Generational Accounting in Korea

Alan J. Auerbach
Young Jun Chun
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Motivation

- Relatively low level of the government debt (positive net wealth) and the surplus of consolidated budget in Korea
- Conceptual Problems

- Consolidated budget omits local government and important government activities such as Medical Insurance.
- government budget balance and net wealth are the results of past and present government activities. Therefore, they cannot be used to evaluate the effects of future changes in the economic environment, future cash flows of the government budget, or future fiscal policies.

e.g. Can not evaluate the change in government finance induced by population aging , National Pension system.

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Table 1. continued

Government Wealth and Debt								
Wealth	124.4	131.2	139.7	150.4	163.1	175.9	188.3	-
Debt	35.6 (9.4)[2)]	36.8 (8.8)	50.5 (11.1)	71.4 (16.1)	89.7 (18.6)	100.9 (19.3)	113.1 (20.8)	-
Net Wealth	88.7 (23.5)[2)]	94.4 (22.6)	89.2 (19.7)	79.0 (17.8)	73.4 (15.2)	75.0 (14.4)	75.2 (13.8)	-

Note: 1) Includes the central government budget (general account, special account, public trust funds) and non-financial public enterprises.
2) Ratio to GDP (%)

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Motivation

- Generational Accounting (GA) provides a useful tool for the investigation of the sustainability of fiscal policies in Korea.
  - Covers all relevant government fiscal policies.
  - Forward-looking properties allow us to explore how the sustainability of the public finances is affected by future developments such as maturing of the National Pension, increase in social welfare expenditure and population aging.

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Purpose

- to assess Korea's long-term fiscal position using Generational Accounting.
- extend the traditional GA calculation in two ways.
  - incorporate prospective changes in age profiles and aggregate benefits and contributions of public pensions.
  - incorporate expected changes in social welfare expenditures in the future.

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Fiscal Situation in Korea

- Rapid increase in government expenditure and debt
  - Debt: 9.4% of GDP (1995) , 20.8% (2001)
  - Expenditure: 19.0%(1995), 25.1% (2001)
- Consolidated Budget Surplus
  - 3.4 Trillion won , 13.4 Trillion won
- Structural problems of Korean Public Finance
  - Excluding the National Pension (NPS) budget transforms the consolidated budget balance from surplus to deficit.
  - Excluding the NPS fund (75.6 trillion won as of December 2001) eliminates government net wealth (75.2 trillion won as of December 2001).
  - Too generous Public Pension benefits promised compared with contribution
  - Rapid increase in social welfare expenditure

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Table 1. Consolidated Budget and Net Wealth of the Korean Government

(Unit: 1 trillion won (current prices), %)

	1995	1996	1997	1998	1999	2000	2001	Growth Rate (1995-2000)
Consolidated Budget (CB)[1)]								
Expenditure	71.6 (19.0)[2)]	84.4 (20.2)	100.3 (22.1)	115.4 (26.0)	121.0 (25.1)	129.3 (24.8)	136.8 (25.1)	12.7
Revenue	72.8	85.5	93.4	96.7	107.9	135.8	144.0	13.5
Balance	1.2 (0.3)[2)]	1.1 (0.3)	-7.0 (-1.5)	-18.8 (-4.2)	-13.1 (-2.7)	6.5 (1.3)	7.3 (1.3)	-
NPS Balance	3.5	4.5	4.7	6.0	7.0	11.2	13.4	-
CB excluding NPS	-2.2 (-0.6)[2)]	-3.4 (-0.8)	-11.7 (-2.6)	-24.7 (-5.6)	-20.0 (-4.1)	-4.7 (-0.9)	-6.1 (-1.1)	-

Note: 1) Includes the central government budget (general account, special account, public trust funds) and non-financial public enterprises.
2) Ratio to GDP (%)

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Table 1. continued

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Note: 1) Includes the central government budget (general account, special account, public trust funds) and non-financial public enterprises.
2) Ratio to GDP (%)

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Table 1. continued

Composition of Central Government Expenditure								
Total	71.0	83.8	99.1	112.4	118.2	126.8	132.2[3)]	12.4
General Public Service	3.0	3.4	4.2	5.0	4.4	6.7	-	19.1
Defense	11.1	12.6	13.2	13.6	13.2	14.4	-	5.4
Public Order and Safety	3.9	4.5	4.8	5.4	5.9	5.8	-	8.2
Education	12.8	14.4	16.2	16.7	17.7	19.4	-	8.8
Health Care	0.5	0.7	0.8	1.0	1.1	0.9	-	13.9
Social Security and Welfare	6.4	7.9	9.6	12.3	14.7	19.3	-	25.0
Housing and Community Amenities	5.7	7.1	6.7	7.0	9.6	6.8	-	6.2
Recreational, Cultural, Religious Activities	0.4	0.5	0.7	0.8	0.9	1.0	-	20.0
Fuel and Energy	0.5	1.2	1.4	2.5	1.9	0.8	-	27.4
Economic Development	11.1	14.3	12.6	16.1	19.0	18.5	-	12.1
Transportation and Communication	6.1	6.5	10.3	11.7	11.7	12.6	-	17.4
Other expenditure	9.5	10.9	18.6	20.4	18.3	20.5	-	19.3

