

# **QSEP**

**RESEARCH INSTITUTE FOR QUANTITATIVE  
STUDIES IN ECONOMICS AND POPULATION**

**THE AGE PATTERN OF RETIREMENT:  
A COMPARISON OF COHORT MEASURES**

**FRANK T. DENTON  
ROSS FINNIE  
BYRON G. SPENCER**

**QSEP Research Report No. 446**

**THE AGE PATTERN OF RETIREMENT:  
A COMPARISON OF COHORT MEASURES**

**FRANK T. DENTON**

**ROSS FINNIE**

**BYRON G. SPENCER**

**QSEP Research Report No. 446**

**May 2011**

**Frank Denton and Byron Spencer are QSEP Research Associates and faculty members in the Department of Economics, McMaster University. Ross Finnie is a faculty member with the Graduate School of Public and International Affairs, University of Ottawa.**

**This report is cross-listed as No. 283 in the McMaster University SEDAP Research Paper Series.**

**The Research Institute for Quantitative Studies in Economics and Population (QSEP) is an interdisciplinary institute established at McMaster University to encourage and facilitate theoretical and empirical studies in economics, population, and related fields. For further information about QSEP visit our web site <http://socserv.mcmaster.ca/qsep> or contact Secretary, QSEP Research Institute, Kenneth Taylor Hall, Room 426, McMaster University, Hamilton, Ontario, Canada, L8S 4M4, FAX: 905 521 8232, Email: [qsep@mcmaster.ca](mailto:qsep@mcmaster.ca). The Research Report series provides a vehicle for distributing the results of studies undertaken by QSEP associates. Authors take full responsibility for all expressions of opinion.**

## **The Age Pattern of Retirement: A Comparison of Cohort Measures**

### *Abstract*

Measures of retirement that take a cohort perspective are appealing since retirement patterns may change, and it would be useful to have consistent measures that would make it possible to compare retirement patterns over time and between countries or regions. We propose and implement two measures. One is based on administrative income tax records and relates to actual cohorts; the other is based on a time-series of cross sectional labour force surveys and relates to pseudo-cohorts. We conclude that while the tax-based observations for actual cohorts provide a richer data set for analysis, the estimated measures of retirement and transition from work to retirement based on the two data sets are quite similar.

*Keywords:* Measures of retirement, cohort perspective

*JEL Classification:* J14, J26

## *Acknowledgements*

The authors thank Human Resources and Skills Development Canada (HRSDC) for its financial support, including the arrangements for access to the *LAD* files at Statistics Canada. They are grateful also to SSHRC for its financial support of the SEDAP (Social and Economic Dimensions of an Aging Population) Research Program through its Major Collaborative Research Initiative. We thank Yan Zhang who worked with the *LAD* files at Statistics Canada to provide the basic tabulations, and Christine Feaver who produced the final figures and commented on the interpretation of results.

## *Introduction*

Many measures of retirement have been proposed but no consensus has emerged in which one dominates the others. New measures are suggested from time to time, but these often draw on features that are specific to a single survey, thereby limiting their comparability with other measures and making comparisons with previous findings impossible (see Denton and Spencer, 2009, for a review). While retirement is inevitably a somewhat fuzzy concept, it would be useful to have consistent measures that would make it possible to compare retirement patterns over time and between countries or regions. Our purpose here is to propose and implement two measures of transition from work to retirement that apply to specific cohorts of workers, measures that could be adapted for use in jurisdictions that have suitable administrative records and on-going household labour force surveys.

Measures that take a cohort perspective are appealing since retirement patterns may change. Recent examples of studies with US data include Cahill, Giandrea, and Quinn (2006) and Coile and Gruber (2007), both of which used the Health and Retirement Study; both take cohort perspectives, albeit with differing indicators of retirement. In what follows we draw on the large *Longitudinal Administrative Databank* compiled from Canadian income tax records to derive income-based cohort-specific measures of retirement.<sup>1</sup> We draw also on time series of cross-sectional data from the Canadian *Labour Force Survey* to derive time-consistent measures of changes in labour force participation retirement for pseudo-cohorts. We conclude that while the longitudinal file may provide a better basis for understanding the changes that have taken place the two sources yield quite similar retirement age patterns and patterns of transition from work to retirement.

---

<sup>1</sup> Other studies that have used that data base to obtain cohort measures of retirement include Tompa (1999) and Wannell (2007), although their measures differ from one another and from what is proposed here.

