Queen's Economics Department Working Paper No. 886

Characterizing Life-Cycle Wealth Distributions in Canada Using Dominance Criteria

Fazley K. Siddiq Charles M. Beach

Department of Economics
Queen's University
94 University Avenue
Kingston, Ontario, Canada
K7L 3N6

7-1993

Discussion Paper #886

Characterizing Life-Cycle Wealth Distributions in Canada Using Dominance Criteria

by

Fazley K. Siddiq
Dalhousie University

and

Charles M. Beach
Queen's University

July 1993

Characterizing Life-Cycle Wealth Distributions in Canada

Using Dominance Criteria

by

Fazley K. Siddiq
Dalhousie University

Charles M. Beach
Queen's University

July 1993

The authors wish to thank James Davies at the 1993 Canadian Economics Association meetings and participants of the Faculty Research Seminar at the University of Melbourne for many helpful and perceptive comments on this paper, though in no way, holding them responsible for any shortcomings of the paper. The authors also wish to acknowledge their appreciation to Brian Lewis for his valuable research assistance. The research for this paper was done while Fazley Siddiq was visiting Queen's University.

ABSTRACT

This paper examines how the distribution of household wealth in Canada varies with age over the life cycle. The wealth distribution is characterized in terms of decile means and decile shares for each of six age groups, and comparisons between age-specific distributions are based on first- and second-order stochastic dominance criteria. It is found that (i) mean wealth levels and wealth distributions increase significantly with age in concave quadratic fashion until near retirement and then decline, and (ii) wealth inequality declines in convex function with age, at first steeply and then not significantly. This joint pattern in mean and inequality of wealth holdings across age groups presents a challenge for basic theories to explain.

I. Introduction

This paper examines how the distribution of household wealth in Canada varies with age over the life-cycle. Interest in wealth distributions has recently come to the fore, because of both policy and methodological concerns. Dramatically increased government deficits have prompted a search for additional sources of tax revenue, and in March 1993 the Ontario Fair Tax Commission brought out a report outlining possible wealth tax proposals for the province. Consequently, having a better understanding of the basic structure of the wealth distribution would seem to be timely. But recent advances in evaluating distributional change have also been developed in the literature in the context of income distributions. It would make sense to apply these now to the distribution of wealth. The data used in this paper are from the Income, Assets and Debts Survey for Canada for 1984.

The study examines the wealth distribution in disaggregated detail, and does so without fitting any form of distribution function to the wealth data. Instead, the wealth distribution is characterized in terms of sets of quantile means and quantile shares. For each of several age groups -- six were defined for this study -- there will be vectors of, say, decile means and decile shares. This method of characterization of a wealth distribution has several advantages. First, it makes use of results in Beach and Davidson (1983) that allow for distribution - free statistical inference between sample quantile or share vectors, so one can formally test for changing wealth distributions over a household's life-cycle. Second, it allows one to apply the approach of Bishop, Formby and Thistle (1992) and Beach and Slotsve (1993) of comparing distributions in terms of first- and second-order stochastic dominance (also known as Rank Dominance and Generalized Lorenz Dominance, respectively) and in terms of Lorenz Dominance. These easy-to-apply methods allow one to reach very general conclusions on the comparisons of distributions, in this case of wealth distributions over the life-cycle. This is the first time that such an approach has been applied to wealth distributions.

An additional motivation for the paper is to provide a more complete characterization of the wealth distribution over the life cycle in terms of both mean (or median) wealth holdings and inequality of wealth holdings across age groups. Just as Mincer's (1974) basic empirical work on earnings distributions revealed life-cycle patterns that are concave quadratic in mean earnings and a J-shape in the inequality of earnings across age groups -- patterns that jointly motivated the development of human capital theory to explain --, so we also seek to establish the basic empirical facts on mean wealth and inequality of wealth holdings jointly for theory to attempt to explain.

Section II of the paper is concerned with the technical background to characterizing wealth distributions by distribution-free techniques. It provides a simple algorithm to compute a set of quantile mean wealth figures and corresponding standard errors. This allows for statistical implementation of all three of the Rank Dominance, Lorenz Dominance, and Generalized Lorenz Dominance criteria for comparing distributions of wealth.

The empirical results on characterizing and testing for the changes in the distribution of wealth over the life-cycle are presented in Section III. Results are presented on both decile means and percentage decile shares for wealth distributions across six age groups. Section IV focuses on characterizing the wealth distribution econometrically and graphically in terms of sets of descriptive equations across age groups and decile classes of the distribution. This allows one to predict, graphically illustrate, and potentially simulate the impact effects of various shocks on the overall wealth distribution.

Section V is a review of the key results. First, all three dominance criteria showed that wealth distributions and mean wealth levels increase with age until near retirement; after retirement age, the Rank Dominance and the Generalized Dominance criteria showed a decline in wealth holdings while the Lorenz Dominance criterion demonstrated no significant change in general inequality of wealth holdings. Second, there is a clear tendency for wealth inequality to decline in convex fashion with age, at first steeply and then not significantly, until the retirement period. The wealth shares of the lower deciles increase with age, but at a declining rate, until the eighth decile. The wealth share of the tenth decile continues to drop with age past retirement. The continuous fall in the Gini coefficient across successive age groups corresponds with the Lorenz curve for wealth moving up closer to the equality diagonal with age. The distinctive patterns of a concave quadratic for mean wealth and a flattening decline in wealth inequality across ages present a challenge for theoretical modellers to explain.

II. Technical Background on Characterizing Differences in Distributions

II.1 Comparing Distributions and Stochastic Dominance

The issue we wish to address is how to compare or rank wealth distributions across different age groups and thus be able to identify significant distributional differences. This involves two recent methodological developments in the empirical literature: the use of social welfare ranking criteria based on stochastic dominance principles and the use of statistical inference procedures. This paper employs both in a disaggregative framework.

Recent developments in applied welfare theory have allowed one to evaluate or infer relative levels of economic well-being in terms of dominance criteria of one (income) distribution by another. One such criterion, Rank Dominance (Saposnik, 1981) or, equivalently, first-order stochastic dominance, has been used to evaluate the convergence of income distributions (Bishop et. al., 1992) and the changes in family well-being since the 1960s (Bishop, et. al, 1991). Rank Dominance essentially says that, for any social welfare functions satisfying the relatively weak properties of symmetry, population invariance, and a (strong) Pareto principle, distribution X is socially preferred to distribution Y if the quantile means for X are all higher than those for Y (Saposnik, 1981). When we implement this criterion in terms of wealth deciles, it involves comparing a vector of ordered decile mean wealth levels for one age-specific distribution to the corresponding set of decile means for another age-specific distribution.

If one set uniformly dominates the second set, we can say that the former distribution rank dominates the latter.

In many cases, however, this condition is not met as all the elements in the two decile mean vectors may not be uniformly ranked. A stronger or second-order dominance criterion may then be applied in terms of the Generalized Lorenz curve (GLC), which is the product of the mean wealth level and the Lorenz curve (Shorrocks, 1983). Essentially, the dominance criterion holds that, for any (additively separable) social welfare function satisfying the now stronger properties of symmetry, population invariance, a (strong) Pareto principle plus the Principle of Transfers, distribution X is socially preferred to distribution Y if the GLC for X lies everywhere above that for Y (Jenkins, 1991, Theorem 5). Now the ordinate for a Lorenz curve can be expressed as $LC_i = p_i\gamma_i / \mu$ for abscissa proportion p_i, where γ_i is the cumulative mean wealth level for wealth holdings up to and including the i'th decile group, and μ is the overall mean wealth level; so the corresponding GLC ordinate is $GLC_i = \mu \cdot LC_i = p_i\gamma_i$. When implemented in terms of deciles, the criterion thus involves calculating decile means for each age-specific wealth distribution and then checking whether a vector of (ordered) cumulative decile mean wealth levels (actually the $p_i\gamma_i$'s) for one age-specific distribution uniformly dominates that for another.

Again, however, even with these stronger conditions, the dominance may not be uniform across all elements in the two vectors. In this case, one may fall back on a weaker but more familiar result involving Lorenz curve dominance (Atkinson, 1970). Essentially stated, for any aggregate inequality measure I, such as a Gini coefficient, satisfying symmetry, mean independence, population homogeneity and the Principle of Transfers, if the Lorenz Curve for distribution X lies everywhere above that for distribution Y, then wealth inequality as measured by I in X will be less than that as measured by I in Y (Jenkins, 1991, Theorem 3). That is, the conclusion refers just to inequality per se rather than the relative level of social welfare more generally. Again, when implemented in terms of deciles, the criterion involves checking whether a vector of Lorenz curve decile ordinates ($p_i\gamma_i/\mu$) for one age-specific wealth distribution uniformly dominates that for another.

