4 Investigate population ageing using national transfer accounts

New economic age profiles for Canada and France

Marcel Mérette and Julien Navaux

In this chapter, authors provide national accounts by age for economic flows of consumption and labor income using the National Transfer Accounts (NTA) methodology. We analyze the new data set we developed for Canada for the year 2011 and we compare the age profiles with the ones reported in France the same year. NTA per capita age profiles suggest that per capita age profiles of labor income are remarkably similar in the two countries. Moreover, age profiles evidence that public expenditures are higher at old ages in Canada than in France, but that France's public expenditure exceeds Canada's public expenditure during working life. Moreover, NTA age profiles show that private consumption is much higher in Canada than in France with a remarkably constant ratio at each age. Consequently, current behavior with respect to private consumption may well be challenged in the following years in the context of population ageing.

Introduction

It is well known that with rising life expectancy and declining fertility rates for many years, inverted dependency ratios such as the number of people aged 20–64 over those aged 0–19 and 65+ are alarming from an economic point of view. Indeed, as the number of active middle-age individuals is declining compared to the dependent younger and older generations, one may be concerned about the capacity of the working age groups to support the increasing number of dependent individuals. In Canada, the inverted dependency ratio was 168 workers per 100 dependents in 2011. Canada's inverted dependency ratio is projected to decline to 115 workers for every 100 people of dependent age by 2063 (Statistics Canada, 2015). The concerns refer to issues such as healthcare costs, pension and, to a lesser degree, labor productivity. Healthcare costs are known to increase rapidly for individuals aged 60 and over. By definition, retired people get pension benefits, and labor productivity is believed to decline with age. Healthcare and public pensions may threaten the balance of government budgets, whereas declining labor productivity may slow down economic growth. To summarize, some scenarios suggest that an increase in the number of elderly adds fiscal pressure, while the economy is slowing down because of the lower productivity of older workers (see for instance Maestas, Mullen and Powell, 2016). Some research argues that the fiscal pressure will be such that systems of public transfers to the elderly, as currently structured, will not be fiscally sustainable as populations continue to age rapidly in the first half of the twenty-first century (see for instance Chojnicki, Navaux and Ragot, 2016). In accordance with the theory that suggests a clash between ages, some authors claim that maintaining public transfers to the elderly will lead to a decline in

educational spending for the young (Poterba, 1997, 1998; Harris, Evans and Schwabb, 2001). To this gloomy scenario, others propose a much more optimistic one (Evans et al., 2001; Denton and Spencer, 1997, 2000; Fougère et al., 2009; d'Albis, Cusset and Navaux, 2016). The fact that there is no clear consensus on the economic impact of ageing in Canada suggests that further investigation is warranted, especially if a new data set is providing new insights.

Better understanding of the economic challenge of ageing undoubtedly requires access to resource allocation across ages. Recent developments in social sciences investigate new ways to improve measurements on economic flows, either on specific topics like long-term care (Grignon and Spencer, 2018) or on a global perspective like the National Transfer Account (NTA) methodology (Lee and Mason, 2011a, 2011b). The NTA provides national accounts by age for economic flows such as labor income, consumption, public transfers and private transfers. The profiles are useful to identify the role of per capita economic variables and that of demographic change. In this chapter, we introduce such a data set for Canada. We focus on per capita consumption and labor income age profiles to provide a different angle on the challenge ahead with respect to population ageing.

The NTA age profiles are clearly subject to economic conditions. Higher economic growth rates and lower unemployment will improve labor income and raise consumption; however, the per capita age profiles also reflect preferences, culture factors, incentives found in various public policies and institutional arrangements, especially between the private (individuals, corporations) and public sector. As part of this chapter, we intend to demonstrate that the NTA we developed for Canada gives a different perspective about the challenges of population ageing in Canada. In other words, we proceed by examining the NTA data to infer what kind of information can be extracted regarding the economic challenge of ageing in Canada. To facilitate the discussion and analysis, we compare the NTA data for Canada with a country with a similar standard of living, France, and for an identical year, 2011.¹

This chapter is organized as follows. The next section briefly explains the NTA methodology and required data sources. The following section reports labor income and consumption profiles for Canada and France respectively, and then introduces a decomposition of total consumption between the private and public components. The last section is the conclusion.

