



Decreasing Fertility, Aging Populations, and Life Cycle Deficit : The Case of South Korea

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1

Development Background of NTA in South Korea

- Decreasing Fertility and Population Aging -

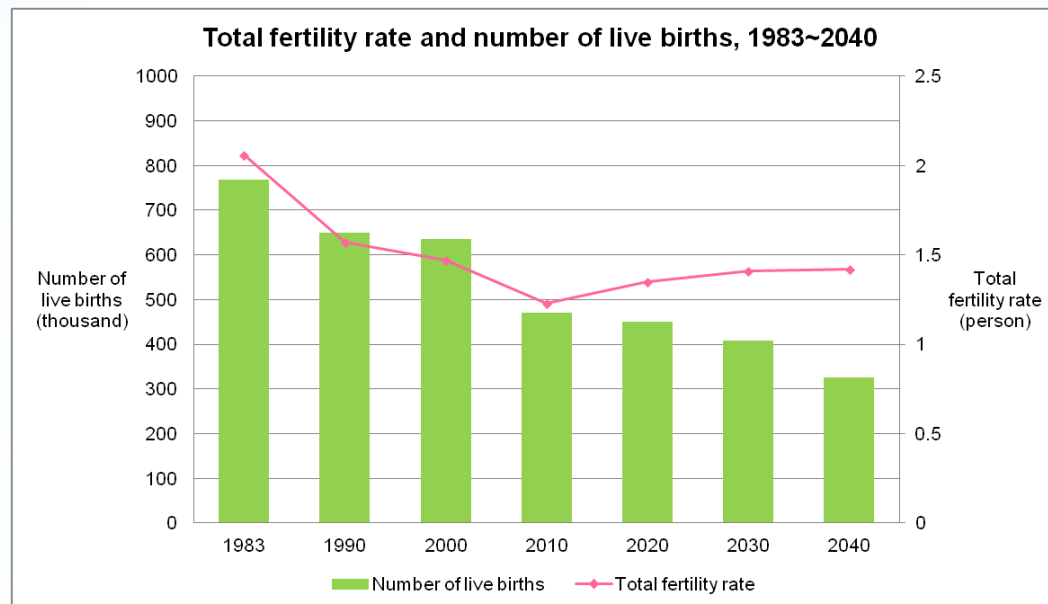
Decreasing Fertility in South Korea

▪ Low fertility – Total fertility rate and number of live births

- Korea experienced below-replacement level fertility (2.1 children per woman) in 1983 and has declined to 1.23 in 2010

	1983	1990	2000	2010	2020	2030	2040
Total fertility rate (person)	2.06	1.57	1.47	1.23	1.35	1.41	1.42
Number of live births (thousand)	769	650	635	470	451	409	325

Source : Statistics Korea (2012), Korea's Population: 50 million



Decreasing Fertility in South Korea

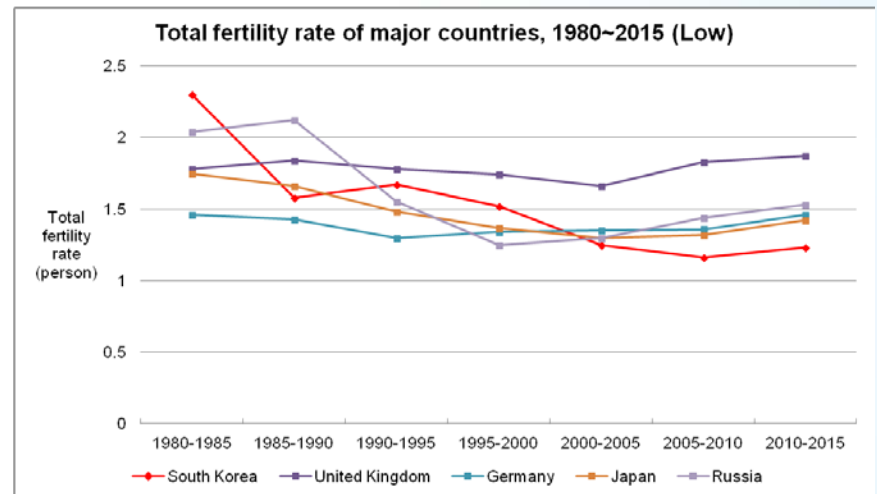
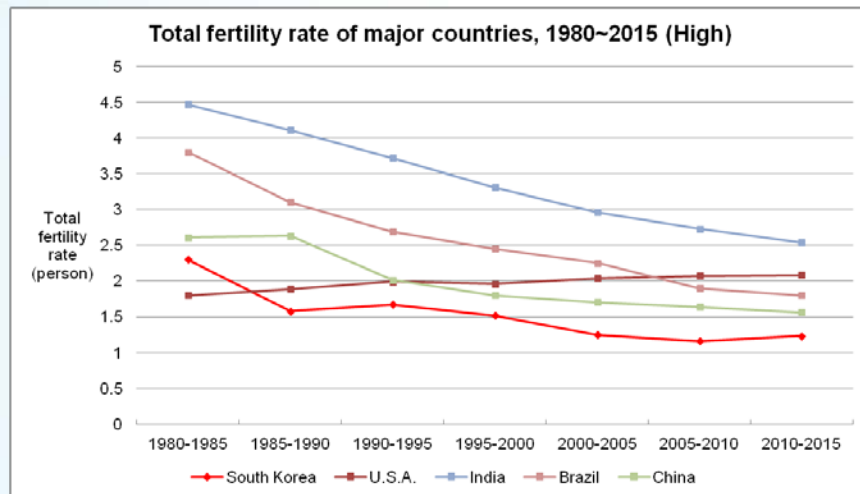
Low fertility – Total fertility rate of major countries

– Over the past three decades, fertility rates have decreased all over the world.

	South Korea	U.S.A.	France	United Kingdom	Germany	Japan	India	Brazil	China	Russia
1980 – 1985	2.30	1.80	1.87	1.78	1.46	1.75	4.47	3.80	2.61	2.04
1985 – 1990	1.58	1.89	1.80	1.84	1.43	1.66	4.11	3.10	2.63	2.12
1990 – 1995	1.67	1.99	1.71	1.78	1.30	1.48	3.72	2.60	2.01	1.55
1995 – 2000	1.52	1.96	1.76	1.74	1.34	1.37	3.31	2.45	1.80	1.25
2000 – 2005	1.25	2.04	1.88	1.66	1.35	1.30	2.96	2.25	1.70	1.30
2005 – 2010	1.16	2.07	1.97	1.83	1.36	1.32	2.73	1.90	1.64	1.44
2010 – 2015	1.23	2.08	1.99	1.87	1.46	1.42	2.54	1.80	1.56	1.53

Unit : person

Source : Statistics Korea (2012), Korea's Population: 50 million



Population Aging in South Korea

▪ Rising median ages – Median ages of major countries

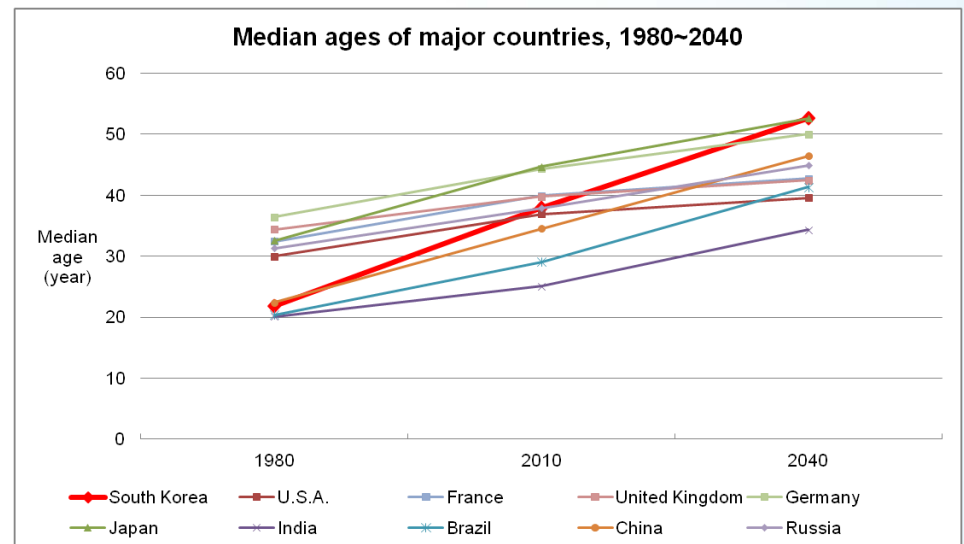
- The median age of South Korea increased by 16 years from 21.8 years in 1980 to 37.9 years in 2010.
 - The median age will increase by 10 years to 48.5 years in 2030.
 - Afterward, the increasing speed of the median age will slow down. The median age will reach 52.6 years in 2040.

	South Korea	U.S.A.	France	United Kingdom	Germany	Japan	India	Brazil	China	Russia
1980	21.8	30.0	32.4	34.4	36.4	32.6	20.1	20.4	22.4	31.3
2010	37.9	36.9	39.9	39.8	44.3	44.7	25.1	29.1	34.5	37.9
2040	52.6	39.6	42.7	42.4	50.0	52.6	34.3	41.3	46.4	44.9
From 1980 to 2010	16.1	6.8	7.5	5.4	7.9	12.1	5.1	8.7	12.1	6.6
From 2010 to 2040	14.7	2.8	2.8	2.6	5.7	7.9	9.1	12.2	11.8	7.0

Unit : year

Source : Statistics Korea (2012), Korea's Population: 50 million

- The low fertility rate and the increase in the life expectancy at birth contributed to the steady increase in median age.



Population Aging in South Korea

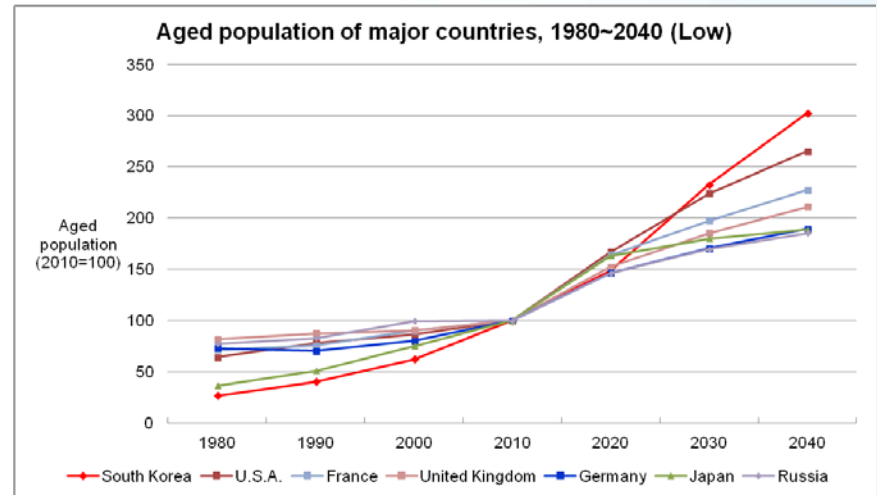
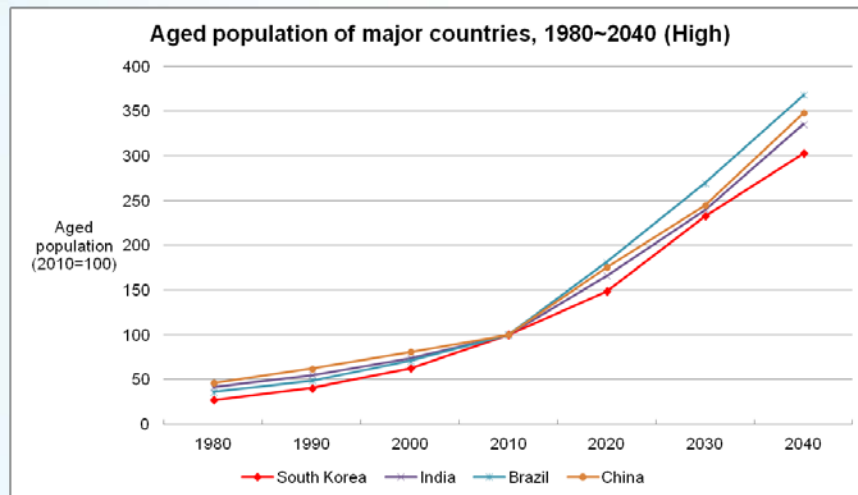
▪ The increasing elderly population – Aged population of major countries

– Over the past three decades, the aged population is projected to increase by 2~3 times all over the world.