The approach used in this paper thus proceeds by first checking for Rank Dominance across the six age-specific wealth distributions. We then turn to the Generalized Lorenz Dominance criterion to see what further rankings this will provide. We also examine inequality comparisons across age-specific wealth distributions based on the Lorenz Dominance criterion.

II.2 Sampling Inferences and Dominance Criteria

The second methodological feature of this paper involves the use of statistical inference procedures. The above dominance criteria are all expressed in terms of a population, whereas the micro-data source of this study comes from the Statistics Canada Income, Assets and Debts Survey. Statistical application of the criteria must thus take account of sampling errors in the estimates of the decile means and wealth shares in the criteria ordinates. That is, corresponding to vectors of sample-estimated decile means, LC ordinates, or GLC ordinates are (asymptotic) variance-covariance matrices which need to be incorporated in the comparison of sample vectors between age-specific wealth distributions.

The basic results on the (asymptotic) distributions of LC and GLC ordinates are given in Beach and Davidson (1983) who established distribution-free formulas for the asymptotic variances and covariances of LC and GLC ordinates. These have been extended to decile means as well in Bishop et. al. (1989) and integrated into a unified computational algorithm by Beach et. al. (1992). One can thus test for significant differences between individual vector elements for two age-specific distributions (as an asymptotic standard normal test for the difference between sample means) and between two overall distributions (as an asymptotic quadratic-form chi-square test for the difference between two sample vectors).

Implementing dominance criteria statistically, however, involves making sets of one-sided comparisons. For individual elements, this can be done straightforwardly in terms of a standard normal test with a one-sided alternative hypothesis. But one-sided comparison of vectors requires a different approach. Beach and Richmond (1985) showed how tests for differences in the full set of LC ordinates or (wealth) share vectors can be re-expressed in terms of joint confidence intervals based on the SMM distribution.

Bishop et. al. (1989, 1992) developed a union-intersection test based on the SMM distribution that involves checking that each of the mean-difference "t-ratios" for the respective elements of the sample vectors is of the same sign and exceeds an SMM critical value of 2.80 (or 3.29) at the 5 percent (or 1 percent) level of significance. More specifically, if the t-ratios of the differences of respective elements fail to reject the hypothesis of equality <u>for every element</u> (i.e., the absolute t-ratios are all less than 2.80 at the 5 percent level), then we can not reject the null hypothesis of equality between the vectors, and we rank the two wealth distributions (or inequality in the two distributions) as the same.

Rejection of equality by any one of the individual t-ratios implies the rejection of the hypothesis of equality between the vectors and the conclusion that the two distributions (or their inequality) are significantly different. This difference, however, may be associated with either dominance (i.e., uniform one-sided ranking of all t-ratios of the differences) or noncomparability (i.e., nonuniform one-sided rankings). Specifically, if there is one or more significant positive differences in the t-ratios and no significant negative differences, they conclude that the first distribution (or inequality) significantly dominates the second. On the other hand, if there are significant t-ratio differences of both signs, they conclude that the two distributions (or inequalities) are noncomparable (e.g., the Lorenz curves cross) and thus cannot be unambiguously ranked (Bishop et. al., 1992).

We now illustrate the application of these principles.

III. Empirical Results on Comparison of Life-Cycle Wealth Distributions

The estimation sample for this study consists of all families with age of head of fifteen years or more in the Income, Assets and Debts Survey of 1984, the most recent Statistics Canada wealth survey for Canada. The sample size of the analysis is 14,029 families. By family is meant "economic family" or a group of individuals sharing a common dwelling unit who are related by blood, marriage or adoption" (Statistics Canada, 1986). The sample used is the full set of family units including both family units sized two or more ("families") and family units of one person ("unattached individuals"). Wealth or net worth in this survey consists of: total deposits and savings certificates; Canada Savings Bonds; cash on hand; estimated market value of all stock holdings; value of RRSPs and RHOSPs holdings; other non-liquid financial assets; market value of cars, trucks, or vans and other vehicles; market value of owner-occupied home; equity in real estate other than owner-occupied home; and equity in business, farm, or profession; minus total consumer debt, personal debt, and mortgage on owner-occupied home. Any non-reported asset or debt components were imputed by Statistics Canada, so that no missing wealth values occurred on the microdata file. Incidence of zero net values and negative values of reported net worth are provided in the Appendix Table A.1. It is important to note that although the asset and debt coverage in this survey is fairly comprehensive, as is common in most wealth surveys, the following items are omitted due to measurement problems: consumer durables other than cars; private occupational pension rights; life insurance; and social security wealth. Davies (1993) notes that, while there is good reason to omit these items, it is important to bear these limitations in mind in interpreting survey estimates of wealth distribution.

The total sample was divided into six age-specific subsamples according to age of household head as follows:

Age Group	Sample Size
15 - 29 years	2,684
30 - 39 years	3,128
40 - 49 years	2,341
50 - 59 years	2,229
60 - 69 years	1,941
70 and over	1,706
All Ages	14,029

III.1 Analysis of Decile Means

The overall sample means and median wealth levels for the age-specific distributions are presented in Table 1. The mean wealth level across all age groups was $ 87,058 while the median was less than half at $ 40,481, reflecting the extreme skewness typical of wealth distributions. (Standard errors are not reported for the median figures because they are not distribution-free.) Evidently, both mean and median wealth levels rise across age groups in the cross-section to peak in the 50-59 year age interval and then decline over older, typically retired age groups. Note that the differences in means are all highly significant with the exception of that between the 50-59 and 60-69 year age groups (t-ratio on the difference of 1.49). The pattern of mean wealth across ages is illustrated in Figure 1A. A similar pattern of mean or median wealth levels across (different) age groups is also found in Statistics Canada (1986), Oja (1987), and Chawla (1989), and for earlier wealth data in Burbidge and Robb (1985) and Oja (1980). By comparison with wealth data for the United States, the mean wealth pattern in Canada is more markedly hump-shaped across ages than in the U.S. (Oja, 1987).

The observations in each age group were ordered by the size of their reported net worth. The ordered samples were then each divided into ten ordered decile groups corresponding to the bottom ("poorest") 10 percent of households, the next poorest 10 percent of family units, and so on up to the top ("richest") 10 percent of family units. The wealth cut-off levels between the decile groups are computed.

For each (age-specific) decile group, the decile-specific sample mean wealth level and the standard deviation of wealth holdings are also computed. Using these results, the decile means and their sample standard errors for each of the age distributions are computed and presented in Table 2. All calculations are done with the Fortran program in Beach and Slotsve (1992). The calculations in this paper are unweighted in order to use the standard formulas for decile mean standard errors. (Corresponding weighted results are provided in the appendix Table A.4 and are seen to be essentially the same as those in Table 2.)

The first six columns of figures in Table 2 provide the decile mean wealth levels for each ordered decile group ranked from the bottom decile (1st) to the top (10th) for each of the six age groups. So, for example, the mean level of wealth holdings in 1984 of the fifth decile group among households with heads less than age 30 was \$ 2,706. This decile mean rises across age groups to a peak of \$ 67,166 for the group aged 50-59 and then decreases. Decile means for all age groups together are provided in the right-hand column of Table 2. The figures in parentheses below each decile mean wealth estimate are the (asymptotic) standard errors.

Table 2 provides the full set of decile means (and corresponding standard errors) for each of the distributions and for all age groups together. Notice that, for all age groups but the oldest, the mean wealth level for the bottom decile is negative. As Appendix Table A.1 shows, the proportion of households having negative net worth declines with age from 18.0 percent in the youngest group to 0.5 percent among the oldest. This should not be surprising as older people have had more opportunity to save and build up assets over their working career, while younger workers may acquire debts from their schooling period and have as their principal asset a car, for example, which they have bought on loans. Looking across the rows of Table 2, one sees that wealth levels for a given decile also increase with age until later middle age or retirement (as was the case for overall mean earnings). But the peak age group varies across deciles, generally decreasing for higher deciles. So, for example, across the first decile the peak occurs at the age group 70 and older, while for the upper seven deciles, the cross-sectional peak occurs at the more typical age of 50-59 years. Figures for decile cut-off wealth levels (which are the wealth levels which divide adjacent decile groups for each distribution) are also presented in Appendix Table A.2 and show similar patterns across rows for given decile groups.

