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Generational Accounting in Japan

Noriyuki Takayama, Yukinobu Kitamura,
and Hiroshi Yoshida

19.1 Introduction

Although the importance of the concept of generational accounting has been well recognized in Japan as the aging of the population proceeds, there has been no definitive study on the subject. This work intends to rectify this omission by providing the most comprehensive analysis of generational accounts in Japan to date.

Given certain conditions such as the prospect of low economic growth and the rapid aging of society, which cannot easily be changed, the government has to implement dramatic reform on both the revenue and expenditure sides of public finances. Although future prospects with respect to public finances are uncertain and policy objectives to avoid any worsening of the fiscal position are unclear, there is no doubt that the government must reduce the public debt. In this context, one fiscal measure that is attracting attention among policy-makers is the gross public burden ratio (i.e., all taxes and the social security contributions divided by national income). For 1996, the ratio is expected to be 37.2 percent, compared with 25.7 percent in 1975. As a rule of thumb, the government is expected to maintain this ratio at around 45 percent at the beginning of the twenty-first century and below 50 percent even when the elderly population reaches its peak, say, in 2020.

We should identify some basic principles for future fiscal reform. First, all agents (individuals, firms, and the government) should take full responsibility for their decisions. A simple cost-benefit analysis, such as the generational accounting presented here, can be a very useful tool in making individual fiscal positions more transparent. Second, competitive market mechanisms must be

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used to ensure the efficient allocation of government funds, which means institutional and political compromises should be avoided if they do not satisfy competitive market mechanisms. Third, as future generations do not yet have a political voice, if the government does not think of them, they will have to bear a huge debt burden to pay for the benefits accruing to current generations. In principle, it is the government that adjusts the burdens and benefits of public transfers and objectively decides the fairness of intergenerational burden sharing.

A summary of our main conclusions is as follows: The base-case calculation of the generational imbalance between present and future generations is 169 percent for case A (educational expenditures are treated as consumption) and 338 percent for case B (educational expenditures are treated as transfers) if the current fiscal policy stance is to be maintained (where real income growth is 1.5 percent and the discount rate is 5 percent). This implies that future generations will have to bear 2.7 to 4.4 times the fiscal burden that present generations do, a huge imbalance by international standards.

For the base case, four basic scenarios and two additional scenarios to resolve this generational imbalance are considered. In the four basic scenarios, government purchases must be cut 26 to 30 percent, or all taxes need to be raised about 16 percent, or income tax has to be increased 54 percent, or transfer payments must be cut by some 25 to 29 percent. In the additional scenarios, both government purchases and transfers are to be cut 14 percent, and if all taxes are reduced by 50 percent, then both purchases and transfers need to be cut by 57 percent, which makes the size of government expenditures one-quarter of the current level.

Another simulation indicates that the generational imbalance is due not to the fiscal debt outstanding per se but to changes in demographic structure. Indeed, if the demographic structure were to remain unchanged, the generational imbalance would fall substantially. This is probably the main implication of generational accounting, not only in Japan but also in other countries.

We also consider the concept of *fixed lifetime relative position* suggested in Musgrave (1981). This concept differs from *generational imbalance* in generational accounting. That is, the fixed lifetime relative position sets contributions and benefits so as to keep constant the ratio of per capita earnings of those in working generations to the per capita benefits of retirees. This concept evaluates the benefits of retirees in terms not of their own net burden but of the earnings of current working generations. In other words, this concept per se includes generational interaction. The result shows that a balanced budget will be achieved and the fixed lifetime relative position kept constant, if taxes are increased 10 to 15 percent and transfer benefits are reduced 10 to 13 percent. In this case, the generational imbalance remains less than 13 percent for case A and 73 percent for case B.

19.2 Brief History of Fiscal Policy and Current Fiscal Debates

19.2.1 Brief History of Fiscal Policy in Japan¹

In 1947, after the Second World War, the government decided to seek a balanced budget, a principle that was applied not only to the general budget but also to the special budget and other governmental organizations. Then, in 1950, fundamental tax reform, the so-called Shoup mission tax reform, was implemented, which laid the foundation of Japan's tax system on direct taxation with a special emphasis on fairness. A deep economic recession in 1949 suddenly ended when special procurement by the U.S. military due to the Korean War commenced.

During 1951–55, active fiscal policy was implemented from time to time. However, under capital market and foreign exchange controls, the economic boom was suppressed when the balance of payments worsened. For example, fiscal policy was tightened in 1954–55 along with tight monetary policy. This type of stop-and-go policy continued until the mid-1960s.

A period of high economic growth started in 1955. The government budget had been increased steadily to finance public investment, social security expenditures among others. Because of the natural increase in tax revenues reflecting high economic growth, the principle of having a balanced general budget was strictly adhered to. Furthermore, a tax reduction was effected almost annually so as to keep the average ratio of tax revenue to GNP at around 19 percent. In addition, the government paved the way for the introduction of a comprehensive social security system, namely, the public pension and medical insurance system, which was intended to cover all citizens in Japan. The fiscal authority in these halcyon days of 1955–64 actually ran fiscal surpluses that fluctuated from year to year and functioned as something of a built-in stabilizer. Looking at the long term, the government invested heavily in fixed public capital formation, and tax incentives to encourage personal savings and corporate investment worked well.

In 1965, the economy entered a recession after policy tightening in 1963. Although the budget was balanced in the original plan, tax revenues fell short and the government thus decided to issue government bonds for the first time since the Second World War. In 1966, the government intended only to issue bonds for the purpose of construction investment, but in so doing it obtained a very useful but potentially dangerous free hand in terms of demand management. This was its historic departure from the principle of a balanced budget.

After that first issue of government bonds, the debt dependency ratio increased (see table 19.1). In 1968, fiscal discipline was the goal, and easy reliance on bond finance halted; as a result, the debt dependency ratio dropped dramatically in 1970.

1. This section draws heavily from Tamura (1996, sec. 4).

Table 19.1 Basic Fiscal Statistics

Year	General Account (100 million yen)			Debt Dependency Ratio ^a (%)	Tax Burden Ratio ^b (%)
	Expenditure	Tax Revenue	Bond Issue		
1960	17,431	16,183			18.9
1965	37,230	30,496	1,972		18.0
1970	81,877	72,958	3,472	4.2	18.9
1975	208,609	137,527	52,805	25.3	18.3
1980	434,050	268,687	141,702	32.6	22.2
1985	530,045	381,988	123,080	23.2	24.0
1990	692,687	601,059	73,120	10.6	27.8
1991	705,472	598,204	67,300	9.5	27.1
1992	704,974	544,453	95,360	13.5	24.9
1993	751,025	541,262	161,740	21.5	24.4
1994	736,136	508,160	164,900	22.4	23.2
1995	780,340	537,310	125,980	28.2	23.3

Source: Ministry of Finance.