	South Korea	U.S.A.	France	United Kingdom	Germany	Japan	India	Brazil	China	Russia
1980	26.7	64.0	71.2	81.7	72.8	36.5	41.3	35.9	46.1	77.4
1990	40.3	78.1	75.4	87.3	70.2	50.9	54.9	48.8	62.0	82.6
2000	62.3	86.3	89.9	90.5	80.0	75.2	74.0	70.9	80.9	99.5
2010	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2020	148.3	166.9	163.9	152.1	146.5	163.3	166.0	180.8	175.4	146.2
2030	232.8	224.1	197.3	185.1	170.6	179.9	239.4	269.4	244.5	169.8
2040	302.6	265.4	227.5	210.9	189.5	188.5	335.3	368.0	347.8	185.1

Unit : Aged population (2010=100)

Source : Statistics Korea (2012), Korea's Population: 50 million



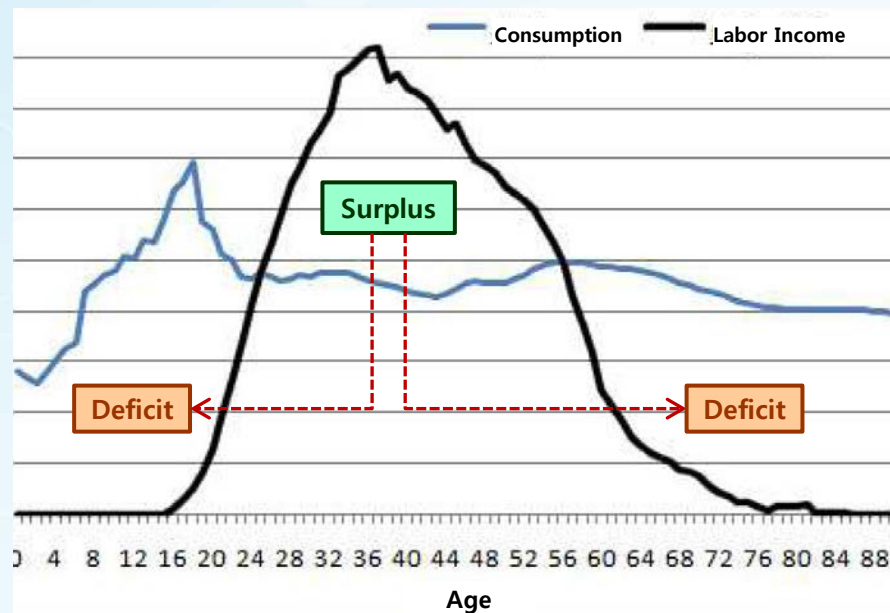


2

Introduction to the Structure of National Transfer Accounts (NTA)

National Transfer Accounts (NTA)

Overview of National Transfer Accounts



$C(x)$: consumption
 $Y^L(x)$: labor income
 $\tau^+(x)$: transfer inflows
 $\tau^-(x)$: transfer outflows
 $Y^{P+}(x)$: property income inflows
 $Y^{P-}(x)$: property income outflows
 $Y^K(x)$: capital income
 $S(x)$: saving

$$Y^A(x) = Y^K(x) + Y^{P+}(x) + Y^{P-}(x)$$

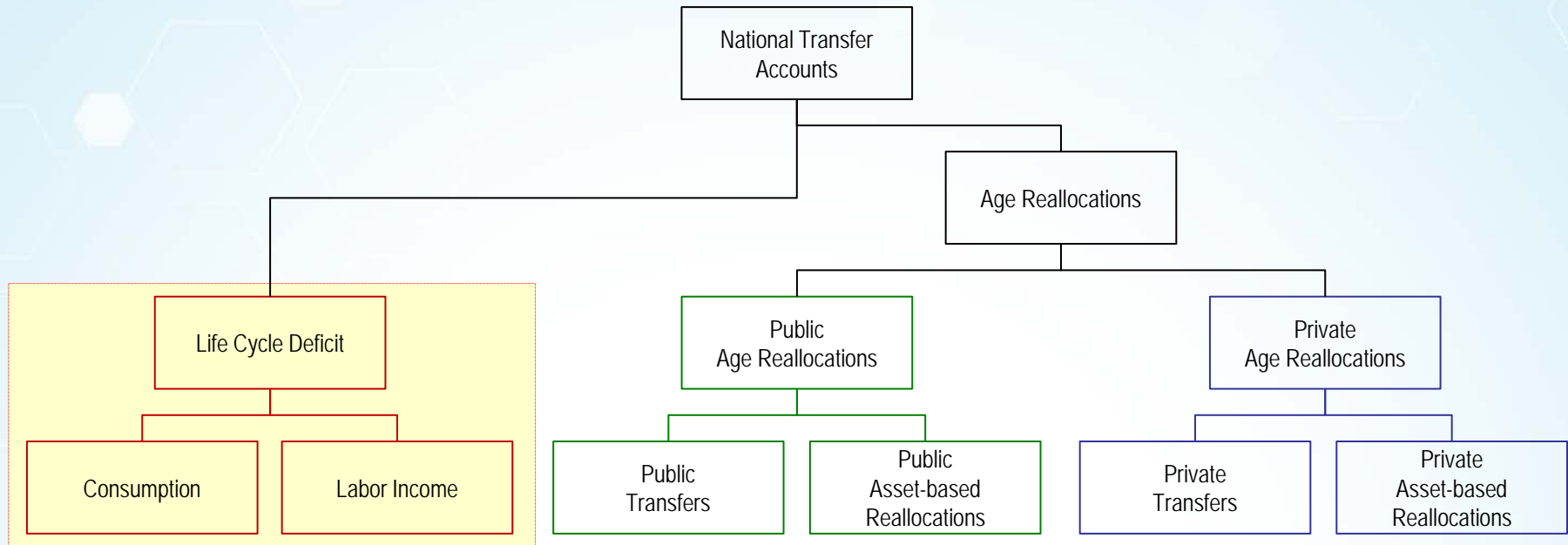
$$\underbrace{Y^L(x) + \tau^+(x) + Y^K(x) + Y^{P+}(x)}_{\text{Inflows}} = \underbrace{C(x) + \tau^-(x) + Y^{P-}(x) + S(x)}_{\text{Outflows}}$$

$$\underbrace{C(x) - Y^L(x)}_{\text{Life Cycle Deficit}} = \underbrace{\tau^+(x) - \tau^-(x)}_{\text{Transfer}} + \underbrace{Y^A(x) - S(x)}_{\text{Asset Reallocation}}$$

Age Reallocation

National Transfer Accounts (NTA)

Structure of National Transfer Accounts





3

Construction of Life Cycle Deficit in NTA of South Korea

Construction of Life Cycle Deficit

▪ Data and methodology for construction of life cycle deficit in NTA of South Korea

Components	Detailed Components	Data	Macro controls (National accounts)	Construction of Age profile distribution	Super smoothing	Adjustment to macro controls
Labor Income	Earnings	KLIPS*	Income accounts by institutional sectors	Using STATA	Using R	Using Excel
	Self-employment labor income	KLIPS*	Income accounts by institutional sectors	Using STATA	Using R	Using Excel
Private Consumption	Private education consumption	HIES*	Final consumption expenditure of HH by purpose**	Using STATA	None	Using Excel
	Private health consumption	HIES*	Final consumption expenditure of HH by purpose**	Using STATA	Using R	Using Excel
	Private other consumption	HIES*	Final consumption expenditure of HH by purpose**	Using STATA	Using R	Using Excel
Public Consumption	Public education consumption	Statistical Yearbook of Education	General government final consumption by function**	Number of students by grade & age, Expenditures at national and public schools	None	Using Excel
	Public health consumption	National Health Insurance Statistical Yearbook	General government final consumption by function**	Service benefits by age : Total Benefit amounts	Using R	Using Excel
	Public other consumption	Consumption Data	General government final consumption by function**	Constant per capita age profile	None	Using Excel

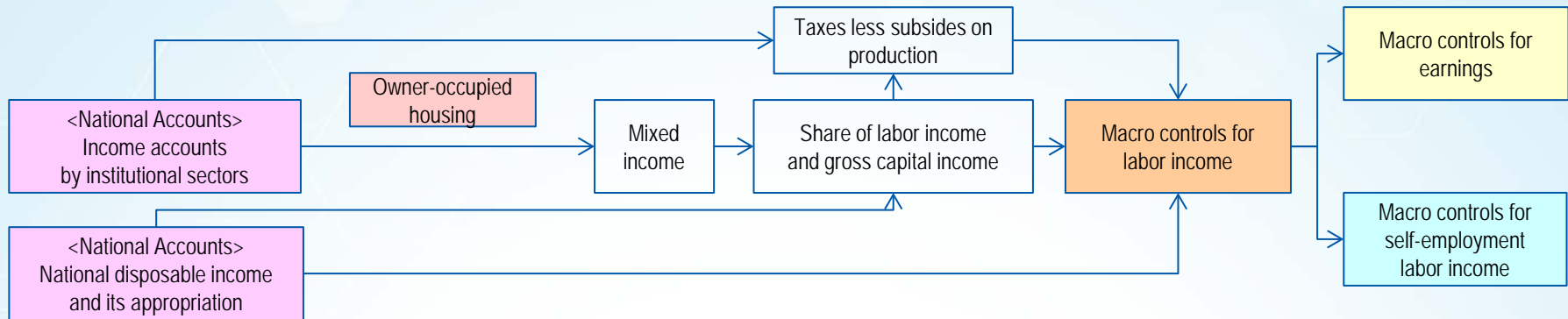
* KLIPS : Korean Labor and Income Panel Study
HIES : Household Income and Expenditure Survey

** Final consumption expenditure of HH by purpose : Final consumption expenditure of households and non-profit institutions serving households by purpose
General government final consumption by function : General government final consumption expenditure by function

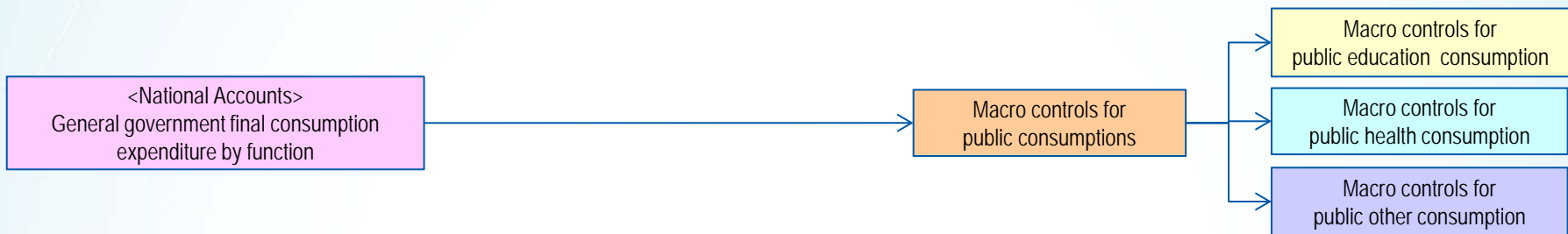
Construction of Macro Controls for Life Cycle Deficit

Construction of macro controls for life cycle deficit

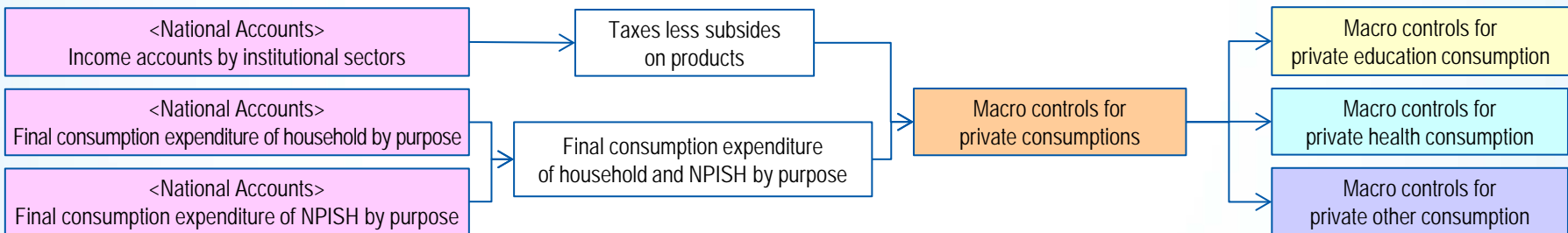
Flow chart of macro control constructions for labor income