Since each age-specific wealth distribution is independent of the others, one can formally test for individual differences in decile-mean wealth levels across age groups by standard (asymptotic) normal tests for differences in means. The sets of "t-ratios" for comparing decile means between adjacent age groups are provided in Table 3. Negative values mean that the decile means in the second of the two age distributions being compared exceed those in the first age distribution listed; positive values mean the converse. As can be seen from the figures in Table 3, all of the decile-mean differences across age distributions are highly significant (based on standard normal critical values of 1.96 at the 5 percent level or 2.645 at the 1 percent level) except for differences in the first decile or differences between the 50-59 and 60-69 year-old age groups.

Recall that the objective of the analysis is to compare distributions across age groups. With a single cross-section, we cannot map out how households may move in a wealth trajectory across relative decile positions over the life-cycle. We can, however, test for differences between wealth distributions over the life-cycle. Since the vector of decile means for each distribution is asymptotically normal, one can test for similarity of wealth distributions over the life-cycle in terms of joint confidence intervals. As discussed in section II.2, a test of the equality of the decile mean vectors can be expressed in terms of checking whether the t-ratios for the differences in decile means given in each column of Table 3 are all within the SMM critical bounds of $\pm$ 2.80 (for a 95 percent confidence level) or $\pm$ 3.29 (for a 99 percent level). Looking down the columns of Table 3, one notes that in each comparison save one (age groups 50-59 versus 60-69), at least one t-ratio well exceeds the SMM critical values, so we reject the null hypothesis of the respective distributions.

If wealth distributions change significantly over the life-cycle, what can we say about how they change? That is, does the wealth distribution for one age group significantly dominate the ones adjacent to it? Again, the tests can be carried out in terms of the t-ratio of Table 3. If there is at least one t-ratio in a given column of Table 3 that is significant relative to the SMM critical bounds and no significant t-ratio of the opposite sign within that column, we infer that the distribution with the significantly higher decile mean rank dominates the other distribution. Turning to the figures in Table 3, one immediately sees that the wealth distribution for age 30-39 clearly rank dominates that for the 15-29 year age group as all the t-ratios indicate higher decile means for the former distribution and indeed, 9 of the 10 decile means are highly statistically significant on the SMM criteria. Similarly, the wealth distribution for ages 40-49 rank dominates that for 30-39, the distribution for 50-59 rank dominates that for ages 40-49, and the distribution for 60-69 rank dominates that for ages 70 and over. But as we have seen, the wealth distribution for ages 60-69 is not significantly different from that for ages 50-59. The life-cycle pattern of changes in overall distributions of wealth corresponds exactly to that of changes in the overall mean wealth holdings, and these changes appear to be highly statistically significant. None of the rankings of life-cycle wealth distributions turns out to be ambiguous.

III.2 Analysis of Lorenz Curves and Generalized Lorenz Curves

Does the analysis of Generalized Lorenz curves supplement or change the results already found for decile means? Alternatively, does the additional information involved in the second-order stochastic dominance criterion buy one any stronger conclusions than already obtained based on first-order stochastic dominance or Rank Dominance? Recall that the decile ordinates of a Generalized Lorenz curve are $p_i\ \hat{\gamma}_i$ where the $\hat{\gamma}_i$ are (sample estimates of) cumulative decile means and the decile proportions p_i take on values 0.1, 0.2, 0.3, etc. corresponding to deciles $i = 1, 2, 3, \ldots$. The asymptotic standard errors of the $\hat{\gamma}_i$'s can be readily calculated from those of the underlying decile means ($\hat{\mu}_i$'s) of the last section. As the GLC ordinates themselves do not provide interesting insights, they are not reproduced here, but are available upon request from the authors. More interesting from the point of view of testing between different age-specific wealth distributions are the t-ratios on the differences in GLC decile ordinates between adjacent age groups. These are provided in Table 4.

Considering individual differences in GLC ordinates between adjacent age groups, one can see that all the differences are again significant on the basis of standard normal critical values except for the first and some of the second decile differences and, except for the comparison of the 50-59 and 60-69 year-old age groups, which again are not significantly different. Turning to joint differences in wealth distributions, one switches to the SMM critical values and checks first whether there are t-ratios in excess of $\pm$ 2.80 (or $\pm$ 3.29) within each column. As before, only the comparison of the 50-59 and 60-69 year-old age groups leads to no significant difference between these two distributions. All the other wealth distributions turn out to be significantly different from each other. Secondly, one checks for dominance between these latter distributions, again using the SMM critical values. Since all the critical t-ratios within each column are of the same sign, we conclude that the 30-39 year-old wealth distribution GL dominates that for the youngest group, the 40-49 year-old distribution GL dominates that for 30-39, the 50-59 year-old distribution GL dominates that for 40-49, and the 60-69 year-old distribution GL dominates that of the oldest age group. In summary then, the wealth rankings revealed by second-order stochastic dominance are no different from and add nothing further to the wealth rankings obtained from first-order stochastic dominance rules.

Next, what can one say about the degree of wealth inequality over the life-cycle? Decile wealth shares for each age-specific distribution are presented in Table 5. One can see that the degree of concentration of wealth holdings is far more concentrated than is the case for income or earnings. Among all ages, the top ten percent of wealth holders own more than one-half (52 percent) of all personal wealth; the top quintile own 69 percent of wealth holdings. The bottom 40 percent of wealth holders own about 2 percent and the bottom half of wealth holders own about 6 percent of personal wealth. A similar pattern for all age groups together is also found in Oja (1987, p. 25). The degree of concentration of wealth also appears to be greatest among the youngest age groups (as indicated by wealth shares at the top and bottom of the distributions) and to monotonically decrease with the age of family head.

To investigate this prospective pattern more formally, we turn to Lorenz curves or the cumulation of decile shares from Table 5. Since the cumulated wealth shares do not provide any further information beyond Table 5, they are not presented. The t-ratios for the differences in Lorenz curve ordinates between adjacent age groups, however, are presented in Table 6. On the basis of standard normal tests, quite a few ordinate differences are individually not significant, particularly in the first decile and between the four older age groups. On the basis of joint confidence SMM tests, the youngest three age groups have significantly different Lorenz curves (and hence, a significantly different structure of wealth inequality), while the oldest four age groups do not have significantly different Lorenz curves between adjacent age groups (i.e., no t-ratio within a column exceeds 2.80, the 5 percent critical value on the SMM distribution). Checking for dominance, one sees that the Lorenz curve for the 15-29 year-old age group Lorenz dominates that for age 30-39, and the curve for age 30-39 Lorenz dominates that for age 40-49. That is, over these three age groups, the age-specific Lorenz curves have shifted significantly upward, corresponding to a significant reduction in wealth inequality. Any further reductions in wealth inequality across the older age groups appear not statistically significant. Thus, the evident decline of wealth inequality with age is significant only over the youngest three age groups; thereafter, the change is not significant.

Further evidence on the change in wealth inequality over the life-cycle is provided by the Gini coefficient. Tables 7 and 8 present estimates of the Gini coefficient for each age group (and corresponding standard errors). These can be used to calculate t-ratios for the differences in Gini coefficients between adjacent age groups, where the t-ratios are asymptotically distributed as standard normal. The last column of Table 7 presents these t-ratios across age groups. As can be seen, the declines in the Gini coefficients between the first three age groups are again significant at the one percent level. But subsequent declines across the remaining age groups are not at all statistically significant -- the same conclusion as found for Lorenz curve shifts. The resulting pattern of wealth inequality is illustrated in Figure 1B. This empirical pattern of monotonically declining wealth inequality across preretirement ages has been found before in Projector and Weiss (1966), Davies (1979 a), Beach et al. (1981), and Greenwood (1987), but has not been based on statistical inference or highlighted in conjunction with the humped mean wealth pattern as a joint set of empirical phenomena to be explained by standard models.

The general results of section III are summarized in Table 9. Rank Dominance and GL Dominance both indicate a significant rise in the cross-sectional wealth distributions over the life-cycle until the 50-59 year-old age interval, followed by a significant post-retirement decline in the distribution. Invoking second-order stochastic dominance turned out to buy no stronger result from that already obtained by simple rank dominance. The last two columns of Table 9 refer to changes in wealth inequality rather than the wealth distribution as a whole. Again, both Lorenz and Gini dominance criteria imply the same conclusion that wealth inequality decreases with age up until the 40-49 year-old age group and subsequently does not significantly change over the life-cycle.

