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4 An International Comparison of Generational Accounts

Laurence J. Kotlikoff and Willi Leibfritz

Generational angst—the fear that we are bequeathing enormous fiscal bills to our children—is global, affecting countries as diverse as Japan and Brazil. The angst is rooted in three facts. First, the affected countries have spent decades accumulating large official liabilities. Second, they have spent the same time accumulating even larger unofficial liabilities. And third, they are aging quite rapidly, leaving relatively few workers to pay the government's bills. Generational accounting, as we have seen, helps countries confront, although not necessarily allay, their generational anxieties. It spells out how much each generation will pay under different policy scenarios, including trying to maintain the status quo.

For most of the 17 countries considered in this book, generational accounting's message is highly unpleasant. The reason is that most of these countries are running fiscal policies that if left unchanged will sentence their children to sky-high rates of net taxation. This chapter documents this contention. It compares the countries' generational accounts, the role of demographics in producing their generational imbalances, and the policies they could adopt to achieve generational balance—a situation in which future generations face the same lifetime net tax rates as current newborns. In drawing these comparisons, this chapter provides an overview of each country's generational policy. But it leaves to each country chapter the task of describing recent fiscal events, discussing the generational impacts of past and pending fiscal actions, and identifying data sources underlying the generational accounts.

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4.1 Methodology and Assumptions

As detailed in chapter 3, generational accounts are defined as the present value of taxes paid minus transfer payments received (net taxes) that individuals of different annual cohorts (generations) pay on average over their remaining lifetimes. The accounts consider only future net taxes; that is, they do not include taxes that have been paid or any transfers that have been received before the base year. Thus among living generations only the newborn generation (the generation born in the base year) has a generational account consisting of its entire lifetime net tax payments, measured in present value.

Generational accounts are based on the government's intertemporal budget constraint, which implies that the sum of future government consumption spending has to be equal to the sum of all future net taxes (taxes minus transfers all in present value terms) plus current government net wealth. The imbalance in existing generational policy is calculated by assuming that future generations (those born after the base year) pay, in the form of net taxes, all of the government's bills left unpaid by current generations. This assumption ensures that the difference between generational accounts of the newborn generation and generational accounts of future generations reflects the policy adjustment required to satisfy the government's intertemporal budget constraint.

If future generations face, on a growth-adjusted basis, a higher lifetime net tax burden than do current newborns, current policy is neither sustainable nor generationally balanced. The same is true if future generations face a smaller growth-adjusted lifetime net tax burden than do current newborns. However, in this case, generational balance can be achieved by reducing the fiscal burden facing current generations rather than the other way around. The calculation of the extent of generational imbalance is an informative counterfactual—not a likely policy scenario. Hence, we also entertain alternative means of achieving generational balance that do not involve foisting all the adjustment on future generations.

Generational accounting depends on various assumptions, in particular about future economic developments and demographic trends. In the base-case generational accounts presented here, labor productivity is assumed to grow at 1.5 percent per year and all future flows of real taxes and real transfer payments are discounted at a 5 percent real rate. We also present results for higher and lower productivity growth and discount rates.[1] Demographic projections are generally taken from national sources. The base-case fiscal policy considered is that prevailing at the time of the writing of the respective chapters, 1996 and

1. The calculations are also carried out for 1 percent and 2 percent productivity growth. Labor productivity increased on average in OECD member countries by 1.8 percent during the 1980s and by 1 percent during the first half of the 1990s. There are different views about how aging of populations affects productivity. Some argue that aging slows technical progress as innovation is less profitable in shrinking markets and as the aging society loses "dynamism" (Simon 1981;

the first half of 1997. The authors who wrote these chapters chose the data to be used in their accounts. They also produced their accounts themselves, using, in most cases, the original generational accounting software package developed by Alan Auerbach, Jagadeesh Gokhale, and Laurence Kotlikoff.

In the first incarnations of generational accounting, educational expenditure was treated as a government purchase rather than as a transfer payment to those on whose behalf the expenditure is made. This treatment followed the classification of educational expenditures of the U.S. National Income and Product Accounts. To maintain comparability with previous work, we present generational accounts treating educational expenditure both as a government purchase (case A) and as transfer payments (case B).

4.2 The Demographic Transition

Table 4.1 considers the demographic trends under way in each of our 17 countries. The first four columns show projected population growth rates for this decade and the next three. The next two columns compare the elderly shares of the population in 1990 and 2030, and the last two columns compare 1990 and 2020 elderly dependency ratios—the ratio of those aged 65 or older to those aged 15 to 64.

In this decade, each country's annual population growth rate is positive. But each is projected to decline dramatically over time. Indeed, in the 2020s, 6 of the 17 countries will experience negative population growth. In Brazil, Argentina, and Thailand population growth is projected to decline from 1 to 1.5 percent per year in the 1990s to 0.6 to 0.7 percent per year after 2020. In the United States, Canada, Australia, and New Zealand, population growth will decline from this decade's rates of 0.9 to 1.2 percent per year to 0.3 to 0.4 percent per year after 2020. Starting at the turn of the century, the German, Italian, and Belgian populations will actually begin to shrink. Thailand, whose elderly currently make up only 4 percent of the population, will have a population that is 11 percent old in 2030.

Of the 17 countries, Germany, Italy, Japan, and the Netherlands will be the oldest in 2030, with over one-quarter of their populations in the ranks of the elderly. In these countries as well as Belgium, there will be over 4 oldsters for every 10 workers (working-age persons). In Germany and Italy, there will be almost 5 oldsters per 10 workers. In another 9 countries—the United States,

Wattenberg 1987), while others find empirical evidence that innovation increases when labor gets scarce (Habakkuk 1962; Cutler et al. 1990).

Discount rates convert projected annual flows into net present values. A higher discount rate would reduce the net present value of future flows compared with a lower discount rate, and the longer the time period under consideration, the greater the sensitivity of the results to the choice of the discount rate. As explained in chapter 2, there are differing views about how to choose an appropriate discount rate for this analysis. The range of discount rates used in this study (3, 5, and 7 percent) encompasses differing interpretations of the appropriate choice of the discount rate and permits sensitivity analysis of the discount rate assumption.

Table 4.1 **Demographic Trends**

Country	Population Growth Rates (% per year)				Elderly Share of the Population[a]		Elderly Dependency Ratio[b]	
	1990–2000	2000–2010	2010–20	2020–30	1990	2030	1990	2030
United States	1.0	0.8	0.6	0.4	12.9	21.9	19.1	36.8
Japan	0.3	0.1	−0.2	−0.3	11.9	26.1	17.1	44.5
Germany	0.2	−0.3	−0.3	−0.4	14.0	28.1	21.7	49.2
Italy	0.0	−0.2	−0.3	−0.4	14.8	27.9	21.6	48.3
Canada	1.2	0.8	0.6	0.3	11.3	23.1	16.7	39.1
Thailand	1.4	1.1	0.8	0.7	3.8	11.0	6.0	16.3
Australia	1.2	0.8	0.5	0.3	10.7	20.3	16.0	33.0
Denmark	0.2	0.0	0.0	−0.1	15.4	22.6	22.7	37.7
Netherlands	0.5	0.1	0.0	−0.1	13.2	26.0	19.1	45.1
New Zealand	0.9	0.6	0.5	0.4	11.1	18.9	16.7	30.5
France	0.5	0.3	0.2	0.1	13.8	23.3	20.9	39.1
Norway	0.5	0.2	0.2	0.2	16.3	23.0	25.2	38.7
Portugal	0.0	0.0	0.0	0.0	13.0	20.9	19.5	33.5
Sweden	0.4	0.2	0.2	0.1	17.8	23.1	27.6	39.4
Argentina	1.0	0.8	0.8	0.6	9.1	13.9	15.0	21.3
Belgium	0.2	−0.1	−0.1	−0.1	15.0	24.3	22.4	41.1
Brazil	1.5	1.2	1.0	0.7	4.7	11.9	7.7	17.8

Source: World Bank, *World Bank Projections* (Washington, D.C., 1994).

[a]Population aged 65 or older as a percentage of total population.

[b]Population aged 65 or older as a percentage of population aged 15 to 64.

Canada, Australia, Denmark, New Zealand, France, Norway, Portugal, and Sweden—there will be between 3 and 4 oldsters per 10 workers. And in Thailand, Argentina, and Brazil, there will be roughly 2 oldsters for every 10 workers.

