Chapter 3
Quebec's Public Finances Between Demographic Changes and Fiscal Sustainability

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3.1 Background

In this chapter, we assess the fiscal sustainability of Quebec's provincial government budget over the 46-year horizon 2010–2056 in light of expected major demographic and economic changes.[1] Broadly speaking, fiscal sustainability requires that the public debt does not ultimately grow faster than the economy – in other words, that the ratio between the two does not follow an explosive path. Our assessment therefore involves projecting the government's debt-to-GDP ratio over the long term based on assumptions about current programme spending commitments and tax-transfer rules, given demographic and economic trends. This allows us to calculate to what extent the current fiscal structure of Quebec's provincial government is in fact sustainable.

One can think of two reasons why running this kind of exercise is particularly important for a Canadian province such as Quebec. First, Quebec's population is ageing rapidly. While the 65-and-over population will have taken 50 years or more to rise from 12% to 24% of total population in most of Europe, the United States, and Australia, the current projection is that it will take just over 30 years for Quebec to get through this passage.[2] If so, this will be the third fastest transition among advanced societies, Korea (17 years) and Japan (22 years) being in the lead.

[1] Quebec is the second largest of the ten Canadian provinces. In 2009, its population was 7.8 million (23.2% of the Canadian total), and its GDP was C$304 billion (20% of the Canadian total).

[2] Based on data from OECD (2011) and ISQ (2009).

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Second, Canada provinces have full jurisdiction over health care and education. Consequently, provincial budgets are large[3] and age-sensitive: their long-term sustainability is a key current concern.

We find that the current fiscal structure of Quebec's provincial government is indeed unsustainable. This is by no means a prediction that its debt-to-GDP ratio will actually follow an explosive path over time. It is an indication that, if the assumed demographic and economic trends make sense, there is an inherent long-term disequilibrium in the current fiscal structure that ought to be corrected through changes in programme commitments and/or tax-transfer rules in the not-too-distant future if the debt situation is not to get out of control. Our projection implies that it would take a permanent increase of tax revenues amounting to 2.2% of GDP for the present discounted value of primary deficits generated by demographic-economic change over the 45-year horizon to be nullified and, hence, for intergenerational equity to be restored.

We proceed as follows. Section 3.2 mentions some relevant theoretical and empirical developments in the literature. Section 3.3 describes the demographic, economic, and budgetary assumptions on which our analysis of sustainability is based. Section 3.4 presents the resulting projection of the government's revenues, expenditures, and budget deficits over the 2010–2056 horizon, as well as implications for fiscal sustainability and intergenerational equity. Section 3.5 indicates how sensitive our projection is to changes in key demographic and economic assumptions. Section 3.6 explores the impact of an alternative scenario where health expenditure shifts with life expectancy due to the high cost of end-of-life health care. Section 3.7 concludes.

3.2 Literature

Blanchard et al. (1990) define fiscal sustainability as 'essentially about whether, based on the policy currently on the books, a government is headed towards excessive debt accumulation'. In what follows, we will take the fiscal structure to be sustainable if its programme spending commitments and tax-transfer rules do not lead to sustained growth in the debt-to-GDP ratio over the long-term horizon of 45 years that we consider.

Blanchard et al. (1990) show that under general conditions, a necessary condition for sustainability over the long term is that the present discounted value of current and future primary budget surpluses be large enough to repay the current outstanding level of the public debt. They go on to define the 'sustainable tax rate'

[3] In 2008, federal government spending amounted to 27% of total public sector expenditure in Quebec. The rest was shared among provincial government ministries and agencies (56%) and local governments (17%). In turn, local governments are under the authority of the provincial government.

as that tax-to-GDP ratio which, if constant, would achieve an unchanged debt-to-GDP ratio over the relevant horizon, given the assumed fiscal structure and projected demographic and economic trends. Their approach to fiscal sustainability has been very influential. It is currently put into practice by the Congressional Budget Office (2011) in the United States, the Office for Budget Responsibility (2011) in the United Kingdom, and the Parliamentary Budget Office (2011) in Canada, among other fiscal agencies.[4]

Our definition of fiscal sustainability follows Blanchard et al. (1990), but we take a slightly different approach to maintaining sustainability (and restoring intergenerational equity). We determine the constant amount by which the tax-to-GDP ratio would have to be raised from 2010 to 2056 to offset the present discounted value of current and future primary budget deficits generated by our assumptions over this period. The additional tax revenues would initially be set aside in a 'demographic fund', would accumulate with interest over a certain period, and would later be disbursed as needed so as to restore budget balance.

3.3 Demographic, Economic, and Budgetary Assumptions

We begin our quantitative assessment of the consequences of the demographic transition on Quebec's budget by setting out our demographic, economic, and budgetary assumptions. In Sect. 3.4, these will be fed into our projection model of government revenues and expenditures from 2010 to 2056, which will allow fiscal sustainability to be judged.

3.3.1 Demographic Assumptions

In a previous paper (Godbout et al. 2007), we provided an assessment of the consequences of the demographic transition on Quebec's public finances over the next 50 years. Two main results stood out: (1) health will consume an ever-increasing share of public spending, and (2) budget deficits will appear in 2013 and grow continuously until 2051.

After that, the Statistical Institute of Quebec published a new demographic reference scenario projecting the population until 2056 (ISQ 2009). Instead of projecting an absolute decline in the population beginning in 2031 as in the

[4] Although it has broad intergenerational consequences, the approach of Blanchard et al. (1990) is mainly concerned with fiscal sustainability in a macroeconomic sense. It differs from Kotlikoff's (1992) generational accounting framework, which proposes a cohort-by-cohort microeconomic analysis of tax payments and transfer receipts over the life cycle.

