A Lesson in Demographics

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Introduction

Demographics is a subject which has often been regarded as a respectable substitute for sleeping tablets. In recent times, however, it has cast off its 'Cinderella' status and has acquired a new vitality, at least in the eyes of investment analysts, economists, marketing specialists and a plethora of financial commentators who now closely examine demographic trends and speculate upon their implications.

For example, are foreseeable population changes

- good or bad for the economy?
- good or bad for the environment?
- good or bad for certain industries?

Indeed such is the fascination with demographics that five years ago an American professor in Massachusetts set out to answer the question: "how many people have ever lived?" He came up with an estimate of fifty billion, producing the irresistable, but as far as I can see utterly useless statistic: "9% of everybody who has ever lived is alive today" (International Herald Tribune, Oct 1987).

The aim of this paper is to examine a certain aspect of demographics which will have major impacts, economic and otherwise, on many aspects of life.

Outlining the problem

In the period 1961-89 the average size of a household in the UK fell from 3.2 to 2.3 persons. More interesting than this is the fact that the structure of units which form the basis of households has gone through a dramatic metamorphosis. In 1961, 12% of households consisted of one person whereas in 1989 this percentage had risen to 28%. Large families (with dependent children) have fallen in size and non-family units (such as persons cohabitating) have increased from 17% to 29% of all households. So the analysis of a change in household size is equivalent to examining changes in the aforementioned subcomponents.

An examination of the household size cannot be taken in isolation. A *ceteris paribus* assumption is simply wishful thinking on our part, as changes in demographic factors and in society as a whole are interwoven in a complex web. Demographics depends on everything and demographic analysis involves more than the sum of its parts - factors cannot be simply delineated. Thus the analysis which follows will, by necessity, entail more than was originally intended.

Theoretical Model

I wish to explain the variation in the average household size with reference to three factors in particular:

Participation rates

The period under review has witnessed an increase in the participation rate of married women in the labour force from 21.7% to 49.5%. In this period there has been a corresponding fall in the birth rate and indeed in the early 1970's it reached a level that fell below the replacement level (Ermisch, 1990).

It appears that this phenomenon was set in motion by the introduction of the contraceptive pill in the 1960's, which raised the probability of women entering paid employment and led to later marriages. Thus, women have gained work experience and this has raised the opportunity cost of childbearing. The services industry, in which women have traditionally taken jobs has experienced an expansion. This new feature of the UK labour market is underpinned by the British Equal Pay Act (1970) as women strove to be on a par with their male counterparts. An econometrics article in *Employment Gazette* of 1984 (Ermisch, 1990) shows a negative correlation between wages and family size.

Arguably, with modern

	Average Household Size	Participation Rates (married women) %	Divorce Rate (per 1000 married persons)	Internal Migration Rates (per ,000's)
1961	3.2	29.7	2.6	18
1966	2.99	38.1	3.2	18
1971	2.89	42.2	6.0	20
1976	2.76	47.8	10.1	26
1981	2.68	49.6	11.9	24
1985	2.56	49.6	13.4	35
1989	2.3	53.1	12.9	38

Sources: '61,'66,'71,'81 Census of Population
Social Trends 1-21,HMSO Publications
Marriage & Divorce Statistics for the UK,OPCS,1959-'89
National health Service Central Register

Table 1

econometric methods and new technological advances, we may proffer that the economic environment is more predictable than parenthood and its associations - hence perhaps the substitution in favour of work. Thus, this increase in the participation rate has led to a fall in family size and a postponement (either partially or wholly) of childbearing, and to cohabitating, the cumulative effect being to lower family size.

Divorce

In 1986, 16% of all families were one-parent as a result of divorce. In the period 1961-89 the divorce rate (per 1,000 married population) rose from 2.6 to an unprecedented level of 12.6. This divorce rate affects two of the subcomponents previously mentioned, namely one-person households and family units.

Divorce stunts family growth directly and as a general rule gives rise to an additional household, the combined effect lowering household sizes. Indeed it may be the case that children exist before a marriage ends, but a higher percentage of divorces occur at a later age and remarriage rates are low among divorcees.

These postulations are supported by a report by Jonathon Bailey of the Office of Population Census and Statistics entitled "Divorce and family size, 1970-80". This report is somewhat lengthy, but a number of points merit explicit mention:

1) an increasing percentage of persons are divorcing at a later age

2) remarriage rates are declining among divorcees

3) the propensity of those who do remarry to have children is low

Thus, with these facts in mind, divorce adds to the number of one-person households and slows down progress in family growth.

It may be argued that the increase in economic independence of women (as indicated by the rise in the participation rates) may lead to divorce, as slight marital strains arise and indeed, post-divorce financial difficulties may make work a necessity rather than an option.

Internal migration

Whereas traditionally Irish workers have migrated to and from the UK, this characteristic is catching within the UK itself. Movements within England, Wales and Scotland, but more so within England itself, have increased at a steady rate from 14 to 29 moves per 1,000 population, with migration rates within regions being somewhat higher.

It is within the 16-24 age group that internal migration has experienced its highest levels particularly in the late '70's and late '80's (Rosenbraum, 1982). Indeed, this may mirror directly the baby booming generation of the late '50's/early '60's who have reached home-leaving age, and the '80's witnessing a period of rising and falling economic prospects for many industries, thus pushing and pulling the labour force in diverse ways. The 16-24 age group may well have migrated simply to obtain education at a third level institution.

Internal migration leads to a diversification of households and it is thought that those who migrate set up a

'secondary' household which is, on average, smaller than the original household due to the nature of migration (whether to look for work or to use simply as a base for certain short periods of time).