4.3 Generational Accounts of Living Generations

When people are young, they receive transfers (e.g., child benefits or educational allowances) and pay consumption taxes. During their working lives, they continue to pay consumption taxes but also pay taxes on their labor and capital income in the form of personal income taxes and payroll taxes. The present value of a generation's remaining lifetime net tax payments—its generational account—is generally highest for generations at the beginning of their work spans, as it does not include child and educational benefits received in youth. When workers reach older ages, the sum of future net tax payments tends to decline as future transfer receipts (e.g., pensions) gain in importance compared with future tax payments. Between ages 50 and 60, future transfer receipts generally start to exceed future tax payments so that generational accounts become negative (net transfers). The absolute amount of net transfers declines during retirement as the remaining lifetime shortens.

Table 4.2 shows the generational accounts of each of our 17 countries. Each set of accounts exhibits a hump-shaped pattern with respect to age. This is true whether one considers case A (educational expenditures treated as a government purchase) or case B (educational expenditures treated as a transfer payment). All amounts in this and subsequent tables are expressed in 1995 U.S. dollars.

Although the accounts all rise and then fall with age, the absolute levels of the accounts vary considerably across countries. Much of this variation—for example, the difference between U.S. and Thai accounts—reflects the level of development. But there is great variation even among developed countries. Take case A, and compare the accounts of 40-year-old Germans and those of 40-year-old Swedes. The Swedish age 40 account equals $228,500, which is 43 percent larger than the corresponding $160,100 German age 40 account. The difference between the two accounts reflects the much higher net transfers paid to older Germans compared to older Swedes. Or compare the 70-year-old Norwegian account with the corresponding Japanese account. The Norwegian account is $135,000 smaller than the Japanese account.

These big cross-country differences in the accounts should not obscure their similarities. Take Italy and Canada. Both countries have quite similar accounts through roughly age 25. But beyond this age, the Italians have much smaller accounts than do the Canadians. Or compare the German and French accounts, on the one hand, or the Argentine and Brazilian accounts, on the other. They are quite similar across all ages.

There are four features of the accounts that particularly merit comment.

Table 4.2 **Generational Accounts, 1995 (thousands of 1995 U.S. dollars)**

Generation's Age in 1995	United States		Japan		Germany		Italy		Canada		Thailand	
	A	B	A	B	A	B	A	B	A	B	A	B
0	86.3	28.5	143.4	73.0	165.0	97.1	114.2	68.4	113.8	56.3	8.3	5.9
5	102.0	35.3	169.3	90.9	194.3	123.6	132.9	80.3	130.1	66.4	9.6	6.8
10	121.7	71.4	200.1	135.4	233.8	179.0	154.1	112.4	152.0	99.0	10.9	8.9
15	144.6	115.0	235.9	187.4	287.9	252.2	178.4	158.9	176.9	138.5	12.3	11.3
20	168.7	159.3	278.1	257.4	333.6	313.6	193.5	186.6	199.0	177.0	13.6	13.2
25	175.4	172.7	295.2	295.2	309.7	303.4	184.4	183.7	183.7	193.1	14.2	14.1
30	170.0	168.7	297.8	297.8	271.8	271.8	155.2	155.2	189.1	183.3	14.1	14.1
35	157.5	156.9	287.4	287.4	224.4	224.4	113.5	113.5	165.2	161.1	13.3	13.3
40	135.7	135.6	263.8	263.8	160.1	160.1	63.4	63.4	137.3	134.5	11.8	11.8
45	101.3	101.3	227.7	227.7	94.0	94.0	10.7	10.7	98.9	97.1	10.0	10.0
50	56.4	56.4	173.1	173.1	−4.2	−4.2	−46.8	−46.8	51.8	50.8	8.1	8.1
55	4.0	4.0	99.0	99.0	−98.9	−98.9	−103.1	−103.1	5.8	5.5	6.2	6.2
60	−51.7	−51.7	11.9	11.9	−183.6	−183.6	−142.0	−142.0	−45.3	−44.8	4.8	4.8
65	−96.0	−96.0	−47.7	−47.7	−206.7	−206.7	−138.3	−138.3	−84.7	−83.6	3.7	3.7
70	−104.6	−104.6	−44.8	−44.8	−180.7	−180.7	−117.5	−117.5	−89.1	−87.9	2.8	2.8
75	−101.9	−101.9	−36.0	−36.0	−150.2	−150.2	−94.7	−94.7	−85.6	−84.4	2.1	2.1
80	−89.5	−89.5	−26.7	−26.7	−109.6	−109.6	−72.2	−72.2	−80.9	−79.8	1.5	1.5
85	−74.4	−74.4	−18.2	−18.2	−68.0	−68.0	−52.7	−52.7	−69.4	−68.5	1.0	1.0
90	−56.7	−56.7	−9.7	−9.7	−3.2	−3.2	−7.4	−7.4	−11.0	−10.9	0.5	0.5
Future generations	130.4	73.9	386.2	319.4	316.8	248.8	264.8	209.9	114.0	58.0	1.0	−1.5
Generational imbalance												
Absolute	44.1	45.3	242.8	246.4	151.8	151.7	150.6	145.1	0.2	2.7	−7.3	−7.4
In percent	51.1	159.0	169.3	337.8	92.0	156.1	131.8	223.8	0.0	3.1	−88.0	−125.4

	Australia		Denmark		Netherlands		New Zealand		France	
	A	B	A	B	A	B	A	B	A	B
0	79.6	49.4	84	−18	110.0	49.4	57.3	18.0	151.5	82.2
5	95.3	60.1	134	14	139.8	68.9	68.2	26.4	191.7	125.4
10	112.8	85.4	178	79	171.0	113.8	74.4	39.0	229.4	175.4
15	134.3	115.8	211	143	205.0	164.0	82.8	57.9	264.8	222.2
20	148.4	138.3	243	209	231.7	209.9	91.9	78.7	304.4	284.8
25	147.7	141.9	251	232	237.3	237.3	104.2	95.3	321.9	318.7
30	138.5	134.2	238	225	220.0	222.0	102.9	95.9	293.7	293.7
35	128.2	124.4	214	202	196.7	196.7	94.1	88.7	242.7	242.7
40	111.9	108.5	166	157	161.2	161.2	79.0	75.1	166.8	166.8
45	87.4	84.5	99	91	116.3	116.3	57.9	55.6	77.5	77.5
50	57.4	55.1	14	9	62.2	62.2	31.3	30.3	−12.5	−12.5
55	25.9	24.2	−61	−64	5.5	5.5	2.5	2.4	−134.7	−134.7
60	1.5	1.5	−143	−143	−46.5	−46.5	−26.3	−26.3	−197.0	−197.0
65	−12.7	−12.7	−172	−172	−91.4	−91.4	−50.2	−50.2	−199.9	−199.9
70	−17.6	−17.6	−186	−186	−103.4	−103.4	−55.8	−55.8	−151.5	−151.5
75	−16.1	−16.1	−194	−194	−113.0	−113.0	−53.7	−53.7	−162.1	−162.1
80	−13.8	−13.8	−202	−202	−118.8	−118.0	−47.1	−47.1	−93.9	−93.9
85	−11.3	−11.3	−202	−202	−116.6	−116.6	−44.5	−44.5	−102.9	−102.9
90	−9.4	−9.4	−49	−49	−110.9	−110.9	−36.3	−36.3	−94.4	−94.4
Future generations	105.2	73.4	124	26	193.8	137.0	55.3	16.0	222.8	161.4
Generational imbalance										
Absolute	25.6	24.0	40	44	83.7	87.6	−2.0	−2.0	71.3	79.2
In percent	32.2	48.6	46.9	–	76.0	177.7	−3.4	−10.8	47.1	96.3

(continued)