Table 3.1 Quebec's population by age group. Real data for 1971 and ISQ reference scenario for 2010 and 2056

				Variations			
				1971–2010		2010–2056	
Age group	1971	2010	2056	Abs	%	Abs	%
0–14	1,799,614	1,233,555	1,334,798	−566,059	−31.5	101,243	8.2
15–64	3,919,243	5,436,459	5,294,848	1,517,216	38.7	−141,611	−2.6
65+	418,448	1,210,910	2,583,179	792,462	189.4	1,372,269	113.3
Total	6,137,305	7,880,924	9,212,825	1,743,619	28.4	1,331,901	16.9

Sources: ISQ (2009) and Statistics Canada (2011), Table 051-0001

previous exercise (ISQ 2003), the new scenario suggests that the population will continue to grow until 2056, due to increases in assumed fertility, net migration, and life expectancy. As reported in Table 3.1, Quebec's population is now expected to grow from 7.9 million in 2010 to 9.2 million people in 2056, instead of declining to 7.8 million by 2051 as in the earlier projection.

A closer look at Table 3.1 reveals that the population increase will be concentrated in the 65-and-over age group. The latter is projected to rise from 1.2 to 2.6 million people between 2010 and 2056, that is, from 15% to almost 28% of the total population. Conversely, the size of the 0–64 population is set to remain almost unchanged.

The 15–64 adult population, which had always increased in previous decades (from 3.9 million in 1971 to 5.4 million in 2010), is now projected to decline somewhat in the next 46 years. Since this group is the main contributor to the labour force and economic activity, its shrinking in absolute and relative terms will not be without consequences on economic growth and government revenues. This trend in Quebec will likely be unique in North America. While the ISQ reference scenario sets the 15–64 population to decline by 3.3% between 2010 and 2030, the same age group is projected to increase by 5.6% in the other Canadian provinces and by 10% in the United States, in the same period.[5] As a result of this ISQ scenario, Quebec's old-age dependency ratio (P_{65+}/P_{15-64}) would increase by 20 percentage points over the next two decades (to 42.4% in 2030 from 22.3% in 2010). It would turn out to be the largest increase in the dependency ratio among the G7 countries, for which the second largest increase projected by the United Nations (UN 2008) would be 17.7 points in Japan. The Quebec situation is compounded by the fact that Quebec workers retire earlier than other North Americans: in 2007, the average retirement age was 59.9 years in Quebec, 61.6 years in Canada, and 64 years in the United States.[6]

[5] Sources: Statistics Canada (2011), Table 052-0004; US Census Bureau, Population Division.

[6] Sources: Statistics Canada (2011), Table 282-0051, ISQ and OECD.

Table 3.2 Change in the components of economic growth, Quebec 1981–2008 (annual rates of growth)

(1)	Population	0.75
(2)	Employment rate	0.29
(3)	Labor productivity	0.96
(4) = (1 + 2 + 3)	Real GDP	2.00

Source: Statistics Canada (2011) and author's calculations

3.3.2 Economic Assumptions

In the last quarter of a century (from 1981 to 2008), net of inflation, the real annual economic growth in Quebec averaged 2.0% (Table 3.2). This growth is attributable in almost equal measure to, on the one hand, the change in hours worked arising from the juxtaposition of population growth and the rise in employment rates[7] and, on the other, the change in productivity per hour worked.

Since the change in the population aged 15–64 (pool of potential workers), the employment rate, and productivity are the three factors that determine the rate of economic growth, assumptions on how they change over time are fundamental.

3.3.2.1 Population

In this analysis, we use as a reference demographic scenario the one provided by the Statistical Institute of Quebec (ISQ 2009: 20). Here are its most important assumptions:

(a) Life expectancy will reach 85.5 years for men and 89.0 years for women in 2051.
(b) The total fertility rate will be of 1.65 as of 2013 (and constant afterwards).
(c) There will be a net migration of 30,000 people as of 2015 (and constant afterwards).

While economic growth in the past quarter century was boosted by a marked increase in the population aged 15–64, the reference demographic scenario points instead to a decline in this age group, both in the first part of the projection (between 2010 and 2030) and in the second part (between 2030 and 2050).

3.3.2.2 Productivity

The annual growth rate of labour productivity (per hour worked) in Quebec was 0.96% on average from 1981 to 2008, while the average between 2000 and 2008 amounts to 1%. In our baseline scenario, we will make it grow linearly from 1% to 1.5% in 2031, at which point the annual rate increase will remain constant.

[7] The employment rate is defined here as the total number of hours worked in a year, per capita.

Table 3.3 Assumptions about employment rates by sex and age group, Quebec, 2005 and 2031

	2005		2031 and on	
Age group	Men	Woman	Men	Woman
15–19	40.0	44.4	46.0	46.0
20–24	70.1	72.6	73.0	73.0
25–29	81.5	74.9	85.0	82.0
30–34	83.7	77.9	90.0	86.0
35–39	84.1	76.2	90.0	86.0
40–44	84.3	77.7	90.0	86.0
45–49	85.7	78.1	90.0	86.0
50–54	81.1	71.4	86.0	82.0
55–59	67.6	48.6	75.0	65.0
60–64	43.5	26.1	55.0	45.0
65–69	16.0	9.2	28.0	17.0
70–79	5.1	2.0	9.0	4.0
80+	0.0	0.0	0.0	0.0
		2006	*2036*	*2056*
Global employment rate		59.3	55.3	53.7

Sources: Table 282-0002 (Statistics Canada 2011), ISQ (2009) and author's computations

A large literature has explored possible feedbacks from demographic change to productivity but so far remains inconclusive at the macroeconomic level (e.g. Feyrer 2007). This is why we have chosen to treat productivity growth as an exogenous factor, unreactive to demographic change.

3.3.2.3 Employment Rate

Turning to the labour market, the employment rates of almost all age groups have risen since the 1970s. It seems plausible that in most cases, they will continue to rise since Quebec might be catching up with its neighbouring economies and, notably, Ontario.

