to our study and similar problems widely arise in studies of consumer behaviour. Indeed "reliable longitudinal data sets that follow the same consumer over long time periods are rare and some form of aggregation prior to empirical analysis is often inevitable" (Blundell, 1988).

consumer" is also supported by survey data that indicate that a non-negligible proportion of consumers deals indeed simultaneously with several distribution channels[9]. We do not analyse substitution effects in this study (we introduce however an interest rate)[10]. The dependence of demand on price is the main focus of this study. The estimation of price elasticities – we expect $\delta_p \leq 0$ - is made possible by the availability of the amount charged by a given DC for a standard personal pension contract. The demand for personal pensions can be expected to depend also on income/wealth (similarly to a standard approach in macroeconomic studies). We will thus introduce an income/wealth variable which is however not channel-specific, i.e. there is no cross section variation, because this information is not available. Instead we have used aggregate measures of income and wealth to take at least account of the evolution of these variables over the three years considered here. We expect $\delta_r > 0$ or, in the case of an inelastic demand, $\delta_r = 0$. It is sometimes suggested that the choice of a distribution channel is income dependent (FSA, 2000a) or that demand depends on quality which would typically be higher in the case of independent financial advisers[11]. However, this evidence is anecdotal and does not convince as an argument in favour of separate markets for, on the one hand, tied agents and, on the other, independent advisers because these two types of channels do not distinguish clearly between groups of income. The argument about quality can, albeit imperfectly, also be captured through channel specific dummy variables. The fiction of a "virtual consumer"[12], reflects the assumption that the product providers' distribution channels face demand curves with common price (and income/wealth) elasticities.

We could stop here and proceed with the econometric estimations similar to previous work on this subject. However, all these studies discuss the demand supply identification problem, even if they – mainly because of data problems – do not integrate it in the empirical work. Our data set allows us to investigate this problem and to check if the supply function really is flat.

3.2. A supply function of personal pensions

We hypothesise the following logarithmic "supply function":

$$\log q_i^s = \alpha + \varepsilon_p \log p_i + \varepsilon_a \log a_m + \sum_l \beta_l cs_{l,i} + u_i, \qquad (2)$$

where q_i^s denotes the total of premiums received from new business sold by supplier *i;* α is a constant; p_i denotes the price of a suitably defined, i.e. standardised, personal pension contract (again, details are given later); a_m represents the total assets of firm *m*; $cs_{l,i}$ are *l* control variables of

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[9] Presentation on "IFA Futures" by Bacon & Woodrow (March, 2001) at the FSA.

[10] It is not obvious that clear substitute products exist whereby a choice between products could be triggered by charges. The main candidates would be with-profit personal pensions (where investors are less exposed to the risk of the underlying assets than is the case with unit-linked personal pensions) and ISAs (individual saving accounts that are more flexible at short term). The choice between unit-linked and with-profit personal pensions is likely to be governed by considerations of risk aversion more than by price. Indeed, providers offering both products typically indicate the same reduction in yield, RIY. Concerning ISAs, the choice exhibits considerable complexity because of intricate tax rules that, for example, make the trade-off dependent on the possibility that contributions stop (Cook and Johnson, 2000).

[11] Sometimes the argument about quality is based on the lower lapse rates of independent financial advisers. However, this is not convincing as the lower lapse rates can also be explained by self-selection of more persistent customers.

[12] We will again come back to this assumption to discuss other details.

the supply function; and ε_p, ε_a and β_l are the coefficients associated with the previous explanatory variables. u_i represents the error term which is assumed to be iid and to follow a normal distribution. (Again, this assumption will be relaxed later.) All variables refer to one single period.

The fact that the focus of our study is mainly on the demand side and particularly its price elasticity explains the choice of a rather crude supply function. Its main ingredients are a price variable and total assets whereby the latter variable is taken as an indicator for distribution capacity (distribution capacity is assumed to be proportional to total assets[13]). This function should therefore be considered a reduced form of the complex relationships between product providers, intermediaries and final consumers[14]. We expect the supply curve to be upward sloping in both arguments. Advisers can be expected to make more effort and thus to sell more personal pensions when they are better compensated in this case. The alignment of the profit-maximising agents' and product provider's interests is indeed usually part of a compensation package which reflects a trade-off between providing incentives to make an effort and sharing risks (see e.g. Basu et al., 1985; Lal and Srinivasan, 1993). Commission that increases with the business written is a typical element of such contracts (which are standardised in our setting). As long as there is a positive link between the commissions paid to the agents and the charges to investors that are fixed by the product providers, the supply of new business will increase when charges increase[15]. However, in the personal pensions industry, we do not expect charges generally to vary much for a given group of DCs. The reason is that DCs are likely to compete in the price-quality space and to react to the behaviour of members of peer groups in order to avoid a commercial war (aspects of this feature have been formalised by Maskin and Tirole, 1988). The outcome is likely to be a fairly stable focal price – except in periods of an external shock. The recent consolidation movement in the insurance industry might be such a shock and is our main motivation for considering the possibility of a significantly positive price elasticity of supply and thus for estimating both supply and demand equations. Another determinant of supply is distribution capacity, i.e. new business written by a firms' DC is assumed to be an increasing function of the DCs' size which reflects the number of possible contact points for geographically distributed customers[16]. These two components, charges and distribution capacity, can be thought of respectively as short term and medium/long term strategic variables firms/DCs have at their disposal. We do however not account for interactions between firms/DCs. Indeed, modelling interactions between firms/DCs

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[13] This is certainly an imperfect indicator that we retain in the absence of better alternatives. Indeed, for example, taking the total of new business would introduce a tautology in the estimation in the cases where a firm has only one distribution channel.

[14] These relationships are indeed complex as witness the different approaches that can be chosen to analyse them: for example, common agency (e.g. Martimort, 1996), cheap talk and strategic information transmission à la Crawford and Sobel (e.g. Krishna and Morgan, 2001), dynamic agency à la Holmström and Milgrom or an IO perspective of vertical relationships (concerning the last two approaches see the references on compensation and resale price maintenance given later in the text).

[15] This argument does however not apply in the same way to the different DCs. For example, when the fixed salary component of the wage is high the effect might be less strong. Company representatives may be paid any combination of a salary, bonus, commission, and non-cash benefits. Independent financial advisers operate typically on a commission basis (sometimes together with fees) or, more rarely, on a pure fee basis (see Lal and Staelin, 1986, for an analysis of multiple compensation plans). A further complication is introduced by the practice of resale price maintenance which can be interpreted as being part of a collusive strategy or a solution to the principal-agent problem between advisers and product providers (for more details see Katz, 1990). For simplicity, we assume that there exists a one-to-one relation between the charges that are – except in the case of fees - fixed by the product providers and the commissions received by the agents.