Flow chart of macro control constructions for public consumption



Flow chart of macro control constructions for private consumption



Construction of Macro Controls for Life Cycle Deficit

▪ Macro controls for life cycle deficit of South Korea, 2009 – 2010

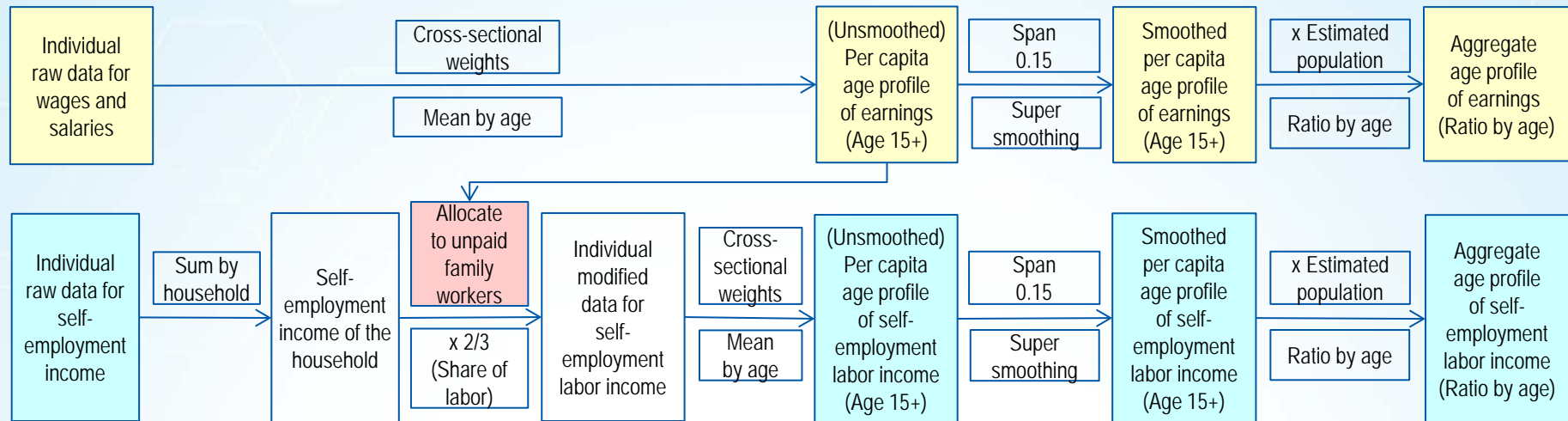
(Unit : Billion Won)

Components	Macro Controls		Formula
	2009 Macro Controls	2010 Macro Controls	
Life Cycle Deficit	91827.8	93166.8	= Consumption – Labor Income
Consumption	640094.1	676036.6	= Public Consumption + Private Consumption
Public Consumption	170324.7	178396.1	= Public Education Consumption + Public Health Consumption + Public Other Consumption
Public Education Consumption	35920.4	36480.7	-
Public Health Consumption	33352.3	38103.4	-
Public Other Consumption	101052.0	103812.0	-
Private Consumption	469769.4	497640.5	= Private Education Consumption + Private Health Consumption + Private Other Consumption
Private Education Consumption	45800.6	46748.6	-
Private Health Consumption	36381.0	39490.0	-
Private Other Consumption	387587.8	411401.9	-
Labor Income	548266.3	582869.8	= Earnings + Self-employment Labor Income
Earnings	501340.3	533342.1	-
Self-employment Labor Income	46926.0	49527.8	-

Construction of Age Profiles for Life Cycle Deficit

Construction of age profiles for labor income

Flow chart of age profile constructions for labor income



Construction of Age Profiles for Life Cycle Deficit

Age profiles for labor income, 2009

Age	Estimated Population	Earnings				Self-Employment Labor Income			
		(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)
0	455458	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
...
18	673288	1.56	77.55	52.22	0.16	0.00	2.39	1.61	0.02
19	649680	22.25	146.95	95.47	0.30	3.13	5.35	3.47	0.04
20	635636	90.05	216.35	137.52	0.43	2.40	8.31	5.28	0.06
...
37	884214	1161.69	1355.68	1198.71	3.74	372.35	242.50	214.42	2.47
38	890092	1195.00	1334.17	1187.54	3.71	298.78	281.14	250.24	2.88
...
84	80523	4.32	1.57	0.13	0.00	3.32	6.98	0.56	0.01
85+	340303	0.00	0.00	0.00	0.00	0.00	3.08	1.05	0.01

Construction of Age Profiles for Life Cycle Deficit

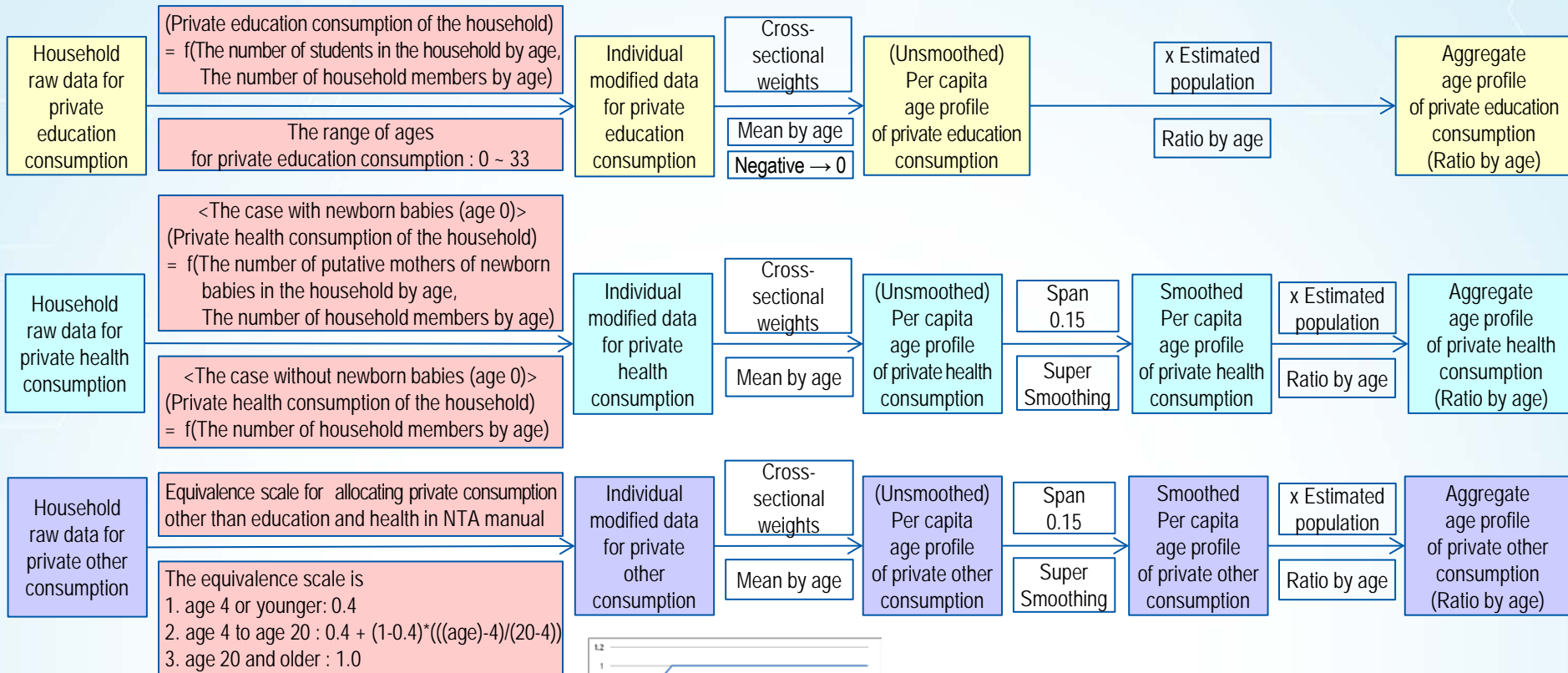
Age profiles for labor income, 2010

Age	Estimated Population	Earnings				Self-Employment Labor Income			
		(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)
0	448853	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
...
18	697847	10.52	84.90	59.24	0.17	0.00	2.37	1.65	0.02
19	679688	73.98	157.08	106.76	0.30	0.83	5.78	3.93	0.04
20	655623	87.63	229.26	150.31	0.43	4.25	9.20	6.03	0.07
...
37	864770	1459.35	1433.56	1239.70	3.54	191.89	248.92	215.26	2.39
38	881409	1169.66	1455.18	1282.61	3.66	433.60	269.72	237.73	2.63
...
84	86087	0.00	1.22	0.11	0.00	0.00	7.34	0.63	0.01
85+	370438	0.90	0.00	0.00	0.00	2.41	5.00	1.85	0.02

Construction of Age Profiles for Life Cycle Deficit

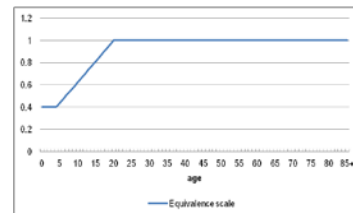
Construction of age profiles for private consumption

Flow chart of age profile constructions for private consumption



The equivalence scale is

- age 4 or younger: 0.4
- age 4 to age 20 : $0.4 + (1-0.4)*((\text{age})-4)/(20-4)$
- age 20 and older : 1.0



Construction of Age Profiles for Life Cycle Deficit

Age profiles for private consumption, 2009

Age	Estimated Population	Private Education Consumption			Private Health Consumption				Private Other Consumption			
		(Unsmoothed) Per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)
0	455458	0.00	0.00	0.00	36.40	41.91	19.09	0.87	270.01	247.64	112.79	0.42
1	487067	0.00	0.00	0.00	70.37	37.50	18.27	0.83	291.01	257.08	125.21	0.47
...
6	478440	294.16	140.74	2.50	2.91	15.48	7.41	0.34	281.42	304.27	145.58	0.54
7	513169	203.05	104.20	1.85	-0.16	14.43	7.41	0.34	291.92	315.23	161.76	0.60
...
32	750710	134.47	100.95	1.79	67.21	44.59	33.47	1.52	736.26	686.87	515.64	1.92
33	768004	296.06	227.37	4.04	40.90	46.73	35.89	1.63	699.56	682.87	524.45	1.95
34	797191	0.00	0.00	0.00	45.77	47.51	37.87	1.72	718.41	680.36	542.38	2.02
...
49	851218	0.00	0.00	0.00	57.45	65.25	55.54	2.52	610.08	621.77	529.26	1.97
50	818128	0.00	0.00	0.00	65.01	65.97	53.97	2.45	647.49	630.19	515.58	1.92
...
84	80523	0.00	0.00	0.00	104.53	66.44	5.35	0.24	355.63	416.42	33.53	0.12
85+	340303	0.00	0.00	0.00	47.53	66.82	22.74	1.03	437.53	420.08	142.95	0.53

Construction of Age Profiles for Life Cycle Deficit

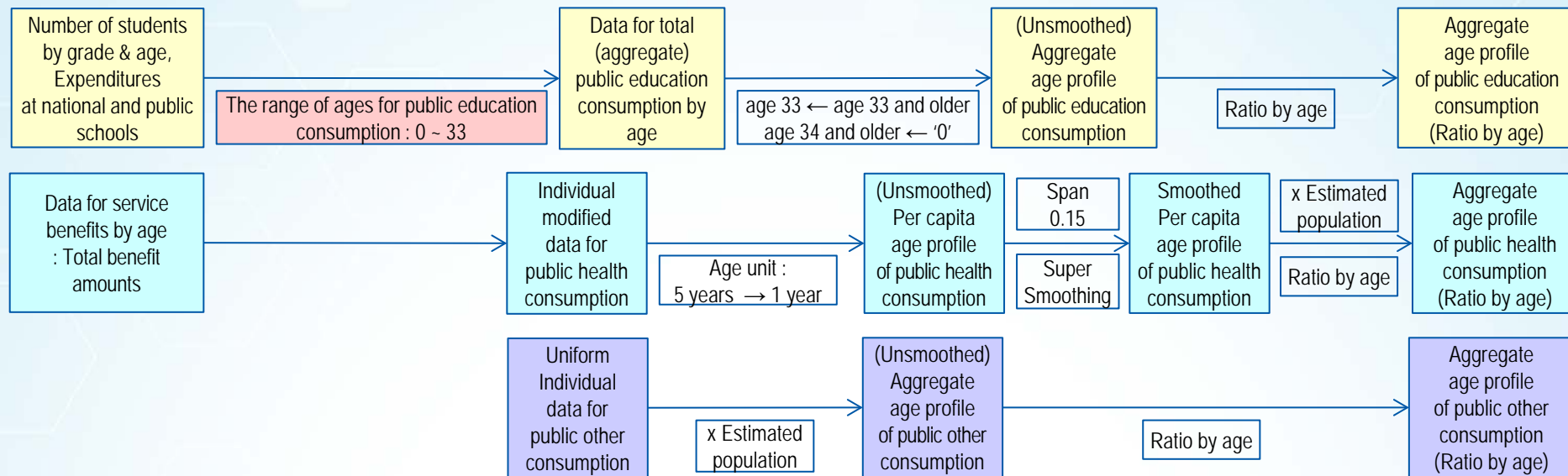
Age profiles for private consumption, 2010

Age	Estimated Population	Private Education Consumption			Private Health Consumption				Private Other Consumption			
		(Unsmoothed) Per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)
0	448853	0.00	0.00	0.00	278.13	109.83	49.30	2.02	295.59	276.94	124.31	0.43
1	453115	0.00	0.00	0.00	89.24	98.77	44.75	1.84	312.38	285.86	129.53	0.45
...
6	476992	295.69	141.04	2.55	10.60	43.48	20.74	0.85	326.58	330.44	157.62	0.54
7	475616	268.24	127.58	2.31	-1.57	23.46	11.16	0.46	332.03	341.09	162.23	0.56
...
32	750692	18.97	14.24	0.26	32.90	34.29	25.74	1.06	781.82	739.92	555.45	1.92
33	750398	194.08	145.64	2.64	36.67	35.31	26.50	1.09	752.58	739.96	555.26	1.92
34	767506	0.00	0.00	0.00	25.75	37.51	28.79	1.18	729.79	734.87	564.02	1.95
...
49	870581	0.00	0.00	0.00	63.37	63.31	55.12	2.26	644.66	662.76	576.99	1.99
50	847723	0.00	0.00	0.00	63.28	65.95	55.91	2.30	705.45	666.32	564.85	1.95
...
84	86087	0.00	0.00	0.00	61.58	83.32	7.17	0.29	498.61	416.64	35.87	0.12
85+	370438	0.00	0.00	0.00	46.94	83.71	31.01	1.27	435.50	413.19	153.06	0.53