Based on a detailed analysis of rates by age group and sex, we assume that our employment rates will rise linearly over a period of 25 years to reach those of Ontario and will remain constant afterwards. This is not unreasonable; for example, the employment rates among older women have made an amazing leap in the last 25 years, and, in 2009, women aged between 25 and 44 had an employment rate of 80% whereas only 20 years ago it was less than two-thirds.

Table 3.3 describes these assumptions. The bottom line indicates the overall (weighted) employment rate for the population aged 15 or over. It can be seen that, despite increases in the employment rate for each age category, the ageing of the population will nonetheless reduce the employment rate for the total population because the effect of the increase in the population aged 65 or over, whose employment rates are low or zero, is dominant.

Fig. 3.1 Index of real GDP with or without improvement in employment and productivity growth rates, 2006 index = 100 (Source: Author's calculations)

3.3.2.4 Inflation

Since the 1990s, the Bank of Canada's inflation target has been 2%. This target will be revised in 2011, but we do not anticipate any change to a policy that has been in effect for 15 years now. This target will be used as part of our projections.

To illustrate the expected impact of our assumptions, Fig. 3.1 shows the possible evolution of the real GDP, both in the baseline scenario and in an alternative scenario that holds employment rates and productivity growth rates constant. This shows the sensitivity of our economic assumptions: without any improvement in them, the real GDP would be 59% lower in 2056.

3.3.3 Budgetary Assumptions

3.3.3.1 Health

Each year, the Canadian Institute for Health Information (CIHI 2009) publishes data on average per capita health spending by age group, which, not surprisingly, increased with age both in 2007 (Table 3.4) and in previous years (not shown here). With the traditional projection method of health expenses, population ageing, with its increase in the relative weight of older age groups, has an upward effect on health spending.[8] The projection of public health spending applies the foreseen demographic structure to per capita spending by age and sex as observed in the recent past. It then submits the result to an annual rate of increase in real per capita spending, which is of 1.7% in this case. This projected increase attempts to incorporate both technological advances and growth in demand.

3.3.3.2 Education and Childcare Services

The method used to project education and childcare services expenditures is similar to the one used for health expenditures. The foreseen young population is applied to

[8] Section 3.6, however, will also consider an alternative approach, by which health expenses depend instead on how close to death each person is.

Table 3.4 Per capita health spending by the Quebec government by age group and sex, 2007 (Canadian dollars)

Age group	Total	Woman	Men
<1	5,771	5,380	6,143
1–4	1,019	986	1,050
5–9	944	905	981
10–14	813	806	819
15–19	988	1,067	912
20–24	1,246	1,468	1,034
25–29	1,359	1,718	1,014
30–34	1,314	1,709	940
35–39	1,460	1,632	1,295
40–44	1,509	1,546	1,473
45–49	1,678	1,705	1,650
50–54	2,062	2,024	2,100
55–59	2,620	2,465	2,781
60–64	3,131	2,925	3,348
65–69	4,880	4,593	5,189
70–74	7,454	7,139	7,822
75–79	10,659	10,401	10,998
80–84	13,552	13,726	13,269
85–89	24,148	25,516	21,244
90+	23,207	23,085	23,613
All ages	*2,840*	*3,142*	*2,533*

Source: CIHI (2009)

recently recorded spending per child, per pupil, and per student, and the result is increased by an estimate of the annual growth in real per capita spending that varies with the group.

3.3.3.3 Other Spending

Under our projection, other budgetary expenditures rise at the same pace as the nominal GDP.

3.3.3.4 Debt

The Quebec government debt contracted to acquire assets (fixed assets, investments in government corporations, etc.) is the primary debt. Between 1998 and 2005, an annual average of about 1% of GDP was devoted to such acquisitions of assets. This rate of increase of the debt is maintained, in our assumptions, until 2056. We assume an average annual interest rate of 6.3%.

3.3.3.5 Pension Plans

The net taxation of pension plans is the balance of taxes levied on withdrawals from registered retirement savings plans (RRSP) and registered pension plans (RPP) less

tax deductions granted on contributions to these plans. The analysis takes explicit account of the fact that the ageing population increases withdrawals faster than contributions, thereby enhancing the yield of income tax. These effects are calculated in the same way as health-care expenses. We project expenses by age, to find out the average net contribution/deduction by age. We then assume that this distribution by age is stationary over time.

3.3.3.6 Own-Source Revenue and Federal Transfers

Except for the tax treatment of retirement plans, we assume that the government's own-source revenues (taxes, fees, and revenues of government corporations) and federal transfers are proportional to nominal GDP. This implies that own-source revenues and federal transfers grow at the same rate as nominal GDP. We assume that the feedback of the changing age structure of taxpayers on tax revenue is negligible. Indeed, a few simulation tests of this assumption, which we based on Quebec tax statistics for the year 2008 (Finances Quebec 2010), suggest that it is consistent with the current tax structure.

The demographic transition is taken into account in the projection of economic growth and the budgetary balance. We keep government revenue constant in proportion to GDP, but we allow spending to increase because of the changes in the age structure of the population. In this way, we can assess whether the budgetary sustainability of public finances will be maintained in time and whether intergenerational equity will be safeguarded. A lack of budgetary sustainability would mean either of the following:

(a) That future generations will be in deficit, if they want to have the same public services at a comparable level of taxation
(b) That to keep the budget balanced, they will have to accept fewer public services for a comparable level of taxation
(c) That they will have to increase taxation to maintain the same public services

3.4 Projection Results and Implications

Based on the economic and budgetary assumptions described above, Table 3.5 shows our baseline scenario and makes it possible to assess the budgetary sustainability of public finances.