Table 4.2 *(continued)*

Generation's Age in 1995	Norway		Portugal		Sweden		Argentina		Belgium		Brazil	
	A	B	A	B	A	B	A	B	A	B	A	B
0	106.3	1.4	61.8	43.5	184.3	121.8	22.7	13.9	93.5	43.3	14.3	10.2
5	112.3	−7.5	67.1	45.5	203.4	140.8	25.3	15.7	132.4	76.2	17.1	12.3
10	123.7	14.7	73.0	50.9	226.4	162.9	28.7	20.3	170.1	116.0	20.9	17.1
15	135.3	58.4	79.6	65.3	253.5	211.3	32.6	26.3	210.5	172.3	25.0	22.6
20	140.8	106.3	86.0	82.7	281.2	265.1	34.0	30.8	242.3	232.9	28.9	27.0
25	143.2	127.1	85.1	84.5	295.2	284.2	33.5	31.6	272.5	270.8	31.2	30.1
30	138.1	129.6	75.0	75.0	283.7	278.9	29.8	28.2	278.6	278.6	31.5	31.3
35	120.9	116.2	60.0	60.0	261.9	258.3	22.8	21.6	259.3	259.3	28.0	28.0
40	93.1	90.3	39.7	39.7	228.5	226.5	13.6	12.6	215.5	215.5	19.7	19.7
45	40.5	38.9	15.9	15.9	177.2	175.8	2.1	1.5	149.3	149.3	6.9	6.9
50	−22.0	−22.3	−10.6	−10.6	105.3	104.6	−11.0	−11.3	65.1	65.1	−6.3	−6.3
55	−73.0	−73.0	−33.9	−33.9	16.5	16.1	−25.2	−25.2	−34.6	−34.6	−18.1	−18.1
60	−135.0	−135.3	−47.1	−47.1	−66.3	−66.4	−39.9	−39.9	−130.6	−130.6	−28.0	−28.0
65	−170.6	−170.6	−49.4	−49.4	−110.8	−110.9	−42.9	−42.9	−165.7	−165.7	−33.3	−33.3
70	−179.8	−179.6	−42.7	−42.7	−97.8	−97.8	−43.0	−43.0	−172.4	−172.4	−32.9	−32.9
75	−170.0	−170.0	−33.3	−33.3	−79.7	−79.7	−41.2	−41.2	−163.7	−163.7	−22.1	−22.1
80	−155.1	−155.1	−24.8	−24.8	−58.1	−58.1	−34.3	−34.3	−153.1	−153.1	−14.1	−14.1
85	−139.4	−139.4	−15.4	−15.4	−33.2	−33.2	−32.5	−32.5	−138.6	−138.6	−9.6	−9.6
90	−122.6	−122.6	−4.1	−4.1	−6.5	−6.5	−7.1	−7.1	−119.0	−119.0	−2.7	−2.7
Future generations	173.5	57.3	98.7	73.2	143.5	83.8	36.1	24.3	147.8	89.5	27.0	22.1
Generational imbalance												
Absolute	67.2	55.9	36.9	29.7	−40.9	−38.0	13.4	10.4	54.2	46.3	12.7	11.9
In percent	63.2	4,091.8	59.7	68.3	−22.2	−31.2	58.6	74.8	58.0	107.0	88.8	116.7

Note: A: Educational expenditure treated as government consumption. B: Educational expenditure treated as government transfers and distributed by age groups.

Table 4.3 Absolute and Relative Levels of Per Capita GDP, 1995

Country	Per Capita GDP (U.S. $)	Per Capita GDP as a Percentage of U.S. GDP
United States	26,980	100.0
Japan	22,110	81.9
Germany	20,070	74.4
Italy	19,870	73.6
Canada	21,130	78.3
Thailand	7,540	27.9
Australia	18,940	70.2
Denmark	21,230	78.7
Netherlands	19,950	73.9
New Zealand	16,360	60.6
France	21,030	77.9
Norway	21,940	81.3
Portugal	12,670	47.0
Sweden	18,540	68.7
Argentina	8,310	30.8
Belgium	21,660	80.3
Brazil	5,400	20.0

Source: World Bank, *World Development Report 1997* (Washington, D.C., 1997).

First, the Japanese, Germans, Swedes, Danes, Dutch, French, and Belgians are confronting their young and middle-aged citizens with strikingly high levels of remaining lifetime net taxes. At age 25, the respective case A accounts of these countries are $295,200, $309,700, $295,200, $251,000, $237,300, $321,900, and $272,500. These values are large not only in absolute terms, but also relative to each of the countries' annual average labor earnings. They are also much higher than the corresponding $175,400 age 25 U.S. account.

Second, with the exception of Thailand, which does not yet have a pay-as-you-go social security system, the accounts of all the countries are negative after age 65. In a number of the countries they are negative at earlier ages. For example, Brazil's accounts turn negative at age 50. Third, certain countries are much more generous to their current elderly than are others. Comparing Australia and Norway makes this point. Both countries have quite similar case A accounts prior to age 40. But for older cohorts, Norway has substantially lower levels of net taxation. Indeed, at age 75 the Norwegian account is $154,000 less than the Australian account. Fourth, as expected, the case B accounts are much lower for all countries at younger ages since educational expenditures are allocated to children and young adults on whose behalf the expenditure is made. For example, in Canada the case B account for 5-year-olds is $66,400—less than half the corresponding case A account.

Table 4.4 repeats table 4.2 except it scales each country's accounts by the ratio of U.S. per capita GDP to the country's per capita GDP. Table 4.3 reports the absolute levels of 1995 per capita GDP for each country as well as the

Table 4.4 **Scaled Generational Accounts, 1995 (thousands of 1995 U.S. dollars)**

Generation's Age in 1995	United States		Japan		Germany		Italy		Canada		Thailand	
	A	B	A	B	A	B	A	B	A	B	A	B
0	86.3	28.5	175.1	89.1	221.8	130.5	155.2	92.9	145.3	71.9	29.7	21.1
5	102.0	35.3	206.7	111.0	261.2	166.1	180.6	109.1	166.2	84.8	34.4	24.4
10	121.7	71.4	244.3	165.3	314.2	240.6	209.4	152.7	194.1	126.4	39.1	31.9
15	144.6	115.0	288.0	228.8	387.0	339.0	242.4	215.9	225.9	176.9	44.1	40.5
20	168.7	159.3	339.6	314.3	448.4	421.5	262.9	253.5	254.2	226.1	48.7	47.3
25	175.4	172.7	360.4	360.4	416.3	407.8	250.5	249.6	234.6	246.6	50.9	50.5
30	170.0	168.7	363.6	363.6	365.3	365.3	210.9	210.9	241.5	234.1	50.5	50.5
35	157.5	156.9	350.9	350.9	301.6	301.6	154.2	154.2	211.0	205.7	47.7	47.7
40	135.7	135.6	322.1	322.1	215.2	215.2	86.1	86.1	175.4	171.8	42.3	42.3
45	101.3	101.3	278.0	278.0	126.3	126.3	14.5	14.5	126.3	124.0	35.8	35.8
50	56.4	56.4	211.4	211.4	−5.6	−5.6	−63.6	−63.6	66.2	64.9	29.0	29.0
55	4.0	4.0	120.9	120.9	−132.9	−132.9	−140.1	−140.1	7.4	7.0	22.2	22.2
60	−51.7	−51.7	14.5	14.5	−246.8	−246.8	−192.9	−192.9	−57.9	−57.2	17.2	17.2
65	−96.0	−96.0	−58.2	−58.2	−277.8	−277.8	−187.9	−187.9	−108.2	−106.8	13.3	13.3
70	−104.6	−104.6	−54.7	−54.7	−242.9	−242.9	−159.6	−159.6	−113.8	−112.3	10.0	10.0
75	−101.9	−101.9	−44.0	−44.0	−201.9	−201.9	−128.7	−128.7	−109.3	−107.8	7.5	7.5
80	−89.5	−89.5	−32.6	−32.6	−147.3	−147.3	−98.1	−98.1	−103.3	−101.9	5.4	5.4
85	−74.4	−74.4	−22.2	−22.2	−91.4	−91.4	−71.6	−71.6	−88.6	−87.5	3.6	3.6
90	−56.7	−56.7	−11.8	−11.8	−4.3	−4.3	−10.1	−10.1	−14.0	−13.9	1.8	1.8
Future generations	130.4	73.9	471.6	390.0	425.8	334.4	359.8	285.2	145.6	74.1	3.6	−5.4
Generational imbalance												
Absolute	44.1	45.3	296.5	300.9	204.0	203.9	204.6	197.1	0.3	3.4	−26.2	−26.5
In percent	51.1	159.0	169.3	337.8	92.0	156.1	131.8	223.8	0.0	3.1	−88.0	−125.4