## *Two Approaches to the Measurement of Retirement Patterns*

### *a. Pseudo-cohort measures based on cross-sectional household survey data*

We confine our attention to the population 50 and over and start by considering measures based on responses to Statistics Canada's *Labour Force Survey (LFS)*. The *LFS* is a monthly sample survey of more than 50,000 households designed to provide basic information about the labour force and its characteristics. It is generally similar to the *Current Population Survey* in the United States and to corresponding surveys in other OECD nations and elsewhere. Drawing on master files, we derive annual average rates of labour force participation by single years of age, separately for each sex, from 1976 to 2006.<sup>2</sup> That provides us with the basis for estimating transition-to-retirement rates for successive pseudo-cohorts (or simply cohorts, for convenience of reference) and for making comparisons with annual cross-sectional rates of labour force participation, or period rates, as we shall call them. We find marked differences between the cohort and period patterns in some cases. As one example, the *period* age profile on the upper left side of Figure 1 shows the male participation profile as it was in 1976, from ages 52 to 72. (The rates have been indexed to 100.0 at age 52 to facilitate comparisons with other measures.) The *cohort* profile shows how participation rates actually evolved for those who were 52 in 1976, 53 in 1977, and so on, up to 72 in 2006.

Since very few people enter the labour force after age 50, the proportion no longer active can be interpreted as an approximation to the proportion retired; that is shown in the lower panel of the figure. Changes in the proportion show the age pattern of withdrawal from the labour force, which we interpret as the transition to retirement. It is evident that this transition was much more gradual for the cohort than would have been predicted using the 1976 period rates. The difference is most pronounced at age 62, where the cohort profile indicates that 40 percent of those aged 50 in 1976 had actually retired while the period profile (based only on 1976 data) indicates only 20 percent. Of

---

<sup>2</sup> The *LFS* master files were accessed in the Statistics Canada Research Data Centre at McMaster University.

particular note, perhaps, is that there was no precipitous drop in participation, and hence no sharp increase in retirement between the ages of 64 and 65.

The right side of Figure 1 relates to females. The period rates that we show in this case are from 1996, and we compare them to the rates for the cohort aged 52 in 1996. The observed experience for the 1996 cohort is much shorter, extending only up to age 62 in 2006, the last year of our data. The participation rates were much higher for this cohort when it was in its late 50s, and the retirement rates commensurately lower, than would have been anticipated from the 1996 cross sectional profile. The difference is emphasised in the lower panel, which shows the estimated proportion retired. Such cohort/period differences show the importance of basing retirement rates on cohort or pseudo-cohort experience, and show the errors that can arise when period rates are interpreted as if they applied to cohorts.

*b. Cohort measures based on longitudinal administrative data*

We work also with Statistics Canada's *Longitudinal Administrative Databank* (the *LAD*). The *LAD* consists of a random 20 percent sample of all taxpayers who filed Canadian income tax returns in any year, starting in 1980.<sup>3</sup> Information is added each year as new returns are filed, and the sample is augmented with 20 percent of first-time tax filers. Individuals are included for all years in which they filed tax returns. By 2006, the most recent year for which we have data, there were more than 4.9 million individuals in the sample.

The *LAD* has much to recommend it. Indeed, the very large sample size, its longitudinal nature, and the detailed and accurate information about income that it provides year by year make it an appealing foundation for the analysis of income-based measures of retirement – how patterns of retirement have changed over time for successive cohorts, and how they vary by level of income and such other individual and family characteristics as may be observable from income tax records.

---

<sup>3</sup> The *LAD* files were accessed at Statistics Canada. The following description is drawn largely from Statistics Canada's *Longitudinal Administrative Data Dictionary* (catalogue no. 12-585-XIE).

Our approach to the choice of observations is as follows. We take the notion of retirement to be irrelevant before the age of 50. We first select all tax filers aged 50 in 1982, and follow them until 2006 if they survived and continued to file income tax returns, or until they died or were otherwise lost from the sample because they failed to file returns.<sup>4</sup> The overall retention rate is very high for the 1982 cohort: by the end of the data period, in 2006, we can account for 92.2 percent of all males who filed income tax returns when they were age 50 in 1982 and 87.7 percent of all females. We then do the same for tax filers aged 50 in 1983, tax filers aged 50 in 1984, and so on, thus building up income histories for a series of successive cohorts, each identified by the year in which it reached the age of 50. The retention rates are even higher for later cohorts than they were for the 1982 cohort.