Our assumptions lean towards optimism on the revenues side, while they are unclear on the expenses side. Productivity growth gradually accelerates, and employment rates rise for all age categories. Health-related spending increases more slowly than during the period 1997–2010, expenditures in education and childcare services rise at a slower pace than GDP, and other current spending remains stable as a percentage of GDP.

Table 3.5 Quebec's budget in our baseline scenario (millions of Canadian dollars, unless otherwise indicated)

	2016	2026	2036	2046	2056	*g*
Revenues						
Autonomous revenues (excl. retirement plans)	74,068	105,551	152,639	216,516	305,215	3.6
Tax from retirement plans	363	1,723	3,288	5,445	8,180	–
Federal transfers	16,821	23,971	34,666	49,172	69,317	3.6
Total revenues	*91,252*	*131,245*	*190,593*	*271,133*	*382,712*	3.6
Expenses						
Health care	39,057	68,004	115,595	181,705	268,032	4.9
Education	15,644	20,915	27,604	36,144	48,227	2.9
Kindergarten services	2,200	2,625	3,051	3,936	4,753	1.9
Interest on debt	9,869	13,073	17,703	24,317	33,641	3.1
Other expenses	27,281	38,877	56,220	79,747	112,417	3.6
Total expenses	*94,051*	*143,494*	*220,174*	*325,849*	*467,070*	4.1
Budget balance	*(2,799)*	*(12,248)*	*(29,581)*	*(54,717)*	*(84,358)*	
GDP	417,350	594,748	860,079	1,220,004	1,719,802	3.6
Deficit/GDP (%)	0.7	2.1	3.4	4.5	4.9	

Source: Author's calculations

g Average yearly growth rate, 2016–2056

Note 1: The debt service shown here is the service on the primary debt. It is equal to the interest expense on debt incurred to acquire assets (fixed assets, investments in government corporations, etc.) only. This excludes interest payable on the debt that would accumulate because of forecast chronic deficits if the baseline scenario were to materialise

Note 2: In accordance with the definition of service on the primary debt, the budgetary balance shown here is the primary budgetary balance. It does not include interest payable on the debt that would accumulate because of forecast chronic deficits if the baseline scenario were to materialise

Note 3: Traditionally, public finance data are presented in current rather than constant dollars. The authors opted for this presentation. Obviously, the ratios, such as the deficit/GDP, remain the same as the data are presented in current or constant dollars. The same result would occur for health spending. In current dollars, health expenditures in 2056 represent 15.6% of GDP ($ 268,032/$ 1,719,802). In constant dollars, health expenditures in 2056 represent 15.6% of GDP ($ 97,628/$ 626,426)

Nonetheless, on the whole, economic growth slows markedly. Real GDP growth (nominal economic growth minus inflation, 2% per year in this scenario) averages 1.6% from 2010 to 2056, compared with an annual average of 2.0% from 1981 to 2008.

This expected slowdown in economic growth combined with the pressures of demographic change and the growth rate of expenses undermines budgetary sustainability. In particular, the growth in health spending fuels the overall growth in public spending at a faster pace than economic growth.

The second feature of the projection is that it shows a rapid accumulation of ever larger deficits over time. These deficits reach 4.9% of GDP in 2056. Furthermore, it should be noted that the primary budgetary balance shown in Table 3.5 voluntarily excludes interest payable on debt that would accumulate as a result of the forecast chronic deficits if the baseline scenario were to materialise. Indeed, the debt service

shown in the table represents only the interest expense on the debt contracted to acquire assets. But, ultimately, what matters is the debt-GDP ratio. Thus, the current budgetary policy could not be maintained indefinitely. Inevitably, changes in budgetary orientations, consisting of tax increases or spending cuts or both, would be needed to avoid a continual increase in debt as a percentage of GDP.

3.4.1 Intergenerational Equity

The analysis of budgetary sustainability makes it possible to introduce the notion of intergenerational equity. For the analysis of intergenerational equity, it should be noted that the present value of the forecast budget deficits from 2010 to 2056, under the assumptions of our baseline scenario, would amount to $193.5 billion.

Obviously, there has been no reserve set up to provide for this amount. On this basis, to restore intergenerational equity, the approach is to determine the amount by which taxes and fees would have to be raised by a constant and uniform percentage from now until 2056. These new tax revenues would be set aside in a fund to accumulate with interest over a certain time and then spent at a later date for the benefit of future generations. Accordingly, what would be needed is to set up a 'demographic fund' whose disbursement terms would depend on pre-established demographic parameters.

From 2010 to 2056, the increase in tax revenues required by this approach would be equal to 2.2% of GDP. This is a considerable amount.

3.5 Sensitivity Analysis

Based on the demographic scenarios of the ISQ, five determinants of the sustainability of public finances relating to the demographic transition will be studied. They are the change in population in connection with fertility, net migration and life expectancy, employment, and productivity rates. We will go over the assumptions made regarding each of these determinants one at a time so as to measure budgetary sensitivity to these assumptions.

3.5.1 Fertility

Higher fertility affects total population projections. For instance, using a total fertility rate (TFR) of 1.85 children per woman, rather than 1.65 as used in the ISQ reference scenario, the population would rise from 9.2 million to 9.8 million in 2056. From now to 2031, this increased fertility would raise the number of births per year by roughly 10,000.