	Australia		Denmark		Netherlands		New Zealand		France	
	A	B	A	B	A	B	A	B	A	B
0	113.4	70.4	106.7	−22.9	148.8	66.8	94.6	29.7	194.5	105.5
5	135.8	85.6	170.3	17.8	189.2	93.2	112.5	43.6	246.1	161.0
10	160.7	121.7	226.2	100.4	231.4	154.0	122.8	64.4	294.5	225.2
15	191.3	165.0	268.1	181.7	277.4	221.9	136.6	95.5	339.9	285.2
20	211.4	197.0	308.8	265.6	313.5	284.0	151.7	129.9	390.8	365.6
25	210.4	202.1	318.9	294.8	321.1	321.1	171.9	157.3	413.2	409.1
30	197.3	191.2	302.4	285.9	297.7	300.4	169.8	158.3	377.0	377.0
35	182.6	177.2	271.9	256.7	266.2	266.2	155.3	146.4	311.6	311.6
40	159.4	154.6	210.9	199.5	218.1	218.1	130.4	123.9	214.1	214.1
45	124.5	120.4	125.8	115.6	157.4	157.4	95.5	91.7	99.5	99.5
50	81.8	78.5	17.8	11.4	84.2	84.2	51.7	50.0	−16.0	−16.0
55	36.9	34.5	−77.5	−81.3	7.4	7.4	4.1	4.0	−172.9	−172.9
60	2.1	2.1	−181.7	−181.7	−62.9	−62.9	−43.4	−43.4	−252.9	−252.9
65	−18.1	−18.1	−218.6	−218.6	−123.7	−123.7	−82.8	−82.8	−256.6	−256.6
70	−25.1	−25.1	−236.3	−236.3	−139.9	−139.9	−92.1	−92.1	−194.5	−194.5
75	−22.9	−22.9	−246.5	−246.5	−152.9	−152.9	−88.6	−88.6	−208.1	−208.1
80	−19.7	−19.7	−256.7	−256.7	−160.8	−159.7	−77.7	−77.7	−120.5	−120.5
85	−16.1	−16.1	−256.7	−256.7	−157.8	−157.8	−73.4	−73.4	−132.1	−132.1
90	−13.4	−13.4	−62.3	−62.3	−150.1	−150.1	−59.9	−59.9	−121.2	−121.2
Future generations	149.9	104.6	157.6	33.0	262.2	185.4	91.3	26.4	286.0	207.2
Generational imbalance										
Absolute	36.5	34.2	50.8	55.9	113.3	118.5	−3.3	−3.3	91.5	101.7
In percent	32.2	48.6	46.9	–	76.0	177.7	−3.4	−10.8	47.1	96.3

(continued)

Table 4.4 *(continued)*

Generation's Age in 1995	Norway		Portugal		Sweden		Argentina		Belgium		Brazil	
	A	B	A	B	A	B	A	B	A	B	A	B
0	130.8	1.7	131.5	92.6	268.3	177.3	73.7	45.1	116.4	53.9	71.5	51.0
5	138.1	−9.2	142.8	96.8	296.1	204.9	82.1	51.0	164.9	94.9	85.5	61.5
10	152.2	18.1	155.3	108.3	329.5	237.1	93.2	65.9	211.8	144.5	104.5	85.5
15	166.4	71.8	169.4	138.9	369.0	307.6	105.8	85.4	262.1	214.6	125.0	113.0
20	173.2	130.8	183.0	176.0	409.3	385.9	110.4	100.0	301.7	290.0	144.5	135.0
25	176.1	156.3	181.1	179.8	429.7	413.7	108.8	102.6	339.4	337.2	156.0	150.5
30	169.9	159.4	159.6	159.6	413.0	406.0	98.6	91.6	346.9	346.9	157.5	156.5
35	148.7	142.9	127.7	127.7	381.2	376.0	74.0	70.1	322.9	322.9	140.0	140.0
40	114.5	111.1	84.5	84.5	332.6	329.7	44.2	40.9	268.4	268.4	98.5	98.5
45	49.8	47.8	33.8	33.8	257.9	255.9	6.8	4.9	185.9	185.9	34.5	34.5
50	−27.1	−27.4	−22.6	−22.6	153.3	152.3	−35.7	−36.7	81.1	81.1	−31.5	−31.5
55	−89.8	−89.8	−72.1	−72.1	24.0	23.4	−81.8	−81.8	−43.1	−43.1	−90.5	−90.5
60	−166.1	−166.4	−100.2	−100.2	−96.5	−96.7	−129.5	−129.5	−162.6	−162.6	−140.0	−140.0
65	−209.8	−209.8	−105.1	−105.1	−161.3	−161.4	−139.3	−139.3	−206.4	−206.4	−166.5	−166.5
70	−221.2	−220.9	−90.9	−90.9	−142.4	−142.4	−139.6	−139.6	−214.7	−214.7	−164.5	−164.5
75	−209.1	−209.1	−70.9	−70.9	−116.0	−116.0	−133.8	−133.8	−203.9	−203.9	−110.5	−110.5
80	−190.8	−190.8	−52.8	−52.8	−84.6	−84.6	−111.4	−111.4	−190.7	−190.7	−70.5	−70.5
85	−171.5	−171.5	−32.8	−32.8	−48.3	−48.3	−105.5	−105.5	−172.6	−172.6	−48.0	−48.0
90	−150.8	−150.8	−8.7	−8.7	−9.5	−9.5	−23.1	−23.1	−148.2	−148.2	−13.5	−13.5
Future generations	213.4	70.5	210.0	155.7	208.9	122.0	117.2	78.9	184.1	111.5	135.0	110.5
Generational imbalance												
Absolute	82.7	68.8	78.5	63.2	−59.5	−55.3	43.5	33.8	67.5	57.7	63.5	59.5
In percent	63.2	4,091.8	59.7	68.3	−22.2	−31.2	58.6	74.8	58.0	107.0	88.8	116.7

Note: A: Educational expenditure treated as government consumption. B: Educational expenditure treated as government transfers and distributed by age groups.

ratios of these living standards to 1995 U.S. per capita GDP. Living standards are measured on a purchasing price parity basis. In absolute terms, the countries' living standards range from $5,400 in Brazil to $26,980 in the United States. Brazil's living standard is only a fifth of that of the United States. Japan's living standard, in contrast, is 82 percent of the U.S. standard.

Scaling the accounts is informative. It shows remarkable differences across countries in the extent of net taxation even after one has taken into account differences in levels of income. Take 40-year-olds. The largest case A account for this cohort is found in Japan. It equals $322,100. The smallest—equal to $42,300—is found in Thailand. The age 40 U.S. case A account is $135,700. In addition to Japan, Germany, Canada, Australia, Denmark, the Netherlands, France, Sweden, and Belgium have higher scaled age 40 generational accounts than the United States. Next consider 65-year-olds. The smallest age 65 scaled account is −$277,800 and belongs to Germany, whereas the largest—$13,300—is that of Thailand. The age 65 U.S. account is −$96,000. In addition to Germany, the age 65 accounts of Italy, Canada, Denmark, the Netherlands, France, Norway, Portugal, Sweden, Argentina, Belgium, and Brazil are less than that of the United States. Finally, consider newborns. The U.S. case A account is $86,300. This is less than one-third the corresponding scaled Swedish newborn account of $268,300. It is also smaller, and in most cases a lot smaller, than the scaled newborn accounts of Japan, Germany, Italy, Canada, Australia, Denmark, the Netherlands, New Zealand, France, Norway, Portugal, and Belgium.

4.4 Imbalances in Generational Policy

The comparison of the generational account facing newborns with that facing future generations indicates the degree of imbalance in generational policy. These accounts can be found in the "age 0" and the "future generations" rows of table 4.2. The last two rows of table 4.2 show the imbalance in both absolute and percentage terms. Take the United States: The case A generational account of newborn Americans is $86,300, whereas that facing future Americans is $130,400. The difference between these numbers—$44,100—is the absolute imbalance. This absolute imbalance is 51.1 percent of the account of current newborns; that is, unless currently living Americans are forced to pay more in net taxes or unless government in the United States can curtail its purchases, future Americans will face net tax rates that are more than 50 percent higher than those facing current newborn Americans! The case B absolute imbalance is quite close to the case A imbalance, but since the case B generational account of newborns is only about one-third the size of the corresponding case A account, the case B percentage imbalance is much larger than the case A percentage imbalance—indeed, three times larger!

Whether one considers the case A or case B imbalance, one thing is clear: there is a very large imbalance in U.S. generational policy. But the United

States is certainly not alone in placing the next generation in harm's way. According to table 4.2, Japan, Germany, Italy, the Netherlands, Norway, and Belgium have larger percentage imbalances than the United States under case A, and Japan, Italy, Denmark, the Netherlands, and Norway have larger percentage imbalances under case B!

The country with the largest absolute imbalances is Japan. Its case A and case B imbalances are $242,800 and $246,400, respectively. These amounts are startling. If future Japanese are asked to pay these sums in addition to what current newborn Japanese are now being asked to pay, they will, in effect, be handed a net tax at birth in excess of $300,000. To view this number in a different light, compound it to age 20 at the 5 percent real discount. The resulting amount exceeds $800,000 and represents the effective lifetime net tax bill that would be handed to future Japanese upon entering the workforce.