It could perhaps be argued that the findings with respect to means, dominance, and inequality change over the life cycle are artifacts of changing mix of family units across ages. That is, among young family units there is a relatively large proportion of unattached individuals (who typically have a high degree of wealth inequality), but this proportion decreases with age until the oldest age group. So the falling level of wealth inequality across ages reflects simply the increasing proportion of family units of size two or more, or what Statistics Canada simply calls "families". It turns out, however, that this does not explain the basic patterns already described. The analysis was also done over just families (as opposed to family units), and the results for decile means of family wealth holdings are presented in the appendix Table A.3. For families, the mean wealth level is $97,068 and the median is $47,280. As can be seen, essentially the same pattern as in Table 2 is found. Decile means are a bit higher for families than for unattached individuals and standard errors are generally a bit larger because of the smaller sample. The one principal difference from Table 2 is the greater concentration of peak wealth in the 60-69 year age group. For decile one, the peak moves from 70 and above to 60-69, while for deciles 4 - 7 the peak shifts from ages 50-59 to 60-69. It should not be surprising, then, that the pattern of dominance results in Table 8 also holds for families. Specifically, the decreasing pattern of Gini coefficients across ages is virtually identical for families as it is for all family units (see Table 8); this is also illustrated in Figure 1B. Consequently, the above empirical findings for all family units are not an artifact of a shifting family mix, but are robust across families of size two or more as well.

IV. Simple Econometric and Graphical Characterizations of the Wealth Distribution

A natural question to ask of the tabular results of the last section is how one might characterize a wealth distribution in a simple yet flexible econometric fashion so as to illustrate jointly the humped pattern of wealth across ages and the convex decline in wealth inequality across ages. Both King and Dicks-Mireaux (1982), and Burbidge and Robb (1985) use 1977 Canadian wealth data to investigate and test a structural life-cycle model. The present paper uses the more recent 1984 wealth data, and in the spirit of Wolff (1991) seeks, not to test economic models, but to characterize the cross-sectional shape and age pattern of the distribution of wealth. This allows one to illustrate graphically the basic descriptive features of a wealth distribution in more detail than a simple frequency distribution of wealth holdings. It also allows one to predict and potentially simulate the immediate impact effects of various shocks, such as a wealth tax, on the overall wealth distribution.

We examine two sets of wealth characterizations which illustrate the joint life-cycle patterns in Figure 1. If the wealth distribution is viewed as a function of age (A) and decile level (D = 1,2,...,10), the first characterization looks at how each decile mean wealth level (DM_{ai}) varies across ages:

$$\ln(DM_{ai}) = \beta_0(i) + \beta_1(i)A_a + \beta_2(i)A_a^2 + \mu_{ai} \tag{1}$$

where the decile subscript, i = 1,...,10, and the age subscript, a = 1,...,6. μ_{ai} is an additive error term. That is, the regressions are run on the (log of the) decile means in Table 2, and separate regressions are run for each decile so they capture the life-cycle cross-section for each decile group. The specification is semi-logarithmic so that the coefficient gradients are in proportional terms to abstract from 1984 nominal dollar values. Since there is a separate regression for each decile group, the specifications can be viewed as a joint age-decile regression with a quadratic in age and complete decile-group interactions. The values for the age variable that were assigned are 25, 34.5, 44.5, 54.5, 64.5, and 78 to correspond roughly to their median values. Since negative wealth values appear in the first decile group, the regression for this group is run with the dependent variable in level form.

The results of the decile regressions (1) are provided in appendix Table A.5. All the equations turn out to be jointly significant at at least the 95 percent level of confidence ($F(2,3;.95) = 9.55$). The coefficients β_1 and β_2 also appear to follow a robust monotonic pattern from the third decile through the tenth. The implied gradients or rate of increase in wealth holdings with age are presented in appendix Table A.6. As can be seen, for deciles two to four, the gradients are over 23 percent at age 25 and over 10 percent at age 45. For deciles seven through ten, the gradients fall to 10 to 13 percent at age 25 and 4 to 5 percent at age 45. That is, since age-wealth profiles are concave quadratic (except for the first decile), age-wealth gradients decline with age. The humped shape pattern in mean wealth levels is also manifested in most of the decile profiles. From the third decile on, the gradients also decline across higher decile levels. That is, the decile profiles tend to converge across ages, thus illustrating the declining wealth inequality pattern across ages. Both patterns are illustrated in Figure 2.

The second characterization of the wealth distribution moves directly to three dimensions. A joint regression in age and decile that is quadratic in each and allows for simple interactions is estimated again across (positive) decile mean wealth levels in Table 2:

$$\begin{aligned}\ln(DM) = \underset{(6.39)}{-10.516} + \underset{(9.69)}{.6465A} - \underset{(8.93)}{.005753A^2} + \underset{(8.93)}{2.4781D} - \underset{(4.08)}{.04583D^2} \\ \underset{(5.46)}{-.05471D*A} + \underset{(5.05)}{.0004934D*A^2} \qquad (2)\end{aligned}$$

$R^2 = .9372$ S.E. $= .4987$
F $= 116.9$

(Figures in parentheses are t-ratios.) The resulting curve is graphed in Figure 3. Once again, the humped-shaped pattern of decile wealth across ages is evident. But also note the flattening gradient of these decile cross-sections as one moves from lower deciles to higher ones. So again the reduction in wealth inequality across ages is also manifested. Graphs using the actual (log) decile mean wealth data and various alternative smoothing techniques also show the same pattern as illustrated in Figure 3, so the principal results appear quite robust.

V. Review of Major Results

Three general conclusions can be drawn from the results of this paper. First, from Tables 1 and 2 and as illustrated in Figure 1A, it is found that mean wealth or expected wealth levels vary in concave quadratic fashion with age; wealth increases with age until late in the 50-59 year age interval (i.e., near retirement), and then decreases. These differences in mean wealth levels between adjacent age groups are all statistically significant except for that between the 50-59 and 60-69 year age groups. This pattern of results for mean wealth levels across age groups is well known, though the current analysis supplements conventional results with more formal statistical inference.

Second, it is found more generally, on the basis of formal dominance criteria, that the life-cycle pattern of changes in overall distributions of wealth corresponds exactly to that of changes in overall mean wealth holdings. As Table 9 summarizes, Rank Dominance and Generalized Lorenz Dominance both indicate a significant rise in the cross-sectional wealth distributions over the life cycle until the 50-59 year-old age interval, followed by a significant post-retirement decline in the distribution. The wealth distributions for the 50-59 and the 60-69 year-old age groups, however, were not significantly different from each other. It turns out that invoking second-order stochastic dominance buys one no stronger results than already obtained with simple Rank Dominance.

Third, and perhaps most interesting, it is found that inequality in the distribution of wealth decreases in convex fashion with age. This is illustrated for Gini coefficients in Figure 1B and more generally found for the Lorenz Dominance criterion in Table 9 as well. In both cases, inequality in wealth holdings decreases significantly over ages 15-29 to 40-49, and thereafter declines at a much slower and non-significant rate. Indeed, as Table 9 indicates, the wealth share of the bottom decile increases monotonically from youngest to oldest age group, while the top decile wealth share decreases monotonically.

This important empirical finding of a monotonic convex decline in wealth inequality across ages, along with a concave quadratic pattern in mean wealth levels, calls out for an explanation. Several tentative hypotheses can be offered to explain this joint set of wealth patterns. One hypothesis (suggested by James Davies) is that life-cycle wealth arises from accumulated savings which, in turn, are generated from the difference between transitory and permanent income with consumption tied to the latter. That is, wealth is the cumulated gap between transitory and permanent income, and as people move through their career, the algebraic differences tend to net out and become dampened, so that wealth inequality across age groups during the working career period becomes attenuated. An alternative explanation about intergenerational wealth transfers is that those households expecting a large inheritance may not work and save as hard so as to build up their own wealth as rapidly as otherwise, so that there is a "regression towards the mean" of wealth holdings. A further possible explanation concerns intergenerational human capital transfer in that high-earnings families may invest relatively more in the education and upbringing of their children so they have less build up of their own wealth than otherwise; they may also have a heavy investment in private pensions which are not picked up in the above wealth figures. A fourth hypothesis concerns an "overtaking point" analogous to that in human capital theory. Those who start working full time early build up early assets, while those who start working late build up early debt. But the former face more uncertain work careers that put pressure on their accumulated savings, while the latter once they get a full-time job rapidly pay off their debts and then start building up net worth at a faster pace than the former resulting in a reduction in wealth inequality relatively early in the working career. Testing among these or other hypotheses to explain the observed pattern of wealth inequality over the life cycle would seem to be an important order of business.

References

Atkinson, A.B., "On the Measurement of Inequality," Journal of Economic Theory, September 1970, 2, 244-63.

Beach, C.M., D.E. Card, and F. Flatters, Distribution of Income and Wealth in Ontario: Theory and Evidence, Toronto, Ont.: Ontario Economic Council, University of Toronto Press, 1981.