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- Population Aging
  - The speed of population aging is very high, even though current level of old age dependency ratio is low.
  - Social welfare expenditure will increase.
- Resistance to rise in tax burden and social insurance contribution
  - Large magnitude of deficit in National Pension, Medical Insurance, and general government account is expected.
- Need a forward looking approach.
  - Consolidated budget and government net wealth are poor indices of Korea's fiscal sustainability.
  - Generational Accounts

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Table 2. Demographic Structure and Dependency Ratios of Selected Countries (%)

Country	Demographic Structure						Total Dependency Ratio	
	2000			2030			2000	2030
	0-14	15-64	65+	0-14	15-64	65+		
World	29.7	63.4	6.9	22.4	65.8	11.8	57.7	52.0
Developed Countries	18.2	67.4	14.4	15.4	62.0	22.6	48.4	61.3
Developing Countries	32.5	62.4	5.1	23.6	66.5	9.9	60.3	50.4
Japan	14.7	68.1	17.2	12.7	59.3	28.0	46.8	68.6
U.S.A	21.5	66.0	12.5	17.8	61.6	20.6	51.5	62.3
Italy	14.3	67.5	18.2	11.6	59.3	29.1	48.1	68.6
France	18.7	65.4	15.9	16.9	59.9	23.2	52.9	66.9
China	24.9	68.3	6.8	17.3	67.0	15.7	46.4	49.3
India	33.3	61.7	5.0	22.3	68.0	9.7	62.1	47.1
Korea	**21.1**	**71.7**	**7.2**	**12.4**	**64.6**	**23.1**	**39.5**	**54.9**

Source: United Nations, *World Population Projections*, 1998

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Table 3. Speed of Population Aging of Selected Countries

	Year Attained			Number of Years Required for Transition	
Proportion of Old Population[1)]	7%	14%	20%	7%→14%	14%→20%
Japan	1970	1994	2006	24	12
France	1864	1979	2020	115	41
Germany	1932	1972	2012	40	40
U.K.	1929	1976	2021	47	45
Italy	1927	1988	2007	61	19
U.S.A	1942	2013	2028	71	15
Korea	**2000**	**2019**	**2026**	**19**	7

Source: United Nations, *The Sex and Age distribution of World Population*, each year
Note: 1) Proportion of the population aged 65 and older.

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Basic Framework

- Divide current generations by age.
- Treat future generations as one generation.

  i.e. we assume that each successive future generation's net payment is the same up to an adjustment for real productivity growth.
- Compute net payment of current generations under current fiscal policies
- The total fiscal burden of future generations is determined as a residual, once the net payment of current generations, government consumption, and government net wealth are determined.

  This implies that Fiscal burden of long-term budgetary imbalance is born by future generations.

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Assessing intergenerational stance of fiscal policy

※ Indices for fiscal sustainability

- Generational Imbalance (GI)

  = (net payment of future generations/net payment of age 0 -1)× 100

  If GI >0, current fiscal policies are not sustainable.

  i.e. in order to attain long-term fiscal balance, net tax burden has to be adjusted sometime in the future.

- Required tax (and transfer) adjustment for long-term budgetary balance

  Adjust tax burden (and transfer) of cohorts, alive in a specific year and thereafter, proportionally until the PV of tax revenue of the future matches that of government expenditure including transfer payment and government consumption.

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Standard Method

- Forecast the aggregate amounts of each type of tax and transfer payment in future years.
- Aggregate amounts are allocated by age and sex based on cross-sectional relative age-sex-tax and age-sex-transfer profiles derived from cross-sectional micro-data sets.
- For years beyond those for which government forecasts are available, age- and sex-specific average tax and transfer amounts are set equal to those for the latest year for which forecasts are available, with an adjustment for growth.
- Compute PV of net payment across generations

※ Standard Method is based on the assumption that the age-sex-profiles of transfer payments and tax burden do not change over time.

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Extending Standard Method

- Incorporate the prospective changes in age profiles and aggregate benefits and contributions of public pensions.
  - In order to take into account the maturing of National Pension
  - Construct Projection Models for Public Pensions
- Incorporate expected future changes in social welfare expenditures.
  - assume that the per capita amount of social welfare expenditure will increase more rapidly than per capita GDP until it reaches the OECD average

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Calculation Procedure and Underlying Assumptions

- Classification of Fiscal Policies

- Social Insurance:

Public Pensions (National Pension, Occupational Pensions)
Medical Insurance
Empolyment Insurance
Industrial Accident Compensation Insurance

- Social Welfare Policies

Minimum Living Standard System
Other social Welfare services

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- Taxes:

Labor Income Tax
Capital Income Tax
Consumption Tax
Taxes on Asset-holdings
Taxes on Asset Transactions
Other Taxes

- Seignorage

-Government Consumption

Age-Specific Consumption: Education, Health, Social Welfare
Non-Age-Specific Consumption

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Table 5. Data Sources for Generational Profile Calculation

