Population Aging and Worklife Duration: Myths and Realities in the Canadien Context

Gilbert MONTCHO\textsuperscript{1}, Yves CARRIERE\textsuperscript{1}, and Marcel MERETTE\textsuperscript{2}

\textsuperscript{1}Department of Demography, University of Montreal
\textsuperscript{2}Faculty of Social Sciences, University of Ottawa

July 12, 2020

Contents

Abstract 2

1 Introduction 2

2 Methods and Data Source 5
  2.1 Life and Worklife Tables . . . . . . . . . . . . . . . . . . . . . 6
  2.2 Data sources and series . . . . . . . . . . . . . . . . . . . . . . . 6
  2.3 Decomposition of Change . . . . . . . . . . . . . . . . . . . . . . . . 7

3 What has Changed in Forty years 8
  3.1 Trends in Participation and Workload . . . . . . . . . . . . . . . . . . . . 8
  3.2 Participation and Workload over the lifecycle . . . . . . . . . . . . . . . . . 9
  3.3 Changes in the gender gap . . . . . . . . . . . . . . . . . . . . . . . . . . 10

4 Worklife Duration and Ratio 11
  4.1 Trends in Worklife Duration and Ratio . . . . . . . . . . . . . . . . . . . 11
  4.2 Lifecycle Worklife Duration and Ratio . . . . . . . . . . . . . . . . . . . 12
  4.3 The Bias of ignoring Working Hours . . . . . . . . . . . . . . . . . . . . 13
  4.4 Contributions to Worklife Duration . . . . . . . . . . . . . . . . . . . . . 14

5 Discussion and Implications 15
  5.1 Myths and Realities . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 15
  5.2 Policy Implication . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 16
  5.3 Possible future trends . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 17

6 Conclusion 17

References 18
Abstract

Worklife Duration, Population Aging, Individual behavior  Population aging is raising concerns about labor shortage and public finance sustainability, on the assumption of shrinking working lifespan for financing expanding lifespan consumptions. However, such assumptions usually omit an appropriate account of changing labor participation and worked hours (behavioral components) which could be playing toward or against the tides of populating aging (structural components).

This paper estimates Worklife Duration in Canada between 1981 and 2016 and decompose the change during this period into demographic and behavioral components. We found that, that individuals are not only working longer than before but are also spending a higher proportion of their increased longevity in the labor market, as Worklife Duration increased by 4.96 years while its ratio to life expectancy increased by 3.55 percentage point. Labor participation has been the main driver of these changes contributing, 3.57 years, against 0.73 and 0.65 years for worked hours and mortality respectively.

Keywords: Worklife Duration, Individual Behaviors, Population Aging.

1 Introduction

Population aging is raising concerns of labor shortage and public finances sustainability in OECD countries and Canada in particular. To many, a "one stone two birds" policy would be to increase the age of public pension (hereafter referred to as retirement age). Such a policy would in one hand force older workers to stay longer in the labor market and on the other hand, enhance public finance sustainability by delaying pension payment. Abide in this reasoning, some countries have passed legislation to increase the retirement age. In Canada however, plans to increase only the age of illigibility of the Old Age Security program have been announced in 2012 but reversed in 2016.

This controversy grew out of several studies that are contradictory in their results. On one hand, macro-level studies analyze some variant of dependency ratio and tend to recommend an increase of retirement age, as the population ages. On the other hand, micro-level studies focus on the share of life expectancy to be spent in retirement, and see no reason for increasing retirement age since individuals are already delaying their retirement. While these studies disagree in their recommendation on increasing retirement age, they have in common the little to no inclusion of changes in individual behavior over the entire life cycle. But, individual behaviors in the labor market have been changing along with changes in the age structure of the population and could be mitigating the effect of population aging on the labor supply. For example, using data on five selected OECD countries from 1983 through 2000, Prskawetz, Zagaglia, Fent, and Skirbekk (2005) found that the change in the crude labor force rate was dominated by the change in age-specific labor force participations, rather than a shift of the working population from ages of high participation to ages of low participation. Thus, direct components (behavioral) such as participation and workload (working hours) could be playing as much important role as indirect (structural) components such as mortality, in shaping the labor market outcomes.

Personal behaviors in the labor market cover patterns in the entry of the young, the exit of the olds as well as the participation (frequency and intensity) of prime-age men.
and women, and the pressure on the the labor supply from each of these components have changed over time. At one end of the lifecycle, today’s young are staying longer in school and thus postponing their entry into the labor market, later than their parents did Clark (2007), Fleury (2009). For instance, Clark (2007) found that three-quarters of canadians aged 18 to 34 used to enter the labor market at 22 years old in 1971. By 2001, only half of this age group was in the labor market. During roughly the same period, full-time employment among young men and women aged 17 to 24 and not in school full-year, has changed from about 76% for men and 58% for women to 59% and 49% respectively (Statistics Canada, 2018).

At the other end of the lifecycle, improvement in life expectancy and health has enabled delaying retirement to a greater extent than it could have been predicted. As a result, the proportion of expected years in retirement has declined. For instance, Carrière and Galarneau (2011) found that in 1994, slightly more than 55% of the remaining years of life after age 50 were expected to be spent in retirement; in 2008, the number fell to a level close to that of 1977 (48% versus 45% in 1977). Similar trends have been observed in other countries. For example, using Finland data, Leinonen, Martikainen, and Myrskylä (2015) found that both working life duration at age 50 and the share of remaining life spent in work has increased across periods (and cohort) following the recession of the early 1990s.