NTA methodology

The NTA originates from the work of Lee (1980) and Mason (1988). NTAs are based on a unified international methodology that consists in the introduction of age in the national accounts. The methodology is described in a technical manual published by the United Nations in 2013. Some recent developments using NTAs are found in Mérette and Navaux (2019) and d'Albis et al. (2017a, 2017b, 2019). Today, the NTA is a well-established empirical tool used to understand cross-age economy, with harmonized data available for about 70 countries (see www.ntaccounts.org).

NTAs are based on an accounting identity, introduced in Equation 4.1, such that the difference between consumption (C_a) and labor income (Y_a^l) at each age a corresponds to the lifecycle deficit (Lee, 1994). The gap between consumption and labor income results in net public or private transfers, $T_a^N = T_a^I - T_a^O$, equal to the difference between transfer inflows T_a^I and transfer outflows T_a^O , and in asset-based reallocations, equal to the asset income net of savings $Y_a^K - S_a$.

$$C_a - Y_a^L = (T_a^I - T_a^O) + (Y_a^K - S_a) \quad (4.1)$$

The methodology relies on three stages for each of its components:

- Per capita age profile f_a is extracted for each component from survey data or an administrative database.
- Each age profile is smoothed with a level 2 polynomial. This smoothed profile, denoted as $\tilde{f}_a$, is multiplied by the number of people at each age a , N_a to get an aggregate flow $F = \sum_{a=0}^n \tilde{f}_a N_a$.
- The age profiles are adjusted to insure that the aggregate amount F fits perfectly with the corresponding aggregate AG from the national accounts.² The corrective term $c = F/AG$ is then calculated and applied to the aggregate smoothed series. The corrected profiles are $\tilde{F}^c = \tilde{F}/c$ at the aggregate level and $\tilde{f}^c = \tilde{F}^c/Nc$ at the individual level.

For the purpose of this chapter, we built Canadian age profiles of labor income and consumption for 2011 and for ages between 0 and 90. Aggregates are made consistent with the CANSIM tables of the System of Macroeconomic Accounts produced by Statistics Canada (see Table 4.1 for the aggregates in 2011) following the United Nations manual (2013).

NTA age profiles are computed from various databases at the individual level. The three components of labor income (labor earnings, employer contributions and self-employment labor income) are calculated from the Survey of Labour and Income Dynamics and from the Canadian Income Survey, which are available at the individual level. Employer contributions are calculated by applying the parameters of employer contributions to individual wages. Private consumption age profiles (education, health and other consumption comprising imputed rents)³ are calculated using the Survey of Household Spending (SHS). The four variables are available at the household level. Private consumption profiles in education and health are obtained by regression methods, following the strategy suggested in the United Nations manual (2013). Household consumption in education is assumed to be a function of the number of household members aged five to 29. The regression coefficients obtained at each age are then used

Table 4.1 Control aggregates for consumption and income in 2011

Aggregates in millions (\$CAD)

Labor income	1,078,017
Gross wages	933,178
Labor earnings	810,086
Employer contributions	123,092
Self-employment labor income	144,839
Private consumption	876,868
Health	37,343
Education	12,832
Other	826,693
Public consumption	375,141
Health	140,847
Education	90,787
Other	143,507

to allocate private consumption in education within the household. Following the works of d'Albis et al. (2015, 2017b), household health expenditure is assumed to be a function of the number of household members in each five-year age group, except for the first year of life (age zero), which is treated separately. Other consumption, including imputed rents, are allocated across ages with the piecewise linear scale suggested by Lee and Mason (2011a). Private consumption other than health and education is assigned to each member by weight. The weight is 0.4 for young children aged four and younger, and then increases linearly from ages four to 20, and equals one for adults 20 years and older.

Public consumption in health is calculated with administrative data from different sources. Public consumption in health relies on provincial/territorial government expenditure by age and sex from the Canadian Institute for Health Information. Age profiles of public consumption in education are estimated from the number of students enrolled in public elementary and secondary schools and from the number of students enrolled in post-secondary education. According to the NTA manual, public consumption other than health and education is allocated to individuals equally by age because it includes sovereign functions such as the police, justice, defense or public administration (United Nations 2013). Aggregates and age profiles for 2011 in France were produced by the French NTA team (d'Albis et al., 2017b) and are available on the website of the National Institute of Demographic Studies: ctn.site.ined.fr.