[16] A firm's total assets are taken here to be a proxy for a DC's size. This is probably more convincing in the case of tied agents than for IFAs. However, it is probably not unreasonable to assume that the larger the product provider the more likely it is that an IFA includes it into its menu of personal pensions.

would, in light of the previous remarks, require a dynamic setting (see e.g. Slade, 1994) as well as the possibility to focus on a subset of observations like peer groups – and our data on just three years with a limited overall number of DCs do not suit this purpose well. The chosen supply equation assumes that all the firms' distribution channels have the same price and capacity elasticities - differences between distribution channels are taken into account by dummies. This assumption seems to us a reasonable starting point for the purpose of our investigation. We will come back later again to the explanatory variables (including control variables and other possible explanatory variables like quality or advertising) when we present the data actually used and the results of the estimations.

3.3. Market equilibrium

We analyse the demand and supply functions by linking them together through the market equilibrium condition,

$$q_i^s = q_i^d . \tag{3}$$

Therefore, the system of three equations can be reduced to two equations with $q_i := q_i^s = q_i^d$.

The appendix presents an alternative model of the market system where the demand equation features price as a function of quantity.

3.4. The econometric methodology

Various forms of the above simultaneous equation model of market equilibrium have been analysed for estimation purposes. The literature (see Working, 1925, for an early contribution, and Hayashi, 2000, for a modern exposition) has analysed the identification problem intensively and brought about several methods for estimating single equation coefficients. It has shown that the 2SLS estimator can be written as an IV estimator with an appropriate choice of instruments, and that the IV estimator, in turn, is a special case of the GMM estimator. System methods include the 3SLS estimator and the FIML estimator. In this study, we use standard parametric methods (OLS, 2SLS, LIML, 3SLS and FIML) - by comparing estimations, if appropriate, by the Durbin-Wu-Hausman test – but also more recently introduced semiparametric estimators (KLIC-MEEL).

We do not want to belabour the statistical underpinnings of each of the parametric estimators here (see Mariano, 2001), but a brief discussion of the reasons for using several estimators should be useful. In our setting, the parameters of the market system are overidentified. We use alternative estimation methods to ensure the robustness of our main conclusions. Indeed, in small sample sizes, it is difficult to draw general conclusions when comparing different estimators (see e.g. Zellner, 1998; Mariano, 2001). OLS is often useful as an exploratory estimator, but it might be biased. However, in small samples then so are all alternative estimators of this class and the OLS estimator has, among these alternatives, minimum variance. 2SLS is consistent and relatively robust to estimating problems. System methods can be expected to have a smaller asymptotic variance-covariance matrix in comparison to single equation estimators. However, a possible misspecification will affect all the parameters. Also, with a small sample size it might be difficult to estimate accurately the variance-covariance matrix so that the comparative advantage of system estimators is no longer obvious. The FIML estimator is asymptotically efficient among all estimators (as long as the disturbances are normally distributed).

The use of LIML requires some further comments. Indeed, LIML does not have finite moments in general and thus is not admissible when quadratic or other loss functions are considered for evaluating its performance. Nevertheless, when the focus is on one single equation of the system, LIML continues to be used because of its maximum likelihood properties in the case of a noise component that is truly multivariate normally distributed. Some Monte Carlo studies also indicate that the finite sample properties of LIML compare favourably with those of 2SLS. Nerlove (1998) has recently

proposed an "errors-in-variables interpretation" of LIML which reminds us that, in the case of over-identified equations, 2SLS estimates depend on the particular variable used for normalisation whereas LIML is not subject to this problem.

The use of the maximum entropy empirical likelihood (MEEL) estimator also needs some explanation as it has been more fully analysed only recently (see Mittelhammer, Judge and Miller, 2000, and Golan, 2002, for more detailed presentations and references). This estimator is part of the class of semiparametric estimators, i.e. it does not necessitate the specification of the error's probability density function – only the first two moments of the error are assumed to exist and to be finite with zero mean.

The MEEL estimator can be presented with reference to the Kullback-Leibler information criterion (KLIC) which measures the discrepancy between two probability distributions:

$$KLIC(\pi, k^{-1}\mathrm{I}) = \sum_{j=1}^{k} \pi_j \ln(k\pi_j),$$

where $k^{-1}\mathrm{I}$ is the reference distribution and π is the subject distribution. The MEEL approach consists in taking a discrete uniform distribution as reference distribution (where I is a (kx1) vector of ones with k being the number of elements in the sample space) because the subject distribution is then evaluated with respect to the most uninformative counterpart under the constraint of the moment conditions. Minimising the KLIC is equivalent to maximising the entropy measure of Shannon and leads to Jaynes' maximum entropy principle (Jaynes, 1957) for determining the sample weights of the subject distribution. The moment conditions reflect the only information this approach introduces as a constraint on the distribution of the π_j's.

In the single equation case, the Lagrangian form of the maximum entropy criterion is for each equation u (u = 1,2):

$$L(\pi, \delta, \lambda, \eta) = \sum_{j=1}^{k} \pi_j \ln(\pi_j) - \lambda'[(\Pi \oplus Z)'(q_{.u} - M_{(u)}\delta_{(u)})] + \eta\left(\sum_{j=1}^{k} \pi_j - 1\right),$$

where $\Pi = (\pi_1, \pi_2, ..., \pi_k)'$, $\oplus$ denotes the Hadamard product operator, Z is the (kxs) matrix of instrumental variables and $M_{(u)}\delta_{(u)}$ is the simultaneous linear system of equations with $M_{(u)} := [q_{(u)}, X_{(u)}]$, where $X_{(u)}$ are the explanatory variables and $\delta_{(u)}$ the corresponding coefficients. The first term represents the KLIC, the second term corresponds to the s moment conditions and the third term is the normalisation restriction on the probability weights. λ and η are the corresponding Lagrange multipliers.

Maximising the above Lagrangian form leads to

$$\pi_j(\lambda, \delta_l) = \frac{\exp[\lambda'(Z_{j.}'[q_{ju} - M_{(u)j.}\,\delta_u])]}{\sum_{j=1}^{k} \exp[\lambda'(Z_{j.}'[q_{ju} - M_{(u)j.}\,\delta_u])]}.$$

If the π_j's are concentrated out it is possible to obtain a maximisation problem that is unconstraint with respect to λ (with δ_u fixed at δ_u^0). Finally, minimising the concentrated Lagrange function with respect to the fixed value gives the minimum KLIC-MEEL estimate:

$$\hat{\delta}_{u,MEEL} = \arg\min_{\delta_u^0}[\max_{\lambda}[L_{conc}(\lambda|\delta_u^0)]].$$

The system of equations estimation can be formulated in a similar way by introducing the corresponding moment conditions. Under general regularity conditions, that are similar to those used in GMM estimation, the minimum KLIC-MEEL estimator is consistent and asymptotically normal distributed (Kitamura and Stutzer, 1997, Theorem 2). Because it does not rely on the recovery of an unknown covariance matrix of scaled moments, the KLIC-MEEL approach is free from the undesirable small sample properties of the parametric two/three-step estimators. However, it achieves asymptotic optimality only in the iid case[17]. Results will be given both for the single equation and the system of equations case.