Recents four decades has also seen significant changes in participation and workload among prime-age adults, those well-passed schooling but before retirement (Black, Schanzenbach, & Breitwieser, 2017; Ketcheson, Kyui, & Vincent, 2017; Loyser, 2017; Ruggles, 2015; Wilson & Jones, n.d.). In Canada, the downward trend in labor participation started in the ’60s for men continue steadily through the ’10s with rate changing from 97% in 1965 to 90% in 2015. For women, the tremendous growth started in mid-1900 seems to have reached its highest level in the late ’90s and has been decreasing since then. As result, the gender gap in labor participation has narrowed from about 60 points in the ’60s to about 9 points in the 10’s (Loyser, 2017).

Almost all the current literature rely solely on survival and participation to estimate WLD. Leaving out workload when estimating WLD assumes that all individuals are working about the same number of hours. This implies that unemployed, part-time workers full-time employees, self-employed, etc work about the same number of hours. It also assumes that workload don’t vary over the lifecycle. For example, a 15 years old, 40 years old and even 65 years old persons, all work about the same number of hours. Furthermore, it assumes that individuals work all year-round with no vacation, weekend and explicit leisure time. Obviously, these assumptions are counterfactual because workload do vary widely across socio-demographic groups and in time.

In early 1900’s, the work week lasted 60 hours over 6 days before before declining to 37 to 40 hours over 5 days in the 1960’s (Sunter & Morissette, 1994). The decline continued through the 80’s, partielly resulting from the increasing in part-time employment which begings its popularity about the same time women beging their entrance into the labor market as a way to concile work and familly. Nowadays, part-time is the prefered work arrangement among students, as it makes it possible to stay longer in school while having a foothold in the labour market. This creates a shift in the age of maximum full-time employment rate among those aged 34 and under, from about age 25 in the ’70s to age 31 in the 2010s (Galarneau, Morissette, & Usalca, 2013). Similary part-time employment
has become a way for older workers to delay and transit into retirement, thus increasing the total annual hours (Carrière & Galanneau, 2011), but decreasing average hours. As result of increasing part-time employment, the hours distribution in many country nowadays show a large spike at around 35-40 hours and a smaller spike at around 15-20 hours a week (Dolton, 2017), while full-part-time classification of employment has become part of official statistics. In Canada, weekly hours changed from 42.3 hours for full-timers and 16.00 hours for part-timers in 1976 to 40.8 and 18.3 respectively in 2018 (Statistics Canada: Table 14-10-0043-01). Despite these variabilities, workload over the entire lifecycle has yet to be adequately considered in studies and debates on labor supply and retirement age policies. This article aims at filling this gap by analyzing Worklife duration and the extent to which mortality, participation, and workload have contributed to its changes between 1981 and 2016 in Canada.

As participation and workload varies across ages, and these age profiles has also been changing, defining "working age" is no longer as simple as delimiting age groups (Carrière et al., 2019). Nor is it still enough to equate population aged 15 to 64 years old with the aggregate supply, as it has been the case for evaluating the effect of aging on the labor supply. An unbiased analysis of the effect of population aging on the labor market must also account for the changes in personal behavior on participation and workload. This article attempts to perform such a task by measuring Worklife duration (WLD) as the labor supply from an individual perspective and decomposing its changes between 1981 and 2016 into behavioral and structural effects. In doing so, we aim to measure the the extent to which work lifespan has been shrinking along with population aging, and to estimate how much of the change in WLD during recent decades can be attributed to personal behaviors.

Personal behaviors have been accounted for, to some extent in the literature and estimates of WLD at older ages are relatively common (Denton, Feaver, & Spencer, 2009; Loichinger & Weber, 2016). This literature attempts to answer policy concerns by analyzing the share of life expectancy at older ages that will be spent working rather than in retirement or vice versa. For example, Denton et al. (2009) published cohort working life tables for Canadian men and women aged 50 and older, taking into account variation in mortality and participation by age. Loichinger and Weber (2016) accounted for variation of mortality and participation by age and education level in analyzing working life expectancy at age 50 in relation to life expectancy and healthy life expectancy for European countries. These papers are usually concerned with how increased life expectancy at old ages is shared between working and retirement but often pay little or no regard to what has happened during young and adult ages. Although interesting, results from such studies are limited in guiding policies on retirement age because they left aside an important part of the lifecycle that could reinforce or cancel out whatever trend is observed after age 50. When it comes to whether the retirement age should be increased or not, the major components of the labor supply should be considered over the entire lifecycle.

Another branch of the literature and perhaps the most common, provide Worklife tables to serve as the basis for life insurers in tort compensation after an injury (Gilbert, 2018). For these purposes, Worklife tables were frequently published in the US, by the Bureau of Labour Statistics till the 1980s. Since then, only unofficial Worklife tables have been published by forensic economists, such as Skoog, Ciecka, and Krueger (2011). Studies in these categories include Krueger and Slesnick (2014), which integrate non-
market labor in estimating WLD and found that doing so nearly equalizes men’s and women’s estimated lifetime total working years as women tend to spend more time than men in non-market labor at home.