We exclude from the sample those few individuals who died or were lost before reaching age 52. We exclude also those who had any income from farming or fishing at ages 50, 51, or 52, since the notion of retirement is conspicuously vague for those occupations. For each tax filer remaining in our observation set, average income from employment at ages 50 to 52 is then calculated as the arithmetic mean of the incomes at those three ages. In order to limit the analysis to individuals with significant labour market attachment, we exclude those for whom this average is less than \$10,000, in constant dollars.<sup>5</sup> That figure is arbitrary, but it may be thought of as representing about the amount that would be earned by someone working roughly half-time at a legislated minimum wage rate.

The next step is to identify those who have retired, as indicated by a major and sustained reduction in employment income. For each tax filer the ratio of employment income at each subsequent age to average employment income at ages 50-52, denoted

---

4 For this analysis income information is imputed for those few (about 0.8 percent of the sample) who failed to file income tax returns for either a single year or two years in a row, but then filed again. The imputation is based on a simple averaging of each component of the income information, including the total, as reported in the year preceding and the year following missing value(s). This is done to reduce possible sample selection bias related to occasional failure to file returns. Such imputation would be inappropriate if the typical reason for not filing was a much lower than average level of income in the affected year but we have no way of assessing whether that was the case.

5 All income measures are adjusted for inflation using the consumer price index and expressed in dollars of 2006. Employment income includes net income from self-employment.

by  $R$ , is calculated for each year for the maximum period permitted by the data. A tax filer is said to have retired at the age at which  $R$  first falls below a critical level,  $R^*$ , provided that that condition continues to be satisfied in each of the subsequent two years.<sup>6</sup> We have experimented with several alternative values of  $R^*$ , ranging from 0.00 to 0.50 (Denton, Finnie and Spencer, 2009a). Thus, at one extreme, a person would be deemed to have retired only if he or she had no income at all from employment ( $R^* = 0.00$ ); at the other, the same person would be classified as retired even if income from employment was just under half as great as its average level when he or she was 50-52 ( $R^*=0.50$ ).

We note and emphasise that what we measure here is *first* retirement. It is possible that an individual may retire by our criterion, but subsequently return to work. However, the criterion is rather demanding, inasmuch as earned income must remain below the threshold ratio for three successive years. We note also that we are unable to distinguish whether retirement, as we measure it, is voluntary or involuntary.

In total, we have 26 cohorts, as defined by the year in which they reached the age of 50, but the younger the cohort the less information we have. In what follows we focus attention on the 1982, 1987, 1992, and 1997 cohorts, whose transitions to retirement we can follow to ages 72, 67, 62, and 57, respectively.

## Results

Figure 2 compares the retirement index based on the *Labour Force Survey* for the 1982 cohort with corresponding indexes based on the *LAD* for four values of  $R^*$ . It is evident from the figure that the *LFS* and *LAD* age profiles are very similar, both for males and females, especially for low values of  $R^*$ . That is as one might expect, since a respondent to the *LFS* with even a very low level of earnings would be classified as

---

<sup>6</sup> Note that this calculation tells us the age reached *during the first full year of retirement*, not age at the exact date of retirement within a year. A tax filer would be deemed to be retired at the youngest age  $x$  at which the specified condition is satisfied. By way of example, a person would be deemed to have retired at 63 if the retirement condition is satisfied at *each* of ages 63, 64, and 65. In addition, a person would be deemed to have retired at age 63 if the condition is satisfied at age 63 and the person is dead or lost from the sample at age 64, or if it is satisfied at ages 63 and 64 and the person is dead or lost at age 65.

being in the labour force and hence not retired. Thus we might anticipate that not being in the labour force and being retired would correspond fairly closely to the case of  $R^* = 0.00$ , as we see it does. The *LFS* series relate to pseudo-cohorts, the *LAD* series to true cohorts. That the two series are in such close agreement provides evidence in support of using pseudo-cohorts derived from times series of cross-sectional data to study retirement patterns when longitudinal data are not available; it also emphasises the advantage of taking an explicit cohort approach rather than assuming that the period rates will continue to apply.

With  $R^* = 0.00$ , both series indicate that about 40 percent of males who had significant labour force attachment when they were in their early 50s had retired by the age of 61, and almost 80 percent by the age of 66. For females the proportions retired at each age are somewhat higher, whichever series is used, but the age pattern of retirement is generally similar. Higher levels of  $R^*$  mean that higher earnings are consistent with being classified as retired, based on the *LAD*. It is not surprising, then, that the age retirement profile based on higher values of  $R^*$  lies above the one based on the *LFS*.