Classification	Programs	Components	Data Sources
Social Welfare System	Public Pensions	National Pension (NPS)	- Long-Term Projection by National Pension Corporation (NPC) - *National Pension Statistical Yearbook*
		Pensions for Civil Servants (PCS)	- *Statistical Yearbook for Pension for Civil Servants*
		Pension for Government Employees (PPS)	- *Statistical Yearbook for Private School Employees* - *Statistical Yearbook of Ministry of Government Administration and Home Affairs*
		Pension for Military Personnel (PMP)	- Net transfer (= pension benefit – contribution) treated as government consumption
	Medical Insurance (MI)	-	- *Medical Insurance Statistical Yearbook*
	Employment Insurance (EI)	-	- *Yearly Statistics of Employment Insurance* - *Annual Report on Economically Active Population Survey* - *Survey Report on Wage Structure* - *Survey Report on Labor Conditions at Small Size Establishments*
	Industrial Accident Compensation Insurance (IACI)	-	- *Statistical Yearbook of Industrial Accident Compensation Insurance* - *Annual Report on Economically Active Population Survey* - *Survey Report on Wage Structure* - *Survey Report on Labor Conditions at Small Size Establishments*
	Social Welfare Services and Public Assistance	Minimum Living Standards Security System (MLSS)	- Daewoo Panel
		Other Social Transfer Programs (OSTP)	- *Summary for Budget of Fiscal Year (each year)* - *Yearbook of Health and Welfare Statistics* - *Annual Report on Economically Active Population Survey*

Table 5, Continued

Classification	Programs	Components	Data Sources
Tax System	Labor Income Tax	Wage and Salary Income Tax, Retirement Income Tax, 60% of Global Income Tax, 60% of Inhabitant Tax, Farmland Tax, 60% of Business Place Tax	- Daewoo Panel - Korea Labor Panel Survey
	Capital Income Tax	40% of Global Income Tax, Timber Income Tax, Interest and Dividend Tax, Corporation Tax, 40% of Inhabitant Tax	- Daewoo Panel - Korea Labor Panel Survey - *Analysis of Private Enterprise Management*
	Consumption Tax	Value Added Tax (VAT), Special Excise Tax, Liquor Tax, Stamp Tax, Transportation Tax, Local Transportation Tax, Race-Pari-Mutuel Tax, Tobacco Consumption Tax	- Family Income and Expenditure Survey
	Tax on Asset-Holdings	Inheritance Tax, Gift Tax, License Tax, Community Facility Tax, Property Tax, Automobile Tax, Aggregate Land Tax, Urban Planning Tax, 40% of Business Place Tax	- Daewoo Panel - Korea Labor Panel Survey
	Tax on Asset-Transactions	Capital Gains Tax, Security Transactions Tax	- Daewoo Panel - National Survey of Family Income and Expenditure
	Other Taxes	Excess Profit Tax, Education Tax, Local Education Tax, Special Tax for Rural Development, Regional Development Tax, Butchery Tax	- Daewoo Panel - Family Income and Expenditure Survey - *Statistical Yearbook of National Tax* - *Annual Local Tax Statistical Report* - *2000 Tax Expenditure Report*
Monetary Policy	Seigniorage	-	- Family Income and Expenditure Survey
Government Consumption	Expenditure on Education	-	- *Statistical Yearbook of Educational Expenditure* - *Financial Yearbook of Local Government*
	Other Government Consumption	-	- *National Income and Product Account* (NIPA) - *Summary of Budget for Fiscal Year* - *Government Finance Statistics in Korea*

Population Projection

- Use the 2001 population projection model of the National Statistics Office (NSO) for the period 2001-2050.
- extend the population projection up to 2110 under the assumption that the total fertility rate and age-sex mortality rates will remain constant at their 2050 levels until 2110.
  - Average life expectancy is projected to rise from currently 76 years to 83 years in 2050.
  - Assume that the international movement rates remain constant at their 2050 levels until 2110

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Projecting Contributions and Benefits of Public Pensions

- Public pensions in Korea:
  - National Pension (NPS)
  - Occupational Pensions.
    Pension for Civil Servants (PCS)
    Pension for Private School Employees (PPS)
    Pension for Military Personnel (PMP).
- PMP is excluded from the GA calculation, as the necessary data are not published.
  Instead, we treat the PMP budget deficit as government consumption

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• National Pension

- Use the long-term projections of the National Pension Corporation (NPC) and data published in the National Pension Statistical Yearbook.
- Recalculate the distributions of NPS insurants and pension benefit recipients based on the 2001 population projection.
- Recalculate the average income of pension participants and the average benefit amount, based on our assumptions about macroeconomic variables, such as growth and inflation rates.

• Occupational Pension

- Construct a projection model for benefits and contributions of the PCS and the PPS.
- Distribution of participants and benefit recipients and their aggregates, and the profiles of average levels of contributions and benefits by year-sex-age are imputed based on data on the statistical yearbooks and some assumptions about their joint distributions and macroeconomic variables.

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• Income Tax on Pension Benefits

- project the tax burden on pension benefits under the assumption that the average effective tax rates across income levels (adjusted for overall growth of GDP per capita) remain constant at current levels.

Fig.2 Public Pension Benefit Profile

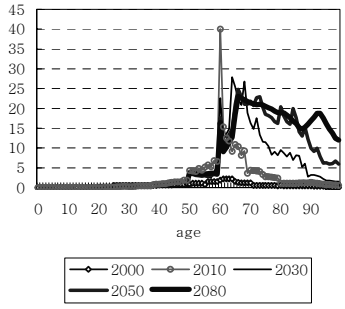
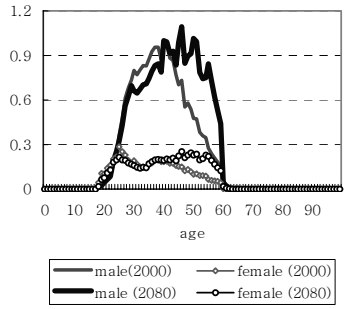


Fig.3 Public Pension Contribution Profile



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Determining Generational Profiles

- Two steps:
  - Compute profiles of the components belonging to each program.
  - compute the weighted average of profiles of components for each program.
- Use various micro-data sets and statistical yearbooks published by the government (see Table 5).
  - Daewoo Panel , Korea Labor Panel , Family Income and Expenditure Survey , and National Survey of Income and Expenditure.
  - Use statistical yearbooks published by the government, for the components that are not covered by the micro-data sets.