The remaining of the paper is organized as followed. Section 2 describes the methods and data used in estimating Worklife duration and its decomposition. In section 3 we portray the trend in participation and workload in Canada between 1981 and 2016. Section 3 and 4 present the results and discuss how they fit in the ongoing debates on increasing retirement age in Canada. Finally, we conclude in section 5 where we underline some of the limitations that future studies will need to address.

2 Methods and Data Source

Worklife Duration (WLD) measures the number of years a person can expect to devote to paid labor while accounting for mortality (Life Expectancy), participation and workload. Work to Life Expectancy Ratio (WLR) is the share of the Life Expectancy an individual is expected to devote to paid work. This is computed at each age by dividing the WLD by corresponding Life Expectancy. By putting in relation WLD with Life Expectancy over time, the trend in WLR provides useful insights about the trend in the dependency ratio at the individual point of view. In these definitions, Life Expectancy reflects the mortality schedules as derived from the traditional lifetable. participation refers to the labor participation rate, which is the ratio of those employed and unemployed over the population aged 15+, and workload refers to the average hours worked annually. Similar to the period life table on which there are based, WLD and WLR for a given year describes working patterns of a synthetic or an hypothetical cohort that has the same mortality, participation and workload as those observed in that year. In other words, a WLD of 25 years at age 20 for the year 2000 means that an individual could expect to work an additional 25 years if patterns of mortality, participation and workload by age over the remaining life cycle follow the same distribution observed in the year 2000.

WLD has been studied under different terms in the literature. Among others, it has been referred to as labor force expectancy, Worklife expectancy, labor market Life Expectancy, Duration of Dorking life, Average length of working life, active life expectancy, etc., (Loichinger & Weber, 2016). Eurostat has developed a similar indicator to monitor the EU 2020 strategy on employment. The duration (expected) of working life indicator is an indication of the number of years a person, at the current age of 15 years, is expected to be in the labour market (i.e. to be employed or unemployed) throughout his or her life (Eurostat, 2012, 2019). A usual distinction is whether both participation and employment rates are, or either one of them is being accounted for on top of mortality rates. While each emphasizes different aspects, these terms have one thing in common, which the rare to none inclusion of working hours and their trends. Therefore, these indicators merely measure the number of years of labor attachment, or the number of years over which participation is spread. But the degree of attachment can vary widely among socio-demographic groups, from very low (seasonal worker) to very high (full-timers, prime-age men) and is described by workload at each level of participation.

The term WLD is used here to make a distinction that comes from accounting for working hours. WLD is a life expectancy at work, taking into account not only participa-
tion but also workload. Similar to the Eurostat’s indicator, it looks at the entire life cycle of active persons rather than on specific states or periods in the life cycle, such as youth unemployment or early withdrawal from the labor force (Eurostat, 2019). But it goes beyond it, by integrating the depth of participation captured by the average workload at each age. Thus, it provides a better approximation for the labor supply at the individual level and better basis for policies that involve individual work lives such as increasing the retirement age.

2.1 Life and Worklife Tables

In the literature, three methods have been used to measure WLD. The most simple method has been to use some reference age at which individuals are assumed to exit from the labor market. For example, assuming, workers qualified for full public pension at age 65, WLD at 25 would be 40 (65-25) years. This approach has been common in the ’70s even though it largely overestimates WLD. Since then, much sophisticated methods like the Markov Process Worklife Expectancy tables (MPWE) of which the LPE tables are but special cases. These approaches not only account for mortality, but also for participation, which in the case of MPWE tables, is allowed to transit through various states from one age to another. For example from active to non-active and vice versa. The LPE tables estimate WLD in terms of probabilities of being alive (L), participating in the labor market (P) and being employed (E) as opposed to unemployed (Ireland, 2010), in the same way that the Sullivans method (Sullivan, 1971) accounts for health status and mortality in estimating Healthy Life Expectancy (HLE). In this study, WLD is estimated similarly, by adjusting the standard life table to account for participation and annual hours. WLDx at age x is estimated by dividing the remaining hours to work from aged x, for all persons (wTx) by the number of persons surviving at x(Sx).

\[
WLD_x = \frac{\sum_{x=0}^{70+} wLx}{S_x} \quad (1)
\]

where wLx is the number of person-hours worked between age x and the next age x + n. Following the Sullivans approach, wLx is computed by multiplying the number of persons that lived (Lx) with the participation rate (wpx) and the workload (whx). Equation (1) is therefore re-written as:

\[
WLD_0 = \frac{\sum_{x=0}^{70+} (Lx \times wpx \times whx)}{S_x} \quad (2)
\]

2.2 Data sources and series

Three data sources have been used in this study. The Lx series are readily available in the Life tables data from the Human mortality Database (HMD) and the wpx are extracted from Table: 14-10-0327-01 (Annual labor force characteristics by sex and detailed age group) of Statistics Canada. The whx are average annual working hours calculated using the data from annual surveys complementary to the labor force surveys. The surveys include the Survey of Consumer Finances (SCF) from 1981 to 1997, The Survey of