4. The data[18]

4.1. Demographic aspects of the PIA survey

The annual PIA disclosure reports make it possible to analyse the evolution of charges to consumers over time. Since 1998, they also give (confidential) information on quantities sold. All the information is available for each company's distribution channel(s).

Table 1 characterises the population in demographic terms for the years 1995 to 2000 by giving flows (entry, exit) and stocks of the companies in the market. First appearances (entries) constitute about 8% of the total number of firms in a given year. Exits represent less than 1%, with the exception of the years 1998 and 1999 where this figure increases to around 15%.

Table 1
Demographic characteristics of the disclosure survey sample 1995-1999
(25-year personal pension business with regular premiums)

Companies' status	1995	1996	1997	1998	1999	2000
Only appearance	6	6	-	-	-	-
First appearance (new or merger)	n.a.	7	4	5	3	7
Before change of name (last year)	-	4	-	1	-	-
After change of name (first year)	-	-	4	-	1	-
Transferred, acquired, merged (last year)	-	4	6	6	1	1
No appearance in the following year	1	4	1	9	10	*
Total of the above	7	25	16	21	15	8
Continued in the following year	59	47	47	40	38	41*
Total number of companies	66	72	63	61	53	49

Source: PIA disclosure survey; * The fact that, for 2000, the information is not complete with respect to future events explains this high number of companies which are all supposed to continue to exist in the following year.

[17] Gregory, Lamarche and Smith (2002) compare GMM and KLIC estimators in independent and dependent environments by the means of Monte Carlo studies and applications. The results suggest that, for dependent data, KLIC estimation does not solve the problem of over-sized tests familiar from GMM studies. However, it yields superior size-adjusted power.

[18] More detailed information can be found in Burkart (2001).

The decline in the total number of companies participating in the survey from around 70[19] to 49 reflects the consolidation process in this industry[20]. The sharp drop since 1999 in the number of companies which are transferred, acquired or merged is interpreted by observers of the industry as a temporary break. A high number of companies disappear from the survey between 1998 and 1999 in comparison to previous years. A tentative explanation would be to link this phenomenon to a possible change in the business strategies of several companies in response to the (expected) stakeholder regime which introduces a minimum quality standard[21]. But it is also possible that these changes only reflect the wider consolidation process under way. We will investigate to what extent the writing of new business is affected by the announcement of the stakeholder regime.

The data are also well suited for analysing separately different channels through which UL personal pensions are distributed: AR - appointed representatives (tied sector); CR - company representatives (tied sector); IFA - independent financial adviser; NA - no advice. Product providers, their staff (company representatives) and appointed representatives are 'tied' to advising on or arranging their own policies whereas IFAs and their appointed representatives (which are usually a member of a network) can advice and arrange policies across the whole market. IFAs are legally the agent of their client, though they typically receive a commission from insurance companies on business they arrange. Here, AR refers to tied agents not to IFA networks.

Table 2 gives the channel capacity, defined as the number of companies that declare selling through a given channel, as a percentage of total channel capacity. For example in 1998, 19.7% of the companies selling personal pensions through one or several channels (81 channel declarations in total) declared to sell through ARs[22]. Interestingly, the weight of IFAs and NAs in the total number of distribution channels increased over the period, whereas that of ARs and CRs declined. This phenomenon is also likely to be linked to the consolidation process.

Table 2

The share of distribution channels in the total number of channels declared by companies
(25-years unit linked regular personal pensions)

Year %	AR	CR	IFA	NA	Total channel capacity (numbers)
1998	19.7	43.2	30.9	6.2	81
1999	17.1	39.0	31.7	12.2	82
2000	15.0	35.0	36.7	13.3	60

Source: PIA disclosure survey

[19] 1995 was the first year of the disclosure survey and might therefore be less well covered than later years.

[20] The disclosure survey does not give a complete picture of the industry as firms are asked to report only if they have written business above a certain threshold level. However, this level is relatively low and, according to experts, the survey covers almost all new business.

[21] See Johnson (2000) for more details on the stakeholder regime.

[22] Note that total channel capacity is not equivalent here to the number of advisers selling through a channel.

4.2. New business and distribution capacity

From 1998 on, the companies were asked to disclose new business corresponding to the information about yields so that price and quantity information on life insurance products is available for three years. However, because the survey is not compulsory, sometimes companies which could figure in the survey are not present and new business data are not available for a number of companies for one or more years. However, according to experts, it covers the quasi-total of the market. Table 3 shows that new business has strongly increased for almost all distribution channels over these three years.

Product supply is not only driven by prices, but also largely depends on distribution capacity. In this respect, firms adopt different strategies: some distribute UL personal pensions only through tied agents, others prefer to sell them exclusively through IFAs, and a remaining group of firms rely both on tied agents and IFAs (non advised selling is relatively rare). In addition, firms might have market power – a considerable number of personal pensions providers are in the top group of UK group/companies with long term ordinary and industrial business in terms of worldwide net premium income. In order to account for these features, and in the absence of more detailed data, we use the companies' total assets as an indicator for their distribution capacity and market power. These effects introduce an ambiguity about the expected sign of the variable because if total assets are taken as an indicator for the size of the distribution channel new business written for a given price should increase with this variable, whereas when it represents market power new business should be decreasing in total assets. When total assets represent market power they are assimilated here to the firms' market shares of the stock of the personal pension business. This is certainly an imperfect measure because it is easy to imagine examples where firms with the same distribution capacity have different market shares - for example because of different organisational efficiency. However we do expect this typically not to happen in practice. In addition, the alternative - using market shares of new business – would introduce a tautology in the log-linear supply equation. Nevertheless we expect the market power effect to be of second order with respect to the effect of distribution capacity. Typically, when firms have different distribution capacities, the firm with the larger capacity will write more business, even if, because of market power, it may write less than it had written if it had no market power. The firm- (not distribution channel-) specific data on total assets are taken from the Synthesis database. Table 3 gives summary statistics by distribution channel.

