The 12th Global Meeting of the NTA Network: Older Person through the NTA Lense (2018.07.25, Mexico City)

The Sources of Population Aging and Its Economic Impact in the Republic of Korea

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Contents

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Development Status of Korean NTA

Development History of NTA in the Republic of Korea

2012
- Begin National Transfer Accounts (NTA) project

2013
- Perform pre-studies for NTA methodological knowledge

2014
- Calculate NTA on trial base

2015
- Incorporate 2008 System of National Accounts (SNA)

2016
- Report to National Statistical Committee (Topic: National Transfer Account Development)

2017
- Release 2010-2012 NTA results

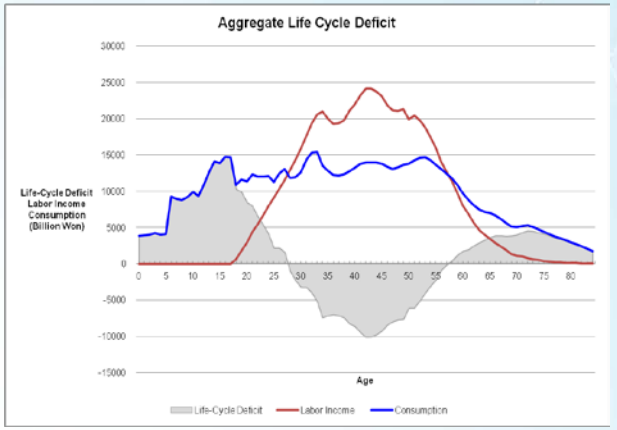
2018
- Release 2013-2014 NTA results
- Obtain approval for NTA to be included in national official statistics (19 April 2018)

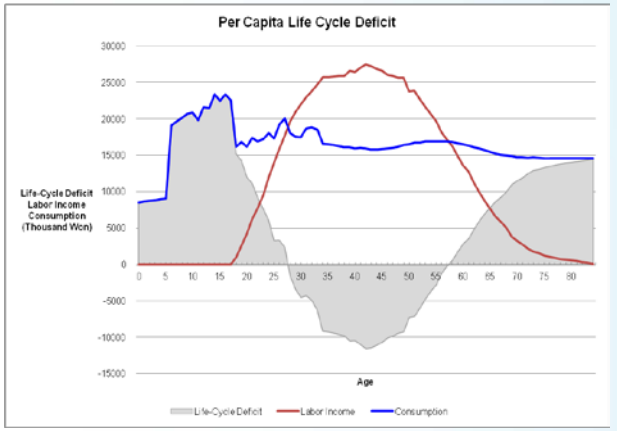
Korean NTA Results

▪ National Transfer Accounts Results (2014, Republic of Korea)

(Age Profile Result – Aggregate, Unit – Billion Won)

Component	Macro Control	Age 0	Age 1	...	Age 84	Age 85+
Life Cycle Deficit	127718.93	3882.15	3924.83	···	1703.77	7434.11
Consumption	841700.90	3882.15	3924.83	···	1717.17	7437.23
Public Consumption	224724.20	1559.46	1523.96	···	802.31	3537.26
Public Education Consumption	52242.50	0.00	0.00	···	0.00	0.00
Public Health Consumption	55496.20	503.54	469.57	···	529.10	2353.79
Public Other Consumption	116985.50	1055.92	1054.39	···	273.21	1183.47
Private Consumption	616976.70	2322.69	2400.87	···	914.86	3899.97
Private Education Consumption	53549.20	0.00	0.00	···	0.00	0.00
Private Health Consumption	35335.90	282.99	260.46	···	101.48	421.37
Private Other Consumption	528091.60	2039.70	2140.40	···	813.38	3478.60
Labor Income	713981.97	0.00	0.00	···	13.40	3.12
Wage Income	671552.01	0.00	0.00	···	9.05	0.00
Self-Employment Labor Income	42429.96	0.00	0.00	···	4.34	3.12
Age Reallocations	127718.93	3882.15	3924.83	···	1703.77	7434.11
Public Age Reallocations	-55117.90	1534.63	1473.40	···	1307.42	5946.97
Public Transfers	0.00	1602.00	1544.10	···	1342.48	6077.63
Public Asset-based Reallocations	-55117.90	-67.37	-70.70	···	-35.06	-130.66
Private Age Reallocations	182836.83	2347.52	2451.42	···	396.35	1487.14
Private Transfers	-5247.00	2347.52	2451.42	···	770.50	2590.91
Private Asset-based Reallocations	188083.83	0.00	0.00	···	-374.15	-1103.77





Using System of National Accounts (SNA)

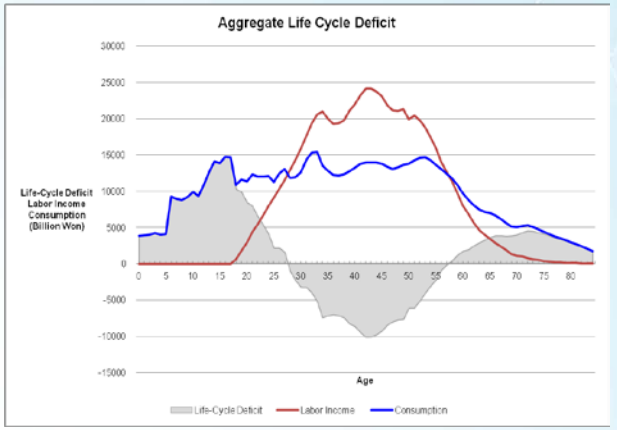
Using Korean Labor and Income Panel Study (KLIPS)
Household Income and Expenditure Survey (HIES) etc

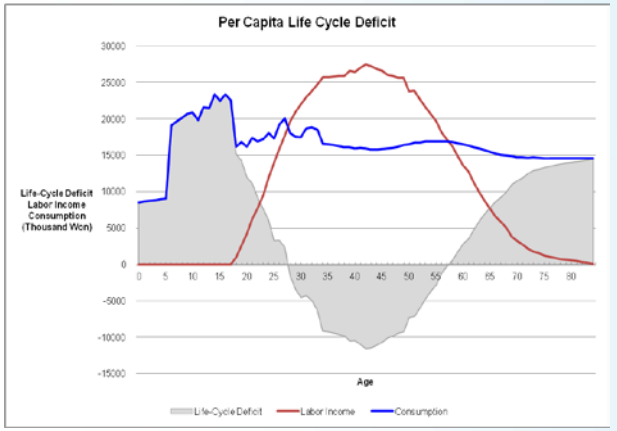
Korean NTA Results

▪ National Transfer Accounts Results (2014, Republic of Korea)