Estimates of 2011 age profiles of labor income and consumption are averages of males and females together in the Canadian and French population. As noted by Lee and Mason (2011a), these profiles reflect culture, and institutional and public policy features found in each country investigated. In the following section, we underline the differences regarding these features between Canada and France. The first profile we look at is labor income, followed by the consumption profile.

Comparison of labor income and consumption between the two countries

About the remarkable similarities of per capita labor income in Canada and in France

Labor income is the sum of labor earnings, employer contributions and self-employment labor income.⁴ In Canada, labor income accounted for 60.9 percent of the gross domestic product (GDP) in 2011. Labor earnings is the most important component of labor income in Canada (75.2 percent), followed by self-employment labor income (13.4 percent) and employer contributions (11.4 percent).

Figure 4.1 reports labor income age profiles for both Canada and France in purchasing power parity (PPP) Canadian dollars. The figure demonstrates that per capita labor income profiles have similar shapes and are comparable in value terms at each age in the two countries, with two exceptions being between ages 35 and 45 and after age 55. Let's start by analyzing per capita labor income for age that covers 15 to 55 years old.

Note first that the per capita labor income increases and is almost equivalent from ages 15 to 35 in both countries. At 25 years old, the per capita labor income is equal to \$31,298 in Canada and to \$33,645 in France. At 35 years old, the gap is even smaller with \$56,127 in Canada and \$54,445 in France (3 percent difference).

Figure 4.1 Per capita labor income age profiles in Canada and France for 2011.

Thereafter, between the ages of 35 and 45, per capita labor income diverges slightly between both countries. While labor income continues to increase in Canada, it remains relatively stable in France. The highest dissimilarity occurs at 38 years old, with a difference of \$3481 between Canada (\$58,906) and France (\$55,425). At 45 years old, the per capita level of labor income is equal to \$63,156 in Canada and \$61,387 in France.

Between 46 and 55 years old, labor income decreases slightly but is once again quite similar in both countries. At 46 years old, the difference between Canada (\$62,634) and France (\$61,689) is \$945, which is comparable to age 55 where the difference is \$879 between Canada (\$55,958) and France (\$55,079).

After 55 years old, labor income decreases promptly with age in both countries; however, it is worthwhile to observe that the difference in labor income between Canada and France increases significantly after age 55. At 60, 70 and 80 years old, labor income is respectively 29 percent, 354 percent and 760 percent higher in Canada than in France. This reflects greater labor participation rates of older workers in Canada. In 2011, there is an employment rate of 58.4 percent in Canada for ages 55 to 64 compared to just 41.4 percent in France. Although we cannot identify the exact cause of this significant disparity, we can certainly point out that Canada has more modest incentives for early retirement built into the pension system. As an illustration, public pension spending in Canada represents 4.3 percent of the GDP in 2011 but is as high as 13.4 percent in France (OECD, 2020a). Moreover, although there is no proof of this, it is possible that Canada's labor market is more open to older workers (as their salary is less structured by seniority) and/or that Canadians may have slower increase in demand for leisure at old ages than in France.

A higher level of consumption at all ages in Canada

Although per capita labor income profiles are remarkably similar in Canada and France, consumption differs significantly at each age in both countries.

Figure 4.2 reports the per capita amounts of total consumption (public and private) at each age in PPP Canadian dollars. First, note that in both countries, the slope moves upward with age. Hence, older individuals consume more than young and middle-age people; however, the consumption level in dollars in Canada deviates from the one in France. As for labor income above, we comment the total consumption age by age, starting with the youngest.

From zero to three years old, total consumption decreases in Canada and France. Consumption is much higher in Canada at birth with a level equal to \$25,551 compared to \$15,591 in France. Three years old is the only age at which consumption is higher in France (\$17,644) than Canada (\$16,034).

After age three, consumption increases in both countries up to the late teens and early 20s. The gap between Canada and France reaches a peak of \$6607 at ten years old, with a total consumption equal to \$31,912 in Canada and \$25,305 in France.