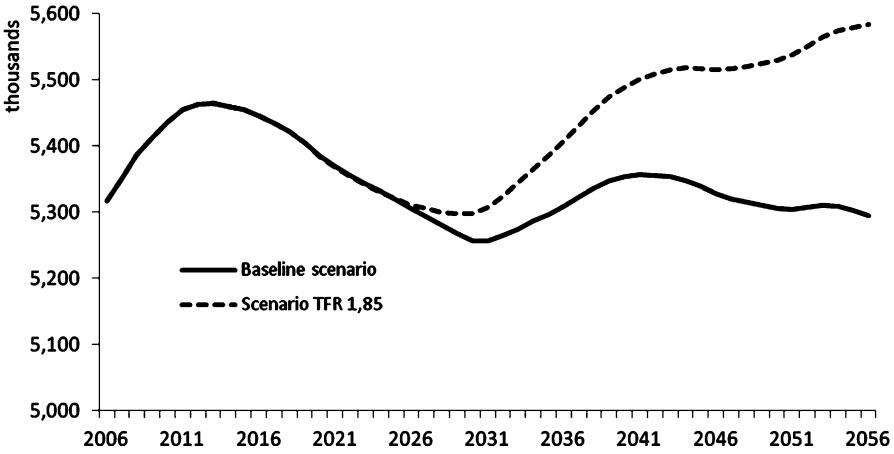

Fig. 3.2 Effect of higher fertility on the pool of workers, Quebec, 2006–2056 (Source: Author's calculations)

Greater fertility does not have an immediate positive effect on public finances. Initially, it even has the opposite effect: it increases pressure on spending, particularly for public childcare and education. The impact thus takes longer to be felt on revenues, which flow through the economy. Ultimately, the impact will be experienced through an increase in the pool of potential workers (population age 15–64). Figure 3.2 shows that using a TFR of 1.85 instead of 1.65 would gradually increase the population age 15–64 years starting in the mid-2020s, eventually offsetting the decrease of this population group that emerges from the baseline scenario.

3.5.2 Net Migration

A change in net migration also has an effect on the projections of population of working age. The effect of net migration on the expected change in the pool of potential workers is important. Figure 3.3 shows the effect on the pool of potential workers in this scenario (no net migration) as compared with the baseline (a yearly influx of 30,000 people). If net migration were zero rather than 30,000 people per year, the number of adults would drop to 3.9 million in 2056 rather than stay at 5.3 million.

3.5.3 Life Expectancy

The third main assumption of the ISQ reference demographic scenario concerns life expectancy. The ISQ assumes that life expectancy will improve to 85.5 years for men and 89.0 years for women in 2051. Figure 3.4 illustrates the effect of this

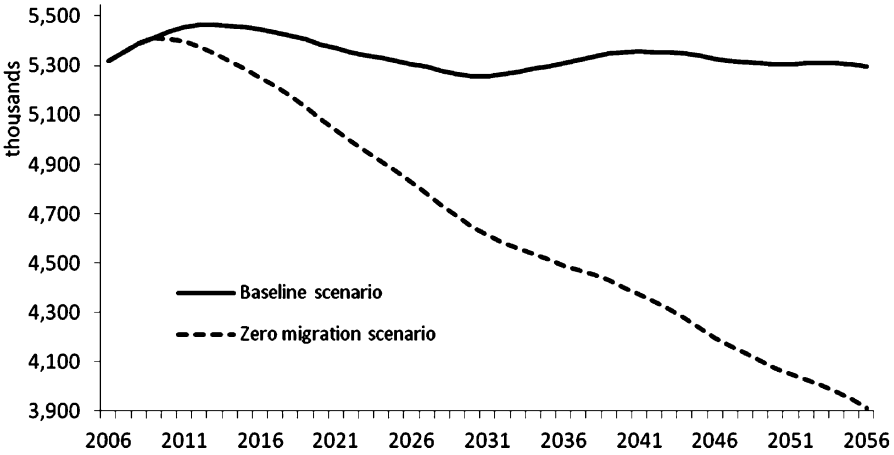

Fig. 3.3 Effect of migration on the pool of potential workers, Quebec, 2006–2056 (Source: Author's calculations)

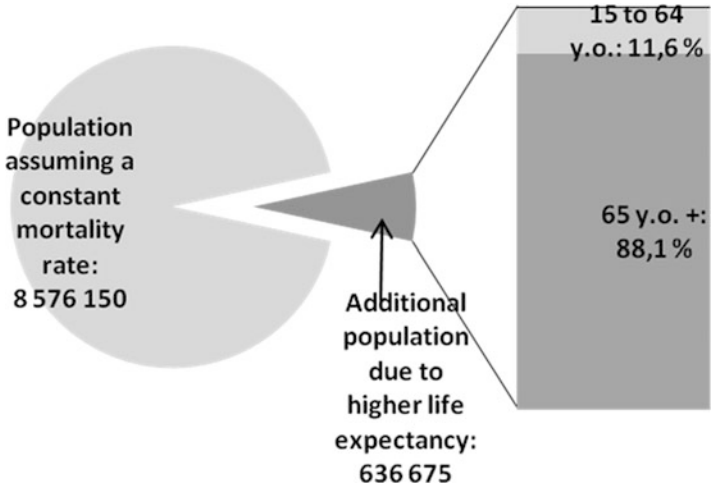

Fig. 3.4 Distribution of the additional population arising from the expected improvement in life expectancy compared to holding life expectancy constant, Quebec, 2056 (Source: Author's calculations)

assumption on Quebec's population by comparing the results with the baseline (constant life expectancy). The lengthening of life expectancy increases population projections by 637,000 people in 2056, but these are primarily the elderly: 88% of this difference would be due to people aged 65 and over.