(Age Profile Result – Per Capita, Unit – Thousand Won)

Component	Age 0	Age 1	Age 2	…	Age 83	Age 84	Age 85+
Life Cycle Deficit	8529.77	8636.07	8742.36	…	14357.57	14468.19	14573.55
Consumption	8529.77	8636.07	8742.36	…	14584.27	14581.97	14579.67
Public Consumption	3426.41	3353.27	3280.12	…	6691.89	6813.10	6934.31
Public Education Consumption	0.00	0.00	0.00	…	0.00	0.00	0.00
Public Health Consumption	1106.37	1033.23	960.09	…	4371.85	4493.06	4614.27
Public Other Consumption	2320.04	2320.04	2320.04	…	2320.04	2320.04	2320.04
Private Consumption	5103.36	5282.80	5462.24	…	7892.38	7768.87	7645.36
Private Education Consumption	0.00	0.00	0.00	…	0.00	0.00	0.00
Private Health Consumption	621.78	573.12	524.46	…	897.49	861.77	826.04
Private Other Consumption	4481.58	4709.68	4937.78	…	6994.90	6907.11	6819.32
Labor Income	0.00	0.00	0.00	…	226.70	113.78	6.12
Wage Income	0.00	0.00	0.00	…	159.03	76.88	0.00
Self-Employment Labor Income	0.00	0.00	0.00	…	67.67	36.90	6.12
Age Reallocations	8529.77	8636.07	8742.36	…	14357.57	14468.19	14573.55
Public Age Reallocations	3371.86	3242.03	3112.21	…	10544.91	11102.45	11658.22
Public Transfers	3519.89	3397.60	3275.31	…	10884.46	11400.18	11914.36
Public Asset-based Reallocations	-148.03	-155.56	-163.10	…	-339.55	-297.72	-256.14
Private Age Reallocations	5157.92	5394.04	5630.16	…	3812.66	3365.74	2915.33
Private Transfers	5157.92	5394.04	5630.16	…	6152.07	6543.00	5079.12
Private Asset-based Reallocations	0.00	0.00	0.00	…	-2339.41	-3177.26	-2163.79



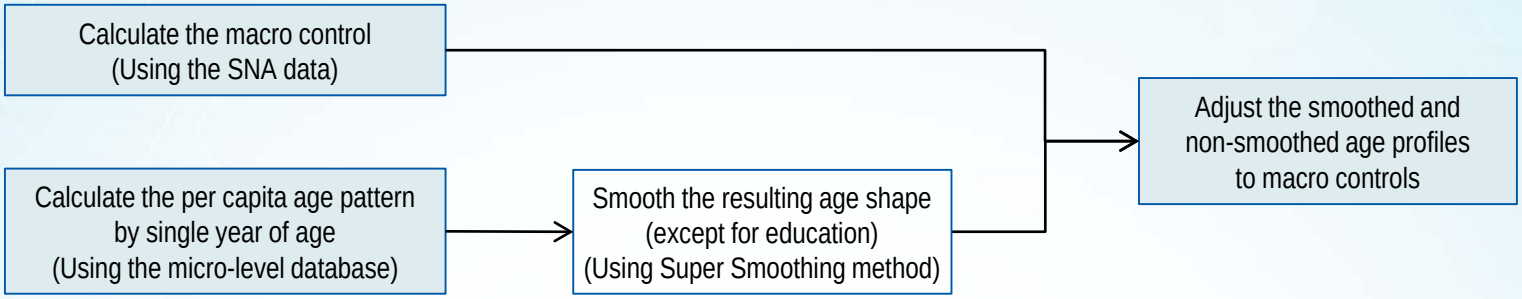


Data and Methodology

Methodology: NTA Age Profile Construction

▪ National Transfer Accounts (NTA) Methodology

< NTA Age Profile Calculating Process >



< Calculate Per Capita Age Profiles and Aggregate Age Profiles >

Year x, Item i Per capita age profile (Age k)	X	Year x (Projection) Population by single year of age (Age k)	=	Year x, Item i Aggregate age profile (Age k)
a_{ikx}	X	P_{kx}	=	A_{ikx}

Year x, Item i Aggregate age profile (Age 0)	+	Year x, Item i Aggregate age profile (Age 1)	+ … +	Year x, Item i Aggregate age profile (Age 85+)	=	Year x, Item i Total national scale (Macro control)
A_{i0x}	+	A_{i1x}	+ … +	$A_{i(85+)x}$	=	$A_{ix}(= M_{ix})$
$\Sigma_{(k=0\sim85+)}A_{ikx}$					=	$A_{ix}(= M_{ix})$

Methodology: NTA Age Profile Construction

▪ National Transfer Accounts (NTA) Methodology (Details)

< Calculate Aggregate Age Profiles using Per Capita Age Pattern (Details) >

(Micro-level data) Year x, Item i Per capita age pattern (Age k)	X	Year x (Projection) Population by single year of age (Age k)	=	(Micro-level data) Year x, Item i Aggregate age pattern (Age k)
$\hat{a}_{ikx}$	X	P_{kx}	=	$\hat{A}_{ikx}$