Beach, C.M., and R. Davidson, "Distribution-Free Statistical Inference with Lorenz Curves and Income Shares," Review of Economic Studies, October 1983, 50, 723-35.

Beach, C.M., K.V. Chow, J.P. Formby and G. A. Slotsve, "Statistical Inference for Decile Means," unpublished working paper, March 1992.

Beach, C.M. and G. Slotsve, "Lorenz Program," Department of Economics mimeo, Queen's University.

_____ "Recession and Recovery: Men's Earnings Through the 1980's," Journal of Income Distribution, forthcoming 1993.

Beach, C.M. and J. Richmond, "Joint Confidence Intervals for Income Shares and Lorenz Curves," International Economic Review, June 1985, 26, 439-50.

Bishop, J.A., J.P. Formby and P.D. Thistle, "Statistical Inference, Income Distributions and Social Welfare," in D.J. Slottje, Ed., Research in Economic Inequality, Vol. 1, Greenwich, CT: JAI Press, 1989, 49-82.

_____ "Changes in the U.S. Earnings Distributions in the 1980's," Applied Economics, March 1991, 23, 425-33.

_____ "Convergence of the South and Non-South Income Distributions, 1969-1979," American Economic Review, March 1992, 82 (1), 262-272.

Burbidge, J.B., and A. L. Robb, "Evidence on Wealth-Age Profiles in Canadian Cross-Section Data," Canadian Journal of Economics, November 1985, 18, 854-875.

Chawla, R.K., "The Distribution of Wealth in Canada and the U.S., 1984," unpublished paper, October 1989.

Davies, J.B., Life-Cycle Savings, Inheritance and the Distribution of Income and Wealth in Canada, 1979a, unpublished PhD thesis, University of London.

_____ "On the Size Distribution of Wealth in Canada," Review of Income and Wealth, September 1979b, 25, 237-260.

_____ "The Distribution of Wealth in Canada," in E. Wolff, Ed., Research in Economic Inequality, Vol.4, Greenwich, CT: JAI Press, forthcoming 1993.

Greenwood, D.T., "Age, Income, and Household Size: Their Relation to Wealth Distribution in the United States", in E.N. Wolff, Ed., International Comparisons of the Distribution of Household Wealth, New York, N.Y.: Oxford University Press, 1987.

Jenkins, S.P., "The Measurement of Income Inequality," in L. Osberg, Ed., Economic Inequality and Poverty, Armonk, N.Y.: M.E. Sharpe, Inc., 1991, 3-38.

King, M.A., and L.D.L. Dicks-Mireaux, "Asset Holdings and the Life Cycle," Economic Journal, June 1982, 92, 247-267.

Mincer, J., Schooling, Experience and Earnings, 1974, New York, N.Y. (NBER: Columbia University Press).

Oja, G., "Inequality of the Wealth Distribution in Canada, 1970 and 1977", in Economic Council of Canada, Reflections on Canadian Incomes, Ottawa, 1980, 341-364.

_____ Changes in the Distribution of Wealth in Canada, 1970-1984, Statistics Canada, Publication No. 13-588, 1987.

Ontario Fair Tax Commission, Wealth Tax: Working Group Report, Fair Tax Commission, Government of Ontario, March 1993.

Osberg, L., ed., Economic Inequality and Poverty: International Perspectives, 1991, Armonk, N.Y. (M.E. Sharpe, Inc.).

Projector, D.S., and G.S. Weiss, Survey of Financial Characteristics of Consumers, Washington, D.C.: Federal Reserve Board, 1966.

Saposnik, R., "Rank Dominance in Income Distribution," Public Choice, 1981, 36 (1), 147-51.

Shorrocks, A.F., "Ranking Income Distributions," Economica, February 1983, 50, 3-17.

Slottje, D., Research in Economic Inequality, Vol. 1, 1989, Greenwich, CT (JAI Press).

Statistics Canada, The Distribution of Wealth in Canada, 1984, Publication No. 13-580, 1986.

Wolff, E.N., "The Distribution of Household Wealth; Methodological Issues, Time Trends, and Cross-Sectional Comparisons," in L. Osberg, Ed., Economic Inequality and Poverty: International Perspectives, 1991, Armonk, N.Y. (M.E. Sharpe, Inc.).

_____ "Changing Inequality of Wealth," American Economic Review, May 1992, 82, 552-558.

_____ Research in Economic Inequality, Vol. 4, forthcoming 1993, Greenwich, CT (JAI Press).

Figure 1A Mean Wealth Holdings of Families and Family Units by Age of Head

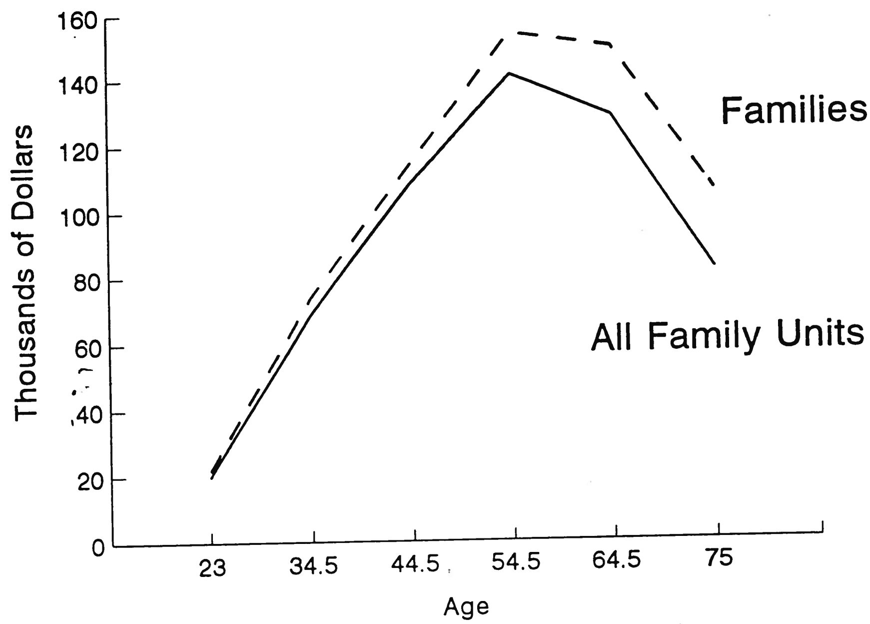

Figure 1B Gini Inequality Coefficients for Wealth Holdings of Families and Family Units by Age of Head