Afterward, consumption follows a V-shaped curve up to the early 60s in both countries. As shown by d'Albis et al. (2017b), the V-shaped curve corresponds to the ages at which individuals are parents. They share their resources within their households with their children to fund children's consumption. At these ages, the difference between Canada and France varies between \$6770 (24 years old) and \$2748 (39 years old). At 45 years old, the per capita level of consumption is equal to \$34,781 in Canada and \$30,718 in France.

After age 60, consumption age profiles diverge substantially between Canada and France. At 64 years old, the difference between Canada and France is still relatively small. Total consumption is equal to \$40,616 in Canada and \$39,837 in France (a difference of \$779); however, the difference increases thereafter to \$3758 at 70 years old, \$10,672 at 80 years old and \$21,529 at 90 years old and more, which is the largest difference between both countries for all ages.

The evolution of the difference between Canada and France over the ages highlights a higher overall level of consumption in Canada, but the difference is not constant at each age. To further investigate the difference in the level consumption between both countries, we now proceed with a decomposition of total consumption into its private and public elements.

Figure 4.2 Per capita consumption age profiles in Canada and France for 2011.

The key role of private consumption and public health expenditures in Canada

Figures 4.3a and 4.3b introduce the per capita age profiles of consumption by separating the private and public consumption components between education, health and other consumption. Figure 4.3c investigates the difference in the level of consumption between both countries. We calculate the ratio of private consumption, public consumption and total consumption in Canada and France for all ages. Note that an identical consumption level of consumption in Canada and France implies that the ratio would be equal to one. The results reported in the three figures are striking.

First, public consumption is lower in Canada for middle-age individuals but higher for school-age individuals and older individuals, aged 75 and over. The highest level of public consumption is clearly due to the high level of public health consumption for older individuals in Canada. The ratio of per capita public health spending between Canada and France is equal to 1.15 at age 70 (\$49,316 in Canada and \$8069 in France) and to 2.25 at age 90 or more (\$31,243 in Canada and \$13,888 in France). Between ages 37 and 70, we find a larger level of public consumption in France. This reflects both the larger public consumption other than health and education that is higher in France than in Canada at each age, and the larger level of public health expenditures in France for the same age group.⁵

The most striking result is found in Figure 4.3c and refers to the ratio for private consumption. Between age 0 and age 90+, the ratio is remarkably stable in 2011. For all ages combined, on average, private consumption is 20.1 percent higher in Canada (\$25,533) than in France (\$21,264). The highest ratio of per capita private consumption is 1.28 for newborns (\$10,366 in Canada and \$8069 in France), whereas the lowest ratio is 1.12 at 69 years old (\$29,950 in Canada and \$26,714 in France).

The high level of private consumption in Canada can be explained by two differences between both countries. First, French people save much more than Canadians. In 2011, the net household saving rate was equal to 9.9 percent of the household disposable income in

Figure 4.3a Canada.

Figure 4.3 Decomposition of per capita consumption age profiles in Canada and France for 2011.

Figure 4.3b France.

Figure 4.3c Ratio of per capita spending between Canada and France at each age from 0 to 90 and over, for 2011, in \$CAD PPP.

France (OECD, 2020b). In Canada, the net household saving rate was equal to 4.4 percent. Therefore, Canadians dedicate a larger portion of their disposable income to consumption. This may reflect cultural differences regarding consumption but also easier access to credit in Canada as shown by the much higher level of household debt. Indeed, the OECD (2020c) reports that in 2011, the household debt with respect to disposable income was 169 percent in Canada but only 113 percent in France.

Conclusion and discussion

Comparing age profiles for labor income and consumption between Canada and France showed that the per capita labor income is very close at each age up to 55–60 years old in both countries, after which labor income is larger in Canada than in France. Despite a similar level of labor income revenue during most of the lifetime, total consumption is much higher at each age in Canada, due to two main differences. First, public health expenses increase significantly with age in Canada, while the rise of public health spending according to age is slower in France; however, the most striking result is the higher level of private consumption at almost each age in Canada. The difference reaches as much as 20.1 percent on average.

The increasing age profile of per capita consumption for 2011 plus the substantially larger level of consumption in Canada compared to France, despite similar labor incomes, should raise concerns regarding consumption in an ageing process. Indeed, we know that in 2011, the share of people aged 65 or more was equal to 14.4 percent in Canada, but 50 years later, Statistics Canada's projections indicate that the share of people aged 65 or more could reach 27.7 percent of the entire population. Consequently, if consumption behavior does not change, total consumption will increase substantially in Canada. Using NTA age profiles, this chapter shows that for Canada, the concern should be more about private consumption than public consumption.