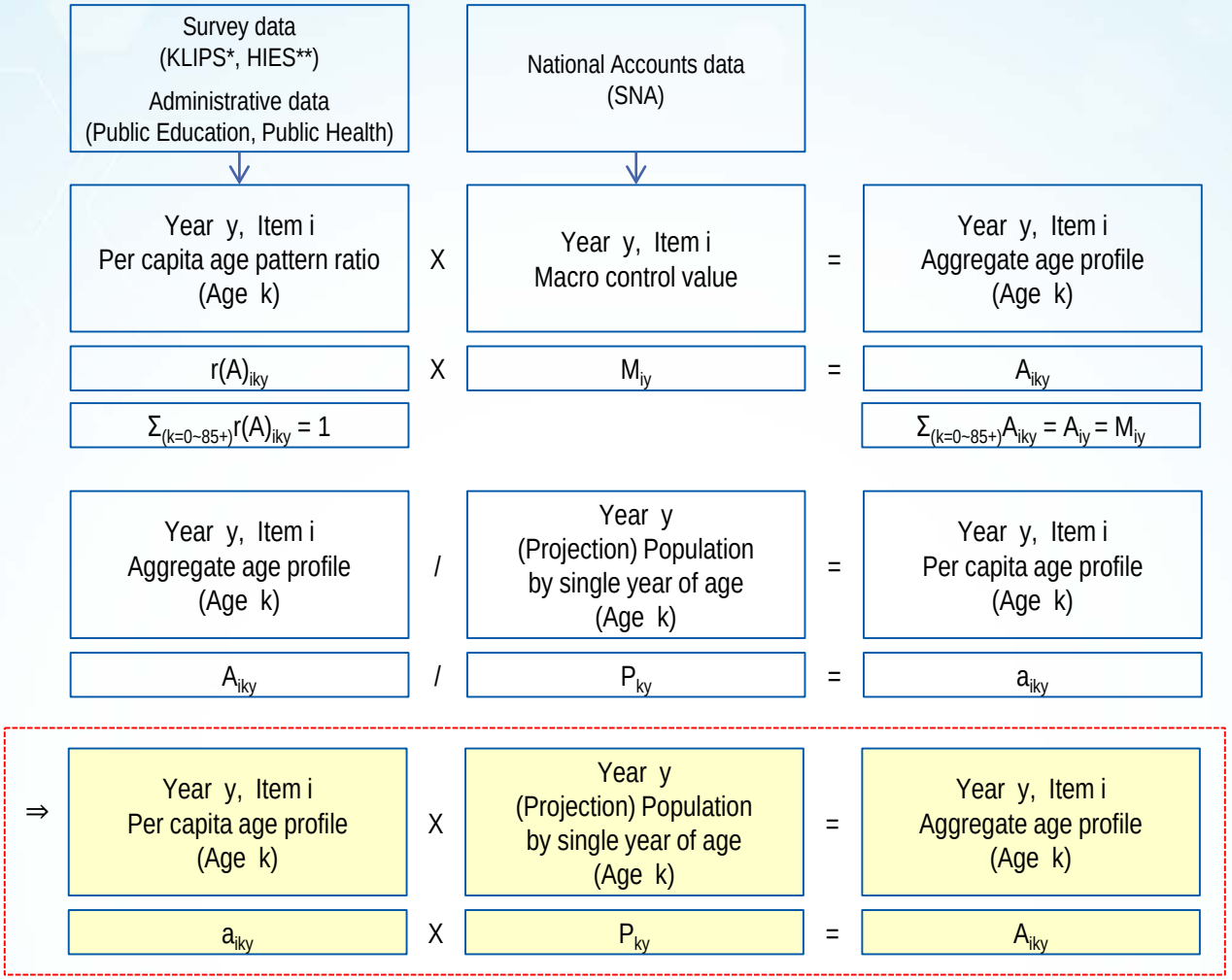
(Micro-level data) Year x, Item i Aggregate age pattern (Age 0)	+	(Micro-level data) Year x, Item i Aggregate age pattern (Age 1)	+	...	+	(Micro-level data) Year x, Item i Aggregate age pattern (Age 85+)	=	(Micro-level data) Year x, Item i Total national scale (Sum of aggregate age patterns)
$\hat{A}_{i0x}$	+	$\hat{A}_{i1x}$	+	...	+	$\hat{A}_{i(85+)x}$	=	$\hat{A}_{ix}$
$\Sigma_{(k=0\sim85+)}\hat{A}_{ikx}$							=	$\hat{A}_{ix}$

(Micro-level data) Year x, Item i Aggregate age pattern (Age k)	/	(Micro-level data) Year x, Item i Total national scale (Sum of aggregate age pattern)	=	(Micro-level data) Year x, Item i Aggregate age pattern ratio (Age k)
$\hat{A}_{ikx}$	/	$\hat{A}_{ix}$	=	$r(\hat{A})_{ikx}$

(Micro-level data) Year x, Item i Aggregate age pattern ratio (Age k)	X	Year x, Item i Macro control value (Total national scale)	=	Year x, Item i Aggregate age profile (Age k)
$r(\hat{A})_{ikx}$	X	M_{ix} (= A_{ix})	=	A_{ikx}

Methodology: NTA Age Profile Construction

▪ National Transfer Accounts (NTA) Methodology (Details: Korean Case)



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

Estimation Assumptions: Kim & Lee (2018)

▪ Assumptions for Age Profiles & Population

– The per capita age profiles for year x are (approximately) the same as the per capita age profiles for 2014.

• Year (x) = 2015, 2016, … , 2064, 2065

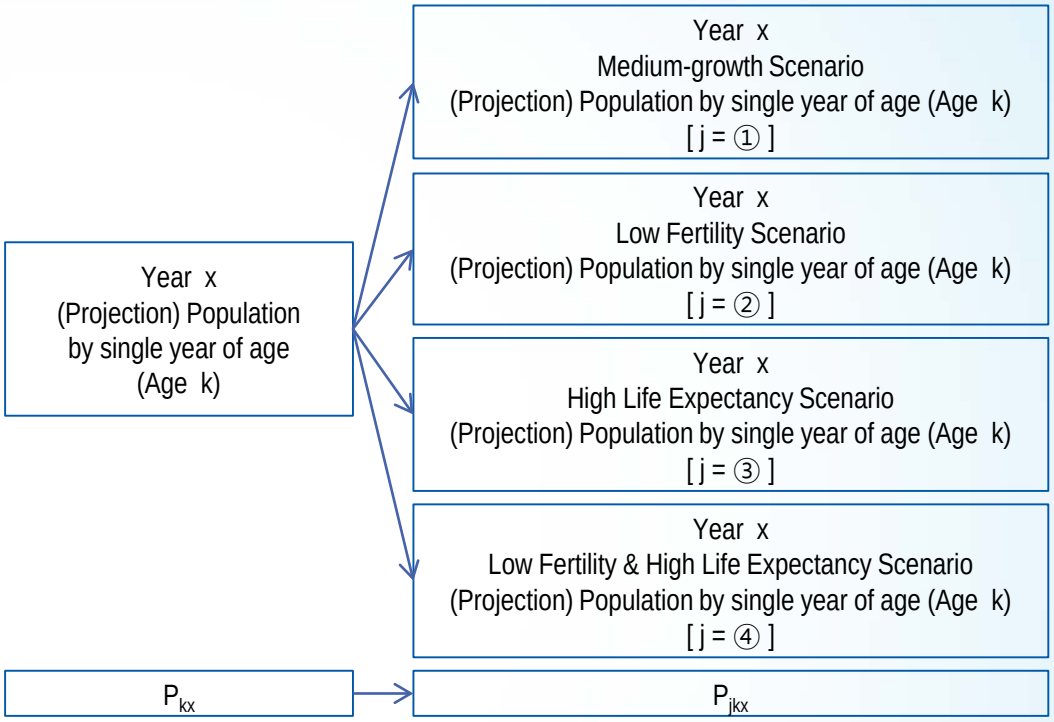
– The population structure for year x follows 4 special scenarios of population projections for Korea.

