Measuring Lifecycle Deficit and Economic Support Ratio

NTA Team
Presented by Sang-Hyop Lee
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Population, Development, and Policy
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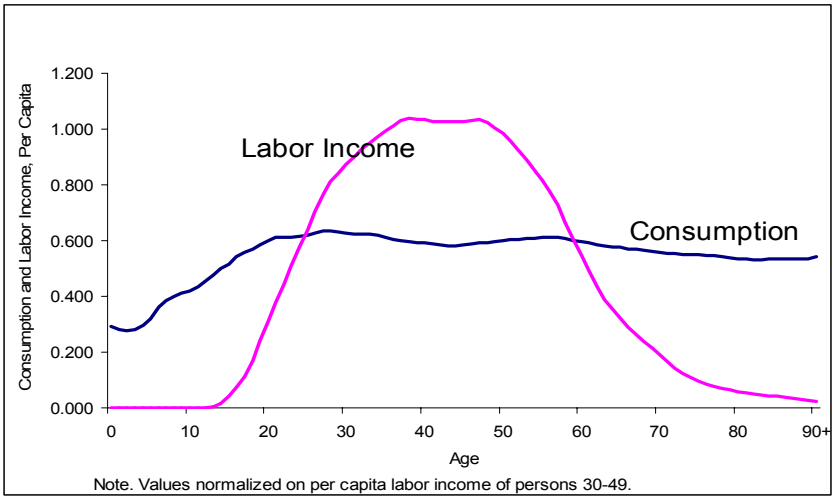
The Economic Lifecycle



Note. Values normalized on per capita labor income of persons 30-49.

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General Rule

- Estimate the per capita age-profile for the variable using household survey data or administrative records.
- Use population data to construct a preliminary aggregate age-profile.
- Adjust the aggregate profile and the per capita profile to match a control total taken from National Income and Product Accounts or some other source.

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General Rule: Equation Version

1. Estimate per capita age profile

2. Multiply by the population

$$X^p(a) = \beta \bar{X}^p(a) N(a)$$

$$\beta = X^p_{NIPA} / \sum_a \bar{X}^p(a) N(a)$$

3. Adjust to National Income and Product Account (NIPA) total.

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General Rule: Numerical Version

- Labor income NIPA – estimated from NIPA in the following way:
  - Compensation of employees, *plus*
  - 2/3 of entrepreneurial income
- Labor income (NIPA) : 5,581 billions NT$
- Labor income (FIES): 4,419 billions NT$
- Coefficient of adjustment β = 1.26

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Conclusion from Friday Lecture

- Estimation method could vary across countries depending on data.
- However, we can apply some standard measure for all the countries and compare the results
  - Definition → Specification → Estimation using weight → Smoothing
- Need to adjust using aggregate (Macro) control

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Estimating the Lifecycle Deficit

$$LD(a) = C(a) - Y^l(a)$$

$$C(a) = C^f(a) + C^g(a)$$

$Y^l(a)$ - Labor income

$C^f(a)$ - Private consumption

$C^g(a)$ - Public consumption

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Assumptions

- Age profiles are estimates of per capita values by single year of age.
- All consumption and labor production can be assigned to individuals
- This assumes away pure public goods, economies of scale, and other important features of consumption and production.

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Private Consumption Age Profile

- Construct an estimate of household consumption using expenditure data
- Allocate household consumption to individual household members
- Tabulate individual consumption by age of individuals

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Allocating Household Consumption among the Members

- Engel method
  - Food share is used to measure households' well-being
  - Calculate the compensation of welfare required for additional household member and tabulate individual consumption by age of household members
- Rothbarth or adult good method
  - Welfare measured by expenditure on adult goods per adult
  - Yields low estimates of cost of children as compared with Engel's method
- Neither method provided reasonable results.