Figure 3 provides similar comparisons for the 1987, 1992, and 1997 cohorts, but restricted to the case of  $R^* = 0.00$ . The age range for which comparisons can be made is necessarily reduced by the length of the period covered by the data, but the general point remains: the two measures provide very similar indications of the transitions from work to retirement.

### *Concluding Remarks*

We argue that when assessing age patterns of retirement it is preferable to base measures on the realized experience of cohorts rather than on information drawn from only one period of time. While the proportion retired increases with age as the transition to retirement occurs, the age pattern of that transition can differ from one cohort to another. If that happens the actual age-transition path for a cohort will differ from one suggested by the work/retirement age pattern in any one period, and it is the cohort

experience that is of greater interest.

We have proposed two longitudinal measures of retirement. The first, a *pseudo-cohort* measure, draws on a time series of household cross sectional surveys; retirement is defined by withdrawal from the labour force and measured by the age pattern of reduction in average labour force participation rates. The second, a *true cohort* measure draws on administrative income tax records in which individuals are tracked over time; retirement is defined in that case at the individual level by a sufficiently large and sustained reduction in employment income, and aggregate rates obtained by summation. Using Canadian data the two measures are found to provide quite similar results when the “sufficiently large” reduction in employment income in the second (true cohort) measure is close to 100 percent. That is useful information: plausible longitudinal measures of the age pattern of retirement can be obtained even without full longitudinal tracking of individuals.

Nonetheless, there are advantages associated with the longitudinal income-based approach. They derive from the fact that actual cohorts of individuals are being followed, a feature that makes it possible to gain insights that are not feasible when looking at pseudo-cohorts. By way of example, when working with longitudinal data such as the tax records used here it is possible to assess relative post-retirement well-being (by comparing income before and after retirement), and to ask how that may vary with the age at which individuals retire and also with their position in the income distribution prior to retirement (Denton, Finnie, and Spencer, 2009b). Furthermore, movements in and out of retirement could also be observed and analysed, something not possible when working with successive cross-sectional data.

Another advantage of using longitudinal data is that the measure of retirement itself is much less rigid: with the repeated cross-section data and pseudo-cohort approach individuals are deemed to be “in the labour force” (and hence not retired) if they are either working (even on a very limited basis, and perhaps earning very little) or looking for work. With longitudinal administrative records it is possible to adopt a much more subtle measure of retirement, and to compare retirement rates based on alternative criteria, as illustrated here.

Finally, longitudinal retirement patterns can be analysed to take into account not only individual pre-retirement income but also other individual or family characteristics. For example, we could ask how retirement patterns vary with the level and composition of pre-retirement income and with the retirement of a spouse or a change in marital status.

We conclude that while we cannot be sure that our findings would apply elsewhere, in Canada at least, overall retirement rates may be estimated quite accurately using pseudo-cohorts derived from cross-sectional labour force survey data. Longitudinal tax data can allow for more extensive analysis of retirement patterns and the factors that affect them, but to realize such benefits one must have access to a large administrative database. In the absence of such longitudinal data our results suggest that reliable estimates of cohort retirement patterns can be based on the pseudo-cohort approach using labour force data.

## References

Cahill, K.E., Giandrea, M.D., & Quinn, J.F. (2006). Retirement Patterns from Career Employment. *The Gerontologist*, 40(4), 514-523.

Coile, C., & Gruber, J. (2007). Future Social Security Entitlements and the Retirement Decision. *Review of Economics and Statistics*, 89(2), 234-246.

Denton, F.T., Finnie, R., & Spencer, B.G. (2009a). Income Replacement in Retirement: Longitudinal Evidence from Income Tax Records. Research Institute for Quantitative Studies in Economics and Population Research Report No. 436.

Denton, F.T., Finnie, R., & Spencer, B.G. (2009b). Patterns of Retirement as Reflected in Income Tax Records for Older Workers. Research Institute for Quantitative Studies in Economics and Population Research Report No. 434.

Denton, F.T., & Spencer, B.G. (2009). What is Retirement? A Review and Assessment of Alternative Concepts and Measures, *Canadian Journal on Aging*, 28(1), 63-76.