Construction of Age Profiles for Life Cycle Deficit

Construction of age profiles for public consumption

Flow chart of age profile constructions for public consumption



Construction of Age Profiles for Life Cycle Deficit

Age profiles for public consumption, 2009

Age	Estimated Population	Public Education Consumption		Public Health Consumption				Public Other Consumption	
		(Unsmoothed) Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Uniform) Per capita Ratio by age (%)	Aggregate age profile (Ratio by age) (%)
0	455458	0.00	0.00	474.47	649.51	295.82	1.01	0.00000203	0.93
1	487067	0.00	0.00	646.91	610.23	297.22	1.01	0.00000203	0.99
2	458214	0.00	0.00	649.91	570.95	261.62	0.89	0.00000203	0.93
3	435775	81.36	0.24	649.91	531.68	231.69	0.79	0.00000203	0.89
...
16	699434	3007.25	8.74	193.18	196.82	137.66	0.47	0.00000203	1.42
17	693106	2862.86	8.32	193.18	196.49	136.19	0.46	0.00000203	1.41
...
47	870736	0.00	0.00	511.50	539.18	469.48	1.60	0.00000203	1.77
48	871232	0.00	0.00	511.50	564.69	491.97	1.68	0.00000203	1.77
49	851218	0.00	0.00	511.50	604.98	514.97	1.76	0.00000203	1.73
...
84	80523	0.00	0.00	1999.94	1970.13	158.64	0.54	0.00000203	0.16
85+	340303	0.00	0.00	1939.11	1980.69	674.03	2.30	0.00000203	0.69

Construction of Age Profiles for Life Cycle Deficit

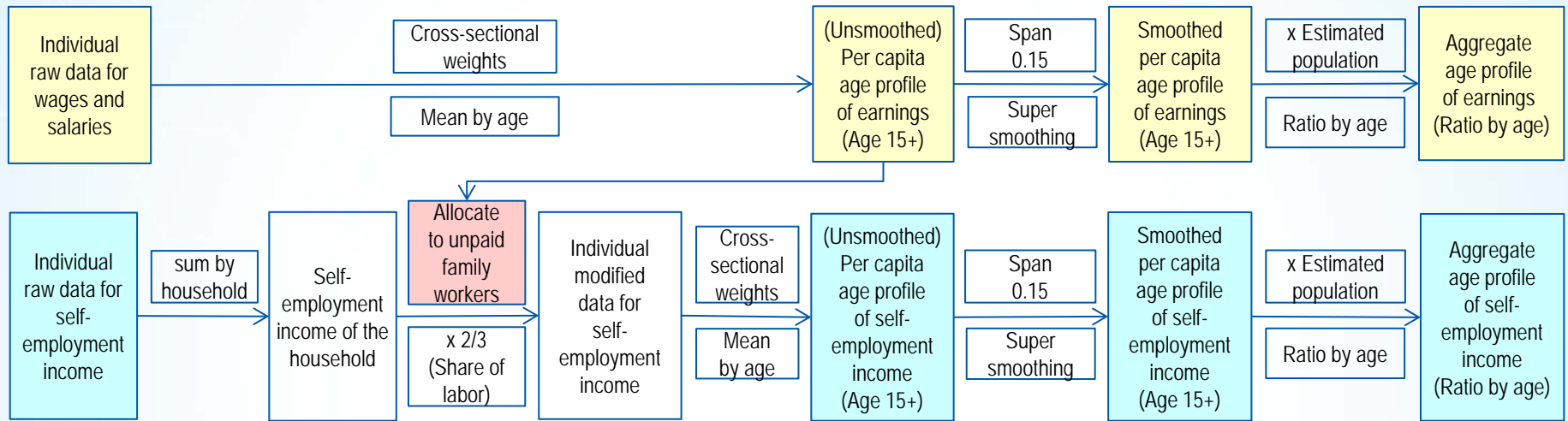
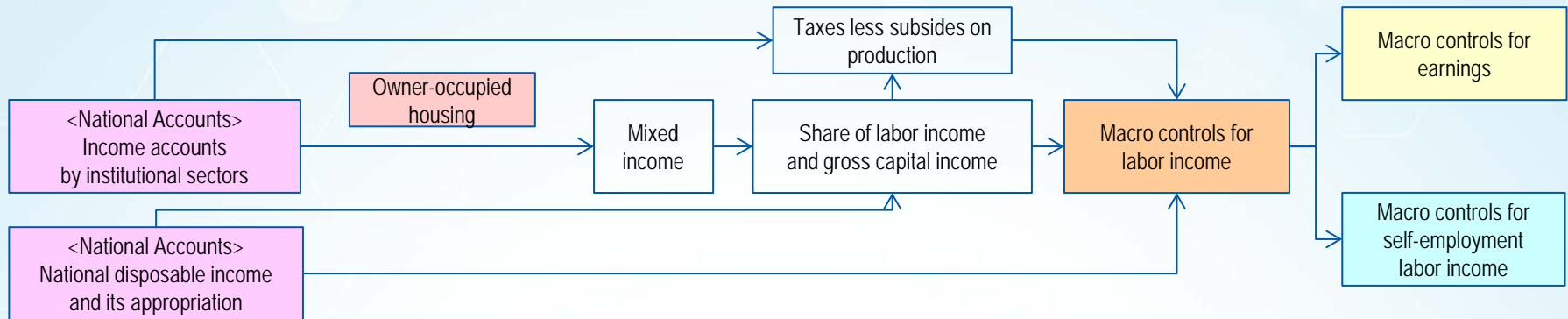
Age profiles for public consumption, 2010

Age	Estimated Population	Public Education Consumption		Public Health Consumption				Public Other Consumption	
		(Unsmoothed) Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Unsmoothed) Per capita age profile (Thousand Won)	Smoothed per capita age profile (Thousand Won)	Aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	(Uniform) Per capita Ratio by age (%)	Aggregate age profile (Ratio by age) (%)
0	448853	0.00	0.00	581.93	760.64	341.42	1.04	0.00000202	0.91
1	453115	0.00	0.00	747.99	712.25	322.73	0.98	0.00000202	0.92
2	486239	0.00	0.00	747.99	663.85	322.79	0.98	0.00000202	0.98
3	457869	97.26	0.28	747.99	615.46	281.80	0.86	0.00000202	0.93
...
16	697311	2866.05	8.18	207.21	212.15	147.94	0.45	0.00000202	1.41
17	701560	2772.22	7.91	207.21	211.69	148.51	0.45	0.00000202	1.42
...
47	854059	0.00	0.00	545.50	580.13	495.47	1.50	0.00000202	1.73
48	871361	0.00	0.00	545.50	607.65	529.48	1.61	0.00000202	1.76
49	870581	0.00	0.00	545.50	653.56	568.98	1.73	0.00000202	1.76
...
84	86087	0.00	0.00	2264.08	2273.80	195.74	0.59	0.00000202	0.17
85+	370438	0.00	0.00	2257.85	2294.80	850.08	2.58	0.00000202	0.75

Adjustments to Macro Controls for Life Cycle Deficit

Adjustments to macro controls for labor income in life cycle deficit

Flow chart of adjustments to macro controls for labor income



Macro controls for earnings	X	Aggregate age profile of earnings (Ratio by age)	=	Final age profile of earnings
Macro controls for self-employment income	X	Aggregate age profile of self-employment income (Ratio by Age)	=	Final age profile of self-employment income

Adjustments to Macro Controls for Life Cycle Deficit

Final age profiles for labor income, 2009

Age	Estimated Population	Aggregate Age Profile (Billion Won)					Per Capita Age Profile (Thousand Won)		
		Earnings		Self-Employment Labor Income		Total Labor Income	Earnings	Self-Employment	Total Labor Income
		Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Final aggregate age profile (Billion Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)
16-	9629690	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	693106	0.02	88.53	0.00	0.00	88.53	127.74	0.00	127.74
18	673288	0.16	817.74	0.02	8.68	826.42	1214.55	12.90	1227.45
...
36	867470	3.64	18272.41	2.17	1018.42	19290.83	21064.02	1174.01	22238.03
37	884214	3.74	18772.42	2.47	1157.33	19929.76	21230.63	1308.88	22539.52
38	890092	3.71	18597.40	2.88	1350.64	19948.04	20893.79	1517.42	22411.21
39	887126	3.68	18426.80	3.11	1459.01	19885.81	20771.34	1644.65	22416.00
...
84	80523	0.00	1.98	0.01	3.03	5.02	24.64	37.66	62.30
85+	340303	0.00	0.00	0.01	5.65	5.65	0.00	16.61	16.61
Total	49182038	100.00	501340.25	100.00	46926.02	548266.28	-	-	-

Adjustments to Macro Controls for Life Cycle Deficit

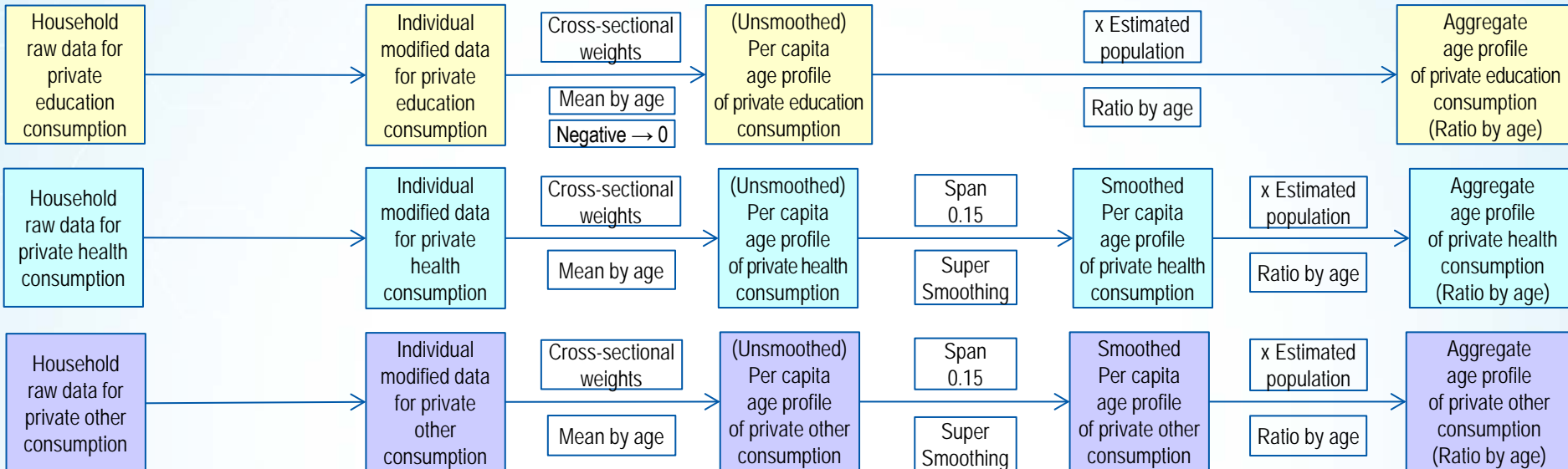
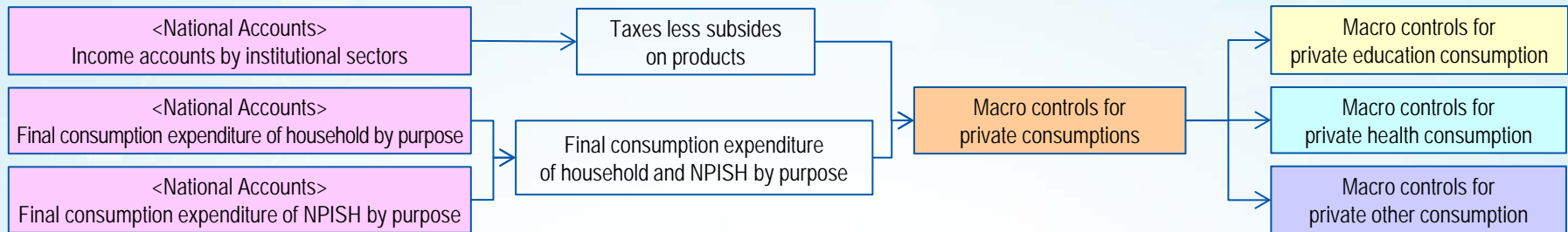
Final age profiles for labor income, 2010