• Medium-growth, Low Fertility, High Life Expectancy, Low Fertility & High Life Expectancy

< Assumptions for per capita age profiles >

Year x, Item i Per capita age profile (Age k)	≒	Year 2014, Item i Per capita age profile (Age k)
a_{ikx}	≒	$a_{ik,2014}$

< Assumptions for population structure >



Korean NTA Results: 2014 Per Capita NTA Result

▪ National Transfer Accounts Results (2014, Republic of Korea)

(Age Profile Result – Per Capita, Unit – Thousand Won)

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Labor Income	0.00	0.00	0.00	…	226.70	113.78	6.12
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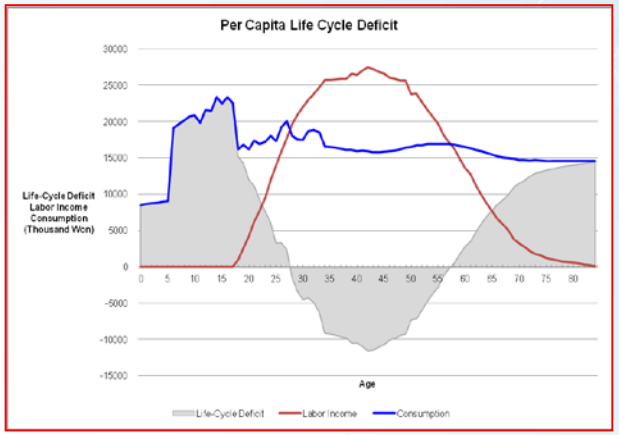
Private Asset-based Reallocations	0.00	0.00	0.00	…	-2339.41	-3177.26	-2163.79



No.	Classification	Specifications for NTA Components (i Item)
01	Life Cycle Deficit	Life Cycle Deficit, Consumption, Labor Income
02	Consumption / Transfers	Public Consumption, Private Consumption, Public Transfers, Private Transfers
03	Public Transfers	Public Transfers, Public Transfer Inflows, Public Transfer Outflows + Public Pension Transfers
04	Private Transfers	Private Transfers, Private Transfer Inflows, Private Transfer Outflows

Population Projections for Korea: 2015~2065

▪ Population Projections for Korea: Special Scenarios, 2015~2065

No.	Scenarios	Fertility	Life Expectancy	Intl. Migration
01	Medium-growth Scenario	Medium	Medium	Medium
02	High-growth Scenario	High	High	High
03	Low-growth Scenario	Low	Low	Low
04	High Fertility Scenario	High	Medium	Medium
05	Low Fertility Scenario	Low	Medium	Medium
06	Constant Fertility Scenario	Constant	Medium	Medium
07	Target Fertility Scenario	Target	Medium	Medium
08	High Life Expectancy Scenario	Medium	High	Medium
09	Low Life Expectancy Scenario	Medium	Low	Medium
10	High Intl. Migration Scenario	Medium	Medium	High
11	Low Intl. Migration Scenario	Medium	Medium	Low
12	Zero Intl. Migration Scenario	Medium	Medium	Zero
13	Other Scenario	Low	High	Low
14	Other Scenario	High	Low	High
15	Other Scenario	Medium	High	High

No.	Scenarios	Fertility	Life Expectancy	Intl. Migration
16	Other Scenario	Medium	High	Low
17	Other Scenario	Medium	Low	High
18	Other Scenario	Medium	Low	Low
19	Other Scenario	High	Medium	High
20	Other Scenario	High	Medium	Low
21	Other Scenario	High	High	Medium
22	Other Scenario	High	High	Low
23	Other Scenario	High	Low	Medium
24	Other Scenario	Low	Medium	High
25	Other Scenario	Low	Medium	Low
26	Other Scenario	Low	High	Medium
27	Other Scenario	Low	High	High
28	Other Scenario	Low	Low	Medium
29	Other Scenario	Low	Low	High
30	Other Scenario	High	Low	Low

Population Projections for Korea: 2015~2065

▪ Population Projections for Korea: Special Scenarios, 2015~2065

No.	Scenario	Fertility	Life Expectancy	Intl. Migration
01	Medium-growth Scenario	Medium	Medium	Medium
05	Low Fertility Scenario	Low	Medium	Medium
08	High Life Expectancy Scenario	Medium	High	Medium
26	Other Scenario	Low	High	Medium

j	Scenario j	Fertility	Life Expectancy	Intl. Migration
①	Medium-growth Scenario	Medium	Medium	Medium
②	Low Fertility Scenario	Low	Medium	Medium
③	High Life Expectancy Scenario	Medium	High	Medium
④	Low Fertility & High Life Expectancy Scenario	Low	High	Medium

j	Low Fertility / Ageing Effect		Calculation for Scenarios				
⑤	Low Fertility Effect	=	② Low Fertility Scenario	-	① Medium-growth Scenario		
⑥	High Life Expectancy Effect	=	③ High Life Expectancy Scenario	-	① Medium-growth Scenario		
⑦	Total Effect	=	④ Low Fertility & High Life Expectancy Scenario	-	① Medium-growth Scenario		
⑧	Residual: Interaction Effect	=	⑤ Low Fertility Effect	+	⑥ High Life Expectancy Effect	-	⑦ Total Effect

Methodology: Kim & Lee (2018)

- **Kim & Lee (2018): Estimation for Total National Scale (Sum of aggregate age profiles)**

Year x, Item i Per capita age profile (Age k)	X	Year x (Projection) Population by single year of age (Age k)	=	Year x, Item i Aggregate age profile (Age k)
a_{ikx}	X	P_{kx}	=	A_{ikx}