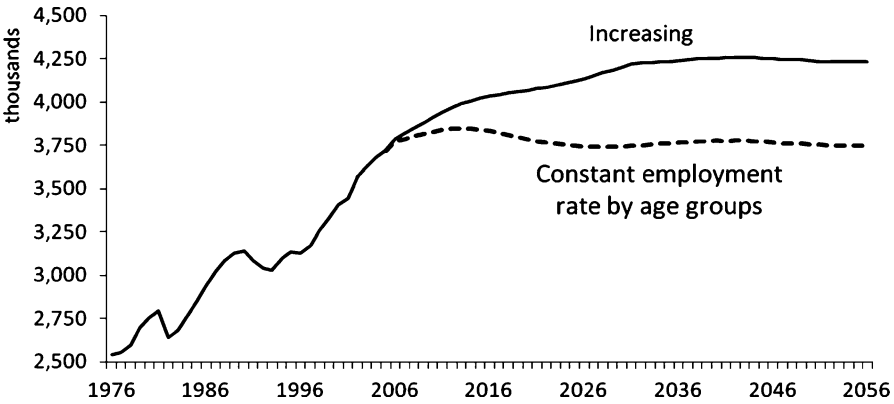

Fig. 3.5 Employed persons in Quebec, in two scenarios (1976–2056) (Source: Author's calculations)

3.5.4 Employment Rates

Figure 3.5 shows the effect of the assumption of a rise in employment rates in comparison with a scenario where they remain unchanged. Without growth in employment rates, the change in the structure of the population would cause the number of jobs to start declining in 2014. The growth in employment rates increases the forecasted number of jobs by 483,000, or 13%, in 2056.

3.5.5 Productivity

The other change in economic assumptions concerns the improvement of the productivity growth rate. Figure 3.6 shows the change in real GDP per job when the productivity growth rate rises from 1.0% to 1.5% by 2031 and then remains constant rather than holding it steady at 1.0% for the entire period. This assumption of an improvement in productivity growth alone raises expected real GDP per job by 19% in 2056.

Obviously, the projection of the sustainability of public finances varies according to changes in economic and budgetary assumptions. The sensitivity analysis, summarised in Table 3.6, measures the effect of these changes.

A change in the assumption on fertility initially affects spending, in particular through increased public spending on education and childcare. Next, the increase in population of working age will have a positive effect on economic activity and government revenues. However, the effect on the ratio of deficit/GDP over the period extending until 2056 remains limited. The ratio would be 5.0% with a lower fertility and 4.7% with a higher fertility. Only in the longer term will the increasing

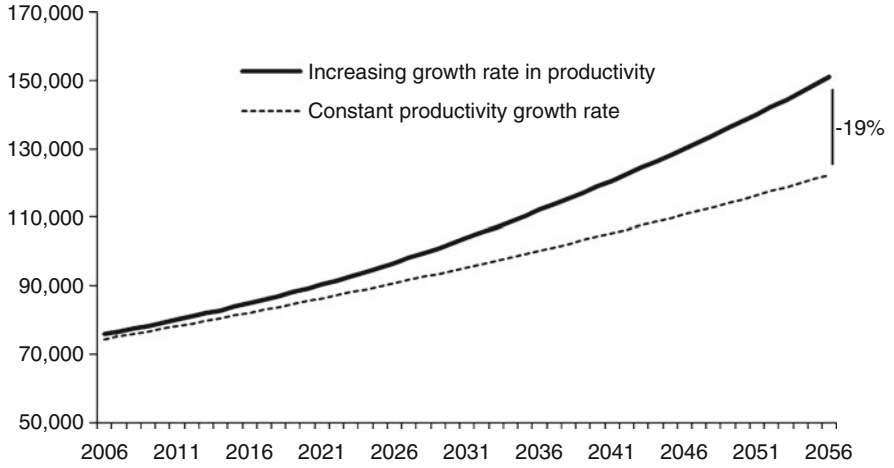

Fig. 3.6 Real GDP per employed, in two scenarios (Source: Author's calculations)

Table 3.6 Effects of changes in assumptions on the determinants of the sustainability of public finances – the budgetary balance as a proportion of GDP

Factor	Hypothesis	Deficit/GDP in 2056 (%)
Fertility	TFR: 1.65 (baseline)	−4.9
	TFR: 1.45	−5.0
	TFR: 1.85	−4.7
Net migration	30,000 (baseline)	−4.9
	15,000	−6.3
	45,000	−3.5
Life expectancy	Man 85.5 and woman 89.0 (baseline)	−4.9
	Constant life expectancy	−2.1
Interest rate	6.3% (baseline)	−4.9
	5.3–1% less	−4.6
	7.3–1% more	−5.2
Employment rate	Increasing employment rate (baseline)	−4.9
	Constant employment rate	−7.3
Productivity	Linear increase in the productivity growth rate from 1% to 1.5% in 2031 and constant afterwards (baseline)	−4.9
	Constant productivity growth rate	−9.1

Source: Author's calculations

effects of a higher birth rate on the number of people aged 15–64 have positive effects on budgetary sustainability.

Migration also has a significant effect on budgetary sustainability, particularly as regards economic activity and government revenue. The effect on the deficit as a proportion of GDP of moving from net migration of 30,000 people as in the ISQ

reference scenario to 45,000 people would lead to a reduction in the deficit as a proportion of GDP from 4.9% to 3.5% by 2056.[9]

Improving life expectancy increases the projected deficit as a proportion of GDP in 2056 from 2.1% to 4.9%. A comparison with the effect of changes in fertility or net migration shows that the population component has the greatest influence on budgetary sustainability. The increased number of people age 65 or over has a direct effect on health spending.

A change in the assumption of 100 points (i.e. 1%) on interest rates would affect the baseline ratio of deficit/GDP of 4.9% by ±0.3%, thus ranging from −4.6% with a lower interest rate to −5.2% with a higher interest rate.

The effect of an improvement in employment rates is significant. The forecast deficit as a proportion of GDP of 4.9% in 2056 would be 7.3% without any increase in employment rates.

Budgetary sustainability is also sensitive to the assumption on productivity growth. The forecasted ratio of deficit/GDP of 4.9% in 2056 would be 9.1% without any improvement in the productivity growth rate.