In percentage terms, the Japanese imbalance is 169 percent in case A and 338 percent in case B. In other words, absent some other, quite dramatic fiscal adjustment, future Japanese face lifetime net tax rates that are 2.7 to 4.4 times the lifetime net tax rates facing current newborn Japanese. These findings, which are detailed in Chapter 19, were developed in a year-long Bank of Japan study by Yukinobu Kitamura and Hiroshi Yoshida of the Bank of Japan working in collaboration with Noriyuki Takayama, one of Japan's leading academic economists. They are remarkable in light of the relatively high level of generational accounts facing young and middle-aged Japanese and the relatively small (in absolute value) negative accounts of Japanese elderly. The explanation for Japan's particularly severe generational imbalance lies in its particularly rapid rate of aging.

Although Japan has the worst generational imbalance, the German, Italian, Dutch, and Brazilian imbalances are also grave. In these countries, the tax burden on future generations will have to rise by more than 75 percent under case A and by more than 100 percent under case B unless those now alive pay more or their governments spend less. Another five countries have severe imbalances: the United States, Norway, Portugal, Argentina, and Belgium. In these countries, the growth-adjusted fiscal burdens facing future generations are 50 to 75 percent larger than those facing current newborns.

Three countries—Australia, Denmark, and France—have substantial imbalances that leave their descendents facing 30 to 50 percent higher lifetime net tax rates. Canada appears to be essentially in generational balance. The remaining three countries—New Zealand, Thailand, and Sweden—have negative imbalances;[2] that is, their policies, if maintained, would leave future generations facing lower lifetime net tax rates than current newborns. The main reason is that in these countries the aging of the population is less rapid and

2. In contrast to the Swedish findings reported here, the latest generational accounting for Sweden by Lundvik, Lüth, and Raffelhüschen (1998) reports a very severe imbalance in Swedish generational policy. As of the time of publication of this volume, the precise explanation for the different findings had yet to be determined, although different assumptions concerning baseline fiscal policy appear to be very important.

Table 4.5 Official Deficit and Debt as a Share of GDP, 1995

Country	Deficit	Primary Deficit	Gross Debt	Net Debt
United States	2.0	−0.4	63.4	48.2
Japan	3.7	3.1	80.6	10.3
Germany	3.6	0.4	62.2	45.0
Italy	7.0	−3.1	124.7	110.2
Canada	4.1	−1.7	100.5	69.6
Thailand	−8.1[a]	n.a.	n.a.	n.a.
Australia	2.0	−0.2	43.4	28.2
Denmark	1.9	−1.5	76.9	46.6
Netherlands	4.1	−1.0	79.5	46.1
New Zealand	−3.2	−4.7	n.a.	n.a.
France	5.0	1.7	60.7	36.1
Norway	−3.3	−3.9	42.8	−23.4
Portugal	5.0	−0.8	68.4	n.a.
Sweden	7.7	5.2	80.3	32.9
Argentina	n.a.	n.a.	n.a.	n.a.
Belgium	4.1	−4.4	133.5	126.1
Brazil	13.3	n.a.	n.a.	n.a.

Source: Organization for Economic Cooperation and Development, unless otherwise indicated.

Notes: Deficits and debts are for general government (federal, state, local, and social security sectors) and are derived from national income accounts. Primary deficit is the official deficit minus interest on net debt. Net debt refers to gross liabilities (gross debt) less financial assets. Negative values indicate surpluses.

[a]From World Bank, *World Development Report 1997* (Washington, D.C, 1997), central government current deficit.

the government is currently following a strict course of fiscal consolidation. In these countries, intergenerational equity could be restored by reducing (somewhat) the tax burden on currently living generations.

Australia is another country whose recent policy measures have had a significant impact on its generational accounts. There, a compulsory savings scheme has been established that leads individuals to accumulate savings for retirement, while public pensions are steadily reduced; these measures increased the net taxes of current generations (as pension benefits of newborns were reduced) while net taxes of future generations declined. However, during the transition from the pay-as-you-go pension system to a privately funded system, current young Australians have to finance both the pensions of the currently retired generations and the accumulation of reserves for their own retirement; that is, they have to "pay twice."

4.5 Generational Accounting versus Deficit Accounting

It is interesting to compare generational accounting's assessment of fiscal sustainability with that suggested by official deficits and debts. Table 4.5 records, as a share of GDP, government deficits, primary deficits (taxes minus noninterest expenditures), levels of gross debt (gross government liabilities),

and levels of net debt (gross government liabilities minus the government's financial assets) for our 17 countries. Consider Japan and Norway: Although Japan has the largest and Norway one of the largest generational imbalances, the two countries have the lowest ratios of net debt to GDP. Indeed, Norway's net debt is negative; the Norwegian government has positive net wealth. If one considers gross rather than net debt, Japan's and Norway's debt levels are still relatively modest. And if one considers deficits, one finds that the Japanese deficit is lower than that of Canada and that Norway is running a surplus. The correlation of generational imbalance with the primary deficit is no better. Norway's primary deficit is negative, and Japan's is lower than Sweden's, even though the Swedes have a negative generational imbalance.

The complete lack of any consistent relationship between nations' generational imbalances and their deficit or debt positions is not surprising given that from a theoretical perspective, there is no intrinsic connection between the two measures. Nonetheless, this finding should be of interest to those who believe deficit or debt levels represent useful criteria for assessing a country's fiscal responsibility. Two institutions that immediately come to mind in this regard are the International Monetary Fund (IMF) and the European Union. The IMF routinely uses budget deficit targets in determining structural adjustment policies for its client countries. And the European Union has adopted a deficit target as the principal requirement for membership in its proposed single-currency monetary union.

In considering the desirability and sustainability of European monetary union, it is worth bearing the following in mind: imposing higher net taxes on current generations by printing money (and exacting a seigniorage tax) is one of the easiest "solutions" to the major generational imbalances facing the various countries who are now likely to join the union. Because their imbalances are quite different, each country will wish to turn on the printing presses to a different degree. This may place significant stress on the union and lead to its eventual collapse. The other and better solution is, however, that countries address the roots of the problems by implementing major fiscal reforms, particularly in old-age pension systems.

4.6 Sensitivity of the Results

Estimates of generational accounts are based on the assumption that except for demographic influences, no other fundamental changes in the economy occur. But with a given working-age population, labor supply could increase if (female) labor participation increases, and this would raise labor tax revenues and reduce transfers. Furthermore, if private saving increases (which may result from a shift toward privately funded pension systems), receipts from capital income taxes would rise. As illustrated for the Netherlands (chap. 14), the combined effects of increasing the labor participation rate of women and increasing aggregate savings could significantly raise the future tax base and

reduce the generational imbalance. Also, if population aging were slower than assumed here (e.g., if fertility rates were higher or if there were more immigration of young workers), the imbalance against future generations would be reduced. This would result from a larger number of taxpayers available to help finance government expenditures. The impact of the various demographic assumptions on generational accounts is illustrated in some country chapters (e.g., the assumption of fertility rates in chap. 13, on Italy, and the assumption of immigration in chap. 6, on Australia).

The results are also sensitive to assumptions about productivity growth and the discount rate. For a given discount rate, higher productivity growth increases the absolute amounts of net tax payments of both existing and future generations. For a given productivity growth rate, a higher discount rate reduces these present value amounts. Table 4.6 shows case A generational imbalances for three discount rate assumptions (3, 5, and 7 percent) and three productivity growth assumptions (1, 1.5, and 2 percent). Table 4.7 does the same for case B.

It is clear from the two tables that the absolute sizes of the accounts of current newborns as well as future generations are fairly sensitive, particularly to the choice of discount rates. On the other hand, the values of both variables move in the same direction in response to changes in the rates of productivity growth and interest. Consequently, the absolute generational imbalance in many countries is rather invariant to the choice of these rates. In Japan, for example, the absolute case A imbalance across the nine combinations of growth and discount rates ranges from \$220,900 to \$294,500. Or take Thailand, whose absolute case A imbalance ranges from −\$6,400 to −\$8,400.

Even in countries where the absolute imbalance is fairly sensitive to the choice of growth and discount rates, the basic message of generational accounting may be the same. France is a good example. Its absolute imbalance ranges from \$33,600 to \$167,800. But the \$33,600 imbalance, arising from the assumption of a 7 percent discount rate and a 1 percent growth rate, represents a percentage imbalance of 49 percent, and the \$167,800 imbalance represents a percentage imbalance of 71 percent; hence, both sets of parameters indicate that future Frenchmen and Frenchwomen face much higher rates of lifetime net taxation than do current newborns assuming current newborns face, over their lifetimes, the panoply of French taxes and transfers now in existence.