Tompa, E. (1999). Transitions to Retirement: Determinants of Age of Social Security Take Up. SEDAP Research Report No. 6. Accessed from <http://socserv.socsci.mcmaster.ca/sedap>.

Wannell, T. (2007). Young Pensioners. *Perspectives on Labour and Income*, 8(1). Ottawa: Statistics Canada.

Figure 1: LFS Period and Cohort Indexes of Labour Force Activity (Age 52 = 100) and Retirement, Selected Years and Cohorts

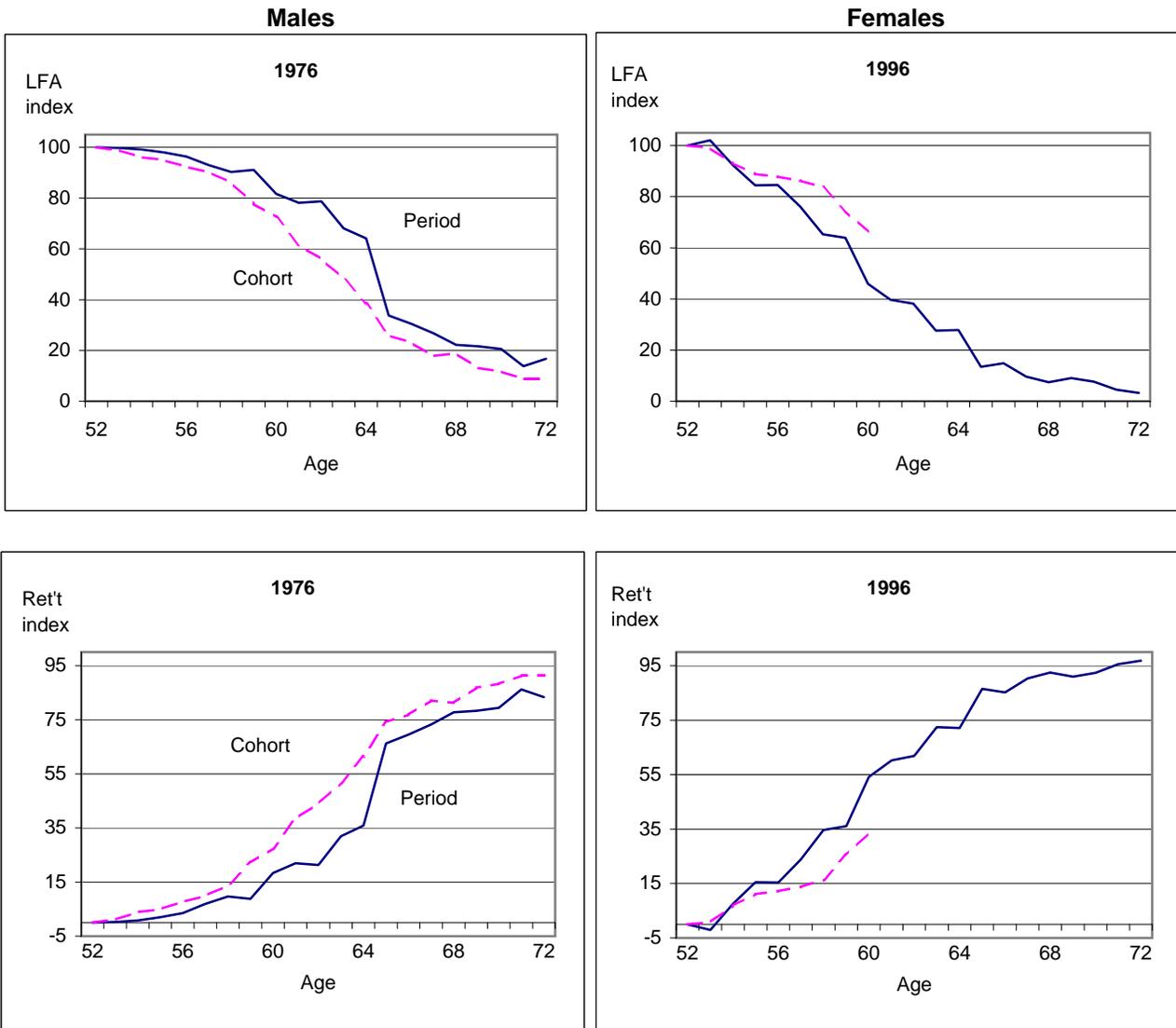


Figure 2: Comparison of LFS and LAD Retirement Indexes, 1982 Cohorts, Alternative R\* Values