Age	Estimated Population	Aggregate Age Profile (Billion Won)					Per Capita Age Profile (Thousand Won)		
		Earnings		Self-Employment Labor Income		Total Labor Income	Earnings	Self-Employment	Total Labor Income
		Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Final aggregate age profile (Billion Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)
16-	9363458	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17	701560	0.03	135.88	0.00	0.00	135.88	193.68	0.00	193.68
18	697847	0.17	902.62	0.02	9.08	911.70	1293.44	13.00	1306.45
...
36	832817	3.36	17939.58	2.01	996.92	18936.50	21540.84	1197.04	22737.89
37	864770	3.54	18887.68	2.39	1181.42	20069.10	21841.28	1366.16	23207.44
38	881409	3.66	19541.45	2.63	1304.77	20846.22	22170.69	1480.33	23651.02
39	887961	3.62	19296.00	3.02	1495.91	20791.91	21730.68	1684.66	23415.34
...
84	86087	0.00	1.61	0.01	3.47	5.08	18.66	40.31	58.96
85+	370438	0.00	0.00	0.02	10.16	10.16	0.00	27.41	27.41
Total	49410366	100.00	533342.09	100.00	49527.76	582869.85	-	-	-

Adjustments to Macro Controls for Life Cycle Deficit

Adjustments to macro controls for private consumption in life cycle deficit

Flow chart of adjustments to macro controls for private consumption



Macro controls for private education consumption	X	Aggregate age profile of private education consumption (Ratio by age)	=	Final age profile of private education consumption
Macro controls for private health consumption	X	Aggregate age profile of private health consumption (Ratio by Age)	=	Final age profile of private health consumption
Macro controls for private other consumption	X	Aggregate age profile of private other consumption (Ratio by Age)	=	Final age profile of private other consumption

Adjustments to Macro Controls for Life Cycle Deficit

Final age profiles for private consumption, 2009

Age	Estimated Population	Aggregate Age Profile (Billion Won)							Per Capita Age Profile (Thousand Won)			
		Private Education Consumption		Private Health Consumption		Private Other Consumption		Private Total	Private Education	Private Health	Private Other	Private Total
		Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Final aggregate age profile (Billion Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)
0	455458	0.00	0.00	0.87	315.32	0.42	1626.80	1942.12	0.00	692.32	3571.79	4264.11
1	487067	0.00	0.00	0.83	301.77	0.47	1806.00	2107.78	0.00	619.57	3707.92	4327.49
...
33	768004	4.04	1850.95	1.63	592.81	1.95	7564.20	10007.96	2410.08	771.89	9849.17	13031.13
34	797191	0.00	0.00	1.72	625.66	2.02	7822.81	8448.47	0.00	784.84	9812.97	10597.80
...
53	708233	0.00	0.00	2.09	759.40	1.67	6482.80	7242.20	0.00	1072.24	9153.49	10225.73
54	663785	0.00	0.00	1.96	712.32	1.56	6042.22	6754.54	0.00	1073.12	9102.68	10175.79
...
84	80523	0.00	0.00	0.24	88.38	0.12	483.63	572.01	0.00	1097.59	6006.14	7103.74
85+	340303	0.00	0.00	1.03	375.65	0.53	2061.84	2437.49	0.00	1103.87	6058.85	7162.72
Total	49182038	100.00	45800.60	100.00	36381.00	100.00	387587.80	469769.40	-	-	-	-

Adjustments to Macro Controls for Life Cycle Deficit

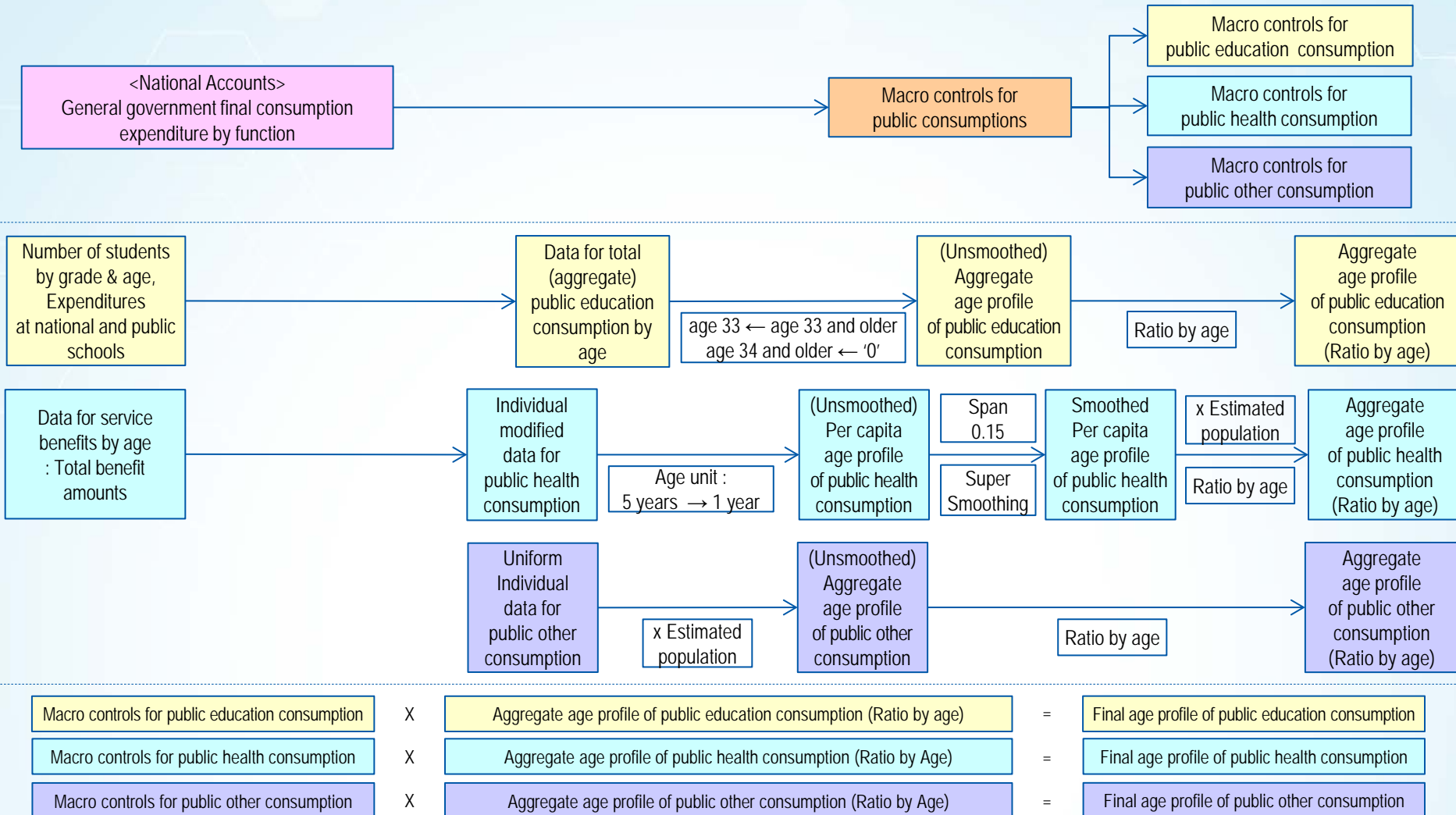
Final age profiles for private consumption, 2010

Age	Estimated Population	Aggregate Age Profile (Billion Won)							Per Capita Age Profile (Thousand Won)			
		Private Education Consumption		Private Health Consumption		Private Other Consumption		Private Total	Private Education	Private Health	Private Other	Private Total
		Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Final aggregate age profile (Billion Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)
0	448853	0.00	0.00	2.02	799.16	0.43	1765.31	2564.47	0.00	1780.45	3932.93	5713.38
1	453115	0.00	0.00	1.84	725.52	0.45	1839.44	2564.97	0.00	1601.19	4059.55	5660.74
...
33	750398	2.64	1232.38	1.09	429.52	1.92	7885.41	9547.31	1642.30	572.39	10508.31	12722.99
34	767506	0.00	0.00	1.18	466.67	1.95	8009.74	8476.41	0.00	608.04	10436.06	11044.10
...
53	741860	0.00	0.00	1.97	779.67	1.72	7060.79	7840.46	0.00	1050.96	9517.69	10568.65
54	704343	0.00	0.00	1.93	762.28	1.62	6668.65	7430.93	0.00	1082.26	9467.90	10550.16
...
84	86087	0.00	0.00	0.29	116.27	0.12	509.36	625.64	0.00	1350.65	5916.83	7267.48
85+	370438	0.00	0.00	1.27	502.72	0.53	2173.64	2676.36	0.00	1357.11	5867.76	7224.86
Total	49410366	100.00	46748.60	100.00	39490.00	100.00	411401.90	497640.50	-	-	-	-

Adjustments to Macro Controls for Life Cycle Deficit

Adjustments to macro controls for public consumption in life cycle deficit

Flow chart of adjustments to macro controls for public consumption



Adjustments to Macro Controls for Life Cycle Deficit

Final age profiles for public consumption, 2009

Age	Estimated Population	Aggregate Age Profile (Billion Won)							Per Capita Age Profile (Thousand Won)			
		Public Education Consumption		Public Health Consumption		Public Other Consumption		Public Total	Public Education	Public Health	Public Other	Public Total
		Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Final aggregate age profile (Billion Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)
0	455458	0.00	0.00	1.01	336.81	0.93	935.81	1272.62	0.00	739.50	2054.65	2794.15
1	487067	0.00	0.00	1.01	338.40	0.99	1000.75	1339.16	0.00	694.78	2054.65	2749.43
...
15	698191	8.81	3165.34	0.49	165.08	1.42	1434.54	4764.96	4533.63	236.44	2054.65	6824.72
16	699434	8.74	3140.26	0.47	156.73	1.42	1437.09	4734.09	4489.72	224.09	2054.65	6768.46
...
53	708233	0.00	0.00	1.82	608.06	1.44	1455.17	2063.23	0.00	858.56	2054.65	2913.21
54	663785	0.00	0.00	1.83	608.98	1.35	1363.85	1972.83	0.00	917.44	2054.65	2972.09
...
84	80523	0.00	0.00	0.54	180.62	0.16	165.45	346.07	0.00	2243.11	2054.65	4297.76
85+	340303	0.00	0.00	2.30	767.43	0.69	699.20	1466.63	0.00	2255.13	2054.65	4309.78
Total	49182038	100.00	35920.40	100.00	33352.30	100.00	101052.00	170324.70	-	-	-	-

Adjustments to Macro Controls for Life Cycle Deficit

Final age profiles for public consumption, 2010

Age	Estimated Population	Aggregate Age Profile (Billion Won)							Per Capita Age Profile (Thousand Won)			
		Public Education Consumption		Public Health Consumption		Public Other Consumption		Public Total	Public Education	Public Health	Public Other	Public Total
		Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Aggregate age profile (Ratio by age) (%)	Final aggregate age profile (Billion Won)	Final aggregate age profile (Billion Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)	Final per capita age profile (Thousand Won)
0	448853	0.00	0.00	1.04	394.82	0.91	943.05	1337.87	0.00	879.62	2101.02	2980.64
1	453115	0.00	0.00	0.98	373.21	0.92	952.00	1325.21	0.00	823.65	2101.02	2924.67
...
15	690773	8.31	3032.53	0.47	179.10	1.40	1451.33	4662.95	4390.05	259.28	2101.02	6750.34
16	697311	8.18	2983.03	0.45	171.08	1.41	1465.06	4619.17	4277.90	245.34	2101.02	6624.26
...
53	741860	0.00	0.00	1.86	708.47	1.50	1558.66	2267.13	0.00	954.99	2101.02	3056.01
54	704343	0.00	0.00	1.89	720.21	1.43	1479.84	2200.05	0.00	1022.53	2101.02	3123.55
...
84	86087	0.00	0.00	0.59	226.36	0.17	180.87	407.23	0.00	2629.46	2101.02	4730.47
85+	370438	0.00	0.00	2.58	983.05	0.75	778.30	1761.34	0.00	2653.74	2101.02	4754.76
Total	49410366	100.00	36480.70	100.00	38103.40	100.00	103812.00	178396.10	-	-	-	-

