PROJECTING HOUSEHOLD HEADSHIP:

EXPLORATION AND COMPARISON OF

FORMAL AND BEHAVIOURAL

APPROACHES

PROJECT SUMMARY

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with the assistance of

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for

NOTE: **DISPONIBLE AUSSI EN FRANÇAIS SOUS LE TITRE:**

PROJECTION DES TAUX DE CHEF DE MÉNAGE: ÉTUDE ET COMPARAISON DE
MÉTHODES CLASSIQUES ET COMPORTEMENTALES

**DISCLAIMER**


This study was conducted for Canada Mortgage and Housing Corporation under Part IX of the National Housing Act.  The analysis, interpretations and recommendations are those of the consultant and do not necessarily reflect the views of Canada Mortgage and Housing Corporation or those divisions of the Corporation that assisted in the study and its publication.

## Background

Around the world, the so-called 'headship' rate method remains the chief method for projecting numbers of households in a population. Assumed future headship rates (by age, sex, marital status or other characteristics) are combined with population projections (typically, official projections) by these same characteristics.

In Canada, headship rates by age and household type (family/non-family) are a key input into the CMHC Potential Housing Demand Projection Model. Clearly, the headship rate inputs are crucial to the quality of projections of household numbers by type, and derived projections of housing demand.

Typically, future headship rates are assumed to remain constant or are extrapolated from current levels on the basis of some simple formula.

This project explored several novel approaches to forecasting headship rates. These are novel in the general sense that they have not been much investigated or used in demographic and other relevant technical literature, and in the specific sense that they have not previously been applied to nationwide projections for Canada.

Begun in 1992, the work involved experimentation with several different methods using several different data sets. This was judged a better strategy than focussing all effort on one relatively untried and unproven approach, however attractive it might have appeared before the fact. This turned out to have been an effective strategy, since the most satisfactory projections were produced using an approach not emphasized in planning or in early stages of the project.

Effort was in two general directions:

1) Exploration of formal methods for parametric modelling of headship curves of Canadian birth cohorts, concrete groups of individuals born in the same period and followed over time. Typical applications of the headship rate method work with cross-sectional rather than cohort data.

2) exploration of multivariate behavioural models, expressing headship rates as a function of various social, economic and demographic co-variates, and serving as a basis for projections of headship given assumed future values of co-variates.

Work on cohort modelling was only partially successful (in the face of major shifts in the shapes of some headship curves), and was curtailed. This work also was judged by CMHC Research Division to be of less interest than the behavioural modelling, and less responsive to the contract focus.

## A Schizoid Literature

An extensive literature review confirmed the novelty of the methods being investigated, and a schizoid character in social science research on household formation and headship.

Research literature by social demographers on household and family formation tends to neglect the role of housing market variables -- stocks, prices, rents, and so forth.

Literature by housing economists and planners tends to neglect the role of social and demographic variables, sometimes focussing almost exclusively on economic variables such as income and housing costs. The two bodies of literature also show distinctive and different methodological traditions, making comparisons of findings across disciplines difficult.

The complementary backgrounds of the principal investigators (social demography and urban planning/economics) served as a bridge between these disparate research traditions.

The literature review also underlined the fact that most behavioural studies of household formation and headship have focussed on a few specific sub-groups in the population, notably never-married young adults (at the early stages of household formation) and elderly persons, especially formerly married elderly women (towards the later stages of household formation, and at high risk of living alone).

To the extent that there has been appreciable development of theory relating to determinants of headship, the theory is thus narrowly focussed, and provided little specific guidance for the specification of behavioural models applicable to a broad range of age, sex and marital status categories.

For the most part, the literature provided only general guidance as to the kinds of variables to include in the models and other aspects of appropriate model specification.

## Household Headship as a Compound Event

Although the concept of household head seems simple enough, in fact entry into or departure from this status is in turn a function of several simpler events, the relevant set of events differing from one age/sex/marital status category to another.

Among young adults, for example, headship depends on decisions whether to leave the parental home, whether to marry or cohabit, and, if outside the parental home but not married or cohabiting, whether to live with others or alone. Among older persons, headship depends on events such as divorce, remarriage, and widowhood.

Attempts to model individual 'headship' behaviour confront difficult problems relating to the correct temporal or causal sequence of these several decisions or behaviours.

In addition, in trying to 'explain' headship, problems arise from the endogeneity of some presumed explanatory variables, and from the presence of simultaneous relationships. For example, labour-force participation and individual income affect but are also affected by household status.

The project made some efforts to cope with these problems, especially in the analysis of 1986 Public-Use Census Sample micro-data files (pertaining to individuals).