Year x, Item i Aggregate age profile (Age 0)	+	Year x, Item i Aggregate age profile (Age 1)	+	...	+	Year x, Item i Aggregate age profile (Age 85+)	=	Year x, Item i Total national scale (Macro control)
A_{i0x}	+	A_{i1x}	+	...	+	$A_{i(85+)x}$	=	A_{ix} (= M_{ix})
$\Sigma_{(k=0\sim85+)}A_{ikx}$							=	A_{ix} (= M_{ix})

⇒

Year 2014, Item i Per capita age profile (Age k)	X	Year x, Scenario j (Projection) Population by single year of age (Age k)	=	Year x, Item i, Scenario j Aggregate age profile (Age k)
$A_{ik,2014}$	X	P_{jkx}	=	A_{ijkx}

Year x, Item i, Scenario j Aggregate age profile (Age 0)	+	Year x, Item i, Scenario j Aggregate age profile (Age 1)	+	...	+	Year x, Item i, Scenario j Aggregate age profile (Age 85+)	=	Year x, Item i, Scenario j Total national scale (Sum of aggregate age profiles)
A_{ij0x}	+	A_{ij1x}	+	...	+	$A_{ij(85+)x}$	=	A_{ijx}
$\Sigma_{(k=0\sim85+)}A_{ijkx}$							=	A_{ijx}

Methodology: Kim & Lee (2018)

▪ Kim & Lee (2018): Estimation for Total National Scale (by age groups)

Year x, Item i, Scenario j Aggregate age profile (Age 0)	+	Year x, Item i, Scenario j Aggregate age profile (Age 1)	+ … +	Year x, Item i, Scenario j Aggregate age profile (Age 85+)	=	Year x, Item i, Scenario j Total national scale
A_{ij0x}	+	A_{ij1x}	+ … +	$A_{ij(85+)x}$	=	A_{ijx}
$\Sigma_{(k=0\sim85+)}A_{ijkx}$					=	A_{ijx}

NTA Item i Total National Scale (A)	All ages (age 0~85+)	=	Youth age group (age 0~14)	+	Working age group (age 15~64)	+	Old age group (age 65+)
	Year x, Item i, Scenario j Total national scale	=	Year x, Item i, Scenario j Youth age group (age 0~14) national scale	+	Year x, Item i, Scenario j Working age (age 15~64) national scale	+	Year x, Item i, Scenario j Old age group (age 65+) national scale
	A_{ijx}	=	$A_{ijx,0\sim14}$	+	$A_{ijx,15\sim64}$	+	$A_{ijx,65+}$
	$\Sigma_{(k=0\sim85+)}A_{ijkx}$	=	$\Sigma_{(k=0\sim14)}A_{ijkx}$	+	$\Sigma_{(k=15\sim64)}A_{ijkx}$	+	$\Sigma_{(k=65\sim85+)}A_{ijkx}$

Methodology: Kim & Lee (2018)

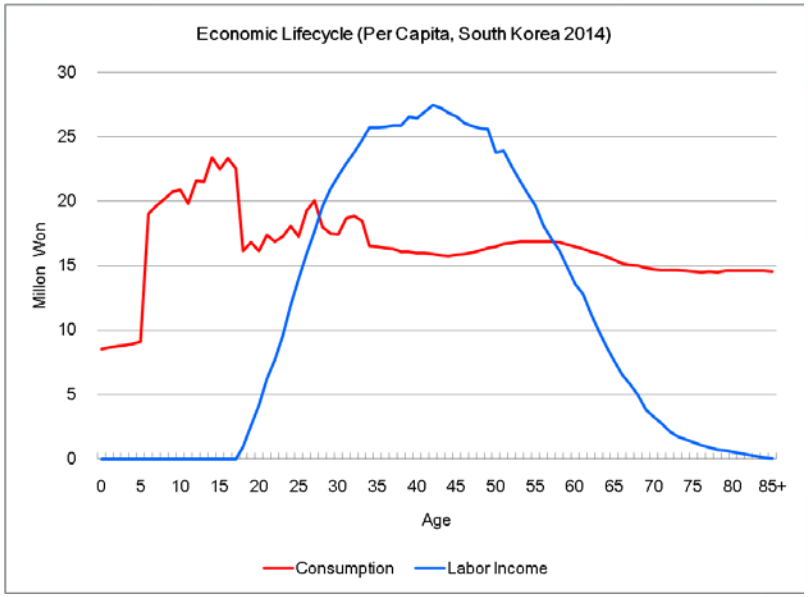
- **Kim & Lee (2018): Estimation for Total National Scale (by age groups)**

	Total National (Aggregate) Scale							
	Low Fertility / High Life Expectancy Effects		Calculations for Each Scenario					
(Classifying by age groups) Low Fertility Effect	Year x, Item i Low Fertility Effect Total National Scale	=	Year x, Item i Low Fertility Scenario Total National Scale	-	Year x, Item i Medium-growth Scenario Total National Scale			
(Classifying by age groups) High Life Expectancy Effect	Year x, Item i High Life Expectancy Effect Total National Scale	=	Year x, Item i High Life Expectancy Scenario Total National Scale	-	Year x, Item i Medium-growth Scenario Total National Scale			
(Classifying by age groups) Total Effect	Year x, Item i Total Effect Total National Scale	=	Year x, Item i Low Fertility & High Life Expectancy Scenario Total National Scale	-	Year x, Item i Medium-growth Scenario Total National Scale			
(Classifying by age groups) Residual / Interaction Effects	Year x, Item i Interaction Effect Total National Scale	=	Year x, Item i Low Fertility Effect Total National Scale	+	Year x, Item i High Life Expectancy Effect Total National Scale	-	Year x, Item i Total Effect Total National Scale	
	Year x, Item i Interaction Effect Per Capita Scale	=	Year x, Item i Low Fertility Effect Per Capita Scale	+	Year x, Item i High Life Expectancy Effect Per Capita Scale	-	Year x, Item i Total Effect Per Capita Scale	

Results

Economic Lifecycle: Per capita economic lifecycle for the Republic of Korea (2014)