^aDebt dependency ratio is bond issue/expenditure.

^bTax burden ratio is all tax revenues/national income.

In 1971, the Nixon administration suspended gold convertibility and imposed a 50 percent import tax as part of a new economic policy—the so-called Nixon shock—which had a serious impact on the Japanese economy. In response, the Japanese government adopted expansionary fiscal policies to increase public investment and to reduce taxes during 1971–72, along with an easy monetary policy. The first oil shock in October 1973 pushed inflation above 20 percent in 1974. Although dramatic reform of the social security system was implemented in 1973, by which 100 percent of the medical expenditures of the elderly and 70 percent of those of nonworking spouses and children were covered, the government otherwise maintained a very tight fiscal policy stance and a lot of public investment was suspended or postponed; 1974 saw zero growth in public investment expenditures.

The economy fell into recession in 1974 and experienced negative growth for the first time since the Second World War. The government could not help but implement aggressive fiscal policy to stimulate the economy. As a consequence of the recession, tax revenues fell short and the government thus again turned to bond financing, but this time, it was permitted to issue bonds that were not for the purpose of public investment. The debt dependency ratio jumped from 11.3 percent in 1974 to 25.3 percent in 1975 and remained high until the late 1980s, with a peak of 34.7 percent in 1979. We consider 1975 a second turning point for fiscal policy.

During 1980–84, after the second oil shock in 1979, the government tried to implement substantial fiscal reform to escape its heavy reliance on debt financing. After 1983, the following reforms were adopted: some fiscal expendi-

tures were cut, the public pension and medical insurance system was reformed, local government finances were revamped, subsidies were reduced, food management expenditures were revised, and public corporations were privatized. As a result, the debt dependency ratio fell to 23.2 percent in 1985.

From 1985 to 1990, the government continued to pursue various fiscal reform measures. In September 1985, the major Organization for Economic Cooperation and Development (OECD) economies agreed to adjust exchange rates against the U.S. dollar by international policy coordination (the Plaza Agreement). In order to avoid repercussions on the Japanese economy from the rapid appreciation of the yen, the government pursued aggressive fiscal policy through an easy monetary policy (i.e., the official discount rate was kept at 2.5 percent for over two years). These policies stimulated the economy, which, in turn, enjoyed a long boom in the latter half of the 1980s. From 1983 to 1987, general government expenditures were cut annually. Thanks to increased tax revenue due to the boom, in 1990 the government succeeded in reducing debt financing by a substantial margin for the first time in 15 years.

In 1991, the economy started contracting as a result of the bursting of the bubble economy, and a deep recession ensued. The government implemented extraordinary fiscal policy packages during 1992–95, and the official discount rate was reduced to a record low 0.5 percent in September 1995. As a consequence, the debt dependency ratio has increased since 1991 (see table 19.1). Debt outstanding reached 200 trillion yen at the end of 1994 (the ratio of gross debt to GDP in 1994 was 73.2 percent) and is expected to reach some 240 trillion yen at the end of 1996; if local government debt (i.e., municipal bonds) were included, the figure would be 442 trillion yen (and the ratio of gross debt to GDP in 1996 would be 87.4 percent). In this respect, the fiscal stance of the Japanese government has been going from bad to worse in recent years.

19.2.2 Current Fiscal Debates²

In reaction to the recent rapid deterioration in its fiscal position and the rapid aging of society toward the twenty-first century, the Japanese government as well as the private sector, including academic economists, has started asserting openly the urgent need to improve the current fiscal position and for more fundamental structural reform of public finance in general.

To clarify the situation, let us first look at the general budget plan for 1996. Of 75.1 trillion yen in expenditures, social-security-related items account for 14.3 trillion yen (19 percent); public investment for infrastructure (i.e., roads, bridges, housing, etc.), 9.7 trillion yen (13 percent); educational and science-research-related expenditures, 6.2 trillion yen (8 percent); transfers to municipal governments, 13.6 trillion yen (18 percent); and other small expenditures for defense, official development assistance, energy-related items, and the promotion of small and medium-sized enterprises, 6.8 trillion yen (9.1 percent).

2. This section mainly relies on Ishi (1996, chap. 1).

In addition to these expenditures, government-bond-related items (i.e., interest payments and the repayment of principal) require 16.4 trillion yen (22 percent), which is the biggest expenditure item. On the revenue side, income tax provides 19.3 trillion yen; corporate tax, 13.5 trillion yen; inheritance tax, 2.6 trillion yen; and consumption tax, 5.9 trillion yen. Together with other tax revenues and stamp duties, tax revenues total 51.3 trillion yen. The gap between expenditures and revenues is mainly filled by public debt, 21 trillion yen (28 percent of total revenues).

On both the expenditure and revenue sides, public-debt-related items account for the biggest shares, an alarming picture of the fiscal position in Japan. To put it into perspective, compare the statistics with those for the other major OECD economies (OECD 1996): while the ratio of gross public debt to GDP in Japan increased from 65.1 percent in 1990 to 80.7 percent in 1995, in the United States it rose from 55.6 to 64.3 percent, in the United Kingdom from 39.3 to 60.0 percent, in Germany from 45.5 to 61.6 percent, and in France from 40.2 to 60.0 percent. As these statistics show, Japan is in the worst position among major OECD countries.

There are some causes and reasons for the worsening of the fiscal position. First, tax revenue growth remains very low as the economy itself has grown very slowly in recent years. Second, the population is aging at an accelerated pace (see table 19.2). Third, expenditures on institutional arrangements, such as the social security system, have been increasing. Fourth, because of the extraordinary fiscal policy packages in 1992–95 to stimulate the economy amid a deep recession, public debt has increased by 68 trillion yen in the past five years.

Prospects with respect to the future fiscal position and policy objectives to avoid a worsening of the fiscal position are still unknown. Without doubt, however, the government must avoid issuing bonds that are not used to provide public capital because such bonds merely transfer the burden without providing any benefits to future generations. A simulation suggests that the government will have to issue bonds simply for repayment purposes until 2003 even if there is no growth in general expenditures from 1997 onward (which means general expenditures 20 percent lower than the natural growth path in 2001). In other words, without any substantial reduction in real terms, government expenditures cannot be maintained, and even if maintained, the government has to issue bonds until 2003.