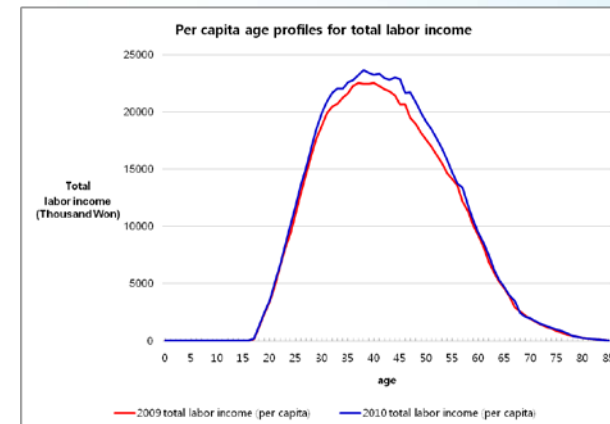
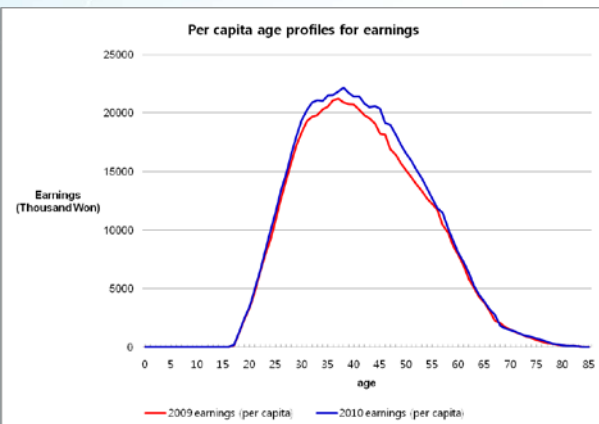
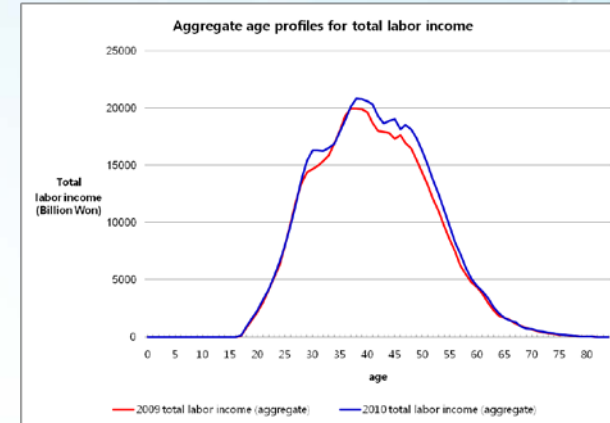
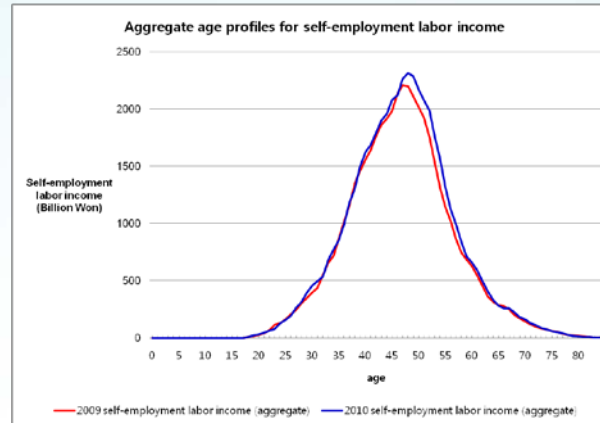
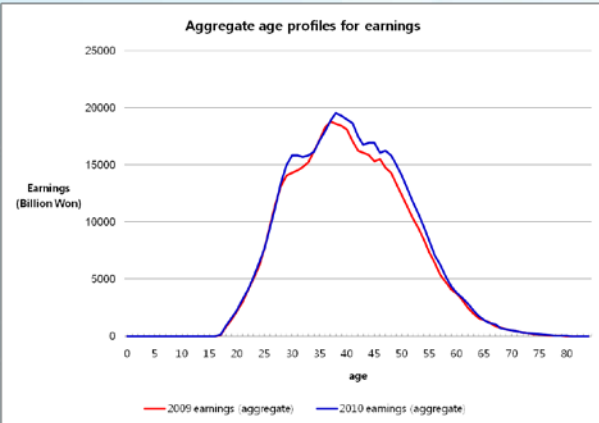


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The Empirical Results for Life Cycle Deficit in NTA of South Korea

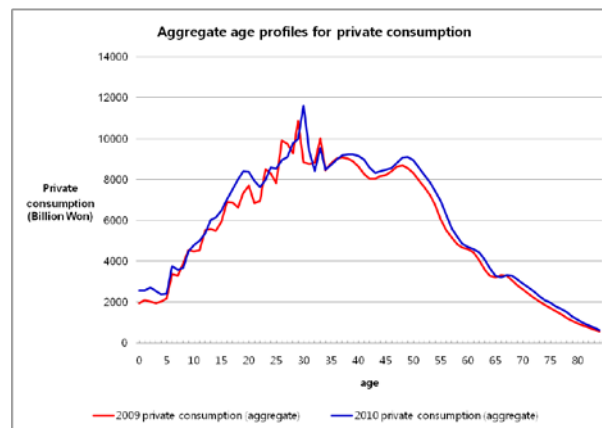
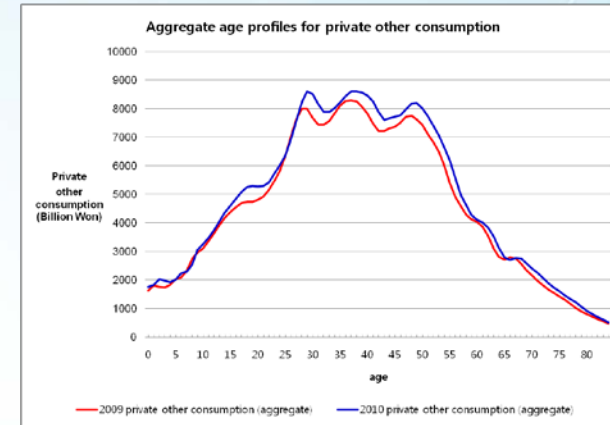
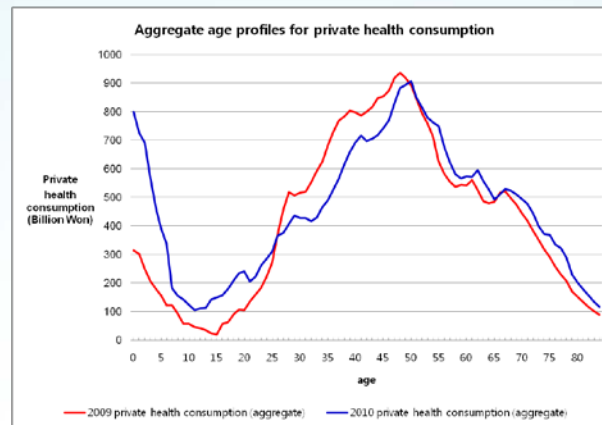
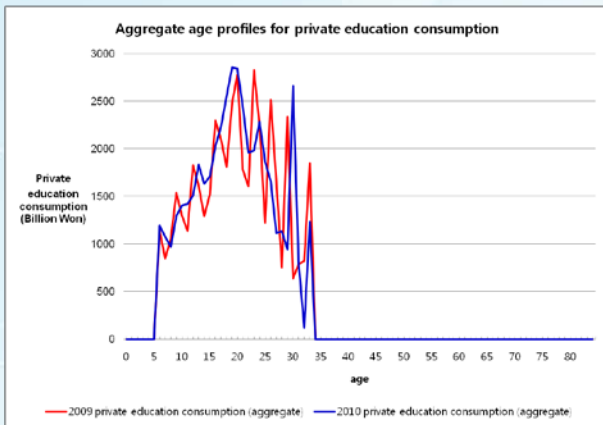
The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final aggregate & per capita age profiles for labor income



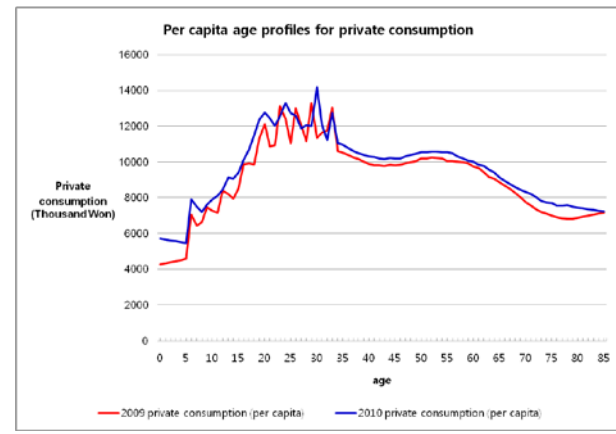
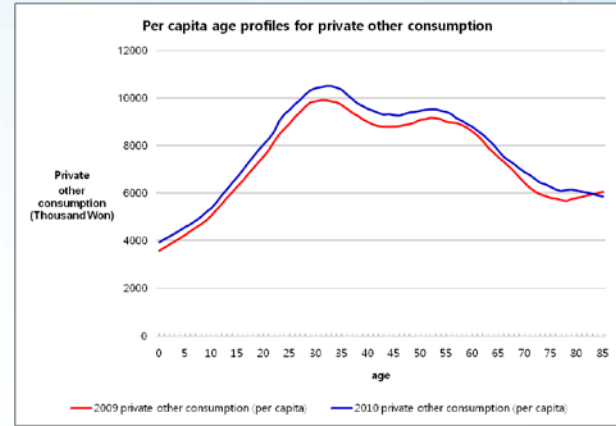
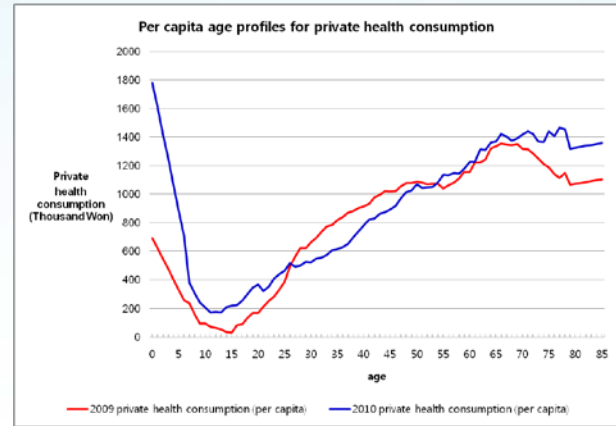
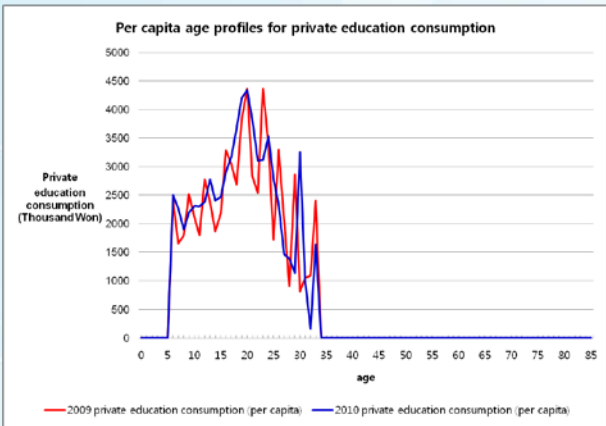
The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final aggregate age profiles for private consumption



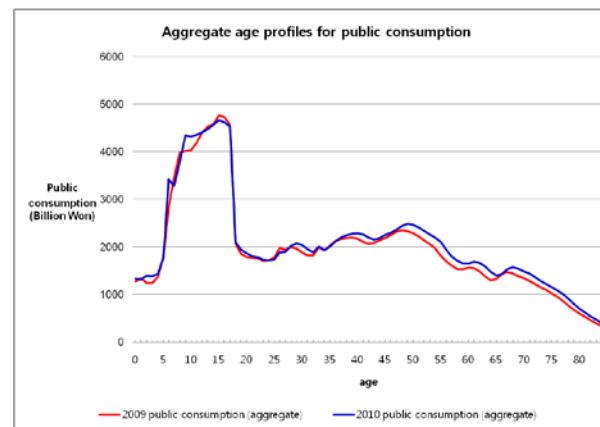
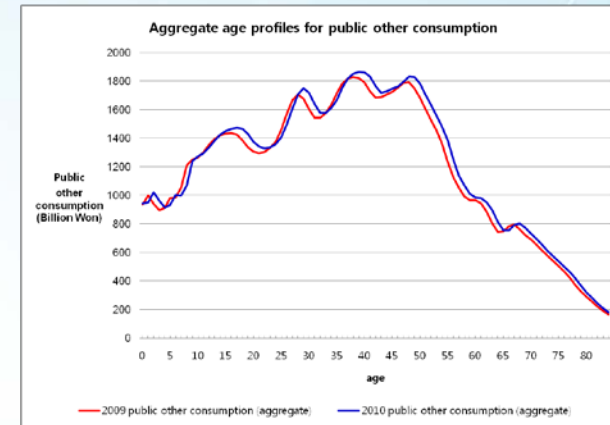
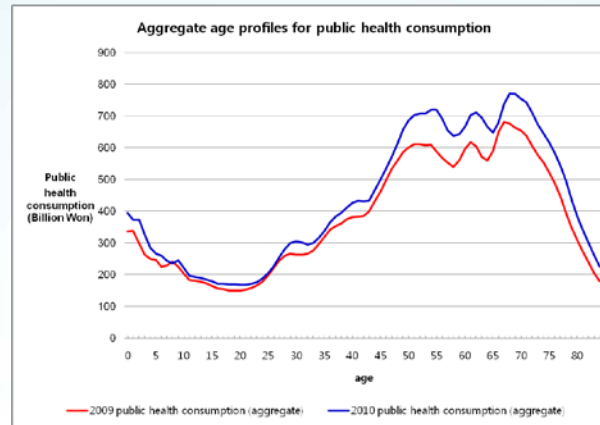
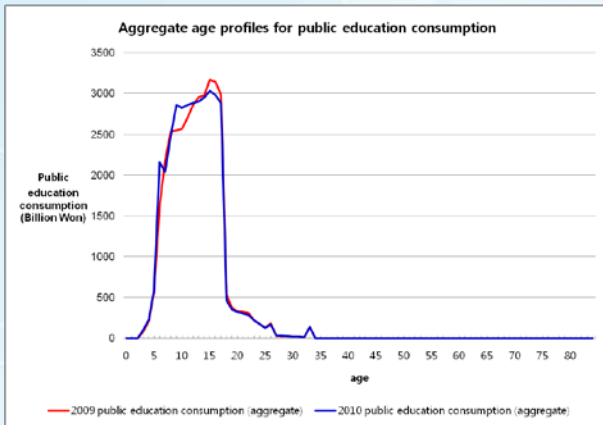
The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final per capita age profiles for private consumption