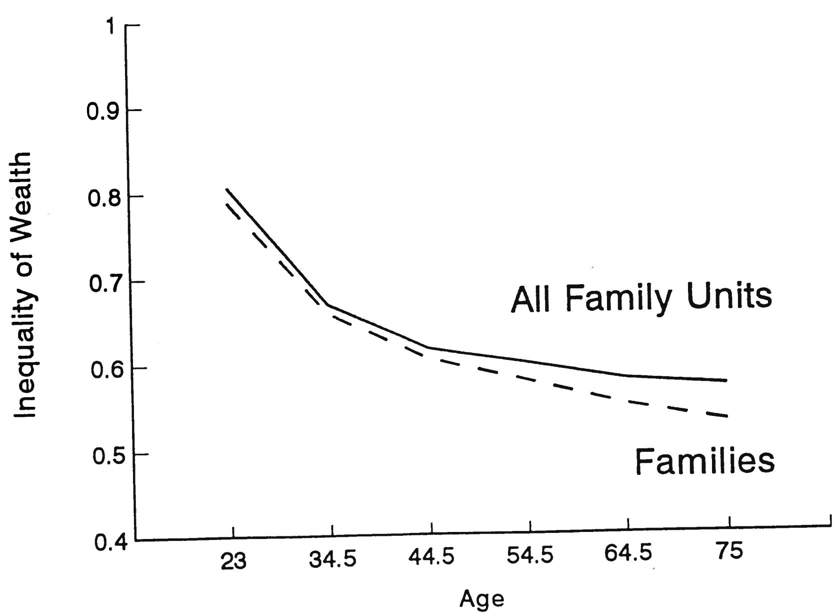

Figure 2 Age-Wealth Profiles by Decile Group

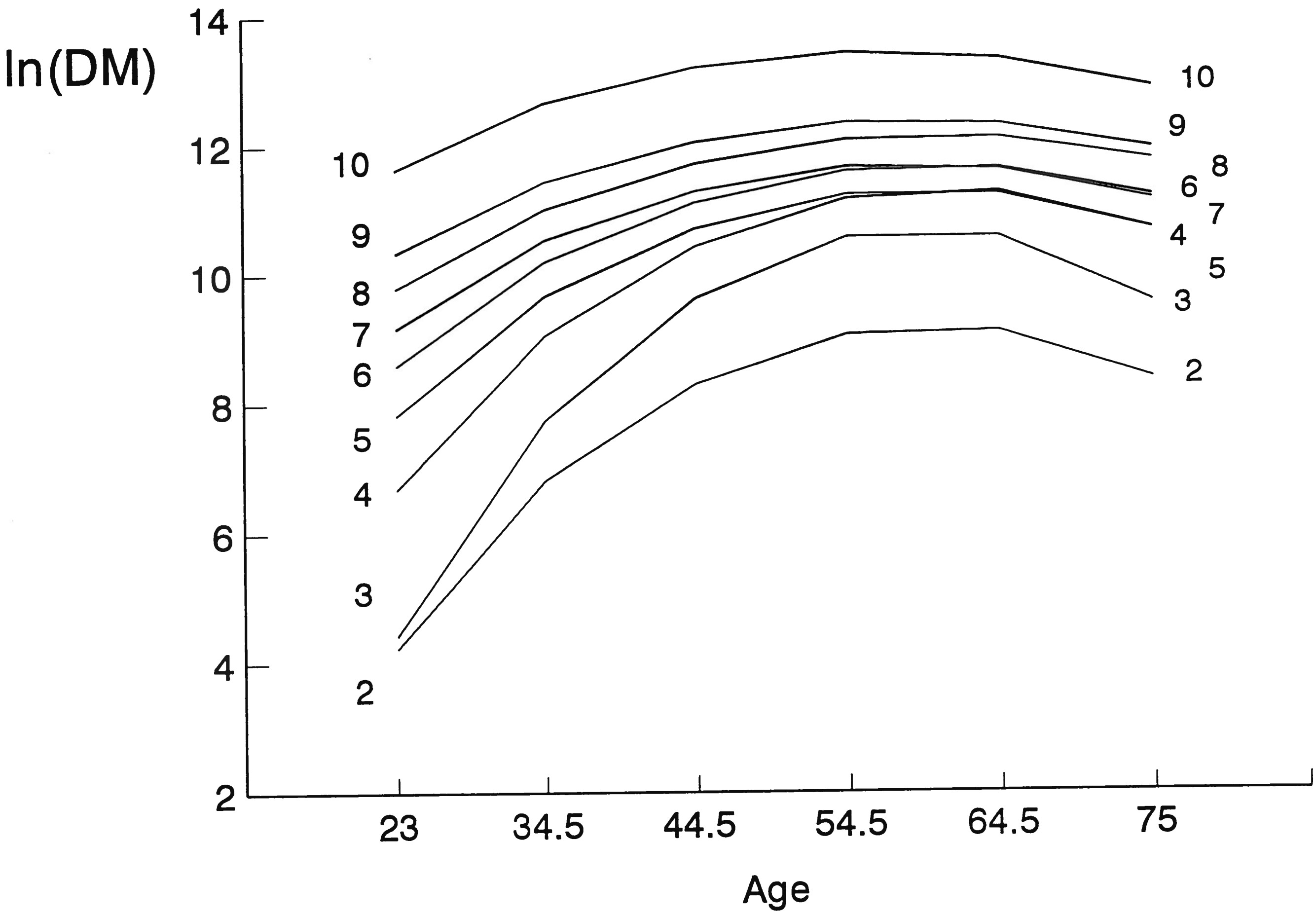

Figure 3

Wealth Deciles by Age

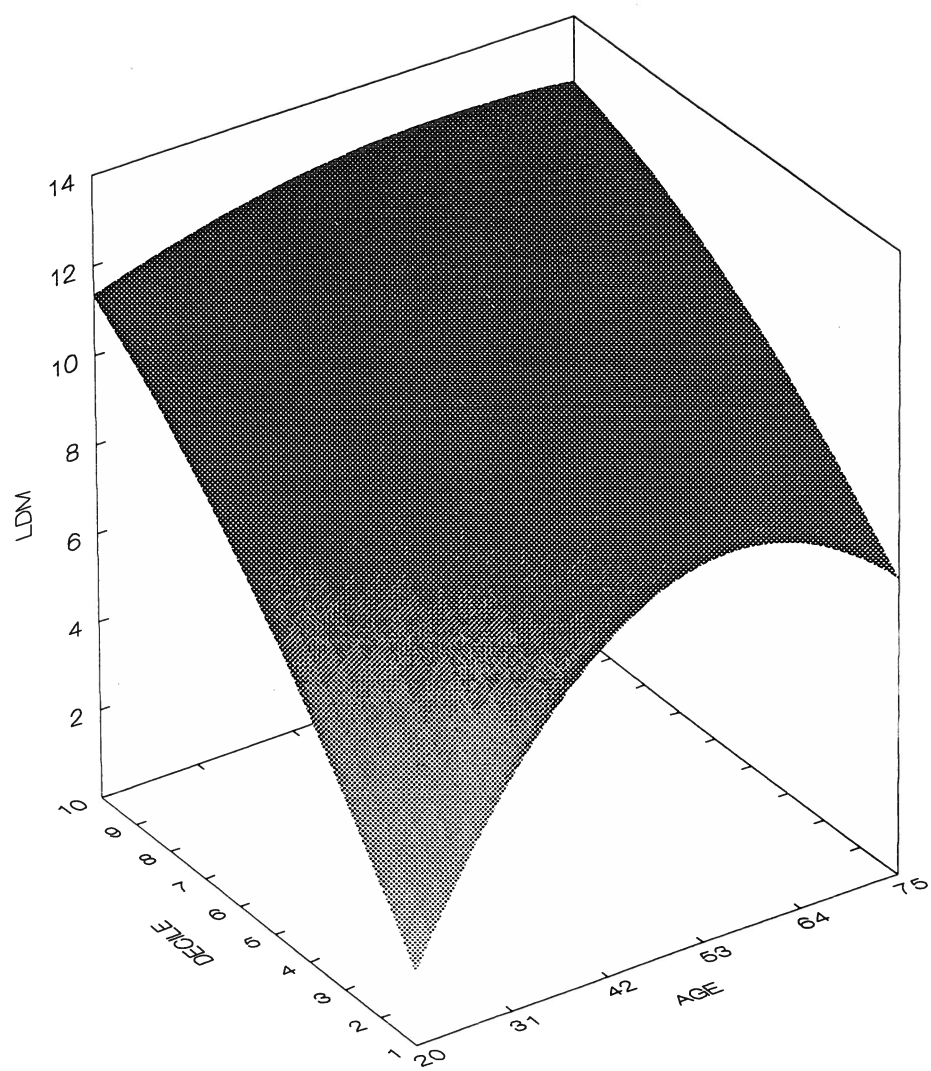

Table 1

Mean and Median Wealth Levels Across Age Groups

Age Group	Overall Mean $	Standard Errors $	Wealth Median $
15 - 29	19,638.	1,087.	4,046.
30 - 39	68,133.	2,974.	31,694.
40 - 49	108,281.	4,357.	59,375.
50 - 59	140,767.	6,117.	77,752.
60 - 69	128,307.	5,566.	74,120.
70 & Over	81,602.	2,762.	52,561.
All Ages	87,058.	1,668.	40,481.

Table 2

Wealth Decile Means of Canadian Family Units by Age

(in 1984 dollars)

(Figures in parentheses are standard errors)

	<---------------- Age Group ---------------->						
Decile	15 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70+	All Ages
1	-5,798.9 (561.2)	-5,239.2 (603.2)	-5,332.8 (2,366.)	-1,650.3 (669.8)	-1,045.8 (785.3)	151.7 (155.0)	-3,806.2 (456.2)
2	-487.2 (86.3)	916.7 (172.2)	4,507.9 (669.8)	8,685.1 (1,256.)	9,977.0 (1,388.)	3,485.6 (442.6)	918.3 (75.5)
3	94.0 (27.0)	5,949.7 (529.5)	18,047.8 (1,393.)	29,438.4 (1,806.)	30,381.9 (1,879.)	13,850.3 (1,540.)	5,863.3 (270.1)
4	842.4 (109.9)	14,800.2 (858.8)	34,200.7 (1,602.)	48,370.1 (1,774.)	47,890.9 (1,681.)	29,496.0 (1,616.)	16,816.7 (538.9)
5	2,705.7 (230.8)	25,932.9 (983.4)	50,924.3 (1,612.)	67,166.0 (2,055.)	65,059.1 (1,960.)	44,627.5 (1,880.)	32,034.3 (664.6)
6	5,751.6 (329.7)	38,334.2 (1,174.)	68,790.4 (1,944.)	88,989.7 (2,220.)	85,503.1 (2,512.)	59,828.5 (1,796.)	49,440.4 (748.8)
7	10,558.4 (570.2)	53,299.0 (1,381.)	90,410.6 (2,189.)	114,247.9 (2,913.)	109,171.3 (2,598.)	76,342.6 (1,989.)	70,034.3 (914.8)
8	19,371.8 (895.9)	73,556.7 (1,771.)	119,966.4 (3,645.)	153,657.4 (4,607.)	141,963.4 (4,223.)	100,729.4 (3,199.)	98,455.0 (1,212.)
9	35,162.5 (1,475.)	110,384.0 (3,215.)	175,817.4 (5,306.)	229,916.2 (8,398.)	211,955.9 (8,013.)	146,181.7 (4,933.)	149,383.5 (2,089.)
10	128,373.7 (9,230.)	364,204.1 (26,042.)	523,697.7 (35,934.)	671,215.7 (51,713.)	579,885.7 (46,399.)	340,552.0 (18,613.)	451,699.6 (14,141.)