One fiscal concept that is attracting attention among policymakers is the gross public burden ratio (i.e., all taxes and the social security burden divided by national income, which is a larger concept than the tax burden rate in table 19.1). The ratio in 1996 is expected to be 37.2 percent, compared with 25.3 percent in 1975. As a rule of thumb, the government is expected to maintain this ratio at around 45 percent at the beginning of the twenty-first century and below 50 percent even at the peak of the elderly population, say, in 2020. Note that this measure itself does not take into account public debt and the genera-

Table 19.2 Demographic Projection

Year	Population				Dependency Ratio ^a		
	Total	Children Ages 0-17	Working Ages 18-64	Old Ages 65+	Elderly	Child	Total
1995	125,570,246	24,989,428	82,303,927	18,276,891	22.21	30.36	52.57
2000	126,892,162	23,043,161	81,978,714	21,870,288	26.68	28.11	54.79
2005	127,683,764	22,050,991	80,627,184	25,005,587	31.01	27.35	58.36
2010	127,622,805	21,875,387	77,621,677	28,125,744	36.23	28.18	64.42
2015	126,443,541	21,583,315	72,977,324	31,882,900	43.69	29.58	73.26
2020	124,133,164	20,709,028	70,088,953	33,335,184	47.56	29.55	77.11
2025	120,913,146	19,424,577	68,372,447	33,116,115	48.43	28.41	76.84
2030	117,149,082	18,239,653	66,141,892	32,767,534	49.54	27.58	77.12
2035	113,114,063	17,436,911	62,890,562	32,786,592	52.13	27.73	79.86
2040	108,964,036	16,965,244	58,272,787	33,726,002	57.88	29.11	86.99
2045	104,758,334	16,552,487	54,708,560	33,497,281	61.23	30.26	91.48
2050	100,496,300	15,954,267	52,087,946	32,454,089	62.31	30.63	92.94
2055	96,188,065	15,202,042	50,288,102	30,697,922	61.04	30.23	91.27
2060	91,848,186	14,486,333	48,858,470	28,503,387	58.34	29.65	87.99
2065	87,636,413	13,964,828	47,121,932	26,549,657	56.34	29.64	85.98
2070	83,773,434	13,652,110	45,023,103	25,098,219	55.75	30.32	86.07
2075	80,367,936	13,404,853	42,899,729	24,063,357	56.09	31.25	87.34
2080	77,375,135	13,106,607	41,068,281	23,200,243	56.49	31.91	88.41
2085	74,639,896	12,736,928	39,624,936	22,278,029	56.22	32.14	88.37
2090	72,067,533	12,364,880	38,445,282	21,257,378	55.29	32.16	87.45
2095	69,634,513	12,073,791	37,293,925	20,266,797	54.34	32.37	86.72
2100	67,365,808	11,887,962	36,068,378	19,409,469	53.81	32.96	86.77

Source: Medium variant projection of future population conducted in 1997 by the Institute of Population Problems, Ministry of Health and Welfare.

Note: The medium variant projection is based on the following assumptions: (1) The base population distribution was estimated on 1 October 1995. (2) The total fertility rate was 1.42 in 1995, dropped to 1.38 in 2000, and then gradually rose to 1.61 in 2030. (3) Life expectancies at birth were 76.36 years for men and 82.84 for women in 1995, rising to 77.40 and 84.12 in 2000 and 79.43 and 86.47 in 2050. (4) The net international migration rate remains very small for Japan (a maximum of 1.5 per million for male immigrants aged 25). Data on net migration is based on the five-year average from 1 October 1990 to 30 September 1995 and is assumed constant from 1 October 1995 onward.

We assume that the population after 2100 will reach a steady state so that the demographic structure remains the same as in 2100.

^aElderly dependency ratio is the old population as a percentage of the working population. Child dependency ratio is the child population as a percentage of the working population. Total dependency ratio is old plus child populations as a percentage of the working population. In Japan, it is conventional to assume that children are aged 0 to 14, the working population, aged 15 to 64, and the old, aged 65 or older. Therefore, officially announced dependency ratios differ from those reported in the table.

tional distribution of the burden. Government expenditures can be increased without raising the gross public burden ratio as long as the gap between expenditures and revenues is financed by public debt. Thus the usefulness of this concept seems rather limited.

All in all, given certain conditions such as prospects of low economic growth and the rapid aging of society, which cannot be easily changed, the

government has to implement dramatic reform on both the revenue and expenditure sides. Several principles for such reform can be put forward. First, all agents (individuals, firms, and the government) must take full responsibility for their decisions; self-help is a rather old but still valid idea. With respect to the burden and benefits of the old social security system, a reasonable balance must be found; that is, benefits cannot go beyond the means of society. Second, competitive market mechanisms must be used in implementing the efficient allocation of government expenditures. Institutional and political compromises should be avoided if they do not satisfy the market mechanism. Third, the stabilization role of public finance has been weakened, if not abandoned completely, in all major OECD countries but Japan. Indeed, stabilization policy has come to be viewed more as one aspect of government intervention to alleviate market failure, and the effectiveness of fiscal stimuli has been very limited, as the recent Japanese experience shows. Finally, as future generations do not have a political voice at the moment, if the government does not consider them, they will have to bear a huge burden of debt that only benefits current generations. In principle, it is the government that adjusts the burden and benefit of public transfers and objectively judges the fairness of intergenerational burden sharing.

19.3 The Data

Government revenues and expenditures are based on the 1995 *Annual Report on National Accounts* (Economic Planning Agency). Tax revenue estimates are from the third 1995 supplementary budget shown in the April 1996 issue of the *Ministry of Finance Statistics Monthly* (vol. 528), municipal government revenues and expenditures are from the *Municipal Government Finance Plan* for 1995, and income from interest and stock sales is from the 1994 *National Tax Bureau Annual Report* (no. 120). Government fixed capital formation is obtained from the general account and not the special account.

Consumption and income for each generation are distributed according to age distribution information from the 1994 National Survey of Family Income and Expenditure (Statistics Bureau, Management and Coordination Agency) by expenditure, savings, and loans for households with two or more members (issued 27 December 1995) and assets (issued 25 May 1996). As age distribution is reported at five-year intervals from ages 20 to 65, and those aged 70 or older are treated equally, we allocate the same value for those aged 70 to 95.

Social security transfers in kind (mainly medical transfers) are calculated according to age distribution information from the 1993 Survey of Income Redistribution (Ministry of Health and Welfare).

Population projections are taken from the medium variant projection of future population conducted in 1997 by the Institute of Population Problems, Ministry of Health and Welfare. The base population is the 1995 population census of Japan.