Table 3

New business of UL personal pensions and companies' total assets for different distribution channels

Distribution channel	Number of observations	Year	Mean	Std dev
New business (in £)				
AR	16	1998	1,257,235	15,469,711
	14	1999	1,342,765	2,365,164
	9	2000	902,051	358,917
CR	35	1998	4,485,007	8,286,161
	32	1999	4,052,887	7,141,869
	21	2000	5,143,369	9,114,591
IFA	25	1998	6,613,032	10,300,000
	26	1999	7,168,240	12,440,000
	22	2000	9,613,286	15,600,000
NA	5	1998	304,936	556,443
	10	1999	427,221	454,629
	8	2000	631,830	942,920
Total assets (in £m)				
AR	16	1998	0.917	1.409
	14	1999	1.056	1.685
	9	2000	1.034	2.054
CR	35	1998	0.825	1.187
	32	1999	1.033	1.384
	21	2000	1.300	1.735
IFA	25	1998	1.066	1.247
	26	1999	1.236	1.384
	22	2000	1.354	1.605
NA	5	1998	1.127	1.403
	10	1999	1.191	2.000
	8	2000	1.650	2.410

Source: new business – PIA disclosure survey; companies' total assets – Synthesis

4.3. A specific consumer perspective

This study adopts a specific consumer perspective by confining itself to examine solely pensions with a 25-year maturity. It thus does not consider the question of persistency, i.e. the fact that many investors step out of the policy before maturity – according to the last persistency survey, between 35% and 40%[23] of investors stop paying in their regular personal pension contract within 4 years (PIA, 2000). The lack of persistency in payments means that a proper study of charges should include the fact that there is a certain probability for each year/month since the beginning of the contract that the

[23] 35% refers to the IFA channel, 40% to the CR channel. The difference in lapse rates between channels is declining.

investor lapses. Such a study could for example consider an "average consumer" whose probabilities of persisting are defined by the yearly average persistency rate of the survey. Unfortunately, the PIA survey considers persistency only at a four years time horizon, nothing is known for the remaining years. Some authors have tried to model persistency for the whole period (Murthi, Orszag and Orszag, 1999), but concluded that the lapse rates obtained depend very much on the model specification. For this reason, the present study is more narrowly limited to the perspective of a single type of consumer who pays premiums until maturity. This limited perspective is not affected by the impact of lapse rates on new business because the effective business at a 25-year horizon can reasonably be assumed to be proportional to the initial business[24] and the logarithmic specification easily allows to account for this effect.

We take account of the income/wealth component of the demand function by using an aggregate measure of the households' disposable income/total financial assets (from the National Statistics) as an indicator. We also worked with different types of income data, but the results were all very similar and therefore only one of them will be reported.

4.4. Charges

The disclosure survey contains information about commissions or a commission-equivalent for the different distribution channels. There are two main elements, the front (also called front-loaded) commissions and a monthly renewal commission which is often paid from the 19th month on. The front commission can be paid front-end (or back-loaded), which means the payment is spread over the time span before the renewal starts to be paid, or up-front on an indemnity basis (for more details see Blake and Board, 1999).

For the purpose of this study we use a summary measure of the different charges, called the "reduction in yield" (RIY) that is usually used as a convenient way to compare the charges of the companies' different distribution channels. On the basis of the raw data (the "what-you-might-get" amount corresponds to the amount received by an investor paying a monthly £60 premium[25], after deduction of charges by assuming an annual interest rate of 7%[26]) we thus calculated the yield and RIY (the annual reference interest rate means that yields and RIY are complements) for all the companies' distribution channels by the same formula, checked the reporting and eliminated inconsistencies. Using the survey introduces certain biases. For example, it does not take into account commission rebating (PIA Disclosure report 1999)[27]. However, a proper study is possible if we assume that the RIY is only an indicator of the true market equilibrium price and that it is distributed independently of the error term. RIYs also vary with the amount of the premium paid and the data on new business in the survey refer to all types of contracts, not only to £60 monthly premiums. We could thus use the total amount of new business as a proxy for the £60 premium business wich has been written by a distribution channel. This assumption can be justified on the grounds that the distribution of average premiums as well as the distribution of RIYs for a given premium level are both approximately normal[28] with a variance small enough to rein back the influence of the attenuation effect. A second way to justify our way to proceed would take the information on RIY as a reference point and assume

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[24] Lapse rates do not differ strongly across providers (PIA, 2000).

[25] The survey focuses solely on standardised £60 contracts.

[26] The rate is assumed to be 9% before 1999.

[27] A similar remark applies to the fact that some members of a channel might negotiate special commissions (large IFAs or network IFAs). These could then be used to reduce the charges (and/or to increase profit margins).

[28] This second point has been checked for £200 premiums with data collected by *Money Management*.

that the data on new business are proportional to the new business that corresponds to the RIYs (or charges) that we use, with a normally distributed error.

Table 4

Charges (reduction in yield) for UL personal pensions for different distribution channels (in %)

Distribution channel	Number of observations	Year	Mean (unweighted)	Std dev
AR	16	1998	1.80	0.20
	14	1999	1.78	0.56
	9	2000	1.65	0.43
CR	35	1998	1.80	0.38
	32	1999	1.65	0.50
	21	2000	1.64	0.49
IFA	25	1998	1.69	0.32
	26	1999	1.66	0.47
	22	2000	1.50	0.40
NA	5	1998	1.31	0.39
	10	1999	1.26	0.50
	8	2000	1.22	0.47

Cook and Johnson (2000) have shown that many companies present in the 1998 and the 1999 PIA disclosure surveys did not change their overall charges substantially, i.e. the RIYs did not vary much from one year to the other. Here we will investigate this phenomenon further and compare all the prices available for 1998, 1999 and 2000, i.e. not only those of companies which are present in all these years. Indeed, adapting to the stakeholder regime[29] might mean for some companies that the optimal business strategy is to leave the market, for example because they feel that they would not be able to afford the cost of staying. This possibility is indeed suggested by the demography of the disclosure survey where, as we have seen, much more companies dropped out in 1998 and 1999 than in previous years. In contrast, other firms might decide that their presence in the stakeholder regime is indispensable, for example to maintain their brand name, and enter a market from which they have been absent so far.

The RIY is widely believed to have decreased over the last years. The available evidence (again, for more details see Burkart, 2001) confirms this intuition and shows that the average charge for 25-year unit linked personal pensions has decreased over the period 1995 to 2000 for all distribution channels (this result is based on all channels for which information on charges exist, i.e. more than those for which new business is available). The decrease however seems to hide potential important differences inside each channel or even to give a misleading overall impression. The evolution of the standard deviation shows indeed that the dispersion of charges has, after a decline since 1995, increased from 1996 or 1997, depending on the distribution channel, until 1999. In 2000, the dispersion has again decreased (table 4), but is still well above the level of 1995.