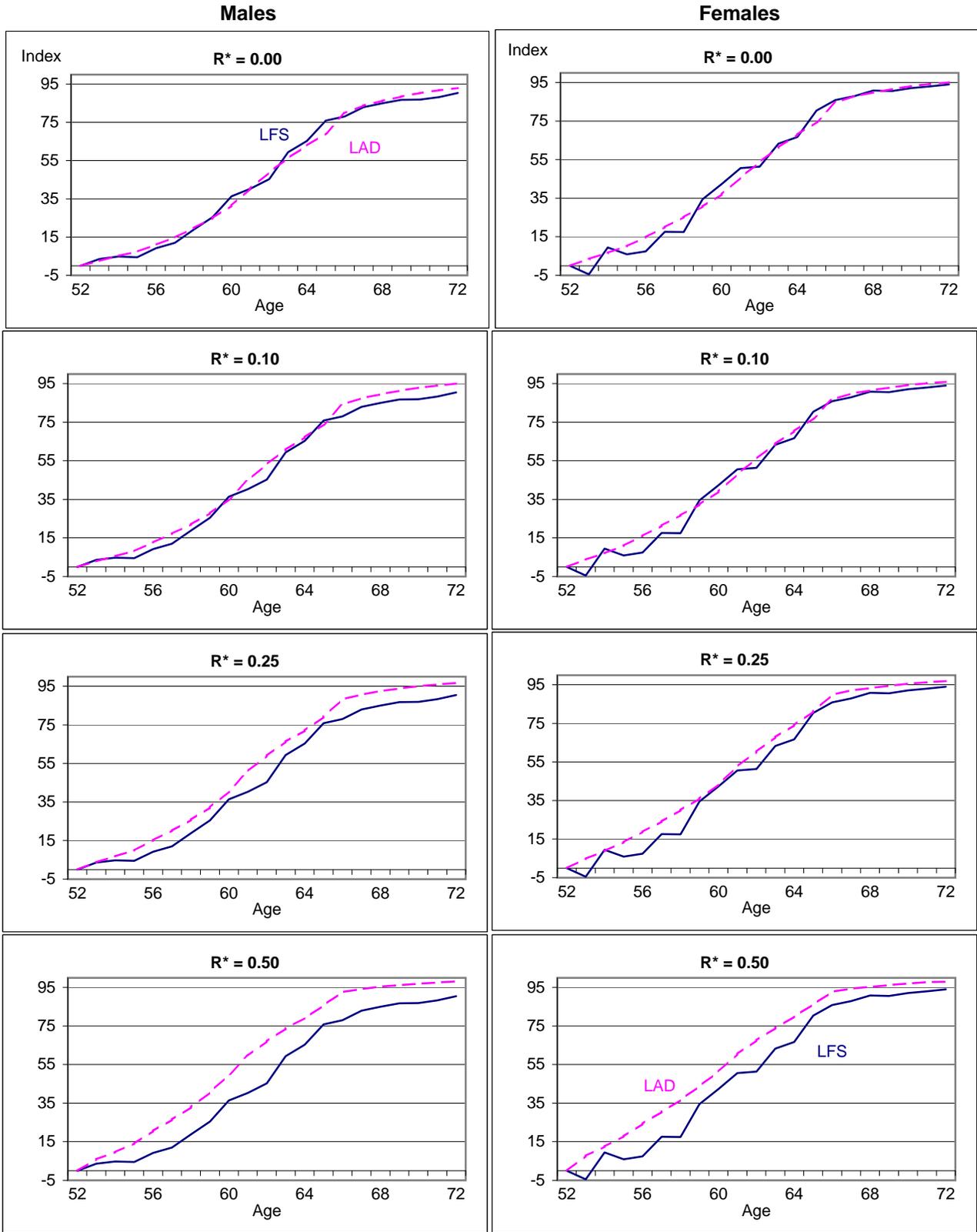
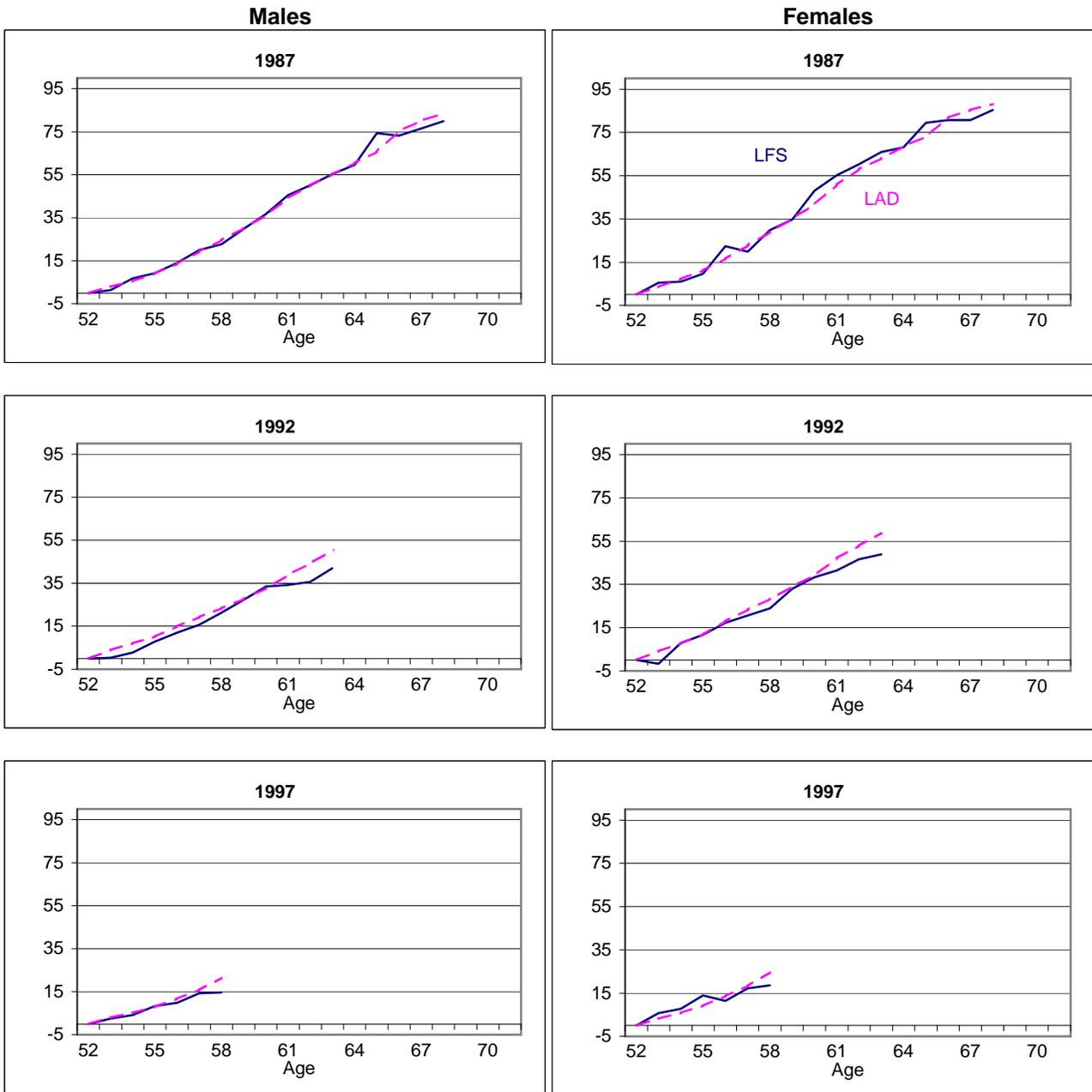