These series have been further processed in several ways to make them compatible with each other and with the methods used and to allow easy interpretation of the results. Processing the series includes, for example, synchronizing the age groups of the series. For instance, \( wpx \) are available for 5 years age groups from age 15 to 69 and as a single group for those aged 70+. \( Lx \) and \( whx \) have been aggregated accordingly. Also, since \( whx \) is the total number of hours worked annually, WLD is ultimately measured in hours. However, to allow convenient conversion in years, a full work year is assumed to be equivalent to 2000 hours, at 40 hours per week for 50 weeks. It may be worthwhile to note here that, because lifetable series from HMD are provided for Male, Female and Both sex separately, there is no precise relationship between the series. For example, averaging LE for men and women will not equal to LE of both sexes. Therefore, calculations of WLD and WLR and decomposition of WLD is done for men, women and both sex separately and no relation is assumed or should be expected between the resulting series. Finally, it is assumed that individuals have no participation or workload in the labor market before the age of 15. However and although not important in magnitude, WLD at later ages is still affected by mortality before 15. Therefore, calculations of WLD and WLR and the decomposition of WLD is done for all ages and the childhood(<15) ages are included as age components in the decomposition.

2.3 Decomposition of Change

The model of continuous change is used to decompose the total change in WLD at 15 (the dependant summary measure) into small changes resulting from the changes in the demographic and behavioral components (the covariates). It is based on the assumption that changes in the covariates happen continuously, or gradually, along an actual or hypothetical dimension rather than discretely. This assumption makes sense, particularly for demographic phenomena where change occurs naturally over time. It, therefore, provides a reasonable justification for the additivity of covariate effects and the elimination of interaction terms, even if the measure in question is a non-additive function of the covariates (Horiuchi, Wilmoth, & Pletcher, 2008, p. 786).

In equation (2), the \( Lx \) represents the demographic component of WLD and are determined by two factors. On one hand, the vector \( qx \) of probabilities of dying between ages \( x \) and \( x + a \). On the other hand, there are the vector \( ax \) of average number of years lived by those who died between ages \( x \) and \( x + a \). Starting the worklife table at \( So = 100000 \) individuals, the \( Sx \) serie are generated with the formula \( Sx + a = Si(1 - qx) \) and since the ages \( x \) do not vary from one year to another, equation (2) can be written as:

\[
WLD_x = f(qx, ax, wpx, whx) \tag{3}
\]

or in more generalized form as:

\[
WLD(t) = f(W(t)) \tag{4}
\]

where \( W \) is the matrix of P components \((qx, ax, wpx, whx)\) over L ages and \( f \) represents the worklife table function that transform \( W \) into WLD.
Based on Horiuchi et al. (2008, p. 792) the contribution to life expectancy at birth $e_0(t)$ for example, of death rate change in the i-th age group from the period $t_1$ to the next period $t_2$ can be calculated as:

$$c_i = \int_{M_i(t_1)}^{M_i(t_2)} \frac{\partial e_0(t)}{\partial M_i(t)} dM_i(t)$$

(5)

where $M_i(t)$ is the death rate for the i-th age group at time $t$. Extending this formula to include the additional behavioral components included in equation (4), we can write:

$$c_i = \int_{W_i(t_1)}^{W_i(t_2)} \frac{\partial e_0(t)}{\partial W_i(t)} dW_i(t)$$

(6)

where $W_i(t)$ represents the age-specific components for the i-th age group at time $t$. To conveniently integrate with the preceding, $W$ from (4) need to be reshaped into a single vector of length $N$ ($N=PxL$), with $WLD_i$ ($i = 1, 2, \ldots, N$) representing the age-specific components. The partial derivative in equation (6) is therefore obtained numerically from:

$$WLD(t) = f(W_i(t)) = g(W_1(t), W_2(t), \ldots, W_N(t))$$

(7)

where $g$ represents the Worklife table function that transforms the covariate values, the vector $W_i(t)$ of length $N=PxL$ into the vector $WLD(t)$ of length $L$, the summary values for a given time $t$. It should be noted here that $f$ and $g$ are different, only to the extent that they process different formats of inputs, but equivalent in terms of their outputs.

Computationally the right side of equation (6) is estimated by numeric integration, that is approximating $\int_{W_i(t_1)}^{W_i(t_2)} d(t)$ with $\sum_{W_i(t_1)}^{W_i(t_2)} \delta(t)$, and assuming that covariate changes incrementally in $T$ interval between $t_1$ and $t_2$ and proportionally to one another. Setting $T$ to 12 to denote monthly changes from one year to another has been sufficient to reduce the overall approximation error to partly(6 decimale points) equal zero.

The method is applied to each pair of consecutive years between 1981 and 2017, resulting in a total of 27648 lifetables (for 12 intervals, 16 age-groups, 4 components, and 36 year-pairs). Each Worklife table provides a new WLD series which is the result of the change from one month to another of a single age-component while holding constant all other covariates at their previous levels. Incremental decomposition between 1981 and 2016 not only provides the contribution of each age-specific component to the total change but also enables to follow the trends in contributions over the entire period which give us an idea of what can be expected for the next few years or decades.

3 What has Changed in Forty years

3.1 Trends in Participation and Workload

As we aim to integrate personal behaviors into estimating WLD, it maybe useful to first review the changes in personal behaviors that make their inclusion necessary. Figure 1
and Figure 2 shows how participation and workload have changed over the past four decades.