Another message emerging from tables 4.6 and 4.7 is that the sensitivity of the generational accounts to growth and interest rate assumptions depends on the country in question. Norway makes this clear. The Norwegian absolute imbalance switches from a small negative to a large positive value depending on parameter values. For Norway the choice of the discount rate is particularly critical. With the base-case 1.5 percent growth rate and 5 percent discount rate, Norway has a sizable generational imbalance. But with a 7 percent discount rate and a 1.5 labor productivity growth rate, Norway is roughly in generational balance.

Table 4.6 **Generational Accounts: Sensitivity to Growth and Discount Rates, Case A (thousands of 1995 U.S. dollars)**

	$g = 1$			$g = 1.5$			$g = 2$		
Country	$r = 3$	$r = 5$	$r = 7$	$r = 3$	$r = 5$	$r = 7$	$r = 3$	$r = 5$	$r = 7$
United States									
Newborn generation	149.1	86.7	48.9	147.4	86.3	48.8	145.6	85.9	48.7
Future generations	243.7	146.7	93.9	203.5	130.4	86.2	163.6	114.2	78.5
Absolute imbalance	94.6	60.1	45.0	56.0	44.1	37.4	18.0	28.3	29.8
Japan									
Newborn generation	242.1	120.1	62.4	291.0	143.4	73.8	349.8	171.4	87.4
Future generations	510.6	356.5	283.3	571.5	386.2	297.6	644.3	421.6	314.9
Absolute imbalance	268.5	236.4	220.9	280.5	242.8	223.8	294.5	250.2	227.5
Germany									
Newborn generation	255.7	140.2	72.6	292.3	165.0	86.7	329.1	193.1	103.0
Future generations	431.8	284.3	196.7	472.8	316.8	214.6	504.3	353.3	235.8
Absolute imbalance	176.1	144.1	124.1	180.5	151.8	127.9	175.2	160.2	132.8
Italy									
Newborn generation	157.2	101.1	62.5	171.6	114.2	70.9	183.2	128.4	80.5
Future generations	312.6	249.5	212.8	331.5	264.8	221.0	347.6	282.1	230.9
Absolute imbalance	155.4	148.4	150.3	159.9	150.6	150.1	164.4	153.7	150.4
Canada									
Newborn generation	190.1	93.1	44.8	231.9	113.8	54.8	281.8	138.5	66.9
Future generations	198.3	94.2	44.3	232.8	114.0	49.6	271.9	129.6	57.2
Absolute imbalance	8.2	1.1	−0.5	0.9	0.2	−5.2	−9.9	8.9	−9.7
Thailand									
Newborn generation	14.1	7.0	3.9	17.2	8.3	4.5	21.1	9.9	5.3
Future generations	6.1	−0.1	−2.5	8.9	1.0	−2.0	12.6	2.4	−1.5
Absolute imbalance	−8.0	−7.1	−6.4	−8.3	−7.3	−6.5	−8.4	−7.6	−6.8

Australia									
Newborn generation	138	66	32	167	80	39	203	96	47
Future generations	187	91	58	247	105	63	362	124	70
Absolute imbalance	49	25	26	80	25	24	159	28	23
Denmark									
Newborn generation	156	66	17	183	84	27	211	105	38
Future generations	196	103	49	224	124	61	251	147	75
Absolute imbalance	40	37	32	41	40	34	40	42	37
Netherlands									
Newborn generation	191	92	41	222	110	50	257	131	61
Future generations	299	170	111	344	194	122	396	222	136
Absolute imbalance	108	78	70	122	84	72	139	91	75
New Zealand									
Newborn generation	106.7	57.3	30.2	106.7	57.3	30.2	106.7	57.3	30.2
Future generations	130.2	62.9	32.1	100.4	55.3	29.4	70.3	55.3	26.7
Absolute imbalance	23.5	5.6	1.9	−6.3	−2	−0.8	−36.4	−2	−3.5
France									
Newborn generation	205.1	134.4	71.7	222.1	151.5	82.5	236.8	169.9	94.5
Future generations	350.6	202.4	105.3	377.8	222.8	116.9	404.6	245.5	130.0
Absolute imbalance	145.5	67.9	33.6	155.7	71.3	34.4	167.8	75.6	35.5
Norway									
Newborn generation	138.3	95.2	61.9	145.2	106.3	69.1	145.1	117.8	77.4
Future generations	270.1	128.8	40.4	327.8	173.5	71.7	381.3	220.3	104.9
Absolute imbalance	131.8	33.6	−21.5	182.6	67.2	2.6	236.2	102.5	27.5
Portugal									
Newborn generation	86.9	54.9	35.5	97.2	61.8	39.6	107.9	69.6	44.3
Future generations	123.7	92.2	76.6	134.1	98.7	79.4	44.8	106.3	83.1
Absolute imbalance	36.8	37.4	41.1	36.8	36.9	39.8	36.9	36.7	38.8

(continued)

Table 4.6 *(continued)*

Country	$g = 1$			$g = 1.5$			$g = 2$		
	$r = 3$	$r = 5$	$r = 7$	$r = 3$	$r = 5$	$r = 7$	$r = 3$	$r = 5$	$r = 7$
Sweden									
Newborn generation	292.4	163.2	97.5	333.0	184.3	108.3	378.8	208.8	120.7
Future generations	268.3	119.2	40.8	309.6	143.5	53.2	351.4	171.2	67.5
Absolute imbalance	−24.1	−44.0	−56.7	−23.4	−40.9	−55.1	−27.3	−37.5	−53.2
Argentina									
Newborn generation	28.0	20.6	13.5	28.3	22.7	15.1	26.6	24.9	16.9
Future generations	50.1	32.3	22.7	55.5	36.1	24.6	60.8	40.4	26.8
Absolute imbalance	22.1	11.7	9.3	27.2	13.4	9.5	34.1	15.5	10.0
Belgium									
Newborn generation	243.9	138.9	73.9	272.5	162.4	87.5	295.8	188.6	103.2
Future generations	369.7	229.4	158.6	415.2	258.8	171.4	462.1	292.8	188.0
Absolute imbalance	125.8	90.5	84.7	142.7	96.4	83.9	166.3	104.2	84.7
Brazil									
Newborn generation	21	12	7	23	14	8	24	17	9
Future generations	41	23	14	47	27	16	54	31	18
Absolute imbalance	20	11	7	24	13	8	30	14	9

Note: g is productivity growth (percent); r is discount rate (percent).

Table 4.7 **Generational Accounts: Sensitivity to Growth and Discount Rates, Case B (thousands of 1995 U.S. dollars)**

	$g = 1$			$g = 1.5$			$g = 2$		
Country	$r = 3$	$r = 5$	$r = 7$	$r = 3$	$r = 5$	$r = 7$	$r = 3$	$r = 5$	$r = 7$
United States									
Newborn generation	75.8	28.9	2.6	74.1	28.5	2.5	72.3	28.1	2.4
Future generations	160.3	82.6	43.1	134.9	73.9	39.8	109.6	65.2	36.4
Absolute imbalance	84.5	53.7	40.5	60.7	45.3	37.2	37.3	37.1	34.0
Japan									
Newborn generation	159.7	53.3	7.4	203.8	73.0	16.0	257.5	97.1	26.7
Future generations	431.3	293.6	232.5	487.2	319.4	243.9	554.7	350.9	258.1
Absolute imbalance	271.6	240.3	225.1	283.4	246.4	227.9	297.2	253.8	231.4
Germany									
Newborn generation	174.1	76.4	21.8	205.1	97.1	32.8	236	120.6	45.9
Future generations	351.5	220.2	144.4	389.6	248.8	159.8	423	281.1	178
Absolute imbalance	177.4	143.8	122.6	184.5	151.7	127.0	187	160.5	132.1
Italy									
Newborn generation	99.2	54.3	24.2	110.3	64.8	30.6	118.3	76.3	38.0
Future generations	249.2	197.5	169.5	264.4	209.9	175.4	276.5	224.1	182.9
Absolute imbalance	150.0	143.2	145.3	154.1	145.1	144.8	158.2	147.8	144.9
Canada									
Newborn generation	118.6	39.7	3.8	154.6	56.3	11.0	107.9	76.8	19.9
Future generations	130.7	47.1	12.2	158.0	58.0	14.1	191.5	72.9	17.9
Absolute imbalance	12.1	7.4	8.4	19.3	1.7	3.1	−6.4	3.9	−2.0
Thailand									
Newborn generation	11.2	4.7	2.0	14.1	5.9	2.5	17.8	7.3	3.2
Future generations	3.2	−2.4	−4.3	5.8	−1.5	−4.0	9.3	−0.3	−3.6
Absolute imbalance	−8.1	−7.1	−6.3	−8.3	−7.4	−6.5	−8.5	−7.6	−6.8