Indeed, per capita public consumption in Canada is lower than in France for ages 31 to 69. For ages under 31, public consumption in Canada is sometimes larger and sometimes lower than in France, reflecting mostly different allocations of education for the two countries. It is as of age 70 that public consumption is much higher in Canada than in France, but we know that the pension system in Canada is sustainable and less demanding on Canadian governments than in France. The main difference in public consumption between both countries is the consumption of public healthcare services by older individuals.

Yet, although public health expenditures are particularly high among older Canadians, recent research conducted on the link between demography and health shows that population ageing is not the main factor explaining the rising costs of public health (Evans et al., 2001; Canadian Institute for Health Information, 2011). Also, health costs at death are an important driver of the total costs over a year. Thus, the decline in mortality rate at each age could postpone the health cost at very high ages. While public consumption seems reasonable in Canada compared to France for most ages, this is not the case for private consumption.

In fact, our study underscores that private consumption is especially high at almost each age in Canada. Assuming that the consumption behavior remains stable over the next few years in Canada and that the labor participation rate does not change much, the ability to finance total private consumption through total labor income will decline over time. One way to avoid this and to keep a relatively high level of private consumption at all ages would be to increase savings, which are very low in Canada, at least compared to France.

A higher saving rate would increase the asset income that actual workers will get once retired and would secure private consumption, assuming that the maintenance of public support systems in Canada will not deteriorate, as expected (see Denton and Spencer, 1997; and Evan et al., 2001). In other words, in the context of population ageing, NTA profiles suggest that public consumption does not seem extreme in Canada, at least on a comparative basis; however, NTA profiles show that private consumption is much higher in Canada than in France, even at old ages. Consequently, current behavior with respect to private consumption may well be challenged in the following years in the context of population ageing.

Notes

- 1 France and 2011 were chosen because of the availability of the database for comparison purposes. French profiles are available online at [ctn.site.ined.fr/en/data/from 1979 to 2011](http://ctn.site.ined.fr/en/data/from%201979%20to%202011). See d'Albis et al. (2017b) for a specific description of labor income and consumption age profiles from 1979 to 2011 in France.
- 2 Note that some aggregates, such as private transfer inflows and outflows, have no equivalent in national accounts. Aggregates for private transfers are thus calculated from the surveys and are readjusted on the net private transfers with the rest of the world (inflows from ROW – outflows to ROW). This is the only aggregate available for private transfers in the System of Nations Accounts.
- 3 Imputed rents are the value of the flow of services that home owners consume from their property. They are calculated in two steps using the Survey of Household Spending. First, we regress the value of rents paid by tenants on a set of variables, including the characteristics of the household, the characteristics of the dwelling (type of accommodation, year of construction, number of rooms, etc.) and the location (16 metropolitan areas and a subdivision of non-metropolitan areas with respect to the urban size). Then, we estimate the imputed rents of owner households according to the coefficients of the first regression.
- 4 The estimates exclude the value of time spent in home production and the value of non-market time spent rearing children, preparing meals, cleaning, providing care and completing other domestic tasks.
- 5 The high level of public health expenditure for older individuals in Canada is also observed by Donehower, Lee and Miller (2011) for the United States.

References

- Albis (d'), H., Badji, I., El Mekkaoui, N. and Navaux, J. (2017a). Private asset income in France: is there a breakdown of intergenerational equity between 1979 and 2011? *Journal of the Economics of Ageing*. doi.org/10.1016/j.jeo.2017.11.002.
- Albis (d'), H., Bonnet, C., Navaux, J., Pelletan, J., Toubon, H. and Wolff, F.-C. (2015). The lifecycle deficit for France, 1979–2005. *Journal of the Economics of Ageing*, 5, 79–85.
- Albis (d'), H., Bonnet, C., Navaux, J., Pelletan, J. and Wolff, F.C. (2017b). Lifecycle deficit in France: an assessment for the period 1979–2011. *Economics and Statistics*, 491–492, 47–70.
- Albis (d'), H., Bonnet, C., Chojnicki, X., El Mekkaoui, N., Greulich, A., Hubert, J. and Navaux, J. (2019). Who pays for the consumption of young and old? *Population and Development Review*, 45(1), 103–132.
- Albis (d'), H., Cusset, P-Y. and Navaux, J. (2016). Les jeunes sont-ils sacrifiés par la protection sociale? *Note d'Analyse – France Stratégie*, 37.
- Canadian Institute for Health Information (2011). Health care cost drivers: the facts. CIHI, Ottawa, Ontario, 33.
- Chojnicki, X., Navaux, J. and Ragot, L. (2016). Retraites et équité intergénérationnelle. In: J-H. Lorenzi (ed.), *Choc démographique, rebond économique*. Paris: éditions Descartes et Cie.