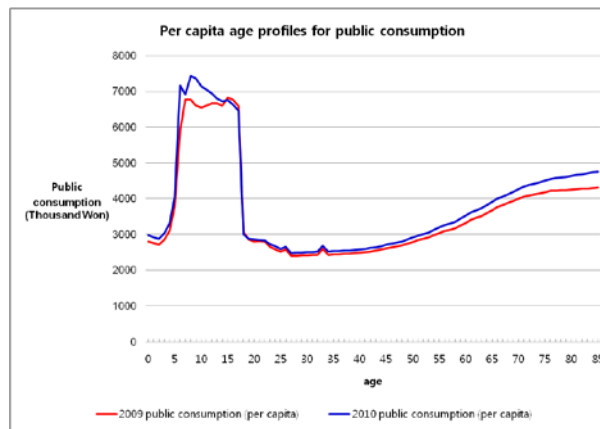
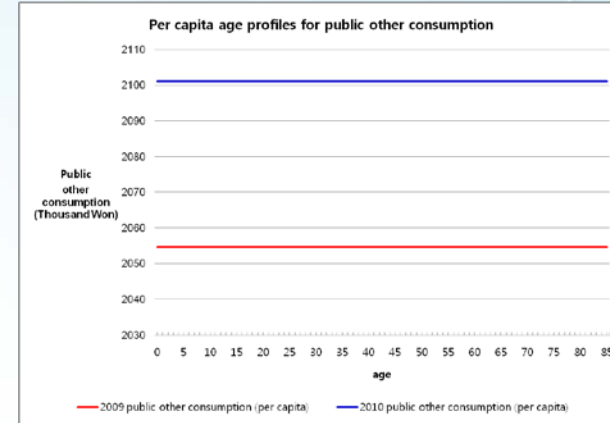
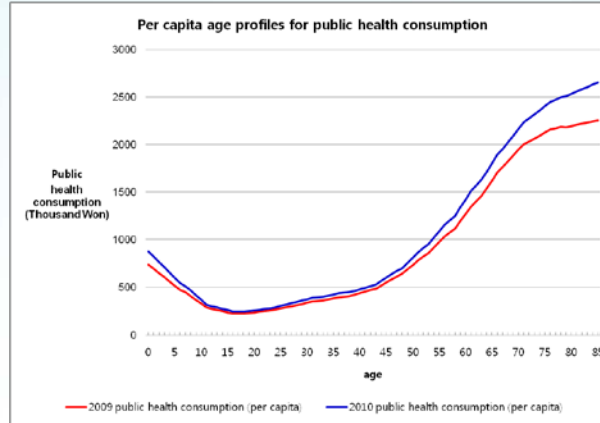
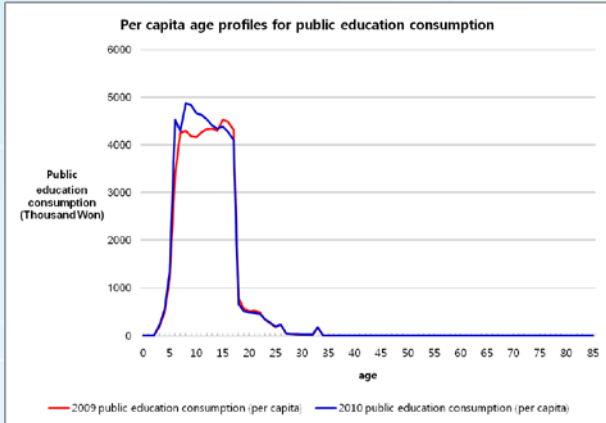
The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final aggregate age profiles for public consumption



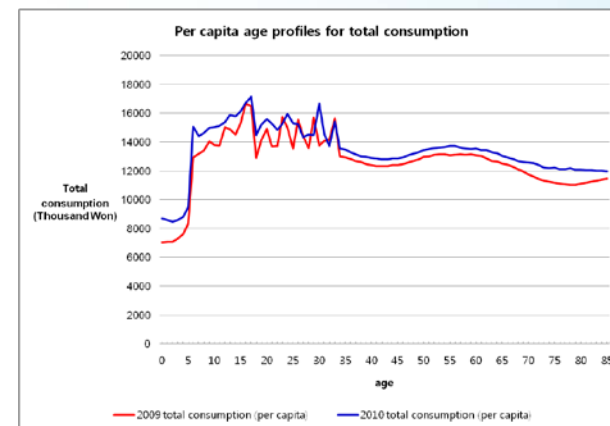
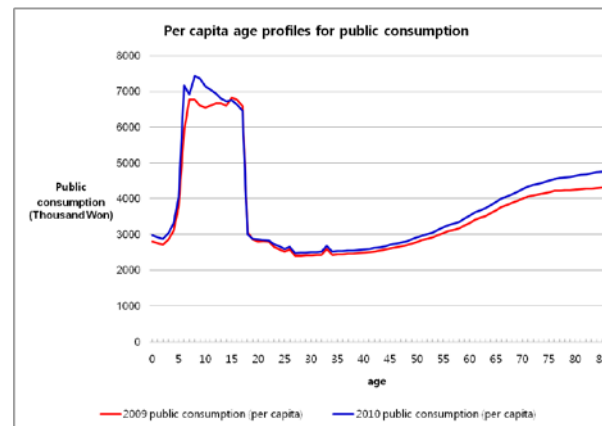
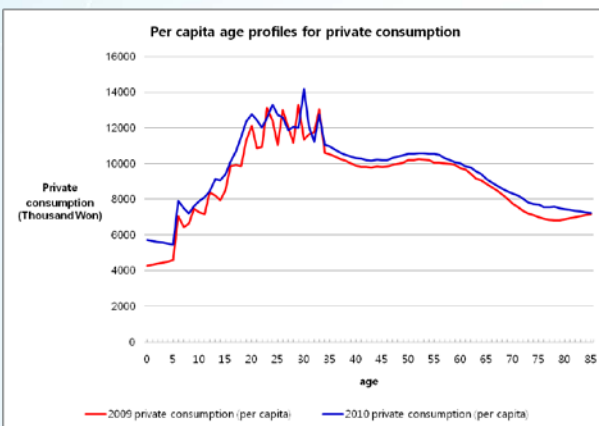
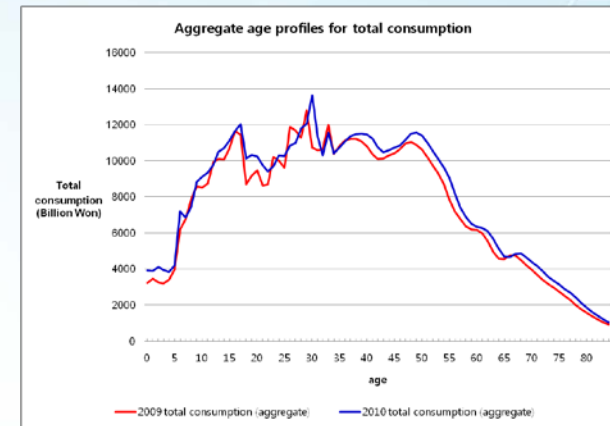
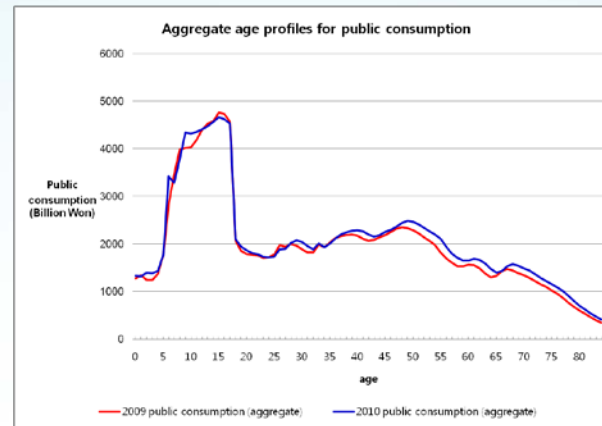
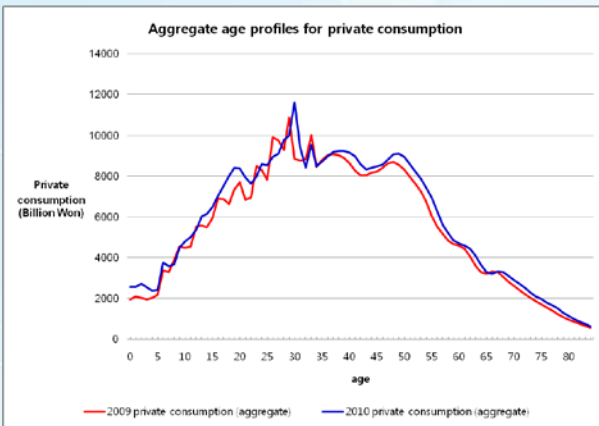
The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final per capita age profiles for public consumption



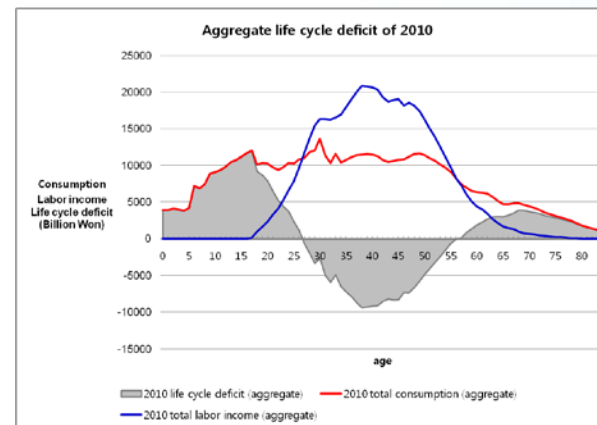
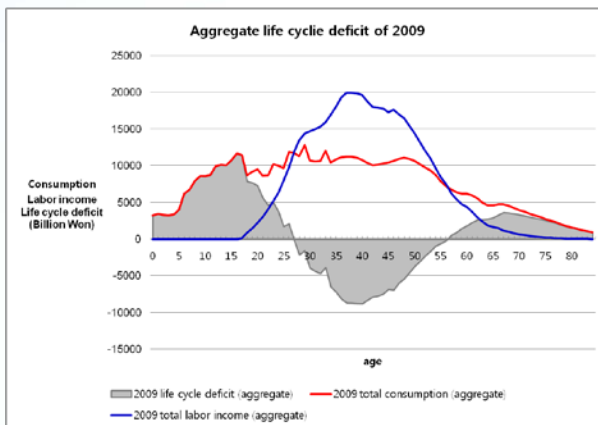
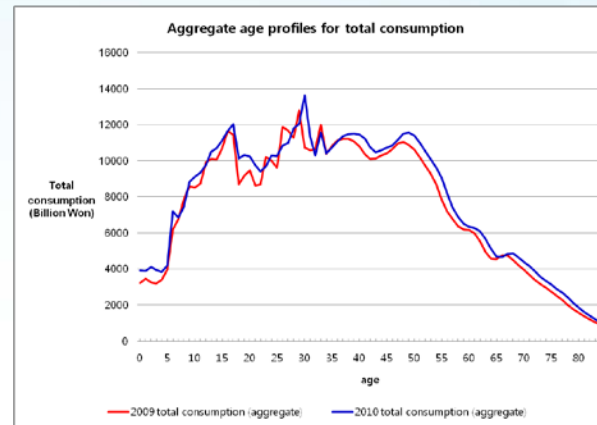
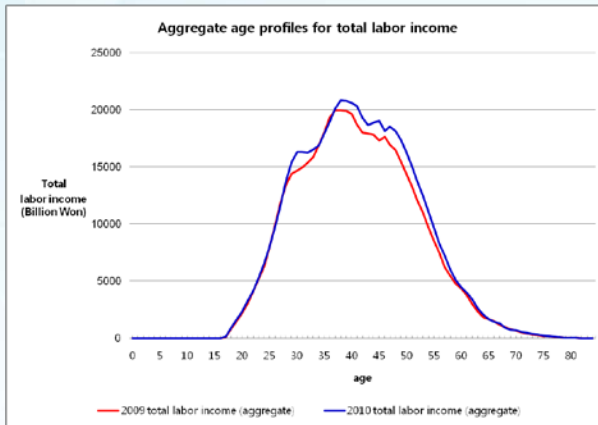
The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final aggregate & per capita age profiles for total consumption