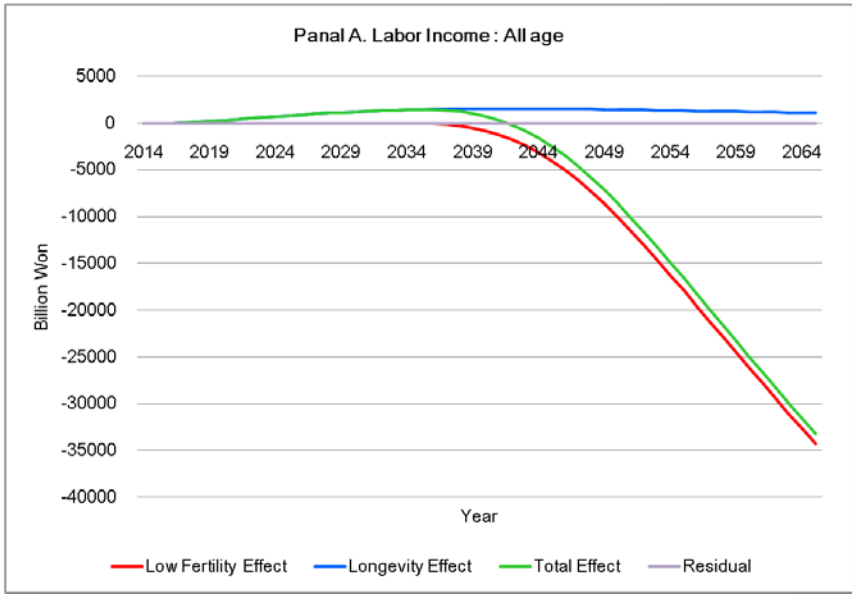
- Koreans younger than 20 do not support themselves through their labor to any significant degree
- Those in their early 20s contribute the least to their own support, funding only half of their consumption, but in their late 20s they are funding all of their consumption through their labor.
- Labor income in Korea drops below consumption around age 58 on average.
- Labor income supports 10 to 30 percent of the consumption of the elderly ages 65 and above



Economic Lifecycle: The economic effect of sources of aging (2014~2065)

– Labor income (using 2014 age profile for the Republic of Korea)

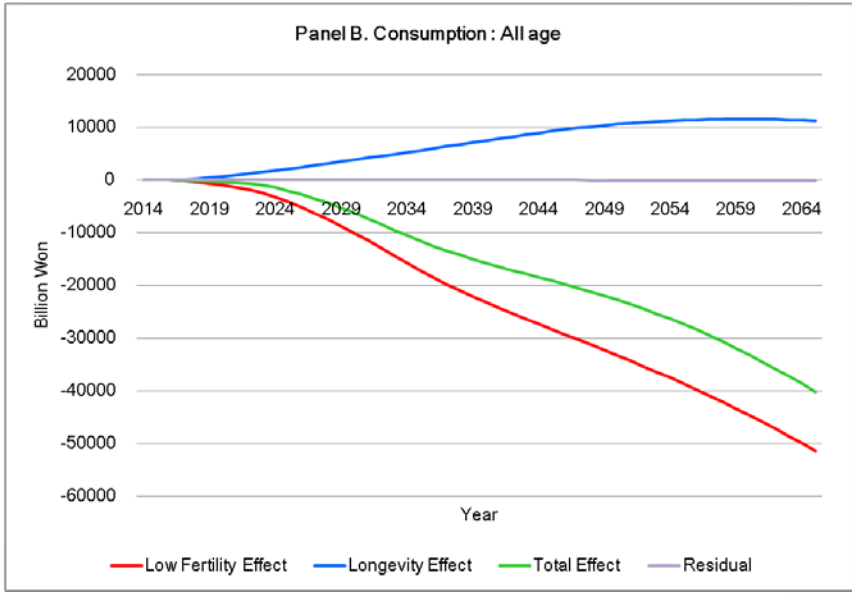
- Labor income declines sharply after 2040 due to decline in fertility.
  – The decline in fertility has no impact for about 25 years as people born in 2015 are less likely to be in the labor market until 2040
  – However, when they start to work in the labor market, the aggregate labor income becomes smaller as the labor force shrinks
- By contrast, the effect of the increase in life expectancy is not as large, as the per capita labor income of older people is substantially smaller than that of prime-age adults



Economic Lifecycle: The economic effect of sources of aging (2014~2065)

– Consumption (using 2014 age profile for the Republic of Korea)

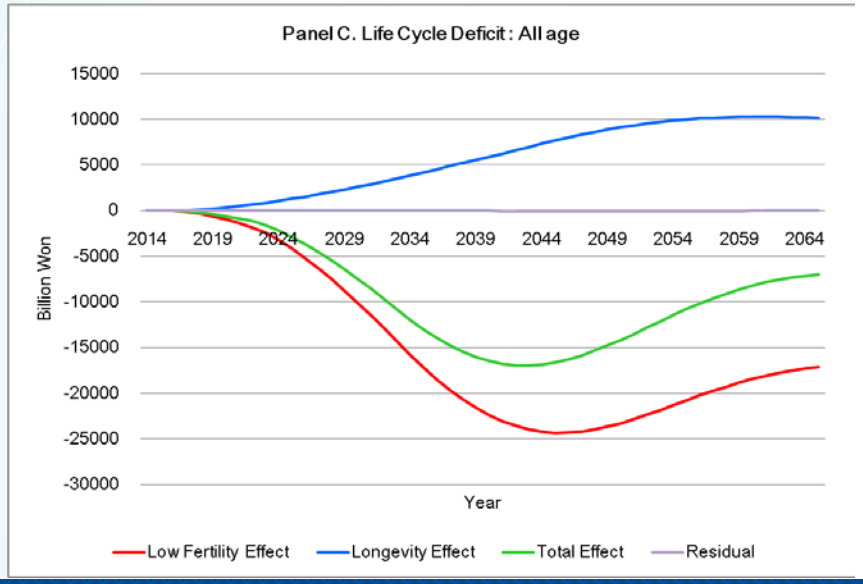
- Consumption of the elderly is expected to increase considerably due to the increase in life expectancy.
- However, the consumption of young people drops much more rapidly due low fertility as consumption by young people in Korea is larger than that of the elderly.
  – This is in large part because of the substantial education consumption of youth in Korea, which is quite different from other advanced economies
  – In other countries, consumption increases rapidly as people age in large part due to healthcare consumption, which is not the case for Korea