Table 19.3 Generational Accounts: Base Case (thousands of U.S. dollars)

Generation's Age in 1995	Case A: Education as Consumption	Case B: Education as Transfer
0	143.4	73.0
5	169.3	90.9
10	200.1	135.4
15	235.9	187.4
20	278.1	257.4
25	295.2	295.2
30	297.8	297.8
35	287.4	287.4
40	263.8	263.8
45	227.7	227.7
50	173.1	173.1
55	99.0	99.0
60	11.9	11.9
65	-47.7	-47.7
70	-44.8	-44.8
75	-36.0	-36.0
80	-26.7	-26.7
85	-18.2	-18.2
90	-9.7	-9.7
Future generations	386.2	319.4
Generational imbalance (%)	169.3	337.8

Note: Case A: Educational expenditures treated as consumption. Case B: Educational expenditures treated as transfers. Exchange rate assumed to be 93.37 yen per U.S. dollar (1995 average); real income growth, 1.5 percent; discount rate, 5 percent.

Per capita educational expenditure for each age is allocated from 1993 school expenditure data (excluding donations) in the 1996 *Ministry of Education Statistics Handbook*.

19.4 Main Findings and Sensitivity Analysis

Table 19.3 presents the basic results of generational accounting in Japan (1995 base year). They are divided into two cases: case A, in which educational expenditures are treated as consumption, and case B, in which they are treated as transfers. This distinction makes for some differences for generations between ages 0 and 24. The percentage imbalance between newborn and future generations is 169 percent for case A and 338 percent for case B, implying that future generations must pay about 2.7 times for case A and about 4.4 times for case B as much tax (net basis) as newborn generations, a huge difference.

Note, however, that such a large generational imbalance does not immediately imply a heavy burden or pain for future generations. That is to say, if the

net present value of payments as a proportion of lifetime income for future generations is reasonably small, this large imbalance might not induce a burden for future generations that is 2.7 to 4.4 times as much as that on newborn generations. In other words, an absolute value comparison of net payments makes sense as far as the generational imbalance is concerned. The net present value of net payments as a proportion of lifetime income for future generations (i.e., the relative burden of future generations), however, cannot be identified solely by the absolute value of net payments because lifetime incomes differ substantially.

In the following, we calculate the net present value of payments as a percentage of lifetime income. Taking the working generations as those aged 0 to 64, the present value of average lifetime income for employees (evaluated at age 0) is approximately \$487,800 (in the case of 1.5 percent growth with a 5.0 percent discount rate). According to table 19.3, case A, the net present value of payments for the present generation is \$143,400, implying that the lifetime net tax rate is 29 percent. It is 79 percent for future generations. Even if we take into consideration pension benefits, net tax payments of nearly 80 percent of lifetime income would be a heavy burden.

However, it is worth noting that because future generations will benefit from government consumption, the 80 percent of lifetime income is not meant to be collected for nothing. In fact, the net tax payments of each generation will be used as government consumption, mostly for one's own generation and the rest for future generations. Government consumption used for future generations can be interpreted as a net burden on the current generation because it is a form of intergenerational transfer via the government. In case B (in which educational expenditures are treated as transfers), the lifetime net tax rate is 15 percent for present generations and 65 percent for future generations.

In addition to the base-case assumptions of 1.5 percent real income growth and 5.0 percent discount rate, table 19.4 assesses various growth and discount rate combinations (see also fig. 19.1). In particular, we include the case of a 2.0 percent discount rate because the standard discount rates in this volume seem rather high (i.e., 3, 5, and 7 percent) by Japanese standards, while the real growth rates are low (i.e., 1, 1.5, 2, and 3 percent).

Given the same fiscal policy, the generational imbalance is very sensitive to real income growth and discount rate assumptions. According to demographic projections, the aging process will reach a peak in 2050, after which society will get younger. The fiscal position is also expected to ease after 2050. The higher real income growth rate reduces the burden of future generations because of a bigger improvement in fiscal position after 2050. On the other hand, the higher discount rate increases the burden of future generations because the fiscal position is heavily discounted.

Because the demographic projection includes a lot of uncertainty, nothing can be said for sure. But if the demographic structure remains stationary after the aging process reaches its peak, the effects of real income growth and the

Table 19.4 **Sensitivity Analysis of Generational Imbalance (thousands of U.S. dollars)**

	<i>g</i> = 1				<i>g</i> = 1.5				<i>g</i> = 2				<i>g</i> = 3			
	<i>r</i> = 2	<i>r</i> = 3	<i>r</i> = 5	<i>r</i> = 7	<i>r</i> = 2	<i>r</i> = 3	<i>r</i> = 5	<i>r</i> = 7	<i>r</i> = 2	<i>r</i> = 3	<i>r</i> = 5	<i>r</i> = 7	<i>r</i> = 2	<i>r</i> = 3	<i>r</i> = 5	<i>r</i> = 7
<i>Case A: Education as Consumption</i>																
Present generations	348.6	242.1	120.1	62.4	419.5	291.0	143.4	73.8	n.a.	349.8	171.4	87.4	n.a.	n.a.	245.6	123.3
Future generations	595.2	510.6	356.5	283.3	730.7	571.5	386.2	297.6	n.a.	644.3	421.6	314.9	n.a.	n.a.	514.7	360.6
Generational imbalance (%)	70.7	110.9	196.9	354.3	74.2	96.4	169.3	303.5	n.a.	84.2	146.0	260.3	n.a.	n.a.	109.6	192.5
<i>Case B: Education as Transfer</i>																
Present generations	256.3	159.7	53.3	7.4	321.7	203.8	73.0	16.0	n.a.	257.5	97.1	26.7	n.a.	n.a.	162.7	56.0
Future generations	553.3	431.3	293.6	232.5	635.3	487.2	319.4	243.9	n.a.	554.7	350.9	258.1	n.a.	n.a.	435.0	297.1
Generational imbalance (%)	115.9	170.1	450.7	3,038.4	97.5	139.0	337.8	1,424.3	n.a.	115.4	261.4	868.5	n.a.	n.a.	167.3	430.6

Note: Exchange rate assumed to be 93.37 yen per U.S. dollar (1995 average); *g* is real income growth (percent); *r* is discount rate (percent). Situations where real growth and discount rates are identical are not available.