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Assignable Goods

- Some goods are assignable to specific age groups on an *a priori* basis:
  - Education
  - Tobacco and alcohol
  - Health components, e.g., child and maternal health
- Useful for sector analysis (education and health)
- Alternative to standard method (for NTA)
  - Estimate assignable consumption directly (Education and Health)
  - Allocate other consumption indirectly (using Equivalence Scale)

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Estimating Private Education Consumption

$$C_j^{edu} = \sum \alpha(a) E_j(a) + \sum \beta(a) NE_j(a)$$

•Private education consumption is regressed on the number of enrolled (E) and non-enrolled (NE) in each age group.

•The age groups included will vary with the country and its enrollment rates.

•Education consumption is intrinsically not smooth.

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Estimating Private Health Care Consumption

- Health care consumption may include
  - Services from physicians, dentists, clinics.
  - Drugs and medical care products.
  - Hospital care, nursing home care, home health care provided by non-family members.
- Very complex in part due to various source of financing (and available source of data)
- It should depend on each county data.
- Estimated using one of four approaches.

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Approach 1: Method based on individual utilization measures from expenditure survey data

$$C_j^{health} = \sum \alpha(a) IN_j(a) + \sum \beta(a) OUT_j(a)$$

•Private health consumption is regressed on the number of members using inpatient services (IN) and outpatient services (OUT) in each age group.

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Approach 2: Based on age profile of per capita utilization measures

$$C_j^{health} = \sum \beta(a)U(a)M_j(a)$$

$$C_j^{health} = \sum \beta_0 U(a)M_j(a) + \sum \beta_1 a U(a)M_j(a)$$

$$+ \sum \beta_2 a^2 U(a)M_j(a)$$

•Private health consumption is regressed on the number of members (M) and per capita utilization measure by age (U)

•Could be linear (the former) or non-linear (the latter)

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Approach 3: Based on non-parametric iterative method

•Assign health expenditure equally to each household member and then tabulate the per capita profile.

• The per capita profile is then used as weights to allocate health expenditure to household members producing a new per capita profile.

• Repeat until the weights do not change much.

• Unlike regression approach, it does not produce negative coefficients for some age groups.

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True Income Profile				Estimated Income Profile (iteration)					
Age				1	2	3	4	5	6
1	10			14.44	11.90	10.83	10.36	10.16	10.07
2	30			25.00	27.42	28.74	29.40	29.72	29.87
3	20			22.22	21.54	20.85	20.43	20.21	20.10
Household	Person	Age	HH Income	1	2	3	4	5	6
1	1	1	70	23.33	15.69	12.48	11.09	10.49	10.22
1	2	2	70	23.33	27.16	28.76	29.45	29.76	29.89
1	3	2	70	23.33	27.16	28.76	29.45	29.76	29.89
2	1	2	80	26.67	27.69	28.72	29.35	29.69	29.85
2	2	2	80	26.67	27.69	28.72	29.35	29.69	29.85
2	3	3	80	26.67	24.62	22.56	21.30	20.63	20.30
3	1	3	40	20	20.00	20.00	20.00	20.00	20.00
3	1	3	40	20	20.00	20.00	20.00	20.00	20.00
4	1	1	20	10	10.00	10.00	10.00	10.00	10.00
4	2	1	20	10	10.00	10.00	10.00	10.00	10.00

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Approach 4: Based on simple regression

$$C_j^{health} = \sum \beta(a) M_j(a)$$

- Private health consumption is regressed on the number of members (M).
- Could have negative coefficients—replace with zero

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Estimating Other Household Consumption

$$\beta(a) = 1 - 0.6 \quad (\text{for } a \le 4)$$

$$\beta(a) = 1 - 0.6 * (20 - a)/16 \quad (\text{for } 4 < a < 20)$$

$$\beta(a) = 1 \quad (\text{otherwise, i.e., } a \ge 20)$$

- Assumed to be proportional to an equivalence scale that is equal to 1 for adults aged twenty or older, declines linearly from age 20 to 0.4 at age 4, and is constant at 0.4 for those age 4 or younger.