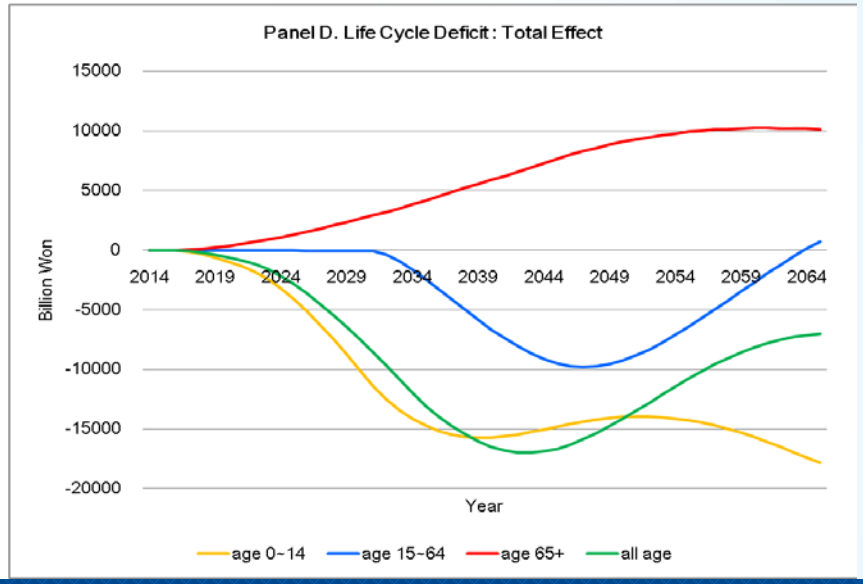


Economic Lifecycle: The economic effect of sources of aging (2014~2065)

– Life cycle deficit (using 2014 age profile for the Republic of Korea)

- Overall, the lifecycle deficit continues to decrease until the mid-2040s
- After the mid-2040s, however, the decline in the lifecycle deficit gradually slows as the labor income of the younger cohort becomes larger than their consumption
- The lifecycle deficit of young people decreases sharply due to the decline in the birth rate, while the lifecycle deficit of elderly people increases substantially due to the increase of life expectancy
- For the working age group, the lifecycle deficit decreases in the beginning due to the decrease in consumption, but it eventually increases as the decrease in labor income exceeds the decrease in consumption

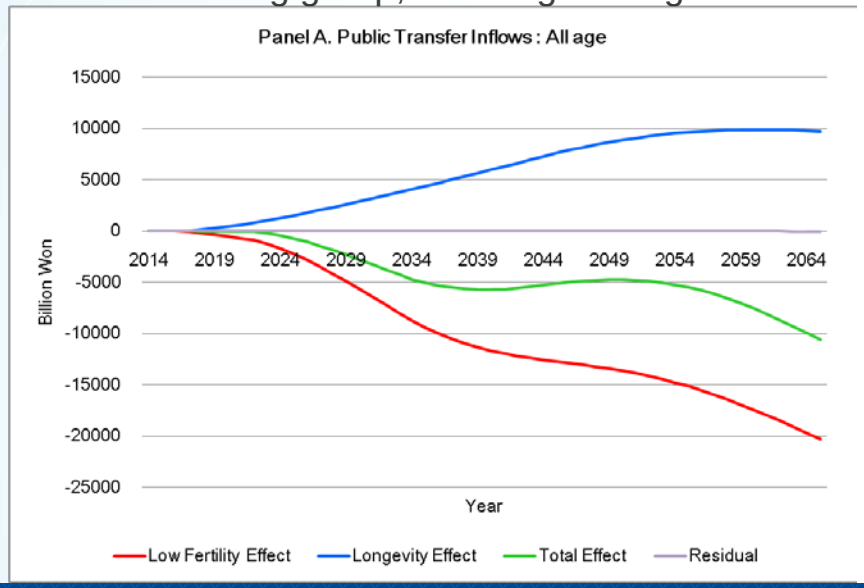


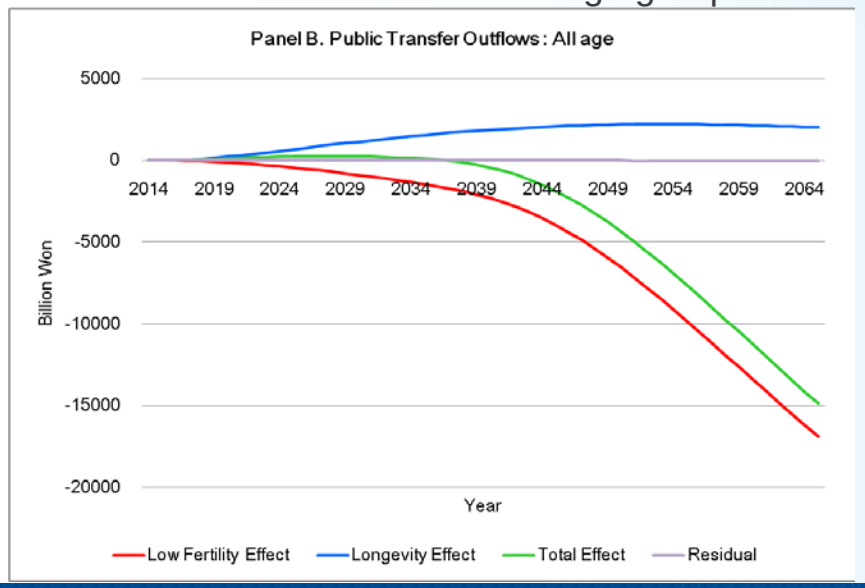


Public Transfers: The economic effect of sources of aging (2014~2065)

– Public transfers: Inflow (expenditure) & outflow (tax burden) (using 2014 age profile for the Rep. of Korea)

- The low birth rate and the increase in life expectancy have a great impact on the public transfer because public transfer outflows (tax) and inflows (expenditure) show very different age profiles
- There will be a rapid fiscal deficit in the end due to a decrease in tax revenues and an increase in government spending.
  – An increase in life expectancy results in an increase in the proportion of the elderly population, which in turn leads to a steady increase in public transfers
  – On the other hand, the low fertility rate results in a significant reduction in public transfer expenditures in the short term, but in the mid- to long-term it leads to a decline in the population of the working group, resulting in a significant reduction in the taxable income of the age group