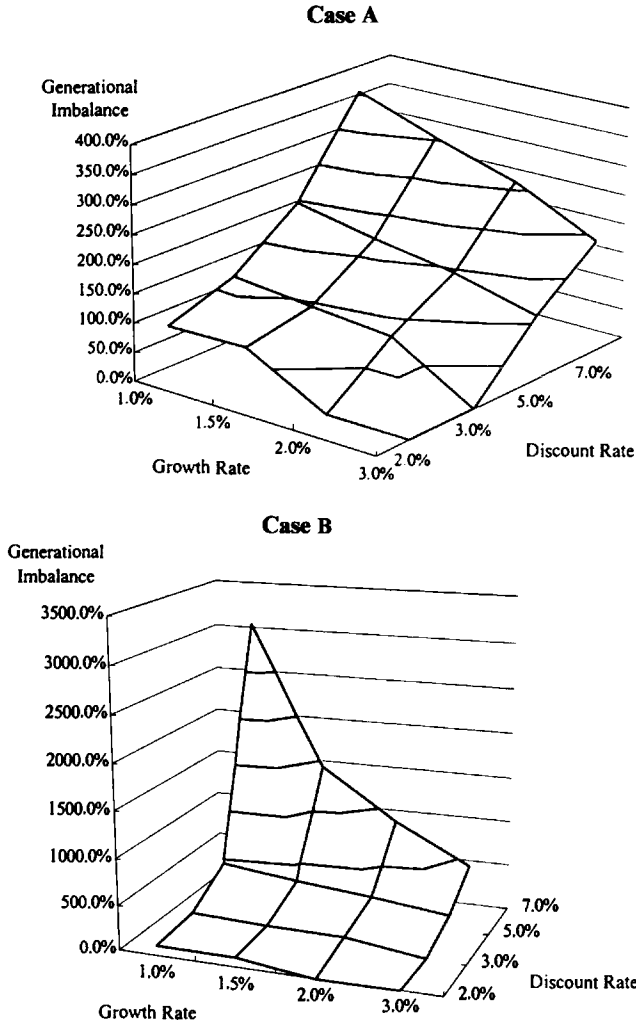


Fig. 19.1 Sensitivity of generational imbalance to growth and discount rate assumptions

Note: Case A, Educational expenditures treated as consumption. Case B, Educational expenditures treated as transfer.

discount rate work in opposite directions. A reasonable scenario would be a real income growth rate of 1.5 percent and a discount rate of 3.0 percent. In this case, the generational imbalance is 96.4 percent for case A and 139 percent for case B. These are much smaller than the imbalances in the base case (i.e., a real income growth rate of 1.5 percent and a discount rate of 5 percent).

Table 19.5 Decomposition of Generational Imbalance (percent)

Case	Base Case	No Demographic Change	Zero Debt
A	169.3	42.19	154.40
B	337.8	77.21	308.64

Note: Case A: Educational expenditures treated as consumption. Case B: Educational expenditures treated as transfers. Real income growth assumed to be 1.5 percent; discount rate, 5 percent.

If we are concerned only with the net present values of payments after 1995, table 19.3 indicates that they are positive for generations aged 64 or younger and negative for generations aged 65 or older. This is partly due to the fact that tax payments and social security contributions that old generations made when they were young are ignored in this calculation and also partly due to large intergenerational transfers from young to old generations via fiscal policy. If redistribution policy is biased toward old generations, the fiscal burden of future generations will increase as the aging process advances. Table 19.5 eloquently indicates this.

Table 19.5 decomposes the generational imbalance into two factors: demographic change and fiscal debt position. Even if we assume no debt outstanding (zero debt) in 1995, there will remain generational imbalances of 155 percent for case A and 309 percent for case B. Hence, current debt outstanding per se is not the main reason for the generational imbalance. On the other hand, if we assume no demographic change after 1995, the generational imbalance shrinks substantially to 42 percent for case A and 77 percent for case B. This implies that in Japan the generational imbalance is largely due to the aging of the demographic structure and intergenerational transfers via fiscal policy.

An important aspect of generational accounting in Japan is the role of the government's fixed capital formation. So far, future generations seem to be forced to bear an unjustifiably huge fiscal burden to finance current and future old generations. However, at the same time, future generations will enjoy without explicit repayment the benefits of public capital accumulated by the previous (old) generations. In order to make a fair judgment of intergenerational income redistribution, it is necessary to evaluate imputed benefits from public capital inherited from previous (old) generations (on this, see the appendix). As for the private sector, young generations either buy private capital or borrow it (paying rent) from old generations. As for the household sector, bequest and gift transfers from old to young generations are made with no repayment except taxes.

Table 19.6 shows the percentage share of public capital formation in total gross domestic fixed capital formation. As is evident, the Japanese government has been investing heavily in public capital formation, probably most heavily among OECD countries. In fact, we can say that the government transfers its gross fixed capital formation to future generations via public capital investment financed by current taxes. We think it is fair to discount the burden of future

Table 19.6 Gross Domestic Fixed Capital Formation in Major OECD Countries, 1995

	A	B	C	D	
	Gross Domestic Fixed Capital Formation	Private Sector Investment	Public Sector Investment (A – B)	Share of Public Sector Investment (%) C/A	Unit
Japan	136,695	95,054	41,641	30.5	Yen (billion)
United Kingdom	104,024	87,283	16,741	16.1	Pounds (million)
Germany	7,534	6,674	860	11.4	Marks (million)
France	13,807	11,403	2,404	17.4	Francs (100 million)
Italy	301,039	261,083	39,956	13.3	Lira (billion)

Source: Bank of Japan, *Comparative Economic and Financial Statistics: Japan and Other Major Countries* (Tokyo, 1996).

Note: Because of the National Income and Product Accounts basis, U.S. data are not shown.

generations because they enjoy benefits from public capital. Unfortunately, the framework we use here makes no distinction between government consumption and investment for public capital formation that will benefit future generations. In the following section, we will discuss the impact of alternative policies and the fairness of intergenerational transfers.

19.5 Generational Impact of Alternative Policies

19.5.1 Six Different Policy Simulations

This section conducts six different policy simulations and an “alternative fairness” exercise for intergenerational transfers. The six different policy simulations are based on the following assumptions to achieve generational balance: (a) an immediate and permanent cut in government purchases, (b) an immediate and permanent increase in all tax revenues, (c) an immediate increase in income tax revenues, (d) an immediate and permanent cut in transfer payments, (e) an immediate and permanent cut in both purchases and transfers, and (f) an immediate and permanent 50 percent cut in all taxes and reduction in both purchases and transfers. The results are reported in table 19.7 under both case A and case B. Let us first look at the base case, with real growth of 1.5 percent and a discount rate of 5.0 percent.

First, policy (a) implies that government purchases and fixed capital investment must be cut by about 26 to 30 percent to achieve generational balance. As the ratio between private and public demand with respect to gross domestic expenditures is about 4:1, an immediate cut in government purchases of 26 to 30 percent implies a reduction in gross domestic expenditure of 5 to 6 percent, which would have a big macroeconomic impact.