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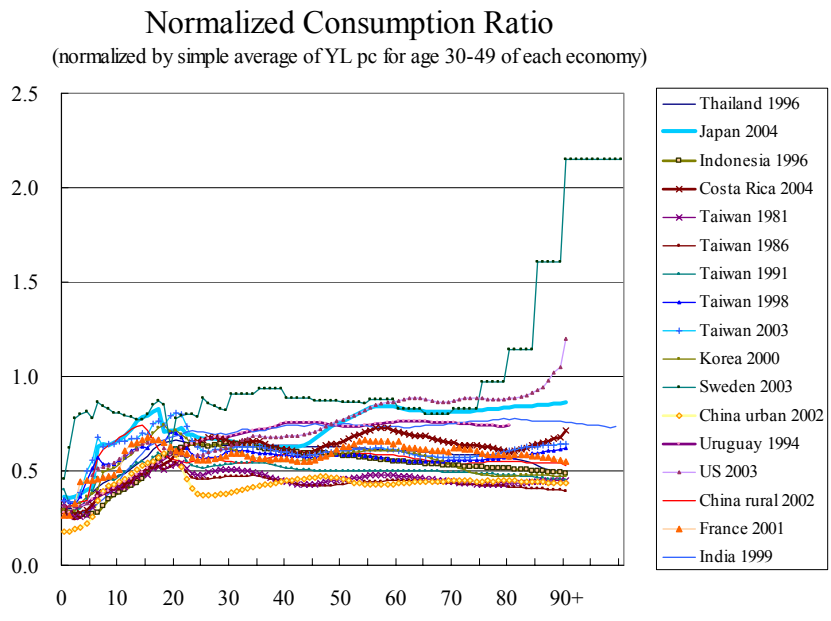
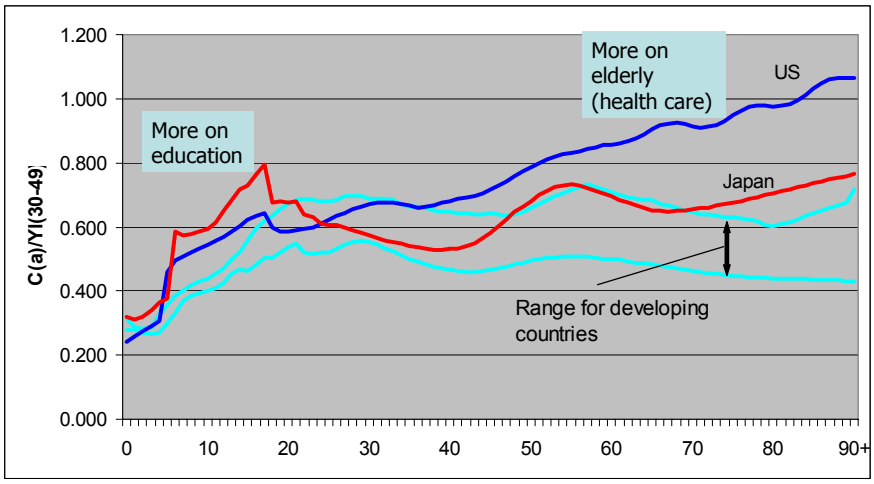


Consumption* Profiles: Industrialized vs Developing Countries.