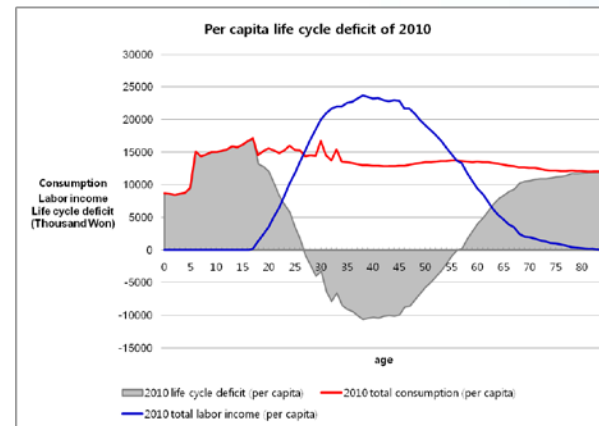
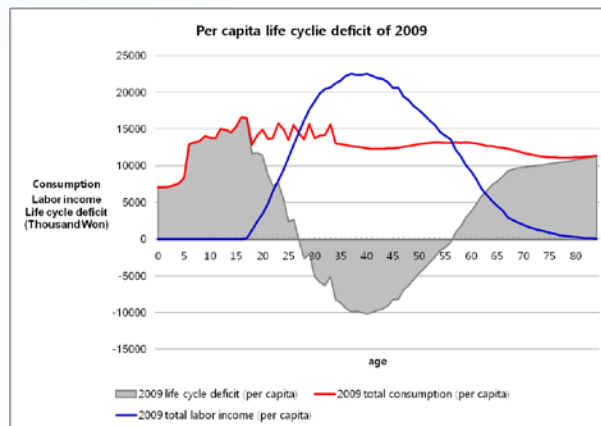
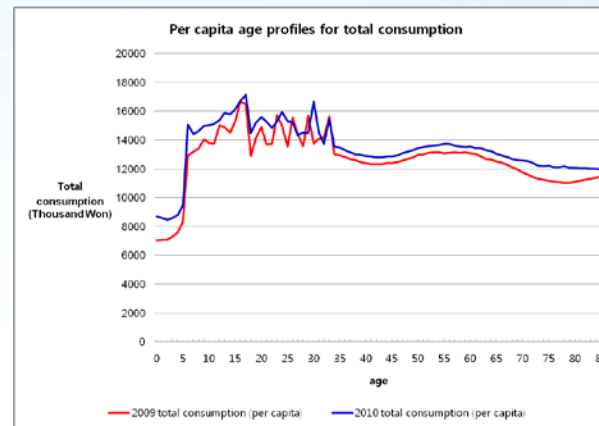
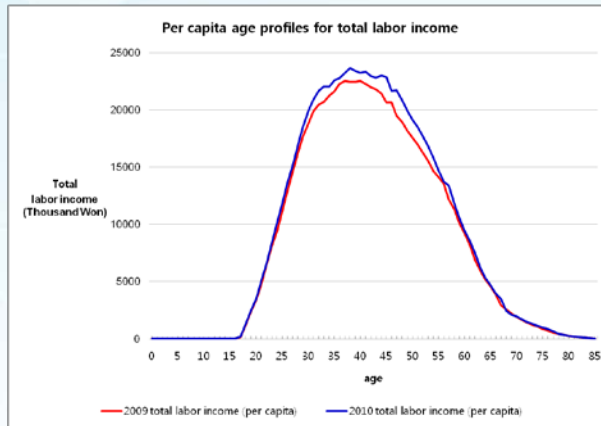
The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final aggregate age profiles for life cycle deficit



The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final per capita age profiles for life cycle deficit



The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final aggregate age profiles for life cycle deficit, 2009

(Unit : Billion Won)

Age	Labor Income		Private Consumption			Public Consumption			Life Cycle Deficit		
	Earnings	Self-employment labor income	Private education consumption	Private health consumption	Private other consumption	Public education consumption	Public health consumption	Public other consumption	Total labor income	Total consumption	Life cycle deficit
0	0.0	0.0	0.0	315.3	1626.8	0.0	336.8	935.8	0.0	3214.7	3214.7
1	0.0	0.0	0.0	301.8	1806.0	0.0	338.4	1000.8	0.0	3446.9	3446.9
...
15	0.0	0.0	1523.8	20.4	4382.3	3165.3	165.1	1434.5	0.0	10691.4	10691.4
16	0.0	0.0	2300.2	57.6	4546.9	3140.3	156.7	1437.1	0.0	11638.8	11638.8
17	88.5	0.0	2100.7	62.0	4707.8	2989.5	155.1	1424.1	88.5	11439.2	11350.6
...
53	9460.3	1541.0	0.0	759.4	6482.8	0.0	608.1	1455.2	11001.3	9305.4	-1695.9
54	8402.0	1307.8	0.0	712.3	6042.2	0.0	609.0	1363.8	9709.8	8727.4	-982.4
...
84	2.0	3.0	0.0	88.4	483.6	0.0	180.6	165.4	5.0	918.1	913.1
85+	0.0	5.7	0.0	375.6	2061.8	0.0	767.4	699.2	5.7	3904.1	3898.5
Total	501340.3	46926.0	45800.6	36381.0	387587.8	35920.4	33352.3	101052.0	548266.3	640094.1	91827.8

The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final aggregate age profiles for life cycle deficit, 2010

(Unit : Billion Won)

Age	Labor Income		Private Consumption			Public Consumption			Life Cycle Deficit		
	Earnings	Self-employment labor income	Private education consumption	Private health consumption	Private other consumption	Public education consumption	Public health consumption	Public other consumption	Total labor income	Total consumption	Life cycle deficit
0	0.0	0.0	0.0	799.2	1765.3	0.0	394.8	943.0	0.0	3902.3	3902.3
1	0.0	0.0	0.0	725.5	1839.4	0.0	373.2	952.0	0.0	3890.2	3890.2
...
15	0.0	0.0	1709.5	150.3	4618.3	3032.5	179.1	1451.3	0.0	11141.1	11141.1
16	0.0	0.0	2026.8	156.5	4852.1	2983.0	171.1	1465.1	0.0	11654.5	11654.5
17	135.9	0.0	2234.7	180.0	5088.6	2885.4	171.7	1474.0	135.9	12034.4	11898.5
...
53	10710.5	1768.6	0.0	779.7	7060.8	0.0	708.5	1558.7	12479.1	10107.6	-2371.5
54	9539.6	1560.2	0.0	762.3	6668.6	0.0	720.2	1479.8	11099.8	9631.0	-1468.8
...
84	1.6	3.5	0.0	116.3	509.4	0.0	226.4	180.9	5.1	1032.9	1027.8
85+	0.0	10.2	0.0	502.7	2173.6	0.0	983.0	778.3	10.2	4437.7	4427.6
Total	533342.1	49527.8	46748.6	39490.0	411401.9	36480.7	38103.4	103812.0	582869.8	676036.6	93166.8

The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final per capita age profiles for life cycle deficit, 2009

(Unit : Thousand Won)

Age	Estimated population	Labor Income		Private Consumption			Public Consumption			Life Cycle Deficit		
		Earnings	Self-employment labor income	Private education consumption	Private health consumption	Private other consumption	Public education consumption	Public health consumption	Public other consumption	Total labor income	Total consumption	Life cycle deficit
0	455458	0.0	0.0	0.0	692.3	3571.8	0.0	739.5	2054.7	0.0	7058.3	7058.3
1	487067	0.0	0.0	0.0	619.6	3707.9	0.0	694.8	2054.7	0.0	7076.9	7076.9
...
15	698191	0.0	0.0	2182.5	29.2	6276.7	4533.6	236.4	2054.7	0.0	15313.1	15313.1
16	699434	0.0	0.0	3288.7	82.3	6500.8	4489.7	224.1	2054.7	0.0	16640.3	16640.3
17	693106	127.7	0.0	3030.9	89.5	6792.3	4313.2	223.7	2054.7	127.7	16504.2	16376.5
...
53	708233	13357.7	2175.8	0.0	1072.2	9153.5	0.0	858.6	2054.7	15533.4	13138.9	-2394.5
54	663785	12657.7	1970.3	0.0	1073.1	9102.7	0.0	917.4	2054.7	14627.9	13147.9	-1480.0
...
84	80523	24.6	37.7	0.0	1097.6	6006.1	0.0	2243.1	2054.7	62.3	11401.5	11339.2
85+	340303	0.0	16.6	0.0	1103.9	6058.8	0.0	2255.1	2054.7	16.6	11472.5	11455.9

The Empirical Results for Life Cycle Deficit in NTA

- The empirical results of final per capita age profiles for life cycle deficit, 2010

(Unit : Thousand Won)

Age	Estimated population	Labor Income		Private Consumption			Public Consumption			Life Cycle Deficit		
		Earnings	Self-employment labor income	Private education consumption	Private health consumption	Private other consumption	Public education consumption	Public health consumption	Public other consumption	Total labor income	Total consumption	Life cycle deficit
0	448853	0.0	0.0	0.0	1780.4	3932.9	0.0	879.6	2101.0	0.0	8694.0	8694.0
1	453115	0.0	0.0	0.0	1601.2	4059.6	0.0	823.7	2101.0	0.0	8585.4	8585.4
...
15	690773	0.0	0.0	2474.8	217.7	6685.7	4390.0	259.3	2101.0	0.0	16128.4	16128.4
16	697311	0.0	0.0	2906.6	224.4	6958.2	4277.9	245.3	2101.0	0.0	16713.5	16713.5
17	701560	193.7	0.0	3185.3	256.6	7253.2	4112.8	244.8	2101.0	193.7	17153.7	16960.1
...
53	741860	14437.4	2384.0	0.0	1051.0	9517.7	0.0	955.0	2101.0	16821.3	13624.7	-3196.7
54	704343	13543.9	2215.2	0.0	1082.3	9467.9	0.0	1022.5	2101.0	15759.1	13673.7	-2085.4
...
84	86087	18.7	40.3	0.0	1350.6	5916.8	0.0	2629.5	2101.0	59.0	11997.9	11939.0
85+	370438	0.0	27.4	0.0	1357.1	5867.8	0.0	2653.7	2101.0	27.4	11979.6	11952.2



5

Further Research and Discussion

Further Research

▪ Construction of age reallocations in NTA of South Korea

- NTA consists of three accounts.
 - Economic life cycle account
 - The economic life cycle account provides a measure of the extent to which individuals at each age are able to provide for their material needs through their current labor.
 - The economic life cycle account is composed of consumption, labor income and the difference between the two – the life cycle deficit/surplus.
 - Two age reallocation accounts
 - The two age reallocation accounts quantify the economic flows that shift resources across age with the net effect of eliminating the deficit at young and old ages and the surplus at prime ages.
 - Public and private age reallocations are captured in separate accounts.
- I am scheduled to construct the public and private age reallocations in the future.
 - Age reallocations are accomplished through two economic mechanisms: transfers and asset-based reallocations.
 - The defining feature of a transfer is that there is no explicit quid pro quo.
 - Asset-based flows rely on income from assets and the accumulation and dis-accumulation of assets to reallocate resources across age.

Discussion

▪ Applying SNA 2008 to macro controls for NTA of South Korea

The status of preparation for the time series data on National Accounts in South Korea

National Accounts	SNA 2003 (Applied in 2005 by BOK)	SNA 2008 (Applied in 2010 by BOK)
National disposable income and its appropriation	1970 - 2012	2000 - 2013
Income Accounts by Institutional Sectors	1975 - 2012	2010 - 2013
Capital Account by Institution Sectors	1975 - 2011	2010 - 2012
Composition of final consumption expenditure of households by purpose	1970 - 2012	2000 - 2013
Final consumption expenditure of non-profit institutions serving households by purpose	1970 - 2012	2000 - 2013

- The current macro controls for NTA of South Korea is based on the data applied to SNA 2003.
- However, the basic data for the macro controls for NTA of South Korea will have to be changed to the data applied to SNA 2008 for the continuity of NTA because the data applied to SNA 2003 was only written in 2012.
 - The macro controls for NTA of South Korea will be changed in the future because there is a difference between the data applied to SNA 2003 and the data applied to SNA 2008.
 - » For example, there are some changes in the full details of ‘property income’ and ‘social benefits’ which are included in ‘Income Accounts by Institutional Sectors’.
- Statistics Korea is planning to construct the macro controls for NTA of South Korea which is based on the data applied to SNA 2008 in the near future.



Thank you

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