But the eventual main thrust of modelling efforts, and the modelling that produced the final headship projections shifted from individual to aggregate analysis, working with pooled data for provinces/territories at several census dates. It is thought that some of the specification problems noted above are less severe in this sort of analysis, allowing simpler, more straightforward models and estimation techniques.

## The Main Model

The model used to generate the final headship projections was estimated empirically using aggregate data for the twelve provinces/territories at four census dates: 1971, 1976, 1981 and 1986. Separate models were estimated for family and non-family headship for selected age categories, chosen so as to allow unambiguous definition of age curves of headship, and interpolation of values for other age categories.

The dependent variable was the relevant age-specific headship rate by province/territory in 1976, 1981 and 1986, with 36 observations resulting. Independent variables (all at the provincial/territorial level) included: the headship rate for the same age category at the previous census (X1) ; per capita income in constant dollars (X2); the unemployment rate (X3); an index of overall housing costs (X4); an index of in-migration, internal and international (X5); the crude divorce rate (X6). For middle-aged and older persons, some of the above independent variables were dropped, for substantive or statistical reasons. For persons seventy-five and older, a mortality index was added.

Model estimation was performed using the econometrics package SHAZAM, the specific module designed for analysis of pooled cross-sectional/time series data.

An illustrative estimated equation, for non-family heads 40-44, is as follows (t-score in parenthesis):

$$H(40-44) = -0.014 + 1.08 \; X1 + 0.00085 \; X2 + 0.00004 \; X4 - 0.00039 \; X5$$

$$(-2.96) \quad (20.14) \quad (2.49) \quad (4.45) \quad (-4.24)$$

The appropriate $R^2$ (measure of goodness of fit) for the model is approximately 0.97, making it one of the better fitting models (although most $R^2$'s were well above 0.8).

Directions and strengths of relationships were not completely consistent across various age/household type categories. But in cases where the statistical relationship was strong, the result was retained even though it might conflict with 'common sense' or with a priori expectations (based, however, largely on analyses of individual data).

Final Projections

Estimated equations such as the above were used to project high and low headship rates from 1991 to 2011. The high and low series were based on the extreme values for the predictor variables observed for an area during the base period 1971 to 1986. High projections were made assuming all the predictor variables took extreme values (high or low, depending on sign in the equation) in the year 2011, that is, values that would most favour high headship rates. The low series was computed conversely. Values of predictor variables in the intervening years were interpolated between 1986 and 2011.

Assumptions regarding future values of independent variables represent one somewhat arbitrary choice out of an indefinitely large number of possibilities. But the resulting projections, despite their relatively narrow range, are thought to capture the limits within which future reality is apt to fall, short of unforeseen revolutions in economic, demographic or family behaviour.

Figures 1 and 2 exhibit high, medium and low projections of non-family and family rates in 2001 for Canada. Figure 1 clearly reflects the greater volatility in non-family headship during the base period of observation, 1971-1986, volatility captured by the estimated model.

Directions for Future Work

Project results point to the value of further work with headship projections based on behavioural models, especially models based on pooled cross-sectional/time series data for aggregates. These models allow the greatest scope for extension of the time dimension, and for the additional of other relevant variables.

Such further work will be more fruitful to the extent:

a) that it can be supported by a larger data base. Data from the 1991 census will soon be available, but special tabulations are also needed from earlier censuses, back as far as 1951. Understanding of household formation behaviour also would be greatly enhanced by longitudinal or retrospective surveys with data on respondent residential histories.