  1) Decompose the benefits of each social welfare program into age-specific benefits and non-age-specific benefits. The age-specific benefits and the non-age-specific benefits are assumed to be distributed equally among the relevant age-sex groups and the whole population, respectively.

  2) Compute the weighted average of the benefits for each age-sex group, with the weight for each benefit being its proportion of total benefits, and compute relative age-sex profiles

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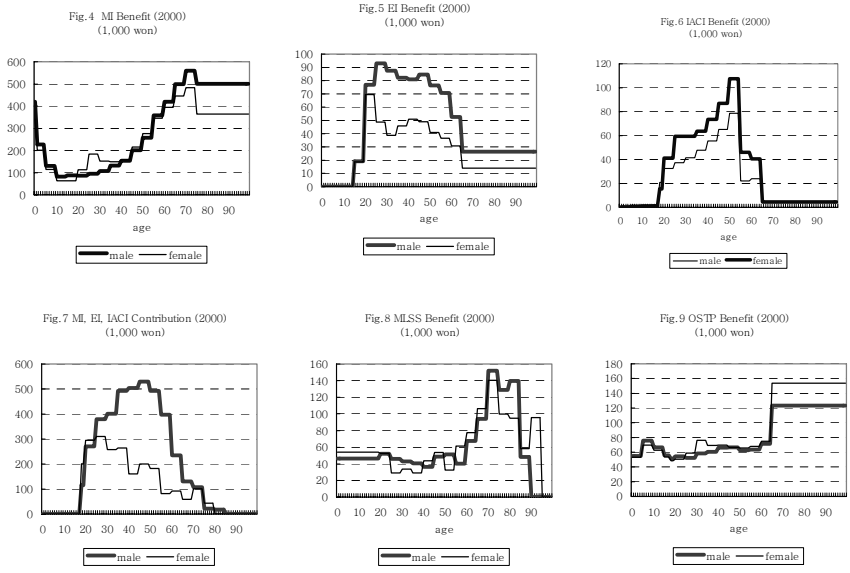

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Fig. 10 Labor Income Tax (2000)
(1,000 won)

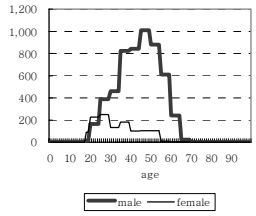

Fig. 11 Capital Income Tax (1) (2000)
(1,000 won)

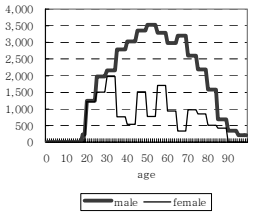

Fig. 12 Consumption Tax (2000)
(1,000 won)

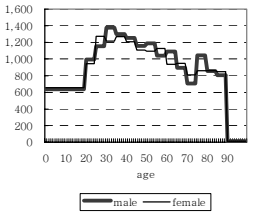

Fig. 13 Tax on Asset-Holding (2000)
(1,000 won)

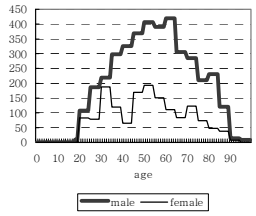

Fig. 14 Tax on Asset Transactions (2000)
(1,000 won)

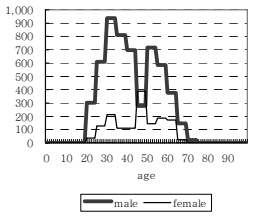

Fig. 15 Other Taxes (2000)
(1,000 won)

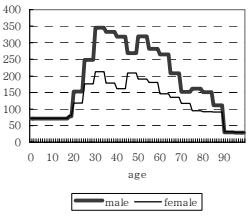

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Fig. 16 Seigniorage (2000)
(1,000 won)

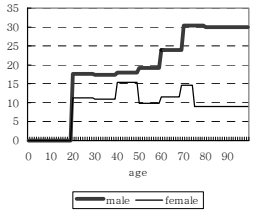

Fig. 17 Educational Benefits (2000)
(1,000 won)

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Projection of Aggregates

- Scope of government is based on the definition of National Account

  - Total Expenditure: 23% of GDP (as of 2000)
  - Includes government final consumption expenditure, subsidies, social security benefits and assistance grants, current transfers, gross fixed capital formation and capital transfers.
  - Classify into social welfare expenditure and government consumption.

    Government consumption covers consumption expenditure and government investment.
- Social Welfare Expenditure

  - Public Pensions, Medical Insurance, Employment Insurance, Industrial Accident Compensation Insurance, Minimum Living Standards Security, Other Social Welfare Services

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- Government Consumption

  - Define government consumption expenditure as government expenditure less social insurance benefits and benefits of social welfare services and public assistance
  - Divide into: age-specific consumption and non-age-specific consumption
  - Age-specific consumption:

    education, health, and social security and welfare services
- Social Welfare Expenditures are all treated as age-specific
- The per capita level of age-specific expenditure of relevant age-sex groups is assumed to increase at the rate of productivity growth

  - Exceptions:

    government consumption on health care, social security and welfare services, and some transfer payments such as MI, MLSS, and OSTP.