Second, policy (b) means an approximate 16 percent increase in tax pay-

Table 19.7 Generational Impact of Alternative Policies

Base Case (real income growth of 1.5%; discount rate of 5.0%)		
Policy	Change (%)	Result (%)
<i>Case A: Education as Consumption</i>		
Cut in government purchases	26.0 cut	74.0
Increase in all taxes ^a	15.5 up	115.5
Increase in income tax	53.6 up	153.6
Cut in transfer payments	28.6 cut	71.4
Cut in both purchases and transfers	13.6 cut	86.4
All taxes cut by half and both purchases and transfers reduced ^a	57.4 cut	42.6
<i>Case B: Education as Transfer</i>		
Cut in government purchases	29.5 cut	70.5
Increase in all taxes ^a	15.5 up	115.5
Increase in income tax	53.6 up	153.6
Cut in transfer payments	25.3 cut	74.7
Cut in both purchases and transfers	13.6 cut	86.4
All taxes cut by half and both purchases and transfers reduced ^a	57.4 cut	42.6
Alternative Case (real income growth of 1.5%; discount rate of 3.0%)		
Policy	Change (%)	Result (%)
<i>Case A: Education as Consumption</i>		
Cut in government purchases	29.7 cut	70.3
Increase in all taxes ^a	17.8 up	117.8
Increase in income tax	60.8 up	160.8
Cut in transfer payments	31.3 cut	68.7
Cut in both purchases and transfers	15.2 cut	84.8
All taxes cut by half and both purchases and transfers reduced ^a	57.9 cut	42.1
<i>Case B: Education as Transfer</i>		
Cut in government purchases	33.5 cut	66.5
Increase in all taxes ^a	17.8 up	117.8
increase in income tax	60.8 up	160.8
Cut in transfer payments	28.0 cut	72.0
Cut in both purchases and transfers	15.2 cut	84.8
All taxes cut by half and both purchases and transfers reduced ^a	57.9 cut	42.1

^aLocal tax and social insurance contribution (the Japanese counterpart of the social security tax) are included in taxes.

ments. Tax payments and social security contributions as a percentage of national income (the so-called gross public burden ratio) in 1995 were 36.8 percent. If scenario (b) is selected, the gross public burden ratio will jump to 41 percent. If this scenario is not selected, the net tax payment of future generations will be 2.7 to 4.4 times that of present generations, as seen in table 19.3. In such a case, the gross public burden ratio would certainly exceed 50 percent. Therefore, this scenario, with a gross public burden ratio of around 40 percent, could be accepted by the public, as long as it is sustainable.

Third, policy (c) implies a 54 percent increase in income tax. Compared with policy (b), it is rather high. Given the percentage share of income tax in total government tax revenue (35.5 percent in 1995), simple arithmetic implies that (c) requires three times as much of an increase as (b). Policy (c) affects mostly current working generations. As the income tax rate is already rather high, it would be very difficult to raise income tax further.

Fourth, policy (d) requires a 29 percent cut in transfer payments for case A and a 25 percent cut for case B. The ratio of social security transfers to national income was 17.5 percent in 1995. A slightly less than 30 percent cut in transfer payments implies a 5 percent decrease in the national income ratio.

We consider two additional scenarios, which seek "small government." Fifth, policy (e) is concerned with an immediate cut in both purchases and transfers to achieve generational balance. Here, a 13.6 percent cut in gross government expenditures is needed. This scenario seems to be reasonable and acceptable.

Sixth, policy (f) is an immediate 50 percent cut in all taxes and a reduction in both purchases and transfers. Gross government expenditures must be cut by 57.4 percent. This implies that the size of government in terms of expenditure shrinks to one-quarter of the current level.

Now look at an alternative case, real income growth of 1.5 percent and a discount rate of 3.0 percent. This case is considered because, as shown in table 19.4, it cuts the generational imbalance to half of that in the base case. In general, with a lower discount rate, the generational impact of alternative policies becomes larger (i.e., larger cuts in purchases and transfers and larger increases in taxes). But the difference between the base case and the alternative case is not as large as we expect. In other words, the generational impact of alternative policies remains robust.

Table 19.8 presents results for the same policy simulations as in table 19.7 with the additional assumption that current policy will be kept for 10 years (i.e., until 2005) and then the listed policy action will be implemented afterward. The underlying assumption is that the government may not be able to implement immediately the policy action needed to achieve generational balance. It is worthwhile examining how the generational impact of alternative policies would change if the government failed to conduct prompt policy action. As expected, the generational impact is larger for all scenarios. This implies that the sooner a policy action is implemented, the more easily generational balance is obtained. In contrast with the results in table 19.7, this exercise shows that policies in the alternative case with a lower discount rate have generational impacts slightly smaller than in the base case.

19.5.2 Alternative Measure of Intergenerational Transfers: The Musgrave Criterion

So far we have examined generational accounting in terms of absolute generational imbalance between present and future generations. In this section, we

Table 19.8 Generational Impact of Alternative Policies after Maintaining Current Policy for 10 Years

Base Case (real income growth of 1.5%; discount rate of 5.0%)		
Policy	Change (%)	Result (%)
<i>Case A: Education as Consumption</i>		
Cut in government purchases	37.8 cut	62.2
Increase in all taxes ^a	22.5 up	122.5
Increase in income tax	76.6 up	176.6
Cut in transfer payments	39.3 cut	60.7
Cut in both purchases and transfers	19.3 cut	80.7
All taxes cut by half and both purchases and transfers reduced ^a	62.0 cut	38.0
<i>Case B: Education as Transfer</i>		
Cut in government purchases	42.5 cut	57.5
Increase in all taxes ^a	22.5 up	122.5
Increase in income tax	76.6 up	176.6
Cut in transfer payments	35.2 cut	64.8
Cut in both purchases and transfers	19.3 cut	80.7
All taxes cut by half and both purchases and transfers reduced ^a	62.3 cut	38.0
Alternative Case (real income growth of 1.5%; discount rate of 3.0%)		
Policy	Change (%)	Result (%)
<i>Case A: Education as Consumption</i>		
Cut in government purchases	35.6 cut	64.4
Increase in all taxes ^a	21.4 up	121.4
Increase in income tax	72.4 up	172.4
Cut in transfer payments	36.5 cut	63.5
Cut in both purchases and transfers	18.0 cut	82.0
All taxes cut by half and both purchases and transfers reduced ^a	60.0 cut	40.0
<i>Case B: Education as Transfer</i>		
Cut in government purchases	40.0 cut	60.0
Increase in all taxes ^a	21.4 up	121.4
Increase in income tax	72.4 up	172.4
Cut in transfer payments	32.7 cut	67.3
Cut in both purchases and transfers	18.0 cut	82.0
All taxes cut by half and both purchases and transfers reduced ^a	60.0 cut	40.0

^aLocal tax and social insurance contribution (the Japanese counterpart of the social security tax) are included in taxes.

propose an alternative criterion to measure the fairness of intergenerational transfers, that is, a concept of intergenerational social contract upon which a social security system may be designed. Richard Musgrave (1981, 97) considers six alternative contracts:

1. *Intergenerational neutrality*: Each generation finances its own retirement, without claims on following generations or obligations to preceding generations.