Figure 1

Comparison of Pooled Projections to 2001
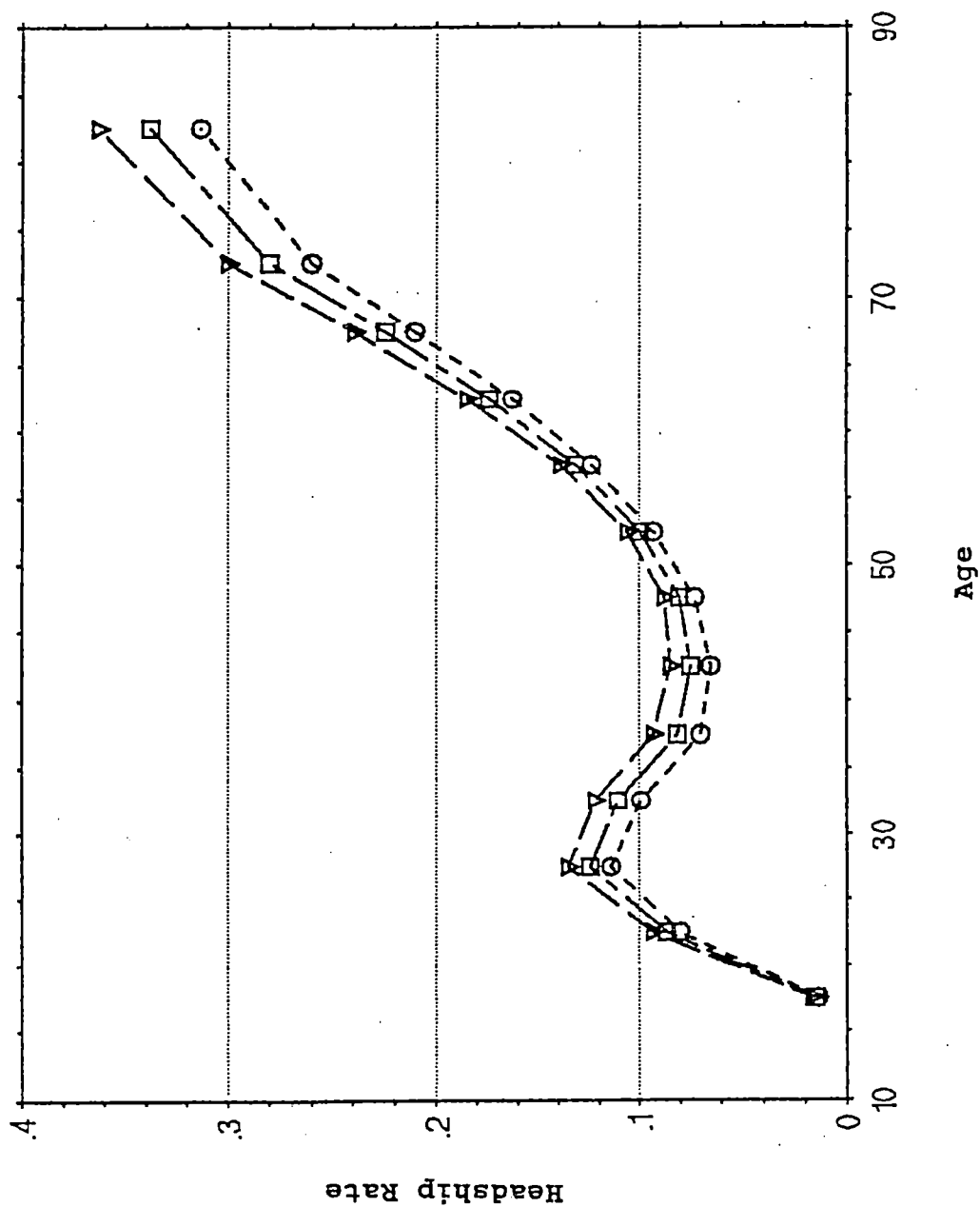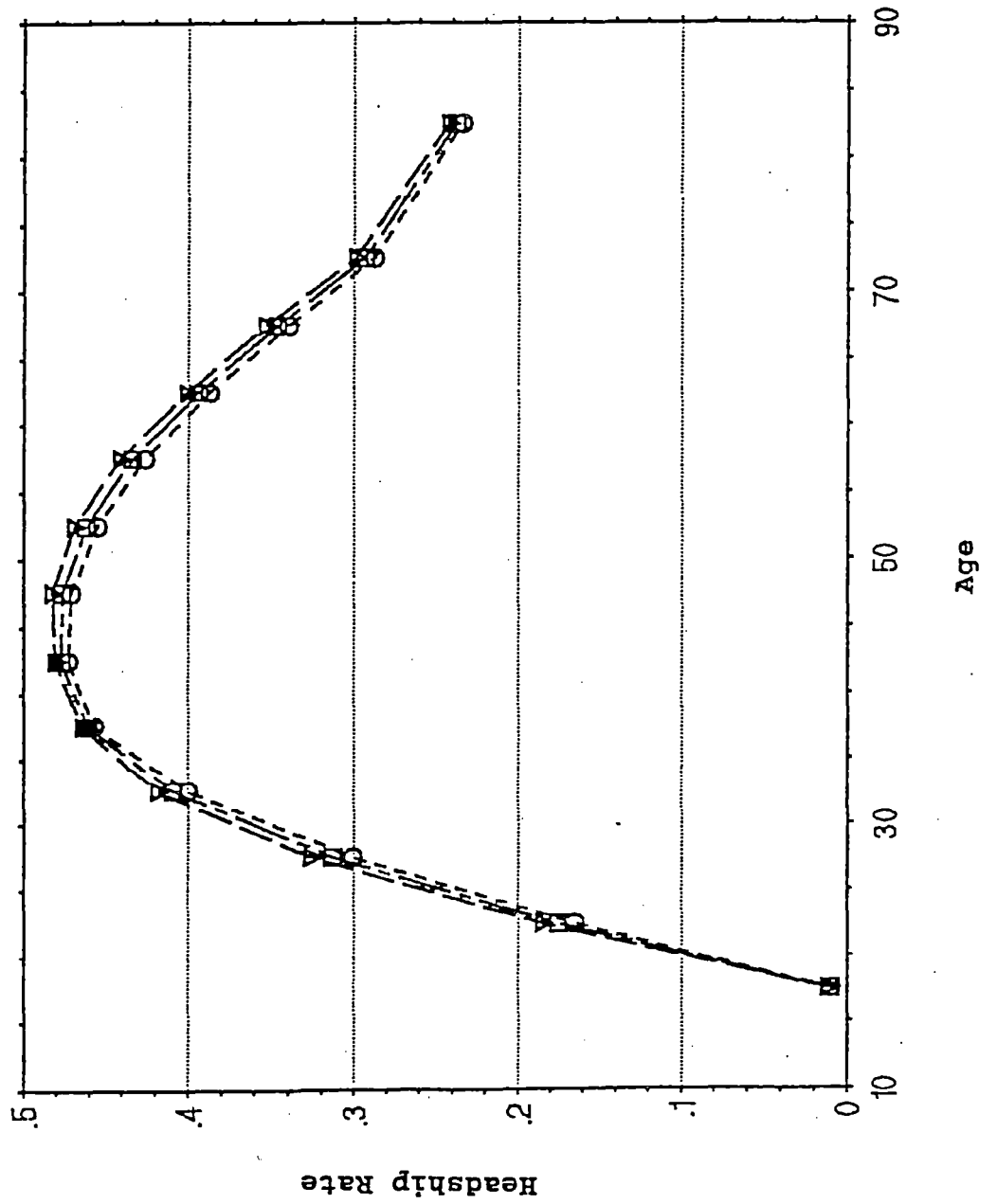Non-Family Variants, Canada