(continued)

Table 4.7 *(continued)*

Country	$g = 1$			$g = 1.5$			$g = 2$		
	$r = 3$	$r = 5$	$r = 7$	$r = 3$	$r = 5$	$r = 7$	$r = 3$	$r = 5$	$r = 7$
Australia									
Newborn generation	101	38	10	127	50	16	158	64	22
Future generations	143	62	36	193	73	39	289	89	44
Absolute imbalance	42	24	26	66	23	23	131	25	22
Denmark									
Newborn generation	29	−29	−56	46	−18	−51	61	−5	−46
Future generations	74	13	−20	93	26	−13	110	42	−4
Absolute imbalance	45	42	36	47	44	38	49	47	42
Netherlands									
Newborn generation	115	34	4	143	49	3	173	67	12
Future generations	226	117	70	267	137	79	313	161	90
Absolute imbalance	111	83	66	124	88	76	140	94	78
New Zealand									
Newborn generation	54.1	18.0	−0.1	54.1	18.0	−0.1	54.1	18.0	−0.1
Future generations	65.1	18.2	−1.1	50.2	16.0	−1.0	35.2	13.8	−0.9
Absolute imbalance	11.0	0.2	−1.0	−3.9	−2.0	−0.9	−18.9	−4.2	−0.8
France									
Newborn generation	125.3	66.6	15.9	140.3	82.2	25.6	153.1	99.0	36.5
Future generations	264.9	147.5	187.2	285.1	161.5	99.3	304.4	178.5	94.2
Absolute imbalance	139.6	80.9	171.3	144.8	79.2	73.7	151.4	79.5	57.7

Norway									
Newborn generation	9	−3	−14	5	1	−11	−6	5	−9
Future generations	126	22	−41	170	57	−16	212	95	11
Absolute imbalance	117	25	27	165	56	−5	218	90	20
Portugal									
Newborn generation	64.5	37.9	22.4	73.1	43.5	25.6	82.0	50.0	29.4
Future generations	93.9	68.0	56.7	102.7	73.2	58.5	111.8	79.4	61.0
Absolute imbalance	29.4	30.2	34.2	29.7	29.7	32.8	29.8	29.4	31.6
Sweden									
Newborn generation	214.9	103.2	49.7	251.8	121.8	58.8	293.5	143.5	69.4
Future generations	191.2	62.3	−1.0	229.3	83.8	9.4	268.0	108.8	21.7
Absolute imbalance	−23.7	−40.9	−50.7	−22.5	−38.0	−49.3	−25.5	−34.7	−47.6
Argentina									
Newborn generation	17	12	7	17	14	8	14	15	10
Future generations	35	21	14	39	24	16	43	28	17
Absolute imbalance	18	9	7	22	10	8	29	13	7
Belgium									
Newborn generation	170.2	80.9	27.5	193.9	100.8	38.4	212.0	123.1	51.2
Future generations	286.4	162.4	104.7	327.5	187.8	114.4	370.2	217.7	127.6
Absolute imbalance	116.3	81.5	77.2	133.6	87.0	76.0	158.2	94.6	76.4
Brazil									
Newborn generation	16	9	4	17	10	5	18	12	6
Future generations	35	19	11	41	22	12	47	26	14
Absolute imbalance	19	10	7	24	12	7	29	14	8

Note: g is productivity growth (percent); r is discount rate (percent).

Table 4.8 Sources of Generational Imbalance (percentage imbalance)

Country	Base Case		No Demographic Change		Zero Debt	
	A	B	A	B	A	B
United States	51.1	159.0	−2.9	21.6	30.5	96.5
Japan	169.3	337.8	42.2	77.2	154.5	308.6
Germany	92.0	156.1	−4.7	−7.6	47.5	80.6
Italy	131.8	223.8	12.9	18.0	60.2	97.6
Canada	0.0	3.1	−46.7	−57.8	−41.0	−51.6
Thailand	−88.0	−125.4	−143.4	−174.6	−190.4	−228.8
Australia	32.0	48.6	20.0	62.4	18.0	25.1
Denmark	46.9	[a]	−13.6	−168.4	12.7	[b]
Netherlands	76.0	177.0	7.0	14.0	42.0	100.0
New Zealand	−3.4	−10.8	−5.0	−5.2	−15.9	−15.9
France	47.1	96.3	4.0	6.0	20.0	39.0
Norway	61.0	4,378.6	−12.1	−91.8	69.3	5,000.2
Portugal	48.7	68.2	17.5	24.9	16.2	22.0
Sweden	−22.2	−31.2	−51.2	−66.9	−31.0	−44.6
Argentina	58.6	74.8	−0.8	1.7	37.9	41.0
Belgium	58.0	106.8	29.3	63.2	−92.0	−217.6
Brazil	88.8	116.7	41.8	64.1	76.2	99.0

Note: A: Educational expenditure treated as government consumption. B: Educational expenditure treated as government transfers and distributed by age groups.

[a]Percentage imbalance is not defined. Newborns' account is −$17,800 and future generations' account is $26,400.

[b]Percentage imbalance is not defined. Newborns' account is −$17,800 and future generations' account is −$2,300.

4.7 Sources of Generational Imbalances

Table 4.8 asks how much of the imbalance in generational policy in the various countries can be traced to the country's demographic transition and how much can be traced to its official net debt. The demographics experiment considers how large the generational imbalance would be were each country to experience no change whatsoever over time in the size or age-sex composition of its population. The zero-debt experiment sets official net debt to zero and recalculates the generational imbalance.

Demographics make a very substantial difference to the imbalance in almost all of the countries. The reason is that the countries are aging and the elderly are net beneficiaries of the governments' tax-transfer systems. For instance, Argentina's imbalance is essentially wiped out if there is no change in demographics. The same is true for Germany, the United States, Denmark, Italy, the Netherlands, France, and Norway. In the case of Japan, zero demographic change would eliminate about three-quarters of the case A imbalance and about four-fifths of the case B imbalance.

Eliminating the government official net debt has a range of impacts on gen-

erational imbalances. Eliminating official debt would have a minor impact on the Japanese imbalance. The same goes for the imbalances in Norway and Brazil. For the United States, the absence of net debt would eliminate only about one-third of the outstanding imbalance. About half of the imbalance would be eliminated in Germany, Argentina, France, Australia, and Italy. The majority, then, of the 17 countries would still face very significant generational imbalances even were there no official net debt. This provides yet more evidence that official deficit and debt figures fall far short of being sufficient statistics for generational policy.

4.8 Restoring Generational Balance?

Apart from the moral dimension of restoring generational balance, doing so represents an economic imperative. Countries that take no action to achieve generational balance will find their generational imbalances worsening over time. Why? Because failure to act in the short run means permitting each new generation that is born in the short run to experience the status quo policy and thus pay the same lifetime net taxes as those now alive. In terms of generational accounting, this confronts generations born in the more distant future with an even larger lifetime net tax rate. But there is a limit—100 percent—to the rate of lifetime net taxation; that is, governments cannot extract more from people in net taxes than they earn. Moreover, the marginal tax rates that would be associated with trying to collect anything close to a 100 percent average net tax would eliminate people's interest in working and, in the process, the government's net tax base.

Eliminating generational imbalances can be done in only two ways. The government can either force those now alive to pay higher net taxes by raising their taxes or by cutting their transfer payments or it can reduce the time path of its spending. Table 4.9 explores each of these alternatives. It considers (1) immediately and permanently reducing the time path of government spending by a fixed percentage, (2) immediately and permanently cutting all government transfers by a fixed percentage, (3) immediately and permanently raising all taxes by a fixed percentage, and (4) immediately and permanently raising all income taxes by a fixed percentage. These percentages are determined such that the residual growth-adjusted net tax bill facing future generations is the same as that facing newborns. Thus each of these policy alternatives achieves generational balance on its own. Obviously, combinations of the policy instruments could achieve the same end, and if the instruments were combined, less would be required of any single policy instrument.

In considering the magnitude of these alternative immediate fiscal adjustments, it is important to bear in mind that larger adjustments are needed if the policies under consideration are not enacted immediately. It is also important to note that the different types of adjustments would affect different currently living generations differently. For example, an income tax hike would hurt current workers more than would a cut in transfer payments.