3.6 Alternative Assumptions for Projection of Health Expenditures

The analysis has shown that improved life expectancy has a significant effect on budgetary sustainability, by increasing the deficit as a proportion of GDP in 2056 from 2.1% to 4.9%. According to our baseline scenario, the increased number of people aged 65 or over together with gains in life expectancy adds 0.6% to the average annual rate of increase of health spending (4.9% versus 4.3%).

In the Quebec government's budget, health spending accounted for more than 40% of total budgetary expenditure in 2010. However, under our baseline scenario, this proportion will increase to more than 57% in 2056. The assumptions used to project its growth are therefore crucial.

In a context where life expectancy rises, a simple proportional projection of health spending based on data by age and sex, which assumes a stationary distribution of health expenses, could lead to an overestimation of future health spending. Zweifel et al. (1999) and Serup-Hansen et al. (2002) have sought to clarify this issue. By breaking down health spending into 'ordinary' spending and spending at the end of life, they show that the size of morbidity expenditure is greater than expenditures by age group as such.

To compare our assumptions and the potential effects of increased life expectancy in the projection of health spending, we can consider an exploratory health

[9] The model applies the same employment and productivity rates for people joining the pool of potential workers regardless of their origin.

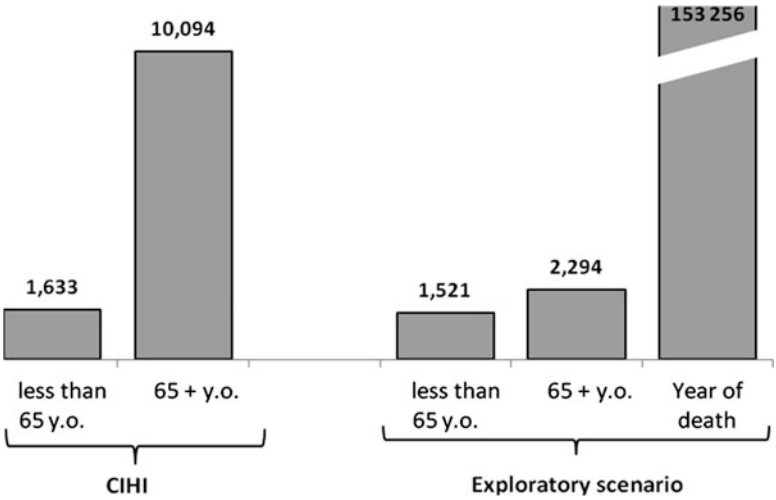

Fig. 3.7 Health-care costs at the beginning of projection (dollars) – exploratory health scenario (Sources: CIHI 2009; Pollock 2001, and author's calculations)

scenario based on the only Canadian study available (Pollock 2001), whose approach is similar to that of Zweifel et al. (1999). The analysis is based on the assumption that the link between increasing age and increasing health spending can at least in part be explained by the fact that health expenditures tend to be relatively small and distributed fairly evenly up to the final stages of life (last year or last 2 years), when spending rises substantially, regardless of the person's age. Since the probability of being in the last year of life increases with age, for the population as a whole health costs are higher at higher ages. But this tendency is lessened when life expectancy increases because these costs are deferred to a later time.

Using Canadian data, Pollock determines average costs by age according to sex of $362 and $430 for men and women under age 65 compared with $666 and $545 when they are 65 or over. For all ages, the cost of death was $29,181 for men and $50,956 for women.

To estimate the scope of this approach on our projection of health spending and its impact on budgetary sustainability, Pollock's costs by age and year of death were scaled so as to obtain the same overall cost of health in Quebec as given by the Canadian Institute for Health Information (CIHI). On this basis, Fig. 3.7 compares health costs by age and sex according to the CIHI data and our exploratory health scenario. Given the higher proportion of deaths among people age 65 or over, there was a sharp decrease in the cost, for those who are not in their last year of life, using the exploratory health method.

To test the effect of using either method of projecting health-care costs, the first step is to project health spending in a demographic framework leaving life expectancy unchanged. Figure 3.8 confirms that in the absence of improvement in life expectancy, health spending, whether using the baseline scenario

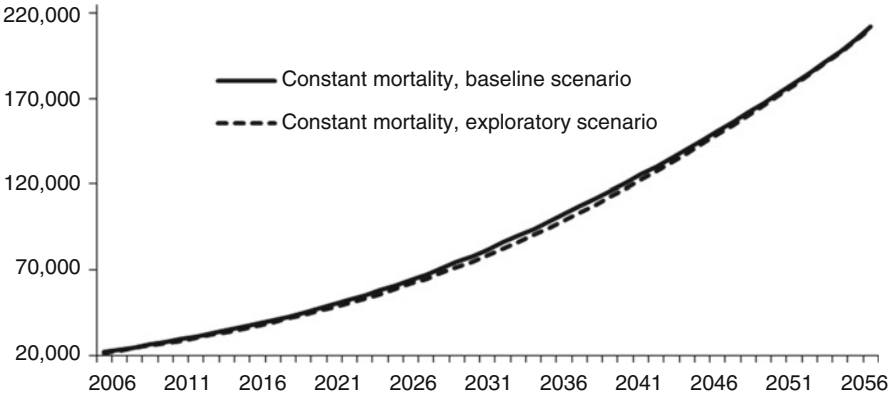

Fig. 3.8 Health spending according to the baseline scenario and the exploratory health scenario at constant mortality (Quebec, 2006–2056, million dollars) (Source: Author's calculations)

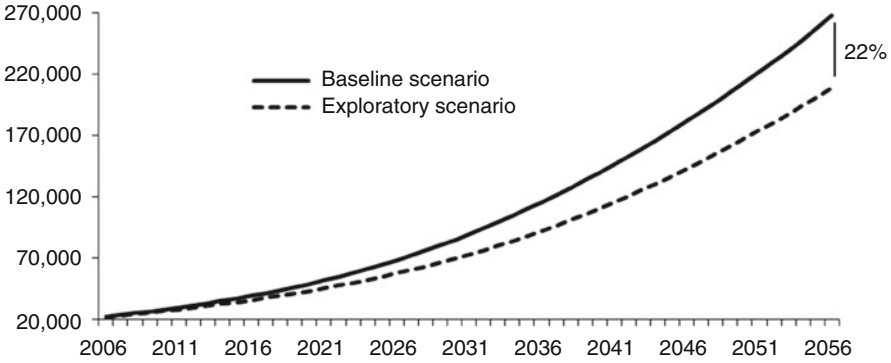

Fig. 3.9 Health spending according to the baseline scenario and the exploratory health scenario (millions of dollars) (Source: Author's calculations)

relying on CIHI data or those of the exploratory health scenario, follows the same trajectory until 2056.