Figure 1: Trend in participation and workload by age group for both sex combined from 1981 and 2016

![Graph showing trends in participation and workload](image)

In 1981 participation of the youngs was very close to that of the adults, however, the two trends diverged as participation increased for the adults but stagnated for the youngs. For instance, the labor participation rate has increased by about 10 points between 1981 (76.97%) and 2016 (86.70%) for adults while it fluctuated slightly around 75% for the youngs. For those aged 55+, participation decreased slightly till the mid-90s but rose rapidly since then to reach 46% in 2016; a 16 points increased compared to 1981. Not only has participation among olders increased, but their workload also increased during during the observed period. From 1250 in 1981, working hours among older aged 55+ increased to 1290 in 2016. This 40 hours increase in 40 years, is however modest compared to the increase among the adult and the young who have increased their workload by 110 and 60 respectively.

For all age groups, most of the increase in workload has happened prior to 2000s, from then however workload has stagnated or decrease slightly. Interestingly, while the young has a labor participation rate that is closer to that of the adult, their workload is much closer to that of the older. This suggests that although schooling has remained their main activity, increased availability of part-time jobs has improved employability for the youngs. Similarly, although their participation increased, more and more elders are opting for part-time jobs in retirement or pre-retirement years. But these trends could be hiding important differences between men and women over the life cycle.

### 3.2 Participation and Workload over the lifecycle

Comparing a synthetic cohort in 2016 with one in 1981, we can see that the age profile of participation and workload has changed very differently for men and women.

For men aged 60 or less, labor participation in 2016 is lower compared to 1981 and the highest drop (12 points) occurred in the ages group 15-19. For instance, while 59.2% of young men aged 15 to 19 years old were in the labor market in 1981, there were only 47.3% in 2016. From ages 65-69, however, the situation reversed with 31.9% participation rate in 2016 compared to 19.1% in 1981. Interestingly, compared to 1981, participation rate in 2016 decreased for youngs aged 15-19, by about the same amount that it increased for those aged 65-69.
for older aged 65-69, suggesting that the increased schooling among the youngs is being compensated by delaying retirement among the olders. Meanwhile, the maximum labor participation in 2016 (92.9%) was reached in the age group 40-44, while in 1981 (96.1%), it was reached in the age group 30-34. For women, participation in 2016 is higher at all ages compared to 1981 except for those aged 15 to 24 who had in 2016 about the same participation rate they had in 1981. From age 25 however, participation in 2016 largely surpassed the levels in 1981 and the largest gap of 32.1 points between the two years occurred for the age group 55-59. For instance, 71.0% of women aged 55-59 were in the labor market in 2016 compared to only 38.9% in 1981. In 2016, the maximum participation rate occurred among those aged 55-59 (83.6%) while in 1981 it occurred among those aged 45-49 (74.9%)

Not only has the age profile of participation among women changed between 1981 and 2016, their age profile in workload also has increased greatly. However, workload in 2016 largely surpassed its level in 1981 only for those aged 25 to 59, with highest increase occurring within the age group 50-54 (365 hours per year), while decreased (146 hours drop for those aged 20-24) or stagnated for other age groups. The stagnation of workload is even pronounced among men for whom, the age profile of Workload in 2016 has been about the same as in 1981, expect that in 2016, there have been a drop at around 55 years old while an increase has been observed among those aged 60 and over. The decrease suggests that pre-retirement marked by a reduction in workload is happening earlier than before, while the increase confirms the pattern of delaying retirement suggested by their higher labor participation.

### 3.3 Changes in the gender gap

Overall, participation and workload have followed different patterns for men and women between 1981 and 2016. In general, trends are increasing for women while decreasing or stagnating for men. Nevertheless, at any given age-period, men have had greater participation and workload than women, even though the gap has narrowed considerably. For example, in 1981, the gap in participation rate between adult (aged 35-54) men and women was 35 points (94% for men and 60% for women). By 2016 it reduced to only 9 points (91% for men and 82% for women). Although less dramatic the change in workload gap were also important. From 591 hours in 1981 (1938 hours for men and
1346 hours for women), the gap in workload among men and women aged 35-54 reduced to 350 hours by 2016 (1945 hours for men and 1595 hours for women).

From these trends, it becomes clear that time allocation beyond simple participation and inclusion of annual workload are required for better estimating the labor supply and its changes over time both individually and collectively. In the next section, we will look at the trend in Worklife duration, a measure of individual labor supply over the life cycle, which results from the interaction of mortality, participation, and workload.

4 Worklife Duration and Ratio

4.1 Trends in Worklife Duration and Ratio

WLD results from the interaction between mortality, participation and workload. Because participation and workload by ages have been changing in parallele with mortality, the result of their interaction in the labor market is less obvigious. Figure 3 present trends in Worklife Duration and Worklife Ratio between 1981 and 2016.

Figure 3: Trend in Worklife Duration and Ratio at age 15 for men, women and both sexes, between 1981 and 2016

Over the part four decades, WLD increased for women by 9.6 years, from 16.8 years in 1981 to 26.4 years in 2016. For men, WLD in 2016 just recovered about the same level in 1981, with only 0.25 years increase. As a result, WLD for both sex combined increased by 4.96 years from 25.9 years in 1981 to 30.8 years in 2016. However, the changes were not monotone throughout the whole period and four sub periods can be identified from the trends. First, the period between 1981 and 1988 has seen a rapid change in WLD for women, from 16.8 to about 22 years, while it fluctuated slightly around 37 years for men. For the next eight years that followed, WLD stagnated for women, but decreased remarkably for men, reaching about 34 years in 1996, the lowest throughout the entire period. During the decades from 1996 to 2006, WLD increased for both sexes to reach 36.57 years for men and 26.29 years for women in 2006. Since then, WLD stabilized for both sexes.