Figure 2

Comparison of Pooled Projections to 2001
Family Variants, Canada

b) that greater attention be paid to the particularities of each province/territory, including trends in predictor variables.

c) that the work be interdisciplinary, avoiding the schism between social demography and economics noted earlier.

d) that there be recognition of the time and other resources needed for the complex econometric work required.

Behavioural models of headship have the advantage for the policy analyst or policy maker that they point to concrete realities in the socio-demographic-economic system, at least some of which are subject to appropriate policy responses. Simulation models have a similar advantage over purely formal projection models, and also merit further exploration.

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## Working Papers and Other Reports Submitted
(In chronological order of submission of initial draft)

Burch and Skaburskis, March 1992

    Determinants and Predictors of Household Headship: A Review
of Literature on Behavioral Models.  Working Paper #1,
39 pp.

Burch, Li and Skaburskis, May 1992

    A Cohort Approach to Projecting Headship Rates.  Working
Paper #2, 16 pp plus graphs.

Skaburskis and Burch, May 1992

    Determinants and Predictors of Household Headship: Model
Specification.  Working Paper #3, 45pp.

Li Sihe, May 1992

    Determinants of Household Headship: A Logistic Analysis.
Research Note, 31 pp.

Skaburskis and Burch, August 1992

    Analysis of Household Formation Behavior Using the 1986
Census Public-Use Micro-Data Files for Households and
Individuals.  Working Paper #4A, 25 pp plus tables.

Burch, Li and Skaburskis, October 1992

    Cohort Based Projections of Headship rates for Family and
Non-Family Households, 1991-2011.  Working Paper #2A, 7 pp
plus tables and graphs.

Burch, Li and Skaburskis, November 1992
    Projecting Household Headship: Aggregate Regression with
    Pooled Cross Section and Time Series Data.  Research Note,
    5pp plus tables.

Skaburskis and Burch, December 1992
    Analysis of Provincial Headship Rate Data, 1971-1986.
    Working Paper #4B, 44 pp plus tables.

Burch, Skaburskis and Li, December 1992
    Projecting Household Headship: Exploration and Comparison of
    Formal and Behavioral Approaches.  Final Report, 27 pp plus
    tables and graphs.

Burch and Skaburskis, February 1993
    Projecting Household Headship: Exploration and Comparison of
    Formal and Behavioral Approaches.  Project Summary, 12 pp.