Figure 3: Comparison of LFS and LAD Retirement Indexes, Selected Cohorts,  $R^* = 0.00$



## QSEP RESEARCH REPORTS - Recent Releases

Number	Title	Author(s)
(2007)		
No. 413:	Gender Inequality in the Wealth of Older Canadians	M. Denton L. Boos
No. 414:	Which Canadian Seniors are Below the Low-Income Measure?	M. Veall
No. 415:	On the Sensitivity of Aggregate Productivity Growth Rates to Noisy Measurement	F.T. Denton
No. 416:	Initial Destination Choices of Skilled-worker Immigrants from South Asia to Canada: Assessment of the Relative Importance of Explanatory Factors	L. Xu K.L. Liaw
No. 417:	Problematic Post-Landing Interprovincial Migration of the Immigrants in Canada: From 1980-83 through 1992-95	K.L. Liaw L. Xu
No. 418:	The Adequacy of Retirement Savings: Subjective Survey Reports by Retired Canadians	S. Alan K. Atalay T.F. Crossley
No. 419:	Ordinary Least Squares Bias and Bias Corrections for <i>iid</i> Samples	L. Magee
No. 420:	The Roles of Ethnicity and Language Acculturation in Determining the Interprovincial Migration Propensities in Canada: from the Late 1970s to the Late 1990s	X. Ma K.L. Liaw
No. 421:	A Note on Income Distribution and Growth	W. Scarth
No. 422:	Is Foreign-Owned Capital a Bad Thing to Tax?	W. Scarth
No. 423:	Looking for Private Information in Self-Assessed Health	J. Banks T. Crossley S. Goshev
No. 424:	An Evaluation of the Working Income Tax Benefit	W. Scarth L. Tang
No. 425:	Exploring the Effects of Aggregation Error in the Estimation of Consumer Demand Elasticities	F.T. Denton D.C. Mountain
(2008)		
No. 426:	An Application of Price and Quantity Indexes in the Analysis of Changes in Expenditures on Physician Services	F.T. Denton C.H. Fever B.G. Spencer