[29] From 2001 on the government has introduced special private pension regimes (see Johnson, 2000).

5. Results

The results reported hereafter have been obtained by estimating[30] the equations (1) and (2) under the market equilibrium constraint (3) and with a number of distribution channels equal to $D_m \leq 4$ (AR, CR, IFA, and NA) for all firms, *m*. Before giving the results two remarks concerning identification and specification testing might be useful.

Identification is achieved by excluding total assets and several other variables from the demand equation and by excluding the income/wealth variable and several other variables from the supply equation. In order to show how well the instruments work for the price variable, we will give, in addition to the final results obtained by the different econometric methods, also the first stage regressions of the 2SLS (see appendix 1). We have also checked that none of the excluded variables is significant in the equation from which they are excluded.

In addition, we have verified the results given below by splitting the population in two groups, IFAs and tied agents (AR and CR). The main insight from the corresponding estimations is that the results about price elasticity are confirmed[31].

5.2. The demand function

Testing for the price elasticity of demand is a classical, but for the financial services sector - because of the lack of data - rare exercise. From a regulatory perspective, it gives insights into the alleged price insensitivity of the demand of consumers who do not "shop around". The following results have been obtained (table 5).

The values and the sign of the coefficients of the OLS estimation are (except for one variable that is however not significant) overall relatively close to those of the other estimators and thus confirms the role OLS can play as an exploratory estimator. This is formally confirmed by the DWH test that does not reject the null hypothesis of OLS being consistent. No strong difference exists between most simultaneous equation estimations.

One result is probably most striking. Demand seems to depend in a quite robust way on prices, i.e. charges (for ease of interpretation, we used the pound equivalent of the reduction in yield in all the estimations). This is in line with the findings of a study on U.S. data which reports evidence against the popular view that "life insurance products are sold, not bought" (Babbel, 1985). We interpret our result as indicating that, without being necessarily completely erroneous, the popular view does not seem to mean that demand is independent of prices. Indeed, the elasticity is statistically significant and lies, depending of the estimator (OLS excluded) in confidence intervals ranging from –0.3 to –0.9 at a 95% level. Usually, goods with elasticities of less than 1 are interpreted as being inelastic. However, this interpretation typically refers to real goods, not to financial services with strong credence characteristics. Unfortunately, there does not seem to exist other estimations of price elasticities for UK retail financial services which would allow us to judge our result from a comparative perspective.

Demand of UL personal pensions does not seem to depend on the income/wealth indicator, households' disposable income/total financial assets (or different definitions of income – as levels or

[30] Programs have been written in GAUSS 3.5 and run on a Pentium II.

[31] We refrained however from giving these results because the then possible comparison between sub-populations would not have been grounded on firm conclusions. The present database is, in our view, indeed not suitable for a comparison of price elasticities between different distribution channels.

growths rates - which we tried as alternative explanatory variables)[32]. This result might reflect the fact that the need for pension saving is rather stable over time (we remind the reader again that we do not consider cross-section variations and use an aggregate indicator which only reflects the change in income/wealth over the three years considered), even if people often seem to fail to save for producing a smooth consumption into retirement (see Mitchell, 2000). This is conform to the conventional wisdom that the demand for personal pensions is stable in comparison for example to the demand for life insurance. We have checked that the introduction of an interest rate as a crude way to account for substitute savings products never appeared to be significant[33]. One should note that the introduction of a proxy for cross-sectional income (for example by distribution channel per firm, but these data are not available) might change the above result slightly insofar as the charges are linked to the premium and the premium is linked to income – but we really expect such a change only to be slight and not to reverse the main result of a significant dependence of demand on price.

The channel through which UL personal pensions are distributed seem all to be special from a demand perspective, i.e. all dummies related to channels are significant in comparison to the norm of a non advised sale. This result underlines the specificity of the NA channel.

We also introduced dummies for the years 1999 and 2000 to capture a possible "stakeholder effect", i.e. a dampening of demand as consumers waited for the launch of stakeholder products from the 6 April 2001 on. The result[34] - neither of these dummies appeared to be significant - is in line with conclusions found in the professional press[35].

Finally, we tried to capture a possible reputation effect in a market of credence goods where advertising plays an important role. We expected particularly large companies to have a significant influence on demand through branding. (We did not include group dummies in the demand equation because it cannot be generally assumed that group links are widely known.) However, this seems generally not to be the case, only for two large suppliers, represented by D_S1 and D_S2, was the effect significant.

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[32] This is the only variable for which the KLIC-MEEL coefficients are very different form those of the other estimators. However, for none of the estimators are the coefficients significantly different from zero.

[33] See also our remarks in an earlier footnote about the absence of close substitutes.

[34] We do not report these results here in order to simplify the presentation. Indeed, it was not possible to introduce both time dummies simultaneously with the income/wealth variable without creating ranking problems.

[35] See for example J. Hinings: "Goliath falls", *Money Management*, June 2001.

Table 5

New business demand function

	OLS			2SLS			LIML			Single KLIC-MEEL			3SLS			FIML			System KLIC-MEEL		
Variables	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value
Constant	13.87	14.82	0.94	22.37	17.81	1.26	28.03	22.14	1.27	12.99	17.41	0.75	22.03	17.81	1.24	27.56	21.41	1.29	13.19	21.09	0.62
Charges	-0.13	0.03	-4.02	-0.45	0.08	-5.36	-0.67	0.13	-5.16	-0.73	0.08	-8.80	-0.45	0.08	-5.31	-0.65	0.12	-5.66	-0.75	0.09	-8.33
Inc/wealth	0.29	2.77	0.10	0.29	3.32	0.09	0.29	4.10	0.07	3.47	3.03	1.14	0.34	3.31	0.10	0.32	3.97	0.08	3.46	4.02	0.87
D_AR	1.95	0.53	3.68	3.54	0.73	4.82	4.59	0.98	4.68	4.71	0.74	6.36	3.30	0.70	4.71	4.38	0.93	4.74	4.90	0.78	6.28
D_CR	2.62	0.47	5.55	3.96	0.64	6.14	4.85	0.86	5.65	5.18	0.62	8.38	3.84	0.63	6.09	4.73	0.81	5.85	5.36	0.74	7.23
D_IFA	2.95	0.48	6.18	4.15	0.64	6.53	4.96	0.84	5.92	5.09	0.71	7.14	4.03	0.62	6.50	4.84	0.79	6.12	5.31	0.70	7.58
D_S1	1.69	0.60	2.79	2.67	0.76	3.53	3.33	0.97	3.45	3.47	0.68	5.08	3.08	0.72	4.30	3.63	0.88	4.11	4.09	0.57	7.18
D_S2	2.19	0.80	2.75	2.58	0.96	2.70	2.86	1.19	2.39	2.80	0.58	4.85	2.06	0.85	2.43	2.54	1.12	2.26	2.22	0.39	5.70
	OLS vs. 2SLS Durbin-Wu-Hausman statistic: 16.892 (df=7)																				
Adj. R2	0.19																				
Nr obs	222																				