By applying the exploratory health scenario to the reference demographic framework, where longer life expectancy is anticipated, predicted health spending is lower than with the baseline scenario (with CIHI data). In the baseline, costs increase as life expectancy lengthens because there are more elderly to care for. Figure 3.9 shows that growth in projected health spending differs depending on the scenario. In 2056, the difference reaches 22%. The average annual growth rate of health spending over the projection period would decline from 5.0% to 4.6% with the exploratory health scenario, and in 2056, the deficit/GDP ratio would drop to 1.4% instead of 4.9% in the baseline scenario (Fig. 3.10).

However, this figure fails to show that, by assumption, these expenses are not saved: merely deferred to after 2056. Thus, if the exploratory health scenario is a

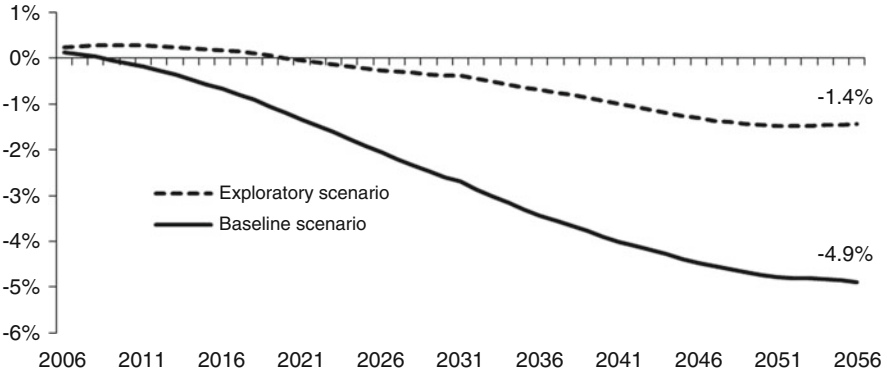

Fig. 3.10 Effect on the budgetary balance as a proportion of GDP of a change in the assumption on health costs (Source: Author's calculations)

better representation of how the expenses are made, the problem of budgetary sustainability needs to be evaluated over a longer period of time. Since these costs would be deferred beyond our projection horizon (2056), it is impossible for us to determine whether this alternative improves or worsens the financial sustainability of the government in the long run.

We note that choosing one method or the other is not without consequences on the determination of budgetary sustainability. The crucial difference lies therefore in the variations in spending due to longer life expectancy, combined with the demographic structure of the population. If life expectancy rises, per capita health costs calculated with CIHI data for elderly groups implicitly take into account current mortality rates, which are higher than in the future. For example, take those of age 75–79, where the number of deaths will decline by almost 9% from an estimate of nearly 8,100 in 2006 to <7,400 in 2056, even though the population of this age group will have risen from 225,000 to 446,000. Without the increase in life expectancy, the number of deaths would instead reach almost 15,000 in 2056.

Knowing the assumption of longer life expectancy projected in the ISQ population scenario, it is doubtless reasonable to indicate that the CIHI data overstate health spending over the projection period while the exploratory health method (Pollock) defers part of this spending to a later date.

Note, however, that the latter approach is not necessarily closer to reality than the standard one. Moreover, since Pollock's estimated results are only briefly presented in a government report, it is difficult to assess their robustness. Indeed, some scholars believe that this approach could result in overstating the expenses at the end of life (e.g. Hogan and Hogan 2002). Scitovsky (1994), for instance, estimates that end-of-life spending in the United States is 4–11 times higher than health spending unrelated to the final year. But, in some cases, the estimate of the exploratory health scenario becomes 100 times as high. In addition, in Europe and North America, Stooker et al. (2001) and Emmanuel (1996) have estimated that end-of-life spending represents roughly 10–12% of total health spending. But when

the exploratory health scenario is applied in 2006, end-of-life health spending represents 40% of total health spending.

Although the results obtained with the exploratory health scenario are far from being proven, they nevertheless show the importance of further analysis of health costs by age and sex according to whether or not the main costs occur in the last year of life.

3.7 Conclusion

The projection of the sustainability of Quebec's public finances, developed using a series of relatively optimistic assumptions, with improvements in employment and productivity, reveals a problem of budgetary sustainability in the medium and long term. Sensitivity analysis exposes the importance not only of the assumptions on these economic variables but also of the main population parameters: an increase in fertility turns out to be positive only in the very long term, or outside the period of analysis; an increase in net migration has a greater impact during the observation period; and improvements in life expectancy tend to exacerbate the problem of budgetary sustainability, except if they come along with improvements in health conditions and, therefore, lower health-related expenses at each age.

Indeed, the discussion surrounding the projection of health spending, the government's largest expenditure item and a variable greatly influenced by the demographic transition, shows that the choice of a method distinguishing whether or not health-care costs occur mainly in the last year of life profoundly affects the determination of budgetary sustainability. The crucial difference lies in the variations in health spending due to longer life expectancy, combined with the demographic structure of the population. Although the results obtained under the exploratory scenario are still far from being proven, they nevertheless show the importance of further analysis of how health costs are actually determined.

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