Estimating the model

The estimation of the regression line is done using the Hummer package. I have used sixteen observations on both the dependent and the independent variables. The regression equation obtained is of the form:

$$F^* = 4.096465 - 0.023157P + 0.003075D - 0.01233M$$

where

F^* = estimated average household size
P = participation rate of married women
D = divorce rate
M = internal migration rate

The true regression line is of the form

$$F = 4.096465 - 0.023157P + 0.003075D + 0.01233M + e$$

where e represents the error term.

The model presented can be evaluated in terms of the Hummer printout. Looking firstly at the coefficient of determination of 0.95989 indicates that over 95% of the variation in the average household size can be explained with reference to the variation in the three aforementioned independent variables. Thus, at a cursory glance it appears that the model is indeed a good one.

Regression Results

$R^2 = 0.95989$

Dependent Variable	Parameter Estimate	t-statistic $H_o: \beta = 0$
Constant	4.096459	20.57931
Particn	-0.023157	-3.47998
Divorce	0.003075	0.26287
Migration	-0.012337	-4.89872

With the exception of the divorce parameter, all parameters have signs consistent with our *a priori* expectations and are statistically significant, and thus the data is consistent with the hypothesis of the theoretical model (eg. the participation parameter is negative which means that rising participation rates can be associated with falling household sizes). The 'incorrect' sign on the divorce parameter is most likely to stem from the problem of multicollinearity.

The downfall of multiple regression is that it 'lumps' the effects of all of the independent variables together - the contribution of each cannot be

determined. Thus, for whatever reason (such as multicollinearity), divorce seems to play a very secondary role in the model when the cumulative effects of the independent variables are assessed.

Indeed, not all variables were included. Other factors such as abortion, housing costs and poll taxes may have repercussions on the model presented. Predictions may now be made on the basis of the estimated regression, though care must be taken because the nature of demographics is such as to invalidate *ceteris paribus* assumptions. Predictions made will thus be of a weak nature, though if present trends continue household sizes may fall further.

An Economic Link

Since population growth has always marched hand in hand with economic growth, some economists would argue that the levelling off of population growth in the world's major economies will usher in a new economic era. They suggest that an ageing society (such as that of the UK) values preservation more that innovation and the tradeoff will realise relative economic decline.

I don't happen to agree with this theory, partly because it ignores the issue of finite resource limits, but this is not the crux of the work here. I refer to it to introduce two observations. Firstly, it is always dangerous to regard tomorrow as a straight-line extension of today. Projections which show unrestrained exponential growth, be they projections of average household size or the number of AIDS victims will ultimately be wrong. Secondly, the presence of change must be underlined. The demographic change is real and the UK is entering a new socio-economic environment. There will be consequential changes in society. What these changes will be remains very much open to conjecture. Some thoughts shall be proffered in due course.

What is most interesting about demographic change is the diverse ways in which it diffuses through society and touches on almost every aspect of life, be it economic, political or social. It is this compelling feature of demographics which behoves us to take a closer examination.

This phenomenon was first brought to my attention on observing the UK life insurance industry. In 1988 a new insurance product was introduced called Long Term Care (Swiss Reinsurance (UK) Ltd., 1991) which provides for care of elderly persons who live alone and who have no immediate dependents. The introduction of Long Term Care was first a realisation of changing demographic patterns and an attempt to adapt to the newly changed environment.

Indeed, what role model do insurance companies have in mind when developing products and designing sales materials? I wonder if we have escaped from the clutches of the couple with two children and the wife dedicated full-time to looking after the home and children? Fifteen years ago a report from the US Labour Department (Marital and Family Characteristics of the Labour Force, March 1976) showed that only 7% of

households fitted this image. In the UK there are still married couples with two children, but the rising proportion of working wives tends to shatter this conventional image. On a sadder note, so does the divorce rate currently running at more than 12% of marriages a year.

The consequences of these have resulted in a complete overhaul of insurance policy packaging and design. The income of the working wife is no longer incidental - it is not optional, but rather integral to the household's standard of living. Like the income of the male, it must be protected against foreseeable contingencies such as ill-health to preserve household lifestyle. Of course, the loss of the contribution made by the wife who does remain at home also damages domestic finance and again, there is a need for protection - one which underwriters have become comfortable with in recent times.

As previously mentioned the effects of demographic change touch on society in many ways. The decline in family sizes and birth rates will create problems in the labour force and with a tight labour market this may increase the demand for female workers, raising their relative wages and countering any efforts to increase family size. This may compound the number of lone elderly people and raise dependency ratios to a higher level, necessitating a dedication of extra resources to looking after the old.

The General Household Survey rounds of family intentions (1980-85) indicate that most British people would like to experience parenthood and have two children. Whether or not this will occur remains debatable. Altering the population is impractical - people cannot be told how many children to have. Adaptive policies such as those mentioned are the only hope to tailor the environment to suit the changes that have occured.

Housing planning may prove useful (though difficult). The baby booming era of the early '60's may have required (on average) larger dwellings than those of today, where household and family sizes are falling. Such accommodating actions may lead to less wastage, and thus a more efficient use of resources.

Conclusion

Owing to the diverse and extensive ways in which demographic changes diffuse and filter through society, the analysis of changing household sizes necessarily entails an analysis of many other demographic features. However, it is hoped that the theoretical model is appealing, both at an intuitive and at an econometric level. Indeed, no econometric model can ever be complete (the current one being no exception), as value judgments and space and time limitations can often result in the omission of important explanatory variables. The estimation of parameters converts the model from a theoretical nicety to an operational one, and it is hoped that the current one is thought provoking, if not operational.

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