5.2. The supply function

The estimations of the supply function (table 6) show that the charges of UL personal pensions imposed on investors (again, we recall that we are using the pound equivalent of the RIY) are a significant determinant of supply. A doubt might arise from the negative sign and the non significance of this variable, as well as from the low value of its coefficient in the OLS estimation in comparison to most other estimations (except 2SLS where the coefficients are not significant), which by and large are concordant. But the DWH test rejects the null hypothesis that OLS is consistent and the other estimators change the result further. The system estimators give very similar results and show that the price elasticity of supply has the expected sign and is significantly different from zero at the 5% level. The KLIC-MEEL estimator is particularly useful here because it confirms the results of the system estimators that one might suspect to be affected by a possible non-normal distribution of the disturbances.

The sign of the coefficient of total assets is very significant which confirms our expectation that the distribution capacity effect dominates the market power effect.

The dummy variables D_CR and D_IFA show that company representatives and IFAs play a particularly important role in the supply of UL personal pensions. Everything else being equal, the fact that a product is distributed through these channels instead through any of the other channels, increases the amount of new business which is offered. This phenomenon is likely to be linked to the already weak and, because of industry restructuring, declining role of ARs in comparison to other important distribution channels (see table 2).

The announcement of the stakeholder regime which we tried to capture through dummies for the years 1999 and 2000 does, in contrast to what one might expect, not give rise to any significant effect (the dummies can't be introduced simultaneously because this would create a collinearity in the first stage regression and we give here only the results for the year 1999 dummy – the results are similar for the year 2000 dummy). One might speculate if this result could possibly be reversed when considering an alternative investment horizon, e.g. the first five years of a 25 years UL personal pensions contract. One should also note that the above result leaves open the possibility of entries or exists linked to the shareholder regime as well as a "signalling effect" based on the redistribution of the overall charge between front and renewal charges for example.

In order to take into account consolidation and internal restructuring in the insurance industry, we have created dummy variables that distinguish between those companies which are affected by a restructuring movement as identified in table 3, and the rest of the companies (D_Mouv = an acquisition/merger or first appearance; D_Exit = exit from the market in the following year). It is interesting that recent external or internal movements seem to have, everything else being equal, a negative influence on the sale of UL personal pensions business. This phenomenon could be due to short term organisational inefficiencies (we have checked that the alternative interpretation of customer/IFA uncertainty arising as a result of the restructuring process is not significant in the demand equation).

A last set of dummy variables has been created to capture effects linked to group membership of a company. Group membership can be expected to have different and sometimes conflicting effects. For example, if the group link is strong, managerial problems can be exasperated or market power can be increased and the effect would be negative. In contrast, a positive effect is likely to arise from the increased financial strength which might be used to implement cost efficient selling strategies. Clearly, our data do not allow us to investigate these possible explanations in detail. It remains that the significance of several, but not all (we do not give all the results obtained), group dummies hints to the existence of negative and positive effects.

The adjusted correlation coefficient of OLS is relatively high for a cross-section regression and suggests that the explanatory variables are important determinants of the supply of UL personal pensions[36].

[36] We have also calculated the corresponding coefficients for the other estimators and obtained very close results. However, we do not give these results because the use of instrumental variables does not allow one to sum up the regression sum of squares and the error sum of squares to the total corrected sum of squares.

Table 6

New business supply function

	OLS			2SLS			LIML			Single KLIC-MEEL			3SLS			FIML			System KLIC-MEEL		
Variables	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value
Constant	8.05	1.29	6.24	-4.05	2.44	1.66	3.55	2.57	1.38	4.11	2.63	1.47	3.41	2.69	1.26	3.40	2.51	1.35	3.65	2.67	1.38
Charges	-0.02	0.03	-0.49	0.13	0.08	1.61	0.14	0.08	1.72	0.13	0.08	1.71	0.18	0.08	2.10	0.16	0.07	2.14	0.14	0.07	1.92
Tot. assets	0.39	0.06	6.22	0.38	0.07	5.75	0.38	0.07	5.66	0.38	0.08	4.97	0.30	0.06	5.12	0.35	0.06	5.42	0.38	0.08	4.84
D_CR	1.05	0.28	3.71	0.92	0.31	3.03	0.91	0.31	2.93	0.78	0.27	2.91	0.94	0.30	3.08	0.92	0.31	3.01	0.94	0.27	3.47
D_IFA	1.21	0.31	3.94	1.11	0.33	3.42	1.10	0.33	3.33	1.08	0.34	3.15	1.15	0.32	3.57	1.11	0.33	3.42	1.25	0.33	3.79
D_Mouv	-1.25	0.33	-3.79	-1.21	0.35	-3.47	-1.21	0.35	-3.41	-1.26	0.39	-3.23	-0.81	0.31	-2.65	-2.01	0.34	-3.04	-1.04	0.36	-2.90
D_Exit	-1.20	0.72	-1.66	-1.76	0.80	-2.17	-1.83	0.83	-2.21	-1.87	0.87	-2.14	-1.96	0.72	-2.72	-0.17	0.76	-2.66	-3.11	0.49	-6.39
D_1999	-0.25	0.24	-1.06	-0.26	0.25	-1.02	-0.25	0.25	-1.01	-0.27	0.24	-0.96	-0.07	0.29	-0.24	-0.17	0.29	-0.58	-0.23	0.24	-1.06
D_G1	-3.10	0.77	-4.01	-3.36	0.82	-4.10	-3.39	0.83	-4.07	-3.41	0.25	-13.49	-2.68	0.72	-3.71	-3.48	0.82	-3.83	-3.53	0.33	-10.86
D_G2	-3.35	1.00	-3.38	-3.73	1.06	-3.52	-3.78	1.07	-3.52	-3.78	0.94	-4.02	-2.95	0.93	-3.17	-2.31	1.05	-3.30	-2.68	0.35	-7.82
D_G3	-1.78	0.80	-2.22	-2.20	0.87	-2.53	-2.25	0.88	-2.55	-2.24	0.83	-2.70	-2.15	0.77	-2.78	-2.30	0.83	-2.77	-2.44	0.65	-3.82
D_G4	1.42	0.73	1.95	1.75	0.79	2.22	1.79	0.80	2.24	1.67	0.46	3.68	1.74	0.70	2.48	1.85	0.76	2.45	1.50	0.40	3.73
D_G5	-2.24	0.78	-2.89	-3.54	1.05	-3.36	-3.71	1.09	-3.41	-3.49	1.61	-2.20	-4.34	1.02	-4.27	-4.29	0.87	-4.91	-5.54	1.34	-4.18
	OLS vs. 2SLS Durbin-Wu-Hausman statistic: 2.790 (df=12)																				
Adj. R2	0.38																				
Nr obs	222																				