    Assume that income elasticity of these expenditure is 1.2.

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- Total amount of government consumption on health care and MI benefits (or on government consumption on social welfare and MLSS and OSTP benefits) is limited not to exceed 5.94% (or 4.12%) of GDP.

- Per Capita non-age-specific expenditure increases at the rate of GDP growth.
- Social insurance contributions are classified as age-specific.

- Assume that per capita contributions of relevant age groups will increase at the productivity growth rate except for the case of MI.
- MI contribution revenue is 80% of total benefit expenditure.

Difference between them is financed by government subsidy.

Assume that the difference between the contribution revenue and the benefit expenditure per participant of each age-sex group remain constant at the level of 2000.

- Aggregate labor income tax and capital income tax revenues are projected under the assumption that per capita values depend on productivity growth and the size of the economically active population.
- Other taxes are treated as non-age-specific.

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Fig.19 Aggregate Public Pension Benefits and Contributions (% of GDP)

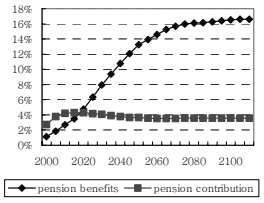


Fig.20 Aggregate MI Benefits and Contributions (% of GDP)

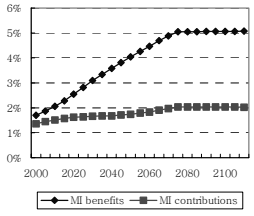


Fig.21 Aggregatge MLSS, OSTP Expenditure(% of GDP)

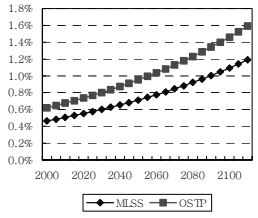


Fig.22 Aggregate Tax Revenue (% of GDP)

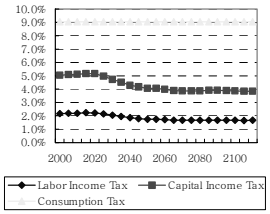


Fig.23 Aggregate Tax Revenue (% of GDP)

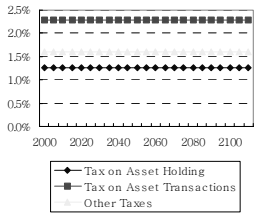
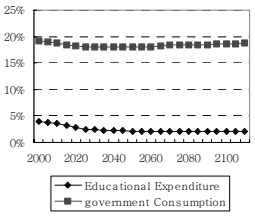


Fig.24 Aggregate Government Expenditure (% of GDP)



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Government Net Wealth and Discount Rate

- Government Net Wealth:

- Assume 100 trillion won.

  net capital income (6.3 trillion won as of 2000) divided by the sum of our assumed real interest rate (3.5%) and an assumed inflation rate (3%) is 97.1 trillion won.

- Discount Rate:

- real discount rate is 3.5%

- inflation rate is 3%.

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Findings

- Benchmark year: 2000
- Productivity growth rate: 1.5% per annum (real)
- Inflation rate: 3%
- Discount Rate: 6.5% (nominal)
- Net payment I: includes an infra-marginal corporation tax adjustment.

  Net payment II does not include one.

  Net payment III: includes infra-marginal corporation tax adjustment and treats the educational expenditure as transfer.

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- The accounts (Net Payment I and Net Payment II) for future generations for males, females, and combined cohorts are about 115% larger than those for those aged 0.
  - In the case of the Net Payment III, the accounts for future generations are about 195% higher than those for the aged 0 .
  - Implies that the current fiscal policies are not sustainable and that a substantial fiscal burden is shifted to future generations.

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Generational Imbalance

- Net Payment of current generations are positive except for the cohorts aged 90 and older in the benchmark year.
  - due to: (1) large proportion of consumption taxes and capital taxes; (2) low level of social welfare expenditure as of 2000.
- Net Payment I is larger than Net Payment II for older generations.
  - due to that older cohorts hold much larger proportions of net wealth, whose values are reduced by the assumed capitalization of some capital income taxes.
- The accounts (Net Payment I and Net Payment II) for future generations for males, females, and combined cohorts are about 115% larger than those for those aged 0.
  - In the case of the Net Payment III, the accounts for future generations are about 195% higher than those for the aged 0 .
  - Implies that the current fiscal policies are not sustainable and that a substantial fiscal burden is shifted to future generations.

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Table 6. Generational Accounts (base case)

(unit: 1,000 won, %)