Table 3

T-Ratios for the Differences in Decile Mean Wealth Levels

Between Adjacent Age Groups

<-----------Age Group Comparisons---------->

Decile	15 - 29 vs 30 - 39	30 - 39 vs 40 - 49	40 - 49 vs 50 - 59	50 - 59 vs 60 - 69	60 - 69 vs 70 & Over
1	-0.68	0.04	-1.50	-0.59	-1.50
2	-7.29	-5.19	-2.64	-0.69	4.46
3	-11.04	-8.12	-4.25	-0.36	6.80
4	-16.12	-10.67	-5.24	0.20	7.89
5	-23.00	-13.23	-5.98	0.74	7.52
6	-26.73	-13.41	-6.51	1.04	8.31
7	-28.61	-14.34	-6.93	1.30	10.03
8	-27.30	-11.45	-7.10	1.87	7.78
9	-21.26	-10.55	-7.17	1.55	6.99
10	-8.54	-3.59	-4.33	1.31	4.79

Source: Figures in Table 2

Table 4

T-Ratios for the Differences in Generalized Lorenz Curve

Ordinates Between Adjacent Age Groups

<-----------Age Group Comparisons---------->

Decile	15 - 29 vs 30 - 39	30 - 39 vs 40 - 49	40 - 49 vs 50 - 59	50 - 59 vs 60 - 69	60 - 69 vs 70 & Over
1	-0.68	0.04	-1.50	-0.59	-1.50
2	-2.15	-1.33	-2.64	-0.81	2.91
3	-6.48	-4.57	-4.25	-0.62	5.58
4	-11.73	-7.48	-5.24	-0.35	6.82
5	-16.79	-9.83	-5.89	-0.03	7.44
6	-21.12	-11.53	-6.51	0.28	8.12
7	-24.78	-13.00	-6.93	0.56	9.05
8	-27.34	-13.56	-7.10	1.03	9.35
9	-27.60	-13.80	-7.17	1.35	9.37
10	-15.32	-7.61	-4.33	1.51	7.52

Table 5

Percentage Shares of Wealth of Canadian Family Units by Age

1984

(Figures in parentheses are standard errors)

	<---------------	Age Group	--------------->			
Decile	15 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70+	All Ages
1	-2.95 (0.34)	-0.77 (0.10)	-0.49 (0.22)	-0.12 (0.05)	-0.08 (0.06)	0.02 (0.02)	-0.44 (0.05)
2	-0.25 (0.05)	0.13 (0.02)	0.42 (0.06)	0.62 (0.09)	0.78 (0.11)	0.43 (0.05	0.11 (0.01)
3	0.05 (0.01)	0.87 (0.08)	1.67 (0.13)	2.09 (0.14)	2.37 (0.15)	1.70 (0.17)	0.67 (0.03)
4	0.43 (0.05)	2.17 (0.13)	3.16 (0.16)	3.44 (0.16)	3.73 (0.17)	3.61 (0.18)	1.93 (0.06)
5	1.38 (0.12)	3.81 (0.18)	4.70 (0.19)	4.77 (0.20)	5.07 (0.21)	5.47 (0.20)	3.68 (0.08)
6	2.93 (0.18)	5.63 (0.24)	6.35 (0.24)	6.32 (0.25)	6.66 (0.27)	7.33 (0.21)	5.68 (0.11)
7	5.38 (0.30)	7.82 (0.31)	8.35 (0.29)	8.12 (0.31)	8.51 (0.32)	9.36 (0.24)	8.04 (0.14)
8	9.86 (0.49)	10.80 (0.41)	11.08 (0.37)	10.92 (0.41)	11.06 (0.41)	12.34 (0.31)	11.31 (0.18)
9	17.91 (0.77)	16.20 (0.58)	16.24 (0.49)	16.33 (0.58)	16.52 (0.59)	17.91 (0.40)	17.16 (0.26)
10	65.37 (1.61)	53.34 (1.70)	48.53 (1.61)	47.51 (1.83)	45.38 (1.88)	41.83 (1.22)	51.86 (0.75)

Table 6

T-Ratios for the Differences in Lorenz Curve Ordinates

Between Adjacent Age Groups

<-----------Age Group Comparisons---------->

Decile	15 - 29 vs 30 - 39	30 - 39 vs 40 - 49	40 - 49 vs 50 - 59	50 - 59 vs 60 - 69	60 - 69 vs 70 & Over
1	-6.10	-1.15	-1.66	-0.46	-1.56
2	-6.61	-2.16	-2.23	-1.15	1.72
3	-8.35	-4.12	-2.73	-1.38	2.69
4	-11.13	-5.09	-2.43	-1.45	1.90
5	-13.25	-5.02	-1.82	-1.37	0.81
6	-13.54	-4.36	-1.29	-1.28	-0.03
7	-11.79	-3.56	-0.78	-1.20	-0.63
8	-8.63	-2.77	-0.50	-0.98	-1.21
9	-5.10	-2.06	-0.42	-0.81	-1.58

Table 7

Gini Coefficients and Their Changes Between Adjacent

Age Groups

Age Group	Gini Coefficient	Standard Error	T-Stat on Difference
15 - 29	.8066	.00869	
			10.71
30 - 39	.6678	.00962	
			3.57
40 - 49	.6162	.01078	
			1.12
50 - 59	.5984	.01177	
			1.15
60 - 69	.5787	.01245	
			0.50
70 & Over	.5710	.00922	
All Ages	.6635	.00426	

Table 8

Gini Coefficients and Their Changes Between Adjacent

Age Groups for Family Units of Size Two or More

Age Group	Gini Coefficient	Standard Error	T-Stat on Difference
15 - 29	.7883	.00953	
			11.67
30 - 39	.6571	.00598	
			4.06
40 - 49	.6046	.01144	
			1.54
50 - 59	.5781	.01287	
			1.48
60 - 69	.5492	.01472	
			1.04
70 & Over	.5295	.01194	
All Ages	.6494	.00479	

Table 9

Summary of Dominance Results from Various

Dominance Criteria

Age Groups Compared	Rank Dominance	G L Dominance	Lorenz Dominance	Change in Gini Coefficient
Age 15-29 -- Age 30-39	+	+	+	+
Age 30-39 -- Age 40-49	+	+	+	+
Age 40-49 -- Age 50-59	+	+	N.C.	N.C.
Age 50-59 -- Age 60-69	N.C.	N.C.	N.C.	N.C.
Age 60-69 -- Age 70+	-	-	N.C.	N.C.

Explanation: In the first two columns: A "+" or "-" means an increase or decrease in stochastic dominance, and "N.C." means no significant change on the dominance criteria; a question mark means ambiguous change.

In the last two columns: a "+" or "-" means an upward or downward shift in the Lorenz curve (so implications for inequality are of the opposite sign), and "N.C." means no significant change.

Appendix Table A.1

Frequency of Wealth Holders Having Zero or Negative

Net Worth by Age Group

Age Group	Zero Net Worth		Negative Net Worth	
	Frequency	Percentage	Frequency	Percentage
15 - 29	63	2.35%	482	17.96%
30 - 39	19	0.61	290	9.27
40 - 49	20	0.85	106	4.53
50 - 59	19	0.85	78	3.50
60 - 69	10	0.52	55	2.83
70 & Over	32	1.88	9	0.53
All Ages	163	1.16	1020	7.27

Appendix Table A.2

Wealth Decile Cut-Off Levels of Canadian Family Units by Age Group, 1984

	<------	------	------	Age Group	------	------>	
Decile	15 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 & Over	All Ages
1	-1,383.	2.	533.	1,375.	2,100.	1,112.	25.
2	1.	2,718.	10,005.	18,700.	20,000.	6,495.	2,569.
3	325.	9,834.	26,314.	39,360.	40,046.	21,830.	10,225.
4	1,555.	20,253.	43,166.	57,600.	56,167.	36,387.	24,100.
5 (Median)	4,046.	31,694.	59,375.	77,752.	74,120.	52,561.	40,481.
6	7,602.	45,348.	78,983.	99,600.	97,147.	68,020.	58,956.
7	14,048.	62,204.	102,063.	129,535.	122,054.	85,989.	82,610.
8	25,330.	86,248.	145,253.	182,570.	167,451.	118,198.	117,590.
9	48,903.	141,209.	225,036.	306,402.	276,288.	180,276.	193,850.