6. Conclusions

The present study estimates demand and supply functions of the UK market for 25-year maturity unit-linked (UL) personal pensions in 1998 to 2000. It exploits the unique information contained in the PIA disclosure surveys on reduction in yields and new business. The results suggest that the popular view about the products of life offices ("insurance is sold, not bought"), when applied to UL personal pensions, does not mean that demand is independent of price. This however might still signify that the demand for personal pensions is relatively inelastic with respect to charges and thus be an indication that consumers do not "shop around" enough. Usually (for real goods) a demand with a price elasticity of less than 1, as is the case here, is interpreted as being inelastic. In the absence of suitable comparisons with price elasticities of other retail financial products offered in the UK, a definitive judgement in the case of a credence financial product seems difficult (which suggests a need for more studies of this kind). The results on elasticities must be interpreted with some caution. Indeed the introduction of a proper proxy for cross-sectional income/wealth might change this result slightly insofar as the charges are linked to the premium and the premium is linked to income – but we really expect such a change only to be slight and not to reverse our result of a significant dependence of demand on price. A further question arises with respect to the overall interpretation of the significant price-elasticity of demand. Could this result be due to exceptional market circumstances? Price dispersion does indeed seem at its high during the period analysed and could have caused a reaction of otherwise price-insensitive consumers leading thus to an increase in price-elasticity that would be lower in "normal", quiet periods. We already have noticed that, from a theoretical point of view, establishing a unambiguous link between price dispersion and price elasticity is far from obvious. This means that the above suggested interpretation is only tentative in nature and that further work might be needed once the necessary data are available. An additional result is that recent restructuring seems to have a negative impact on the quantities sold. From a 25 years perspective, the stakeholder regime does not appear to have had a significant impact on premiums written in the market of UL personal pensions in 1999 or 2000.

7. References

Association of British Insurers (2000): *Insurance Statistics Yearbook, 1989-1999*, London.

Babbel, D. F. (1985): "The Price Elasticity of Demand for Whole Life Insurance", *Journal of Finance*, 15(1), 225-239.

Basu, A. K., R, Lal, V. Srinivasan and R. Staelin (1985): "Sales Compensation Plans: An Agency Theoretic Perspective", *Marketing Science*, 4, 267-291.

Blake, D. and J. Board (1999): "Value Added by the Pensions Industry", mimeo, Pensions Institute.

Blundell, R. (1988): "Consumer Behaviour: Theory and Empirical Evidence – A Survey", *Economic Journal*, 98, 16-65.

Burkart, O. (2001): "Yields, New Business and Competition in the Unit-linked Personal Pensions Sector", mimeo.

Carlson, J. A. and R. P. McAfee (1983): "Discrete Equilibrium Price Dispersion", *Journal of Political Economy*, 91(3), 480-93.

Campbell, R. A. (1980): "The Demand for Life Insurance: An Application of the Economics of Uncertainty", *Journal of Finance*, 35, 1155-72.

Cook, M. and P. Johnson (2000): "Saving for Retirement, How taxes and charges affect choice", FSA Occasional Paper 8.

Deaton, A. and J. Muellbauer (1980): *Economics and consumer behavior*, Cambridge University Press.

Dulleck, U. and R. Kerschbamer (2001): "On Doctors, Mechanics and Computer Specialists. Or Where are the Problems with Credence Goods?", CEPR Discussion Paper 3016.

Fortune, P. (1973): " A Theory of Optimal Life Insurance: Development and Test", *Journal of Finance*, 27, 587-600.

FSA (2000): "Better informed consumers", *Consumer research* 1.

FSA (2000a): "Polarisation and Financial Services Intermediary Regulation, A Review for the Financial Services Authority", Report by London Economics.

Golan, A. (2002): "Information and Entropy Econometrics", *Journal of Econometrics*, 107(1-2), 1–15.

Gregory, A.W., J.-F. Lamarche and G. W. Smith (2002): "Information-theoretic estimation of preference parameters: macroeconomic applications and simulation evidence", *Journal of Econometrics*, 107(1-2), 213–233.

Hayashi, F. (2000): *Econometrics*, Princeton University Press.

Jaynes, E.T. (1957):"Information Theory and Statistical Mechanics", *Physical Review*, 106(4), 620-630.

Johnson, P. (2000): "CAT Standards and Stakeholders", FSA Occasional Paper 11.

Katz, M. (1990): ”Vertical Contractual Relations”, in R. Schmalensee and R. Willig (eds.): *Handbook of Industrial Organisation*, Elseviers Science Publishers, Amsterdam.

Kirman, A. and L. Phlips (1993): “Empirical Studies of Product Markets”, EUI Working Paper.

Kitamura, Y. and M. Stutzer (1997): “An Information-Theoretic Alternative to Generalised Methods of Moments Estimation”, *Econometrica*, 65(4), 861-874.

Krishna, V. and J. Morgan (2001): “A Model of Expertise”, *Quarterly Journal of Economics*, 116(2), 747-775.

Lal, R. and R. Staelin (1986): “Salesforce Compensation Plans in Environments with Asymmetric Information”, *Marketing Science*, 5(3), 179-198.

Lal, R. and V. Srinivasan (1993): “Compensation Plans for Single- and Multi-product Salesforces: An Application of the Holmstrom-Milgrom Model”, *Marketing Science*, 39(7), 777-793.

Mariano, R. S. (2001): “Simultaneous Equation Models Estimators: Statistical Properties and Practical Implications”, in B. Baltagi (ed.): *A Companion to Theoretical Econometrics*, Blackwell.

Martimort, D. (1996): “Exclusive dealing, common agency, and multiprincipals incentive theory”, *Rand Journal of Economics*, 27(1), 1-31.

Maskin, E. and J. Tirole (1988): “A Theory of Dynamic Oligopoly, II: Price Competition, Kinked Demand Curves and Edgeworth Cycles”, *Econometrica*, 56(3), 571-99.