Although total WLD has increased over the the past four decades, life expectancy also has increased during this period and how changes in WLD compare with that of
life expectancy has been a source of many debates. Indeed between 1981 and 2016 life expectancy at age 15 has increased by about 7.37 years for men (from 58.19 years to 65.56 years) resulting in a decrease in their WLR. In 1981, men aged 15 would expect to devote about 60.1% of their lives to paid work. By 2016 that proportion fell to about 53.8%, a decrease of -6.38 points. Women on the other hand, have increased their WLR by 12.08 points, from 28% in 1981 to 39.6% in 2016. This increase is partially due to a less favorable mortality for women. In fact, mortality has improved for both sexes, but the improvement was less pronounced for women, with only a 3.83 years gain in Life Expectancy (from 65.85 years in 1981 to 69.68 years in 2016). Therefore, despite a decreasing WLR among men, increasing trend among women resulted in an increased Total WLR by 3.55 points from 42 % to 45.5%. But these annual trends hides important variations from a life cycle perspective. Figure 4 compares WLD and WLR of a synthetic cohort in 1981 to one in 2016 by age and gender.

4.2 Lifecycle Worklife Duration and Ratio

From Figure 4 we can see that, the decrease in WLR for men has happened mostly before age 60. From age 60 however, WLR in 2016 surpassed that of 1981. For example, men aged 65-69 in 2016 could expect to work 3 percentage points more of their remaining life, than they would in 1981, as their WLR increased from 6% in 1981 to 9% in 2016. For women, the increase in WLR resulted from an upward trend at all ages, with the highest increase (14%) being observed among those aged 25-29, going from 28% in 1981 to 42% in 2016. The same pattern is observed in WLD age profile, with 10 years increase among women aged 25-29, from 14% in 1981 to 24% in 2016, while the stagnation of WLD among men has happened at all ages of the lifecycle.

Figure 4: Worklife Duration(WLD) and Ratio (WLR) by age in 1981 and 2016 for men and women

In summary, while women have historically had a higher life expectancy, men in contrary have had a higher Worklife Duration and ratio than women, as a result of their higher labor participation and workload. However, as trends in WLD and WLR increased for women but stagnated or decreased for men, the gap between men and women reduced considerably over the last four decades. The disparity in favor of men regarding WLD at age 15 went from 18.2 years in 1981 to 8.8 years in 2016, while the gap (in percentage points) in WLR decreased from 34.3 in 1981 to only 15.8 in 2016. If the increases
among women is tied to increases at all ages, the decrease or stagnation among among men was mostly due to the young and adult as there was a noticeable increase among older males. As a result, between 1981 and 2016 total WLD has increased by 4.96 years while WLR has increase by at 3.55 percentage points. These results suggest that increase in engagement towards the labor force among women and the older adults have not only compensated for the decrease among men and the young, but also compensated for the improvement in mortality.

4.3 The Bias of ignoring Working Hours

In previous sections, we emphasized the need to include working hours in estimating the labor supply. Although this inclusion is reasonable in principle, we have yet to compare empirical results with and without working hours accounted for. Figure 5 describes the trends in WLD and the associated WLR with and without the workload.

Figure 5: Trends in Worklife Duration with and without workload between 1981 and 2016

Among others, three observations stand out. First, excluding workload results in higher estimates in WLD and WLR. For example, WLD in 2016 would be 42 (instead of 35.2) years for men and 38 (instead of 26.4) years for women. Although slightly higher, these results are comparable with those of other countries that relying on similar methods. For instance, recent reports from Eurostat (2019) show that, the expected duration of working life in the European Union (EU) in 2016 is 35.7 (40 in canada) years for both sexes. In 2018, the expected average duration among the EU member States ranges from 31.8 years in Italy to 41.9 years in Sweden. This is exceeded at both ends of the range by non-EU countries: Turkey (29.4 years) and Iceland (46.3 years). Second, by assuming that men and women work about the same number of hours, the gap between men and women is reduced considerably. For example, the gap in WLD for 2016 is reduced to less than half, with 3.9 years, hours excluded, instead of 8.8 years, hours included. In Europe, excluding working hours results in a 5 years gap (Bureau of Labor Statistics, 2020) for the same year, with men at 38.1 (42 in canada) years, and women at 33.1 (38 in canada) years. Third, workload does not only affect values of WLD and WLR but also their trends. For instance, the two trends (with and without) were similar at the beginning of the period, but slowly departed from each other, especially since 2004 for men, leading to a different trend as workload variability increases.
Although Canada has seen an increase in average annual workload over the past four decades, the trends suggest that workload is likely to decrease in the next decades or stagnate at best. In fact, working hours have been falling in other high income countries (Dolton, 2017), and this trend is most likely to continue along with an increasing proportion of part-time workers. This applies not only to the young who are still in school and the older adults in or close to retirement, but also to prime-age workers for whom reducing working hours is becoming a lifestyle. As the proportion of part-timers increases, so will the bias of WLD solely based on participation. Not accounting for working hours will therefore not only become a source of increasing biases in labor supply estimates, but also in gender inequalities and intergenerational differences. To say the least, workload has had a mitigating effect on the labor supply as we shall see in greater details in the next section, where we analyze the contributions of mortality, participation and workload to the changes that occurred in WLD over the past four decades.