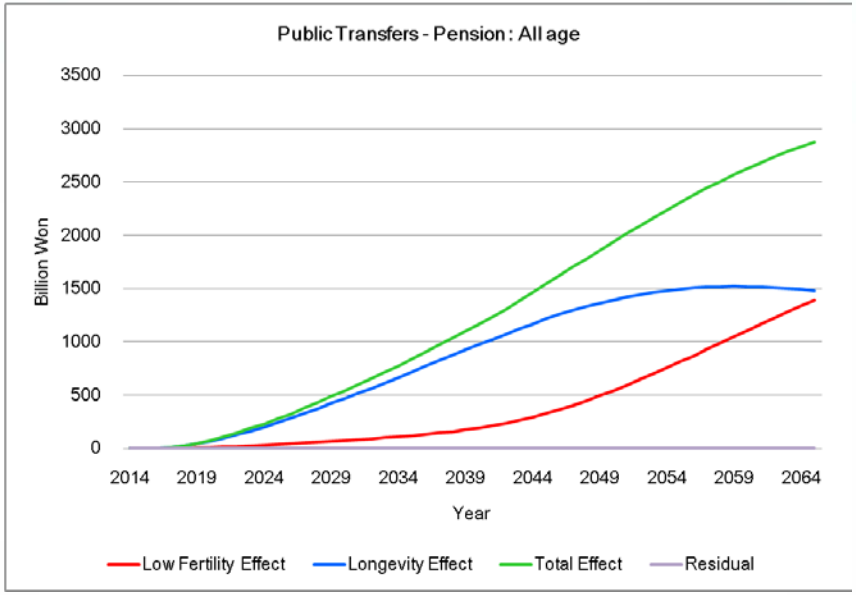




Public Transfers: The economic effect of sources of aging (2014~2065)

– Categories of Public Transfers
  • Public transfers can be divided into various categories such as education, health, and pension.
  • It is meaningful to look at the results by category of fiscal expenditure

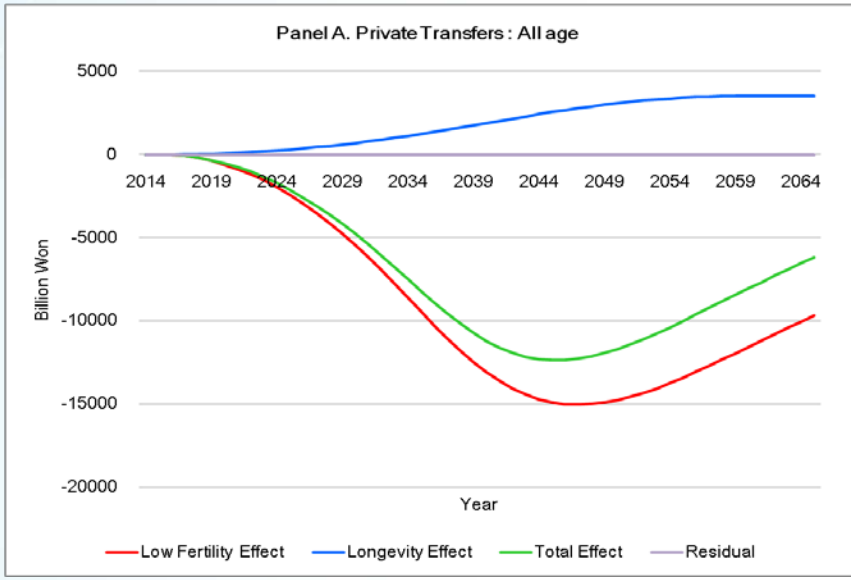
– Public Transfers: Pension Scheme (using 2014 age profile for the Republic of Korea)
  • The pension expenditure continuously increases due to the increase of life expectancy
  • However, the decrease in the birth rate in the pension scheme results in a smaller tax base, resulting in a government budget deficit under a pay-as-you go system

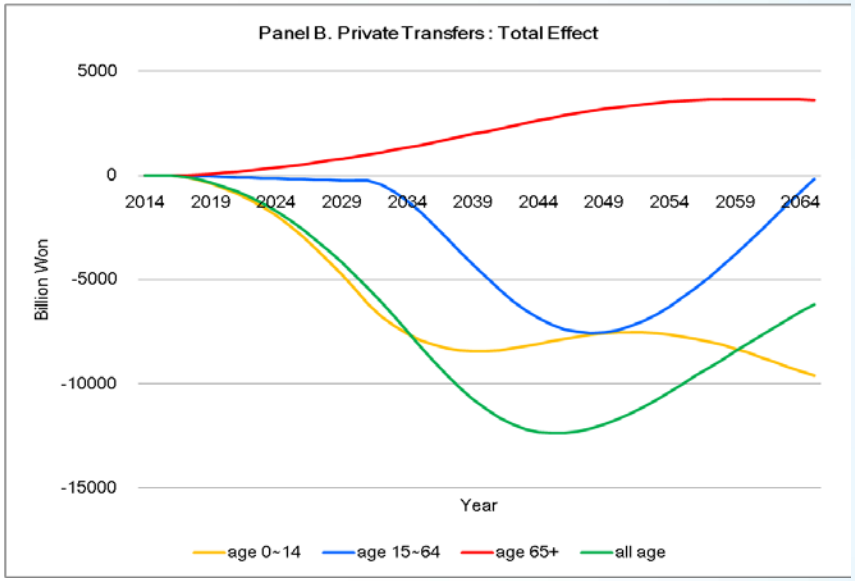


Private Transfers: The economic effect of sources of aging (2014~2065)

– Private transfers: Net Transfers (Inflow - Outflow) (using 2014 age profile for the Republic of Korea)

- Private transfers are the dominant support system for children everywhere
  – Although the extended family has deteriorated very rapidly in the last few decades, private transfers have been important for supporting the elderly in Korea
- The low birth rate greatly reduces the size of the population providing private transfers, while the high life expectancy increases the population receiving private transfers
- Overall, the net effect will be a decrease in the share of net private transfers to older people





4 Summary and Conclusion

Conclusion

- **There is no study measuring how changes in the birth rate or survivorship will affect the future Korean economy**
  - The target fertility rate will be meaningful only if we provide evidence for it

- **This research attempted to analyze how aging, birth rate and life expectancy will affect the Korean economy**
  - The effect of low birth rate and high life expectancy does not show a uniform picture
    - Both factors may contribute to population aging, but their effects on the economy are very different in terms of their direction, magnitude, and timing
  - Most of all, the effects are very diverse depending on the economic variables: consumption, labor income, tax burden or spending, and private transfers
  - The only effect that moves in the same direction is the effect on pension; both decrease in fertility and increase in survivorship will increase the pressure on the Korean pension system

Thank you

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