Appendix Table A.3

Wealth Decile Means of Canadian Families (FS $\geq$ 2) by Age

(in 1984 dollars)
(Figures in parentheses are standard errors)

	<------ Age Group ------>						
Decile	15 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 & Over	All Ages
1	-5,401.9 (624.4)	-5,310.0 (669.6)	-5,209.4 (2,605.)	-480.8 (865.5)	1,366.3 (726.0)	917.9 (443.4)	-3,827.8 (543.7)
2	-343.5 (81.4)	1,325.6 (248.6)	7,158.5 (945.8)	17,080.7 (1,772.)	22,643.5 (2,197.)	13,367.9 (1,864.)	1,612.9 (133.9)
3	135.6 (37.4)	7,847.7 (678.7)	22,615.3 (1,433.)	38,938.1 (1,749.)	43,355.5 (1,883.)	30,382.1 (2,200.)	9,124.9 (437.0)
4	1,068.6 (155.4)	18,151.6 (1,028.)	38,691.1 (1,652.)	56,313.4 (1,904.)	61,020.3 (2,245.)	47,055.2 (2,363.)	22,796.6 (647.8)
5	3,149.6 (274.5)	29,567.4 (1,021.)	55,513.7 (1,831.)	76,722.0 (2,424.)	79,960.7 (2,645.)	61,754.4 (2,291.)	38,782.3 (763.1)
6	6,703.6 (454.5)	42,364.4 (1,283.)	73,179.3 (1,982.)	97,553.9 (2,374.)	100,871.6 (2,584.)	76,403.1 (2,289.)	56,731.5 (873.3)
7	12,665.1 (816.8)	57,385.1 (1,505.)	94,067.7 (2,181.)	123,854.4 (3,269.)	125,421.9 (3,553.)	97,228.3 (3,757.)	78,493.8 (1,084.)
8	22,545.2 (1,007.)	77,894.0 (1,989.)	125,519.7 (3,859.)	166,270.1 (5,693.)	164,435.8 (5,653.)	129,855.7 (5,777.)	108,451.4 (1,435.)
9	39,049.2 (1,753.)	116,167.3 (3,430.)	181,954.2 (5,563.)	249,447.7 (8,987.)	246,297.2 (10,518.)	183,205.8 (7,964.)	163,981.4 (2,589.)
10	137,152.4 (10,865.)	386,865.7 (13,788.)	547,367.2 (39,084.)	711,961.3 (58,263.)	645,168.9 (59,079.)	416,155.7 (28,255.)	494,533.8 (16,863.)

Appendix Table A.4

Wealth (Weighted) Decile Means of Canadian Family Units by Age
(in 1984 dollars)
(Figures in parentheses are standard errors)

	<------------	------------	------------ Age Group	------------	------------	------------>	
Decile	15 - 29	30 - 39	40 - 49	50 - 59	60 - 69	70 & Over	All Ages
1	-5,667.8 (536.5)	-5,354.8 (602.1)	-4,484.9 (2,074.)	-1,650.9 (586.1)	-1,659.8 (833.8)	56.9 (144.1)	-3,797.2 (413.2)
2	-487.1 (84.3)	804.2 (160.5)	4,757.9 (668.8)	6,447.3 (1,054.)	6,467.2 (1,138.)	2,442.5 (348.5)	689.0 (59.8)
3	82.9 (25.0)	5,397.6 (480.6)	18,547.0 (1,527.)	27,461.8 (2,040.)	27,208.4 (2,117.)	10,217.4 (1,300.)	4,738.4 (225.2)
4	781.0 (103.7)	14,318.2 (929.7)	35,382.4 (1,546.)	48,814.2 (1,952.)	46,074.7 (1,646.)	26,012.6 (1,827.)	14,623.2 (508.7)
5	2,538.5 (207.8)	26,716.6 (1,091.)	52,183.2 (1,616.)	68,716.9 (2,208.)	63,217.9 (2,016.)	42,600.8 (1,913.)	30,196.1 (706.6)
6	5,545.7 (342.8)	39,485.4 (1,209.)	70,685.1 (2,075.)	91,461.0 (2,223.)	84,491.1 (2,548.)	59,328.7 (2,027.)	48,196.5 (766.6)
7	10,269.8 (565.4)	54,908.8 (1,363.)	92,749.9 (2,190.)	117,560.5 (3,009.)	108,017.9 (2,619.)	75,767.5 (1,931.)	69,304.2 (945.6)
8	18,511.1 (839.8)	76,099.5 (1,899.)	123,439.7 (3,564.)	157,539.1 (4,538.)	139,357.0 (3,911.)	99,795.6 (3,166.)	98,013.6 (1,218.)
9	34,416.2 (1,465.)	113,774.4 (3,286.)	177,385.6 (5,126.)	229,399.9 (7,845.)	210,093.5 (8,203.)	146,850.2 (5,022.)	148,676.5 (2,021.)
10	122,528.3 (8,730.)	358,360.2 (25,038.)	516,846.4 (36,894.)	659,626.8 (53,009.)	570,517.4 (48,673.)	329,751.5 (17,442.)	439,531.0 (14,239.)

Table A.5

Age and Decile Mean Wealth by Deciles

$$\ln(DM_{ai}) = \beta_0 + \beta_1(\text{Age}) + \beta_2(\text{Age})^2$$

(Figures in parentheses are t-statistics)

Decile	β_0	β_1	β_2	R^2	$\bar{R}^2$	F	S.E.
1	-8,601.1 (2.274)	87.5570 (0.550)	0.3725 (0.243)	0.8987	0.8311	13.3	1,067.3
2	-3.8186 (-8.486)	0.4325 (25.744)	-0.0036 (-24.149)	0.9975	0.9951	403.9	0.0670
3	-5.9577 (-2.373)	0.5593 (5.292)	-0.0047 (-4.593)	0.9377	0.8962	22.6	0.7087
4	-0.6112 (-0.355)	0.3905 (5.385)	-0.0032 (-4.656)	0.9409	0.9015	23.9	0.4862
5	2.0774 (1.533)	0.3096 (5.428)	-0.0026 (-4.699)	0.9414	0.9024	24.1	0.3824
6	3.6449 (3.340)	0.2657 (5.785)	-0.0022 (-5.025)	0.9472	0.9120	26.9	0.3079
7	4.8390 (5.493)	0.2340 (6.311)	-0.0020 (-5.510)	0.9540	0.9233	31.1	0.2486
8	5.9797 (9.291)	0.2045 (7.548)	-0.0017 (-6.618)	0.9667	0.9444	43.5	0.1816
9	6.8734 (15.185)	0.1874 (9.837)	-0.0016 (-8.662)	0.9797	0.9661	72.2	0.1277
10	8.3292 (21.698)	0.1805 (11.169)	-0.0016 (-10.266)	0.9804	0.9673	75.0	0.1083

Table A.5 (Cont'd.)

Overall Means	6.3217 (29.21)	0.1966 (20.56)	-0.00174 (-18.05)	0.9953	0.9921	316.7	0.0642

Note: The decile mean, not the logarithm of the decile mean, is used as the dependent variable in the regression for the first decile, since the decile mean values for this decile for all age groups are negative.

Table A.6

Annual Rate of Increase in Wealth by Age and Decile

Decile\Age	25	45	65	Peak Age
1	.012	.010	.037	/
2	.252	.100	-.036	60.1
3	.324	.136	-.052	59.5
4	.230	.103	-.026	61.0
5	.180	.076	-.028	59.5
6	.156	.068	-.020	60.4
7	.134	.054	-.026	58.5
8	.120	.052	-.016	60.1
9	.107	.043	-.021	58.6
10	.100	.036	-.028	56.4
Overall Means	.110	.040	-.030	56.5

Note: In the case of the first decile, the derivative with respect to age is divided by the absolute value of mean wealth holdings for that decile.
The "Peak Age" in the last column is that age at which the age gradient is estimated to be zero.