4.4 Contributions to Worklife Duration

Figure 6 shows the results from decomposing the total change in WLD into contributions made by each component. Participation has been the main contributor to the change in total WLD with 3.57 out of the 4.96 years increase in total WLD. But the mitigating effect of workload is also reflected with contribution (0.73 years) greater than that from mortality (0.65 years). From an age perspective, contributions (all component combined) come mainly from the adult aged 35-54 (2.51) but also importantly 1.68 from older aged 55 and over (only 0.77 from the young aged 15-34). While all age group have contributed positively to WLD among women, the effects among men are mitigating, with positive contribution only from older aged 55 and over.

Figure 6: Number of years contributed by mortality, participation and workload to changes of Worklife duration for men, women and both sexes between 1981 and 2016
Looking at contributions to WLD by each component for men and women, it can be observed that mortality improvements have benefited men at all ages, contributing 1.25 years to changes in their WLD. This positive contribution, however, was not enough to compensate for the downward impact of changes in their participation (-0.75 years) and workload (-0.25 years). As a result, WLD among men increase only by 1.25 years in four decades. Compared to men, women have benefited much less from mortality improvements. As a result, mortality contribute almost nothing to the change in their WLD and participation has been the largest contributor by far, with 6.72 years against 2.64 year from workload.

Overall, between 1981 and 2016, Worklife Duration increased by 4.96 years while its ratio to life expectancy increased by 3.55 percentage points. Labor participation has been the main driver of these changes contributing, 3.57 years, against 0.73 and 0.65 years for worked hours and mortality respectively. Compared to behavioral factors, increased life expectancy has had a smaller effect on Worklife Duration. However, this effect is positive and since increasing life expectancy is an integrant part of population aging, it follows that, population aging has had a positive effect on Worklife Duration. In other words, population aging did result, not in shrinking, but expanding work lifespan. In the next section we discuss these findings in the context of increasing retirement in Canada.

5 Discussion and Implications

5.1 Myths and Realities

As populating aging increases, so does concerns about financial pressure on public healthcare and pension systems on the assumption that added years of life are predominantly being spent in retirement, collecting a pension but not contributing to government revenues. Recent studies have focussed on worklife at older ages, 50 for instance, and tend to conclude that gains in life expectancy is increasingly being spent at work rather than in leisure. Nevertheless, the fear remains still and has led many countries to pass legislation to increase official retirement age and to take measures that promote labor force participation among older adults. While most scholars and policy makers welcome these measures, increasing the age requirement for full public pension benefit has been a source of heated debates and discords. In Canada for example, in 2015 the federal government reversed plans from the previous government to progressively increase the age of eligibility of the Old Age Security (OAS) and Guaranteed Income Supplement (GIS) from 65 to 67. In February 2017, the government’s Advisory Council on Economic Growth proposed that raising the age of eligibility for public pension benefits should be reconsidered to persuade more seniors to keep working (Brown & Aris, 2017). Such controversies suggest that the essential questions on why and when to increase retirement age have yet to receive a bi-partisan answer. This study provides new elements to policy makers working on these issues while and dissipates some of the myths that surround WLD and the role played by changes in demographic and individual behaviors among Canadians during the last four decades.

These results show that even though population aging is a reality, the idea that it had led to shrinking worklife span may be a myth and need to be manced, to say the least. The myth lies in the fact that, not only has total WLD increased, but its ratio to life expectancy also increased between 1981 and 2016. For instance, over the observed period,
total WLD has increased by 4.96 years while WLR has increased 3.55 percentage points. It is a reality that WLD decreased or stagnated among men. But the opposite is true among women who have, more than twofold, compensated for the decrease among men. The stagnating Worklife Duration among men during the observed period was, probably or at least in part, linked to the fact that it was already very high, compared to women, and that it might have been a necessary condition for enabling the increase in women labor force participation. For example, Wilson and Jones (n.d.) point out that the lack of growth in work hours among men reflects the fact that the average prime-age male worker was already working roughly 2,000 hours per year in 1979, a level consistent with working full-time year-round, and leaving little room to increase hours further. How do these results fit in the ongoing debate related to increasing or not the normal retirement age in Canada?

5.2 Policy Implication

Since the overall Worklife has increased, raising retirement age through policy is no longer justifiable on opposite assumptions. In other words, the argument to raising the retirement age to match life expectancy should now be nuanced, and public pension and health systems should not have experienced increased pressure as a result of population aging over the last four decades. If anything, these systems should have experienced a relief resulting from increased WLD, unless the pressure has its source elsewhere. This is in line with some other previous studies which found, for example, that demographic factors have contributed to increased health care cost but not anywhere near to factors such as medical practices (Dormont, Grignon, & Huber, 2006) and technology (Huber, 2009). Therefore, any policy to increase retirement in Canada takes the risk of being unfair as an attempt to force a given retirement age on everyone just because Worklife has decreased for a sub-group without undermining that of the whole. Automatic adjustments that balance Worklife between men and women have proved to result in an overall positive effect on WLD. Increasing retirement age through policy would be attempting to force such changes which could result in negative outcomes for some subgroups of the population. For example, those who retire early because of economic reasons or disabilities would have to suffer for a much longer period of financial precarity before being eligible for a public pension.