- Denton, F.T. and Spencer, B.G. (1997). Population ageing and the maintenance of social support systems. *Canadian Journal on Ageing*, 16(3), 485–498.
- Denton, F.T. and Spencer, B.G. (2000). Population ageing and its economic costs: a survey of the issues and evidence. *Canadian Journal on Ageing*, 19(suppl. 1), 1–31.
- Donehower, G., Lee, R. and Miller, T. (2011). The changing shape of the economic lifecycle in the United States, 1960 to 2003. In: R. Lee and A. Mason (eds), *Population ageing and the generational economy: a global perspective*. Northampton, MA: Edward Elgar.
- Evans, R.G., McGrail, K.M., Morgan, S.G., Barer, M.L and Hertzman, C. (2001). APOCALYPSE NO: population ageing and the future of health care systems. *Canadian Journal on Ageing*, 20(suppl. 1), 160–191.
- Fougère, M., Harvey, S., Mercenier, J. and Mérette, M. (2009). Population ageing, time allocation and human capital: a general equilibrium analysis for Canada. *Economic Modelling*, 26(1), 30–39.
- Grignon, M. and Spencer, B.G. (2018). The funding of long-term care in Canada: what do we know, what should we know? *Canadian Journal on Ageing*, 37(2), 110–120.
- Harris, A.R., Evans, W.N. and Schwabb, R.M. (2001). Economics education spending in an ageing America. *Journal of Public Economics*, 81(3), 449–472.
- Lee, R.D. (1994). Population age structure, intergenerational transfer, and wealth: a new approach, with applications to the United States. *Journal of Human Resources*, 29(4), Special Issue: The Family and Intergenerational Relations, 1027–1063.
- Lee, R.D. (1980). Age structure, intergenerational transfers and economic growth: an overview. *Revue Économique*, 31, 1129–1156.
- Lee, R.D. and Mason, A. (eds) (2011a). *Population ageing and the generational economy: a global perspective*. Northampton, MA: Edward Elgar.
- Lee, R.D. and Mason, A. (2011b). Generational economics in a changing world. *Population and Development Review*, 37(S1), 115–142.
- Maestas, N., Mullen, K.J. and Powell, D. (2016). The effect of population ageing on economic growth, the labor force and productivity. *NBER Working Paper*, 22452(July), 53.
- Mason, A. (1988). Saving, economic growth, and demographic change. *Population and Development Review*, 14, 113–144.
- Mérette, M. and Navaux, J. (2019). Population ageing in Canada: what the lifecycle deficit profiles are telling us about living standards? *Canadian Public Policy*, 45(2), 192–211.
- OECD (2020a). Pension spending (indicator). Available at: doi:10.1787/a041f4ef-en [Accessed 6 April 2020].
- OECD (2020b). Household savings (indicator). Available at: doi:10.1787/cfc6f499-en [Accessed 6 April 2020].
- OECD (2020c). Household debt (indicator). Available at: doi:10.1787/f03b6469-en [Accessed 6 April 2020].
- Poterba, J.M. (1997). Demographic structure and the political economy of public education. *Journal of Policy Analysis and Management*, 16(1), 48–66.
- Poterba, J.M. (1998). Demographic change, intergenerational linkages, and public education. *American Economic Review*, 88(2), 315–320.
- Statistics Canada (2015). Table 17-10-0057-01: projected population, by projection scenario, age and sex, as of July 1. doi:10.25318/1710005701-eng.
- United Nations (2013). National transfer accounts manual: measuring and analysing the generational economy. Department of Economic and Social Affairs, Population Division.