Age	Total			Male			Female		
	Net payment I[1)]	Net payment II[2)]	Net payment III[3)]	Net payment I[1)]	Net payment II[2)]	Net payment III[3)]	Net payment I[1)]	Net payment II[2)]	Net payment III[3)]
0	56,355	57,376	33,476	72,097	73,504	49,205	39,038	39,636	16,175
5	62,733	63,830	37,260	80,530	82,023	55,046	42,409	43,053	16,948
10	67,695	68,868	48,202	88,709	90,302	69,212	43,902	44,600	24,414
15	67,811	69,080	56,936	89,255	90,983	78,376	44,507	45,277	33,635
20	77,244	77,912	74,977	103,187	104,358	100,917	49,891	50,030	47,627
25	73,719	74,100	73,655	101,526	102,320	101,463	43,721	43,656	43,657
30	64,716	64,849	64,683	91,376	92,042	91,345	37,346	36,932	37,312
35	39,299	39,566	39,268	54,361	54,683	54,332	23,264	23,472	23,232
40	36,728	36,982	36,699	54,144	54,319	54,117	18,920	19,256	18,890
45	32,384	32,195	32,357	43,905	43,807	43,881	20,718	20,439	20,690
50	22,158	21,935	22,134	34,341	33,750	34,319	9,755	9,907	9,729
55	12,705	12,180	12,684	18,920	18,382	18,901	6,320	5,809	6,298
60	14,277	13,819	14,259	20,132	19,476	20,116	8,868	8,592	8,848
65	8,374	8,015	8,359	11,962	11,114	11,949	5,465	5,501	5,448
70	6,356	5,786	6,344	7,434	6,462	7,423	5,644	5,340	5,631
75	5,813	5,218	5,803	7,622	6,680	7,613	4,749	4,358	4,738
180	2,831	2,451	2,823	3,661	3,005	3,654	2,415	2,174	2,407
85	569	309	563	219	-142	214	695	472	689
90	-2,491	-2,530	-2,494	-2,408	-2,594	-2,411	-2,513	-2,513	-2,517
95	-1,281	-1,297	-1,284	-1,273	-1,388	-1,275	-1,283	-1,283	-1,285
99	-486	-502	-487	-453	-575	-454	-491	-491	-492
Future	122,280	121,289	98,899	157,048	155,992	146,322	85,037	84,117	48,100
Generational Imbalance(%)	117	111	195	-	-	-	-	-	-

Notes: 1) Net Payment with infra-marginal capital income tax adjustment
2) Net Payment without infra-marginal capital income tax adjustment
3) Net Payment with infra-marginal capital income tax adjustment (regarding educational expenditure as transfer)

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Composition of GA

- Public Pensions:
  - National Pension accounts for about 25% of generational imbalance (Net Payment I or Net Payment II), and 31% in the case of Net Payment III.
  - Pension for Government Employees accounts for 7.9% (Net Payment I or Net Payment II), and 9.8% in the case of Net Payment III.
  - Pension for Private School Employees accounts for 1.0% (Net Payment I or Net Payment II), and 1.2% in the case of Net Payment III.
- Medical Insurance
  - Explains about 11.7% of Net Payment I or Net Payment II, and about 14.5% of Net Payment III for future generations.

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- Minimum Living Standards Security (MLSS) system and other social welfare services and public assistance (OSTP)

  - The burden is not heavy.

    PV of benefits from these programs at age 0 is about 80.7% of that for labor income taxes.

    due to: conservative income elasticity assumed.

  - Cannot preclude the possibility that MLSS expenditures will increase more rapidly than we project.

    because of reduction of work incentives presented by the MLSS (100% tax rate) and population aging

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Table 7. Composition of Generational Accounts (Male and Female, 1,000 won)

	Net payment I	Public Pensions				Medical Ins.	Employ. Ins.	IACI	MLSS
		subtotal	NPS	PCS	PPS				
0	56,355	-9,216	-7,908	-1,212	-96	-5,187	-608	217	-2,542
5	62,733	-8,819	-7,546	-1,169	-104	-4,167	-696	254	-2,490
10	67,695	-9,072	-7,516	-1,425	-131	-3,748	-786	278	-2,419
15	67,811	-14,461	-12,804	-1,503	-153	-3,614	-885	295	-2,353
20	77,244	-11,311	-9,829	-1,325	-157	-3,659	-920	295	-2,268
25	73,719	-15,128	-13,389	-1,531	-208	-4,335	-791	271	-2,169
30	64,716	-17,993	-14,444	-3,154	-396	-5,145	-685	198	-2,131
35	39,299	-35,155	-29,544	-4,780	-832	-5,828	-611	174	-2,089
40	36,728	-27,779	-20,810	-5,860	-1,109	-6,723	-580	43	-2,083
45	32,384	-23,461	-15,055	-7,009	-1,397	-7,399	-504	11	-2,060
50	22,158	-22,865	-12,274	-9,091	-1,501	-7,914	-443	-6	-1,978
55	12,705	-21,361	-14,090	-5,802	-1,469	-8,097	-404	99	-1,939
60	14,277	-8,367	-1,977	-5,735	-655	-7,647	-318	18	-1,876
65	8,374	-6,314	-367	-5,892	-55	-6,753	-239	21	-1,724
70	6,356	-3,754	-325	-3,386	-42	-5,374	-228	-52	-1,452
75	5,813	-1,367	-296	-1,052	-19	-4,098	-176	-41	-966
80	2,831	-991	-243	-742	-6	-3,174	-132	-32	-656
85	569	-647	-159	-486	-2	-2,323	-95	-24	-335
90	-2,491	-341	-40	-300	-1	-1,579	-64	-17	-257
95	-1,281	-33	-24	-8	-1	-985	-40	-11	0
99	-486	-10	-9	0	0	-381	-15	-4	0
future	122,280	41,676	30,708	9,718	1,250	14,316	1,478	-487	-

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- Structure of Tax Burden

  - large share of consumption taxes
  - relative unimportance of labor income taxes
  - the large proportion accounted for by taxes on asset transactions

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Table 7. Composition continued