Michell, O. (2000): “Developments in Pensions”, in G. Dionne (ed): *Handbook of Insurance*, Kluwer Academic Publishers.

Mittelhammer, R., G. Judge and D. Miller (2000): *Econometric Foundations*, Cambridge University Press.

Mossin, J. (1968): “Aspects of Rational Insurance Purchasing”, *Journal of Political Economy*, 76, 553-68.

Murthi, M., J.M. Orszag and P.R. Orszag (1999): “Administrative costs under a decentralised approach to individual accounts: lessons from the United Kingdom”, Discussion paper Birbeck College, London.

Nerlove, M. (1998): “An Errors-in-Variables Interpretation of Limited-Information Maximum Likelihood and Its Relation to Two-Stage Least Squares”, mimeo.

Personal Investment Authority (2000): *2000 Survey of the persistency of life and pension policies*, London.

Reinganum, J. (1979): “A Simple model of Equilibrium Price Dispersion”, *Journal of Political Economy*, 87, 851-58.

Russel, R., R. Breunig and C.-H. Chiu (1998): “Aggregation and Econometric Analysis of Demand and Supply”, in A. Ullah and D. Giles (eds.): *Handbook of Applied Economic Statistics*, .

Salop, S. and J. Stiglitz (1977): “Bargains and Ripoffs: A Model of Monopolistically Competitive Price Dispersion”, *Review of Economic Studies*, 44, 493-510.

Sandler, R. (2001): *Review of Long-term Retail Savings*, Report to the Chancellor of the Exchequer.

Slade, M. (1994): " Empirical Games: The Oligopoly Case", GREQAM working paper 94A18.

Sorensen, A. T. (2000): "Equilibrium Price Dispersion in Retail Markets for Description Drugs", *Journal of Political Economy*, 108(4), 833-50.

Stone, J. R. (1954): *The Measurement of Consumers' Expenditure and Behaviour in the United Kingdom, 1920-1939*, vol. 1, Cambridge University Press.

Van Hoomissen, T. (1988): "Price Dispersion and Inflation: Evidence from Israel", *Journal of Political Economy*, 96, 1303-14.

Villeneuve, B. (2000): "Life Insurance", in G. Dionne (ed): *Handbook of Insurance*, Kluwer Academic Publishers.

Working, E.J. (1925): "The statistical determination of demand curves", *Quarterly Journal of Economics*, 39, 503-43.

Zellner, A. (1998): "The finite sample properties of simultaneous equations' estimates and estimators Bayesian and non-Bayesian approaches", *Journal of Econometrics*, 83, 185-212.

Appendix 1: First stage regression for 2SLS

Identification is achieved by excluding total assets and several other variables from the demand equation and by excluding the income/wealth variable and several other variables from the supply equation. The following results (we give the Student-t and the level of significance, 1-p) of the first stage regression in 2SLS show how the instruments work for the price variable.

Table 8

Explanatory Variables	t	p > |t|
Constant	2.28	0.02
Tot. assets	-1.63	0.10
Inc/wealth	-2.27	0.02
D_AR	4.70	<0.0001
D_CR	4.59	<0.0001
D_IFA	4.30	<0.0001
D_Mouv	0.20	0.84
D_Exit	2.04	0.04
D_1999	-2.27	0.02
D_G1	1.29	0.17
D_G2	1.01	0.31
D_G3	1.64	0.10
D_G4	-1.60	0.11
D_G5	5.20	<0.0001
D_S1	3.64	0.0003
D_S2	1.41	0.16

Appendix 2: An alternative model of the market system

Alternatively to a supply and a demand equation in which quantities depend, among other variables, on prices, one could conceive a market system where in one of the two equations price depends on quantities. In the market for personal pensions, such an alternative would not be intuitive for the supply side where the quantities are certainly not exogenously fixed, but on the demand side it could be considered reasonable. (We use with the same notation as in section 3.)

The "demand function" becomes:

$$\log p_i = \gamma + \delta_p \log q_i + \delta_r \log r + \sum_n \eta_n cd_{n,i} + \vartheta_i . \qquad (1a)$$

and the "supply function" remains:

$$\log q_i = \alpha + \varepsilon_p \log p_i + \varepsilon_a \log a_m + \sum_l \beta_l cs_{l,i} + u_i , \qquad (2)$$

We have estimated this system by the same estimators as previously used. The supply equation is identical to what has been previously obtained (table 6). The price elasticities of demand, which can be obtained by taking the reciprocals of the estimated coefficients (table 9), are similar to those obtained in the previous estimations.

Table 9

Charges demand function

	OLS			2SLS			LIML			Single KLIC-MEEL			3SLS			FIML			System KLIC-MEEL		
Variables	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value	Estim	Stand error	t-value
Constant	31.88	29.13	1.09	39.66	31.42	1.26	41.57	32.60	1.28	17.69	35.73	0.49	46.74	30.62	1.53	49.93	31.67	1.58	17.68	28.50	0.62
New bus.	-0.52	0.13	-4.02	-1.27	0.25	-5.15	-1.46	0.28	-5.26	-1.36	0.18	-7.74	-1.29	0.25	-5.22	-1.50	0.27	-5.59	-1.34	0.17	-7.89
Inc/wealth	0.15	5.46	0.03	0.37	5.87	0.06	0.42	6.09	0.07	4.72	6.85	0.69	-0.90	5.73	-0.16	-1.04	5.86	-0.18	4.64	5.28	0.87
D_AR	5.61	1.00	5.58	6.58	1.11	5.92	6.82	1.16	5.87	6.41	0.91	7.05	6.40	1.11	5.79	6.70	1.12	5.97	6.56	0.84	7.82
D_CR	5.24	0.93	5.67	6.80	1.08	6.29	7.17	1.14	6.28	7.05	0.82	8.57	6.73	1.08	6.24	7.18	1.11	6.48	7.17	0.87	8.23
D_IFA	5.03	0.96	2.25	6.88	1.15	6.00	7.33	1.22	6.03	6.94	0.94	7.33	6.82	1.14	5.96	7.35	1.18	6.24	7.11	0.79	9.00
D_S1	3.74	1.18	3.16	4.70	1.30	3.62	4.93	1.35	3.65	4.73	0.86	5.47	5.12	1.28	4.01	5.48	1.37	4.00	5.48	0.80	6.84
D_S2	2.27	1.59	1.43	3.80	1.76	2.16	4.18	1.84	2.27	3.82	0.93	4.10	3.46	1.72	2.02	3.84	1.72	2.23	2.97	0.56	5.31
	OLS vs. 2SLS; Durbin-Wu-Hausman statistic 12.775 (df=7)																				
Adj. R2	0.16																				
Nr obs	222																				