2. *Ad hoc provision:* The agreement may be a very loose one, allowing the voters of each period to decide the level of support.

3. *Fixed replacement rate:* Retirees are entitled to receive a given fraction of their gross earnings in the form of benefits. With the replacement rate fixed, the working generation must adjust its contribution rate accordingly. Thus the tax rate changes.

4. *Fixed replacement rate, adjusted:* The replacement rate is fixed, as under the fixed replacement rate contract, but the earning base of retirees to which this rate is applied is adjusted upward to allow for the productivity gains and higher wage rates enjoyed by subsequent working generations.

5. *Fixed contribution rate:* The working population is required to contribute a given fraction of its gross earnings for the support of retirees. With the contribution rate thus fixed over generations, the replacement rate has to be changed. However, it seems impossible to maintain a fixed contribution rate throughout the aging process, and the contribution rate has been changed frequently (in an intergenerationally redistributive way) and it would be very costly to maintain.

6. *Fixed relative position:* Contributions and benefits are set so as to hold constant the ratio of per capita earnings of those in working generations (net of contribution) to the per capita benefits of retirees.

In the following, we will consider the concept of fixed relative position in detail. This means that government transfers to the “old” generation as a percentage of disposable income of the “young” generation is *fixed*. This resembles the concept of “net income indexation” in the case of public pension transfers.³

Denoting transfer benefits to the old generation by B_o , gross wage income of the working (young) generation by W_y , and social security tax, pension contributions, and all other taxes of the working generation by T_y , the fixed relative position k can be expressed as

$$(1) \quad k = B_o / (W_y - T_y).$$

As long as k remains constant, transfer benefits to the old generation will not increase even if the aging process advances. This is because the disposable income of the working generation binds transfers as equation (1) shows.

Now, let us denote the number of people in the old generation by N_o and that in the working generation by N_y . Under the fully pay-as-you-go social security system,

$$(2) \quad B_o N_o = N_y T_y \quad \text{or} \quad T_y = B_o (N_o / N_y)$$

Substituting equation (2) into equation (1) yields

3. Net income indexation is a concept in which pension benefits for pensioners are a given fraction of the disposable income of pension contributors, the working generation. This concept has been adopted in Germany and Japan.

$$(3) \quad k = B_o / [W_y - B_o(N_o/N_y)] = B_o / (W_y - B_o \cdot a),$$

where $a = N_o/N_y$, the ratio of the old generation to the working generation. Solving for B_o , we obtain

$$(4) \quad B_o = kW_y / (1 + ak).$$

Given that k is constant, transfer benefits to the old generation increase as gross wage income increases and decrease as the ratio of the old generation to the working generation increases.

The main characteristics of this fixed relative position can be summarized as follows. First, it includes interaction with other generations within society, while the concept of net present value of payments for each generation as discussed in sections 19.4 and 19.5.1 is an individualistic one, meaning that it is a closed accounting system within a generation. Fixed relative position is suitable for the current social security system, which is virtually a pay-as-you-go system. Furthermore, at the end of section 19.4, we pointed out that intergenerational transfers of fixed public capital to future generations are prevalent and, therefore, it is important to take account of a productivity increase due to public capital that, in turn, is reflected in the income of the working generation. The fixed relative position takes income changes of the working generation into full account.

Second, the concept of fixed relative position allows for policy changes such as reductions in transfer payments and tax cuts, as long as k remains constant. On the other hand, generational accounting of the net present value of payments assumes once-for-all policy changes and a balanced budget in the infinite future. In practice, political pressure increasingly imposes heavy restrictions on annual budget deficits and allows frequent changes in policy stance. The concept of fixed relative position can be used as an alternative (or a complement) to generational accounting of the net present value of payments. Note also that fixed relative position is not a discretionary policy but a rule with some intrinsic flexibility.

Third, the policy authority can manage this policy rule of fixed relative position easily because it only needs to pay attention to the relative relationship between old and working generations on an annual basis. In addition, this rule may be politically acceptable because it avoids direct generational conflict as to who bears the fiscal burden of the aging process.

In order to calculate fixed relative position in Japan, we extend this concept over life. The working period is defined as ages 0 to 64 and the old period as age 65 and older. We then calculate disposable income (gross earnings minus net tax burden) of the working period and transfer benefits for the old period. Our fixed lifetime relative position is defined as

$$(5) \quad k(1995) = \sum_{t=65}^{99} B_{ot} / \sum_{t=0}^{64} (W_{yt} - T_{yt}).$$

Table 19.9 Fixed Lifetime Relative Position: Simulation

Year	a	b	g	$h(1)$	$h(2)$	$i(n)$
<i>Case A: Education as Consumption</i>						
1995	17.0	Start	0.699	Start	Start	Start
2020	36.7	16.3 up	0.816	9.6 cut	10.9 up	5.4
2045	47.7	23.4 up	0.880	13.3 cut	15.1 up	13.0
2070	42.8	21.3 up	0.860	12.2 cut	13.9 up	10.8
<i>Case B: Education as Transfer</i>						
1995	17.0	Start	0.699	Start	Start	Start
2020	36.7	16.3 up	0.816	9.2 cut	10.5 up	52.3
2045	47.7	23.4 up	0.880	12.8 cut	14.6 up	72.8
2070	42.8	21.3 up	0.860	11.8 cut	13.4 up	66.9

Note: Real income growth assumed to be 1.5 percent; discount rate, 5 percent. "Up" and "cut" imply percentage changes from the base year, 1995.

Definitions of simulation:

a = Ratio of old generation to working generation (percent).

b = Increase in taxes from 1995 level to achieve a balanced budget.

g = Value of fixed relative position k under tax increase b .

$h(1)$ = Cut in transfer benefits to maintain k ($= 0.699$).

$h(2)$ = Increase in taxes from 1995 level under transfer cut $h(1)$ and constant k ($= 0.699$).