	OSTP	Labor Income Tax	Capital Income Tax	Con-sump-tion Tax	Tax on Asset Holding	Tax on Asset Transact	Other Taxes	Seign-iorage	Edu. Exp
0	-3,342	7,288	12,806	37,755	3,926	8,727	6,224	172	-22,878
5	-3,334	8,168	14,778	38,382	4,378	9,488	6,522	193	-25,473
10	-3,215	8,975	16,839	38,830	4,829	10,148	6,785	216	-19,493
15	-3,146	9,810	19,155	39,481	5,342	10,846	7,087	244	-10,875
20	-3,118	10,610	22,389	40,010	5,922	11,632	7,387	274	-2,268
25	-3,085	10,777	23,464	38,951	6,177	11,860	7,465	262	-64
30	-3,034	9,941	23,022	36,284	6,156	10,802	7,046	256	-33
35	-2,904	9,527	21,937	32,915	5,910	8,873	6,314	237	-31
40	-2,807	7,756	20,814	29,451	5,541	7,253	5,609	234	-29
45	-2,690	6,165	19,963	25,987	5,291	5,909	4,962	209	-26
50	-2,564	4,031	17,185	22,701	4,662	4,883	4,271	196	-24
55	-2,445	1,983	15,111	19,115	3,803	3,235	3,432	173	-21
60	-2,351	587	11,226	15,681	2,934	1,597	2,630	161	-18
65	-2,257	54	8,523	12,538	2,062	392	1,941	128	-15
70	-1,860	0	6,276	9,767	1,502	38	1,386	107	-13
75	-1,465	0	4,069	7,878	898	0	1,009	73	-10
80	-1,122	0	2,223	5,395	560	0	698	61	-8
85	-846	0	969	3,179	231	0	417	41	-6
90	-593	0	126	51	31	0	121	32	-4
95	-383	0	42	33	3	0	74	18	-3
99	-150	0	25	13	1	0	29	6	-1

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Establishing Generational Balance

- Under the base case assumptions (g=1.5%, r=6.5%, medium fertility), the required increase is 56-59% of the tax burden, if the adjustment is made only for generations born in 2001 and thereafter.

  - If the adjustment is made to all cohorts alive in 2004 and later, the required adjustment represents a 19-20% increase in tax burden.

- Delay in the tax adjustment raises its magnitude.

  - If delay until 2030, it reaches 37-39%.

- If the increase in tax burden is accompanied by the same percentage decrease in transfer payments,

  - The required adjustment decreases to 34-39% (if the adjustment is made only for the generations born after 2000), 12-13% (if the adjustment is made to all the cohorts alive in 2004 and later) and 21-22% (if we delay the adjustment until 2030).

Table 10. Required Tax Adjustment[1] for Long-Term Government Budgetary Balance (unit: %)

	Labor productivity	g = 0%			g = 1.5%							g = 3.0%	
	Discount rate	r = 5.5%	r = 6.5%	r = 7.5%	r = 5.5%	r = 6.5%					r = 7.5%	r = 6.5%	r = 7.5%
	Fertility[2] Welfare expenditure[2]	MF MW	MF MW	MF MW	MF MW	MF LW	LF MW	**MF MW**	HF MW	MF, HW	MF MW	MF MW	MF MW
Net Payment I	Current[3]	26.1	13.5	5.6	61.7	35.0	24.6	**26.4**	29.3	35.0	12.8	100.7	29.7
	Future[4]	75.8	59.7	35.5	66.3	77.7	65.2	**58.7**	51.4	77.7	45.9	54.2	48.3
	2004[5]	21.4	12.5	5.7	33.7	26.2	19.6	**19.8**	20.2	26.2	11.2	36.4	19.7
	2010[5]	25.2	15.5	7.4	36.7	30.0	22.7	**22.8**	22.9	30.0	13.5	38.3	22.1
	2020[5]	34.1	22.8	12.0	42.8	38.6	29.8	**29.4**	28.7	38.6	19.1	42.0	27.2
	2030[5]	47.3	34.7	19.9	50.5	51.0	40.3	**38.6**	36.5	51.0	27.6	46.2	33.9
Net Payment II	Current	25.4	13.1	5.6	59.4	33.9	23.5	**25.3**	28.3	33.9	12.2	95.7	28.1
	Future	73.6	58.1	35.0	63.8	75.4	62.4	**56.4**	49.6	75.4	43.9	51.5	45.7
	2004	20.8	12.2	5.6	32.4	25.4	18.7	**19.0**	19.5	25.4	10.7	34.6	18.7
	2010	24.5	15.1	7.3	35.3	29.1	21.7	**21.9**	22.1	29.1	13.0	36.4	20.9
	2020	33.2	22.2	11.8	41.2	37.5	28.5	**28.2**	27.7	37.5	18.3	39.9	25.7
	2030	45.9	33.8	19.6	48.6	49.5	38.6	**37.1**	35.1	49.5	26.4	43.9	32.1
Net Payment III	Current	26.1	13.5	5.6	61.7	35.0	24.6	**26.4**	29.3	35.0	12.8	100.7	29.7
	Future	75.8	59.7	35.5	66.3	77.7	65.2	**58.7**	51.4	77.7	45.9	54.2	48.3
	2004	21.4	12.5	5.7	33.7	26.2	19.6	**19.8**	20.2	26.2	11.6	36.4	19.7
	2010	25.2	15.5	7.4	36.7	30.0	22.7	**22.8**	22.9	30.0	13.5	38.3	22.1
	2020	34.1	22.8	12.0	42.8	38.6	29.8	**29.4**	28.7	38.6	19.1	42.0	27.2
	2030	47.3	34.7	19.9	50.5	51.0	40.3	**38.6**	36.5	51.0	27.6	46.2	33.9

Notes: 1) Percentage increase in tax burden to attain long-run budgetary balance
2) LF: low fertility, MF: medium fertility, HF: high fertility
LW: low welfare expenditure, MW: medium welfare expenditure, HW: high welfare expenditure
3) Tax burden and benefits of current generations (as of 2000) are adjusted, while those of future generations not changed.
4) Tax burden and benefits of future generations are adjusted, while those of current generations not changed.
5) Adjust tax burden and benefits for all age groups from the respective year.