Table 4.9 **Alternative Ways to Achieve Generational Balance**

	Cut in Government Purchases		Cut in Government Transfers		Increase in All Taxes		Increase in Income Tax	
Country	A	B	A	B	A	B	A	B
United States	18.7	27.0	19.8	20.3	10.5	10.8	23.8	24.4
Japan	26.0	29.5	28.6	25.3	15.5	15.5	53.6	53.6
Germany	21.1	25.9	17.6	14.1	9.5	9.5	29.5	29.5
Italy	52.7	87.9	41.0	40.0	66.7	61.4	198.4	188.8
Canada	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.2
Thailand	−38.1	−47.7	−185.1	−114.2	−25.0	−25.0	−81.7	−81.8
Australia	8.8	10.2	12.1	9.1	5.1	4.8	8.5	8.1
Denmark	9.9	29.0	4.7	4.5	3.4	4.0	5.8	6.7
Netherlands	21.0	28.7	21.4	22.3	8.5	8.9	14.9	15.6
New Zealand	−1.0	−1.6	−0.8	−0.6	−0.4	−0.4	−0.8	−0.8
France	17.2	22.2	11.5	9.8	7.1	6.9	66.0	64.0
Norway	11.5	9.9	9.4	8.1	7.4	6.3	11.3	9.7
Portugal	7.6	9.8	9.6	7.5	4.2	4.2	13.3	13.3
Sweden	−7.6	−8.7	−7.7	−6.0	−3.4	−3.1	−9.3	−8.6
Argentina	24.6	29.1	16.8	11.0	10.7	8.4	97.1	75.7
Belgium	11.2	12.4	6.0	4.6	3.7	3.1	11.7	10.0
Brazil	23.8	26.2	21.3	17.9	12.4	11.7	78.9	74.0

Note: A: Educational expenditure treated as government consumption. B: Educational expenditure treated as government transfers and distributed by age groups.

Restoring the balance between newborns and future generations would require immediate and permanent cuts in government purchases of more than one-half in Italy, of about one-quarter in Japan, Argentina, and Brazil, and of about one-fifth in the United States, Germany, the Netherlands, and France. These are very sizable adjustments. Their enactment would materially alter the official deficits now being reported by these countries. In the United States, the government sector (federal, state, and local) deficit would fall by roughly $200 billion. The U.S. federal surplus is now small. Thus achieving generational balance in the United States requires immediately running what would be, from a historical perspective, huge official surpluses.

Not all countries would need to cut spending to achieve generational balance. Thailand, Sweden, and New Zealand need to raise government spending—by about 40 percent, 8 percent, and 1 percent, respectively—since their baseline generational imbalances are negative.[3] Another point is that the spend-

3. Lundvik, Lüth, and Raffelhüschen's (1998) figures for Sweden, corresponding to table 4.9 above, are 34.6, 48.8, 21.2, 18.0, 14.8, 14.8, 40.3, and 40.3. These figures tell a dramatically different story than those reported in this study. Sartor's (1998) update of Italy's generational accounts, based on Italy's recent dramatic pension reform, shows a much smaller generational imbalance in Italy. For example, the case B 61.4 percent requisite increase in all taxes is now less than 10 percent.

ing adjustment needed to achieve balance is quite similar across alternatives A and B; that is, how one allocates educational expenditures does not matter much to the adjustments needed to achieve generational balance.

An alternative to cutting government spending is cutting all transfer payments be they government-provided health care, unemployment benefits, social security pensions, or welfare benefits.[4] Achieving generational balance in this way means transfer cuts of roughly two-fifths in Italy, one-quarter in Japan, and one-fifth in the United States, the Netherlands, and Brazil. For other countries, the requisite cut is smaller. Germany's case A required transfer cut is 17.6 percent. The corresponding U.S. cut is 19.8 percent. Germany's cut is smaller because transfer payments relative to GDP are somewhat larger in Germany than they are in the United States. Thailand's current transfers are so small relative to GDP that they would need to be more than doubled to achieve generational balance.

Restoring generational balance in Italy through higher taxes translates into more than a 60 percent across-the-board tax hike. The corresponding general tax hike needed for generational balance in the United States, Japan, Germany, the Netherlands, Brazil, and Argentina ranges from 9 to 16 percent. In France and Norway, a roughly 7 percent hike is needed. Portugal, Australia, Denmark, Canada, and Belgium require about a 2 to 5 percent hike. In Thailand, New Zealand, and Sweden across-the-board tax cuts of about 25 percent, 0.4 percent, and 3 percent, respectively, would produce generational balance.

The corresponding income tax hikes needed to achieve generational balance have a much greater range across countries because the ratio of income taxes to GDP varies more across countries than does the ratio of total taxes to GDP. In Italy, which has a relatively small ratio of income tax to GDP, almost a tripling of the income tax rate would be needed to achieve generational balance. This assumes no erosion in the income tax base. If one were to take such erosion into account, it might well be the case that achieving generational balance in Italy solely through a hike in the income tax is infeasible.

Argentina, Brazil, and France would also need to raise their income taxes dramatically to bring their accounts into balance. The requisite income tax hikes for these countries range from 64 to 97 percent. Japan is not far behind. It would need over a 50 percent income tax hike. The corresponding U.S. and German income tax hikes range from 24 to 30 percent. These tax increases are modest compared to what would be needed in Italy, but they would be viewed as enormously painful by current generations of Americans and Germans. Indeed, the focus of U.S. politicians is now on cutting, not raising, federal income taxes. For other countries—Belgium, Portugal, Norway, Australia, Denmark, and Canada—a more modest income tax hike would do the trick. At the other end of the imbalance spectrum is Thailand, which would have to cut its

4. In the case of social security pensions, the cuts might come in the form of raising early and normal retirement ages.

income taxes by 82 percent to achieve balance. Sweden could achieve balance with a 9 percent income tax cut, and New Zealand with a 1 percent cut.

4.9 Summary and Conclusion

Policymakers take official budget deficits and debts as their primary fiscal indicators. For example, European countries are currently aiming at budget deficits below 3 percent of GDP—the target for European monetary union membership—while others are aiming at balancing their budgets over the medium term. Such deficit reductions may succeed in stabilizing debt-to-GDP ratios in the near future, but they do not represent fiscally sustainable policies that will achieve generational balance—a situation in which today's and tomorrow's children pay, in net taxes, the same share of their lifetime labor incomes. In fact, by focusing on budget balance, rather than generational balance, many countries appear to be doing too little to achieve generational balance. This makes their long-term fiscal situations worse. The reason is that the longer a country waits to adjust, the more painful the ultimate adjustment will be. And adjusting too little in the short run is a form of waiting too long to adjust.

The international generational accounts presented here are quite shocking. The world's leading industrial powers—the United States, Japan, and Germany—all have severe imbalances in their generational policies. Unless currently living members of these countries pay more in net taxes or unless these countries dramatically cut their purchases of goods and services, future Americans, Japanese, and Germans will face dramatically higher rates of lifetime net taxation. Leaving current Americans untouched and maintaining the current projected time path of government purchases will leave future Americans collectively facing roughly 50 percent higher net tax rates over their lifetimes than those confronting a newborn American based on current U.S. tax-transfer policy. For future Germans, the imbalance, if not rectified, means they will face lifetime net tax rates that are roughly twice as high as those now in place. And for future Japanese, policy inaction means lifetime net tax rates that are more than 2.5 times as high as current values.

These three countries are not alone in running imbalanced generational policies. Of the 17 countries examined here, five—Japan, Italy, Germany, the Netherlands, and Brazil—have extreme imbalances. Another five—the United States, Norway, Portugal, Argentina, and Belgium—have severe imbalances. Three countries—Australia, Denmark, and France—have substantial imbalances. Canada appears to be essentially in generational balance. The remaining three countries—New Zealand, Thailand, and Sweden have negative imbalances; that is, their policies, if maintained, would leave future generations facing lower lifetime net tax rates than current newborns.[5]

There are a range of policy options that can be used to restore fiscal sus-

5. Again, the Swedish findings are strongly contradicted by Lundvik, Lüth, and Raffelhüschen (1998).

tainability and generational equity. But for most of the 17 countries, their medicine, no matter how they take it, will be very unpleasant. Since conditions differ substantially across the various countries, the best combination of fiscal responses will be country specific. Although each country may respond differently, those with sizable generational imbalances all need to act immediately. Generational accounting's fundamental message is that who pays the government's bills is a zero-sum game. The less those now alive pay, the larger the amounts their descendants will pay. Delay not only makes the situation worse, it also leaves everyone in society uncertain about how long-term fiscal problems will ultimately be resolved.

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