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Labor Income

- Labor income includes
  - The compensation of employees
    - . wages and salaries
    - . employee benefits (excluding paid-leave)
    - . deferred payments
  - – Labor's estimated share of self-employed, entrepreneurial income, operating surplus
- No data sets include
  - – Value of time (e.g. childcare)

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Estimating Labor Income

- Compensation of employees should be measured from individual level data.
- For self-employed income, we assume that two-thirds accrues to labor and one-third to capital. Estimated using one of three approaches.
  - Direct tabulation from individual data
  - Non-parametric iterative methods (similar to health)
  - Regression methods: Let's try some alternative methods (June 8th,11th)

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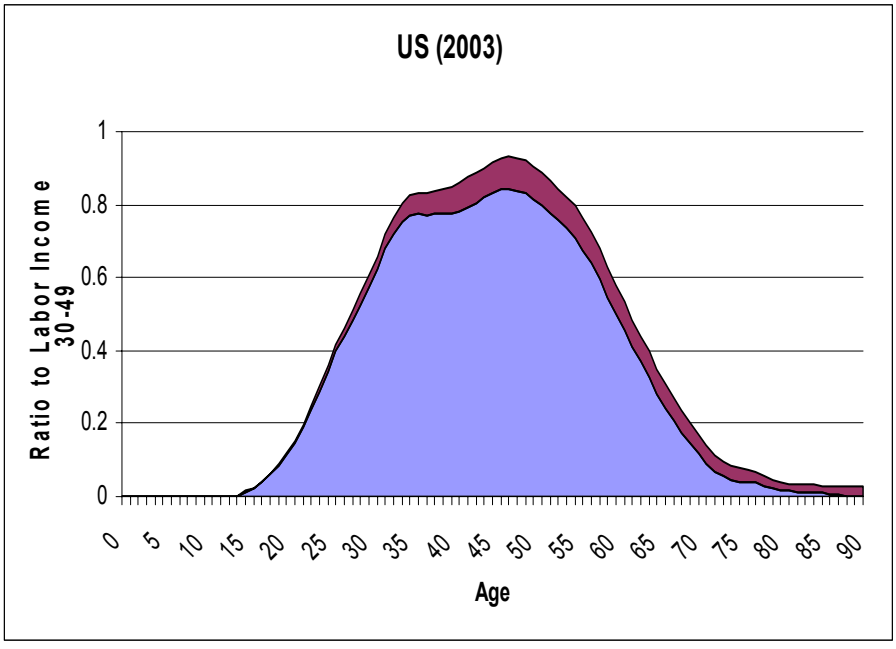
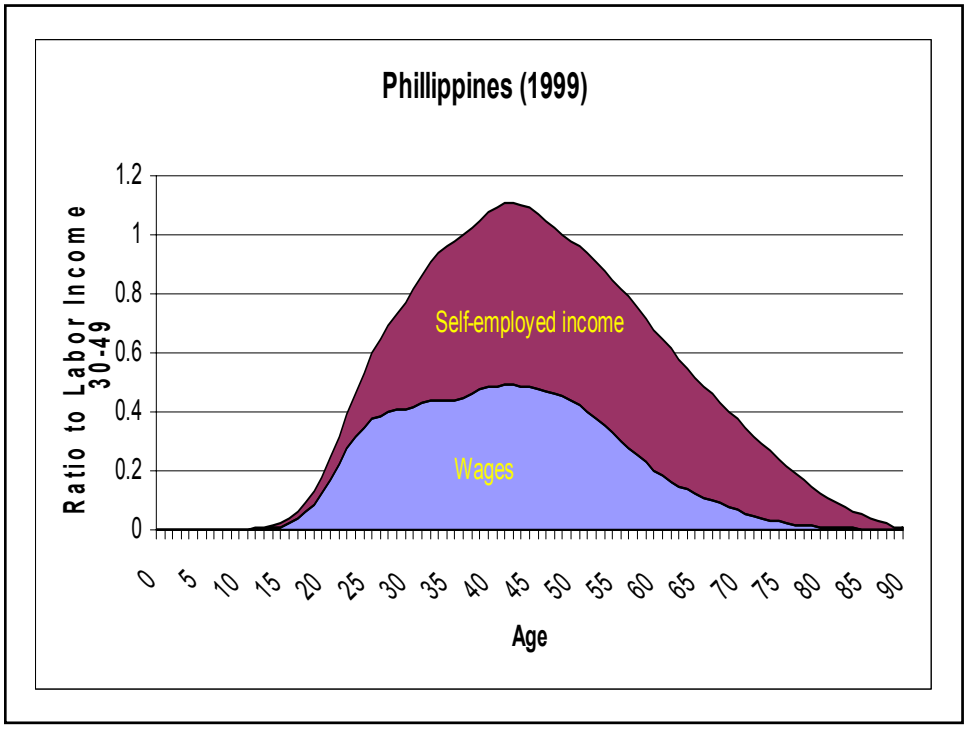
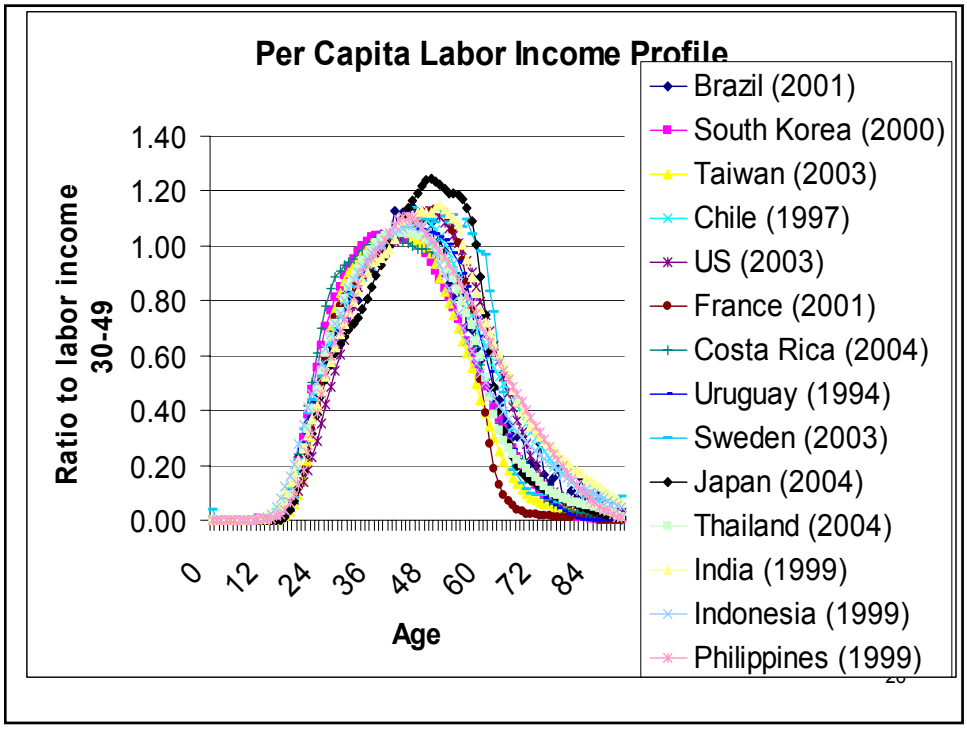
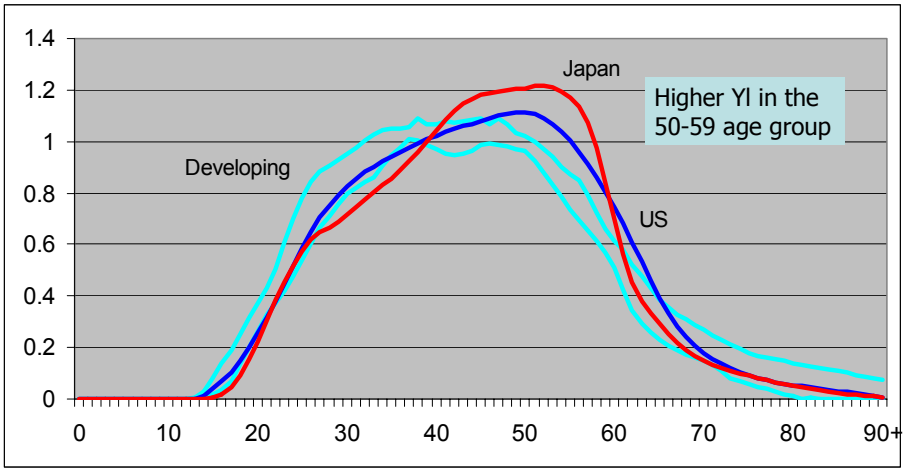