$i(n)$ = Generational imbalance to maintain k ($= 0.699$), where it is defined as lifetime net taxes of the future generation born in year n divided by that of the 1995 generation (percent).

As table 19.9 shows, the fixed lifetime relative position in 1995 is 0.699. Suppose the policy stance in 1995 is kept for the future, then the fixed lifetime relative position will be high, at 0.88, when the aging process approaches its peak in 2045. Note that T_y includes taxes other than income tax (e.g., corporate tax) so that the high value of fixed lifetime relative position, k , does not necessarily imply a very small lifetime disposable income.

We have conducted two additional policy simulations: (g) an increase in taxes and reduction in transfer benefits to achieve a balanced budget every year from now on and (h) a reduction in transfer benefits ($h(1)$) and an increase in taxes ($h(2)$) in order to maintain the level of the fixed lifetime relative position in 1995 ($= 0.699$). Table 19.9 shows that a balanced budget will be achieved and that the fixed lifetime relative position will be maintained constant if transfer benefits are reduced 9 to 13 percent and taxes are increased by some 10 to 15 percent. These policy simulation results appear politically acceptable as they satisfy the political trade-off between some transfer benefit reductions (i.e., a cut in the size of the government) and some tax increases (i.e., to sustain decent economic policy in an aging society). To put it differently, if the fixed lifetime relative position is kept constant at $k = 0.699$, the generational imbalance would be less than 13 percent for case A and 73 percent for case B, even at the peak of the aging process.⁴

4. In this exercise, the generational imbalance is defined as lifetime net tax of the generation born in year n divided by that of the generation born in 1995.

Nevertheless, some problems remain. First, it is difficult to determine the base-year value of k , the fixed lifetime relative position. Second, it may not be politically easy to change policies such as reductions in transfer payments, given an arbitrary value of k .

19.6 Brief Summary and Conclusion

This study has presented the most comprehensive picture of generational accounting in Japan to date. The main results are summarized as follows: The base-case calculation of the generational imbalance between present and future generations is 69 percent for case A and 338 percent for case B, assuming the current fiscal policy stance is to be maintained and real income growth of 1.5 percent and a discount rate of 5 percent. This implies that future generations have to bear 2.7 to 4.4 times the fiscal burden facing present generations over their lifetimes. This imbalance is very large by international standards.

For the base case, four basic scenarios and two additional scenarios to resolve such a generational imbalance are considered. In the four basic scenarios, government purchases have to be cut 26 to 30 percent, or all taxes have to be raised about 16 percent, or the income tax has to be increased 54 percent, or transfer payments must be reduced 25 to 29 percent. In the additional scenarios, both government purchases and transfers have to be reduced 14 percent; if all taxes are cut by 50 percent, then both purchases and transfers have to be cut by 57 percent, shrinking government expenditures to one-quarter of the current level.

Another simulation indicates that the generational imbalance is due not to fiscal debt outstanding per se but to change in the demographic structure. Indeed, if the demographic structure were to remain stationary, the generational imbalance would fall substantially. This is probably the main implication from the study of generational accounts, not only in Japan but in other countries as well.

Because of the relatively low stock of public capital, the Japanese government has been investing heavily. In flow statistics, the share of government investment in total gross domestic fixed capital formation has been much higher than in other OECD economies. And a portion of present government expenditure is used to accumulate public capital that will benefit future generations without repayment. In this respect, present generations transfer benefits, via the government, to future generations.

To take into account this aspect of public capital accruing to future generations, we consider the concept of fixed lifetime relative position. The result shows that balanced budgets will be achieved annually and that the fixed lifetime relative position will remain constant if taxes are increased by 10 to 15 percent and transfer benefits are reduced by 10 to 13 percent. In this case, the generational imbalance remains less than 13 percent for case A and 73 percent for case B.

Some problems and topics for future research remain. First, generational accounting in general and the generational imbalance in particular are very sensitive to real interest rate and income growth assumptions. It is very difficult to set reasonable assumptions for these parameters over a long period. It may be interesting to estimate alternatively the real income growth rate needed to minimize the generational imbalance for a given discount rate.

Second, and somehow related to the first point, generational accounting is based on a comparative static framework. It would be much more realistic to formulate a dynamic general equilibrium framework in which economic growth and interest rates are determined endogenously, as discussed in Auerbach and Kotlikoff (1987).

Third, the standard framework of generational accounting ignores benefits from government consumption. Suppose a cut in government purchases is made to achieve generational balance; future generations may not enjoy this situation because of reduced benefits from government consumption. The same argument can be applied to government investment and public capital, as has been discussed elsewhere in this study.

Fourth, the demographic projections we use in this study assume a gradual increase in the fertility rate in the mid-twenty-first century. But, in fact, there is no guarantee of this happening. If the demographic structure in 2050 remains as it is, the intergenerational imbalance will be larger.

Appendix

Evaluation of Imputed Benefits from Public Capital

There are at least three approaches to evaluating the imputed benefits stemming from public capital inherited from previous (old) generations.

Simple Distribution of Public Capital among Current Generations. The simplest approach is to estimate the monetary value of public capital. According to our calculations, per capita public capital in 1954 was \$99,800 (1993 value), and in 1993 it was \$610,400 (1993 value). This significant increase may indicate that intergenerational transfers in the form of public capital are rather huge. This approach, however, has two drawbacks. First, a large portion of public capital inherited from previous generations, such as roads, public buildings, and sewage systems, cannot be disposed of by individuals or a generation but is simply handed over to future generations. Second, the value of public capital stock may not necessarily correspond to the benefit to current generations.

Evaluation of Imputed Benefits from Public Capital. The second drawback we raised above can be avoided by estimating imputed benefits, which can be obtained by multiplying public capital stock by its annual return. However, this approach does not solve the problem of how imputed benefits are distributed among generations (e.g., through consumption, income, or assets).

Evaluation of Public Capital in Terms of Wage Rate. This approach evaluates benefits stemming from public capital in terms of labor productivity; that is, young generations enjoy marginally higher production levels because of inherited public capital from previous (old) generations. This fact must be reflected in the wage rate. Assume a production function such that

$$(A1) \quad Y = F(G, K, L),$$

where G is public capital, K is private capital, and L is labor input. Differentiate Y with respect to L ; it must be equal to the wage rate W :

$$(A2) \quad W = \frac{\partial Y}{\partial L} = \frac{\partial F(G, K, L)}{\partial L} = H(G).$$

Now the wage rate becomes a function of public capital G . The sign condition of G on W is positive. With this approach, we can evaluate the net present value of payments for each generation in comparison with the lifetime income of each generation, which includes benefits stemming from public capital.

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