Table 11. Required Tax and Benefit Adjustment[1] for Long-Term Government Budgetary Balance (unit: %)

	Labor productivity	g = 0%			g = 1.5%							g = 3.0%	
	Discount rate	r = 5.5%	r = 6.5%	r = 7.5%	r = 5.5%	r = 6.5%					r = 7.5%	r = 6.5%	r = 7.5%
	Fertility[2] Welfare expenditure[2]	MF MW	MF MW	MF MW	MF MW	MF LW	LF MW	MF MW	HF MW	MF, HW	MF MW	MF MW	MF MW
Net Payment I	Current[3]	16.8	9.1	4.0	38.9	13.2	16.3	17.5	19.5	22.3	8.8	65.9	20.3
	Future[4]	49.9	42.3	26.4	39.7	30.7	42.8	38.8	34.4	49.7	32.5	32.7	32.1
	2004[5]	13.5	8.3	3.9	20.4	9.9	12.7	12.9	13.2	16.4	7.6	22.4	13.2
	2010[5]	15.3	9.8	4.9	21.7	11.1	14.2	14.4	14.6	18.2	8.9	23.2	14.4
	2020[5]	19.2	13.3	7.2	24.3	13.6	17.6	17.6	17.5	22.1	11.8	24.9	17.0
	2030[5]	24.8	18.7	10.9	27.7	17.2	22.4	21.9	21.3	27.7	16.1	26.9	20.5
Net Payment II	Current	16.3	8.8	3.9	37.4	12.4	15.6	16.8	18.8	21.7	8.4	62.6	19.2
	Future	48.5	41.1	26.0	38.2	29.0	40.9	37.3	33.1	48.2	31.1	31.1	30.4
	2004	13.2	8.1	3.9	19.6	9.3	12.1	12.4	12.8	15.9	7.3	21.3	12.5
	2010	14.9	9.5	4.8	20.9	10.5	13.6	13.8	14.1	17.6	8.5	22.1	13.7
	2020	18.7	12.9	7.1	23.4	12.9	16.8	16.9	16.9	21.4	11.3	23.7	16.1
	2030	24.1	18.2	10.7	26.6	16.2	21.4	21.1	20.6	26.9	15.3	25.6	19.4
Net Payment III	Current	16.2	8.7	3.8	37.8	12.7	15.8	16.9	18.8	21.6	8.5	64.0	19.6
	Future	43.4	35.0	20.9	36.6	26.8	37.7	34.3	30.2	44.1	27.4	30.6	28.7
	2004	12.8	7.8	3.7	19.4	9.3	12.0	12.1	12.4	15.5	7.2	21.2	12.4
	2010	14.5	9.3	4.6	20.7	10.4	13.5	13.6	13.7	17.3	8.4	22.1	13.6
	2020	18.4	12.7	6.8	23.3	12.9	16.9	16.7	16.5	21.1	11.2	23.7	16.2
	2030	23.8	17.9	10.5	26.5	16.4	21.6	21.0	20.2	26.6	15.3	25.7	19.5

Notes: 1) Percentage increase in tax burden and (the same) percentage decrease in benefits to attain long-run budgetary balance
2) LF: low fertility, MF: medium fertility, HF: high fertility
LW: low welfare expenditure, MW: medium welfare expenditure, HW: high welfare expenditure
3) Tax burden and benefits of current generations (as of 2000) are adjusted, while those of future generations not changed.
4) Tax burden and benefits of future generations are adjusted, while those of current generations not changed.
5) Adjust tax burden and benefits for all age groups from the respective year.

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Sensitivity Analysis

- The alternative assumptions do not change the qualitative results.
- Contrary to initial intuition, an increase in the rate of labor pr oductivity growth increases the generational imbalance.

- Due to the fact that the budgetary imbalance of public pensions and MI is worsened as the growth rate increases.
- PV of public pension benefits is more than double that of future contribution revenues. Therefore, the gap between benefits and contributions will increase faster than contributions with productivity growth, since the benefits and contributions are proportionally related to the income level of participants.

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Table 12. Generational Imbalance (future account / 2000 newborn, %)

Labor productivity (g)	0%			1.5%							3.0%	
Discount rate (r)	5.5%	6.5%	7.5%	5.5%	6.5%					7.5%	6.5%	7.5%
Fertility[1] Welfare expenditure[1]	MF MW	MF MW	MF MW	MF MW	MF LW	LF MW	MF MW	HF MW	MF, HW	MF MW	MF MW	MF MW
Net Payment I	151	102	55	178	85	128	117	102	165	78	172	100
Net Payment II	145	98	54	169	80	122	111	97	159	74	165	95
Net Payment III	279	202	123	283	136	216	195	168	288	141	245	153

Notes: 1) LF: low fertility, MF: medium fertility, HF: high fertility
LW: low welfare expenditure, MW: medium welfare expenditure, HW: high welfare expenditure

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