Since the overall worklife has increased, the argument in favor of raising normal retirement age to match increasing life expectancy should be nuanced. What is likely going to be needed are policies that will promote, support and enhance existing trends of living and working longer. The narrative behind the policies should, however, take into account the existing reality and not be based false assumptions about a shrinking working lifespan. Therefore, raising normal retirement age may still be an option provided the policy is backed by a narrative that focuses on its potential benefits rather than on false issues. Such a narrative has begun to appear, for example in a recent public statement from the Canadian Institute of Actuaries (2019) titled: Retire Later for Greater Benefits. One argument in the statement is that raising the normal retirement age is in line with current trends in effective retirement age, while providing higher payouts for those who chose to retire later. Unfortunately, the report has not quite let go of the old narrative, as it is also saying “... that later retirement is a reasonable response to longer life expectancies, worker shortages, and lower interest rates...”
5.3 Possible future trends

What can be expected from these trends for the future? Past trends may not continue into the future and yet they may provide some insights on what is to come. A possible development for the decades to come is for past trends to persist. Since there has been a sort of stagnation in both participation and workload in the last four decades, men and women have perhaps reached a stable balance of time allocation, which only a major social or economic shock could (perhaps) affect. In this case, future trends in WLD will be driven mainly by trends in mortality. However if somehow the current gap between men and women changes, for example as a result of a more equitable sharing of domestic chores, or further reduction of gender discrimination in the workplace, it would be, therefore, possible to observe a further increase in women’s WLD, may be compensated by a decrease in men WLD. In any case, the overall effect on WLD may be small and unnoticeable.

It is also possible for engagement in the labor market to move in the same direction for both men and women. For example, an increase in WLD could be the result of an economic boom that requires an increase in both per capita production and consumption, while a decrease could result from progress in automation that requires less human capital. As for mortality, past trends have contributed positively to the overall WLD, but nowhere close to the contribution made by participation and workload. With Participation and workload reaching their limits for adult men and women, WLD for the next few decades will probably be driven by trends in Mortality at older ages where 100% of Mortality improvement will be happening (Eggleston & Fuchs, 2012).

There is room for workload to improve though. The decreasing effect of workload may have been the result of greater investment in education at younger ages or lifestyle preferences at adult ages, but it may also be due to significant under-employment which includes unemployment. While there is little to do in the first two cases, under-employment can be addressed, resulting in greater social wellbeing. It has put downward pressure on average workload over the last four decades and policies to limit its impact would result in an increase in workload and WLD. Therefore, one way to improve workload would be for policy makers to actively target those workers that have lower labor supply than desired. This will require an adequate measure of the level of under-employment and to estimate the additional labor supply that the under-employment could potentially bring into the labor market. So far, immigration has been the preferred policy in Canada to compensate for the alleged labor shortages due to population aging and the retirement of the baby boomers. Immigrants, however, could contribute optimally only if conditions for full employment are present. Data seems to indicate that immigrants, especially new-comers, tend to have a higher prevalence of under-employment. More research in the area of under-employment and immigrant contributions to participation and workload needs is needed.

6 Conclusion

This article contributes to the ongoing debates on the effect of population aging on the labor supply and public health and pension systems, by accounting for age-sex specific mortality, participation and working hours. Results show, that individuals are not only working longer than before but are also spending a higher proportion of their increased longevity in the labor market, as Worklife Duration increased by 4.96 years while its
The ratio to life expectancy increased by 3.55 percentage point. Labor participation has been the main driver of these changes contributing, 3.57 years, against 0.73 and 0.65 years for worked hours and mortality respectively. As far as we know, this study is the first of its kind to introduce working hours as a component of Worklife Duration (WLD) over the life cycle for Canadian men and women. Nevertheless, it has left some questions unanswered.

First, how far in time will automatic adjustment of personal behaviors, be enough to maintain a stable WLD to life expectancy ratio, as it has been the case over the last four decades? A recent report from the Canadian Institute of Actuaries (CIA) estimates that current retirement programs are sustainable for the next 40 to 75 years, but how behavioral components have been accounted for in such a conclusion is still unclear.

Second, at the individual level, population aging is reduced to increasing life expectancy and this study has shown that its effects on the labor supply, although small, are positive over the last four decades. However, Population aging is the results of interactions between fertility, mortality, and immigration and these factors contribute to shaping the age structure of the population which may have an opposite effect on the labor supply at aggregate level. Theses effects, combined with those of individual’s behavior make the prediction of the labor supply much challenging, but still need to be accounted for, in a broader policy response to population aging.

Third, future research will also need to compensate for some of the methodological limitations in this paper. For example, the study has accounted only for age and sex differential in mortality, participation and workload rates. However, differences in demographic and behavioral components go beyond these factors, to include, for example, education, marital status, job type and migration, variables that could have provided a more fine-tuned rates. Furthermore, similar to other studies that rely on cross-sectional data, this study suffers from the same shortcomings that limit the period lifetable by using synthetic cohorts rather than actual ones. Still, just as period lifetables provide useful insights on mortality trends, so does WLD estimated in this paper providing essential insights for policies on retirement and aging.

References


Wilson, V., & Jones, J. (n.d.). Working harder or finding it harder to work: Demographic trends in annual work hours show an increasingly fractured workforce.