QSEP RESEARCH REPORTS - Recent Releases

Number	Title	Author(s)
No. 427:	What Is Retirement? A Review and Assessment of Alternative Concepts and Measures	F.T. Denton B.G. Spencer
No. 428:	Pension Benefit Insurance and Pension Plan Portfolio Choice	T. Crossley M. Jametti
(2009)		
No. 429:	Visiting and Office Home Care Workers' Occupational Health: An Analysis of Workplace Flexibility and Worker Insecurity Measures Associated with Emotional and Physical Health	I.U. Zeytinoglu M. Denton S. Davies M.B. Seaton J. Millen
No. 430:	Where Would You Turn For Help? Older Adults' Knowledge and Awareness of Community Support Services	M. Denton J. Ploeg J. Tindale B. Hutchison K. Brazil N. Akhtar-Danesh M. Quinlan
No. 431:	New Evidence on Taxes and Portfolio Choice	S. Alan K. Atalay T.F. Crossley S.H. Jeon
No. 432:	Cohort Working Life Tables for Older Canadians	F.T. Denton C.H. Feaver B.G. Spencer
No. 433:	Population Aging, Older Workers, and Canada's Labour Force	F.T. Denton B.G. Spencer
No. 434:	Patterns of Retirement as Reflected in Income Tax Records for Older Workers	F.T. Denton R. Finnie B.G. Spencer
No. 435:	Chronic Health Conditions: Changing Prevalence in an Aging Population and Some Implications for the Delivery of Health Care Services	F.T. Denton B.G. Spencer
No. 436:	Income Replacement in Retirement: Longitudinal Evidence from Income Tax Records	F.T. Denton R. Finnie B.G. Spencer

QSEP RESEARCH REPORTS - Recent Releases

Number	Title	Author(s)
(2010)		
No. 437:	Understanding the Outcomes of Older Job Losers	M. Brzozowski T.F. Crossley
No. 438:	Employer Pension Plan Inequality in Canada	M. Denton J. Plenderleith
No. 439:	Retirement Decisions of People with Disabilities: Voluntary or Involuntary	M. Denton J. Plenderleith J. Chowhan
No. 440:	Where Would You Turn for Help? Older Adults' Awareness of Community Support Services	M. Denton J. Ploeg J. Tinsdale B. Hutchison K. Brazil N. Akhtar-Danesh M. Quinlan J. Lillie J. Millen Plenderleith L. Boos
No. 441:	Older Adults' Awareness of Community Health and Support Services for Dementia Care	J. Ploeg M. Denton J. Tinsdale B. Hutchison K. Brazil N. Akhtar-Danesh J. Lillie J. Millen Plenderleith
No. 442:	Age of Pension Eligibility, Gains in Life Expectancy, and Social Policy	F.T. Denton B.G. Spencer
No. 443:	The Private Cost of Long-Term Care in Canada: Where You Live Matters	N. Fernandes B.G. Spencer
No. 444:	Is There an Age Pattern in the Treatment of AMI? Evidence from Ontario	M. Grignon B.G. Spencer L. Wang
(2011)		
No. 445:	Taxing a Commodity With and Without Revenue Neutrality: An Exploration using a Calibrated Theoretical Consumer Equilibrium Model	F.T. Denton D.C. Mountain

QSEP RESEARCH REPORTS - Recent Releases

---

Number	Title	Author(s)
No. 446:	The Age Pattern of Retirement: A Comparison of Cohort Measures	F.T. Denton R. Finnie B.G. Spencer