Phillippines (1999)
Ratio to Labor Income 30-49
1.2
1
0.8
0.6
0.4
0.2
0
Self-employed income
Wages
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90
Age


Per Capita Labor Income Profile
Ratio to labor income 30-49
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
0 12 24 36 48 60 72 84
Age
Brazil (2001)
South Korea (2000)
Taiwan (2003)
Chile (1997)
US (2003)
France (2001)
Costa Rica (2004)
Uruguay (1994)
Sweden (2003)
Japan (2004)
Thailand (2004)
India (1999)
Indonesia (1999)
Philippines (1999)

Labor Income: Industrialized vs Developing Countries.



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Country	Peak	65+	<=25	<=20	Mean	Median
Brazil (2001)	44	8.1	7.4	2.0	45.1	49.2
S. Korea (2000)	40	4.6	8.6	2.0	42.7	55.4
Taiwan (2003)	41	3.8	6.3	0.9	42.9	55.7
Chile (1997)	45	10.8	7.0	2.0	46.4	46.0
US (2003)	47	7.8	4.2	0.9	46.8	43.1
France (2001)	49	1.0	6.4	1.1	42.8	52.3
Costa Rica (2004)	40	5.0	8.8	1.9	43.1	54.2
Uruguay (1994)	42	3.7	7.3	2.4	43.8	50.6
Sweden (2003)	43	5.6	6.6	1.5	45.9	45.2
Japan (2004)	48	5.2	5.2	0.9	46.2	42.7
Thailand (2004)	40	6.2	7.4	1.9	44.2	51.5
India (1999)	50	12.5	6.4	2.1	47.8	42.1
Indonesia (1999)	45	10.2	8.6	2.9	45.2	50.3
Philippines (1999)	43	11.8	5.4	1.2	47.2	44.5
U. China (2002)	47	11.1	1.1	0.5	50.3	31.5
R. China (2002)	37	14.3	13.5	7.9	45.8	46.9

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Factors Shaping Labor Income Profile

- Mechanical decomposition

$$\left(\frac{Y}{N}\right)_a = \left(\frac{Y}{E}\right)_a * \left(\frac{L}{N}\right)_a * \left(\frac{E}{L}\right)_a$$

$$= \left(\frac{Y}{E}\right)_a * \left(\frac{L}{N}\right)_a * \left(1 - \left(\frac{UE}{L}\right)_a\right)$$

- Per capita labor income
  = Age specific productivity *
  Labor force participation rate *
  (1-Unemployment rate)

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Factors Shaping Labor Income Profile

- Per capita labor income profile depends on
  - P: Age specific productivity (concave/inverse U) (health, technological change, OJT)
  - Q: Labor force participation rates (LFPRs) by age (inverse U), working hours by age (inverse U), and unemployment rate by age
  - Institution matters (pension system, mandatory retirement practice, minimum wage, seniority-based wage system)

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Some Observations: Labor Income

- Decisions made by women, children, and elderly are very important in shaping the labor income profiles across countries and over time.
- These decisions seems to be related with the level of development.
- The share of self-employed income might be related with the level of development.

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Lifecycle Deficit and Surplus Ages

Country	Year	Early Age	Later Age	Duration
Indonesia	1996	29	58	29
Thailand	1996	26	61	35
Taiwan	1998	24	56	32
Japan	1999	29	61	32
United States	2000	27	59	32
Costa Rica	2004	24	57	33

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The End

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